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An ethnobotanical importance and phytochemical analysis of *Carica papaya* l.

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Abstract
The qualitative and quantitative phytochemical studies were carried out in the solvents *viz*. Methanol, Chloroform and n-Butanol. The Methanol, Chloroform and n-Butanol Leaves and fruit extract of *Carica papaya* L. shows the presence of alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols but in fruit of *Carica papaya* L. Total content of Alkaloid, flavonoids and phenols in the Methanol, 1.926, 0.434 and 1.641 µg/ml. respectively, in the Chloroform 1.554, 0.391 and 0.856 µg/ml. and followed by in the n-Butanol leaves extract of *Gloriosa superba* L. that was 2.045, 0.423 and 0.426 µg/ml.

Keywords: *carica papaya* l., qualitative, quantitative, phytochemicals, ethnobotanical importance etc

Introduction
Papaya (*Carica papaya* L.) belonging family *Caricaceae* and Genus *Carica* is a deliciously sweet tropical fruit with musky undertones and a distinctive pleasant aroma. It was first cultivated in Mexico several centuries ago but is currently being cultivated in most of the tropical countries.

Plant: It is a fast-growing arborescent herb, with short life; it has single straight or sometimes branched stem reaching 2-10 m height.
The stem is cylindrical spongy-fibrous, loose, hollow, gray or gray-brown colour, 10-30 cm diameter and toughened.

Leaves: The leaves are spirally arranged in a terminal cluster, simple, on petioles 30-70 cm long. The margins of the lobes are very variable, and range from entire to undulate to deeply lobed. The leaves are rounded in outline, 60-90 cm in diameter, bundled at the apex between stem and branches, long petioles; widely evident, 25-75 cm diameter, smooth, moderately palm shape with thick middle irradiant veins, the base is deeply string shape with over-imposed lobes; from 7-11 large lobed, each with a wide base or slightly constrained and sharp-pointed, and sharp apex. The bundle of leaves is dark green to yellow-green, bright, visibly marked by the off-white nerves embedded and reticulated veins; the underneath surface is pale green-yellow and opaque with visibly prominent vascular structures; the petioles are round and yellow-green, with sporadic purple or violet stains, fistulous form, fragile, 25-100 cm length and 0.5-1.5 cm thick. The lifespan of each leaf is 4 to 6 months.

Typical female flower
It is a rather large flower of conical shape when closed, when open, its five petals spread from the base. The ovary is large with circular and smooth or slightly undulated. Fruits produced by this flower are spherical or ovoid in shape. ternately arranged, Similar to the above when closed, but this type has five short anthers, which correspond in their orientation with the five petals that also spread from the base. The ovary has five deep longitudinal grooves that remain until maturity. Fruit develop a form from globular to egg-shaped.
***Fruit*:** An ovoid-oblong berry pyriform or almost cylindrical, large, fleshy, juicy, grooved along the upper longer side, green yellow to yellow or yellow-orange colour when ripen, single cell of orange or redish internal colour with many parietal seeds and a length of 10-25 cm or longer and 7-15 cm or more of diameter. Generally, the fruit is melon-like, oval to nearly round, somewhat pyriform, or elongated club-shaped, 15-50 cm long and 10-20 cm thick; weighing up to 9 kg. Semi-wild (naturalized) plants bear miniature fruits 2.5-15 cm long. The skin is waxy and thin but fairly tough. When the fruit is green and hard it is rich in white latex. As it ripens, it becomes light or deep-yellow externally and the thick wall of succulent flesh becomes aromatic, yellow, orange or various shades of salmon or red. It is then juicy, sweetish and somewhat like a cantaloupe in flavour; in some types quite musky. Attached lightly to the wall by soft, white, fibrous tissue, are usually numerous small, black, ovoid, corrugated, peppery seeds about 3/16 in (5 mm) long, each coated with a transparent
Total annual world production is estimated at 6 million tonnes of fruits. India leads the world in papaya production with an annual output of about 3 million tonnes. Other leading producers are Brazil, Mexico, Nigeria, Indonesia, China, Peru, Thailand and Philippines.
Everything in papaya plant such as roots, leaves, peel, latex, flower, fruit and seeds have their nutritional and medicinal significance.

Ethnobotanical Importance of *Carica papaya*
The nutrients and phytochemicals contained in papaya help in digestion, reduce inflammation, support the functioning of cardiovascular, immune and digestive systems and may also help in prevention of colon, lung and prostate cancers. Overall, the papaya can act as a detoxifier, activator of metabolism, rejuvenating the body and in the maintenance of body's homeostasis because it is rich in antioxidants, B vitamins, folate and pantothenic acid, and potassium and

magnesium as well as fiber. Because of its high vitamin A and carotenoids contents, it can help in preventing the cataract and age-related macular degeneration. Papaya pastes can be used externally as a treatment for skin wounds and burns. This paper discusses the nutritional and medicinal value of papaya (*Carica papaya* L.) and its relationship to human health.

Material and Methods

Collection of Plant

Collection of *Carica papaya* L. plant part were collected from Manora tehshil area, district, Washim, Maharashtra state, India. Plant part i.e., fruit and leaves cleaned soil dust with tap water. The plant material and specimens were identified by using standard floras like Cook 1907, Dhore 2005, Naik 1989, Yadav and Sardesai 2002.

Preparation of Plant Part Extract

Preparation of plant part fruit and leaves dried under shade and prepared fine powder, plant part extraction according to previously method used by Megala, and Elango, 2012, but were used some modified method in which the 5 gram of fruit and leaves dried powder extracted with 50 ml of three different solvent i.e. methanol, chloroform and n-butonol, 24 hrs at room temperature and shaking constant and then filter with Whatman filter paper no.1, excess solvent in extract evaporated and extract used for Qualitative and quantitative evaluation of phytochemicals. The preliminary screening test were performed for the presence of following secondary metabolites such as alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols (Harborne, 1973) [5] and Sofowara (2005).

According to Budhiraja, 2012, fruit and leaves powder extract in Chloroform and n-butonol solvent shows positive results of phytochemicals constituent and their activities against the anticancer and antibacterial so were used chloroform and n-butonol solvent.

Qualitative analysis of *Carica papaya* L.

Alkaloids test

The plant extract was evaporated to dryness and the residue was heated on a boiling water bath with 2% hydrochloric acid. After cooling, the mixture was filtered and treated with a few drops of Mayer's reagent. Formation of turbidity or yellow precipitation showed the presence of alkaloid.

Glycosides

Glycosides are compounds which upon hydrolysis give rise to one or more sugars (glycones) and a compound which is not a sugar (Glycone or Genine). To the solution of the extract in glacial acetic acid, few drops of ferric chloride and concentrated sulphuric acid are added, and observed for a reddish-brown coloration at the junction of two layers and the bluish green colour in the upper layer.

Terpenoids and steroids

Four milligrams of extract were treated with 0.5 ml of acetic anhydride and 0.5 ml of chloroform. Then concentrated solution of sulphuric acid was added slowly and red violet colour was observed for terpenoid and green bluish colour for steroids.

Flavonoids

4 ml of extract solution was treated with 1.5 ml of 50% methanol solution. The solution was warmed and metal magnesium was added. To this solution, 5 – 6 drops of concentrated hydrochloric acid was added and red colour was observed for flavonoids and orange colour for flavones.

Saponins

0.5 g of extracts was added to 5 ml of distilled water in a test tube. The solution was shaken vigorously and observed for a stable persistent froth. The frothing was mixed with 3 drops of olive oil and shaken vigorously after which it was observed for the formation of an emulsion.

Phenols

The extract (50 mg) is dissolved in 5 ml of distilled water. To this few drop of neutral 5% ferric chloride solution are added. A dark green colour indicates the presence of phenolic compounds. 3

Tannins

To 0.5 ml of extract solution 1 ml of water and 1-2 drops of ferric chloride solution was added. Blue colour was observed for Gallic tannins and green black for catecholic tannins.

Quantitative analysis of *Carica papaya* L. plant parts

Preparation of plant extracts for quantitative determination of alkaloids 5 gm of powdered plant material was taken into 20 ml of n-butanol and vigorously stirred. The content was transferred into a reagent bottle. The slurry was kept overnight at room temperature. Then it was centrifuged at 6000 rpm for 10 min and the supernatant was made up to 50 ml with n-butanol

Estimation of total alkaloids by titrimetric methods Plummer, 2013 and Debnath *et al.* 2015.

Obtained supernatant of the plant sample was used for the estimation of total alkaloids by titrimetric methods. 10 ml of the supernatant was taken into a100 ml separating funnel. 10 ml of 0.1 (N) HCl was added and shaken thoroughly for 2-3 min. This results in the solubility of alkaloids. The lower layer contains alkaloids neutralized with 0.1 (N) HCl and the upper layer contains n-butanol. 10 ml HCL portion was collected in a beaker and 2-3 drops methyl red was added to it, that turns the solution into slightly reddish colour. The contents of beaker were titrated against 0.1 (N) NaOH, till colour change changed from red to pale yellow. The neutralization point was determined. Same procedure was repeated triplicate. The total amount of alkaloids was calculated by considering the following equivalent:

1 ml 0.1N HCl ≡ 0.0162 g alkaloid

Estimation of Total Phenolic Content

Total phenol content of *Carica papaya* L. was assayed by modified Dewanto *et al.*, 2002 and Jothi *et al.*, 2019 procedure. The different concentrations of 10µg, 20µg, 40µg, 60µg, 80µg, and 100 µg were using an aliquot of diluted extract and added to 0.25mL of Folin Ciocalteu reagent. The elucidation was adjusted with distilled water to a final volume of 3mL and shaken thoroughly. The solution was incubated and kept in the dark placed and read at 760nm was read against prepared blank. The total phenol content of plant parts was expressed as milligrams of gallic

acid equivalents per gram of dry weight. The total sample was analyzed in three replicates.

Estimation Total Flavonoid Content

Total Flavonoid content in *Carica papaya* L. whole plant extract was analysed by the aluminum chloride colorimetric system M.M Mervat, *et al* 2009 and Jothi *et al*., 2019. 0.5ml of entire plant extract of at different concentrations like 10µg, 20µg, 40 µg, 60 µg, 80 µg, and 100 µg were taken and the final volume was made up to 3mL with methanol. After that, 0.1ml AlCl3 (10%), 0.1ml of potassium acetate and 2.8ml of distilled water were added continuously and test solution was vigorously shaken. After 30 minutes for the incubation periods, absorbance was recorded at 415 nm. The concentration of flavonoids in test samples was calculated and expressed as the equivalent of quercetin (QE) / g of sample. The entire sample was analysed in three replicates.

Fig 1: Papaya Plant

Fig 2: Papaya plant with Fruits

Fig 3: Dreied powder of papaya

Fig 4: Fruit dried powder

Fig 5: Dried Powder dissolved solvent

Fig 6: Extraction in Soxhlet apparatus

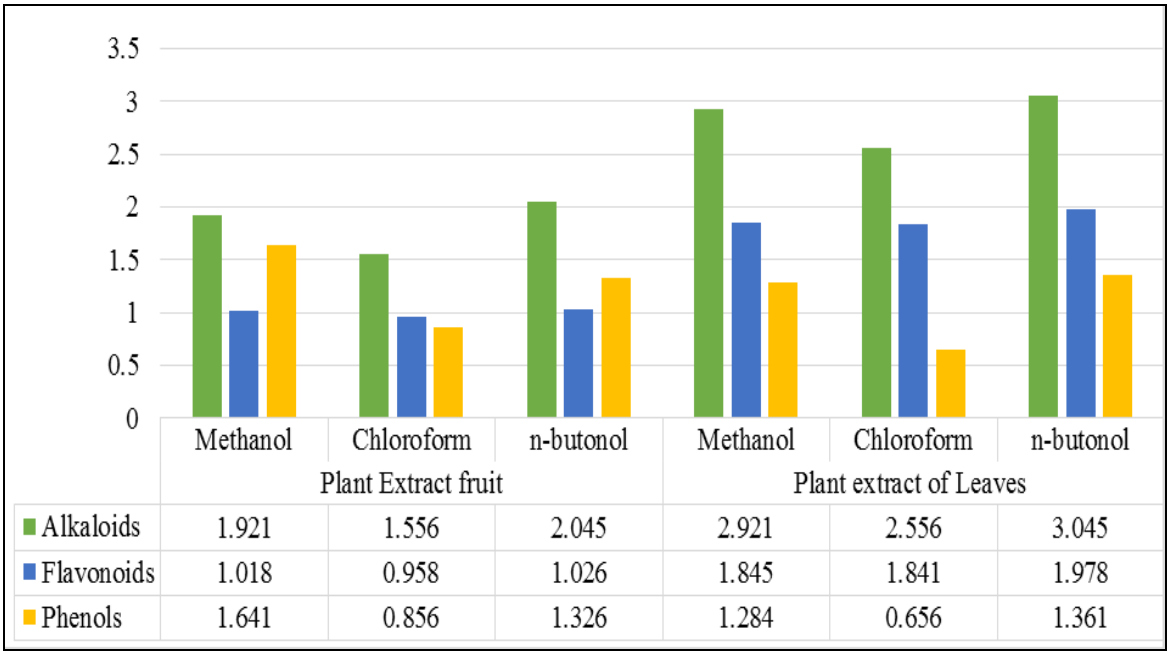
Results, Discussion and Conclusion

Table 1: Qualitative analysis of *Carica papaya* L. Fruit and leaves

Sr. No.	Phytochemical	Plant extract of leaves in			Plant extract of fruit in		
		Methanol	Chloroform	N-Butonol	Methanol	Chloroform	n-butonol
1.	Alkaloids	++	++	++	++	+	+

2.	Glycosides	++	+	++	+	+	+
3.	Terpenoids	+	++	+	+	+	+
4.	Steroids	++	+	++	++	+	+
5.	Flavonoids	++	++	++	++	+	+
6.	Saponins	++	++	++	+	++	++
7.	Phenols	++	+	++	++	+	-
8.	Tannins	++	++	++	-	+	-

Quantitative analysis of *Carica papaya* L. plant parts, (leaves and Fruit µg/ml)



	Plant Extract fruit			Plant extract of Leaves		
Alkaloids	1.921	1.556	2.045	2.921	2.556	3.045
Flavonoids	1.018	0.958	1.026	1.845	1.841	1.978
Phenols	1.641	0.856	1.326	1.284	0.656	1.361

Fig 7

Results taken average of triplicates for different concentration of plant extract.

The qualitative phytochemical studies were carried out in the solvents *viz*. Methanol, Chloroform and n-Butanol. The Methanol, Chloroform and n-Butanol Leaves and fruit extract of *Carica papaya* L. shows the presence of alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols but in fruit of *Carica papaya* L. high intensity of phytochemicals than that of leaves showed in table no.1 by twice and tannin absence in methanolic fruit and n-butanol extract of leaves. Also, the quantitative studies were carried out in the same solvent mentioned above, Alkaloid content in fruit of *Carica papaya* L. that was 2.921, 2.546 and 3.045 µg/ml respectively, and total flavonoids in fruit, 0.845, 0.641 and 0.978 µg/ml respectively and also followed by total content of phenols that was 1.284, 0.652 and 1.361 µg/ml.

Total content of Alkaloid, flavonoids and phenols in the Methanol, 1.926, 0.434 and 1.641 µg/ml. respectively, in the Chloroform 1.554, 0.391 and 0.856 µg/ml. and followed by in the n-Butanol leaves extract of *Gloriosa superba* L. that was 2.045, 0.423 and 0.426 µg/ml.

Discussion

Papaya is a small, frost-tender, succulent, broadleaved evergreen tree that bears papaya fruits throughout the year. Each tree typically has a single, unbranched, non-woody trunk bearing the scars of old leaf bases. The trunk is topped by an umbrella-like canopy of palmately lobed leaves. Large, fleshy, melon-like fruits (papayas) hang in clusters attached to the trunk top just under the leaf canopy. Papaya typically grows to 6 - 20' tall (container plants to 10' tall) and is most noted for its edible melon-like fruit. Papaya tree sometimes branches due to injury and it contains white latex in all parts. The stem is cylindrical, 10 - 30 cm in diameter, hollow with prominent leaf scars and spongy-fibrous tissue. It has an extensive rooting system (Orwa *et al*., 2009) [2]. Leaves spirally arranged, clustered near apex of the trunk; petiole up to 1 m long, hollow, greenish or purplish-green (Fig. 4); lamina orbicular, 25 - 75 cm in diameter, palmate, deeply 7- lobed, glabrous, prominently veined; lobes deeply and broadly toothed (Orwa *et al*., 2009) [2]. The species plants are typically dioecious (hermaphroditic), and maple trees are uncommon. Hermaphrodite trees (flowers with male and female parts) are the commercial standard, producing a pear-shaped fruit. These plants are self-pollinated (Jari, 2009). Flowers tiny, yellow, funnel-shaped, solitary or clustered in the leaf axils, of 3 types; female flowers 3 - 5 cm long, large functional pistil, no stamens, ovoid-shaped ovary; male flowers on long hanging panicles, with 10 stamens in 2 rows, gynoecium absent except for a pistil lode; hermaphrodite flowers larger than males, 5-carpellate ovary; occurrence depends on the season or age of the tree (Orwa *et al*., 2009) [9]. The female flowers give way to smooth-skinned green fruits that ripen to yellow-orange with a yellow to pinkish-orange flesh and central cavity of pea-sized black seeds. However, several distinct varieties of papaya have been mentioned (Richharia, 1957; Sen, 1939) [12], which vary in shape and size of fruits, height of plants, etc.

Papaya is considered one of the most important fruits because it is a rich source of antioxidant nutrients (e.g.,

carotenes, vitamin C, and flavonoids), the B vitamins (e.g., folate and pantothenic acid), minerals (e.g., potassium and magnesium), and fibre (EDI, 2012). Papaya plant is laticiferous as they contain specialized cells known as laticifers. The lactifiers secrete latex and are dispersed throughout most plant tissues. The papaya latex is well known for being a rich source of the four cysteine endopeptidases namely papain, chymopapain, glycyl endopeptidase and caricain (Azarkan *et al*., 2003) and the content of latex may vary in fruit, leaves and roots. As the papaya fruit ripen, the amount of laticifers cells that produces latex decreases (OECD, 2005). Therefore, ripe papaya contains less latex and other constituents. The richness of enzymes in papaya juice has been known since 1878 (Witmann, 1978). The most important enzyme papain was characterized in 1968 (Drenth *et al*., 1968). The enzymes chymopapain and papaya protease III were characterized in the 1980s of the last century (Jacquet *et al*., 1989; Zucker et al., 1985) [7] these two important compounds like papain and chymopapain are supposed to aid in digestion and therefore they are widely used to cure the digestive disorders. In addition, papain is used in meat tenderizing, pharmaceuticals, beauty products, and cosmetics (EDI, 2012). Besides, it has been used in brewing and wine making, and in the textile and tanning industries. It is also used to treat arthritis. It is important to note that the level and amount of the chemical compounds vary in the fruit, latex, leaves, and roots. The phytomedicine contents of the 100 gm of leaf, young fruit. In addition, plant parts from male and female trees differ in the quantity of the compounds. For example, phenolic compounds tend to be higher in male trees than female trees. The amount of fresh papaya latex and dry latex (crude papain) also vary with the gender and age of the tree. Female and hermaphrodite trees yield cruder papain than the male trees and the older fruit yields more than the younger fruit. However, the activity of the papain is higher in the extracts from the younger fruit than the older fruit. Cultivars also vary in the quantity of the compounds (Cornel University, 2009). A recent study has reported that the green, yellow and brown leaves of papaya contain various phytochemicals, vitamins and minerals composition (Ayoola and Adeyeye, 2010) [2]. Therefore, the papaya leaves can be seen as a potential source of useful food and drug items.

The HIV infected/ immune compromised individuals are extremely vulnerable to opportunistic infections and these infections can be prevented by specialized nutritional supplement in terms of ingesting phytonutrient-rich fruits particularly papaya very regularly. Since papaya is a gifted nutraceutical plant, it offers an opportunity for controlling various diseases, particularly neurodegenerative diseases and in AIDS management (Bonuccelli, 2012). Recent studies indicate that the papaya may hold the cure to the deadly AIDS virus. Researchers in the Philippines believe that eating papaya could help in boosting the immune system and can reduce the viral load of HIV in some patients. Papaya juice is sometimes used in pharmaceuticals as it can be used to remove blemishes. Latex obtained from unripe fruits is used in folk medicine to treat warts and corns (Dass, 2010) [3]. Fermented papaya preparation (FPP) (a product of yeast fermentation of C. papaya) is a food supplement. folk medicine reportedly uses papaya as an herbal remedy for the management of sickle cell anaemia. The results indicate that the previously reported anti-sickling properties of papaya may be due to the inherent antioxidant nutrient composition, thus supporting the claims of the traditional healers and suggests a possible correlation between the chemical composition of the papaya plant and its uses in traditional medicine as an ant sickle cell anemia agent (Imaga *et al*., 2010) [6]. In addition, Oduola *et al*. (2006) has described about the anti-sickling activity of unripe papaya extracts that the anti-sickling and reversal of sickling activities reside in the ethyl acetate fraction that prevents the sickling of haemoglobin of the sickle cell patients.

Conclusion

Carica papaya L. is the rich source of phytochemicals, alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols. Its extraction in n-butanol solvent shows highest intensity and content of phytochemicals.

So, *Carica papaya* L. of plant presence different phytochemical compounds useful for Further purification, identification and characterization of the active compounds of would be our priority in future studies.

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VUV investigation of blue emitting $MAl_{12}O_{19}$: Eu (M = Ca, Sr, Ba) phosphors synthesized by combustion method

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VUV investigation of blue emitting $MAl_{12}O_{19}$: Eu (M = Ca, Sr, Ba) phosphors synthesized by combustion method

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Abstract. Synthesis of europium doped alkaline earth aluminates $MAl_{12}O_{19}$ [M=Ca, Sr, Ba] by low temperatures (500ºC) solution combustion method. It corresponds to maintain the ratio of metal nitrate and urea solution mixtures. The characterization of Eu doped $MAl_{12}O_{19}$ [M=Ca, Sr, Ba] materials were done by X-ray diffraction, scanning electron microscope analysis and the optical properties were studied under 147 nm and 172 nm from synchrotron radiation excitation. The Eu-doped $MAl_{12}O_{19}$ phosphor shows broad and strong absorption in VUV region and exhibits intensive emission in blue region. The $CaAl_{12}O_{19}$: Eu^{2+} shows strong blue emission band at 414 nm while in $SrAl_{12}O_{19}$:Eu^{2+} two emission peaks are observed at about 395 nm and another around 418 nm. Both $CaAl_{12}O_{19}$: Eu^{2+} and $SrAl_{12}O_{19}$:Eu^{2+} display two very weak red emission bands at 592, 613 and 591, 613 nm respectively due to co-existence of Eu^{3+}. $BaAl_{12}O_{19}$: Eu^{2+} phosphor shows emission around 440 nm in the blue region of the spectrum.

Keywords: $MAl_{12}O_{19}$: Eu^{2+} (M=Ca, Sr, Ba); Combustion synthesis; VUV; Photoluminescence.

1. Introduction

The development of VUV radiation excited luminescence materials has attracted much attention with their potential industrial applications such as mercury-free fluorescent lamps, plasma display panels (PDPs) etc [1]. In these applications the luminescence materials are excited by the radiation lines of Xe atoms at 147 nm and a molecular Xe at 172 nm to emit visible luminescence, therefore high luminous efficiency; thermal stability, radiation resistivity and narrow size distribution are required for the luminescence materials [2]. Some oxide compounds with aluminate, borate and silicate groups have a strong absorption in the VUV region. Recently, compounds of the aluminate doped with rare earth ions family seem to be promising for high luminescent efficiency and good thermal stability [3–7].

Alkaline-earth aluminate materials are one of the important luminescence materials are use in luminescent devices [8-10]. Recently, increasing attention is being paid to binary hexa-aluminate phosphors owing to their application in opto-electronics [11-13]. Hexa-aluminate based materials have also found application in the field of nuclear waste storage [14]. Further, porous hexa-aluminate ceramics

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are expected to be used as light structural components and catalyst carriers at high temperatures [15]. The phosphors with rare-earth doped alkaline-earth aluminates systems fall into three broad classes:
1. Binary alkaline earth aluminates such as $SrAl_2O_4$.
2. Alkaline earth hexa aluminates related to magnetoplumbite and beta-alumina and their superstructures.
3. Rare earth hexa aluminates with the magnetoplumbite structure.
With a variety of activators were used, the most important among them are Eu^{2+}, Ce^{3+}/Tb^{3+}, and to a lesser extent, Mn^{2+} [9]. Eu^{2+} activated phosphors MAl_2O_4 and $MAl_{12}O_{19}$ (M =Sr, Ba, Ca, Mg) are well known since the studies by Blasse [16]. Their researches lead to the conclusion that these compounds were adequate phosphorescent materials because of their high quantum efficiency in the visible region. The binary hexa aluminates are compounds with the formula $MAl_{12}O_{19}$ where M= Ca and Sr have the magnetoplumbite structure [17,18]. But $BaAl_{12}O_{19}$ does not exist and instead there are two compounds, one deficient in barium and one with excess barium, that were shown to have the beta-alumina structure [19–21].

Various researchers have reported hexagonal alkaline earth aluminates ($MAl_{12}O_{19)}$ doped by divalent europium as efficient photoluminescent materials with a blue emission which is characterized by high quantum efficiency under UV region [9,16, 22-24]. Literature reveals that very few report exist about photoluminescence studies of europium doped alkaline earth aluminates of $MAl_{12}O_{19}$ (M:Ca, Sr, Ba) type phosphors under Vacuum Ultra Violet (VUV) mainly at 147 and 172 nm excitation. Therefore, the massive photoluminescence potential in Eu doped $MAl_{12}O_{19}$ type alkaline earth aluminates is interesting to study the materials for VUV applications.

In this report, we have successfully employed a relatively low temperature, fast, simple and safe solvent combustion process for the preparation of Eu^{2+} doped $MAl_{12}O_{19}$ [M=Ca, Sr, Ba] phosphors. Also the main emphasis on VUV studies of the synthesized samples under 147/172 nm synchrotron radiation excitation. The prepared phosphor has been further characterized by X-ray diffraction (XRD) and scanning electron microscopy (SEM) techniques.

2. Experimental

2.1. Synthesis

The $(Ca, Sr, Ba)_{1-x}Al_{12}O_{19}:Eu_x$ (x = 5%) phosphor doped with Eu ions were prepared through a low temperature solution combustion synthesis. It is a simple, time saving and cost effective method [25]. The starting material were taken as aluminium nitrate [$Al(NO_3)_3 .9H_2O$], alkaline earth metal nitrates like $M(NO_3)_2$ (M=Ca, Sr, Ba). Europium nitrate was prepared by dissolving europium oxide [Eu_2O_3] in nitric acid.

All the reagents were analytical purity and used without further purification. For a quick material screening, material elaboration was done following the flow chart given in **Fig. 1.** The correct amount of each excess urea [$CO(NH_2)_2$] were injected into the precursor solution or these compositions. The amount of metal nitrates (oxidizers) and urea (fuel) were calculated using the total oxidizing and reducing valencies of the components, which serve as the numerical coefficients so that the equivalence ratio is unity and the heat liberated during combustion is at a maximum. After stirring for about 15 min, precursor solution was transferred to a furnace preheated to 500°C. Initially, the solution underwent dehydration followed by decomposition with the evolution of large amounts of gases. The mixture then froths and swells forming foam, which ruptures with a flame and glows to incandescence. During incandescence the foam further swells to the capacity of the container. The entire combustion process completes within 5 min leading to the foamy porous products. The foamy and voluminous combustion product was easily crushed into powder using pestle and mortar. The prepared $(Ca, Ba, Sr)_{1-x}Al_{12}O_{19}:Eu_x^{3+}$ samples were post-treated at 1000^oC under a reducing atmosphere of activated carbon for 6h. The obtained white colored powdered products were used for further analysis.

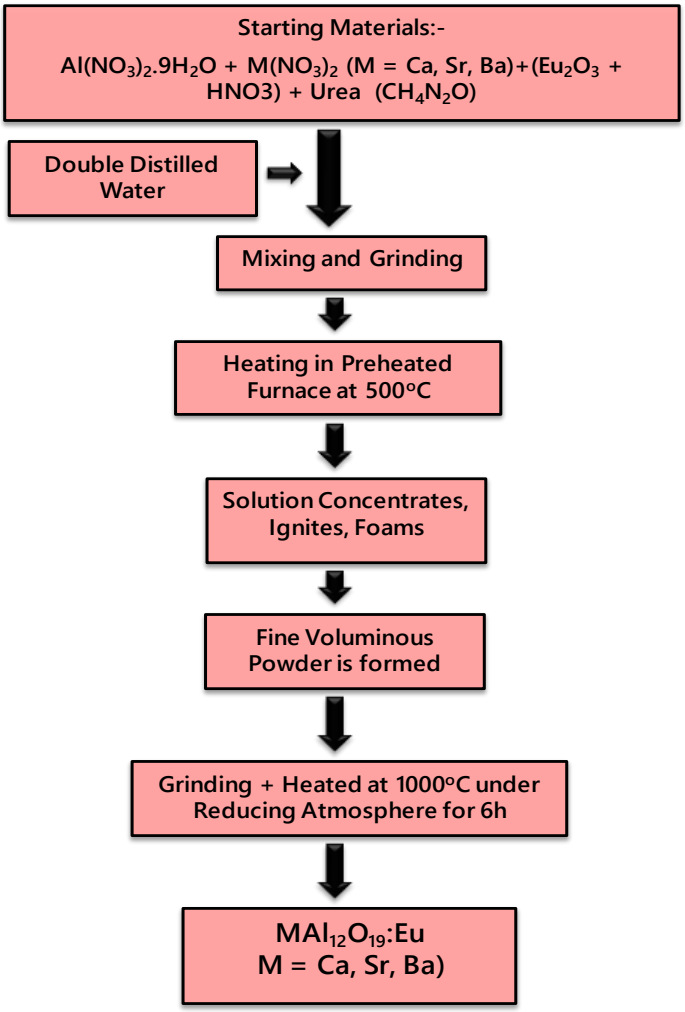

Fig.1. Flow chart for the quick material screening applied in this study

2.2 Characterizations

The X-ray diffraction (XRD) pattern of host sample of $MAl_{12}O_{19}$: Eu (M=Ca, Sr, Ba) was recorded on Rigaku miniflex X-ray diffractometer with scan speed 2.000 deg/min and with Cu Kα radiation. The morphology of the phosphor particles was studied by using Hitachi model S-4800 type-2 field emission scanning electron microscope and elemental analysis by Bruker EDS. The VUV spectra were recorded at Department of Physics S.G.B. Amravati University, Amravati by using remote access mode of Beamline 4B8 in Beijing synchrotron radiation facilities (BSRF) under dedicated synchrotron mode (2.5 GeV, 150-60mA). A 1 m Seya monochromator (1200 g/mm, 120–350nm, 1 nm bandwidth) was used for the synchrotron radiation excitation spectra measurement, and an Acton SP-308 monochromator (600 g/mm, 330–900nm) was used for the emission spectra measurement. The signal was detected with a Hamamatsu H8259-01 photon counting unit. The vacuum in the sample chamber was about 1×10^{-5} mbar. The effect of the experimental set-up response on the relative VUV excitation intensities of the samples were corrected by dividing the measured excitation intensities of the samples with the excitation intensities of sodium salicylate (o-$C_6H_4OHCOONa$) measured simultaneously in the same excitation conditions. The region of excitation spectra was from 100 nm to 300 nm and the emission spectra recorded at 147 and 172 nm excitation.

3. Results and discussion

3.1. X-ray diffraction

X-ray diffraction pattern (Fig. 2a, b, c) shows the Bragg diffraction peaks of europium-doped $CaAl_{12}O_{19}$, $SrAl_{12}O_{19}$ and $BaAl_{12}O_{19}$ phosphors synthesized by solution combustion synthesis. The XRD results indicated that the as synthesized products are highly pure, single-phase. The XRD peaks of doped and undoped $CaAl_{12}O_{19}$, $SrAl_{12}O_{19}$ and $BaAl_{12}O_{19}$ are similar since the level of impurity doping is low (5 mol%) in the $CaAl_{12}O_{19}$, $SrAl_{12}O_{19}$ and $BaAl_{12}O_{19}$ host lattice. The binary hexa aluminates ($SrAl_{12}O_{19}$ and $CaAl_{12}O_{19}$) have the magnetoplumbite structure [17, 18]. In comparison, the compound $BaAl_{12}O_{19}$ does not exist and instead there are two compounds, one with excess barium an done deficient in barium, and that were shown to have the beta alumina structure [19]. Both the samples of $CaAl_{12}O_{19}$, $SrAl_{12}O_{19}$ synthesized and post treated in reduced atmosphere exhibit almost identical XRD patterns corresponding to the pure hexagonal magnetoplumbite phase of $CaAl_{12}O_{19}$and $SrAl_{12}O_{19}$ matching perfectly with the JCPDS Card No.26-976.

The XRD pattern for $BaAl_{12}O_{19}$ deviates from ideal magnetoplumbite pattern due to the presence of secondary phase as $BaAl_2O_4$ in $BaAl_{12}O_{19}$ system. The fact is reported in the literature [26, 27] that phase-pure $BaAl_{12}O_{19}$ does not exit always, except as a mixture of two distinct non stoichiometric phases, referred to as phase I and phase II by Kimura *et al.* [19]. More recently, Wang and *et al.* [28] reported presence of secondary phase as $BaAl_2O_4$ in $BaAl_{12}O_{19}$ system. It is observed that even after calcination at 1000°C under reduced atmosphere along with the dominate diffraction peaks due to the hexagonal $BaAl_{12}O_{19}$ (JCPDS, File-26-0135) phases, in addition the sample demonstrate weak reflex ion lines belonging to $BaAl_2O_4$ phase. XRD pattern for our sample of $BaAl_{12}O_{19}$ is similar to obtained by other authors matching perfectly with the JCPDS, File-26-0135.

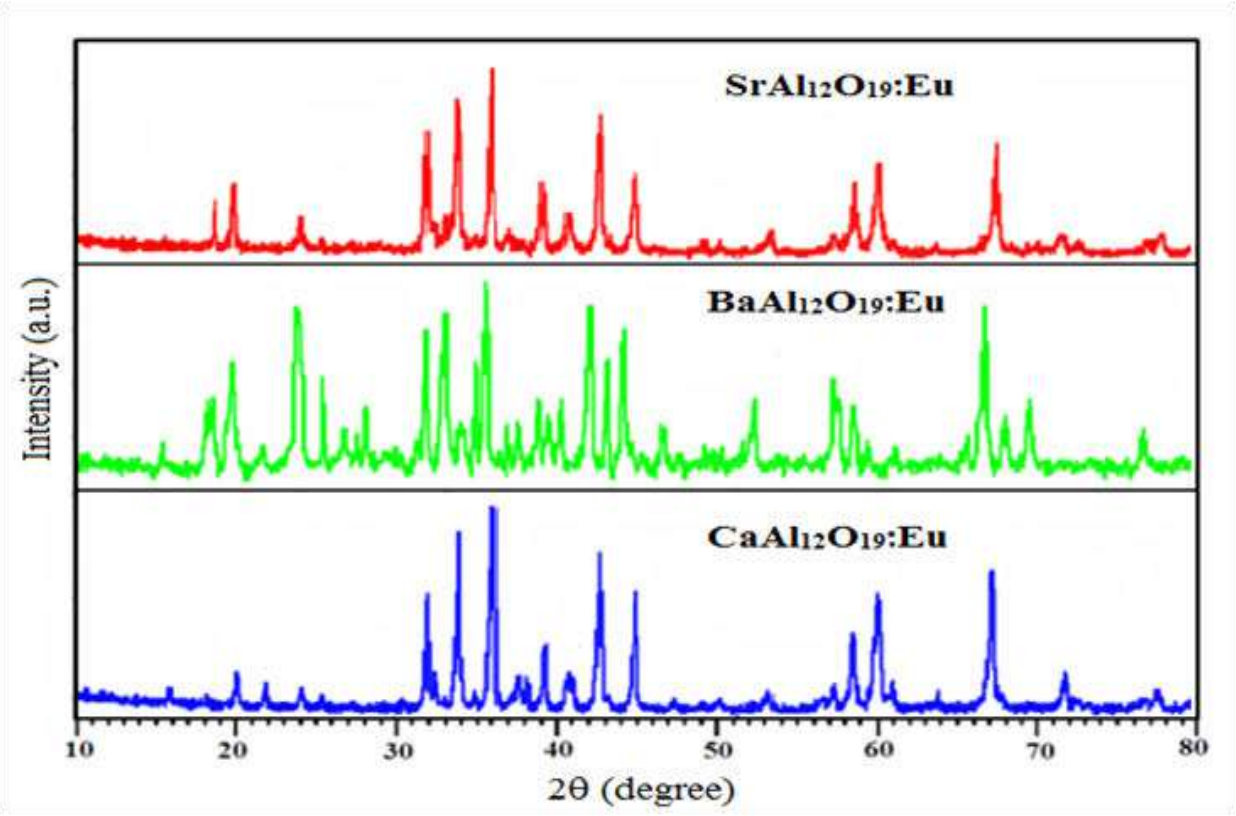

Fig.2. Powder XRD pattern of $MAl_{12}O_{19}$:Eu

3.2. Scanning electron microscopy

Fig. 3, displays an SEM micrograph of a europium doped $MAl_{12}O_{19}$ powder prepared by combustion method and post treated at 1000^{o}C under reduced atmosphere. Fig 3a, b and c represent SEM micrograph of $CaAl_{12}O_{19}$:Eu, $SrAl_{12}O_{19}$:Eu and $BaAl_{12}O_{19}$:Eu respectively. Almost all the three materials display highly agglomerated foamy and porous surface morphology with average particle size in between 5–10 μm. These types of features are inherent in combustion derived powder and are formed due to large number of escaping gases during combustion. The morphology of the prepared (Fig. 3a–c) powder also displays faceted plates of varying sizes and shapes. This irregularity in sizes and shapes is caused by the non-uniform distribution of temperature and mass flow during combustion [23].

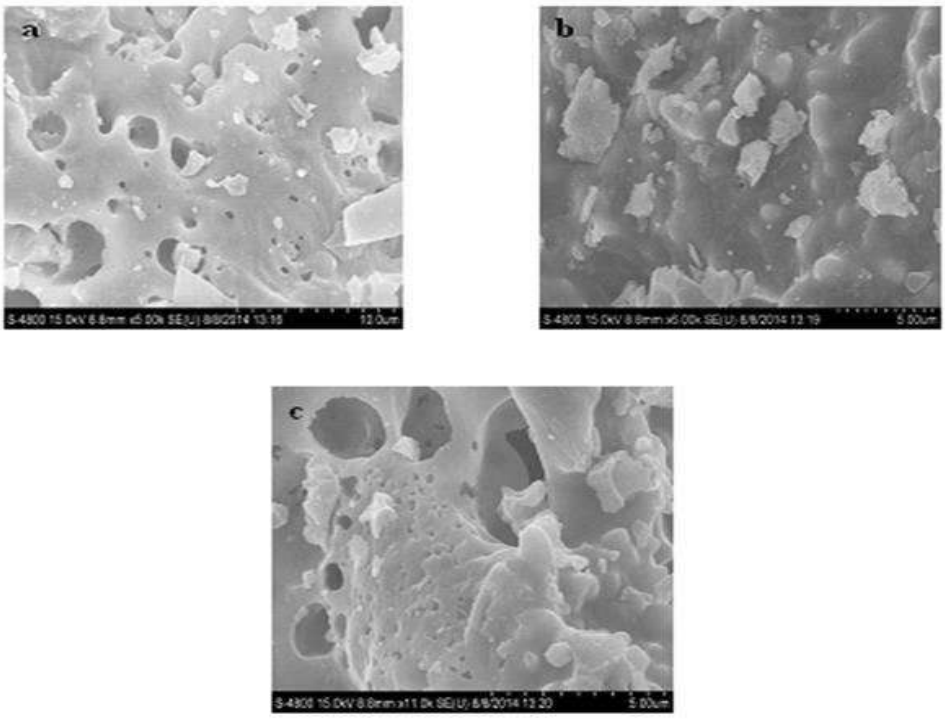

Fig.3. SEM Images of **a.** $CaAl_{12}O_{19}$:Eu, **b.** $SrAl_{12}O_{19}$:Eu and **c.** $BaAl_{12}O_{19}$:Eu Phosphors

3.3. Photoluminescence studies

Europium ions can be stabilized in host lattice in either divalent or trivalent oxidation state. The incorporation and stabilization of Eu ions in the sample were confirmed by the luminescence investigations. The photoluminescence excitation, emission spectra for the $M_{1-x}Al_{12}O_{19}$: Eu_x (M = Ca, Sr, Ba) (x = 5 mol %) phosphors post treated under reduced atmosphere are studied at 147 and 172 nm excitation shown in **Fig. 4 a-c**. The VUV spectrum of the $CaAl_{12}O_{19}$: Eu (5 mol %) sample for excitation at 147 and 172 nm is shown in **Fig. 4a.** The emission spectrum reveals one strong band at 414 nm and two very weak bands at 592 and 613 nm. Similarly for $SrAl_{12}O_{19}$: Eu (5 mol %). In **Fig.4b,** two emission peaks were recognized one with low intensity at 395 nm and other with slightly higher intensity at 418 nm and two very weak bands at 591 and 613nm.

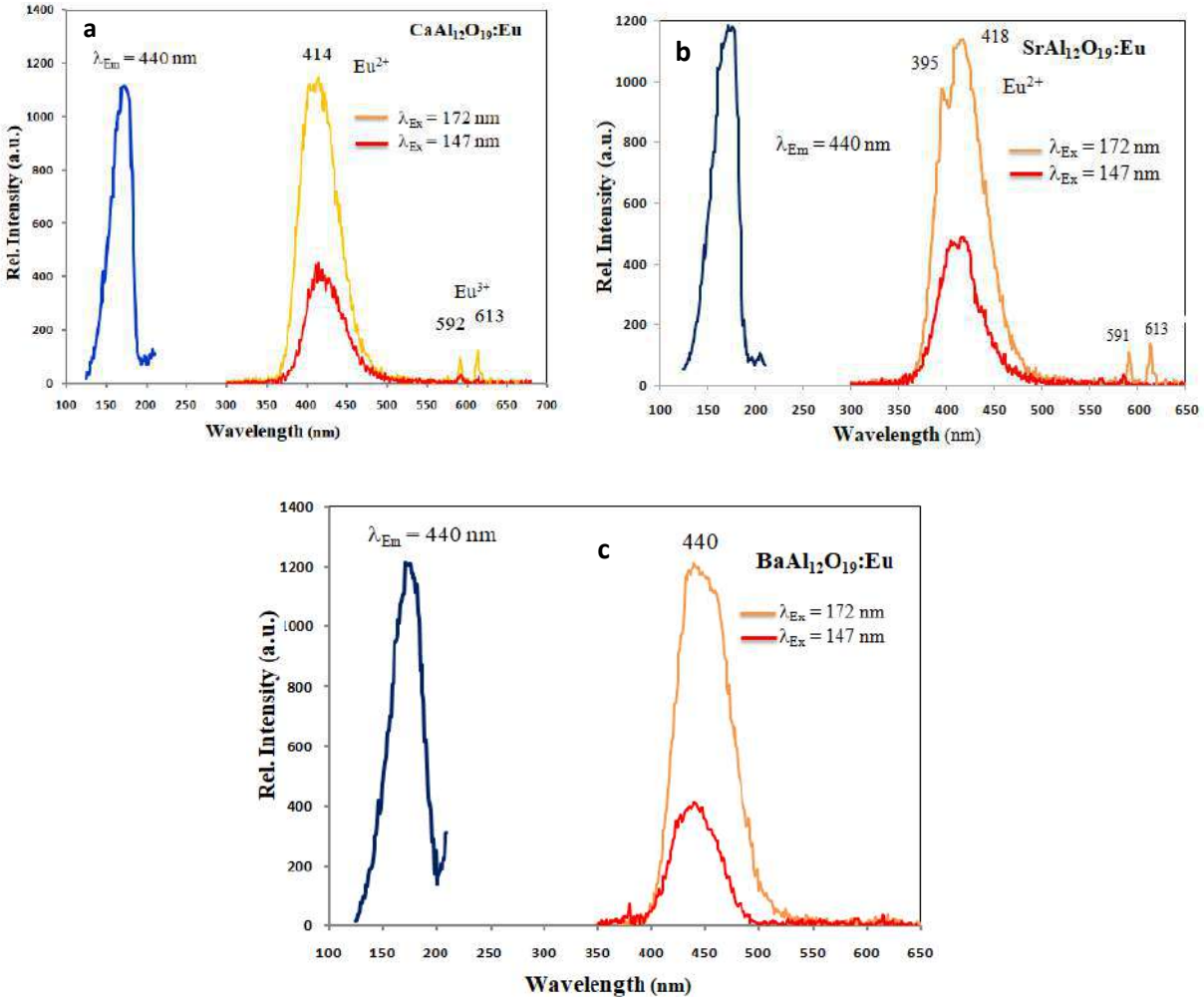

Fig.4. Excitation and emission spectra of $MAl_{12}O_{19}$:Eu (M=Ca, Sr, Ba) phosphor at 172 and 147nm .

The intense excitation observed in the VUV region is associated with 4f→5d electronic transitions. The excitation bands at 172 nm are due to the $4f^7$ ($^8S_{7/2}$) →$4f^6$ 5d transitions. The emission band observed at 414 nm in $CaAl_{12}O_{19}$: Eu and 395 and 418 nm in $SrAl_{12}O_{19}$: Eu, is due to the transition of Eu^{2+} from excited state of $4f^6$ $5d^1$ configuration to the ground state $^8S_{7/2}$. It is obvious from Fig. 4a and Fig. 4b that emission bands almost of same intensity which is characteristic of Eu^{3+} ions are also present in $CaAl_{12}O_{19}$: Eu and $SrAl_{12}O_{19}$: Eu samples. The emission spectra of $CaAl_{12}O_{19}$: Eu peaking at 592 nm and 613 nm and also emission spectra of $SrAl_{12}O_{19}$:Eu peaking at 591, 613 nm are due to $^5D_0$-$^7F_1$ and$^5D_0$-$^7F_2$ transitions, respectively. The excitation and emission spectra of $BaAl_{12}O_{19}$:Eu as- prepared phosphor are shown in Fig. 4c. The broad excitation spectral band is observed at 172 nm. On excitation at 147 and 172 nm the emission spectrum exhibits a well defined asymmetric band with maximum at 440 nm emitting a blue light. Further, it is interesting to note that when all the prepared samples were exited at 172 and147 nm the emission spectrums are recorded at same wavelengths as discussed earlier but there is difference in intensity of emitted spectrum. The intensity of the emission band is excited by 172 nm is 60% more than those excited by 147 nm and this trend is repeated in all the $MAl_{12}O_{19}$: Eu (M = Ca, Sr, Ba) samples synthesized. **Fig. 4 a - c** shows the relative emission intensity of $CaAl_{12}O_{19}$: Eu, $SrAl_{12}O_{19}$: Eu and $BaAl_{12}O_{19}$:Eu phosphors as a function of Eu doping concentration respectively. All the $MAl_{12}O_{19}$: Eu (M = Ca, Sr, Ba) phosphors were annealed at 1000◦C reduced atmosphere and the emission spectra were obtained at room temperature under 147 and 172nm excitation. Vijay Singh *et al*. have earlier reported the similar Eu^{2+} emission band at about413 nm and very low intensity Eu^{3+} emission band about at 591 and 614 nm in $CaAl_{12}O_{19}$ phosphor [29].

4. Conclusions

Based on the results presented above, the following conclusions may be highlighted:
1. The present VUV investigation on europium-doped $MAl_{12}O_{19}$(M=Ca, Sr, Ba) phosphor prepared via a combustion method indicates that europium ions are present both in divalent as well as trivalent oxidation state in the $CaAl_{12}O_{19}$:Euand $SrAl_{12}O_{19}$:Eu samples.
2. The Eu-doped $MAl_{12}O_{19}$ phosphor shows broad and strong absorption in VUV region and exhibits intensive emission in blue region. The $CaAl_{12}O_{19}$: Eu^{2+} shows strong blue emission band at 413 nm while in $SrAl_{12}O_{19}$:Eu^{2+} two emission peaks are observed at about 389 nm and another around 420 nm. Both $CaAl_{12}O_{19}$: Eu^{2+} and $SrAl_{12}O_{19}$:Eu^{2+} display two very weak red emission bands at 592, 613 and 591, 613nm respectively due to co-existence of Eu^{3+} and $BaAl_{12}O_{19}$: Eu^{2+} phosphor shows emission around 460 nm in the blue region of the spectrum.
3. Our work shows that the solution combustion synthesis technique is reliable and can be successfully used to produce pure, crystalline calcium aluminates, with good compositional control of the powders produced. The major advantages of the combustion process are it is easy to synthesis, fast and low cost method.
4. The emission spectra for 172 nm excitation are 3 times superior to 147 nm excitation. These results shows that the $MAl_{12}O_{19}$: Eu (M = Ca, Ba, Sr) phosphor exhibit potential application in the VUV region.

Acknowledgements

We are grateful to 4B8 VUV spectroscopy beamline scientists of Being Synchrotron Radiation Facility (BSRF), China for providing access in recording VUV on Beamline 4B8 under dedicated synchrotron mode by using remote access mode. The authors are also thankful to the Chairman FIST-DST Project, for providing XRD facility for this work.

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Aldo-Keto Gel Synthesis and Photoluminescence Properties of $YVO_4:Eu^{3+}$ Microsphere

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ABSTRACT

The Eu^{3+} doped YVO_4 phosphor synthesized via simple aldo-keto gel method by using Benzaldehyde and Acetone which then compared with conventional solid state diffusion. Powder X-ray diffraction (XRD) and field emission scanning electron microscopy (FE-SEM) studies indicate that the prepared samples were well crystalline and free from organic impurities. However, the nature of as-prepared phosphor by using aldo-keto gel method does not having any agglomeration. Further photoluminescence (PL), photoluminescence excitation (PLE) spectra and decay curves were superior as compared to solid state diffusion method.

Keywords: Aldo-keto gel method; aldehydes and ketones; spherical particle, PL properties; CIE diagram.

I. INTRODUCTION

Yttrium based materials doped with europium (III) have attracted more attentions among the many researcher group because these are important excellent commercial red-emitting phosphors used in various applications such as color television, the cathode ray tube and plasma display panel [1-3] due to its high quantum efficiency, dip red color purity, and high thermal stability [4]. Among all these yttrium based phosphors, the Eu^{3+} doped YVO_4 is still more demanding in the field of luminescence for the upcoming research because, its wide band gap. Also, absorption spectrum of YVO_4 shows strong and broad bands in the ultraviolet (UV) region [5].

The effect of synthesis method is important in the rare earth doped host lattice because luminescence efficiency is depending on nature of particles (agglomerated or un-agglomerated) [6]. A lot of efforts have been focused on the enhancement in luminescent properties of $YVO_4:Eu^{3+}$ phosphor with non agglomerated and narrow particle size. For the synthesis of phosphors, a variety of conventional and non conventional techniques have been adopted. The conventional method such as solid-state reaction is required lot of time with high temperature for preparation of phosphor [7]. Therefore, there is need to synthesis of such a phosphors at low temperature. The particle size of material prepared by solid state method is in the range of few micrometers and non homogeneous nature of as-prepared phosphor particle size.

All conventional and non conventional synthesis approach is sophisticated synthesis techniques for preparation of $YVO_4:Eu^{3+}$, but suffers with drawback. Because precursor require for synthesis is very costly and other additive chemical required for these methods are very expensive which leads to increase cost of application devices. Therefore in progressive

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research we developed a novel synthesis technique for preparation of phosphors.

Inspiring from the above discussions, the present work planned to study the luminescent properties of $YVO_4:Eu^{3+}$ phosphor synthesized by using aldo-keto gel method and compared with very famous method is known as solid state diffusion.

II. METHODS AND MATERIAL

2.1 Solid state diffusion

The phosphor YVO_4: Eu^{3+} was synthesized by solid state methods with Eu concentration 0.01 mole. The precursor Y_2O_3 (99.99%, AR), NH_4VO_3 (AR) and Eu_2O_3 (99.90%, AR) were mixed thoroughly in a mortar with small amount of acetone. The resultant mixture was transferred to an alumina crucible and oven dried at 50°C. The mixture was heated in a resistive furnace at 1100ºC for 10h with intermittent grindings. The white powder of $YVO_4:Eu^{3+}$ so obtained was used for characterization.

2.2 Aldo-keto gel method

Aldo-keto gel method is uses to synthesis of $YVO_4:Eu^{3+}$ phosphor as per the previous work [8]. The precursors used $Y(NO_3)_3$ (99.99%, AR) and $Eu(NO_3)_3$ (99.99%, AR) were mixed together in a china clay basin. In basin $VOSO_4$ (AR) were mixed with some amount of water. On slowly heating to dryness, precipitated changed its color to reddish black. The acidic traces were removed by adding small quantity of deionized water to precipitated and drying 2-3 times; it finally changes to red color.

The red dried compound was finally milled. The benzaldehyde (1M) and acetone (1M) were added to this compound after that NaOH added drop by drop with increasing temperature.

On further slow heating, pyrolysis of foam was started at 450°C and shining black foam was formed at 500°C, which started burning from 700°C. After that one time washing and drying is required for better luminescence properties.

2.3 Material characterization

The phase purities of $YVO_4:Eu^{3+}$ samples were studied using Rigaku miniflex II X-ray diffractometer with scan speed of 2.000°/min and CuK_α (λ = 1.5406 Å) radiation in the range 10° to 90°. The PL and PLE spectra were measured on (Hitachi F-7000) fluorescence spectrophotometer at room temperature. The parameters such as spectral resolution, width of the monochromatic slits (1.0 nm), photomultiplier tube (PMT) detector voltage and scan speed were kept constant throughout the analysis of samples.

III. RESULTS AND DISCUSSION

3.1 XRD analysis

The formation of the crystalline phase of as-prepared products of solid state diffusion and aldo-keto gel method was confirmed by X-ray diffraction patterns as shown in Fig.1, to verify the phase purity and crystal structure. The X-ray pattern of both method samples indicated a pure phase of the standard YVO_4 and all the peaks are in good agreement with the (ICDD, 01-082-1968). Also the XRD shows that the formed material is completely crystalline and is in single phase, where a = b = 7.11 and c = 6.28 Å. The space group for YVO_4 is a I41/amd(141).

3.2 Morphology of $YVO_4:Eu^{3+}$ phosphors

FE-SEM analysis was done and resulting image displayed in Fig. 2 (A and D). The representative micrograph (A) for solid state diffusion and (D) for aldo-keto gel method shows that synthesized sample comprises regular shape with agglomerated and non agglomeration particles. The $YVO_4:Eu^{3+}$ phosphor prepared by aldo-keto gel method gives the non agglomerated and fine spherical particles. Also the grain boundaries of as-prepared materials were fine and well separated with no organic additives. On the other hand, sample prepared by solid state diffusion method reflects the agglomerated irregular nature of particles.

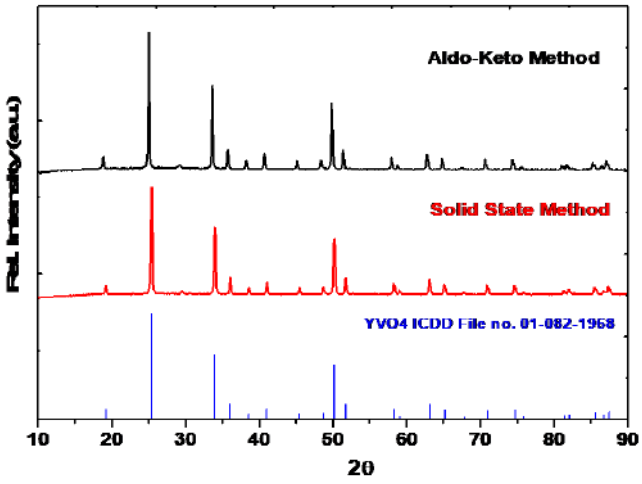

Fig. 1 XRD patterns of the $YVO_4:Eu^{3+}$ nanophosphor synthesized through solid state diffusion and aldo-keto gel method.

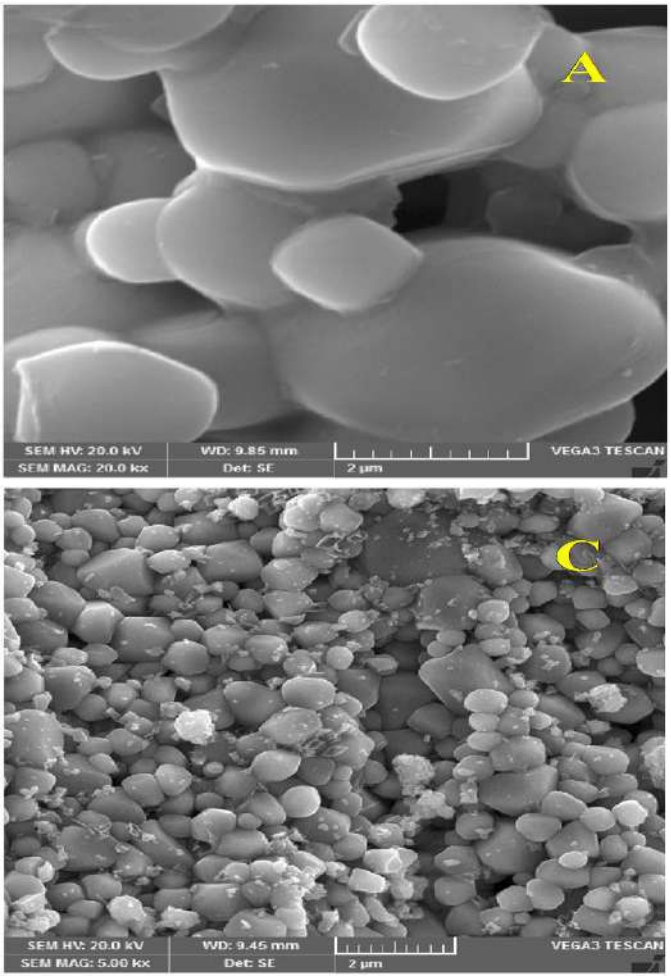

Fig. 2 FE-SEM images of the $YVO_{4:0.01}Eu^{3+}$ phosphor synthesized through solid state diffusion (A) and aldo-keto gel method D).

3.3 Photoluminescence properties

Fig. 3 demonstrates excitation and emission spectra of $YVO_4:Eu^{3+}$ phosphor synthesized by using solid state method and aldo-keto method with same concentration of Eu^{3+} ions (0.01 mole). The excitation and emission spectrum reflects that the phosphor prepared by aldo-keto gel method gives highest PL emission intensity as compared to solid state diffusion. The excitation attributed at 615 nm and emission monitored at 621 nm wavelength. The excitation spectrum shows similar nature except for a difference in intensity. It consists of a broad band with high intensity from 200 to 350 nm centered at 315 nm due to a charge-transfer transition from the oxygen ligands to the central vanadium atom inside the VO^{3-}_4 ion. Also, several narrow bands with low intensity in the range of 350–500 nm are due to the f–f transitions within Eu^{3+} 4f6 electron configuration [9].

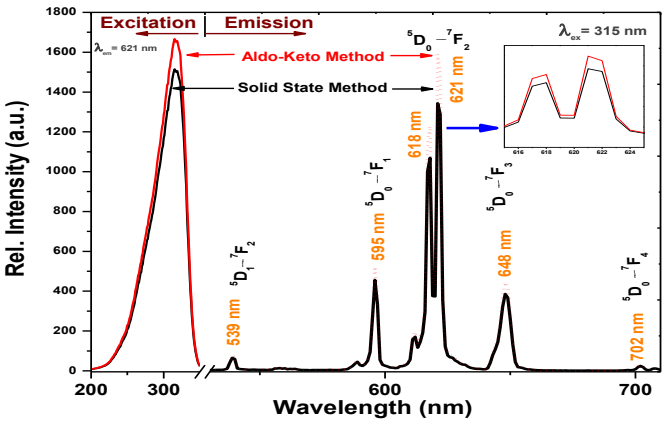

Fig. 3 PL excitation and emission spectra of $YVO_{4:0.01}Eu^{3+}$ phosphor synthesized via solid state diffusion (Black lines) and aldo-keto gel method (Red lines) (Inset of emission at 618 nm and 621 nm.

The emission spectra of $YVO_4:Eu^{3+}$ is as shown in Fig. 3. It consist of number of emission peaks in the ranging 550 to 710 nm corresponding to of $^5D_0 \rightarrow {}^7F_J$ (J = 1, 2, 3, 4) transitions of Eu^{3+} ions. The peak at 595 nm is corresponding to $^5D_0 \rightarrow {}^7F_1$ transition in the orange region due to magnetic dipole interaction and peaks at 618 and 621 nm are corresponding to $^5D_0 \rightarrow {}^7F_2$ transition in the red region due to electric dipole transition. The electric dipole transition is sensitive to

chemical bonds in the vicinity of the Eu^{3+} ion. On the other hand, the magnetic dipole transition is changes with the crystal field strength around the Eu^{3+} ion. Therefore, the PL intensity ratio of $^5D_0 \rightarrow {}^7F_2$ (Red) to $^5D_0 \rightarrow {}^7F_1$ (Orange) transitions is depend on the Eu^{3+} ions local surrounding environment. Generally, Eu^{3+} ions occupies an inversion symmetry site in the host matrix, then the orange emission ($^5D_0 \rightarrow {}^7F_1$) could be a dominant emission. Moreover, The peaks at 648 and 702 are corresponding to $^5D_0 \rightarrow {}^7F_3$ and $^5D_0 \rightarrow {}^7F_4$ transition respectively. In $YVO_4:Eu^{3+}$ phosphor the electric dipole transition ($^5D_0 \rightarrow {}^7F_1$) shows superior PL intensity than magnetic dipole transition ($^5D_0 \rightarrow {}^7F_2$). The small peak at 539 nm is attributed to $^5D_1 \rightarrow {}^7F_2$ transition. [10].

IV. CONCLUSION

The inorganic intense red emitting $YVO_4:Eu^{3+}$ phosphor was first time successfully prepared by aldo-keto gel method and compared with solid state diffusion method. The experimental results indicate that aldo-keto gel method requires low temperature than that of solid state reaction and also reaction complete in less time.

The aldo-keto gel method does not need expensive equipment and result in good PL intensity. The aldo-keto gel method is based on molecular synthesis of particles so that agglomeration of phosphor particle can be avoided.

V. ACKNOWLEDGEMENT

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Novel Molten Salts Synthesis and Photoluminescence Properties of Eu (III) Doped Y_2O_3 Phosphor

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ABSTRACT

A novel molten salt method used for the synthesis of Eu^{3+} doped yttriumbased phosphor. It is well known that $Y_2O_3:Eu^{3+}$ is highly efficient red phosphors used for Lamp phosphor. The $Y_2O_3:Eu^{3+}$ phosphor was synthesized by reactions in molten salts method.The red emitting phosphor characterized through powder X-ray diffraction (XRD), and PL spectra. A novel molten salt is one step methodand decrease calcining temperature.

Keywords : $Y_2O_3:Eu^{3+}$,Molten salts method, PL spectra.

I. INTRODUCTION

The production of reliable and reproducible ceramic materials for high technology applications require strict control over their powder characteristics, which includes chemical homogeneity, low impurity levels, small particle size, narrow size distribution and freedom from agglomeration. A variety of methods e.g. sol-gel, chemical precipitation of precursors in aqueous or organic solutions, thermal decomposition of solutions by spraying technique, high alkaline and hydrothermal precipitation have been proposed for obtaining small, uniform un-agglomerated powders. These methods so-called wet chemical method, have been found to be successful for number of systems. Also self-sustaining combustion synthesis is a simple, inexpensive and quick way of synthesizing various oxide materials in comparison to the wet chemical techniques [1].

Compounds containing rare earths have long been used as phosphors and laser materials because of their sharp, intensely luminescent f-f electronic transitions.In particular, Eu^{3+} has five narrow emission bands corresponding to the $^5D_0 \rightarrow {}^7F_j$ transitions where, j = 0,1,2,3,4. The strongest transition, $^5D_0 \rightarrow {}^7F_2$ occurs at 613 nm, which is a characteristic of red fluorescence of Eu^{3+}. This transition has also been shown to exhibit laser emission under appropriate conditions in Eu^{3+} doped crystals [2, 3]. It is well known that the $Y_2O_3:Eu^{3+}$ is highly efficient red phosphor and has its own importance in scintillation, lamp and color TV picture tubes [4].

The preparation of these red emitting phosphors is critical and requires special methods such as wet chemical methods. Recently preparation of Eu^{3+} doped yttria was carried out by the alkoxide route and combustion process [5, 6]. Though these processes are efficient, requires expensive chemicals and special

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equipment. Here we report the preparation of Y_2O_3: Eu^{3+} by the novel method of reactions in molten salts.

The term molten salt refersto the liquid state of compound, which melts to give liquids displaying a degree of ionic properties [7, 8]. Alkali metal nitrates have relatively low melting points (Table:1) whereas even lower melting points are obtained in their eutectic mixtures. A molten salt can behave as a solvent or as a reactant. Thus in a nitrate melt acid-base reactions can occur according to the Lux -flood formalism, whereby an acid is an oxide ion acceptor and a base is an oxide ion donor; nitrate ions are bases in this formalism [9]. Nitrite melts are more basic than nitrate melts whereas addition of Lux-flood bases such as Na_2O_2, Na_2O and NaOH to a nitrate melt, which its basicity.

The precursors are the inorganic compounds, in particular sulphates and chlorides that are blended with the alkali metal nitrates or nitrites as a powder mixture before heating to the reaction temperature. Table:1 shows the various eutectic mixtures and corresponding melting points.

Table-1 Melting points for alkali metal nitrates and eutectic mixtures.

Metal Nitrate	Melting point (^{0}C)
$NaNO_3$	307
KNO_3	334
50 mol% $NaNO_3$-50 mol% KNO_3	220
43 mol% $LiNO_3$- 57 mol% KNO_3	132

II. METHODS AND MATERIAL

2.1 Synthesis of $Y_2O_3:Eu^{3+}$

The precursors used were Y_2O_3 (AR) and Eu_2O_3 (AR). Both were mixed together in a china basin. A small quantity of double distilled (DD) water was added and paste was formed. Then HCl was added drop by drop and mixture was heated slowly under observation at 50^{0}C till the paste dissolved completely. The solution was further heated till the excess of acid was boiled off. Little quantity of double distilled (DD)water was again added and slowly evaporated to dryness. The resulting powder was YCl_3: Eu. The chemical reaction is $0.97\ Y_2O_3 + 0.03\ Eu_2O_3 + HCl \rightarrow 2\ Y_{0.97}Cl_3 : Eu_{0.03} + 3H_2O$ ---------- (1)

The eutectic mixture of nitrates $LiNO_3.3H_2O$ (43 mole %) and KNO_3 (57 mole %) were taken in a china basin and mixture was dried at 50^{0}C.The dry chloride YCl_3:Eu was added to this mixture of dried nitrates and thoroughly ground in a china basin. This mixture was then heated in a resistive furnace first at 100^{0}C for 1h and then with the gradual rise of temperature it was further heated at 425^{0}C for12 hours. The chemical reaction is $2Y_{0.97}Cl_3 :Eu_{0.03} + 0.43\ LiNO_3.3H_2O + 0.57\ KNO_3 \rightarrow Y_{1.94}O_3 : Eu_{0.06}$ --------- (2)

The mixture was then cooled slowly. A semi convex white solid was formed. With the help of sufficient lukewarm DD water, the solid was transferred to a glass beaker. Keeping the beaker in an oven at 60^{0}C for 10 minutes, the white solid was partly dissolved in water and the fine particles of Y_2O_3:Eu started settling down at the bottom. The precipitate was washed repeatedly by DD water and then dried. The dried precipitate was then calcinated at 800°C for 2h and quenched suddenly at room temperature.The calcinated and quenched powder was $Y_2O_3:Eu^{3+}$ phosphor.

2.2 Material characterization

The phase purities of $Y_2O_3:Eu^{3+}$ phosphor was studied using Rigaku miniflex II X-ray Diffractometer with scan speed of 2.000°/min and Cu Kα (λ = 1.5406 Å) radiation in the range 10° to 90°. PL and PL excitation (PLE) spectra were measured on (Hitachi F-7000) fluorescence spectrophotometer at room temperature. The parameters such as spectral resolution, width of the monochromatic slits (1.0 nm), photomultiplier

tube (PMT) detector voltage and scan speed were kept constant throughout the analysis of samples

III. RESULTS AND DISCUSSION

3.1 Powder XRD pattern of $Y_2O_3:Eu^{3+}$

The formation of the phase purity and crystal structure of Y_2O_3 synthesized by using molten salts at 800°C was confirmed by XRD pattern as shown in Figure. 1. All the peaks in XRD pattern very well agree with the standard data from ICDD file no. 01-071-0049. Also the XRD shows that the formed material was completely crystalline and was in single phase with cubic structure where a=b=c=10.5957 Å. The space group for Y_2O_3 is Ia-3 (206).The average crystallite size of $Y_2O_3:Eu^{3+}$determined from XRD pattern using Scherrer formula and it was found to be 965.52 nm [10]

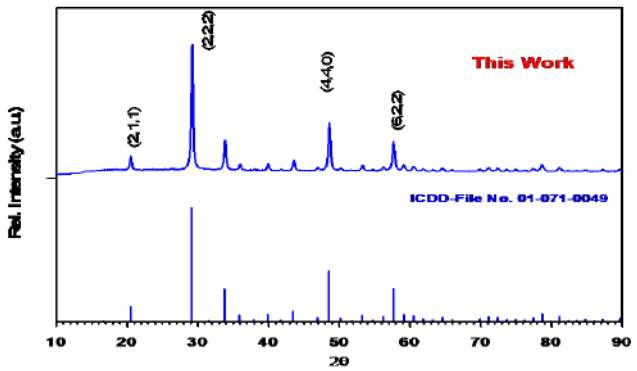

Figure:2 XRD pattern of $Y_2O_3:Eu^{3+}$.

Figure 2 shows PL spectra of $Y_2O_3:Eu^{3+}$ phosphor. It consists of a broadband excitation spectrum peaking at 246 nm, monitored at emission wavelength 613 nm. The emission spectrum is sharp peaking at 613 nm at excitation wavelength 254 nm, corresponding to the transition $^5D_0 \rightarrow {}^7F_2$ of Eu^{3+}. The intensity of emission is found to be comparable and excitation, emission wavelengths matches well with those of reported in literature.

The rare earth compounds such as $Y_2O_3:Eu^{3+}$ mainly belong to luminescent materials with individual luminescent center. Luminescence of these materials is due to the transition between 4f energy levels. Because of spin-orbit interaction, the degenerate 4f configuration is split into several energy levels such as ^5Dj and ^7Fj. The crystal field of host lattice affects the electronic transitions in Eu^{3+} [11]. For $^5D_0$ term, j = 0, so it cannot split (only one energy level). For the term $^7F_2$, j = 2 and $2_{j+1}=5$, so it can split into five energy levels (Γ_1, Γ_2,Γ_3, Γ_4, Γ_5). The strongest peak at 613 nm in $Y_2O_3:Eu^{3+}$ phosphor corresponds to the transition $^5D_0 \rightarrow {}^7F_2$ of Eu^{3+}. This method of reactions in molten salts is a low temperature and single step synthesis. This method is easy to synthesis and precursors used are readily available. The sample synthesized is a snow-white powder and particle size varies from sub-micron to nano. Frequent washing and calcinations enhances the PL intensity.

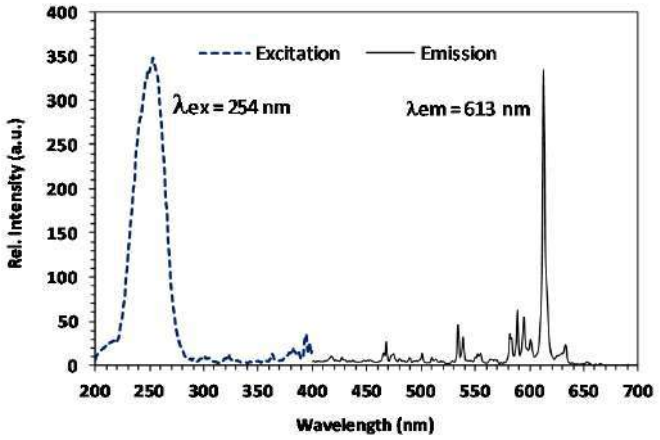

Figure:1 Photoluminescence emission and excitation Spectrum of $Y_2O_3:Eu^{3+}$

This method of reactions in molten salts is a low temperature and single step synthesis. This method is easy to synthesis and precursors used are readily available. The sample synthesized is a snow-white powder and particle size varies from sub-micron to nano. Frequent washing and calcinations enhances the PL intensity.

IV. CONCLUSION

The excitation and emission wavelengths in PL spectra of $Y_2O_3:Eu^{3+}$ synthesized by molten salts method confirms the formation of desired phase and crystal structure in the compounds. As phosphors

with particles of required size and colour are needed for their use in the display devices and other applications. This method has new horizons in the lighting industries.

V. ACKNOWLEDGEMENT

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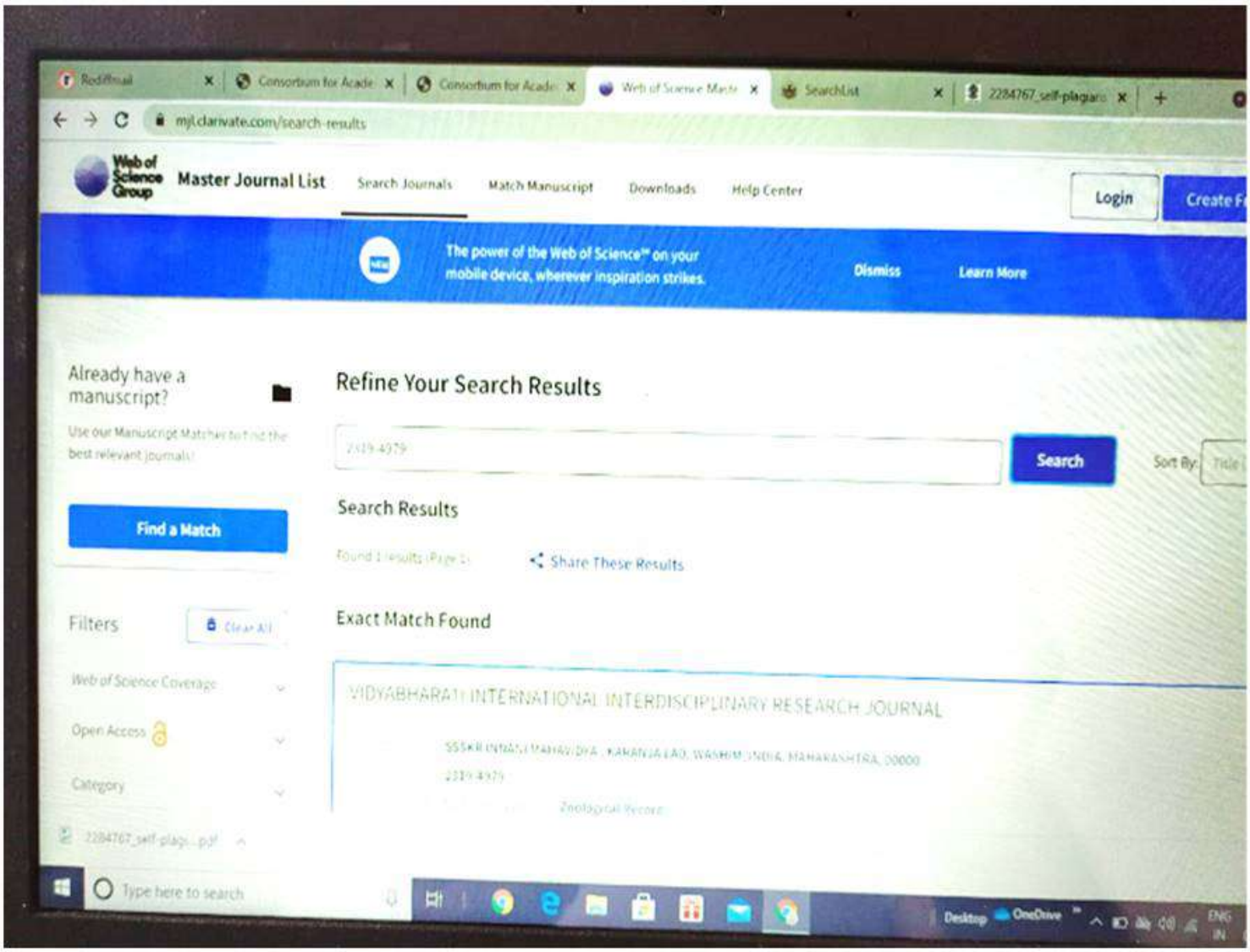
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BIOLOGICAL EVALUATION OF NEWLY SYNTHESIZED AZO DYES OF SALICYLIC ACID

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ABSTRACT

The present work series of eight azo dyes were synthesized by the diazotization process of eight aromatic amines using NaNO2 and HCl, and coupling of these diazonium salts with Salicyclic acid. Newly synthesized azo dyes have been confirmed by FT-IR and H1 NMR spectral data. The synthesized compounds have been tested in vitro against human pathogens to assess their antimicrobial activities using the disk diffusion method. The compound analyzed for its antimicrobial activity were found to have effective antimicrobial activity at both concentrations against all the tested pathogenic culture.

Keywords: *Azo dyes, Salicylic acid, antimicrobial activity.*

Introduction

Azo compounds are the most fundamental class of commercial dyes and are well colored that have been used as dyes and pigments[1, 2]. Azo compounds are known to be involved in a number of biological reactions such as inhibition of DNA, RNA and protein synthesis, carcinogenesis, and nitrogen fixation[3, 4], also known for their use as antibacterial, antifungal antineoplastics, antidiabetics, antiseptics, anticancer, anti-inflammatory and other useful chemotherapeutic agents [5-8]. Azo dyes have been most widely used in dying textile fibres[9,10], biomedical studies[11,12], advanced applications in organic synthesis and high technology areas like lasers, liquid crystalline displays, electro-optical devices, and inkjet printer[13,14] as well as shows a variety of interesting biological activities including antibacterial and pesticidal activities[15,16] and also used in food.

The azo dyes possess antiseptic and antiprotozoal properties and some are useful as a chemotherapeutic agent. The cationic dyes are more active in acidic medium preferably attack on gram-positive bacteria as compared to anionic dyes. The most common azo dyes used as antiseptics are scarlet red and diamazon. The industrial use as a colorant and biological activities of azo compounds promotes us to synthesis of azo compounds.

In the present study, Salicyclic acid is coupled with diazonium salt of eight aromatic amines VIZ: Aniline, o-Nitro aniline, p-Toluedine, α-Naphthylamine, Sulphanilic acid, m-Nitro aniline, p-aminobenzoic acid, and m-aminobenzoic acid.

Methods and Materials

All the chemicals used in these experiments were of analytical grade. All the melting points were determined by the open capillary method and are uncorrected. The products were confirmed by 1H NMR (Burker avernce II 400 NMR Spectrometer) and IR technique (Shimatzu). The biological activity was evaluated against two kinds of bacteria gram-positive and gram-negative. The products were recrystallized by ethanol as a solvent.

General procedure for synthesis of azo compounds[17-19]

Substituted aromatic amines (0.01mole) were mixed with 2.5 ml conc. HCl and 2.5 ml (4N) cold solution of $NaNO_2$ was added with the stirring. The temperature of the reaction was maintained up to $0\text{-}5^0$ C. Diazonium salt solution prepared above was added drop wise to the alkaline solution of Salicylic acid. The reaction mixture stirred for 10 – 20 minutes maintaining the temperature $5\text{-}10^0$ C. The colored product so obtained is filtered washed with water and recrystallised from 80% ethanol. The general Scheme for the synthesis of azo dyes of Salicyclic acid is shown in figure (I).

Figure I: General Scheme for the synthesis of azo dyes of Salicylic acid

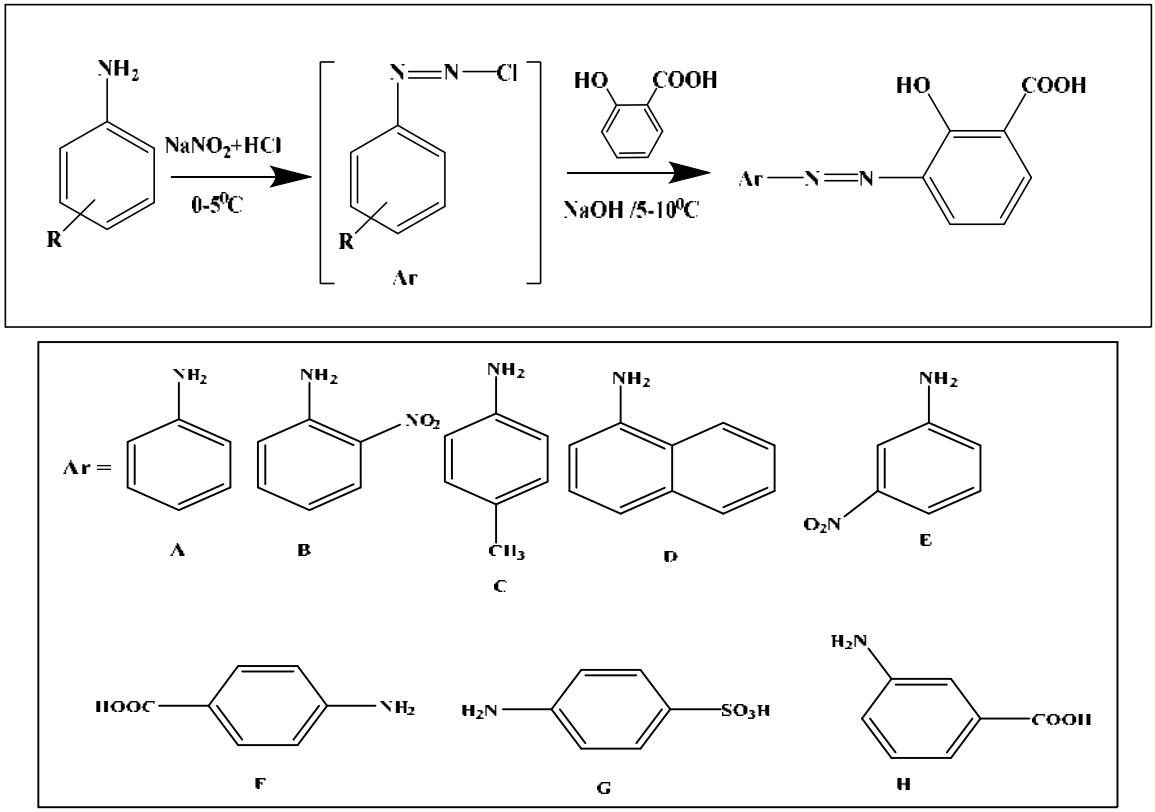


Table (I): The code, compound name, molecular formula, molecular weight, melting point and percentage yield of synthesized compounds of Salicyclic acid.

Code	Structure	Molecular Formulae	Molecular Weight	Melting Point (^{0}C)	Yield
1A	2-hydroxy-3-(phenyldiazenyl)benzoic acid	$C_{13}H_{10}N_2O_3$	242.23	165	62
1B	2-hydroxy-3-((2-nitrophenyl)diazenyl)benzoic acid	$C_{13}H_9N_3O_5$	287.23	155	61%
1C	2-hydroxy-3-((p-tolydiazenyl)diazenyl)benzoic acid	$C_{14}H_{12}N_2O_3$	256.26	162	53%
1D	2-hydroxy-3-(napthalen-1-yldiazenyl)benzoic acid	$C_{17}H_{12}N_2O_3$	292.29	156	52%
1E	2-hydroxy-3-((3-nitrophenyl)diazenyl)benzoic acid	$C_{13}H_9N_3O_5$	287.23	162	59%
1F	2-((4-carboxyphenyl)diazenyl)-2-hydroxybenzoic acid	$C_{14}H_{10}N_2O_5$	286.24	165	55%
1G	2-hydroxy-3-((4-sulfophenyl)diazenyl)benzoic acid	$C_{13}H_{10}N_2O_6S$	322.29	155	59%
1H	3-((3-carboxyphenyl)diazenyl)-2-hydroxybenzoic acid	$C_{14}H_{10}N_2O_5$	286.24	151	60%

Antimicrobial Activity

The newly synthesized azo compounds 1A-1H were analyzed for their antimicrobial activity against four gram positive and gram negative bacteria viz. *Escherichia coli, Staphylococcus aureus, Pseudomanas aeroginosa and Salmonella typhi* by using agar well diffusion method. These compounds were mixed in Ethanol to form the solution of concentration 1mg/ml. sterile disc were dipped in the solutions, dried it and placed on the nutrient agar medium spreaded with the bacteria. The plates were further incubated for 24 to 48 hours at 37^0 C and the diameter of zones of inhibition was measured in millimeter.

Result and Discussion

The azo dyes synthesized in the present study were characterized by IR and NMR spectroscopic methods. IR and ^{1}H-NMR spectra showed the expected signals which correspond to various groups present in each compounds. The IR and ^{1}H-NMR spectral values for different synthesis dyes are shown in table II.

Table (II): FTIR AND ^{1}H NMR data of azo compounds of Salicyclic acid.

Compound	Spectra	Spectroscopic Data
SDI 1A	IR (KBr. cm-1)	3389 cm^{-1} (Phenolic –OH stretch), 3063 cm^{-1} (Carboxylic acid O-H stretch), 1481 cm^{-1} (C=C Ring stretch), 1581 cm^{-1} (N=N stretch),1283 cm^{-1}(C-N stretch) 1687 cm^{-1} (C=O stretch of -COOH)
	NMR (δ ppm)	6.79 (s 1H of –OH), 12.41 (s 1H of –COOH), 7.44-8.31(m 8H of Ar-H).
SDI 1B	IR (KBr. cm^{-1})	3429 cm^{-1} (Phenolic –OH stretch), 3105 cm^{-1}(Carboxylic acid O-H stretch), 3078cm^{-1} (N-H stretch), 1493 cm^{-1}(C=C Ring stretch), 1579 cm^{-1} (N=N stretch), 1285 cm^{-1} (C-N stretch), 1523 cm^{-1} (-NO_2 stretch (N-O Asym), 1345 cm^{-1} (-NO_2 stretch (N-O sym),1660 cm^{-1} (C=O stretch of -COOH)
	NMR (δ ppm)	6.78 (s 1H of –OH), 12.01 (s 1H of –COOH), 7.61-8.26(m 8H of Ar-H).
SDI 1C	IR (KBr. cm^{-1})	3405 cm^{-1} (Phenolic –OH stretch), 3125 cm^{-1}(Carboxylic acid O-H stretch), 1482 cm^{-1}(C=C Ring stretch), 1600 cm^{-1} (N=N stretch), 1284 cm^{-1} (C-N stretch), 1651 cm^{-1} (C=O stretch of -COOH), 2915 cm^{-1} ($^{C-H}$ stretch of -CH_3)
	NMR (δ ppm)	6.73 (s 1H of –OH), 12.40 (s 1H of –COOH), 2.50 (s 3H of –CH_3), 7.12-8.25 (m 7H of Ar-H).
SDI 1D	IR (KBr. cm^{-1})	3391 cm^{-1} (Phenolic –OH stretch), 3046 cm^{-1}(Carboxylic acid O-H stretch), 1455 cm^{-1}(C=C Ring stretch), 1578 cm^{-1} (N=N stretch), 1285 cm^{-1} (C-N stretch)
	NMR (δ ppm)	6.88 (s 1H of –OH), 12.82(s 1H of –COOH), 7.84-8.48 (m 10H of Ar-H).
SDI 1E	IR (KBr. cm^{-1})	3471 cm^{-1} (Phenolic –OH stretch), 3286 cm^{-1}(Carboxylic acid O-H stretch), 3095cm^{-1} (N-H stretch), 1490 cm^{-1}(C=C Ring stretch), 1584 cm^{-1} (N=N stretch), 1288 cm^{-1} (C-N stretch), 1521 cm^{-1} (-NO_2 stretch (N-O Asym), 1348 cm^{-1} (-NO_2 stretch (N-O sym)
	NMR (δ ppm)	6.79 (s 1H of –OH), 11.90 (s 1H of –COOH), 7.33-8.32 (m 7H of Ar-H).
SDI 1F	IR (KBr. cm^{-1})	3438 cm^{-1} (Phenolic –OH stretch), 3001 cm^{-1} (Carboxylic acid O-H stretch), 1434 cm^{-1}(C=C Ring stretch), 1579 cm^{-1} (N=N stretch), 1235 cm^{-1} (C-N stretch)
	NMR (δ ppm)	6.81 (s 1H of –OH), 12.30 (s 2H of –COOH), 7.21-8.85 (m 7H of Ar-H).
SDI 1G	IR (KBr. cm^{-1})	3449 cm^{-1} (Phenolic –OH stretch), 2828 cm^{-1} (Carboxylic acid O-H stretch), 3070 cm^{-1} (N-H stretch), 1583 cm^{-1}(C=C Ring stretch), 1600 cm^{-1} (N=N stretch), 1287 cm^{-1} (C-N stretch), 1178 cm^{-1} (Sulphonic acid stretch)
	NMR (δ ppm)	6.68 (s 1H of –OH), 11.80 (s 2H of –COOH), 7.96 (s 1H of –SO_3H), 6.92-7.94 (m 7H of Ar-H).
SDI 1H	IR (KBr. cm^{-1})	3390 cm^{-1} (Phenolic –OH stretch), 3040 cm^{-1} (Carboxylic acid O-H stretch), 1488 cm^{-1}(C=C Ring stretch), 1586 cm^{-1} (N=N stretch), 1338 cm^{-1} (C-N stretch)
	NMR (δ ppm)	6.76 (s 1H of –OH), 12.40 (s 2H of –COOH), 7.14-8.30 (m 7H of Ar-H).

Antimicrobial Activity

Eight azo compounds of Salicylic acid have been synthesized, recrystaliesed and used separately for its study of antimicrobial activity against four gram positive and gram negative bacteria viz. *Escherichia coli, Staphylococcus aureus, Pseudomanas aeroginosa and Salmonella typhi*. The data of antimicrobial activity of these newly synthesized azo dyes of Salicyclic acid 1A-1H against four pathogens are presented in the tables 1-4.

Antibacterial properties of the synthesized azo compounds of Salicylic acid viz 1A – 1H [Zone of inhibition (mm)]

Table (1): Effect of azo compounds of Salicylic acid viz. 1A – 1H on the growth response of *Escherichia coli.*

Conc.(mg/ml)	1A	1B	1C	1D	1E	1F	1G	1H
0.5	I (12)	I (10)	I (10)	I (10)	I (13)	NI	I (10)	NI
1.0	I (10)	I (11)	I (10)	I (10)	I (11)	I (10)	NI	I (10)

I = Inhibition, values of inhibition are given in parenthesis, NI = No inhibition

Table (2): Effect of azo compounds of Salicylic acid viz. 1A – 1Hon the growth response of *S. aureus*.

Conc.(mg/ml)	1A	1B	1C	1D	1E	1F	1G	1H
0.5	I (9)	I (10)	I (10)	I (11)	I (10)	I (11)	I (10)	I (10)
1.0	I (10)	NI	I (10)	I (15)	NI	I (12)	I (12)	I (10)

I = Inhibition, values of inhibition are given in parenthesis, NI = No inhibition

Table (3): Effect of azo compounds of Salicylic acid viz. 1A – 1H on the growth response of *P. aeroginosa*.

Conc.(mg/ml)	1A	1B	1C	1D	1E	1F	1G	1H
0.5	I (9)	I (11)	I (8)	I (11)	I (10)	I (9)	I (10)	I (10)
1.0	I (10)	I (14)	I (16)	I (10)	I (14)	I (11)	I (10)	I (11)

I = Inhibition, values of inhibition are given in parenthesis, NI = No inhibition

Table (4): Effect of azo compounds of Salicylic acidviz. 1A – 1Hon the growth response of *Salmonella typhi.*

Conc.(mg/ml)	1A	1B	1C	1D	1E	1F	1G	1H
0.5	I (11)	I (9)	I (10)	I (9)	I (10)	I (10)	I (10)	I(8)
1.0	I (12)	I (11)	I (12)	I (10)	I (12)	I (13)	I (10)	I(10)

I = Inhibition, values of inhibition are given in parenthesis, NI = No inhibition

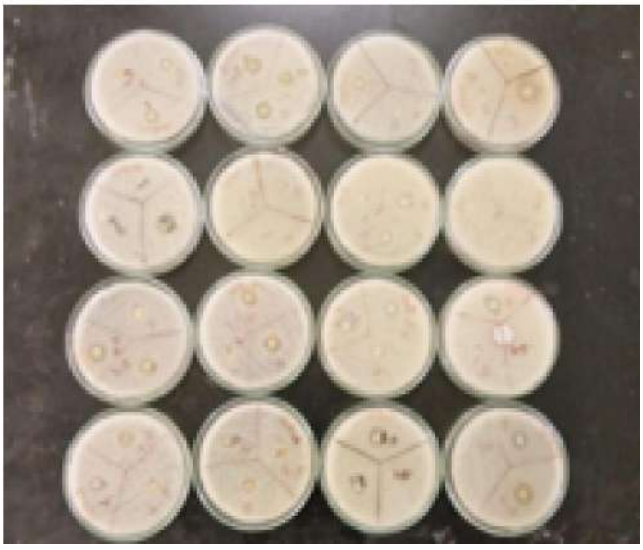


Figure 1: Effect of azo compounds of Salicylic acid 1A – 1Hon the growth of *E.Coli.*

Figure 2: Effect of azo compounds of Salicylic acid1A – 1Hon the growth of *Staphylococcus aureusus.*

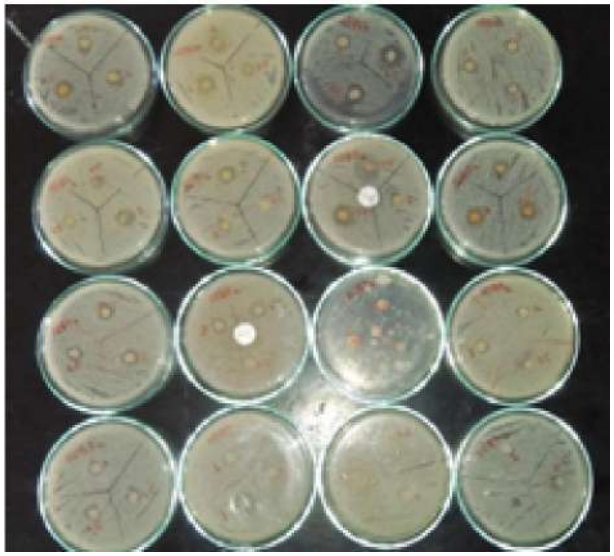
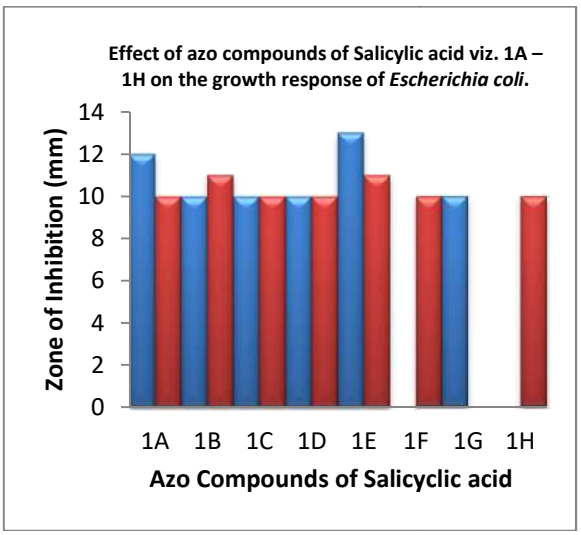
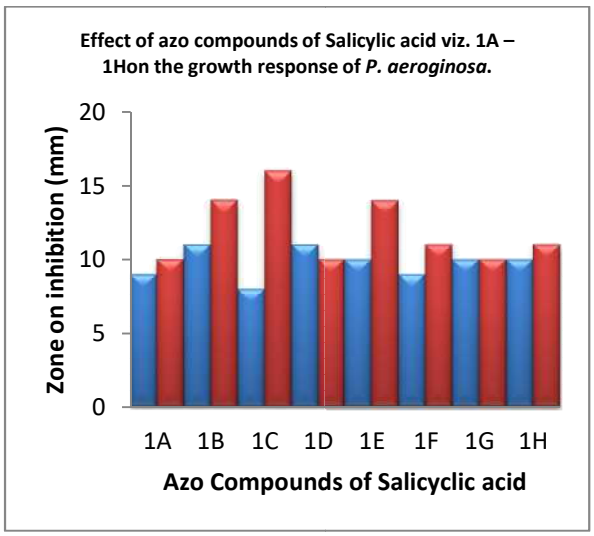
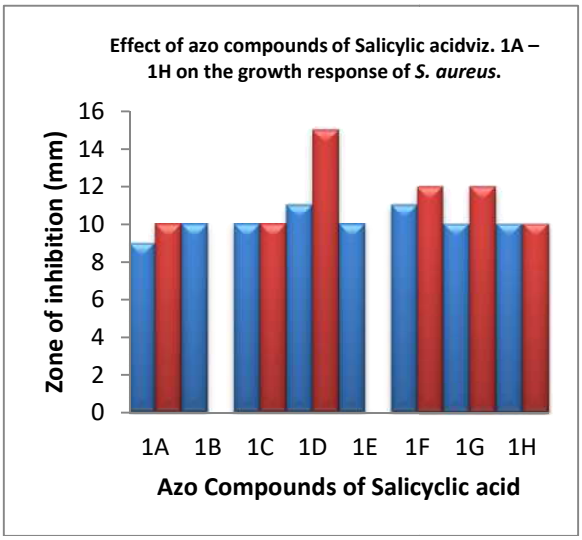


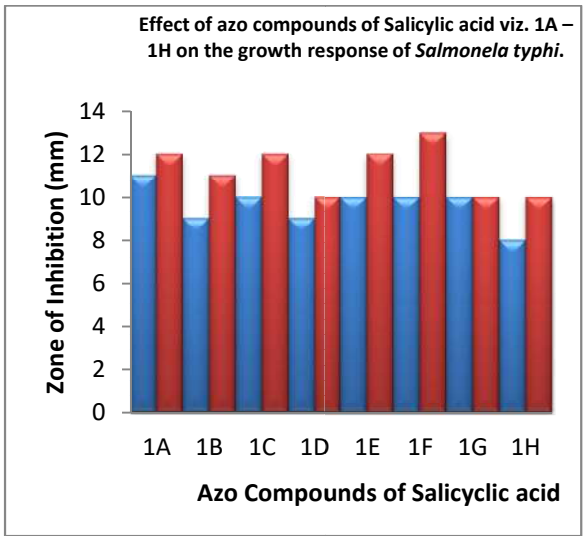
Figure 3: Effect of azo compounds of Salicylic acid1A – 1Hon the growth of *Pseudomonas aeroginosa.*

Figure 4: Effect of azo compounds of Salicylic acid1A – 1Hon the growth of *Salmonella typhi.*









Conclusion

All the azo compounds 1A-1H containing Salicyclic acid moiety were successfully synthesized in good yield and their structures were confirmed using FTIR, & 1HNMR spectroscopy. The results on antimicrobial activity tells that all the eight newly synthesized compounds viz 1A-1H found to have good antibacterial effect against *E.Coli*, *S. aureus, Pseudomonas aeroginosa,* and *Salmonella typhi* nearly at all the concentrations analysed. The results shown, the broad spectrum potential of all the compounds in inhibiting the growth of human pathogens, and this finding shows the possible help in drug discovery.

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Electronic Speckle Pattern Interference technique for measuring thickness of metallic nano thin films

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ABSTRACT

Electronic Speckle Pattern Interference (ESPI) is a non-contact optical technique generally used for the measurement of surface deformations of various kinds. With the help of phase retrieval algorithms, phase of the deformed object is calculated in this method which can be then converted into displacement information. This paper demonstrates the use of ESPI method to measure the thickness of some nano-sized metallic thin films. Calculated thickness values are in good agreement with the values measured via Profilometer. The least thickness (z-axis) measured by this method is ~ 52 ± 3.1 nm. The z-axis resolution of the used method is at par with other expensive microscopy techniques like atomic force microscopy. Therefore, a low-cost alternative to expensive microscopy techniques is presented in this paper as far as z-axis is concern. Surface roughness of thin films can also be calculated using retrieved surface profiles and they are also found to be in the nanometer range.
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1. Introduction

Electronic Speckle Pattern Interferometer is an optical technique developed by J. Butter and J. Leendertz [1,2] which combines the electronic recording and processing with the speckle interferometer. In this technique, speckle interferograms are recorded by the electronic camera and stored in the computer. The speckle interferograms can be process with any image processing software. Subtraction of speckle interferograms obtained before and after deformation of the object yields correlation fringe patterns which carries the object's deformation information [3]. Phase information from these patterns can be retrieved using variety of phase retrieval methods such as Fourier transforms methods [4,5], Digital image correlation (DIC) methods [6,7], Moiré's method [8,9] and Phase shifting methods [10,11].

Development in the electronic speckle pattern interferometer (ESPI) has helped in precise measurement of amount of deformation in the static as well as dynamic systems [12–14]. It is one of the most effective non-contact tools developed so far for the quality control and evaluation. Thin film thickness measurements using ESPI were attempted in the past [15–17]. Surface uniformity and profiles of transparent thin films were analysed in these works respectively.

In this paper, we have successfully attempted to scale down the range of measurement down to nanometer size. Nano sized thin films of Copper, fabricated using pulsed laser deposition technique were used for the work. 3D surface profile, thickness information and surface roughness were extracted from ESPI technique using five phase step temporal phase shifting algorithms.

2. Methodology

The Schematic diagram of the out-of-plane electronic speckle pattern Interferometer set up to measured thickness of thin film is as shown in the Fig. 1. Details of the set-up is already been reported [18].

He-Ne laser having 632.8 nm wavelength with output power of 5 mW is used as the light source here. Beam splitter kept in front of

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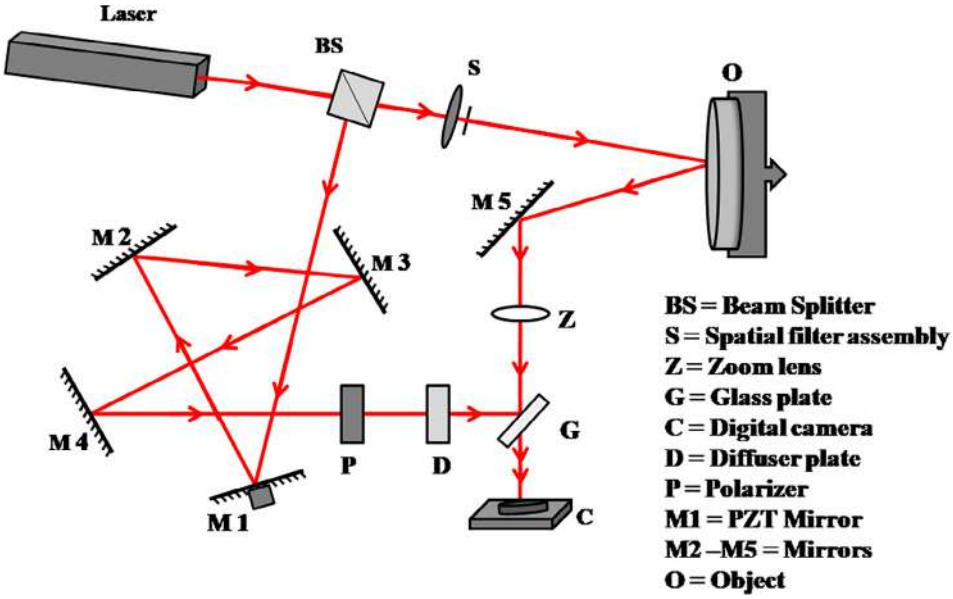

Fig. 1. Schematics of Electronic Speckle Pattern Interferometer.

it, splits the laser beam into object beam and reference beam. Object beam illuminates a middle part of object. In this case, object is a thin film. Reference beam, after bouncing from number of mirrors to make the beam path equivalent, interfere with object beam and thus forms speckle interferogram. Speckle interferogram can be recorded using a CMOS camera and stored in the computer.

Thin films used in the study are as shown in Fig. 2. Thin films having diameter 2 cm were prepared using pulsed laser deposition (PLD) technique. Nanosecond Nd:YAG laser of wavelength 532 nm and the energy 38–40 mJ was used for the fabrication of these thin films. PLD process was carried out in high vacuum of 10^{-6} mbar. The distance between target and substrate was 5 cm. The deposition time required for making these films was 1 hr. Substrates was kept at an elevated temperature of 300 °C (Fig. 2(a)) and 200 °C (Fig. 2(b)) respectively during the deposition. Annealing of thin films were done at similar temperatures. Thickness of thin films were measured at different locations using Stylus profilometer (Model: Detak 150, Make: Veeco) and marked accordingly as shown in Fig. 2. As one can see from these images, thin film thickness varies with the direction.

One by one these films were used in the set up as shown in Fig. 1 and phase shifted speckle interferograms were recorded using calibrated PZT mirror (M_1) [19,20] as shown in Fig. 1. Temporal five phase shift algorithm was deployed to extract phase information from it [21]. This process yield wrapped phase map. Wrapped phase map contain 2π phase ambiguity hence we cannot extract the surface information. Therefore, it is necessary to unwrapped the phase map before extracting surface information. Phase map can be unwrapped using an unwrapping algorithm [22]. 3D Surface profiles can be constructed from the calculated phase map using the following Eq. (1) [23].

$$D = U.P\frac{\lambda}{4\pi} \tag{1}$$

where D represent surface profile values, U.P. represent unwrapped phase map and λ is the wavelength of the laser light used.

Another important factor is surface roughness. From the 3D surface profile maps, surface roughness values for both the thin films were calculated using Eq. (2) [24].

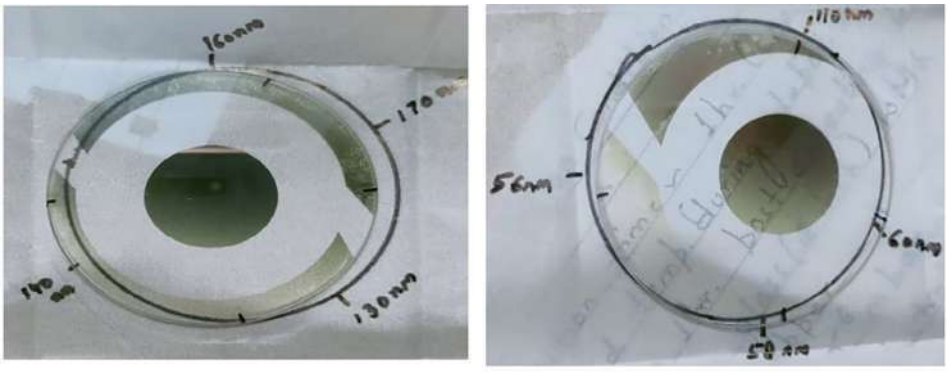

Fig. 2. Copper thin films fabricated using PLD with marked thickness (a) 170 nm, 160 nm, 140 nm and 130 nm (b) 110 nm, 60 nm, 58 nm and 56 nm.

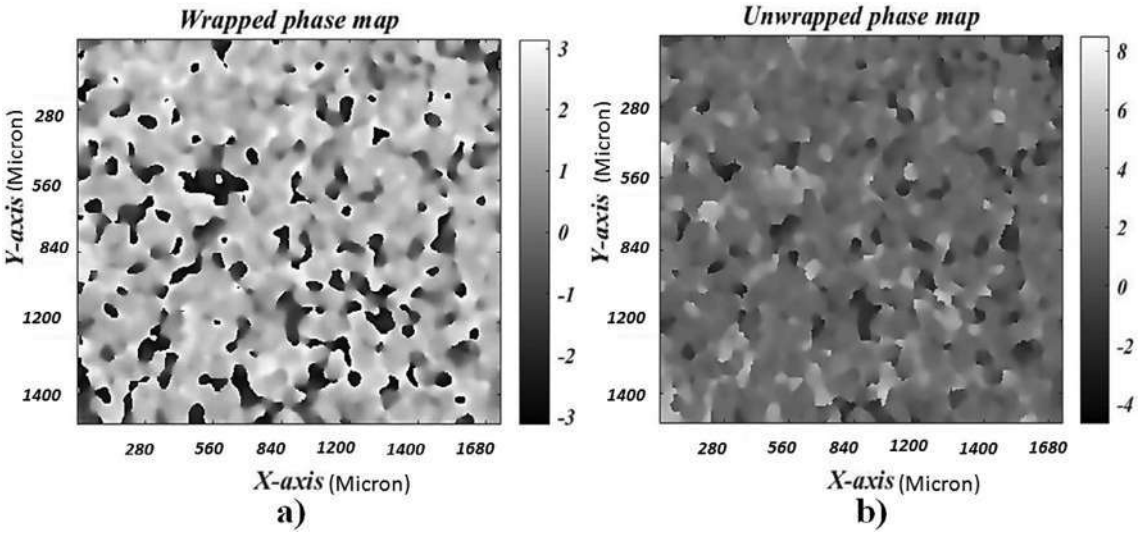

Fig. 3. a) Wrapped Phase Map and b) Unwrapped Phase Map corresponding to the thin film sample of Fig. 2a.

$$R_{rms} = \left\{ \frac{1}{MN} \sum_{j=1}^{N} \sum_{i=1}^{M} [z(i,j) - \langle z(i,j) \rangle]^2 \right\}^{1/2} \quad (2)$$

where, z (i, j) is the surface profile values and < z (i, j) > represent its average intensity values.

3. Result and discussion

Fig. 3(a) and (b) shows the wrapped and unwrapped phase map for the thin film sample shown in Fig. 2(a). From the unwrapped phase map, 3D surface profile can be calculated using Eq. (1) as discussed in the previous section. Fig. 4(a) and (b) shows the 3D surface profile and line profile corresponding to the thin film sample of Fig. 2(a).

As it is easier to evaluate the surface profile by plotting one dimensional versions of it. Fig. 5 shows the individual one dimensional line profiles for the step size of (a) 130 nm (b) 170 nm (c) 160 nm and (d) 140 nm respectively corresponding to the thin film sample of Fig. 2a. Thicknesses were measured at these sites using the line profiles shown in Fig. 5.

Fig. 6 shows the wrapped and unwrapped phase map while Fig. 7 shows surface profile and line profile for the thin film shown in Fig. 2(b).

The Fig. 8 shows the individual line profiles for the step size of (a) 60 nm (b) 58 nm and (c) 56 nm respectively corresponding to the thin film sample of Fig. 2b. At a step size of 110 nm, as shown in Fig. 2(b), sample got bit damage, so we have avoided that region for the evaluation. Therefore, we have drawn line profiles at 60 nm, 58 nm and 56 nm only.

Using Fig. 5 and Fig. 8, we have measured the thicknesses of copper thin films at the locations shown in Fig. 2(a) and (b) and compared them with values measured using Stylus profilometer. These values are tabulated in Table 1. As one can see from the Table 1, both the values are in good agreement with each other. Error in the calibration of the phase shifter is the main source of

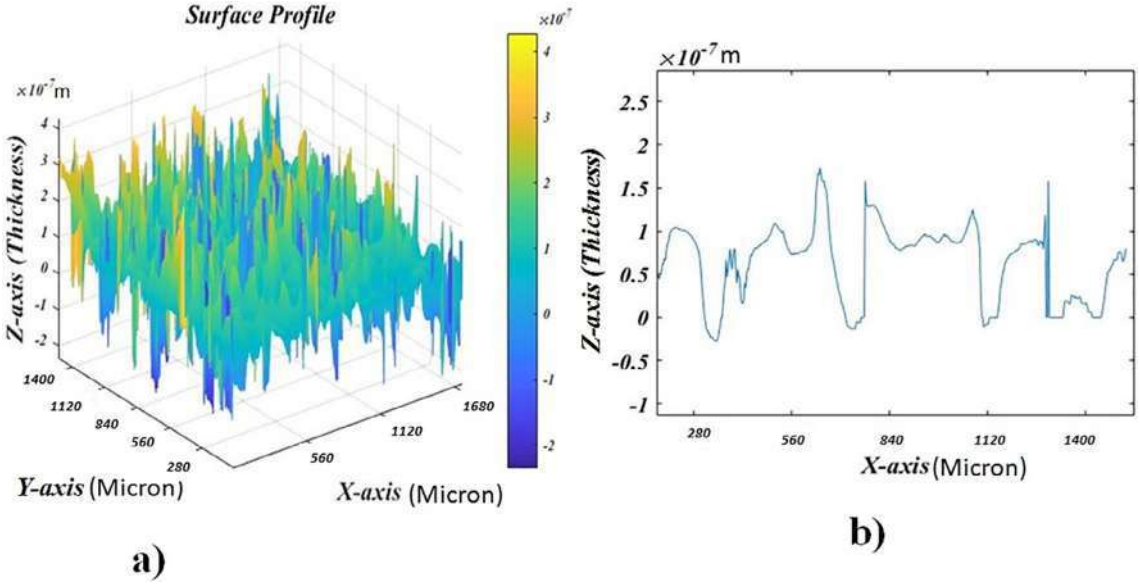

Fig. 4. a) 3D Surface Profile and b) Line Profile corresponding to the thin film sample of Fig. 2a.

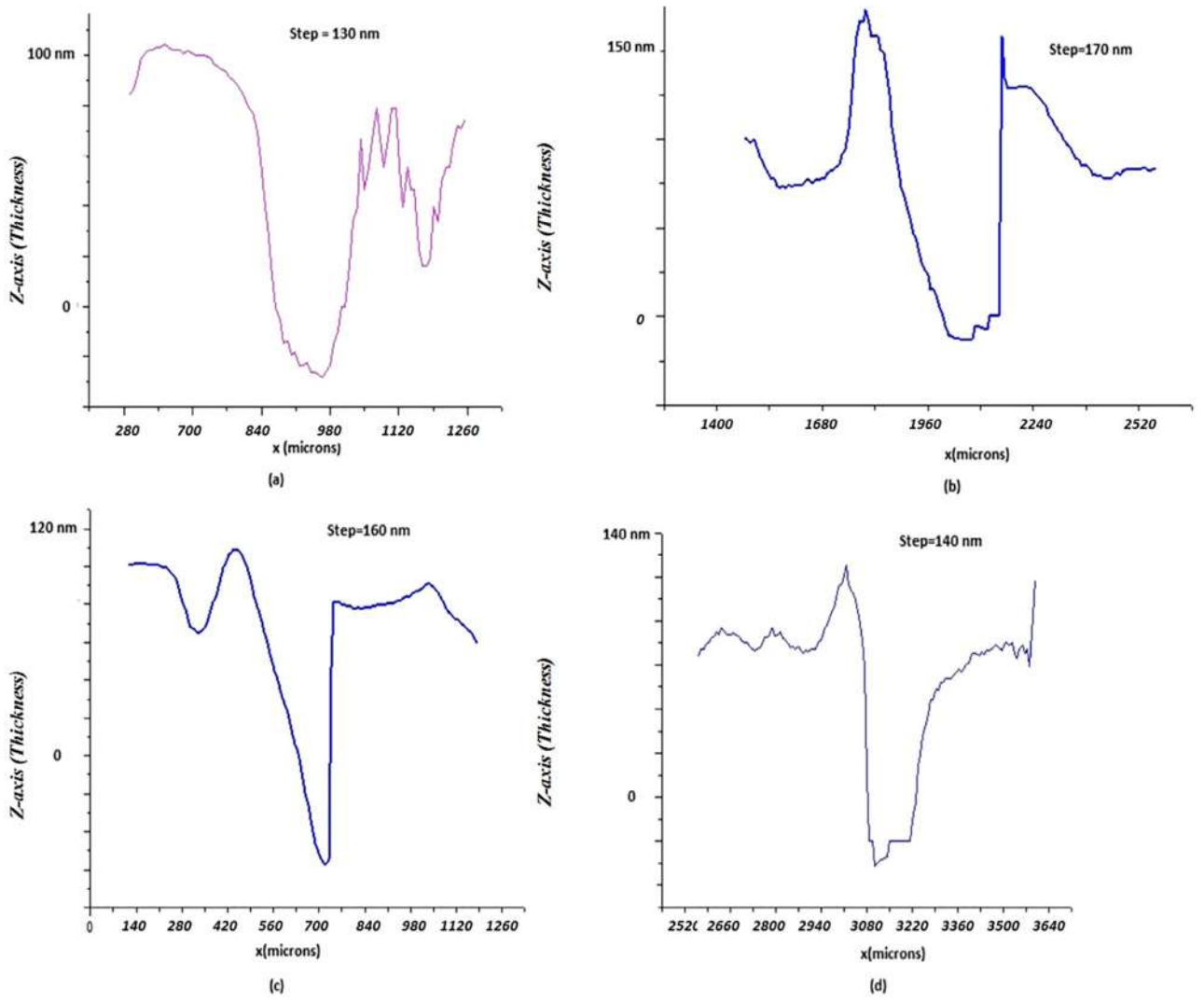

Fig. 5. Line profile for the step size of (a) 130 nm (b) 170 nm (c) 160 nm and (d) 140 nm corresponding to the thin film sample of Fig. 2a.

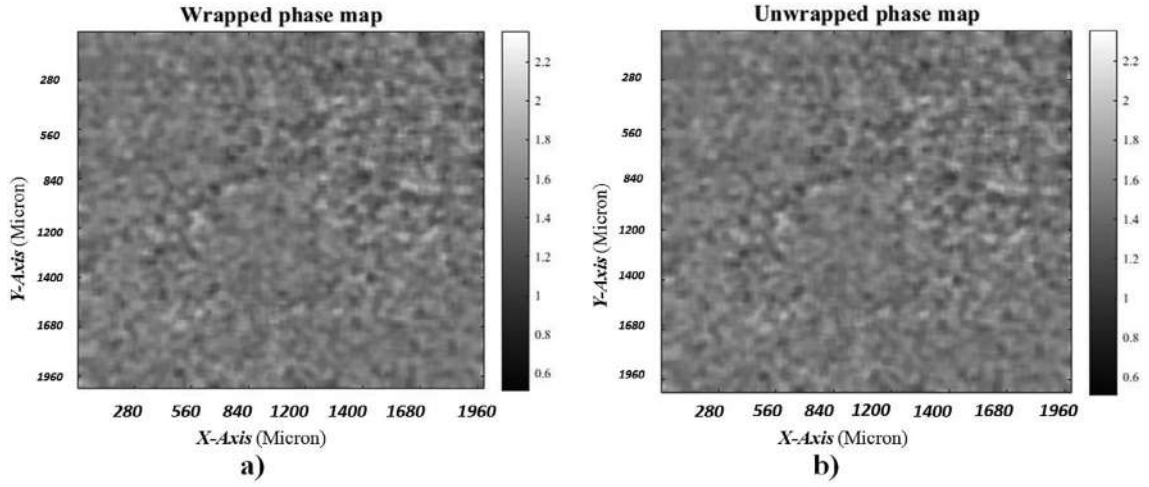

Fig. 6. a) Wrapped Phase Map and b) Unwrapped Phase Map corresponding to the thin film sample of Fig. 2b.

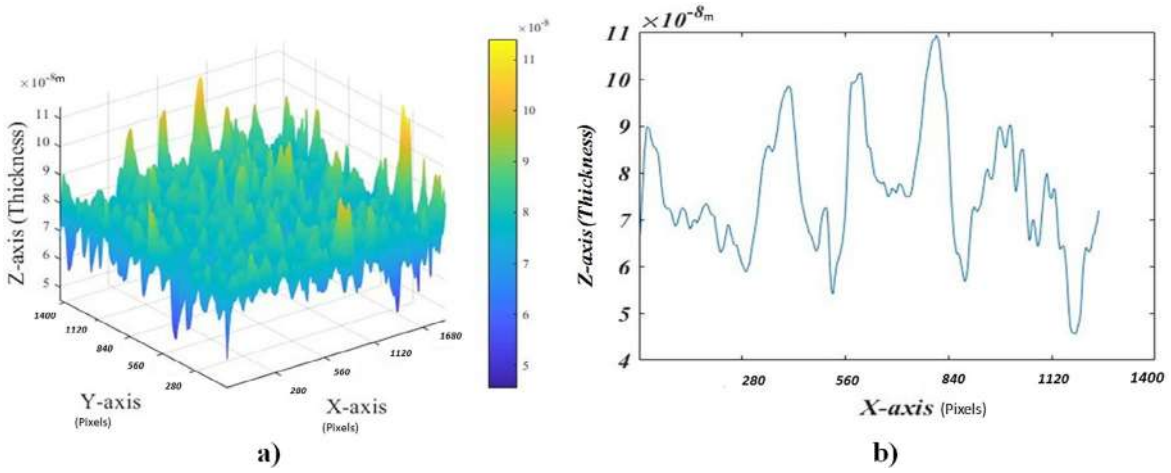

Fig. 7. a) 3D Surface Profile and b) Line Profile corresponding to the thin film sample of Fig. 2b.

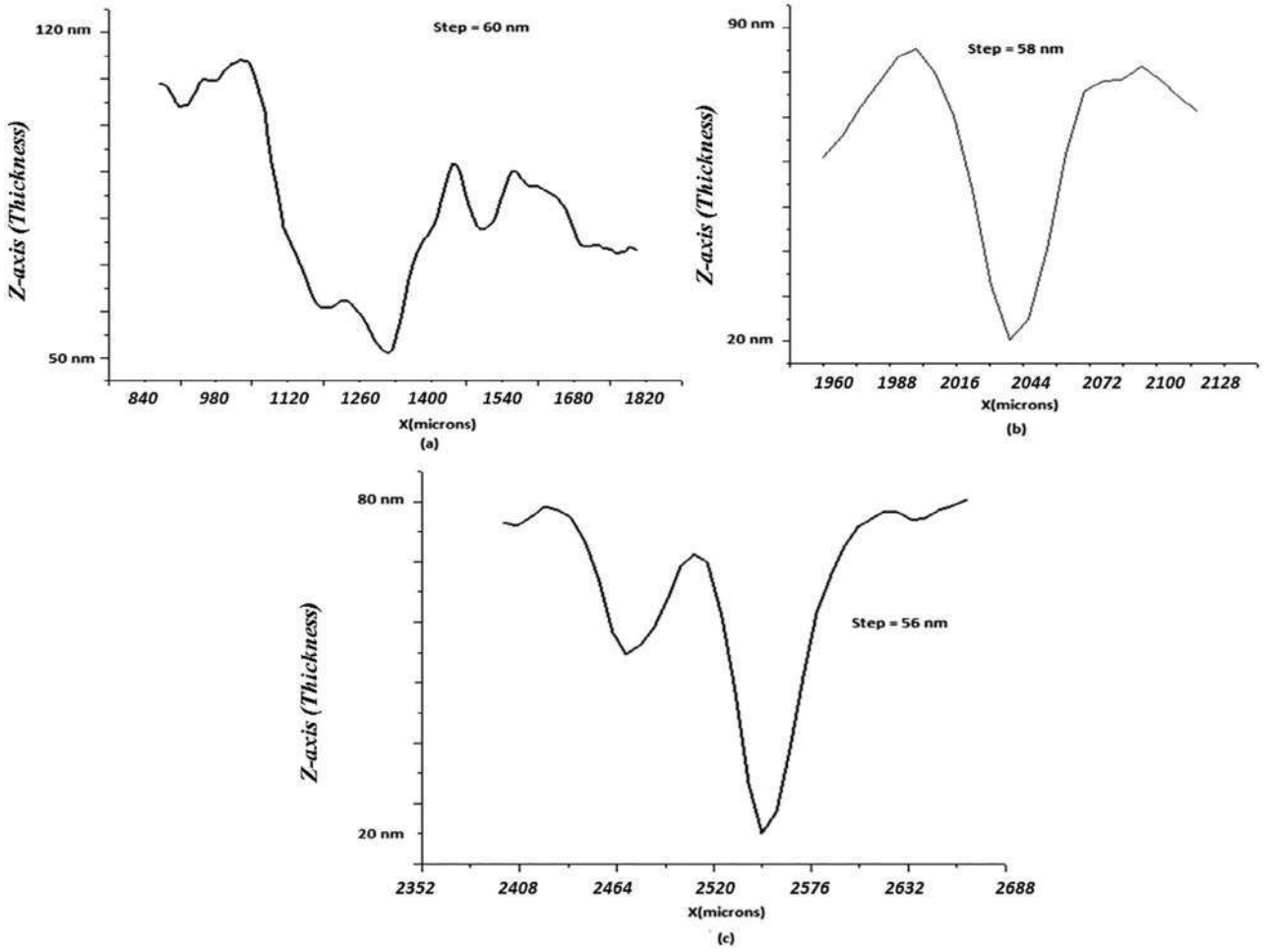

Fig. 8. Line profile for the step size of (a) 60 nm (b) 58 nm and (c) 56 nm corresponding to the thin film sample of Fig. 2b.

error in the calculation of phase map. Average deviation in the phase step is found to be 0.72 (ε) [21]. The error in the calculated value of phase (ΔΦ) is given by Eq. (3) [25]

$$\Delta\phi = (\varepsilon^2/4)\sin 2\phi \quad (3)$$

So, a deviation in the phase step of 0.72 from its value of (Φ) (say 15°) results in a maximum error in the calculated value of the phase difference of only ± 0.06°. This phase difference error corresponds to error in surface measurement of ± 3.1 nm.

Table 1
Comparison of thicknesses of samples measured using two different techniques.

Samples	Sr. No.	Thickness (Measured using Profilometer)	Thickness (Measured By ESPI Technique) (±3.1 nm)
Sample 1 (Fig. 2a)	1.	130 nm	130.64 nm
	2.	140 nm	136.21 nm
	3.	160 nm	163.05 nm
	4.	170 nm	170.54 nm
Sample 2 (Fig. 2b)	5.	60 nm	60.6 nm
	6.	58 nm	59 nm
	7.	56 nm	52 nm

We went further and calculated surface roughness values of sample 1 (Fig. 2a) and sample 2 (Fig. 2b) by using Eq. (2). Surface roughness values for sample 1 (Fig. 2a) and sample 2 (Fig. 2b) calculated as 88.7 nm and 76 nm respectively.

Recent paper [26] demonstrate utilization of in-plane ESPI technique and radial basis function for determination of thickness uniformity of a transparent thin film. No thickness values were reported in this paper. This paper reports utilization of out-of-plane ESPI technique alone for determination of 3D surface profile, thickness and surface roughness in nm range of a metallic (reflective) thin film.

4. Conclusion

We demonstrated the ESPI technique for the measurement of thickness of two nano size copper films. Calculated thickness values are in good agreement with the values measured using Stylus Profilometer. The least thickness measured using this method is ~ 52 ± 3.1 nm. Surface roughness of thin films were calculated using the evaluated surface profiles and they are also in the nanometer range.

CRediT authorship contribution statement

N.B. Bhagat: Methodology, Investigation, Writing - original draft. **P.P. Padghan:** Software, Methodology, Investigation, Writing - original draft. **R. Kesarwani:** Resources, Formal analysis. **A. Khare:** Conceptualization, Supervision. **K.M. Alti:** Conceptualization, Writing - review & editing, Visualization, Supervision. **:** .

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Effects of *Fusarium* wilt on chickpea in India: A review

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Abstract

Chickpea (*Cicer arientinum* L.) is an important consumed rabbi pulse crop all over India. Wilt is caused due to *Fusarium oxysporum f.* sp. *ciceris.* It is the most severe and expansive disease of chickpea under favorable and agro-climatic conditions. It is responsible for 80 to 100% yield loss. This parasite spreads everywhere on the pieces of the tainted plant remembering seeds with extraordinary financial loss of yield for chickpea. The microbe has incredible varieties in social characters and tainting nature. Various accounts on wilt (*Fusarium*) are assessed to decide the current status of information on the illness and to discover the spaces of exploration which need moment consideration. This review focuses on accessible information on *Fusarium* wilt sickness, etiology, pathology, and impact on yield in the Indian region and also safe components adjusted by chickpea to oppose the *Fusarium* wilt.

Keywords: *Cicer arietinum*, *Fusarium oxysporum* f. sp. *ciceris*, Resistance, Wilt.

Introduction

Chickpea (*Cicer arientinum* L., Fabaceae) is a significant annual legume crop. It self-pollinated and characterized by 2n = 16. It is one of the primitive crops of the world that originated in south-eastern Turkey about 8000-9000 years ago from its wild ancestor *C. reticulatus* [33, 59]. All over the world, *C. arietinum* L. (Chickpea) is the most preferred food for vegetarians after *Phaseolus vulgaris* L. (Soya bean) and *Pisum sativum* L.(Dry bean) [14]. It stands for the third position concerning the area under cultivation [13, 37]. In the Indian subcontinent, it grows as a post-monsoon winter-season crop. It matures within 80 - 170 days. It requires 21 - 29°C nights and 18 - 26°C day's temperatures with 600 to 1000mm rainfall as an optimum condition for better growth [38, 15].

Different abiotic and biotic agents affect adversely chickpea productivity around the world [70, 13]. Chickpea is very sensitive to biotic stresses from a variety of organisms such as fungus, bacteria, viruses, mycoplasma, and nematodes. Worldwide around 172 infectious pathogens have been recorded which harmful to Chickpea [47]. A few of them are fungal species that are hazardous since they produce mycotoxins. It is, therefore, important to check to spread infection [61]. The wilt disease is found worldwide encompassing the countries such as India, Burma, Bangladesh, Chile, Ethiopia, Iran, Mexico, Nepal, Pakistan, Sudan, Syria, Tunisia, Iran, USSR Malawi, the United States, Spain, Peru, Turkey, and Italy. However, the cultivation of Chickpea is highly threatened due to this wilt disease in India, Myanmar, Nepal, Iran, Spain, Pakistan, and Tunisia. *Fusarium* wilt has been found disastrous fungal disease showing adverse effects on chickpea productivity [24, 27].

Fusarium wilt brought about by *Fusarium oxysporum f.* sp *ciceris* is the main far and wide sickness of chickpea that happen in the semi-bone-dry tropical district of the world where the chickpea developing season is much dry and warm. In Indian Sub-landmass Fusarium wilt was accounted for interestingly by Buttler in 1918 [29]. *Fusarium* wilt is a root-occupying, soil-borne organism [27, 50].

No unequivocal information is accessible regarding trim misfortunes. Nonetheless, best guesses demonstrate that misfortunes may around 10-15% every year as an ordinary component. In the long periods of extreme pestilences, crop misfortunes have shoot up as high as 60-70%. At the seedling and blossoming stage, loss of yield was 59% and 41% individually [55]. Seeds gathered from wilt-infected plants indicate low weightage, more bluntness, and wrinkled than from normal plants. The yield misfortunes fluctuate somewhere in the range of 10% and 100% relying upon the agroclimatic conditions. In India, yearly yield misfortunes because of *Fusarium* wilt were assessed about 10% [7] Chickpea sicknesses may cause yield misfortunes of up to 100% contingent upon the season of disease[48].

Fusarium wilt fundamentally diminishes both the yield and weight of chickpea. These impacts were identified with chickpea cultivar, planting date, and destructiveness of the far-reaching *F. oxysporum f.* sp. *Ciceris* [41].

The objective of this review is (i) to check event and appropriation of chickpea wilt in Indian 'Desi' cultivars (ii) to discover the seriousness of sickness and impact of agro-climatic components like soil, temperature assists with causing Fusarium in chickpea its belongings (iii) to study the pathogenesis because of *Fusarium* wilt in chickpea and normal protection component in having a plant.

1. Scientific categorization and intricacy of *Fusarium*

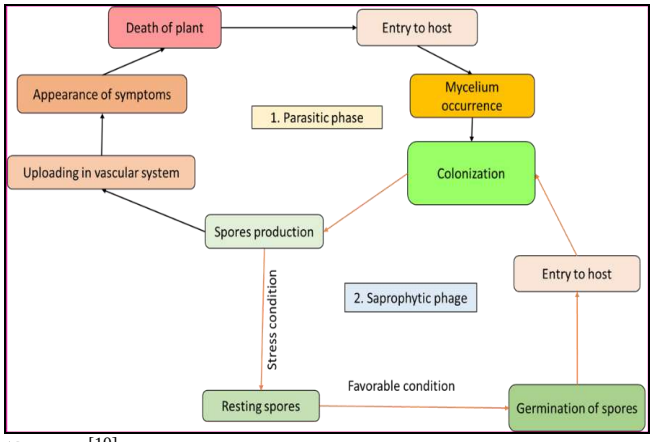
Dependent on the plant species and plant cultivars tainted, *F. oxysporum* is characterized into more than 120 structures a speciales [5]. As of now acknowledged arrangement for the *Fusarium* wilt microbe *Fusarium oxysporum* f. sp. *ciceri* is, class: Deuteromycota (Growths Defective), request:

Moniliales, family: Tuberculariaceae, sort: *Fusarium*, species: *oxysporum*, specialis: *ciceri*.

F. oxysporum f sp. *ciceris* is accounted for from the vast majority of the chickpea developing regions. *F. oxysporum* is a pathogenic organism regularly found throughout the planet. It is a dirt form ascomycete causing *Fusarium shrivel*, on numerous monetarily significant yields. The microorganism comprises more than 120 known strains and every one of which is explicit to one-of-a a kind host plant in which it causes sickness. *F. oxysporum* strains taint and slaughters numerous industrially reaped yields and vegetables. The spores of *F. oxysporum* get by in a lethargic stage in the dirt for quite a while and are effectively spread in water, it can taint vegetative cuttings and can communicate to others. Researchers throughout the planet proposed creating *F. oxysporum* as an all-inclusive model for the comprehension of parasitic destructiveness [56].

2. Advancement of *Fusarium* wilt in chickpea

History and Pathogenicity: The attack on chickpea by *Fusarium* wilt is brought by *F. oxysporum f.* sp. *ciceris* (Padwick) Matuo and K. Sato. This organism was initially named *F. orthoceras* Appel and Wollenw var. *ciceri* by Padwick; then named *F. oxysporum* Schl. *f.* sp. *ciceris* (Padwick) Snyder and Hansen by Chattopadhyay and Sen Gupta. This was recognized as the correct title of the organism until corrected by Holliday (1980) [28, 46]. This growth is pathogenic just on *Cicer* sp. on which chickpea has the solitary developed species [31]. In any case, *F. oxysporum f.* sp. *ciceris* can likewise attack root tissues of other grain vegetables like the bean, lentil (Focal point culinaris), faba bean (*Vicia faba*), pigeon pea (*Cajanus cajans*), and pea (*Pisum sativum*)[25]. *F. oxysporum f.* sp. *ciceris* shows broad pathogenic changeability notwithstanding. Two pathotypes have been recognized based on the particular yellowing or withering maladies with gritty colored vascular stains that they cause in powerless chickpeas.



(Source: [10]

Fig 1: Parasitic and sporophytic stage of *F. oxysporum f.* sp. *ciceris*

3. Sickness stages making contamination chickpea

a. Easygoing creature: To recognize the causal living being *F. oxysporum* f sp. *ciceris* applying atomic apparatuses like PCR procedures, explicit ground works, and PCR examines have been created [12, 30, 20, 23, 11]. Sickness can happen in practically all phases of plant development and infected plants might be found in gatherings or patches across the fields[46, 22, 29]. Wilting in chickpeas can be observed 20-25 days after planting. Under field conditions, the disease manifests itself during the seedling (September-October) and regenerating stages (February-Walk) of the crop.

b. Indications: Toward the beginning illness side effects show up on upper leaves, blossoms and twigs hanging, loss of bloat and staining of leaves followed by yellowing and drying of influenced plant parts may happen while in later stages it brings about the breakdown of the entire plant [34, 39].

Organisms pass in taproots, then, at that point into the vascular pack bringing about histological modification of vascular tissue and tanish staining of xylem vessel resemble. Soon, sidelong roots get dry, shriveling can be seen in upper plant parts, and in the long run entire plant is tumble off. Wilting may likewise be halfway; influencing some plant parts. Seeds in wilted plants are sub-par in quality generally more modest in size, stained, and wrinkled.

4. Occurrence of wilt on chickpea in different parts of India

Fusarium wilt is the most common disease that affects all chickpea growing areas in India. *Fusarium* wilt infection was found to be a major chickpea illness in central and southern India (Ghosh *et al*., 2013) [21]. Chickpea is one of the most vulnerable crops to pest and disease assault, resulting in massive production losses. Chickpea wilt is a serious concern in rainfed parts of Jammu and Kashmir [1]. The Major States affected by *Fusarium* wilt: Uttar Pradesh, Madhya Pradesh, Maharashtra, Karnataka, Andra Pradesh, Chattisgarh, Jammu region [21, 1, 57].

5. Planting time and Effect of *Fusarium*

The planting period is an important component in calculating chickpea crop production. Chickpeas are traditionally sown in the Mediterranean region in the spring, though winter planting started to coordinate different edit formative stages with the greatest natural circumstance and raises net surrender by superior application of water from the soil [40]. In India Chickpea is planted from September to November and that is why it comes under the grouping of rabbi crops.

The yield of chickpea is evaluated by the time of planting; if sowing is delayed, the yield will be reduced since sowing occurs from early winter to early spring. Net abdicate diminishes caused by the infection were bigger than decreases in hundred seed weight. As a result, the normal abdicate misfortune initiated by the contamination can be credited for the most part to a drop within the number of grains per plant to a lesser degree, to a diminish in normal seed weight [41]. In India, abdicate decrease in 'Desi' assortments planted within the early October was influenced by development organize at which the contamination created due to *Fusarium* wilt. However, there is no relationship to demonstrated in-between disease development and yield loss [44].

While some researchers reported the adverse impact of intensity of disease and seed yield in *Fusarium* wilt while planting delayed up to the mid of October [28].

6. Improvement of *Fusarium* wilt in chickpea because of ecological variables

Fusarium wilt is a genuine illness danger, particularly in low precipitation regions, where climate conditions are positive for infection improvement. Brimming with air change is the reason for languishing over-farming. Environment influences plants as well as influences the microorganisms, creepy crawly bugs, or weeds that decrease yield [3]. The exemplary infection triangle distinguishes the part of the environment in sickness advancement on crops, as no destructive microbe can prompt illness on a profoundly powerless host if climatic conditions are unfavorable[2,74]. Wilt occurrence in chickpea is likewise relying upon climatic states of the locale. Data on the impact of Indian tropical climatic conditions on *Fusarium* wilt rate in chickpea is immensely restricted.

Table 1: The appearance of chickpea sickness comparable to different ecological factors in India, 2010

Parameter	Disease appearance (%)			
	AP	MP	CG	KS
	FW	FW	FW	FW
Cultivar type				
Local	18.76	19.44	20.02	15.10
Improved	9.86	0.00	0.00	8.78
Soil type				
Black	14.31	19.44	19.58	11.94
Red	-	0.00	20.67	19.83
Seed treatment				
Yes	10.46	0.00	0.00	12.40
No	16.81	19.44	20.02	14.86

Source of the table: [21]

*FW: *Fusarium* wilt; AP: Andhra Pradesh; MP: Madhya Pradesh; CG: Chhattisgarh; KS: Karnataka; "-" indicate red soil type fields were not available.

7. Agro-climatic zone shrewd *Fusarium* wilt infection event on chickpea

[57] give details that, the date introduced in Fig.3 uncovered that chickpea wilt illness event was discovered greatest in moderate precipitation zone (29.28 and 30.60 %) trailed by guaranteed precipitation zone (25.12 and 26.18 %) separately, during Rabi 2018-19 and 2019-20. Nonetheless, the least infection event was recorded in the Shortage zone (19.36 and 22.11 %) during two Rabi years i.e. 2018-20 [57].

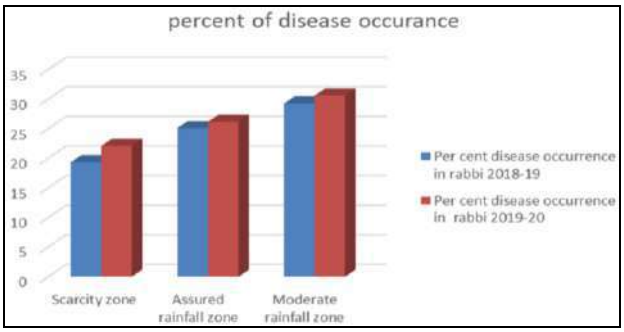


Fig 2: Agro-climatic zone shrewd *Fusarium* wilt infection event on chickpea [57].

8. Safe system of Chickpea against *Fusarium* wilt

a. Allelopathy-arrival of synthetics for protection instrument: Different frameworks can be related with the natural control of Fusarium shrink sicknesses by non-host *F. oxysporum* isolates. These components join the saprophytic challenge for supplements; parasitic contention for malady districts; and activated or made strides hindrance interior the host plant [53, 2, 36]. These systems are not restricted to each other, and a few instruments might be liable for sickness obliteration by numerous biocontrol specialists [35]. In past examinations, it was shown that specific plant protection reactions, in particular phytoalexin union and amassing of chitinase plus b-1, 3-glucanase exercises, might be engaged with the non-host opposition of chickpea against nonhost *F. oxysporum* segregates[4, 9]. Chickpea phytoalexins (the pterocarpans maackiain and medicarpin) are essential segments of the opposition system of the chickpea plant to *F. wilt* [58].

b. Biochemical changes in opposition system: Pathogenic assault on plants seems to cause changes in protein (chemical) amalgamation in the plant that can prompt the advancement of nearby obstruction or invulnerable layer around contamination destinations. Obstruction or resistance of plants to a microbe may rely upon the speed and degree of protein amalgamation instigated in the host by the microorganism. After disease, an amalgamation of pathogenesis-related protein [60]. The host-microbe collaboration is extremely intricate and assorted. Opposition in higher plants against microbial microorganisms is the consequence of constitutive and inducible guard components. The metabolic changes happening in unhealthy plants habitually prompt aggregation of sweet-smelling compounds particularly phenolic intensifies which are by and large more articulated in safe assortments [16, 6].

c. Plant protection from pathogenic organisms include various reaction: Pathways including the gathering of hydrolytic chemicals, for example, chitinases and ß-1, 3-glucanases [8, 42]. Phenols, peroxidase, and ß-1, 3-glucanases are fundamental segments of the reaction of a plant to different diseases and stress conditions, reacting working together with other safeguard-related proteins. These qualities could hence be utilized as markers for recognizing chickpea lines impervious to contagious microbes [56]. Because of the shifting nature of plants and microorganisms, biochemical changes happened at various phases of disease just as the development of the plant [51].

9. Primary Metabolism Effect in host plant

Essential Digestion Impact: Biotropic collaboration among host and microorganism initiates Receptive Oxygen Species which prompts customized cell death in have a tissue at the tainted site. Wound interceded Passage of the microorganism inside the host plant which was anticipated by the enlistment of guard qualities like arginase, cytochrome P450 monooxygenase, ATPases, Ser/Thr kinase, phospholipase C, and DNA methylation implies marginally early detecting of the microbe by having a plant. Enlistment of this load of qualities prompts adjusted essential digestion of the host, which includes changes in sugar as well as nitrogen digestion. This assertion was upheld over articulation of sugar and nitrogen digestion-related reproductions and carriers. These progressions in

essential digestion may also control numerous primary and transcriptional controllers. All in all, it is anticipated that in viable communication of *Fusarium* sets up inside the host plant, triggers HR, focuses on the host's essential digestion and losses have obstruction. Then again, in safe plants the microorganism is detected early, its foundation inside the host is postponed, HR power is similarly lower than the vulnerable assortment, and host essential metabolic signs pay off for the microbe instigated harm[29].

10. **Utilization of safe cultivars:** The most extreme applied and cost-productive strategy for the executives of wilt of chickpea plant is the utilization of safe variety [28, 44, 45]. First recognized races 1, 2, 3, and 4 of *F. oxysporum f.* sp. *ciceris* in our country. Rearing practices help in protection from biotic anxieties and balance out chickpea creation. Reproducing rehearses have sponsored to fundamentally diminish the *Fusarium* wilt impact on the chickpea crop. There are fundamental three stages or parts are by and large engaged with any chickpea rearing system: i-hereditary variety, which is the foundation of the reproducing program; ii-choice inside that variety for attractive plant types with illness opposition and iii-assessment of the chose lines for business creation [52, 55]. Within the interim chickpea may be a self-pollinated plant, the progression of unadulterated line cultivars have to require settling qualities in replicating stream. Mass or unadulterated line choice from landraces was the least complex strategy at first utilized. A long way ahead, crossing programs and a few alterations of family and mass techniques were utilized in dealing with isolating ages [18]. Single crosses are embraced in most chickpea rearing projects, especially in various species hybridization among local and Kabuli-types having distinctive hereditary foundations [7]. Desi gatekeepers have been cast off move noteworthy qualities to shrink obstacles into Kabuli-type replicating programs, at that point once more, Kabuli gatekeepers have been utilized as a source to upgrade colossal seed measure as well as quality in neighborhood assortment raising ventures [19].

There is a need to improve the exactness and capability of determinations in the isolating ages for cutting edge and rapid hereditary additions [18]. Powerful wilt debilitated plots for the field and area of interest area screening, nursery, and lab methodology for opposition screening have been set up for fruitful reproducing programs [19].

Fusarium wilt is essentially overseen by obstruction rearing projects. Be that as it may, pathogenic changeability and impermanence promoting the breakdown of normally chose opposition are the fundamental obstacles for plant reproducers. Marker-helped quality planning contemplates have been finished by many exploration gatherings [22]. Numerous researchers have been investigated for post-pathogenic intrusion-related biochemical [16], which recommends that the opposition verses' *F. oxysporum* f. sp. *ciceri* in chickpea isn't represented by the old-style subordinate protection reactions operational in conventional plant-biotrophic experiences. These investigations underline the presence of some unusual protection component in this specific plant/microbe association [5].

Discussion

The researchers in the current investigation uncover that *Cicer arietinum* L. (Chickpea) is one of the significant yearly vegetable yields, developed all through India since old times. It is likewise filled in numerous nations worldwide. The yield has been confronting various biotic or abiotic imperatives. Among the biotic imperative harvest was influenced unfavorably by illnesses, brought about by numerous microorganisms. Since the time 1918 when interestingly wilt sickness of chickpea was accounted for and *F. oxysporum f.* sp. *ciceri* was the causal creature numerous methodologies have been received to control the wilt infection [10].

Dissimilar outcomes seen by the decision of planting time have been suggested for the board of *Fusarium* wilt of chickpea [28] yet those reports did not evaluate with regards to how these factors in pathogenesis would impact its productivity. The intuitive impacts of chickpea cultivar, planting date, or race of *F. oxysporum f.* sp. *ciceris* on wilt advancement and yield misfortune have not been resolved.

The comparative assessment was given by various researchers that, Chickpea filled in as a significant dietary protein for people at the least expensive expense contrast with different wellsprings of protein. Like different harvests, chickpea is exposed to numerous abiotic or biotic pressure, which causes restricted creation according to the hypothetical potential. The creation of chickpea in the subcontinent and Asian nations is seriously influenced by pathogenic growth [47, 49].

Biochemical changes in vulnerable and safe cultivars of chickpea were assessed based on significant biochemical mixtures like free amino acids, all-out phenol, ascorbic acids. Vulnerable and safe cultivars tainted with wilt infection were utilized for understanding biochemical instruments of sickness opposition [51]. Endeavors have been made to utilize interspecific crosses for improving hereditary fluctuation and introgressing valuable qualities from wild *Cicer* spp. into the developed species. Protection from Foc races has been distinguished essentially in Desi germplasm just as in wild *Cicer* spp.

Conclusion and Future Viewpoints

Fusarium wilt of chickpea certainly stays the indispensable danger in the dependable creation of chickpea around the world. This audit has been mirrored the reason for wilt infection and its impacts on chickpeas. *Fusarium* wilt is a major threat to chickpea creation misfortune. There is a need for a detailed investigation of the yield of misfortune due to *Fusarium* wilt in chickpea in the Indian area.

In the future, there is a need for investigation of all-out production loss of cultivar chickpea due to *Fusarium* wilt on chickpea in chickpea developing spaces of India. With the goal that legitimate work could be done in the future.No information accessible of yield misfortune and chickpea creation in an eastern locale of India. *Fusarium* illness becomes a challenge to the present-day horticultural economy since its impacts on chickpea are serious and it contaminates all pieces of the plants.

Moreover, there is a necessity of trademark on agro-climatic highlights influencing chickpea in all areas of India. Now, there is a need for sufficient examination to give agreeable clarifications to the in-plant pathogenic foundation and the comparing plant responses. Moreover, this specific pathogenic assault and its resultant host protection offer a chance for wide-going exploration.

Different hereditary and biochemical instruments are working in the safe cultivar for *Fusarium oxysporum* guard when contrasted with the weak plant. The guard-related

gene(s) ATPases, Ser/Thr kinase, phospholipase C, arginase, cytochrome P450 monooxygenase, and DNA methylation assumed a basic part in contributing regular protection from the safe host. Henceforth there is a need of developing a safe assortment of chickpea in various chickpea developing regions for more creation and yield.

Conflicts of interest

The authors declare no conflict of interest.

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In vivo Evaluation of Chemicals and Plant extracts against powdery mildew of Black gram and green gram

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Abstract

Present experiment was conducted in field by using susceptible varieties of Black gram and Green Gram to evaluate the relative efficiency of chemicals and plant extract against powdery mildew fungi Diseases of black gram and green gram i.e., powdery mildew of black gram and green gram. During 2015-16 & 2016-17. In this session measured the temperature and relative humidity ranges between 10-22 ^{o}C and wet weather near about 85 to 90%. Because powdery mildew fungi favorable condition for growth, development, reproduction and disease development on host plant. Observed First symptoms appeared on plant 22 days after germination i.e., White powdery patches appear on leaves and other green parts. Observation was recorded on disease incidence and disease severity before 1st spray, 2nd spray and 3rd spray of chemicals and plant extract at different concentration range. It was confirmed that all used different concentrated chemicals and plant extracts capable to reduce disease incidence and severity as compared to the unsprayed plants i.e., control.

Keywords; Susceptible varieties, powdery mildew disease, Chemicals, plant extracts, disease incidence. Control over disease

Introduction

Powdery mildew of Black gram and green gram disease is the major biotic stress which constrains the production and productivity of these crops. Powdery mildew of Black gram and green gram caused by Erysiphe *polygoni* and *Erysiphe polygoni* D.C which favored by ranges between 10-22 ^{o}C and wet weather near about 85 to 90% Condition. The disease has been reported from all over world including India,

Thailand, Philippiens, Sri Lanka, Taiwan, Colombia, Ethiopia, Thailand, Korea and U.S.A. In India reported this disease in Maharashtra, Karnataka, Madhya Pradesh, Andhra Pradesh and Rajasthan.

Production losses on farmer field range 20-40% and 100% when it occurs at the seedling stages in green gram (Reddy *et al*, 1994). Singh *et al.* (1991) reported 12.5 to 85.7% losses in yield on twenty mung bean varieties due to powdery mildew from Chhattisgarh State. Barak *et al*. (1979) reported that application of systemic fungicide Bayleton (triadimefon) at 500 g/ha through the trickle irrigation system each week for three months gave outstanding control of *Leveillula taurica* on *Capsicum anum.*

Therefore, it is need to develop strategies for management of powdery mildew by plant breeding technique develop resistant varieties and also use low-cost chemicals and plant extracts to minimize the disease incidence and protect the production cost as well as environment. Present studies showed that, effective control of powdery mildew with different concentration of fungicides that are Bavistin 50% WP (0.05% and 0.10%), Bayleton 25% WP (0.05% and 0.10%) and Mancozeb 75% WP (0.3 and 0.5%) and plant extract i.e Lantana leaf extract 5% and 10% datura leaf extract 5% & 10.

Material and Methods

Present investigation was conducted at local village of Manora District Washim, Maharashtra. Experiment repeating twice during year 2015-16 and 2016-17. In field of Black gram and green gram susceptible cultivars appearance of powedery on the leaves and Observations were recorded on per cent disease severity once before first spray. Chemicals and plant extract suitable for control and screening of promosing cultivars for resistant against powdery mildew fungi.

Preparation of chemicals

Table 1 *In vivo* evaluation, fungicides used and the concentration tested has been given in table.

Sr.No.	Name of fungicide	Conc %
1.	Bavistin 50% WP	0.05
		0.10
2.	Bayleton 25% WP	0.05
		0.10
3.	Mancozeb 75% WP	0.3
		0.5
4.	Distilled water (Control)	Control

Preparation of plant extracts

Healthy plants of lantana camera and datura plant was collected from local field and area, each plant leaves washed with runing water then surface sterilized with 70% alcohol then washed in sterile distilled water and macerated with sterile distilled water at 1:1 (w/v) ration using mortal and pestel. The plant extract was filtered through whatman no. 1 filter paper. The filtrate plant extract considered as 100% concentration

(Gangwar S.K,*et al*,.2000; Vidyasagar G.M.*et.al,* 2001). From this concentrated extract desired concentration was taken i.e.,5 and 10 % respectively.

Sr.No.	Name of fungicide	Conc %
1.	Lantana leaf extract	5
		10
2.	Datura leaf extract	5
		10
3.	Distilled water	Control

Application of chemicals (fungicide) and plant extract in field of susceptible cultivars of Black gram and Green Gram.

The application of chemicals (fungicides) and plant extract was conducted Black Gram (TAU-1) and Green Gram (K-851) susceptible cultivars grown in soil plot with different line. each line sowing 1000 seeds . 22 days after germination white patches appear on leaves of cultivars and were recorded disease incidence and disease severity before applying chemicals and plant extract, Observations were recorded on per cent disease severity once before first spray, before 2nd spary, before 3rd spray and after 3 rd spray at 60 DAS.

Disease incidence and Severity analysis

In all experiments, disease incidence (percentage) and severity were assessed at 2-day intervals. Severity of symptoms on individual plants were rated on a scale from 0–4 according to the percentage of foliage with yellowing or necrosis in acropetal progression: 0 = 0%, 1 = 1–33%, 2 = 34– 66%, 3 = 67–100%, 4 = dead plant. Incidence and severity data (0–4 scale) within a pot were used to calculate a disease intensity index (DII) by the equation: DII = [(ΣSi x Ni)/ 4x Nt) x 100] and percent disease control was calculated using another formula (Munshi N.A, *et al* , 1994)

$$\textbf{Percent disease control (PDC)} = \frac{\text{Control PDI} - \text{Treatment PDI}}{\text{Control PDI}} \times 100$$

Results and Discussion

In *vivo* experiment was conducted to evaluate the effect of chemicals (fungicides) and plant extract against powdery mildew of Black Gram and Green Gram during 2015-16&2016-17. Disease severity and disease incidence before spray of chemicals and plant extract were recorded range 32 to 42%. In both susceptible cultivars found that Bavistin 50% WP with concentration was most effective afer 3rd spray on control of powdery mildew, followed by Balyton 25% WP with concentration 0.10 % was effective for reduction of disease severity after 3rd spray but least effective low conc. of mancozeb also plant extract,

Lantena camera extract with concentration 10% was considerable effect on control of powdery mildew on both crops' cultivars summarized in **table 1&2.**

Agrawal (1989) reported the effective control of disease with two sprays of bavistin @ 500 ppm at 15 days interval starting on the appearance of the first symptoms.Pawar *et al*. (1985a) noticed that among eight fungicides tested on chilli (*Capsicum annuum*) against *L. taurica*, Bayleton 25 WP at 0.05%, Saprol 20% EC at 0.15 per cent and Karathane 48% EC (dinocap) at 0.1 mildew %. Proved most effective in controlling the disease and increasing the yield.

Audichya and Thakare (2000) reported carbendazim @ 0.05% to be most effective for control of powdery mildew in opium poppy.

Table. 1. Evaluation of different concentration of chemicals/ fungicides and plant extracts for management of powdery mildew on Black Gram Cultivar (TAU-1).

Name of chemicals/ Fungicide	Conc %	Powdery mildew disease incidence (%)			
		Before spray	After 1^{s}spray	After 2nd spray	After 3rd spray
Bavistin 50% WP	0.05	39	34	25	11
	0.10		29	18	07
	Unsprayed		46	53	59
Bayleton 25% WP	0.05	38	31	26	12
	0.10		27	22	09
	Unsprayed		43	54	61
Mancozeb75% WP	0.03	34	29	25	14
	0.05		23	19	11
	Unsprayed		40	51	63
Lantana Camera extract	5%	37	34	29	18
	10%		31	21	13
	Unsprayed		43	56	63
Metal dutura extract	5	39	32	25	15
	10		27	22	16
	Unsprayed		45	57	63

Table. 1. Evaluation of different concentration of chemicals/ fungicides and plant extracts for management of powdery mildew on Green Gram Cultivar (K-753)

Name of chemicals/ Fungicide	Conc %	Powdery mildew disease incidence (%)			
		Before spray	After 1^{s}spray	After 2nd spray	After 3rd spray
Bavistin 50% WP	0.05	41	32	23	12
	0.10		28	17	10
	Unsprayed		48	57	67
Bayleton 25% WP	0.05	43	37	27	18
	0.10		29	22	12
	Unsprayed		49	64	69
Mancozeb75% WP	0.03	41	37	26	17
	0.05		31	25	13
	Unsprayed		47	56	62
Lantana Camera extract	5%	42	39	28	21
	10%		33	22	14
	Unsprayed		49	54	59
Metal dutura extract	5	43	38	29	20
	10		34	23	15
	Unsprayed		46	58	61

Conclusion

Experiment indicates that, management of powdery mildew fungi on Black Gram and Green Gram, Bavistin 50% WP with concentration 0.10% response to reduction of disease severity after 1st spray upto 3rd at the intervals of 8 days in each spray.

Similar trends found in both cultivars after spraying of chemicals and plant extract. If the increasing concentration of chemicals/ fungicides and plant extract 3 spray at 8 days intervals may help for maximum reduction of disease severity but production cost increased.

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A Climate Change : Center of Attention

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Abstract

The rise in CO_2 and Green houses gases (GHGs) originated from fossil fuels emissions and deforestation is only due to human activity. Intergovernmental Panel on Climate Change (IPCC) has measurable scientific evidences in its fourth report on climate change (2007) and they have become clearly accepted universally. Climate change is commonly understood to be one of the drivers of extinction, affecting biodiversity in nearly every corner of the planet. Climate change is one of the major problems and placed in the queue of other hazardous influence which disturbs the earth balance. The rise in average temperature is only one indicator of broader changes also translating into extreme temperatures, drought, flooding, storms, rising sea levels, impacts on food production, and infectious diseases. Although the scientific community has been aware of the link between greenhouse gases (GHGs) and climate change for many years, world leaders have been slow to react and implement measures to mitigate the risks. New research initiatives should focus on collecting high-quality, long-term data on climate-related health outcomes with the dual purpose of understanding current climate–health associations and predicting future scenarios. The global warming issue and challenge has focused on the lightening of greenhouse gases based on international environmental conventions such as IPCC and Kyoto Protocol. The warm effect of global warming affects not only ecological systems but also human life; it has become an important issue both nationally and internationally so need to study.

Keywords : Climate change, health, global warming, Climate Variability

Introduction

Present time climate change concluding both global warming and its consequences on Earth's weather patterns. There have been previous circumstances of climate change, but the rapid changes in climate are rapidly moving and obviously its not due to natural causes.[1] For the years that the international community has engaged on climate change, it has the UN Framework Convention on Climate Change (FCCC)[2] and its Kyoto Protocol,[3] to show for it. The emission reduction commitments made under these agreements are inadequate [4] and inadequately implemented.[5] Instead, they are caused by the emission of greenhouse gases, mostly carbon dioxide (CO2) and methane. Burning fossil fuels for energy use creates most of these emissions. Agriculture, steelmaking, cement production, and forest loss are additional sources.[6] Greenhouse gases are transparent to sunlight, allowing it through to heat the Earth's surface. When the Earth emits that heat as infrared radiation the gases absorb it, trapping the heat near the Earth's surface. As the planet heats up it causes changes like the loss of sunlight-reflecting snow cover, amplifying global warming.[7] Due to its effect the earth temperature rises twice as fast as global temperature resulted into the area of deserts increases so the heat waves and wildfires occurs more common .[8] There is now convincing scientific evidence that human activity is altering the global climate (IPCC 2007). Although questions remains about the timing and impact of climate change, it is already clear that there are risks of significant adverse consequences.[9] Although low- and middle-income countries are responsible for only a small percentage of global greenhouse gas emissions, the adverse health effects associated with climate change will likely fall disproportionately on their populations. This inequity will further exacerbate global health disparities. High-risk areas include those already experiencing a scarcity of resources, environmental degradation, high rates of infectious disease, weak infrastructure, and overpopulation .[10-13] In particular, tropical regions will experience significant changes in human–pathogen relationships because of climate change.[14] Changing temperatures and precipitation patterns linked to climate change will further affect health by changing the ecology of various vector-borne diseases, such as malaria, dengue, chikungunya, Japanese encephalitis, kala-azar, and filariasis. [15-16]

Challenges of Climate Change

Climate change is arguably the most severe challenge facing our planet during the 21st century. The spatial and temporal extent of the climate challenge deeply connects it to ethical questions as well. These arise both from the fact that the poorest people on Earth are not significantly contributing to global emissions, but may well feel the impacts most severely, and from the long-term commitment to future warming and climate change impacts – like sea level or the partial melting of the large ice sheets – which will be felt by future generations. In essence, past and future greenhouse gas emissions seriously affect a large fraction of the still growing human population on our planet and profoundly shape the environment in which our children and grandchildren will have to live in. Humanity therefore has a moral obligation to address the climate challenge. This will have to combine successful negotiations on a binding and effective international climate agreement and bottom-up initiatives from individuals or communities. There is a wide range of global threats that certainly require humanity's urgent attention.(17) But climate change cannot be considered isolated from other challenges. Indeed, climate change is a truly cross-cutting issue affecting many sectors and connected to other global challenges. For example, climate change has the potential to impact global water supplies, agricultural production, human health, and our energy infrastructure. (18) In turn, the way in which we produce our energy and food has a profound effect on the Earth's climate system. Finally, the impacts of policies in one of the fields on the other challenges need to be explored if truly sustainable solutions to global problems shall be achieved. These close connections – and the societal and technical challenges of climate mitigation (IPCC 2014b) and adaptation (IPCC 2014a) – require interdisciplinary and transdisciplinary thinking; we hope that our new journal Global Challenges can serve as a highly visible forum for research bridging classical scientific disciplines, for ideas which have the potential to directly influence future climate policy and for discussions about new research and different policy options.[19] Within the climate change focus of Global Challenges, we therefore invite submissions related to climate change of the highest quality, with a clear focus on the global view of the climate problem and with relevance for (global) climate policy or bottom-up initiatives which are a significant step towards a solution of the climate challenge.[20] Indoor air pollution presents yet another major health threat, with 32% of deaths in South Asia attributable to the burning of solid fuels in poor, small, unventilated houses [21] these health risks will be exacerbated as a result of climate change is yet to be determined, but cobenefit interventions aimed at reducing the health impacts associated with indoor air pollution, decreasing the release of green house gases from the burning of solid fuel, and preventing deforestation by introducing alternative, more efficient stoves and fuels will have serious implications for health and society.

Conclusion

In this paper we were studied the cause of climate change and its adverse effect in all over fields and here we concluded that the climate change is having adverse effect and it collapses number of species which having measurable numbers. It is clear that climate change is a security problem for some states and its due to emission of CO_2 which must be controlled by the countries but, what does it serve us to speak of climate change in these terms and what are the implications of doing so? The rise in the amounts of greenhouse gases cause climate changes. It discusses the evidence that the concentrations of these gases in the atmosphere have increased and are still increasing rapidly and progressively, and thus that most of the recent change is almost certainly due to emissions of greenhouse gases caused by human activities. Untill and unless if we not prohibited the rise in concentration green house gases , their consequences will be uncontrollable. There remains a range of estimates of the magnitude and regional expression of future change, but increases in the extremes of climate that can adversely affect natural ecosystems and human activities and infrastructure are expected. Citizens and governments can choose among several options in response to this information: they can change their pattern of energy production and usage in order to limit emissions of greenhouse gases and hence the magnitude of climate changes; they can wait for changes to occur and accept the losses, damage, and suffering that arise; they can adapt to actual and expected changes as much as possible; or they can seek as yet unproven solutions to counteract some of the climate changes that would otherwise occur. Different nations and communities will vary in their vulnerability and their capacity to adapt. There is an important debate to be had about choices among these options, to decide what is best for each group or nation, and most importantly for the global population as a whole.

The options have to be discussed at a global scale because in many cases those communities that are most vulnerable control few of the emissions, either past or future. Our description of the science of climate change, with both its facts and its uncertainties, is offered as a basis to inform that policy debate. In 2008 India developed the National Action Plan on Climate Change, promising further enhancement of ecological sustainability as part of India's development path, signaling their involvement in the international discussion on climate change. Countries like India have a tremendous opportunity to guide our future trajectory regarding sustainable development and adaptation to climate change, but it will take the combined effort of policy makers and scientists from around the world to address the complex challenges associated with climate change and human health. In conclusion, innovative, multidisciplinary investigations using environmental epidemiologic methods to elucidate health risks posed by climate variability—and subsequent climate change—in regions such as India are possible. However, such work will require expanded partnerships among researchers, governments, and communities to develop a cobenefit strategy that addresses public health challenges and risks associated with climate change. Adoption and implementation of these research initiatives will provide the necessary tools and infrastructure to pose interesting scientific questions and design effective solutions to the complex issues imposed by climate change. Health outcomes of interest, for which such data should be collected, include total morbidity and mortality and noncommunicable diseases such as cardiovascular, respiratory, and circulatory diseases and asthma, as well as infectious diseases such as cholera, malaria, tuberculosis, typhoid, hepatitis, dysentery, tick-borne encephalitis, and other vector-borne and waterborne diseases. Such monitoring also requires the collection of appropriate climatic (e.g., temperature and precipitation) and nonclimatic data (e.g., ozone). And finally if you save your 'EARTH', 'EARTH' will always save you.

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Study of Cyanophyceae Diversity of Mandwa Lake Near Dharni (Melghat) Tahsil, District Amravati (M.S.), India

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Abstract

The Mandwa Lake is principal fresh water body located in Mandwa village of Dharni tahsil in Amravati district of Maharashtra state. Dharni is a tahsil place and it is 148 km north west side of Amravati and 80 km east side from Burhanpur, Madhyapradesh It is situated at about 500 m above the mean sea level. A Study of Cyanophyceae was undertaken during Jan 2021 to Dec 2021 One Year to assess the types of Cyanophyceae present in this water body. The water of this lake is primary used for washing, bathing, fishing activities, agriculture and other domestic purpose but now it is at a transitional state with respect to degradation. The Cyanophyceae is important group of fresh water blue green algae. They include some of the most common species which are important both ecologically and scientifically. During the present study 7 species of Cyanophyceae were found at all three sites A,B,and C of Mandwa Lake

Keywords: Mandwa lake, Cyanophyceae diversity.

Introduction

The cyanophyceae means blue green algae may be unicellular organism or in the form of chain or filaments is called as trichon.

Cyanophyceae one of the most significant algal group among phytoplankton and it is also founded abundance in water bodies. The freshwater blue green algae occur in the unpolluted as well as polluted water body generally it exhibits a characteristic cyclic growth.

In Present investigation Mandwa lake is 4 km south east side from Dharni Tahsil at about 500 m above mean sea level and is at 76°55'49''E longitude and 21°31'28'' N latitude. Mandwa Lake receives the water from the surrounding catchment areas during the monsoon period. The area of Mandwa Lake is spread over 500 acres. The depth of water is 38 feet during the monsoon and 15 feet during the summer season. The water of this lake is primary used for washing, bathing, fishing activities, agriculture and other domestic purpose but now it is at a transitional state with respect to degradation.

Material And Method

Sample for planktonic study were collected monthly from three sites of lake. The samples were collected in the morning hours between

8.30 a.m. to 10.30 a.m. 50 Lt. of water sample was filtrated through the plankton net made of bolting silk number 25 with mesh size 64 lime the collected samples were allowed to settle down by adding Lugol's Iodine. Normally sedimentation requires 24 hrs. after which supernatant was removed and concentrate was made up to 50 ml. depending the number of plankton and preserved in 5% formalin for further studies.

For the quantitative study the concentrated sample was shaken and immediately one drop of sample was taken on a clear micro side with the help of standard dropper the whole drop was then carefully covered with the cover glass and observed. Plankton identification up to genera and whenever possible upto species level was classified according to keys given by Prescott (1954), Edmonsonic (1959), Sehgal (1983), Adoni (1985), and APHA (1985) and standard analysis was undertaken as per Zar (2005).

Quantitative study of plankton was done by Sedgwick – Rafter Cell method

Sedgwick – Rafter Cell Method

The Sedgwick – Rafter Cell is a special kind of slide similar to the Haemocytometer. The cell has a 50 mm x 20 mm × 10 mm rectangular cavity that holds 1 ml. sample. The cell is moved in horizontal direction on the stage of an inverted microscope and plankton species encountered in the field are enumerated.

A number of replicate samples are enumerated to calculate plankton/lit.

Plankton (units/lit) = n x c/v

Where,

n = number of plankton in 1ml c = Volume of concentrate

v = Volume of sample in lit.

Result And Discussion:

In Present investigation a Total 7 species wered recorded the lake under study,

In site A, Cyanophyceae were represented by 6 species in Jan 2021 to Dec 2021 . In site B, Cyanophyceae were represented by 6 species in Jan 2021 to Dec 2021 . and site C, Cyanophyceae were represented by 7 species in Jan 2021 to Dec 2021 .

Shirsat, et.al., (2004) observed 6 species of Cyanophycaea from freshwater pond in Dharmapuri in Beed District, Maharashtra.Tiwari and Chauhan (2006) founded 21 species of Cyanophyceae from Kithan lake of Agra, Uttar Pradesh. Jayabhaye, et.al., (2007) revealed 7 species of Cyanophyceae from Parola dam of Hingoli, Maharashtra. Aijaz, et.al.,(2009) reported Cyanophyceae contributed 10 species from Wular lake. R. Prathap Singh and G.S. Regini Balasingh (2011) observed 14 species of Cyanophyta in Kodaikanal lake of Dindugal District. D.S. Malik and Umesh Bharti (2012) reported 7 species belong to Cyanophyceae in Sahastradhara stream at Uttarakhand. M.R. Abdar (2013) observed seven taxa of Cyanophyceae from Morna lake of Shirala (M.S.), Sachinkumar R. Patil, et.al., (2015) founded 1 species belongs to Cyanophyaceae in major freshwater bodies of Ajara Tahsil in Kolhapur District (M.S.). R. Prathap Singh and G.S. Regini Balasingh (2012) reported 18 species of Cyanophycaea in Kodaikanal of Dindigul District, Tamilnadu. Patil Alaka A. (2015) recored 5 species of Cyanophyceae in Sangli, Maharashtra. Priya Gopinath, T. and Ajit Kumar, K.G. (2015) observed 7 genera belong to Cyanophyceae in the fresh water lake in Thiruvananthapuram.

In Present investigation in site A, during Jan2021 to Dec 2021, 6 species are recorded among which Oscillatoria sp. (122 no./lit) is dominant followed by *Microcystis sp.* (120 no./lit), *Agmenellum quadruplicatum* (55 no./lit), *Nostoc sp.* (51 no./lit), *Anabaena sp.* (43 no./lit) and *Spirulina sp.* (34 no./lit).

In site B, during Jan2021 to Dec 2021, 6 species were recorded among which Microcystis sp. (145 no./lit) is dominant followed by *Oscillatoria sp*. (67 no./lit), *nostoc sp.* (49 no./lit), *Anacystis cyanea* (41 no,/lit), *Agmenellum quadruplicatum* (34 no./lit) and *Anabaena sp.* (34 no./lit).

In site C during Jan2021 to Dec 2021 ,7 species were recorded among which *Microcystis sp.* (198 no./lit) was dominant followed by *Oscillatoria sp*. (196 no./lit), *Nostoc sp.* (143 no./lit), *Agmenellum quadruplicatum* (75 no./lit), *Spirulina sp*. (36 no./lit), *Anabaenasp.* (34 no./lit) and *Rivularia sp.* (12 no./lit).

Among the different species of Cyanophyceae in site A, *microcystis sp*. was dominant followed *by Gleotrichia echinulata, Nostoc sp, Oscillatoria sp, Agmenellum quadruplicatum, Anabaena sp.* and *Spirulina sp.* in site B of lake *Microsystis sp. was dominant followed by Oscillatoria sp Nostoc sp. Anacystis cyanea, Anabaena sp.* and *Agmenellum quadruplicatum* in site C, of lake *Microsystis sp.* was dominant followed by *Oscillatoria sp, Nostoc sp., Angmenellum quadruplicatum, Gleotrichia echinulata and Anabaena sp.*

According to Harris and James (1974) presence of *Microcystic sp.* the toxin producing the blue green algae in abundance is a significant feature of tropical. Parmashivam and Sreenivasan (1981) recorded the polluted water bodies having heavy growth of the blue green algae. M.R. Abdar (2013) observed presence of organic pollution indicator algal species like *Microcystis aeruginosa, Oscillatoria limnetica,* at Morna lake Shirala (M.S.). Mischke and Nixdorf (2003) have observed that the presence of *Anabaena* and *Oscillatoria indicates* beginning of biological pollution.

Kamat, *et.al.*, (2006) was of the opinion that blue green algae occurred continuously in the contaminated tank while occasionally in less unpolluted tank. They reported frequent existence of species like *Microcystic, Oscillotoria* and *Anabaena* in the contaminated tanks of Shimoga District, Karnataka. Jindal and Gusain (2007) founded the presence of *Microcystis sp., Oscillotoria sp.* and the *Spirullina sp.* as a pollution indicator species of Bichorli pond, Rajasthan. Shashi Shekhar, *et.al.,*(2008) and Baruah and Bhaswati Kakati (2012) observed that *Microcystis aeruginosa* is related with highest degree of pollution and may be considered as the best single indicator of the organic pollution in any water bodys.

In the present investigation the Cyanophyceae was maximum during in winter season and minimum during in the monsoon season. Pendse, *et.al.*, (2000) observed the maximum population of in blue-green algae during winter season. Mazher Sultana and Dawood Sharif (2004) noted the maximum of blue-green percentage during winter season and minimum during in monsoon. D. S. Malik and Umesh Bharti (2012) founded that Chlorophyceae were maximum during in winter season and minimum during monsoon season in Sahastradhara stream at Uttarakhand. In the present investigation, the dominant of *Microcystis sp.* and *Oscillotoria sp.* in site A and site B and site C showed the polluted nature of the three sites shows lake is highly polluted.

Conclusion:

In the present investigation, the maximum amount of Cyanophyceae during in winter due to favourable sunlight, increase in domestic sewage, human generated pollution, an minimum quantity during the monsoon season is probably due to increase in water quantity

Table 1: Yearly variation of Phytoplankton from sites of Mandwa Lake during year Jan 2021 to Dec 2021.

Sr. No.	Parameters	A	B	C	Total
1	Cyanophyceae	35.42	30.83	57.33	**45.00**
		±	±	±	±
		37.63	**14.12**	**21.93**	**3.93**

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Ethno medicinal plants used by Munda Tribe for their primary healthcare system and their conseravation in and around Tamar Block of Ranchi District, Jharkhand

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Abstract

The tribal people depend on forests for their livelihood and most of rural people depend on traditional medicine as a primary health care source. Traditional medicines remained as the affordable and easily accessible source of treatment in the primary health care system among Tribes of ***Tamar Block****. The paper highlights' the rich plant resources and the vast wealth of ethno medicinal information available with the Tribes especially* ***Munda Tribe*** *of the* ***fifteen(12) revenue villages*** *of Tamar Block of Ranchi District. This study focus on the comprehensive ethno medicinal investigation in an attempt to safeguard the deteriorating ethno medicinal knowledge. The main objective of present work is to give information and documentation of medicinal plants used by tribal of the study area. The ethno medicinal information was gathered from interviews with living elders, Baidhyas and knowledgeable person belonging to Munda Tribe of the study area. The present work on ethno medicinal plants used in the primary healthcare systems of Tribe (Munda) in 12 villages was carried out from Tamar Block of Ranchi District. These ethno medicinal plants are very useful, hence an essential conservation should be needed.*

Keywords*: --- Ethno medicinal plants, documentation, Tamar Block, Munda Tribe, Conservation etc.*

Introduction

Medicinal plants have great contribution in the primary healthcare system of local communities as the main source of medicine for the majority of the rural population especially Munda Tribe. Out of the total 4, 21,500 flowering plants reported from the world more than 40,000 are used for medicinal purposes. About 60% of the world population &80% of developing countries rely on traditional medicine. According to Bhatt et al. more than 4.5 billion people in the developing world rely on ethno medicinal plants as components of their primary healthcare.

Tamar Block of Ranchi District is very rich in ethno medicinal plants as well as Schedule Tribe population. The Munda Tribe was totally dependent on indigenous medicine for traditional healthcare, but now this is practiced only in the remote rural areas. Where the hospital facilities were available, that region's person were not depends upon the ethno medicinal plants, because they had no more knowledge about this field. The Ethno medicinal studies in various areas of Tamar Block have been carried out. It is believed that such studies can constitute the starting point for the development of new herbal medicines and other useful substances.

The present study was aimed at investigating the traditional utilization of plants of Tamar Block. Tamar Block has eighty one (81) revenue villages. The study area is the richest biodiversity centre and a source of ethno botanical knowledge. There is no any ethno botanical studied has been carried out in this region. The main **Munda tribe** containing villages **are Murpa, Jaradih, Jojodih, Poradih, Kasam Burudih, Agra, Bandu, Sirkadih, Deori, Basukoncha, Birdih and Kubasal**. The main objective of the present study were: - (1) to identify and explore plant species that are used locally for the treatment and presentation of various diseases, (2) to document traditional recipes from medicinal plants including methods of preparation, dosages, and the mode of administration, (3) to point out the main Baidhyas of the area by which suffer person can be treated easily, and (4) to assess the plants conservation issues of the study area.

Materials and methods

Study Area

The present study was carried out in Tamar Block of Ranchi District**.** The Block is with an area of 513.91km² and forest area is 148.71Km ²(29%) and is situated between 23°3`21``N and 85°39`44`` E. The main

Munda containing villages are Murpa, Jaradih, Jojodih, Poradih, Kasam Burudih, Agra, Bandu, Sirkadih, Deori, Basukoncha, Birdih and Kubasal. Many villages are situated on forest top and near forest. All forest areas having many ethno medicinal plants. The Munda Tribe is about 43% and Oraon Tribe is about 7% according to 2011 population census. Climate of this block is subtropical in nature. The annual rainfall is ranges between 230 mm to 1390 mm and the temp. Are ranges between 6-43°c with highest in the month of May and June? The November to January is the coldest months.

The population of the block is 1, 32,702(One lakh thirty two thousand seven hundred two), in which **Munda** Tribe is about 43% and **Oraon** Tribe is about 7%. The livelihood is depends mainly on smallholder agriculture and livestock production.

There are many ethno medicinal as well ethno botanical plants which are used by specific **Munda Tribe** and **Oraon Tribe** for the ailment of different types of diseases. Some of them are ***Abrus precorius, Achyranthes aspera, Acorus calamus, Ageratum conyzoides, Aloe vera, Allium sativum, Asparagus racemosus, Azadirachta indica, Boerhaavia diffusa, Butea monosperma, Calotropis procera, Cassia tora, Curcuma longa, Eclipta alba,Emblica officinalis, Ficus bengalensis, Gloriopsa superba, Holarrhena antidysenterica, Lawsonia inermis, Madhuka longifolia,Ocimum sanctum, Phyllanthus nirurii, Phyla nodiflora, Rauvolfia serpentina,Scleichera oleosa, Shorea robusta, Sida cordifolia, Terminalia arjuna, T. bellirica, T.chebula, Tinospera cordifolia, Tridax procumbens, Vitex negundo etc.***

Data collection methods: ----

The authors have conducted an extensive field survey in the tribal belts and other **Munda** and Oraon Tribe containing villages, adjoining forest area in the Block to collect ethno botanical lore. First hand information was gathered through interactions with tribal and rural knowledgeable person and Baidhyas. The local Baidhyas were invited to tap the information of medicinal plants commonly used by questionnaire. Medicinal properties of plants were learned through in formal interviews. A number of group discussions were also conducted during the period of investigation.

Ethno botanical information was collected from 28 informants (24 male &4 female).Among the 28 informants, 20 informants were selected with the Munda Tribe and 4 informants were selected with the Oraons Tribe. Semi –structured interviews with 28 informants and group discussions (total of 5 groups discussed with average number of 7 per groups) were administered in the local language (Munda) to collect basic information on the local names and traditional description of the medicinal plants species , diseases treated or collected ,parts used conditions and method of preparation , routes of remedial administration , dosages used ,and locally marketable medicinal plants . Besides, practical observations session in preparation of remedies and some observation of traditional

Treatments given to the patient by traditional healers were conducted. To ascertain the uses of these ethno medicinal plants the earlier published scientific literature sources referred to are Sharma et al.(1985-86), Jain (1991), Kirtikar and Basu (1991), Ambasta et al. (1992), Chopra et al.(1996) . Photographic, digital cameras were used for graphic documentation. Specimens were collected and numbered on the spot, later indentified using taxonomic keys in the relevant Book, Hains flora-Bihar and Orissa (vol-I-VI), Flora of Hazaribag etc (BSI).

Results

The data on ethno medicinal plants, which was collected from inhabitants of study areas, Baidhyas and knowledgeable person in and around Tamar Block of Ranchi District were pooled and analysed. The investigation revealed the medicinal plants of 53 species and 47 genera belonging to 31 families, which are commonly used for various ailments by Munda Tribe of different villages of Tamar Block of Ranchi District.

Sl.No	Botanical name of plants	Family	Common name of plant	Therapeutic uses of ethno medicinal plants
1	*Abrus precatorius* L.	Fabaceae	Gunja	Leaves are grind with roots and mixture is given with orally to prevent pregnancy.

2	*Achyranthes aspera* L.	Amaranthaceae	Chirchiti	Leaves are grind & make paste. This paste is applied externally for paralysis. In case of painful delivery the piece of stem may be chewed. Chewing of stem, also gives relief from toothache.
3	*Acorus calamus* L.	Araceae	Vacha	Old ghee processed with Brahmi juice and shankhapuspi alleviates insanity and epilepsy.
4	**Ageratum conyzoides** L.	Asteraceae	Sahadevi	The aqueous extract of leaves exhibits anti fungal and crude plant extract antibacterial properties.
5	*Aloe vera* Mill.	Liliaceae	Ghrikuwari	In syphilis, apply its pulp on the affected area. It cures syphilis. For diabetic patient, give 5 gm pulp of Aloe vera with 500 mg guduchi extract. It cure diabetes. Leaf pulp is given with honey for 7 days to cure irregular menstruation.
6	*Allium sativum* L.	Liliaceae	Lahsun	The bulb is used as a brain tonic in epilepsy and psychic disorders. The Lahsun is also used for upper respiratory tract infections & catarrhal conditions.
7	*Amophophallus campanulatus* (Roxb.) Blume	Araceae	Zamikand,Ol	Zamikand is prescribed in bronchitis, asthma, abdominal pain, dysentery, enlargement of spleen, piles and rheumatic swellings.
8	*Andrographis paniculata* (Nees.)	Acanthaceae	Kalmegh	The powder of Kalmegh is mixed the powder of black pepper and taken to the malarial patient. It controls the malaria completely.
9	*Asparagus racemosus* (Willd.)	Liliaceae	Shatawari	Shatawari powder taken with milk is increases the flow of breast milk. In night-blindness, tender leaves of shatawari cooked in ghee and taken to the patient.
10	*Azadirachta indica* A. Juss.	Meliaceae	Neem	Grind Margosa leaves with half the amount of phitkiri and prepare the tablet of 500mg each. Give one tablet with sugar syrup. It cures all types of fever & is especially beneficial in malarial fever.
11	*Boerhaavia diffusa* L.	Nyctaginaceae	Punarnava	Fresh root powder of punarnava mixed honey should be used as eyes disorder.
12	*Bombax ceiba* L.	Bombacaceae	Semal	Tap root of young plant, barks and flowers are diuretic.
13	*Butea monosperma* (Lamk.) Taub.	Fabaceae	Dhak, Palas	Decoction of root bark is given internally for blood pressure, crushed stem bark with tilt el(sesame oil) is filtered and administered for antifertility.
14	*Calotropis procera* R. Br.	Asclepiadaceae	Akwan. Madar	The root is used for cleaning teeth and for relieving toothache. Latex mixed with cow milk & given orally in rabies. Fresh leaves slightly roasted &pounded are bandaged to painful rheumatic joints, headache and swelling.
15	*Cardiospermum helicacabum* L.	Sapindaceae	Hathisundi	An extract of the leaves is used as an antiseptic to dress wounds.
16	*Cassia tora* L.	Caesalpiniaceae	Chakor	Paste of roots is applied on scabies & ringworm. Decoction of leaves is given to the children having fever while teething.

17	*Calocasia esculenta (*L.) Scott.	Araceae	Kachu	Crushed petiole is applied on fresh cuts and wounds to stop bleeding.
18	*Curcuma longa* L.	Zingiberaceae	Turmeric (Haldi)	Mix 5gm turmeric in butter milk and give to the patient twice a day. Within 5 days, it cures jaundice. Mix 5gm turmeric and 20 gm powder of Neem leaves with butter and apply on the affected are. It makes the skin soft and glowing. It also cures scabies disorder.
19	*Curcuma amada* Roxb.	Zingiberaceae	Amahaldi	A paste is prepared from the rhizome of the plant and dissolved in it water and drink to cure diarrhoea.
20	*Cyperus rotundus L.*	Cyperaceae	Nagarmotha	The rhizome is mainly used in rheumatism, inflammations, dysuria and obesity.
21	*Dalbergia sissoo L.*	Fabaceae	Shisham	In gonorrhoea, give 15 ml juice of its leaves thrice a day, it control gonorrhoea. Prepare squash of 5gm powder and give this to the patient. It cures blood impurities and blood disorder.
22	*Eclipta alba* (L.) Hassk.	Asteraceae	Bhringraj	Take each of Bhringraj, triphala, anantmool and seed of mango. Prepare their paste. Take 10 gm mandoor paste and 500 ml oil. Mix them all and add one litre water and cook the mixture till only oil is left. Strain the oil and apply on the hair. It cures all types of hair disorders.
23	*Emblica officinalis* Gaertn.	Euphorbiaceae	Amla	Take 30 gm of dried amla, 10 gm baheda, 50 gm mango seed and 10 gm iron vashma. Soak all the elements in a vessel overnight. Apply this on hair every day. Prematurely grey hair turns black with this treatment.
24	*Euphorbia hirta* (L.)	Euphorbiaceae	Doodhi	Paste of root is mixed with honey & given nursing mother to increase milk. Latex used in warts and skin diseases like leucoderma spots.
25	*E. neriifolia* (L.)	Euphorbiaceae	Sehund	The latex is used to cure skin diseases and body pain. Luke warm latex and common salt is taken with water for curing whooping coughs and leprosy.
26	*Ficus bengalensis* L.	Moraceae	Banyan Tree	Take 6 pieces of fresh leaves or its aerial roots and grind them with 15 gm of masoor dal. Apply the paste on the face. It cures all types of skin problems. Prepare decoction of its soft leaves and give to the patient with sugar, mixed in it. It controls vomiting.
27	*F.religiosa L.*	Moraceae	Peepal	Give 3 gm powder of its fruits, with milk, thrice a day. It promotes potency and physical strength. Give its ripe fruits to eat. It cures kapha, pitta &blood disorders. It also cures burning sensation and vomiting. In constipation, patient would eaten 7 fruits regularly. After one month constipation cured completely.
28	*Gloriopsa superba* L.	Liliaceae	Vachhnag	Powder of dry leaves is mixed with buffalo's milk (butter milk) & given internally in jaundice. 3 gm paste of tuber of Vachhnag with 1 gm paste of

				peppers is prescribed once a day for twenty one days as a cure for rheumatism.
29	*Guizotia abyssynica* L.	Asteraceae	Surgunja	Equal quantity of roots of surgunja and sarson is crushed & powdered. One pill is made by 10 gm of powder. One pill is taken in empty stomach for five days after menstruation. It is permanent birth control.
30	*Holarrhena antidysenterica* (Roth.) DC.	Apocynaceae	Kutaja, kurchi	In diarrhoea, boil 40 gm of its seeds in water. Give this water with honey, mixed in it to the patient, thrice a day. Grind its 15 gm of the fresh bark in butter milk & give this to the dysentery patient. It immediately controls dysentery.
31	*Lantana camera* L.	Verbenaceae	Putus	15ml, decoction of plant is taken for the treatment of tetanus & there is strict prohibition of taking of sour food during treatment. In malarial fever, the decoction of leaves is taken twice a day for a week after food.
32	*Lawsonia inermis* L.	Lythraceae	Mehendi	Paste of leaves mixed with butter milk &applied externally on face itching during monsoon & wounds for fast healing. Decoction of the leaves is also used as a gargle for sore throat.
33	*Madhuka longifolia* (Koenig)	Sapotaceae	Mahua	Nectary honey collects from flowers &is taken continuously 7 days for cures of piles.
34	*Mangifera indica* L.	Anacardiaceae	Mango, Aam	The juice from the bark is used for diarrhoea and dysentery. Take 2.5 gm of powder made from shade-dried soft leaves of mango, every day. It is very helpful in controlling diabetes.
35	*Mimosa pudica* L.	Mimosaceae	Lajwanti	In piles, give 5 gm powder of its leaves with milk, thrice a day. Give 30 mg juice of its leaves, it cures indigestion. For diabetic patient, they take 100 ml decoction of its roots, regularly up to 15 days & after 15 days; they take 10-15 ml of decoction regularly.
36	*Moringa pterygosperma* Lam.	Moringaceae	Sahjan	Mix 2 gm ginger root in 10 gm juice of its root and give this to the patient every morning and evening, it enhances the digestion power. In intestinal worms- cook its pod and give this to the patient. It kills the intestinal worms.
37	*Ocimum grattissimum* L.	Lamiaceae	Ban tulsi	The leaf juice is used to treat infantile cough, cold, catarrh, dysentery and skin diseases.
38	*O. sanctum* L.	Lamiaceae	Tulsi, Holy basil	Grind tulsi leaves in lemon juice and apply the paste on the affected area of skin. It helps cure eczema, gout, derma toes etc. Take powder of its root or seeds and add equal amount of jiggery in it. Give 2 gm of this mixture with cow's milk regularly. It cures the sexual disorders in one month to six weeks.
39	*Phyllanthus nirurii* L.	Euphorbiaceae	Bhui amla	In jaundice, grind 10 gm of its root and give it with 250 ml milk every morning and evening on empty stomach. In diabetes, give 15 gm whole plant powder with 20 black peppers three times a day. It cures even chronic diabetes.

40	*Phylla nodiflora* (L.) Greene	Verbenaceae	Jalpipal	3 ml decoction of root with un boiled egg (2 mg) is given to women to promote sexual desire.
41	*Psidium guajava* L.	Myrtaceae	Amrud	In vomiting, give 1o gm decoction of guava leaves. It indigestion ,take 10 gm juice of its soft leaves & mix sugar in it .Give this to the patient daily ,once in the morning .It gives relief within 7 days .
42	*Rauvolfia serpentina* L.	Apocynaceae	Sarpagandha	The extracts of roots are valued for to treat intestinal disorders. The leaves extract is also used to control hypertension.
43	*Schleichera oleosa* (Lour.) Oken	Sapindaceae	Kusum	The oil is applied externally in skin eruption. The seed oil is also used for massage in rheumatism & applied in alopecia, inch & acne.
44	*Shorea robusta* L.	Dipterocarpaceae	Sal tree	Fruit paste is prescribed in diarrhoea. In sal resin an essential oil is found, which is antiseptic. This is used for skin diseases.
45	*Sida cordifolia* L.	Malvaceae	Nilatutti, Balaa	Decoction of roots is used for the treatment of rheumatism & neurological disorder (facial paralysis, Sciatica etc). The leaves are demulcent, febrifuge & used in dysentery.
46	*Terminalia arjuna* (Roxb).Wight & Arn .	Combretaceae	Arjuna	In heartbeat, when normal rate of heartbeat increases from 72 to 150 take one glass juice of tomato & add 1 teaspoonful of powder of Arjuna bark in it . Give this to the patient regularly. It normalizes the heartbeat for complete benefit, prepare the decoction in milk. It cures disorder like injured heartbeat, angina pain, and anxiety.
47	*T.bellirica* (Gaertn.) Roxb.	Combretaceae	Beheda	Mix equal amount of beheda and sugar. Take this mixture every day. It improves eye power. Take 4 gm powder of fruit after meals. It enhances digestion power & cures loss of appetite. It also strengthens the stomach.
48	*T. chebula* (Gaertn) Retz.	Combretaceae	Harad, Hartaki	Give 5 gm harad powder with equal amount of sugar candy mixed in it, every morning and evening after meals. It improves the digestion power
49	*Tinospora cordifolia* (Willd.) Hook. F. &Thorns.	Menispermaceae	Giloy, Guduchi	Mix 50 ml bitter oil in 15 gm Tinospora juice and give this to the patient every morning on empty stomach. It cures elephantiasis. In arthritis—give 5 gm of its powder with milk three times a day. It cures arthritis and acidity in urine.
50	*Tridax procumbens* L.	Asteraceae	Jayanti, Akala kohadi	The leaf juice exhibits antiseptic, insecticidal, and parasiticidal properties. It is used to check haemorrhage from wounds, cuts, and bruises, also for restoring hair growth.
51	*Nitex negundo* L.	Verbenaceae	Nirgundi	Oil cooked with the juice of root & leaves of Nirgundi is useful as in take an ointment & filling in sinus, kustha, vatavyadhi, eczema & scrofula.
52	*Withauia somnifera*	solanaceae	Aswagandha	On whom takes powder of Aswagandha roots in late winter mixed with honey & ghee along with milk re gain youthfulness even if old. In bronchial asthma, the ash of Aswagandha should be taken with honey and ghee.

53	*Ziziphus jujuba* L.	Rhamnaceae	Ber	Leaves are astringent and diaphoretic. Stem bark is also astringent and used in diarrhoea. The paste of leaves and twigs are applied to abscesses, boils and carbuncles.

Conclusions:-

In conclusion, Tamar Block has plenty of ethno medicinal plants and the people (especially Munda Tribe) of the region are highly dependent on these plants for their primary healthcare system and other ethno botanical purposes. The people of the region have tremendous traditional knowledge regarding the utilization and preparation of various ethno medicinal remedies. They are using some medicinal plants for multipurpose and posing great pressures on certain medicinal plants like ***Aloe vera, Azadirachta indica*** and ***Dalbergia sissoo***. Hence natives should be educated regarding the sustainable usage of medicinal plants. The persistence of traditional knowledge is more among old people; however as a matter of concern, young people are taking less interest in such knowledge due to multiple reasons. Hence studies on ethno medicinal plants and also documentation may be extended to other areas for protection of traditional knowledge. The Baidhyas or knowledgeable person are giving different types of ethno medicines for curing of different diseases, hence clinical trials are therefore recommended in order to evaluate the authenticity of ethno medicines to scientific standards. Now all these mentioned medicinal plants as well as others plants are very useful for all of us, hence, there should be essential to conserve these all plants.

Acknowledgments:-

The authors are thankful to Baidhyas, knowledgeable person and inhabitants of Tamar Block for their co-operation in research works. The authors are thankful to Block authority, who gives many information about the population of Munda Tribe as well as forest inhabitants of the Tamar Block of Ranchi District of Jharkhand (India). All these collected medicinal plants were kept at University Depatartment of Botany, Kolhan University, Chaibasa, Jharkhand for herbarium purposes and helping the identification of new students. Finally it can say that "**Everythings green is medicine, please conserve them, protect them and more and more plants them".**

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Awareness of Globlal Warming And E-Waste Among Urban And Rural School Students.

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Abstract

Global warming means average increase in the earth's temperature and is considered as a major health issue of the 21st century and E-waste is the issu of electronic garbage its also harm of living animals and E-waste is the issu of electronic garbage its also harm of living animals Objectives:1] To find out the awareness and knowledge about global warming among the school students 2]. To find out the awareness and knowledge about E-waste among the school students. Materials and Methods: Self administered questionnaire was used to collect information from 1050 randomly selected school students of three different medium. Statistical analyses were performed with the perceantage of each quetions Ethical clearance, informed consent and assent were obtained. Results: a) 22.9% of the student have high level of about the knowledge of the global warming and e-waste b) 25.9% of the student have high level of awareness about the causes of the global warming and e-waste c) 27.6% of the student have high level of awareness about effect of the global warming and e-waste d) 28% of the student have high level of awareness of global problem. e) 25.1% of the student have high level of awareness of global warming and e-waste in total. Conclusion:. Periodic health education regarding global warming and e-waste is still needed to increase awareness and knowledge among the school students.

Keywords: *Environment,Global warming, E-waste,Awareness, Green House gases, electronic materials, Knowledge, School students.*

Introduction

Global warming means average increase in the earth's temperature and is considered as a major health issue of the 21st century and E-waste is the issu of electronic garbage its also harm of living animals Modern society has been growing concern about global global warming issues. The developing countries are experiencing complex, serious and fast-growing pollution problems of their own. Global warming pollution is more than just a health issue; it is a wider social issue Pollution has the potential to destroy homes and communities. Pollution problems are also closely tied to the mode of development in developing countries Despite this, many developing countries either have not developed global warming pollution control measures or have not provided adequate implementation structures to ensure that policies are effective its also one of the major problems of e-waste that has become an immediate and long term concern as its unregulated accumulation and recycling can lead to major global warming problems such as in air, water, soil and also including physical, chemistry, biology, geology, meteorology, oceanography sociology and human health

In this study, the awareness of electronic waste and global warming are discussed among school students.

Need for the research: -

All living and non-living things. Lives in the atmosphere and chooses air, land and water Uses resources to meet needs. The pressure that comes on the earth.This exceeds the conductivity of the global warming, which can lead to serious global warming degradation The water level in the water is getting higher than the water level, you may think so Can lose. From the very beginning, of the global warming has been called 'Awakening' It needs to be created And potential dangers to all species of living beings.

Understand the underlying causes and consequences

1. To study and find out the problems of population,health etc.The way to solve the problem.
2. Considering the need for sustainable use of natural resources.
3. To develop appreciation of caste and habitat management techniques
4. Understanding the feelings of human beings.

Objectives

1] To find out the level of awareness of e-waste among school students.

2) To find out the level of awareness of global warming among school students

3] Suggetion for the proper implementation of government rule for global warmingal issues

Hypothesis

1. Awareness of global warming among school students.
2. Awareness of E-waste pollution among school students.

Methodology

Since the present research is related to the present time , the survey method will be used.

population and sample of the study

The population for the present study consist of all school students. of Aurangabad District.1050 students from 100 schools, Aurangabad District were selected through Random sampling Technique for the study.The overall response Rate was 82%

Tools Used for the Study

For the presented research, the Author has chosen the survey method as the problem is related to the present time. Questionaries and document will be used among the various tools for the data collection for the survey method. to collect information, school students from aurangabd district were considered. The quetionaries will be filled by the students to get the information. Also the information about the school students. who have aware about the pollution and percentages will be useed to anylyze the information obtained and conclusions will be drawn based on it.

Data Analysis

Percentage,Mean,Standard Deviationand t-test. This statstical dimention will be used to analysis the information in present research

Findings

1.

a) 22.9% of the student have high level of about the knowledge of the global warming and e-waste
b) 25.9% of the student have high level of awareness about the causes of the global warming and e-waste
c) 27.6% of the student have high level of awareness about effect of the global warming and e-waste
d) 28% of the student have high level of awareness of global problem.
e) 25.1% of the student have high level of awareness of global warming and e-waste in total. (From Table no 1)

2.

a) 26.7% of the urban college student have high level of knowledge about global warming and e-waste and 20.1% of the rural student have high level of knowledge about global warming and e-waste
b) 24.7% of the urban student have high level of awareness about the causes of the global warming and e-waste and 26.8% of the rural student have high level of awareness about the causes of the global warming and e-waste
c) 29.8 % of the urban student have high level of awareness about effect of the global warming and e-waste and 26.0% of the rural student have high level of awareness about effect of the global warming and e-waste
d) 31.5% of the urban student have high level of awareness of global problem and 25.4% of the rural student have high level awareness of global problem
e) 27.6 % of the urban student have high level of awareness of global warming and e-waste in total and 23.3% of the rural student have high level of awareness of global warming and e-waste in total.(From Table 2)

3. There is no significant difference between urban student and rural student in their awareness towards global warming and e-waste in total and its dimensions- about the knowledge of the global warming and e-waste, awareness about the causes of the global warming and e-waste, awareness about effect of the global warming and

e-waste and awareness of global problem content, whereas there is significant difference between urban and rural student in the dimension- of awareness of global warming and e-waste in total..(From Table 3)

Table 1. Level of awareness of school students towards global warming and E-waste and its dimensions

Dimensions	Low		Moderate		High	
	N	%	N	%	N	%
Knowledge	257	23.8	576	53.3	247	22.9
Cause	279	25.8	521	48.2	280	25.9
Effect	289	26.8	493	45.9	298	27.9
Global Problem	322	29.8	456	42.2	302	28.0
Awareness of global warming and E-Waste of students in total	278	25.7	531	49.2	271	25.1

Table no 2 Level of awareness of school students towards global warming and E-waste and its dimensions in terms of locality of the school

Dimensions	Locality	Low		Moderate		High	
		N	%	N	%	N	%
Knowledge	Urban	110	24.0	225	49.2	122	26.1
	Rural	147	23.6	351	56.3	125	20.1
Cause	Urban	120	26.3	224	49.0	113	24.7
	Rural	159	25.5	297	47.7	167	26.8
Effect	Urban	116	25.4	205	44.6	136	29.5
	Rural	173	27.8	288	46.2	162	26.0
Global problem	Urban	126	27.6	187	40.9	144	31.5
	Rural	196	31.5	269	43.2	158	25.4
Awareness of global warming and E-Waste of students in total	Urban	121	26.2	210	46.0	126	27.6
	Rural	157	25.2	321	51.5	145	23.3

Table 3 Significant difference between urban and rural school student in their awareness towards global warming and E-waste

Dimensions	Nature of the school	Mean	SD	Calcuiated 't' Value	Remark at 5% Level
Knowledge	Urban	26.13	5.131	1.402	NS
	Rural	25.71	4.806		

Cause	Urban	23.97	5.037	0.343	NS
	Rural	26.08	5.178		
Effect	Urban	20.74	4.676	1.467	NS
	Rural	20.31	4.804		
Global problem	Urban	11.13	2.72	2.056	S
	Rural	10.77	2.803		
Awareness of global warming and E-waste of students in total	Urban	84.02	13.462	1.901	NS
	Rural	82.44	13.559		

Discussion:

The Author selected the study of global warming awareness and electronic waste among school students. in the district of Aurangabad. The problem was thoroughly studied and objectives were set. Collected information through Aadhaar content collection tools related to the problem presented. The information obtained with the help of this statistical technique was analyzed and interpreted Statistical tables were used to study the global warming awareness of in the context of and electronic waste among the school students in the district of Aurangabad and drew conclusions based on that.

Awareness of the students. through the questionnaire regarding the research problem and hence the breadth of the research problem was noticed and thus the need and usefulness of the presented problem was realized in the district of Aurangabad. The problem was thoroughly studied and objectives were set. Collected information through Aadhaar content collection tools related to the problem presented. The information obtained with the help of this statistical technique was analyzed and interpreted Statistical tables were used to study the global warming awareness in the context of and electronic waste among the school students in the district of Aurangabad and drew conclusions based on that.

Awareness of the students through the questionnaire regarding the research problem and hence the breadth of the research problem was noticed and thus the need and usefulness of the presented problem was realized.

Recommendations

1] School administrators should arrange short term training programs for teachers, students and society for global warming awareness and electronic waste awareness.
2] At the primary and secondary level, the issue of global warming should be kept as a separate unit. Therefore, this subject should be included in the syllabus offered by the State of Maharashtra.
3] There is a need to create e-waste awareness program to educate the society on how to manage e-waste
4] Scientists, NGOs, government representatives and corporate bodies. The e-waste disposal system proposed by them can help projects that are successfully implemented

Conclusion

In the present case the Author has summarized the research. And the important part of this case is that the findings obtained by analyzing and interpreting the information from above given. According to that conclusion, the hypothesis has been examined and based on the findings, some difficulties have been noticed and some recommendations have been suggested accordingly. Also the questionnaire and list used for research in the reference section

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Diversity of Macrophytes present in the Vicinity of Kapsi Lake, Kapsi Dist. Akola. M.S. India.

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Abstract:-

The present study has been undertaken in Kapsi lake, Kapsi situated in Akola district, Maharashtra State, India. The main objective of this study is to evaluate the quantitative characters of the aquatic macrophytes viz., frequency, density, abundance, and importance value index (IVI). During the whole study period, a total of 50 macrophytic plants species belonging to 27 families were found distributed in the lake. Aquatic plant species recorded were grouped into different egoriesed viz., submerged (5 species),free floating (8 species) and submerge (33 species) respectively.Hygrophylla auriculata,Ipomoea aquatica ForskIpomea carnea Jacq.Marsilea minuta L, Nymphoides aquatica, Nymphea pubescens,Azolla sp. Typha aquistata,Phyla nodiflora were the dominant species found to occur in all the study sites during the entire study period.and Amarathus species, Gangea maderaspatana, Xanthium, Sphearanthus species, Cassia species, Delonix ragia, Ipomoea species, Cyperus species, Ceratophyllum species, Phylla nodiflora, Commellina benghalensis, Euphorbia species, Phyllanthus amarus, Acalypha indica, Albizia lebeck, Ludwigia species and Polygonum species. The analysis of variance (ANOVA) for all the aquatic macrophytes reported from the lake indicates that there is no significant variation within the four study sites in terms of distribution. However, F-test result indicates significant variation in the quantitative characters between the different macrophytic plant species of the lake.

Keywords:- *Diversity, vicinity, macrophytes, quantitative, Kapsi Lake , India.*

Introduction

Macrophytes usually includes any plants which are observable by the naked eye and always identifiable when observed (Homes & Whitton, 1977). Macrophytes are an important component of the aquatic and terrestrial ecosystem and major changes in the abundance of individual species and community composition usually provide valuable information on the reason on how and why an ecosystem might be changing. Macrophytes are also valued as an important means for indirectly monitoring the water quality for instance, eutrophication can bring about change in the species composition and a loss of species diversity. At the same time, macrophytes also affect the physical, chemical and biological characters of the lake, and are affected by a group of factors such as lake Morphometry, water chemistry and biological characters of the lake (Lacoul & Freeman, 2006).

The Maharashtra state has been included under deciduous diversity of the world along with Kapsi Lake, Dist. Akola, India. The assessments of the Physico-chemical characteristics of the freshwater environment are essential to understand the distribution and productivity of aquatic macrophytes in the freshwater ecosystems. Some of the earlier studies on Phytosociology, Biomass and Primary Productivity, Physico-chemical characteristics of water are not adequate enough to compile a composite ecological database of the freshwater ecosystems of the country. Some of the relevant earlier works which have been carried out by a number of researchers at national and global levels are Devi, (1993), Melzer, (1999), Hanlon, et al., (2000), Devi, (2007), Devi, (2008), Usha & Sharma (2008), Cheruvelil & Soranno, (2008), Nurminen & Horppila, (2009), Mormul, et al., (2010), Usha, et.al., (2010a, 2010b), Singh, et. al., (2010a, 2010b, 2010c), Singh, et. al., (2011), Singh & Sharma, (2012), Singh, K.K. et. al., (2012), Soranno, et. al., (2011), Usha, et. al., (2012), Kanninen, et al., (2012), Singh & Sharma, (2013) etc.

This study would serve as an important prerequisite for assessment of the distribution of the aquatic macrophytes of the lake. The present study has been carried out with the main objectives to evaluate the quantitative characters like frequency, density, abundance, abundance by frequency (A/F) ratios and importance value index (IVI) of the aquatic macrophytes found in the lake at regular intervals during the study periods.

Methods

For the present investigation, the lake was divided into three study sites representing as Site I, II, and III. The aquatic macrophytic plant samples were collected at regular monthly intervals during the period July

2012 to June 2014 from the different study sites. The sampling technique used for diversity of the aquatic macrophytes was the standard method as described by Curtis (1959) and Misra (1968). The quantitative analysis comprises frequency, density, abundance, abundance to frequency ratio, relative frequency, relative density, relative abundance and importance value index (IVI).Assessing of the different quantitative characters were done by using a square quadrat of 25 cm × 25 cm in dimension and in each study site not less than 20 quadrat were sampled randomly.

2.1. Description of the Study Site

Kapsi Lake is one of the oldest lake in Akola district, situated about 20 kms from the district place and existing since the British regime. The lake is one of major drinking water source in the area. The people in the vicinity are also using the lake water for agriculture purposes, household acts, fishing, and other necessary things like washing of animals, clothing etc. Therefore, it is essential to know the water quality parameters to avoid the major hazardous conditions and health hazards. Keeping all this in view, the present investigation was planned to analyze various physiochemical parameters of Kapsi lake with special reference to the algal diversity of the lake.

2.2. Calculation of Quantitative Characters

$$\text{Frequency (\%)} = \frac{\text{No. of quadrats in which the species occurs}}{\text{Total number of quadrats studied}} \times 100$$

$$\text{Density/quadrat} = \frac{\text{Total number of individuals of a species in all the quadrats}}{\text{Total number of quadrats studied}}$$

$$\text{Abundance/quadrat} = \frac{\text{Total number of individuals of a species in all the quadrats}}{\text{Total number of quadrats in which the species occurs}}$$

$$\text{Abundance of a species A/F Ratio} = \frac{\text{Abundance of a species}}{\text{Frequency of the same species}}$$

Importance Value Index (IVI)/300 = Relative Frequency (%) + Relative Density (%) + Relative Abundance (%).

Figure 1.Map of Kapsi Lake, India

FIgure 2.-Google Map of Kapsi Lake

Results:-

A total of 50 aquatic macrophytes belonging to 27 families were found distributed in the lake. Out of total 50 species recorded, Poaceae family has shown the presence of maximum number of species i.e. 12 species contributing to 23.92% which was then followed by families like Cyperaceae, Nymphaceae and Polygonaceae with 3 species each contributing to 4.95%. Other families like Alismataceae, Amaranthaceae, Convolvulaceae, Hydrocharitaceae, Lemnaceae and Salvinaceae had 2 species each contributing to 3.70%. The remaining families viz., Apiaceae, Araceae, Asteraceae, Azollaceae, Characeae, Commelinaceae, Lemnaceae, Marsileaceae, Mimosaceae, Nelumbonaceae, Onagraceae, comprised 1 species each constituting 1.85% . The aquatic macrophytes found in the lake were categorized into four main sub-categories viz., (a) submerged (b) rooted with floating leaves (c) free-floating groups. Under submerged group 5 species (10.67%) were reported. C Hydrilla verticillata, Utricularia exoleta, Utricularia flexuosa were restricted to shallow areas where light is abundantly available upto the bottom and such plants usually have long stems with disLemnaceae sected leaves. Altogether 6 species belonging to rooted with floating leaves were reported viz., Nymphoides cristatum, Nymphaea stellata, Trapa bispinosa etc. In the free-floating category 8 species were recorded viz., Azolla pinnata, Ceratopteris thalictroides, Eicchornia crassipes, Neptunia prostrata, Pistia stratiotes, Salvinia cucullata etc. The maximum numbers of 33 species were recorded under the emergent group viz., Echinochloa stagnina, Enhydra fluctuans, Ludwigia adscendens, Hygroryza aristata, Ipomoea aquatica. Zizania latifolia, Phragmites karka, Pseudoraphis minuta etc. The percentage compositions of the different macrophytic species were found maximum in submerged species (77.42%). the, which was then followed, by the free-floating species (13.47%) and . The lowest percentage (9.21%) was contributed by rooted and floating leaved species

Table 1. ANOVA of Aquatic Macrophytes in the different study sites of Lake Kapsi, Maharashtra, India.

Parameter	Study Site	N	Mean± S.E	95% Confidence Interval Lower Bound	Upper Bound	Minimum	Maximum	F	P-Value
Frequency	1.	50	13 ± 2	9	17	0	51	0.222	0.877
	2.	50	12 ± 2	8	16	0	49		
	3.	50	14 ± 2	10	18	0	51		
	Total	150	13 ± 1	11	15	0	51		
Density	1.	50	15.26 ± 3.15	8.94	21.58	0	111	0.087	0.967
	2.	50	16.00 ± 3.28	9.42	22.59	0	89		
	3.	50	17.00 ± 3.41	10.17	23.84	0	122		
	Total	150	15.76 ± 1.63	12.55	18.96	0	122		
Abundance	1.	50	49.53 ± 8.74	1.99	67.06	0	324	0.233	873
	2.	50	50.05 ± 9.25	31.50	68.60	0	251		
	3.	50	55.13 ± 8.89	37.29	72.97	0	324		
	Total	150	49.81 ± 4.46	41.02	58.60	0	325		
AF/ratio	1.	50	0.09 ± 0.011	0.07	0.11	0	0.26	0.504	0.68
	2.	50	0.08 ± 0.012	0.05	0.10	0	0.27		
	3.	50	0.10 ± 0.012	0.07	0.12	0	0.34		
	Total	150	0.09 ± 0.006	0.07	0.10	0	0.39		
IVI	1.	50	4.60 ± 0.78	3.08	6.12	0	25	0.022	0.995
	2.	50	4.87 ± 0.86	3.15	6.59	0	22		
	3.	50	4.80 ± 0.72	3.35	6.25	0	246.47		
	Total	150	4.74 ± 0.40	3.94	5.53	0	29		

Note: S.E. = standard error; C.I. = Confidence Interval; Units-(Frequency - %; Density and Abundance- Plants m/sq.)

Discussion

The quantitative characters which comprises the estimation of frequency, density, abundance, abundance by frequency (A/F) ratio and importance value index (IVI) of the different macrophytic species in the different study sites of the lake, recorded higher values during rainy season which influenced the growth of the macrophytes and favouring good climatic conditions. The rainy season seems to be most favourable season for the germination of buried seeds of the perennial emergents like Cyperus species and other mud-growing species like Eclipta, Enhydra, Ipomoea, Caesula species etc (Rai & Munshi, 1982). Similarly, high values during the rainy season were recorded from a number of lakes and wetlands viz., Hokarsar wetland, India (Kumar & Pandit, 2005), Manasbal Lake, India (Rather & Pandit, 2006), Awangsoipat Lake, India (Devi, 2007), Oksoipat Lake India (Devi, 2008), Poiroupat Lake, India (Usha, et. al., 2010b) etc. It was observed that the maximum numbers of aquatic macrophytic plant species were recorded at the onset of the summer season and the rainy season due to the favourable warm temperature while the lowest numbers of species were recorded during the winter season. Hogeweg & Brenkert (1969) and Verma et al., (1982) earlier recorded luxuriant growth of the aquatic macrophytes, in the tropics during the rainy season. It is evident from the survey of the aquatic macrophytes distributions in the different lakes and wetlands in record that the Lake Kapsi is comparatively intermixed mats representing heterogeneous composition and distribution. Such heterogeneous compositions of species were also recorded earlier by Swindale & Curtis (1957) and Schmid (1965) in the submerged vegetations of U.S.A. and Seshavatharam & Venu (1982) in the Kolleru Lake, India.

The statistical analysis reveals that there is no significant variation with respect to frequency, density, abundance, A/F ratio and IVI of the different aquatic macrophytes recorded from the lake in the four study sites of the lake. The analysis of variance within the different species of the aquatic macrophytes indicated significant variation with respect to the quantitative characters. Comparable findings were reported from Manasbal Lake, Kashmir Himalaya, India (Rather & Pandit, 2006), Itaipu reservoir, Brazil (Mormul, et al., 2010) and Poiroupat Lake, India (Usha, et.al., 2012).

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A Study Of Global Biodiversity Change With Respect To Biodiversity Loss

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Abstract:

Global biodiversity change the very known and one of the most burning environmental issues of the present time. Inspite of the the various components we are discussing the two important components of biodiversity change—one is biodiversity alterations and the other is biodiversity loss.Here we briefly assess the impacts that modern humans and their ancestors had on biodiversity and discuss the recent declines and the changes in biodiversity. We evaluate the direct pressures on biodiversity change, change in habitat, overexploitation, the exotic species, pollution, and climate change. We discuss the root causes, such as demographic growth and resources used, and review existing scenario projections. We identify successes and impending opportunities in biodiversity policy and management, and highlight gaps in biodiversity monitoring and models. Finally, we have discussed how the ecosystem conceptual framework can be used to identify undesirable biodiversity change and to distribute conservation efforts.

Keywords : extinctions, species, abundance, range, land-use, climate

Introduction:

Biodiversity is commonly defined as the variety of life on Earth in all its forms that includes the diversity of species, their genetic variations, and the interaction of these lifeforms. it is also the sum of all "plants, animals, fungi, and microorganisms on Earth, their variation, (**2**). Biodiversity is multidimensional, and no single measure of biodiversity can capture all its dimensions (**3**). It is responsible for ecosystem services, including nutrient cycling, climate regulation, food production, and the regulation of the water cycle, and it is therefore intimately linked with human well-being(2,3,4). This foundation is now becoming endangered as the human footprint on the planet increases and biodiversity declines. Species are becoming extinct at rates higher than in the fossil record of the past few million years, including the peak extinction rate owing to the mega fauna disappearance at the end of the Pleistocene (**6**). Several other dimensions of biodiversity are also declining, such as the extent of tropical forests and the mean abundance of wild bird species (**7**, **8**). The human appropriation of Earth's natural resources is not only leading to biodiversity loss but also to large alterations of biodiversity distribution, composition, and abundance. In short we can say Biodiversity underpins human life. Halting biodiversity loss and restoring degraded ecosystems is therefore an essential element of sustainable development pathways. Failure to scale up action to address biodiversity loss will come at a significant cost to economies, businesses and more generally to human well-being.

Although biodiversity loss is as great a challenge as climate change, it has received substantially less attention on the political agenda. The focus of the 2019 G7 meeting on biodiversity is a positive step forward. Here, we review our current understanding of global biodiversity change and its underlying drivers. We start by scoping our definition of global biodiversity change, which includes both biodiversity loss and biodiversity alterations. Next, we briefly review human-induced global biodiversity change.

1) **HABITAT DESTRUCTION :** Ever more people need ever more space. Damaging human activity continues to encroach on natural environments, thereby destroying the habitats of countless species. As our numbers rise, cities, infrastructure and cropland (see 'Agricultural Intensification' below) are growing and merging into each other, fragmenting the remaining habitat and leaving isolated "islands" of natural populations of plants and animals too small to survive. According to IPBES, only one quarter of land areas and one third of oceans remain relatively undamaged by human activity.

2) **OVEREXPLOITATION :** Ever more people need ever more things. Humankind's relentless consumption of resources such as timber, oil and minerals is continuing to destroy natural habitats around the globe. We are also putting enormous pressure on populations of wild species, both by bushmeat hunting in the developing world and by large-scale industrial fishing in our seas. Wildlife poaching and trafficking still present a huge threat to many species, including rhinos, tigers and pangolins(13).
3) **CLIMATE CHANGE :** Ever more people produce ever more climate emission . Our planet is on the verge of a climate crisis due to our endless production of greenhouse gases including carbon dioxide and methane. We are headed for a 3-4 °C warmer world by the end of the century if nations' current climate ambitions are delivered on. We are already seeing species decline due to global temperature increase(10). Every half a degree of warming has a huge knock-on effect on ecosystems, with mobile species running out of areas to migrate to and temperature-sensitive organisms like corals undergoing massive die-offs. When keystone species like reef-building corals disappear, the rich and complex ecosystems they support collapse as well.
4) **POLLUTION :** Ever more people produce ever more waste and pollution. As populations increase, the disposal of waste from households, agriculture and industry, becomes an increasingly serious issue. Our oceans are becoming choked with plastic waste which is killing millions of animals, from sea turtles to whales. (**10**)The Ellen MacArthur Foundation estimates that by 2050, there will be more plastic than fish in the sea. As well as affecting the lives of humans, noise, light and chemical pollution all damage the health of wild species.
5) **AGRICULTURAL INTENSIFICATION :** Ever more people need ever more food. Agriculture deserves a special mention here as it is a primary driver of habitat destruction, climate change and pollution. Agriculture takes up 50% of all habitable land on Earth, 80% of extinction threats to mammal and bird species are due to agriculture, and our modern food systems are also the biggest contributor to climate change, responsible for around a third of all greenhouse gas emissions, with more than half of these coming from animal agriculture. In order to meet the unsustainable consumption patterns of the Global North and feed our huge population, humanity has developed agricultural systems which rely on monocultures, artificial fertilisers and pesticides. Monocultures are increasingly susceptible to disease so require widespread pesticide use which destroys insect populations. Intensive farming leads to soil depletion and runoff from farms pollutes water bodies and causes harmful algal blooms and the collapse of fish stocks.
6) **INVASIVE SPECIES :** Ever more people means ever more travel. Human travel across the world has a very large emissions footprint but it has also allowed the spread of invasive species, both accidental and intentional. As a consequence of the introduction of non-native species to some areas, such as rabbits and cats in Australia, goats on St. Helena, and American mink in Great Britain, we have put many vulnerable ecosystems at risk, threatening native species and diminishing biodiversity.
7) **GENETIC DIVERSITY IN DOMESTICATED AND WILD SPECIES :** Of the four biodiversity dimensions analyzed here, we have the least information at the global level for changes in genetic diversity. Studies of loss of genetic diversity can be classified into two categories: studies of genetic diversity of domesticated species and studies of genetic diversity of wild species. Studies of domesticated species can further be divided into plant genetic resources (12) and animal genetic resources (14).

Over the past few decades, the worldwide adoption of modern crop varieties adapted to high-input systems has led to the reduction in the area farmed with local crop varieties (14). This change in agricultural practices has raised concerns: For instance in China, the number of rice breeds in production is reported to have declined since the 1950s from 46,000 to 1,000, and most of the 10,000 traditional corn breeds are no longer in production (9). Still, there are many farm communities that, although exposed to modern varieties, choose to maintain, at least in portions of the farm, traditional varieties (8). The picture of allelic diversity change is also complex. Although

some studies report declines in allelic diversity of modern varieties over the past few decades (9), a meta-analysis of 44 studies has found no significant overall

Solutions to biodiversity loss

Dealing with biodiversity loss is tied directly to the conservation challenges posed by the underlying drivers. Conservation biologists note that these problems could be solved using a mix of public policy and economic solutions assisted by continued monitoring and education. Governments, nongovernmental organizations, and the scientific community must work together to create incentives to conserve natural habitats and protect the species within them from unnecessary harvesting, while disincentivizing behaviour that contributes to habitat loss and degradation. Sustainable development (economic planning that seeks to foster growth while preserving environmental quality) must be considered when creating new farmland and human living spaces. Laws that prevent poaching and the indiscriminate trade in wildlife must be improved and enforced. Shipping materials at ports must be inspected for stowaway organisms.

Developing and implementing solutions for each of these causes of biodiversity loss will relieve the pressure on species and ecosystems in their own way, but conservation biologists agree that the most effective way to prevent continued biodiversity loss is to protect the remaining species from overhunting and overfishing and to keep their habitats and the ecosystems they rely on intact and secure from species invasions and land use conversion. Efforts that monitor the status of individual species, such as the Red List of Threatened Species from the International Union for Conservation of Nature and Natural Resources (IUCN) and the United States Endangered Species list remain critical tools that help decision makers prioritize conservation efforts. In addition, a number of areas rich in unique species that could serve as priorities for habitat protection have been identified. Such "hot spots" are regions of high endemism, meaning that the species found there are not found anywhere else on Earth. Ecological hot spots tend to occur in tropical environments where species richness and biodiversity are much higher than in ecosystems closer to the poles.

Concerted actions by the world's governments are critical in protecting biodiversity. Numerous national governments have conserved portions of their territories under the Convention on Biological Diversity (CBD). A list of 20 biodiversity goals, called the Aichi Biodiversity Targets, was unveiled at the CBD meeting held in Nagoya, Japan, in October 2010. The purpose of the list was to make issues of biodiversity mainstream in both economic markets and society at large and to increase biodiversity protection by 2020.

Loss of Biodiversity Solution

The solutions to Loss of Biodiversity are:

Protection of Species: Hunting of animals and poaching of birds should be restricted. But, unfortunately, to fulfil our greed, we kill animals and ignore the consequences of our actions.

Protection of Habitat: Due to the increase in human population, we need more space to survive and agriculture, which leads to the destruction of natural habitats of many animals and plants. Therefore, we should take measures to control the population to protect the habitat of animals and plants to keep them safe from extinction.

Prevention of Deforestation: Many animals, plants, and tiny organisms stay in tropical rainforests. However, these species are endangered due to deforestation, which will have a negative chain impact. So, we should make sure that we can save our forests and preserve them and keep the species safe.

Controlled Usage of Natural Resources: We should keep control of the usage of natural resources by using alternative options of cooking, fuel, and mineral usage.

Prevention of Species Invasion: We should stop the invasion of species because they will lead to the displacement of local species from their habitat, and this will cause the extinction of many species.

Pollution Control: We should control pollution levels as it affects the biodiversity in adverse and high pollution may lead many species to extinction.

Government Regulatory: Government should make laws that can protect or conserve the natural variety of plants and animals from getting extinct.

Education: People should be educated about the importance of the ecosystem and the preservation of biodiversity. They should also know the consequences of declining biodiversity so people can seriously take part in the growth of healthy biodiversity.

Conservation of Species: Species of the various living organisms should be preserved by In-situconservation by protecting them in natural habitats for growth and Ex-situ conservation by protecting the species outside their natural habitat.

Summary

Biodiversity loss is a significant worry in the present time. It creates a negative impact on the environment. It results in loss of habitat, extinction of species, and increase in natural calamities droughts etc. The present work gives a glance of the causes of biodiversity loss and its consequences. That's why it is necessary to preserve our ecosystem, for this we should find more effective solution to protect all the species and other important biological elements of the ecosystem.

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A brief Study of Forest and Wildlife Conservation

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Abstract :

This Review highlights the major issues about deforestation, wild life extinction and conservation. Forest conservation is the practice of planting and maintaining forest areas for the benefits and Sustainability of further generations. Along with that wildlife conservation is also mandatory. It is necessary to know current scenario about wildlife protection and conservation at national and international level. Habitat conservation is the key solution to conserve biodiversity. Lots of efforts has been done in many areas. Similarly by discouraging the pet trades, over shooting as well as hunting by applying different banes, marine pollution by different lows and regulation. And public awareness are the main concerns.

Introduction :

Forest and wildlife resources are indispensable four the provisions as ecosystem goods and services; as well as spiritual and cultural values in rural area. Now a days, conservation of biodiversity is the great challenge. There is a great need of different planning strategies for protection, conservation and minimizing the loss of natural resources, wildlife and forest cover. Forest may vary significantly in size and have different classifications according to how and of what the forest is composed. Tree forests cover approximately 9.4 % of the Earth's surface (30% of total land area). Forests are central to all human life because they provide a diverse range of resources and multiple benefits too. As we conserve the forest i.e. habitat of wildlife, wildlife conservation also done side by side. Cooney et. al. (2018) state that wild animals are essential part of biodiversity and source of food and recreation. However, forest and wildlife resources are disappearing at an alarming rate, across the globe. The degradation of forests has gradually led to loss in biodiversity, acsthetic view at landscapes and ecological functions including the provisions at goods and services of human needs.

History of forest and wildlife conservation :

The scheme of biodiversity and encompassing unique and representative ecosystems are identified and designated as Biosphere Reserves to facilate conservation in India's immense biological diversity which is estimated to be over 47,000 plant species and 81,000 animal species, respectively about 7 % of world's flora and 6.5% of world's fauna respectively. Nearly 15,000 flowering plants are endemic to country and in case of fauna, the extent of endemism is estimated at about 62 %.

The scheme of biodiversity conservation was initiated during 1991-92 to ensure co-ordination among various agencies with dealing with issues relating to conservation of biodiversity, and to review, monitor and evolve adequate policy instruments for the same. Pursant to ratiflaction of the conservation on Biological Diversity by India on 18th February 1994, several steps have been initiated to meet the commitments under the conservation and to realize the opportunities offered by convention. These efforts aim at bringing the legislative administrative and policy regimes in tune with the tree – fold objectives of conservation.

Methods of conservation :

Ways to conserve forests :

Forests serve as a natural resource and habitat for wide variety of living organisms on the Earth. Millions of animal species take shelter in forests. Conservation of forests is one of major steps to be taken to bring book sustainability in ecosystem. Use of following way can help to conserve forests and promote sustainability.

a) Controlling and regulating deforestation :

Industrialization and urbanization have cause a huge loss to forests and wildlife. One of the ways to conserve forests by controlling and regulating the cutting of forests. Shelter wood cutting, selective cutting, and clear – cutting methods may be employed to regulate the felling at trees.

b) Afforestation :

The most effective and promising way of conserving forests is afforestation. With afforestation, we can not only increase the overall forest cover but also recover the land due to deforestation.

c) Control Forest Fires :

One of the most significant causes of the loss of forests is forest fires. Although forest fires aid in replenishing essential nutrients form deal organic matter. In the soil, they cause a huge loss. The two types of forest are natural and artificial. Artificial forest fires are when complete forest land is set on fire. To convert the land for agricultural purposes. Artificial forest fires should be avoided completely. And, innovative forest fires fighting techniques should be discovered and implemented to stop natural forest fires.

d) Proper care :

Forest trees are also supplied with pesticides to protect them from harmful pests and diseases. This is when most trees get impacted negatively. The use of chemical substances poses a huge threat to the whole forest. Therefore proper care should be taken while safeguarding the plants from harmful pests and diseases.

Various Act of Protection and Conservation of Forest :

The important forest legislation in India are :

1) The Indian Forest Act, 1927
2) The Wildlife Protection Act, 1972
3) The Forest Conservation Act, 1980
4) The Scheduled Tribes and other Traditional Forest Dwellers Act, 2016

Ways to conserve wildlife :

Plants and animals are interdependent to each other. Plants supports animal's existence and vice-versa. some of them are fundamental to maintaining ecological balance. Here is some of the ways to conserve wild life.

a) Prevent deforestation :

Deforestation is one of the leading cause of the loss of wildlife. Wildlife can be protected and conserved with the help of afforestation.

b) Develop Protective areas :

Developing protective areas for animals to live is another promising way to conserve. Wildlife some of the example of protective areas include wildlife sanctuaries, national parks, zoos and so on.

c) Protecting critically endangered species :

Safeguarding the vulnerable and critically endangered animals from becoming extinct is another way of promoting wildlife. There critically endangered or vulnerable species many be brought to safer places such as zoos where they can breed and reproduce.

D) Ban on wildlife hunting :

Introducing strict rules on banning wildlife hunting is critical to stop further loss of wildlife.

Importance of Conservation :

Forest and animal are the most important aspects of our lives. We value them for many reasons, some utilitarian, some intrinsic. This means we value biodiversity both for what it provide to humans and for the value it has in its own right. Utilitarian values include the many basic needs human obtain from forest and also from animals. More than 33% of our drug needs are obtained from wild plants. The forest gives incredible breadth to leap forwards in the field of clinical science and innovation alongside the necessities for the huge scope if assembling anti-infection agents and different medications for medicinal use. A forest keeps up with temperatures universally, accordingly batting against the impact at greenhouse gases. Forests also aid in forestalling the ocean levels to rise strongly. Plat and animals are interdependent on each other.

Plant support animal's existence and vice-versa. Both of them are fundamental to maintaining ecological balance. The Forest is a natural habitat for. Many animal species. Thousands of animal species reside in these immense forests. Micro-organisms in wildlife fix the nitrogen levels, thereby promoting soil fertility. Forest as well as wild animals have importance in human life.

Various Act of Protection and Conservation of Wild Animals :

The important wild life legislation in India are :

1) Wild life Protection Act, 1972
2) Wild Life (Stock Declaration) Central Rules, 1973
3) Wild life (Transactions and Taxidermy) Rules, 1973
4) Wild Life (Protection) Licensing (Additional Matters for Consideration) Rules,1983
5) Wild Zoo Policy, 1998
6) Declaration of Wild Life Stock Rules, 2003
7) National Board for Wild life Rules, 2003
8) National Tiger Conservation Authority (Salaries, Allowances and Other Conditions of Appointment) Rules, 2006
9) Recognition of Zoo Rules, 2009

Conclusion :

In this way, this paper conclude that, individuals as well as governments can do their part in presenting the forests of the world. Knowledge about the importance of forest and wild animals needs to be spread so that people become aware of the danger to everyone and everything on the earth by deforestation and extinction of animals. People's participation in conservation of forests is of vital importance. So that people must get involved in this national task. Methods, strategies and measures mentioned here for the conservation of forests and wild life are very simple so that every individual could follow them and act at their own level in order to achieves the goal of conservation of forest as well as wild creatures. If people starts now and act now, it might get too late for the cause of conservation of forests and wildlife.

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Conservation and Use of Wild Medicinal Plants Problems, Progress, and Prospects

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Abstract:

In India, the research works on wild plants and agriculture is meager as compared to developed countries. There are numerous methods being used to study the agriculture of wild pants and their uses in herbal medicine and cosmetics industry. Therefore, the focus of this article is to explain the methods and their potential utility to the researcher, with a special emphasis on how Indian scientific communities can utilize the simple and feasible methods of collection of wild medicinal plants and explain their uses for the society. Ocimum americanum belongs to the family Lameaceae and have an aromatic and medicinal importance. In application of advanced method like GC-MS computational techniques plays an important role in the development of drug of interest concerning the study of O. americanum contents. Four compounds were identified in aerial parts of leaves of Ocimum americanum. These four compounds identified in ethanolic extract are 3,3-dimethyl-2-(phenylsenyl)-,2,2,2-trifluoro-1-(9-anthracenyl)ethyl ester (Butanoic acid), Diacetato[1,2-bis(diclohexylphosphino)ethane, Osmium dibromi(E) [tetrakis(trimethylphosphine)],10,10'-diselenodi-(Decanoic acid)). It was observed that in the different sites of Nagpur region, the constituents of Ocimum americanum differed in quantity, which may be due to the local geographical differences. Aromatic oil found in 3gm of dry weight of powder of leaves of Ocimum americanum is 5%.

Keywords *- Ocimum americanum (L.), GC-MS, Compounds, Agriculture.*

Introduction

Medicinal plants are valuable sources of new drugs [1–4]. Up to 80 % of people in developing countries are totally dependent on herbal drugs for their primary health care, and over 25 % of prescribed medicines in developed countries are derived from wild plant species [4].According to world health organization (WHO) variety of drugs are obtained from medicinal plants.In developed countries almost 80% of individuals depends on compounds derived from medicinal plant.In this regard properties,saftey & efficiency of them should be investingated.[5]. The study of indigenous food production and local medicinal knowledge may have practical implication for developing sastainble agriculture and discovery of new medicines.Medicinal and herble plants also encourage an awarness of the link between biodiversity and culture diversity as well as a sophisticated understainding of the mutual influence of plants mutual influence of plants and human. The conservation and sustainable use of medicinal plants have been studied extensively [6, 7]. Various sets of recommendations have been compiled regarding their conservation, including the establishment of systems for species inventorying and status monitoring, The Global strategy for Plant consevation is a catalyst for working together at all levels-local national,regional and global-to understrand,conserve and use sustainbly the worlds's immense wealth of plant diversity whilst promoting awareness and building the necessary capcities for its implention.Gas chromatogrphy and Mass spectrum is one of the best method for to identify the plants chemical components. *Ocimum americanum* contain essential oil which is volatile organic strong smell substance and have great importance in pharmaceuticals as well as cosmatics industries.

Fig- *Ocimum americanum*

Methodology

Collection of plant material

Ocimum americanum leaves were collected from Panjabrao Deshmukh Krushi Vidyapeeth (PDKV) forest of Nagpur district. The plant was identified by the Plant systemic laboratory Department of Botany,R.T.M.University Nagpur Maharastra.GC-MS Analysis - The test plant extracts were subjected to GC-MS analysis at laboratory's (IIT Bombay) Sophisticated Analytical Instrument Facility (formerly RSIC), Indian Institute of Technology, Powai, Mumbai.

Result And Discussion

The present investigation was carried out on plant *Ocimum americanum* of Lamiaceae family to study the presence of medicinally active phytochemicals in the leaves.The leaves of *Ocimum americanum* (L.) Poit collected from campus and PDKV forest which experienced different climatic and geographic circumstances, were determined by GC-MS. It has been already reported by various workers. As seen in the table- 1, different compounds were determined from the leaves of *Ocimum americanum*. The present investigations concluded that the leaf *Ocimum americanum* contains chemical compounds. These chemicals are widely used in Ayurvedic traditional and herbal medicines as well as cosmetics industry.Decanoic acid is used in the manufacture of esters for artificial fruit flavours and perfumes. Problematically some wild plant resource is becoming scarce and threatened by over harvesting It needs substantial investment before and during production Uncontrolled harvesting leads to the extinction of ecotype and species. In progressively, the natural way access resource without investment it relieves harvesting pressure on rare and threatened species. It is natural resource and free from pesticides It can keep genotypes being standardized or improved

Ocimum americanum in chemical compounds and herbal ingredients,and it has been said that 70-80% of the world's population relies on some from of non-conventional medicine[4] and around 25-40% of all prescription drugs contain active ingredients derived from plants in theUnited States[5].

Medicinal Importance of *Ocimum americanum*

- In traditional medicine, *O.americanum* holy basil is used for several ailments.
- Decoctions are used for coughs; pounded leaves are placed on the forehead to relieve catarrh or on the chest for respiratory problems.
- The whole plant is used in baths to treat rheumatism, renal colic and calcifications.
- More recently, the plant has been listed as a potential medicine against cancer.
- Aromatic oil is found in 5% in 3gm of dry weight of powder of leaves of *Ocimum americanum.*
- An essential oil can be extracted from plants leaves of *O. americanum* are used in soap and cosmetics. It has been reported to exhibit fungi toxic properties (without phototoxic side-effects).The oil contains camphor, and methyl-cinnamate.
- *O. americanum* has been planted on a large scale in the Common wealth of Independent States, Kenya and Pakistan for the production of camphor, which has medicinal and industrial applications (celluloid, fireworks).
- *O. americanum* used to treat inflammatory and allergic conditions.
- The leaves pest is used in tretment of skin deaseses,it is also appplied on wound and burns that are not healing well.

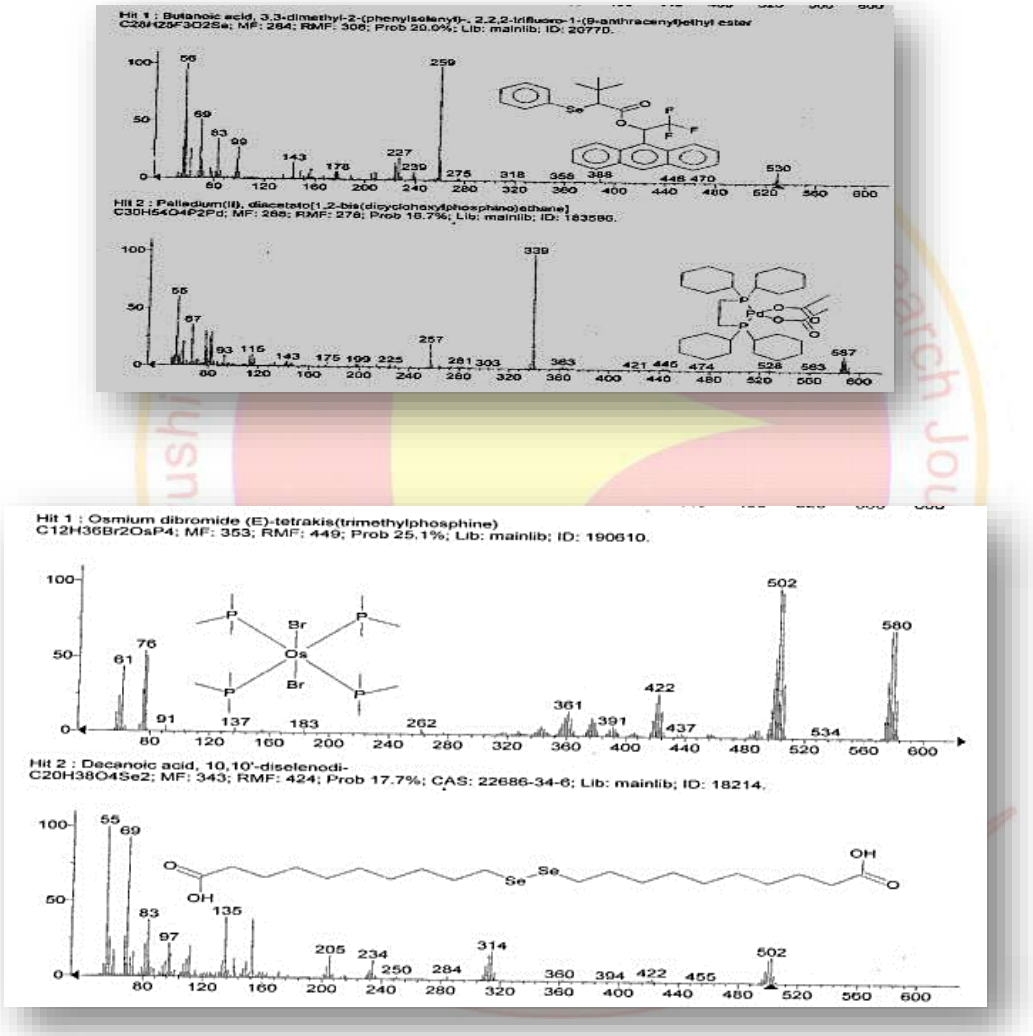
Table 1- Uses of Plants species, life forms and Percentage of plant parts used

Life form	Leave	Flower/bud	Fruit/seed	Bark	Root	Whole plant
Herb	High	High	High	Low	Medium	High

Table No.:2 The Chemical Composition of *Ocimum americanum*

S. N.	Name of compound	Molecular formula	Biological activity	Peak Area
1	3,3-dimethyl-2-(phenylsenyl)-,2,2,2-trifluoro-1-(9-anthracenyl) ethyl ester. (Butanoic acid)	$C_{28}H_{25}F_3O_2$	Antioxidant activity	141200
2	Diacetato[1,2-bis(diclohexylphosphino)ethane]	$C_{30}H_{54}O_4P_2$	----	141200
3	Osmium dibromi(E) (tetrakis(trimethylphosphine	$C_{12}H_{36}Br_2O_4$	Anticancer Compounds	66375
4	10,10'-diselenodi-(Decanoic acid)	$C_{20}H_{38}O_4$	Antioxidant activity	66375

Graphical Representation of *Ocimum americanum*



Conclusion:

The study concluded that *Ocimum americanum* and its habitat less but its own reproductive strategies. In spite of the existence of various sets of recommendations for the conservation and sustainable use of medicinal plants, only a small portion of these have achieved adequate.

Protection of medicinal plant resources through conventional conservation in natural reserves.

Most of the medicinal claims are centered on flowerand inflorescence of the plant. The whole plant and l eaves,are also administered in a few specific clinical conditions.Theanalysis of all the claims clearly indi

cates the,potential of the plant to be an excellent analgesic, antipyretic and anti inflammator drug whi ch needs to,be,validated.The present GC-MS screening are an essential tools for confirmation of the results and it may serve as pavements for the researcher to select a group of plants having similar chemical constituents and their detailed investigation regarding their chemistry and functions is required, so that they can be used in allopathic or in Ayurvedic medicine as well as cosmatics industry.

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Qualitative phytochemical study of Certain Ficus Species from Manora Tehsil.

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Abstract

Family Moraceae (fig family) one of the angiospermic plants family can be found throughout the world bearing about 38 genera and over 1100 species with cosmopolitan distribution. Ficus is a genus of more than 850 species in the Moraceae family. Generally, there are five species of Ficus in Maharashtra's Washim District: Ficus hispida L., Ficus benghalensis L. Ficus glomerata L., Ficus religiosa L.., Ficus benjamina L. are more commonly found having a diversified habitat. The presence of active phytochemicals in various parts of the plants gives these Ficus species their traditional therapeutic use. The present work is focused on the comparative preliminary phytochemical analysis of above selected five Ficus species from Manora tehsil of Washim District, (M.S.) India. It is observed that Ficus species have rich but diverse phytochemicals in their different parts.

Keywords: Moraceae, Ficus, Phytochemicals, traditional medicine, Manora.

1. Introduction

For thousands of years, plant have provided to human beings many basic and important materials required for their day-to-day life. Plants are also considered as biochemical factories, as involved in the production of various chemical components for the utilization of mankind.

Natural products have found use in antiquity as folk remedies, soaps and essences. They include drugs and other medicinal products, dyestuffs, feedstocks for chemical industries (gums, resins, rubber) and a variety of substances used to flavor food and drink. In recent years, however, it has become increasingly evident that many natural products do have significant ecological functions, such as protection against microbial or insect attack. (Hopkins, 1995).

Different traditional literatures are literal witness that *Ficus* are having many ethnomedicinal values. (Babu K, 2010).

In this present work, it was attempted to give a comparative phytochemical from five selected Ficus species i.e. Ficus hispida L., *Ficus benghalensis L. Ficus glomerata* L., Ficus religiosa L.., *Ficus benjamina* L. and their some traditional ethnomedicinal uses.

2. Materials And Method

2.1 Collection of plant materials:

Plants and plant materials selected for the study were collected from different localities of Manora tehsil, Washim district specially from villages, Abhaykheda, Kolar,Kondoli, Dapura, Vitholi, Manora region. Firstly, the plants were spotted in different localities, identified them using different floras like Cook 1907, Dhore 2005, Naik 1989, Yadav and Sardesai 2002. A specimen copies of selected plant is submitted to the herbarium of Department of Botany, M.S.P. Arts, Sci. & K.P.T. Comm. College Manora, Dist. Washim (MS).

Photographs of five Selected *Ficus* Species:

Ficus hispida L. ***Ficus benghalensis L*** ***Ficus glomerata*** **L. Ficus religiosa L.** ***Ficus benjamina*** **L.**

The leaves and stems of the plants were picked and washed with tap water and then distilled water. Then the material is shade dried for 10-15 days and grinded well to obtain homogenous fine grade powder. a 4-gm powdered sample soaked for 1 hour in each of 40 ml Methanol, Petroleum ether, and distilled water, Preliminary phytochemistry was conducted after the solvents were filtered.

2.2 Preliminary phytochemistry: Preliminary phytochemistry was done as method given by Harborne (1973), and Krishnaiah et al, (2009). **..**

Preliminary phytochemistry was done for 11 group of secondary metabolites i.e. Alkaloids, Cardiac Glycosides, Phenolic compounds, Flavonoids, Terpenoids, Saponin, Steroids, Reducing Sugar & Tannins.

3. Result And Discussion:

Table No. 1 - Comparative preliminary phytochemical analysis of five *Ficus* Species (Leaves extract).

Sr. No.	Phytochemicals	Ficus hispida L.	*Ficus benghalensis L.*	*Ficus glomerata L.*	Ficus religiosa L.	*Ficus benjamina* L.
1.	Alkaloids	+	+	+	+	+
2.	Cardiac Glycosides	+	-	-	+	+
3.	Phenol	+	+	+	+	-
4.	Flavonoids	-	+	-	+	+
5.	Terpenoids	+	+	+	+	+
6.	Saponin	+	+	+	+	+
7.	Steroids	+	+	+	+	+
8.	Reducing sugar	+	+	+	-	+
11.	Tannins	+	+	+	+	-

Table No. 2 – Comparative preliminary phytochemical analysis of five *Ficus* Species (Stem extract).

Sr. No.	Phytochemicals	Ficus hispida L.	*Ficus benghalensis L.*	*Ficus glomerata L.*	Ficus religiosa L.	*Ficus benjamina* L.
1.	Alkaloids	+	+	+	+	+
2.	Cardiac Glycosides	+	+	-	+	-
3.	Phenol	+	+	+	+	+
4.	Flavonoids	-	+	-	+	+
5.	Terpenoids	-	+	+	+	+
6.	Saponin	+	+	+	+	+
7.	Steroids	-	+	+	+	+

8.	Reducing sugar	+	+	+	+	-
11.	Tannins	-	+	+	+	-

4. Conclusion:

Methanol, petrolium ether, and distilled water were utilised as solvents for preliminary phytochemistry. Methanolic leaf extracts of Ficus hispida L, *Ficus benghalensis L.*, *Ficus glomerata* L, and Ficus benjamina L contain alkaloids and reducing sugar.

Ficus benghalensis L., Ficus hispida L., and *Ficus benjamina* L. all contain steroids, but *Ficus benghalensis L.*, Ficus hispida L., and *Ficus benjamina* L. do not.

Glycosides were found in the petroleum ether leaf extracts of Ficus hispida L., Ficus religiosa L., and Ficus benjamina L. *Ficus benghalensis L.*, *Ficus glomerata* L., Ficus religiosa L., and Ficus benjamina L. all contain terpenoids, as do *Ficus glomerata* L., Ficus religiosa L., and Ficus benjamina L.

The aqueous leaves extract of Ficus hispida *L*, *Ficus benghalensis L.*, *Ficus glomerata* L. and Ficus religiosa L. shows the presence of Phenol and Saponins, Steroids, while it shows the presence of Flavonoids and Tannin are found *Ficus benghalensis L.*

Alkaloids and phenols can be found in Methanolic stem extracts from all of the plants studied, while Flavonoids can be found in *Ficus benghalensis L.* and Ficus religiosa L.

Glycosides can be found in the petroleum ether stem extracts of Ficus religiosa *L.* and *Ficus benghalensis L.* Reducing sugar is detected in the aqueous stem extracts of *Ficus hispida* L, *Ficus benghalensis L.*, *Ficus glomerata* L, and *Ficus religiosa* L., whereas Phenolics, Terpenoids, Saponin, and Steroids are present in *Ficus glomerata* L and Ficus religiosa L.The phytochemical study of the above plants shows that the plants of the selected *Ficus* species have the common secondary metabolites viz. Alkaloids, Glycosides, Terpenoids, Steroids, Saponins, reducing sugar, Tannins, and a variety of other phytochemicals are found in abundance in almost all members of the family. These phytochemicals are studied for the various medicinal properties and has been probed used again various diseases such as diabetes, fever, tuberculosis, renal tubular disease, malaria, intestinal diseases, etc. These plants' natural phenolic compounds performed an essential part in cancer prevention. (Singla and Pathak, 1993; Munshi et al., 1993; Omale and Emmanual, 1997; Ravichandran et al., 2012).

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Diversity of Selaginella in Melghat forest , Amravati district, Vidharbha region of Maharashtra.

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Abstract

Melghat lies on the Southern shoot of the Satpuda range of hills. This part of Satpuda is known as Melghat; consists of hills and vallies . The most prominent geological feature of Melghat is the Gavilgad range of hills which is abundantly rich in biological diversity.

Forest of Melghat is Dry deciduous type of Forest.The entire area of Melghat is covered by the forest of the Dry deciduous Teak Forest. Tectona grandis is the most important and dominant species distributed in the entire area. The Melghat forest composed of Gugamal national Park with 361.28 sq.km. area, Melghat sanctuary with 788.75 sq.km area and Multiple use area with 526.90 sq.km. area.

In Melghat forest Pteridophytes flourishes naturally very well. Selaginella species well flourishes in Melghat. Key Words – Melghat, Pteridophytes, Selaginella.

Key words- Pteridophytes, Selaginella, Melghat forest.

Introduction

Pteridophytes formed a dominant part of Earth's vegetation in the historic past.Although they been largely replaced by the spermatophytes in the modern day flora.The present day lycopods like Lycopodium, Selaginella and Equisetum are the mere relicts of the mighty lycopsid and sphenopsid group.

Forest of Melghat is Dry deciduous type of Forest.The entire area of Melghat is covered by the forest of the Dry deciduous Teak Forest. Tectona grandis is the most important and dominant species distributed in the entire area. The Melghat forest composed of Gugamal national Park with 361.28 sq.km. area, Melghat sanctuary with 788.75 sq.km area and Multiple use area with 526.90 sq.km. area.

Materials and Methods

Pteridophytes division of vascular plants which do not produce seeds. It include Ferns, Club mosses and Horse tail. In Melghat under shady and damp places, along waterfalls, road sides of Ghats, in association with Angiosperms and Gymnosperms.

The plant specimen of Selaginella was collected in every stage of their growth and habitats and reproduction from different localities of Melghat Forest area. The plants were collected in tin vasculum. The plants are pressed flat, before their wilting. They are pressed after the day's visit.

The Selaginella was pressed between the sheets of news or blotting paper. These sheets were alternated between sheets of news or blotting paper. The plant became dry by transferring their moisture into the blotting papers.

After drying of plant material, the plant specimen were mounted on herbarium sheets of standard size . The specimens are labeled as per all data. The Selaginella specimen were preserved in 4% formaline solution.

Observation –

Selaginella blatteria

Selaginella blatteria found along the road sides in moist condition. It is distributed from August to October. The sporophyte observed from September to October.

The sporophyte herbaceous, dorsiventral prostrate, 6-16 cm long . Stem herbaceous, dichotomously branched, solid, prostrate, green, smooth and glabrous. The hairs unicellular. Leaves microphyllous, heterophyllous. Each leaf traversed by single unbranched mid-rib. The leaf with ligule, ligule arises from the base of each leaf.

Ligule delicate green with entire margine and acute apex, tongue shaped. A mature ligule has a prominent basal portion called the glossopodium. The ligule is a secretary structure which secretes water and mucilage. The leaves from four side of the stem. The larger leaves on the ventral side of the stem in opposite decussate manner.

Rhizophore leaf less, positively geotropic organ bears roots at the swollen end. A single rhizophore comes out downward from the rhizome. A rhizophore is an organ intermediate in structure and function between the stem and root, it is root like in appearance and behavior but has no root cap.

Rhizophores grow down to the soil and true roots emerge from them. Roots adventitious originate from the tips of rhizophores, dichotomously branched. The roots have root cap and bear root hairs.

Strobilus- The spore bearing organ is known as Strobilus. Sporangia bearing organ is sporophyte. The sporangia develop in the axil of leaves called as Sporophylls. The sporophylls are similar to photosynthetic vegetative leaves. There are two types of sporangia. The microsporangia, the sporophyll bearing microsporangia called microsporophyll. The megasporangia, the sporophyll bearing megasporangia called mega-sporophyll. The strobilus always terminal in position. The sporophylls ligulate which are present between the sporangium and the base of sporophylls. The strobilus also called the sporangiferous or the cone.

Selaginella repanda

Sporophyte observed from August to October . The strobilus from September to October.The sporophyte is terrestrial erect, dichotomously branched, 1.4 to 2.0 cm long . Leaves dorsiventral heterophyllous and alternate, leaves are of two kinds in four vertical rows, dorsal two rows are small, ventral two rows are large , ligulate. Ligule arise from the base of leaf, delicate green with entire margin and acute apex. The stem dorsi-ventral , dichotomously branched, solid. The rhizophore white coloured, 0.5 -1.0 cm long.

A rhizophore is an organ intermediate in structure and function between the stem and root; it is root like in appearance and behavior but has no root cap. Roots are adventitious, produced from the ends of the rhizophores.

The spore bearing organ is known as strobilus.Sporophylls are spirally arranged at the tips of the lateral branches forming strobilus. The sporophyll develop in the axil of leaves called as sporophylls. There are two types of Sporangia, The microsporangia, The sporophyll bearing microsporangia called microsporophyll. The megasporangia , the sporophyll bearing megasporangia called megasporophyll. The strobilus always terminal in position. The sporophylls are ligulate which present between the sporangium and the base of sporophylls. The strobilus also called the sporangiferous spike or the cone.

Result and Discussion

The pteridophytes are considered as a first vascular plants that colonized the terrestrial habitat. In the course of evolution they reached upto arborescent habit that has resulted into a gigantic and thick forest in Siluro-Devonian period. Pteridophytes have well developed conducting system. The plants are with feather like fronds.

The living members are represented by living taxa widely distributed over the surface of the global part . In Melghat Forest area Selaginella with two different species distributed in different climatic conditions. *Selaginella blatteri* and *Selaginella rependa*. Selaginella distributed on rock at moist condition with creeping stem, spirally arranged leaves, sporangia arranged in terminal strobilus.

Selaninella shows ecological succession in forest ecosystem.

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Diversity of Insect pest on Banana plant in Pandhari region,Anjangaon surji

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Introduction

Banana is a globally important fruit crop with 97.5 million tons of production. In India, it supports livelihood of millions of people. Banana occupies 20% area among the total area under crop in India and contributes 37% of the total fruit production and ranks second in importance next to mango with a total annual production of 16.91 million tons from 490.70 thousand hectares with national average of 33.5 T/ha. Bananas were originally found in South East Asia, mainly in India.

Banana, the fruit of a plant of the genus -Musa (family- Musaceae) is basically cultivated for food, and secondary for the production of fibers, and also for producing tissue-thin tea bags. Besides this, bananas are also cultivated for some ornamental purposes in various regions of the world. They are also known as Bananier Nain, Canbur, Curro and Plantain. These creamy, rich, and sweet fruits are favourite among the people of all ages right from infants to elders. Bananas consist mainly of sugars (glucose, fructose and sucrose) and fiber. They provide instant energy as they are the rich sources of Vitamin B6.

Origin of Banana

Musa species grow in a wide range of environments and plantains of the tropics to cold-hardy fiber and ornamental plants. These large, perennial herbs, 2-9 m in height, is evolved in Southeast Asia, New Guinea, and the Indian subcontinent, developing in modern time secondary loci of genetic diversity in Africa, Latin America, and the Pacific.

Musa species attained a position of central importance within pacific societies, the plant is a source of food, beverages, fermentable sugars, medicines, flavorings, cooked foods, silage, fragrance, rope, cordage, garlands, shelter, clothing, smoking material and numerous ceremonial and religious use.

Botanical Description

Banana plants are fast-growing herbaceous perennials that grow at 6 to 7.6 meters (20-25 feet) tall, from a corm. The banana has an underground stem with adventitious roots. Below is the brief botanical description of the banana plant.

Plant

They are herbaceous plant with an apparent trunk that bends without breaking. The "trunk" or pseudostem is not a true stem, but only the clustered, cylindrical aggregation of leaf stalk bases. This is the largest of all herbaceous plants having its leaves arranged spirally which can grow 2.7 metres (9 feet) long and 60 cm (2 feet) wide. There are 5-15 leaves on each plant, with 10 considered the minimum for properly maturing a bunch of fruit and approximately 44 leaves will appear before the inflorescence

Flowers

The inflorescence shooting out from the heart in the tip of the stem appears above the last leaves in an upright position, and consists only of a large, purple, tapered bud. As the bud opens, the narrow, nectar- rich, tubular, toothed, white flowers are revealed. They are then clustered in whorled double rows along the stalk, each cluster covered by a thick, purple, bract. The flower stalk begins to droop down under its own weight after opening; the flowers are negatively geotropic, and turn upright during growth

Pollination

Bananas are male sterile, and those of the Cavendish group are female sterile as well; fruit is set parthenocarpically

Fruits

The fruit (technically a berry) turns from deep green to yellow or red, and may range from 2-1/2 to 12 inches in length and 3/4 to 2 inches in width. The flesh, ivory-white to yellow or salmon-yellow, may be firm, astringent, even gummy with latex when unripe, turning tender and slippery, or soft and mellow or rather dry and mealy or starchy when ripe. through the literature we came to know the major and minor pest on banana tree viz.

Spondoptera litura (Cutworm) chaetanaphothrips signipenn (Banana thrips) , Nacoleia octasema (Banana scab moth) Apterona helicoidella (Hard scale)

In present study aimed to collect the data of minor pests of banana from selected banana field.

These minor insect causes the harm to banana tree and damage the banana leaves and some pest spread the diseases.

Thrips- Distinctive reddish brown oval stains on the finger, which can extend the entire length. In severe cases peel splits and the exposed flesh quickly discolors.

Aphids- Banana leaves are bunched into a rosette appearance with leaf margins becoming wavy and upward rolling thereby reducing the growth and vigour of plant. Severely infected plants do not produce bunches and act as a vector of bunchy top disease.

In addition,the climate change exerts a profound effect on the intensity of pest problem. Hence, there is considerable shift in insect pest problem and crop losses(Arora and Dhaliwal,1996;Dowens,et al.,2007 and Ramamurthy et al.,2009).

Banana plantation suffers number of pest: The minor pest and diseases affecting bananas are follows-

Viral diseases-Banana bunchy top virus is also known Banana virus,cucumber mosoic virus.

Fungal diseases-Panama disease,Singatoka diseases caused by fungus: Mycospheaerella musicola, Black Sigatok.

Insect pest-Banana stem weevil, banana pseudo stem borer, Odeoiporus longicollis, Oliver, banana rust thrips, Fruit rust thrips, Hard scale-Aspidiotus destructor, Cut worm. Nematods have been growth and yield through its damage to the roots and corm. The parasitic nematodes feed, multiply and migrate to roots.

Material and Method

There are different types of methods are available for collecting banana pest like pitfall trap method, handpick methods, light trap method, net swapping method, above methods are used for the collection of the banana pest.

In this reserch used the hand-pick methods for the collection of banana pest, firstly selected a specific agricultural land for the collection of banana pest, this agricultural land is in Amravati district in Pandhari village. This agricultural land visited on dated 13/9/2014 for the collection, near about 20 to 30 different types of pest collected and preserved in 70% alcohol. Later took photographs of each and every pest for their identification.

The specific field which were selected for the collection of pest is of 4 hectares. On these agricultural there are 4000 banana trees and each row contains 100 banana trees, having distance between two trees of 2.5 feet and distance between two rows is of 5 feet respectively.

Collection Time : The insects were collected between 11am-5pm. The owner of the land gave lots of information about banana trees and, his agricultural land was fully developed as compared to other farmers land. The survey was carried out 5-6 times for the observation of pests and were observed that there are some pests having an side effect on the banana trees and causing harmful effects on the yield of banana.

The study Area-Anjangoan surji is situated in Amravati district in Maharashtra, selected for study area because in these area more production of banana crop. The agriculture field of this area is developed for banana crop

Observation and Result

Total 40 to 50 individuals of various groups of insects were collected from the selected banana field and stored in70% alcohol later brought to laboratory. After sorting the minor pests are identified through available literature. Five minor banana pests are selected for the study and observed and their biology werestudied .

1) Cut worm - *Spondoptera litura*
2) Banana Scale Moth –*Nacoleia octasema*
3) Hard scale - *Aspidiotus destructor*
4) *Chaetanaphothrips Signipennis*

1) *Spondoptera litura*(Tobacco Caterpillar/ Cut worm)

classification
Kingdom: Animalia Phylum:Arthropod
Class :Insecta
Order :Lepidoptera Division:Ditrysia
Family:Noctuidae
Genus :Spodoptera
Species:litura

It is commonly called the cut worm or tobacco caterpillar and it is the type of Moth.

The lipidopteran pest Sondoptera Litura is a serious pest of banana,it has been recorded on several other crops like tobacco, cotton,mulberry.the full grown caterpillar are the most varacious feeders and cause extensive damage by defolication.

Identification- It having greenish brown with dark making, yellow and purplish spot in the sub marginal areas. It having forewing-stout moth with wavy white marking on the brown. Hind wing-white having a brown patch along margin.

Nature of damage

1)Young larvae feed by scrapping the leaves from ventral surface.
2)Later on feed voraciously at night on the foliag.

Fig-*Spondoptera litura*

Fig-*Spondoptera litura* (larva)

Result and Discussion

In the present study 40 to 50 banana pest were collected from selected agriculture field. The pestswere identified later minor pest were sorted out from collection. The minor banana pests are *Spondoptera litura* known as Banana scale moth, *Aapidiotus destructor*, known as Thrips, Bag worm , these are identified minor banana pest.

Many workers reported works on banana pest. Banana rust thrips(*chaetanaphothrips signipennis)* (Bagnall) (Thysanoptera:Thripidae) are present in parts of Australia and central America ,Brazil, Fiji, sri Lanka ,and India and also established in Florida caused severe damage to banana. The banana rust thrips is similar in appearance to two other introduced *Chaetanaphothrips species* the anthurium thrips,*C.orchidii*(Moulton) (Hara *et al.*,2002) and C.leeuweni (karny),which also share the samehosts,including banana, and anthrium .Banana rust thrips can be differentiated from two species by clear differences in body features. Gold(1998) and Umesh *et al*.,(2002) reported banana weevil and other insect such as moth, bag worm. The banana weevil has been identified as the most important insect pest of banana plantain in Africa.

The major pests found in Sri Lanka are banana weevil , stem weevile, banana aphid, banana thrips and fruit fly. However, diseases are more damaging as they reduced yield of banana more than insect pests. The major virus diseases recorded in Sri Lanka are banana tract mosaic virus, banana steak virus and cucumber mosaic virus.

Ariyarantna and Liyanage , (2002) reported that 82% and 59% of the cultivated banana are infected with banana bract mosoic and banana streak virus, respectively.

Plantain and banana cultivation is constrained by problem of pests and diseases.The minor pests namely banana fruit scarring beetle thrips, bag worm were reported from India. Shivayogeshwara et al.,(1991) reported spondoptera litura is becoming gradually an important insect pest crops including banana in India and many other countries.There have been a number of studies on the biological parameters of S.litura on different host plant under different environmental condition,particularly in India.Seasonal incidence of spondoptera litura on banana under South Gujarat conditions was studied by(patel et al.,1987)

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जैव विविधता : एक अमूल्य धरोहर

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*अंतर्राष्ट्रीय प्रकृति संरक्षण संघ (IUCN) एक विश्वस्तरीय संगठन है जो विभिन्न प्रजातियों के संरक्षण, निगरानी और प्रबंधन **का कार्य** करता है। अंतरराष्ट्रीय प्राकृतिक संरक्षण संघ के अनुसार जीवो को विलुप्त, घोर संकट ग्रस्त, संकटग्रस्त, असुरक्षित और संकट मुक्त जीवो की श्रेणी में बांटा गया है। अंतरराष्ट्रीय प्रकृति संरक्षण संघ के द्वारा संकटग्रस्त प्रजातियों को लाल सूची या रेड डाटा बुक के अंतर्गत सूचीबद्ध किया **जाता** है। अंतरराष्ट्रीय प्रकृति संरक्षण संघ के द्वारा लगभग 40,000 से अधिक प्रजातियां घोर संकटग्रस्त जीवो की श्रेणी में दर्ज की गई है। जिसमें 41% उभयचरी जीव, 21% सरीसृप, 26% स्तनधारी जीव, 13% पक्षियों, 33% कोरल रीफ, 34% कोनिफर, 63% साइकेड है।[1] अगर यह जीव पृथ्वी से विलुप्त हो जाते हैं तो परिस्थितिक तंत्र में धीरे-धीरे असंतुलन बढ़ता जाएगा और एक दिन ऐसा आएगा जिससे मानव का अस्तित्व खतरे में पड़ जाएगा।*

1. प्रस्तावना

जैव विविधता प्राकृति के द्वारा, मानव को दी गई रक्षा कवच के समान है। जो लाखो सालो की प्रतीक्षा के बाद बरदान स्वरूप मिला है। जैव विविधता शब्द जीवन एवं विविधता के संजोग से निर्मित है। जिसका शाब्दिक अर्थ है पृथ्वी पर मौजूद जीवो की भिन्न-भिन्न प्रजातियाँ। हमारी थाली में मौजूद संतुलित आहार चावल, रोटी, दाल, सब्जी और फल इत्यादि जैव विविधता के उत्तम उदाहरण है। **(Figure 1).** जैव विविधता से ही हमारे जीवन की आधारभूत आवश्यकताओं की पूर्ति होती है। चावल, दाल रोटी से हमें ऊर्जा की पूर्ति होती है। तो फल व सब्जियों से हमें विटामिन्स और खनिज की प्राप्ति होते हैं। जिससे **हमारी** शारीरिक और मानसिक शक्ति का विकास होता है और रोग प्रतिरोधक क्षमता बढ़ती हैं। इस तरह हम कह सकते हैं कि जैव विविधता से मानव जीवन की आधारभूत आवश्यकताओं की पूर्ति होती है। जरा सोचिए चावल की प्रजाति में अगर बासमती चावल विलुप्त हो जाए तो क्या हमारी आने वाली पीढ़िया सुगंधित पुलाव खा पाएंगे। फलों का राजा आम की लगभग 1000 किस्में भारत में उगाई जाती है।[2] जैसे मालदा, लंगड़ा, फजली, दसहरी, बैगनपल्ली, नीलम, तोतापुरी, चौसा, केसर, अलफोसो, बादामी, आम्रपाली इत्यादि। अगर इनमे से लंगड़ा और दसहरी आम का पृथ्वी से लोप हो गया होता तो हम लंगड़ा और दसहरी आम का स्वाद कभी नही चख पाते।

दुर्भाग्य की बात है कि हम अपनी इच्छाओं की पूर्ति हेतु जैव विविधता के रूप में प्राप्त अपना सुरक्षा कवच तोड़ रहे हैं। उन्नत किस्म की प्रजाति प्राप्त करने की अभिलाषा में हम जंगली (wild) किस्म की प्रजातियों का संरक्षण नहीं कर पाते हैं। जबकि हम यह भूल जाते हैं कि उन्नत किस्म के पौधों का आधार जंगली (wild) किस्म की प्रजातियां ही होती हैं। जंगली (wild) किस्म की प्रजातियों का पैदावार भले ही कम होता, लेकिन उनमे रोग प्रतिरोधक क्षमता ज्यादा होती है। इसीलिए हमे विकास की दौड़ में आगे बढ़ने के लिए, जैविक संसाधनों का संरक्षण करना पड़ेगा, ना कि जैविक संसाधनों का क्षरण। तभी जीवो जीवस्य जीवनम की संकल्पना सार्थक होगी।

Figure 1. **भोजन की थाली में जैवविविधता का समागम**

2. वन एवं वन्य जीवो का विदोहन के प्रभाव

भारतीय परिदृश्य में वन और वन्य जीव का क्षरण का मुख्य कारण मानव आधारित विकास की दुहाई, प्रदूषण, विदेशी प्रजातियों का समागम, **प्राकृतिक आवास** का विच्छेदन, व्यापारिक विदोहन, ठेकेदारों और वन कर्मियों की मिलीभगत आदि प्रमुख है। हमारी 80% सुविधाओं का भरण पोषण वन और वन्य जीव से ही होता है। लेकिन संसाधनों के आवंटन में वन्य और वन्यजीवों को नीची वरीयता दी जाती है जिसके कारण उनके संरक्षण के किए गए उपाय गौड़ सा प्रतीत हो जाते हैं। मध्य प्रदेश का बैतूल जिला सीताबलड़ी 1818 में दुर्गम वन के रूप में जाना जाता था जहां आवागमन के साधन विकसित नहीं थे। 19वीं सदी के बीच में रेल मार्गों का निर्माण शुरू हुआ तो सरकार और ठेकेदारों की मिलीभगत से इमारती लकड़ियों की मांग पूर्ति के लिए साल और सागौन के पेड़ों की अंधाधुन कटाई की गई। जबकि पहला भारतीय वन अधिनियम 1818 में बन चुका था। इसी तरह की स्थिति देश के अन्य भागों में देखने को मिलती है। जंगलों की अंधाधुंध कटाई से बहु प्रजातियां **वनजीव** विलुप्त होते चले गए और उनका स्थान एक प्रजाति वन**जीव** ले लिए। पशुओं की बढ़ती आबादी का दबाव और मानव की आवश्यकता की पूर्ति के लिए एकल प्रजातीय वन, जैविक दबाव नहीं सह सकते हैं। **जिसके फलस्वरूप,** एक ही प्रजाति के गुणों का विकास **होता है, जो** आग, बीमारी, कीड़े, सूखे का मुकाबला करने में सक्षम नहीं होते हैं **जिससे** पारिस्थितिक संतुलन बिगड़ने लगता है। यह बहुत ही दुख के साथ कहना पड़ रहा है कि वन का हमारी राष्ट्र की जीडीपी में अहम योगदान होते हुए भी वन को आय का साधन नहीं माना जाता है।[3]

दूसरी तरफ स्वास्थ्य सेवा, पशु चिकित्सा और कृषि विज्ञान में सुधार होने के कारण पशुओं और मनुष्य की मृत्यु दर में कमी आती गई जिससे जीवितो की संख्या बढ़ने लगी। इनकी खाद्यान्न पूर्ति के लिए वनों को अनियंत्रित ढंग से काटा गया फलस्वरूप वनों को काट के कृषि योग्य भूमि और रहने योग्य मकान बनाए गए। विकास की परियोजनाओं ने, वनों के संरक्षक आदिवासियों को भी प्रभावित किया। (**Figure 2**). संथाल जिन वनों में रहते थे उन वनों के विनाश से झारखंड आंदोलन पैदा हुआ। चिपको आंदोलन **भारत के उत्तराखंड राज्य में ठेकेदारों द्वारा वनों की कटाई के विरोध में हुआ जिसमे लोग पेड़ो से चिपक जाते थे।**[4]

Figure. 2 **वनों का कटाव और वनों के बीच सड़क बना कर प्राकृतिक आवास का विखंडन**

3. **धार्मिक मान्यताओ के** पीछे **जैव विविधता संरक्षण**

धर्म हमेशा से प्रकृत के मूल सिद्धांत और मनुष्य के बीच सामंजस्य बनाए रखता है। हिंदू धर्म की हर मान्यता के पीछे जैवविविधता संरक्षण का संदेश छुपा रहता है। भगवान विष्णु का मत्स्य (मछली), कूर्म (कछुआ), वराह, नरसिंह (आधा आदमी और आधा शेर) और वामन अवतार सभी जीवो का सम्मान करना सिखाता है। हिंदू धर्म के हर त्यौहार में जीव या पादप का संरक्षण के लिए किसी न किसी रूप में पूजा की जाती है। वातावरण को शुद्ध बनाए रखने के लिए नवमी में आंवले के वृक्ष की पूजा, वट सावित्री बरगद की पूजा, शमी वृक्ष की पूजा और पीपल वृक्ष की पूजा की जाती है। चूहा और हाथियों के संरक्षण के लिए भगवान गणेश की पूजा, शेरों को बचाए रखने के लिए मां दुर्गा की **पूजा**, सर्पों के संरक्षण के लिए भगवान शंकर की माला के रूप में प्रतिनिधित्व **होता** हैं। महाग्रंथ रामायण में भगवान रामचंद्र के 14 साल वनवास के समय जामवंत, जटायु, नल नील वानर एवं हनुमान जी, **हिरन, गिलाहरी,** संजीवनी बूटी, कुंभकरण, देव और दानव का उल्लेख जैवविविधता **को प्रदर्शित** करता है। लेखक का मानना यह है कि भगवान राम की सेना में जैवविविधता होने से ही लंका पर विजय प्राप्त हुई क्योंकि आज का आधुनिक विज्ञान भी इस बात को साबित कर चुका है कि जिस परिस्थितिक तंत्र **में** जैव विविधता ज्यादा होती है वह पारिस्थितिक तंत्र ज्यादा स्थिर **और सफल** होता है। भगवान कृष्ण ने गोकुल वासियों से गोवर्धन पर्वत की पूजा करवा कर जैवविविधता को संरक्षित करने का **उपदेश** दिया था। समुंद्र मंथन के उपरांत प्राप्त सभी रत्नों **का** संरक्षण जैवविविधता को संरक्षित **करने** का संदेश **देता है**। बचपन की कहानियों में वन्य देवता **और** वन्य देवी की पूजा की मान्यता के पीछे वनस्पतियों को संरक्षित करने का **ही उद्देश्य होता** है। आज भी हम **ग्रीष्म**ऋतु में पक्षियों के संरक्षण के लिए जगह जगह पर अन्न और जल का प्रबंध करते हैं। मछलियों को दाना देना, चीटियों को आटा खिलाना, गौ पूजा करना पर्यावरण संरक्षण से ही जुड़ा है। बोधिवृक्ष पीपल के नीचे अमृत्व का ज्ञान प्राप्त करने वाले भगवान बुद्ध और महात्मा गांधी ने हिंसा और बलि प्रथा को जघन्य अपराध माना था। ईसाई धर्म में क्रिसमस ट्री और इस्लाम में खजूर का पेड़ को शुभ माना जाता है।[5]

4. **भारत सरकार का जैवविविधता संरक्षण अधिनियम**

भारत सरकार 2002 में **जैव**विविधता संरक्षण अधिनियम **बनाया गया** जिसका मुख्य उद्देश्य स्थानीय समुदायों के साथ उचित और न्याय संगत तरीके से जैविक संसाधनों का संरक्षण एवं प्रबंधन करना है। अधिनियम को लागू करने के लिए भारत सरकार ने 2003 में राष्ट्रीय जैव विविधता प्राधिकरण (एनबीए) स्थापित किया गया **है**। यह एक वैधानिक स्वायत्त निकाय है जिसका मुख्यालय चेन्नई में है। इसके तहत भारत के 29 राज्यों में जैव विविधता बोर्ड (एसबीबी) और स्थानीय निकाय के लिए 31,574 जैविक प्रबंधन समितियों निर्माण किया गया हैं। कोई भी विदेशी व्यक्ति या गैर सरकारी संस्थान, एनबीए की अनुमति के बिना जैविक संसाधनों पर अनुसंधान या बौद्धिक संपदा संरक्षण के लिए आवेदन नहीं कर सकता है। यदि कोई व्यक्ति अधिनियम के प्रावधानों का उल्लंघन करता है, तो उसे एक से पांच साल तक कारावास या दस लाख रुपये तक का जुर्माना या दोनों एक साथ हो

सकता है। इस अधिनियम के तहत जैव विविधता को नुकसान पहुंचाना गैर-जमानती और संज्ञेय अपराध माना गया है।[6] जैवविविधता संरक्षण अधिनियम के अलावा, भारत सरकार ने पर्यावरण और जीवों के संरक्षण हेतु विभिन्न अधिनियम बनाए हैं जो निम्नवत है

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2. भारतीय वन अधिनियम 1927
3. खनन और खनिज विकास विनियमन अधिनियम 1957
4. पशुओं के प्रति क्रूरता की रोकथाम 1960
5. वन्यजीव संरक्षण अधिनियम 1972
6. जल (प्रदूषण की रोकथाम और नियंत्रण) अधिनियम 1974
7. वन संरक्षण अधिनियम 1980
8. वायु (प्रदूषण की रोकथाम और नियंत्रण) अधिनियम 1981
9. पर्यावरण संरक्षण अधिनियम 1986
10. जैविक विविधता अधिनियम 2002
11. अनुसूचित जनजाति और अन्य पारंपरिक वनवासी (अधिकारों की मान्यता) अधिनियम 2006

5. निष्कर्ष

धरती पर मौजूद जल, जंगल, जमीन के संरक्षण से ही मानव का अस्तित्व की कल्पना कर सकते है। मानव को मानवता तभी प्रदर्शित होगी जब मानव जैविक सम्पदा को प्रदूषित और क्षीण होने से बचायेगा क्योकि जल, जंगल, जमीन पर सभी जीवो का अधिकार है। **संरक्षण अधिनियम** और धार्मिक मान्यताये से **जीवो जीवस्य जीवनम** की संकल्पना को संबल मिलता है। मानव का यह उत्तरदायितव है कि जो जैविक सम्पदा को अपने पूर्वजो से प्राप्त कर उपयोग किया है उसे उसी मूल रूप में अपनी संतति हो हस्तांतरित करे।

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Co-relation of BMI with Nutritional Status Observed in Tribal People of Chikhaldara Region (Melghat)

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Abstract

The present cross-sectional study was undertaken among the tribal people of Chikhaldara region (Melghat) Dist. Amravati. This study used to investigate body mass Index (BMI) among male and female tribes of Chikhaldara region. Total 254 males and 288 females were taken for examination commonly used indicators. i.e. weight (wt), height (ht) and body mass index (BMI) were used to evaluate nutritional status. Results also reveal that prevalence of under nutrition among these peoples of both sexes. Tribal people are mostly illiterate and malnourished.
Key words – Body Mass Index (BMI), nutritional status, Tribes, Chikhaldara, India

Women and preschool children are known to be most vulnerable group for under nutrition, adolescents girls are also being recognized as a potential group during which the nutrient requirements are relatively high under nutrition during adolescence, confounded by childhood marriages, leads to higher mortality and morbidity among women and young children. (Studied carried out by National Nutritional monitoring Bureau. (2003)
World Health Organization (1995) has recommended that anthropometry could be used to assess the nutritional and health status of adults. One such measure now in widespread use in Quetel index which is weight (in kg) divided by height in (m^2). Several scholars have emphasized the importance of body mass index as an nutritional assessment (Gupta et al (1979, (Yadav et al (2011) observed that tribal preschool children of Gond community had low Hb% with low BMI due to certain adverse realities like insufficient food intake, adverse cultural practice, micronutrientdeficiency disorders such as anaemia.

It is established fact that body mass index (BMI) is a useful anthropometric indicator of measuring nutritional status of the population (FAO, 1996) and is specifically suitable for large scale surveys (Ulijaszek and Kern 1999, WHO 1995).

The prevalence of chronic energy deficiency (CED) measured through BMI (James et al (1988) Ferro-Luzzi et al (1992), can be used in the standard of living between population groups Nube et al (1998). The appropriateness of using BMI less than 18.5 kg/ m^2 as under nutrition are validated by many authors to predict poor demographic economic, social and environmental conditions of the population (Pryer and Rogers, 2006), Subramanian and Smith (2006) under nutrition reduces physical capacity James (1994) increases mortality (Harris T.B. 1995), morbidity (khongsdier (2002).
In India, the most underprivileged group is the tribal communities both in terms of socioeconomic condition as well as nutritional status (Basu 1994). Several studies shows these reflection as high under nutrition among tribals across India (Adak et al 2006)

Material and Method :

A cross sectional study was performed to evaluate BMI and nutritional status of tribal people of Chikhaldara region Dist. Amravati.

Hight and weight were measured weight was calculated by weigning balance and height by stadiometer. The nutritional status and background information was collected from each individual through questionnaire as well as tribal community informed consent was obtained for carrying out survey. The age groups were distributed into 0-20, 21-40, 41-60 and 61 respectively.

The BMI was computed using the following standard equation.BMI = Weight (kg)/height (m^2).
Nutritional status was evaluated following BMI cut off points to define trimness. The age and sex specific cut-off values were established based oninternational survey.

This classification categories the prevalence of under nutrition according to percentage of population with BMI under 18.5 low, medium and very high critical situation (WHO 1995).

Result and Observation :

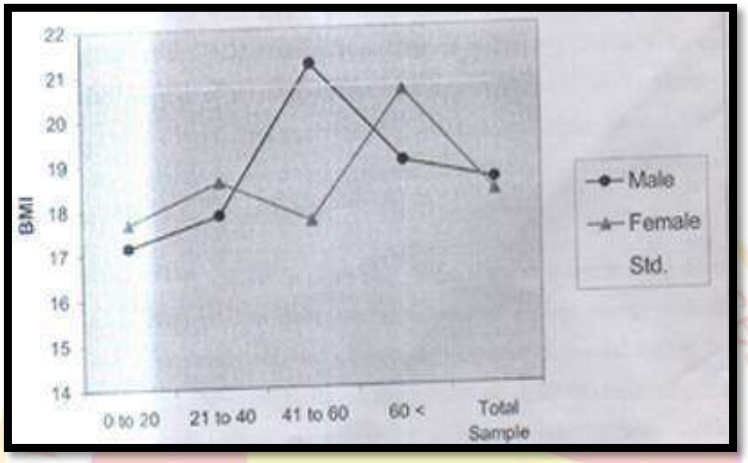
Table 1 BMI observed in male and female tribes of Chikhaldara (Melghatregion)

Age Group		Df	Pm	M	SD	SE	T
0 to 20	Male	54	20.7	17.15	4.596	0.62	**5.74****
	Female	85	20.7	17.68	4.438	0.48	**6.31****
21 to 40	Male	108	20.7	17.86	2.472	0.24	**11.99****
	Female	140	20.7	18.59	2.925	0.25	**8.58****

41 to 60	Male	51	20.7	21.20	3.718	0.52	**0.98**
	Female	45	20.7	17.71	5.074	0.75	**3.99****
61	Male	38	20.7	19.00	4.593	0.74	**2.31***
	Female	15	20.7	20.58	4.407	1.10	**0.11**
Total Sample	Male	254	20.7	18.56	3.889	0.24	**8.77****
	Female	**288**	**20.7**	**18.29**	**3.937**	**0.23**	**10.41****

(*-Significant at 0.05; **-Significant at 0.05 & 0.01 level of significance)

(Critical values for 15 df; $t_{0.05}$ = 1.7530, $t_{0.01}$ = 2.6025, for 38 df; $t_{0.05}$ = 1.6859, $t_{0.01}$ = 2.4286, for 45 df; $t_{0.05}$ = 1.6794, $t_{0.01}$ =2.4121, for 51 df; $t_{0.05}$ = 1.6753, $t_{0.01}$ = 2.4017, for 54 df; $t_{0.05}$ = 1.6736, $t_{0.01}$ = 2.3974, for 85 df; $t_{0.05}$ = 1.6630, $t_{0.01}$ = 2.3710, for 108 df; $t_{0.05}$ = 1.6591, $t_{0.01}$ = 2.3614, for 140 df; $t_{0.05}$ = 1.6558, $t_{0.01}$ = 2.3533, for 254 & 288 df; $t_{0.05}$ = 1.285, $t_{0.01}$ = 1.967)



Result & Discussion : Co relation of BMI with nutritional status observed inTribal Males and Females

The above table-1 reveal that the calculated T values between standard range mean and Obtained BMI mean for various groups i.e. 0-20, 21-40, 41-60, 5.74, 11.99, 0.98, 2.31 and 8.77 respectively, for male. All these values are greater than critical values of 't' at 0.05 and 0.01 level of significance. Hence there is a significant difference in BMI and standard range of male except for age group 41-60. From the table it is also observed that in all the groups BMI range is within 17 to 19, which is quite less than the standard range mean value for men 2C.8 except for age group 41-60 i.e. 20.3 which is above average.

For different groups of female i.e. 0-20, 21-40, 41-60, above 60 and total sample the calculated Y values are 6.31, 8.58, 3.99, 0.11 and 10.41 respectively. All these values are greater than critical values of 't' at 0.05 and 0.01 level of significance except for age group 61 which is non-significant. Hence there is a significant difference in BMI and standard range mean of female. From the table it is also observed that in all the groups BMI range is within! 7.8 to 18.8, which is quite smaller than the standard range mean value for female 20.8 except for age group of 61 i.e. 20.8 which is required value of BMI for females.

Hence from the table and graph it is concluded that, the BMI in both male and female tries of Chikhaldara region is below the standard range mean.

Discussion:

Malnutrition was wide spread phenomenon in tribal area Carlson and Waterlaw (1991) have studied the child malnutrition problem at global, regional as wells country level. (Khandare, et al 2008) studies on tribals of Thane district of Maharashtra, India. The result revealed that majority of population belonging to schedule tribe community were malnourished. Socio-economic factors have been contributory to malnutrition.

Meghadas (2010) studied on nutritional status of Korku tribes in Betul district of Madhya Pradesh observed that there was prevalence of protein energy malnutrition anemia, because Korku tribes obtained mean intake of nutrients. Several studies Sonwal CJ. (2010), Dhore and Joshi (1988), Rajesh Sing, Preeti Singh (2008) reported that tribal children suffered from highest percentage of severe malnutrition with inadequate nutrition.

Sing Bhupinder (1994), Nagdda B.L. (2004), examine and assess the tribal health situation which is related to their economic pursuit, nutritional availability medicines etc. Nutritional anemia is major problem for women in India and so morein rural and tribal belt.

International center for research on women (ICRW) studies sting was highly prevalent in adolescent boys and girls, ranging . In contrast the rate of low body mass indices indicative of current under nutrition under nutrition in early childhood may diminish a person's even tautly body size malnourished children are typically shorter and lighter than their well nourished peers at the end of adolescent growth, s Cameron (1996). Several studies from India (yadav et al (1999), Gogoi and Sengupta(2002) have utilized BMI to study nutritional status of tribal populations. The basic causes of under nutrition in developing countries are poverty, poor hygienic conditions and little access to preventive and health care Mitra(1985), WHO(1990,1995).

Conclusion:

Therefore BMI has strong association with nutritional status in present study low level of BMI and under nutrition was observed which may be responsible for life threating diseases, higher ratio of maternal mortility. Also poverty illiteracy, very less facilities for health, blind beiefs, socio, economic status was affecting each and every as part of tribal people of Chikhaldara region.

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Comparative Preliminary Phytochemical Analysis Of *Capparis Decidua (Forsk.)* And *Capparis Zeylanica Linn.*

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Abstract
The present study was aimed to evaluate the phytoconstituents of the leaf extracts of Capparis decidua Forsk. and Capparis zeylanica Linn. plants of an ethno-botanical importance belonging to the family Cappariceae using ethanolic extracts. The result reveals the presence of bioactive compounds (phytoconstituents) such as anthraquinones, terpenoids, flavonoids, saponins, tannins, alkaloids, and cardiac glycosides. Both the Capparis species have an ethno-medicinal importance such as being anti-inflammatory, analgesic, antioxidant, antipyretic and antimicrobial properties. The results showed the dominantly presence of alkaloids, flavonoids, phenols and saponins in both plants. So, further research is necessary to isolate and determine the identity of the bioactive compounds present in this plants species.
KEYWORDS: *Phytochemistry, Capparis spp. and Medicinal uses.*

Introduction
According to the World Health Organization (WHO), more than 80% of the world's population relies on traditional medicines for their primary health care needs (Trivedi, 2006). These chemical elements of plants can be therapeutically active or inactive and are referred to as phytochemicals or secondary metabolites. Alkaloids, phenolic glycosides, flavonoids, steroids, terpenoids, amino acids, and glycopeptides are some of the phytochemicals found in vegetables, fruits, flowers, leaves, stems, bark, and roots that work with and protect against diseases more effectively (Rangari, 2006). Many species of Capparaceae are used as ethno-medicinal purposes (Bokhad *et. al*., 2013). So, here we select two species of *Capparis* for phytochemical analysis.

The genus *Capparis* comprises 250 species, including shrubs, trees, and woody climbers. *Capparis zeylanica* Linn. (Capparaceae) is a many-branched, thorny, sub-scandent climbing shrub. Plants are 2-3 m in height, armed with 3-6 mm long recurved thorns, branched, leaves are elliptic or broadly lanceolate, base rounded, apex mucronate; flowers are profuse, pinkish-white, later turning pink, berries are globular or ellipsoid, 3-4 cm in diameter, and seeds are globose, embedded in the white pulp. It is medicinally used for snake bites, to cure swelling of testicles, smallpox, boils, cholera, colic, hemiplegia, neuralgia, sores, etc (Chopra *et. al*., 1956; Joshi, 1997 and Satyanarayan *et. al*., 2008). Whereas, *Capparis decidua* (Forsk.) plant height 5 m high, or occasionally a small, branched, Leaves are very minute 2 mm long. Flowers are pink in color and red-veined, in small groups along with the leafless shoots, in the axils of the spines. Fruits are small, many-seeded, ovoid or sub-globulous (Padhan *et. al*., 2010). It shows some medicinal properties like hypercholesterolemic, anti-inflammatory, analgesic, antidiabetic, antimicrobial, antihypertensive, antihelmintic, and purgative activities (Deshmukh *et. al*., 2010 and Bokhad *et. al*., 2013).
Due to these medicinal properties, it is necessary to investigate and compare phytochemical analysis of these plants.

Materials And Methods
A] Identification and Collection:
Frequent field visit were conducted in nearby forest area of Yavatmal and Wardha District (Maharashtra) for the collection of plant materials. The Collected plant specimens were identified using available standard floras (Ugemuge, 1986; Karthikeyan & Kumar, 1993; Naik, 1998 and Singh & Karthikeyan, 2000).

B] Extraction Methods:
The collected plant leaves were dried and made into powder for further analysis. The powder was then subjected to soxhlet extraction with different solvents (petroleum ether, benzene, acetone, chloroform, ethanol and water) according to their increasing polarity. Only ethanolic extract of the plants under study were analysed for the presence of different phytochemical constituents (Kokate *et al*., 2005).

C] Qualitative Phytochemical Analysis:
It involves testing of different classes of compounds. The methods used for detection of various phytochemicals were followed by qualitative chemical test to give general idea regarding the nature of constituents present in crude drug (Wallis, 1990; Harborne, 1998; Kokate, 2005 and Sadashivan & Manickam, 2005). The extracts were analyzed for the presence of phytoconstituents like carbohydrates, alkaloids, anthraquinone, cardenolides, flavonoids, phenolics, steroids, terpenoids and saponin.

Observations

Table-1: Comparative phytochemical study of ethanolic extract of *Capparis spp.* (Leaves)

S.N	Compound / test	*C. decidua*	*C. zeylanica*
1	Alkaloids	+	+
2	Anthraquinone	_	+
3	Cardenolides	_	+
4	Flavonoids	+	+
5	Phenolics	+	+
6	Saponins	+	+
7	Steroids	_	_
8	Carbohydrates	+	_
9	Terpenoids	_	_

Results And Discussion

In the present investigation, there are dominantly presence of alkaloids, flavonoids, phenols and saponins in both plants which having the major applications in medical and pharmaceutical sciences (Kakpure & Rothe, 2012). The ethanolic extract of ***C. zeylanica*** shows dominantly the presence of alkaloids, anthraquinone, cardenolides, flavonoids, phenolic compounds and saponins. Whereas, steroids, carbohydrates and terpenoids were absent. However, ***C. decidua*** shows the the presence of alkaloids, flavonoids, phenolic compounds, carbohydrates and saponins. (Table-1). These types of studies have a vital role because of their commercial uses and research interests. Further research is necessary to isolate and determine the identity of these bioactive compounds for its quality control.

Conclusions

This research work has revealed further potentials of these selected *Capparis* spp. in the area of pharmacology as potential source of useful drugs. This study therefore has provided some biochemical basis for ethno-pharmacological uses of these plants in the treatment and prevention of various ailments. The qualitative phytochemical screening shows that, the leaves of the *C. decidua* and *C. zeylanica* are rich in alkaloids, flavonoids, phenols and saponins which are popular phytochemical constituents.

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Avifaunal Diversity With Relation To Ecology Around Borgaon Dam, India

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Abstract:
This study was carried out around Borgaon Dam in Pandharakawada forest Division of Maharashtra state from June 2020-April 2021. The present study was made to find out the avian diversity with reference to ecology. We estimate the avian fauna in terms of species richness and diversity of Borgaon aquatic habitat. Total 71 birds belonging to 21 families were observed of which 38 was resident, 14 were local migrant and 19 were migrant. The favorable ecological conditions like availability of food, wetland and roosting places were attracting the various birds. There is need to retain a proportion of natural habitat of aquatic ecosystem as to conserve the biodiversity.
Keyword: *Avian diversity, birds, Borgaon*

Introduction:

India has a numerous diversity of plants and animals both domesticated as well as wild in variety of habitats and ecosystems. Biodiversity has central importance in the study of ecology. It is likely to play an important role for ecosystem functioning (Loreau et al., 2001). The change in number of assemblage of species affects the nature of habitat. Recent global changes are likely to have strong negative impacts on biodiversity of terrestrial ecosystem (Sala et al., 2000). Today a greatest threat to wildlife is loss of habitat which is widely recognized by ecologists. Most are primarily endangered by habitat loss and degradation (Sodhi and Smith, 2007). Among all the fauna, birds are use as bio-indicators. The bird species are adapted to a specific plant species, community and use to describe the vegetation condition, consequently the ecosystem situation (Jansen & Roberstrom, 2001). The bird populations are usually limited by limiting factors including food supplies, nest and refuge site, competitors, natural enemies and weather (Andrewartha & Birch, 1984, Begon et.al 2006; Brambilla et al: 2010). There are growing evidences that climate change will become one of the major diverse of species extinctions in the 21 st century. Numbers of published studies have documented a variety of changes attributable to climatic change (1PCC, 2007).

To stop the threats to biodiversity and mass extinction, meaningful information that could contribute to conservation planning and management is needed to maintain or improve the structure of aquatic ecosystem. So we selected aquatic ecosystem which is first ever scientific attempt to study avian diversity with aspect to ecology.

Material and Methods:

Study Site:

The study was carried out around Borgaon dam in Pandharkawada forest division which is situated of Yavatmal district of state Maharashtra adjoing the Adilabad distict of state Telangana Pradesh.

Materials used for study:

For each census, a map and aerial photographs was use to identify sites. So that camera Nikon was used of 45x zoom and 12.6 megapixels. A Tape recorder was also utilized during each survey to record the particular calls, which were later analyzed and used to identify the species. For watching, counting and identifying birds, Binocular (10x50), Telescope (25-40x), Notebook, Pen, pencil, Compass, Observation sheet, metal or wooden stakes, Handheld GPS was used.

Bird Survey:

The bird survey was conducted according to a standard point count method (Reynolds et al., 1980; Bibby et al., 2000).We involved visual and voice hearing methods for bird identification within fixed or variable radius plots (Blondel et al., 1970; Hutto et al., 1986). The data collected from the surveys was used to estimate populations of birds, density, diversity and relative abundance or richness of bird species in different habitats. The bird surveys were carried out from June 2018 to April 2019 for 1 year. We used a 25-m/50-m fixed-radius point count method to census the avifauna at each count station (Hutto et al. 1986). Surveys were conducted four days in a week, either from sunrise to 4 hours after sunrise or from 4 hours before sunset until sunset depending on weather conditions. Each count was conducted for 10 minutes, which was further divided into 3 minutes, 2 minutes and 5 minutes respectively.

Identification, Classification and Data analysis:

For identification and field diagnosis of birds, colored plates of All and Ripley (1983), Ali (1996). Grimrnett et al.,(1998) were used. Classification of birds was made in accordance with lnskipp et.al (1996). We

followed Whittaker (1976) to measure diversity of birds as alpha, beta and gamma diversity. All the diversity of birds was analyzed using biodiversity analysis online software alyoung.

Observation and Result:

The basic factor to be studied in this on avifauna distribution with aspect to ecology is climate, topography and vegetation. Thus Geology, climate, soil and vegetation types with altitude, latitude and surface topography of particular sites were studied.

Finding of birds:

Total 71 birds belonging to 21 families was observed of which 38 was resident, 14 were local migrant and 19 were migrant with family corvidae comprising more bird species following Passeridae and accipitridae.

Diversity of Bird Community:

The species richness Index i.e. Menhinick index (RI) of forest was 1.06 and Margalef richness index (R2) was 15.71. The overall Shannon-Weiner index was found 4.R7 while the Dominance index was 0.017. The two different Evenness measures were calculate namely Shannon evenness (El) and Sheldon evenness (E2) to measure the evenness of species-abundance which is complimentary to the diversity index concept. The Shannon Evenness (El) was found 2.21 and Sheldon Evenness (E2) was 0.083. The Similarity Indices were also calculated between the different habitats of the sanctuary namely Jaccard Index and Sorenson's index which was found 0.03 and 0.06 respectively. The abundances of bird were found higher in July 2020-June as compared to July 2021. The higher diversity of birds (H′) was found (4.87) in first year than in second year (4.45). The Simpson index was found 0.029 and 0.022.

Discussion And Conclusion:

In present study, Bird communities vary among forest types and functional groups. Different vegetation types as well as abundant food resources might be played a greater role in difference in habitat preference by bird species. The rich and high vegetation might be providing heterogeneous and suitable site of nesting, roosting and foraging of bird. Similar finding reported regarding vegetation diversity and richness of wetlands on the bird population richness. Water birds like. Lesser whistling teal, Little cormorant, bite-breasted kingfisher, Black-winged Stilt, Red-wattled Lapwing. Cattle egret and Indian pond-heron were the common species inhabiting the water bodies, while Purple Heron (Ardea purpurea) were rarely sighted. The passage migrant Rosy starling (Sturnus roseus) was found everywhere before and after the winter season. The birds like Demoiselle crane, common crane and Barr headed groose which are generally seen at wetlands were not found or recorded. An important reason for high bird diversity may be the existence of a varied topography coupled with a mosaic of forest types including scrub forest, tall riparian forest hilltop forest and dry deciduous forest. Conversion of the native vegetation-scrub jungle and grasslands to monoculture plantations is detrimental to bird diversity. There is need to conserve the avifauna' bio-diversity of this area by protecting its habit conditions especially, the water bodies, riparian areas, edges and streams. Also there is need to generate awareness about the conservation value and ecological role of avifauna and maintainace of natural habitat conditions and ecological balance of forest. Conservation awareness programmes among the local peoples is required to conserve it for future generations.

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Traditional knowledge of wild edible plants used in the Yavatmal District, Maharashtra State, India.

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Abstract

Use of wild plants as a food source is an integral part of the culture of indigenous people that dwell in the remote forest areas. These people consume wild edible plants as food source and depend on these resources to meet their food needs particularly in periods of food crisis. The wild edible plants are also used as supplements to the cultivated crops and as famine foods.

The diversity in wild species in the district offers variety in edible plants and contributes to household food assurance. The present ethnobotanical explorations conducted in forest areas of Yavatmal resulted in the information on about traditional plant uses of53plants species belonging to 35 Angiospermic families. Moraceae recorded highest number of species (5 species) followed by Amaranthaceae, Caesalpiniaceae, Euphorbiaceae and Cucurbitaceae are (3 species). Information gathered from Yavatmal district indicates that the tribal's and other village people of this region possess good knowledge of wild edibles but their continuous and progressive exposure to modernization may result in extinction of the such rich heritage of knowledge in the course of time. Majority of edible parts are from fruits (29 species), leaves (14 species), seeds (6 species), Flower (2 species) and some are of underground parts like rhizome, tuber, etc.

Key words:*Traditional Uses, Wild edible plants, Yavatmal.*

Introduction

District Yavatmal is situated in the eastern part of the Maharashtra between north latitudes 19º23` and 20º48`and longitudes 77º 19` and 79º 07` It occupies an area of 13,582 Sq. Km with forest cover of 2956 sq. Km. Average rain fall is 1089.7 mm. The district is inhabited by several tribes. These are Andh, Banjara, Bahurupi, Bhil, Chitrakathi, Gond, Gopal, Kolam, Kolhati, Rajgond, Pardhan, Panchal, Tambatkar and Wadar. Kolam tribe is on the verge of extinction; in 2001 the population was only 900. Population of Bhil is also decreasing

Forest Dwellers:

Wild plants even after the availability of variety of food crops constituted an important part of the human diet particularly in remote forest dwellers. Recent regional studies, from the different parts of country[1,2,4,5,6,8,9,10,12,13,14,15,16,17] have shown that the several wild plants have nutritive potential and are being used all over. Now a day's people are giving more attention to wild food plants as the present day food crops are not meeting the need of complete required nutrients.This work is an attempt to provide a data on food plants collected from Yavatmal district.

Methodology

Ethnobotanical studies in Yavatmal with respect to wild food plants were carried out during 2019 to 2021. Different parts of the district were frequently visited, and information on indigenous knowledge about food plants was gathered from knowledgeable people in the district. Data was collected using semi-structured questionnaire and group discussions based on the standard procedures [7]. Detailed information regarding the part eaten and various preparation made was noted. Plants were identified using relevant scientific literature [3,11] Following table gives the detailed information such as, plant name, family name which followed by local name and uses.

Sr. No	Botanical Name / Family	Local Name	Use
1.	*Aegal marmelos* (L.) Corr. (Rutaceae)	Bel	Ripe fruit pulp is eaten. 'Sharbat' is made by fruit pulp during summer.
2.	*Aerva lanata* (L.) Juss. (Amaranthaceae)	Tandula	Curry is made by leaves.
3.	*Alangium salvifolium* (L.f.)Wang.(Alangiaceae)	Ankol	Ripe fruits are eaten.
4.	*Alternanthera sessilis* (L.)R. Br. (Amaranthaceae)	Chibuk Kata	Curry is made by tender stem and leaves.

5.	*Amaranthus spinosus* L. (Amaranthaceae)	Kat e – math	Curry is made by tender leaves.
6.	*Basella alba* L. (Basellaceae)	Mayalu	Curry is made by leaves and 'Pakodi' made by leaves.
7.	*Boerhavia diffusa* (L.)Hook. (Nyctaginaceae)	Punarnawa	Curry is made by leaves.
8.	*Buchanania lanzan* Spreng. (Anacardiaceae)	Charoli	Ripe fruit pulp eaten. Seeds are used in sweet dishes made by using milk.
9.	*Canavalia ensiformis* (L.)DC. (Fabaceae)	Abai	Curry is made by fruits.
10.	*Canthium parviflorum* Lam. (Rubiaceae)	Karbit	Ripe fruits are eaten.
11.	*Capparis zeylanica* L. (Capparaceae)	Waghati	Curry is made by unripe fruits.
12.	*Cassia fistula* L. (Caesalpiniaceae)	Bahava	Curry is made by flowers.
13.	*Cassia occidentalis* L. (Caesalpiniaceae)	Tarwad	'Chutney' is made by tender leaves.
14.	*Cassia sophera* L. (Caesalpiniaceae)	Jangali takla	'Chutney' is made by leaves.
15.	*Chlorophytum tuberosum* (Roxb.) Baker (Liliaceae)	Safed Musli	Tubers are eaten.
16.	*Coccinia grandis* (L.)Voigt. (Cucurbitaceae)	Tondli	Curry is made by unripe fruits.
17.	*Colocasia esculenta* Schott. (Araceae)	Chamkura	Curry is made by leaves and 'Pakodi' made by leaves.
18.	Commelina benghalensis L. (Commelinaceae)	Kena	'Pakodi' made by leaves.
19.	*Cordia dichotoma* Forst. f. (Boraginaceae.)	Bhokar	Ripe fruits are eaten.
20.	*Dioscorea bulbifera* L. (Dioscoreaceae)	Dukkar Kand	Tubers are boiled and eaten, curry is prepared from bulbils.
21.	*Diospyros melanoxylon* Roxb. (Ebenaceae)	Tembhurni	Ripe fruit pulp is eaten.
22.	*Embli ca officinalis* Gaertn. (Euphorbiaceae)	Awala	Fruits are eaten. 'Chutney' is made by fruit s. Murrabba Prepared from fruits.
23.	*Euphorbia heterophylla* L. (Euphorbiaceae)	Nivdung	Curry is made by tender leaves.
24.	*Ficus bengalensis* L. (Moraceae)	Wad	Ripe fruits are eaten.
25.	*Ficus carica* L. (Moraceae)	Anjeer	Ripe fruits are eaten.
26.	*Ficus hispida* L. f. (Moraceae)	Umber	Ripe fruits are eaten.
27.	*Ficus racemosa* L. (Moraceae)	Umber	Ripe fruits are eaten.
28.	*Grewia hirsuta* Vahl. (Tiliaceae)	Dhaman	Ripe fruits are eaten.
29.	*Hygrophila auriculata* (K. Schum.)Heine. (Acanthaceae)	Talim Khana	Curry is made by tender leaves.
30.	*Lablab purpureus* (L.) Sweet.(Fabaceae)	Waal Pawta	Curry is made by pods.
31.	*Leucas aspera* (Willd.) Link. (Lamiaceae)	Gumma	Curry is made by leaves.
32.	*Limonia acidissima* L. (Rutaceae)	Kauth	Ripe fruits are eaten, 'Chutney' is prepared from fruits.
33.	*Madhuca longifolia* (Koen.) Mac Bride. Ver: *latifolia* (Roxb.) Chev. (Sapotaceae)	Moha	Flowers are eaten.
34.	*Merremia gangetica* (L.)Cufod. (Convolvulaceae)	Undirkani	Curry made by leaves.

35.	*Momordica dioica* Roxb. Ex Willd. (Cucurbitaceae)	Kartoli	Curry is made by unripe fruits.
36.	*Morus alba* L.(Moraceae)	Tuti	Ripe fruits are eaten.
37.	*Mukia maderaspatana* (L.) Roem. (Cucurbitaceae)	Bilavi	Unripe fruits are eaten.
38.	*Nelumbo nucifera* Gaertn. (Nelumbonaceae)	Kamal	Tubers are boiled and eaten, curry is also prepared from tubers.
39.	*Olax psittacorum (*Willd.)Vahl. (Olacaceae)	Harduly	Ripe fruits are eaten.
40.	*Opuntia stricta* (How.)How. (Cactaceae)	Phadya Nivdung	Ripe fruits are eaten.
41.	*Emblica officinalis* Gaertn. (Euphorbiaceae)	Awala	Fruits are eaten. 'Chutney' is made by fruits.
42.	*Pithecellobium dulce* (Roxb.) Benth. (Mimosaceae)	Wilayati Chinch	Seed kernels are eaten.
43.	*Semecarpus anacardium* L.f. (Anacardiaceae)	Bibha	Ripe fruits hypocarp and seed s are eaten.
44.	*Solanum nigram* L. (Solanaceae)	Kangani	Ripe fruits are eaten.
45.	*Solanum virginianum* L. (Solanaceae)	Kateringani	Curry is made by unripe fruits.
46.	*Sterculia urens* Roxb. (Sterculiaceae)	Kandol	Fruits are roasted and seeds are eaten.
47.	*Strychnos potatorum* L.f. (Loganiaceae)	Nirmali	Fruits and seeds are eaten.
48.	*Synantherias sylvatica* Schott.(Araceae)	Jangli suran	Curry is made by tuber.
49.	*Syzygium cumini* (L.)Skeels. (Myrtaceae)	Jambhul	Ripe fruits are eaten.
50.	*Terminalia bellirica* (Gaerth.)Roxb. (Combretaceae)	Behada	Seed cotyledons are eaten by Children.
51.	*Trianthema portulacastrum* L.(Aizoaceae)	Wasu	Curry is made by leaves.
52.	*Ziziphus mauritiana* Lam. (Rhamnaceae)	Bor	Ripe fruits are eaten. Fruits are also used to made chutney.
53.	*Ziziphus oenoplia* (L.) Mill. (Rhamnaceae)	Burgi	Ripe fruits are eaten.

Results and discussions:-

As there is increase in demand of food materials, such as, cereals, pulses and vegetables, etc. since several decades emphasis was given increase the yield by using different chemical fertilizers and pesticides. This resulted in the common occurrence of pesticide and chemical residues in food plants. Same time, no attention was given to keep the optimum level of micro and macro nutrient in the plants, which is a requirement of healthy food.

After realization of all these facts the people from developed and developing countries have been choosing the wild edible which may fulfill their requirements, of nutritive foods.

Since the ages the human societies residing in remote areas are using several wild plants for edible purposes. Information gathered from Yavatmal reveals that a treasurer of edible plants remains untouched in these areas.

A total of 53plant species belonging to 35 families were recorded after conducting survey Moraceae recorded highest number of species (5 species) followed by Amaranthaceae, Caesalpiniaceae, Euphorbiaceae and Cucurbitaceae are (3 species).

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Phytochemical Analysis of *Cassia Grandis*

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Abstract:

Plants are recognized in the pharmaceutical industry for their broad structural diversity as wellas their wide range of pharmacological activities. The plant Cassia Grandis is a widely cultivated ornamental plant . The trees is also known as pink showerCaro and stinking toe. It is a plantae- plant belonging to the order- Fabales, family – Fabaceae-Pea, and genus – Cassia L.Cassia. The phytochemical study on the leaf extract of Cassia Grandis is done. Fresh leaves were collected, shade dried, and a crude extract was prepared using soxhlet extraction method and the preliminary phytochemical analysis on the leaf extracts of Cassia grandis were conducted. The solvents used for extraction namely Aqueous, Ethanol and chloroform is chosen based on their increasing polarity. The extractive value is highest with Aqueous. Phytochemical studies revealed the presence of phytochemicals such as carbohydrates, phenols, flavonoids, steroids, saponins, alkaloids, tannins, and cardiac glycosides,Terpenoids.

Keywords:*Phytochemical analysis, Soxhlet extraction, Extraction solvents, Cassia Grandis leaf.*

Introduction

Herbalism is a type of traditional medicine that uses plants and plant extracts to treat ailments. There is a legal duty to maintain track of all traditional medicine research on paper. As a result of this disadvantage, it's vital to verify that the plant and its components that will be employed as medication are uniform.The objective of this work was to evaluate the phytochemical constitution of the Herbal plantcassia gradis.To collect the leaves of the plant and extraction is carried out different solutions like Water, ethanol and chloroform by soxhlet extractio method.To analyse the overall phyto chemicals Present in this plant leaves.

Materials And Methods

Sample Collection

The leaves were collected from near the garden.The leaves were sundried and then finely powdered. The powered leaves were stored in an air tight container for future use.

Pytochemistry

Plant Extraction

The collected materials (leaves) were chopped into small pieces separately, shade-dried, and coarsely powdered using mortar and pestle. 5 grams of of powdered leaves were added into 100 ml of the following extracts like aqueous, chloroform and ethanol. After adding them, they were boiled for few minutes, filtered in whattman filter paper & then stored in a reagent bottle for future use.

Detection of Phytochemicals :

All the extracts were subjected to preliminary phyto chemical tests followed by the methods of Harborneand Evans (2006).

TestforAlkaloids:

Wagner's test: Extract were treated with 3-5 drops of wagner's reagent. (Wanger's reagent – 1.27 g of iodine with 2 g of potassium idodide in 100 ml water. The Formationofbrown/reddishPrecipitateindicates thepresenceof alkaloids

Test for Carbohydrates:

Fehling test : Filtrates were hydrolyzed with diluted HCL, neutralized with Alkali and heated with fehling A & B solution. Formation of red precipitate indicates the presence of reducing sugars.

Test for Cardiac Glycosides:

The extract is treated with glacial acetic acid and also adding few drops of ferric chloride solution underplayed with 1 ml of concentrated sulpuric acid.The brown ring at the interphase indicates the presence of dexoy sugar characteristics.

Test for Flavonoids:

Alkaline Reagent test :Extracts were treated with few drops of 10% sodium hydroxide solution. Formation of intense yellow color which becomes colorless on addition of dilute acid indicates the presence of flavonoids

Test for Phenols:
Ferric chloride test: Extracts were treated with 3-4 drops of 1% of ferric chloride solution. Formation of bluish black color indicates the presence of phenols.

Test for phlobatannins :
The extract is boiled with 1 % of hydrochloric acid. The formation of blue- purple colour indicates the presence of phlobatannins.

Test for Saponins:
Foam test: 0.5 g of extract was shaken with 2ml of water. If foam produced persists for 10 minutes , it indicates the presence of saponins.

Test for Sterols and Triterpenoids:
The extract is treated with few drops of chloroform, acetic anhydride and concentrated sulphuric acid. The formation of reddish pink colour immediately indicates the presence of sterols and triterpenoids.

Test for Tannins:
Gelatin test :To the extract , 1% gelatin solution containing sodium chloride solution was added. Formation of white precipitate indicates the presence of tannins.

Test for quinones:
The extract is treated with concentrated hydrochloric acid, The formation of yellow precipitate indicates the presence of quinones.

Test for oxalates :
The extract is treated with glacial acetic acid. The formation of greenish black colour indicates the presence of oxalates.

Test for Treterpenoids :
Sankowski's test : The extract is treated with 1 ml of chloroform and concentratedSulphuric acid.The formation of reddish brown precipitate indicates the presence of treterpenoids.

Extraction Results :

Extract	Colour under visible light	Colour under UV light	Texture
Water + Powdered leaves	Mustard Yellow	Light gray	Dry, Shiny appearance
Ethanol + Powdered leaves	Peacock Green	Dark Pink	Completely Dry
Chloroform + Powdered leaves.	Brown	Dark Pink	Sticky

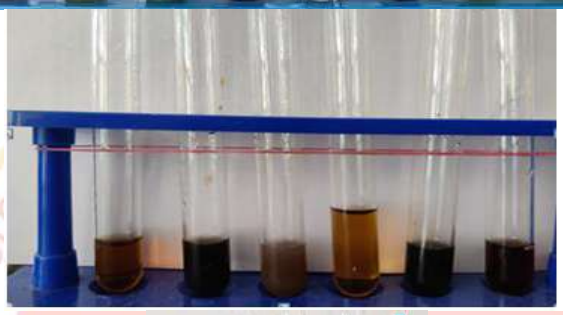
Phytochemical Screening Tests And Results :

TESTS	DIFFERNET SOLVENTS		
PHYTOCHEMICALS	**AQUEOUS**	**ETHANOL**	**CHLOROFORM**
ALKALOIDS	-		-
CARBOHYDRATE	+++	++	-
CARDIAC GLYCOSIDES	+++	++	-
FLAVANOIDS	-	+	-
PHENOLS	+++	+++	-
PHLOBATANNINS	+	+	-
STEROLS AND TRETERPHENOIDS	+	++	-
TANNINS	+++	++	-
QUINONES	-	+	-
OXALATES	+	-	-
SAPONINS	+	-	-
TERPENOIDS	+++	+	-

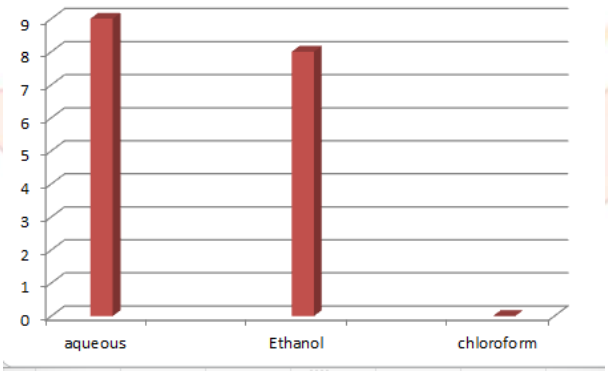
(" +++ ") : Phytochemicals present in high quantity.
("++ ") : Phytochemicals present in medium quantity.
(" + ") : Phytochemicals present in low quantity.
(" – ") : Absence of Phytochemicals.

Results:

The results for preliminary phytochemical screening of various extracts of the leaves are given in the table such as alkaloids, Carbohydrate, Cardiac Glycosides, Flavanoids, Phenols, Saponnins, sterols and triterpinoids, Tannis, Terpenoids, Quinones, Oxalates and phlobatannins. The extract were carried out phytochemical screening process. Based on the results the yield calculations was made and the percentage of yield was significantly high Aqueous > Ethanol> Chloroform. The phytochemical screening was conducted for twelve phytochemicals.Carbohydrate, Cardiac glycosides, Phenols, Strerols, Tannins and Terpenoids were found in high quantites. The presence of phytochemicals always nil in chloroform extract. The oxalates are completely absent. Flavonoids, Alkaloids, Saponins, Quinones are present in few amounts.



Grphyical Representation of Phytochemical Tests:



In Aqueous extract : High amount of phytochemicals are present.
In Ethanol extract : Medium amount of Phytochemicals are present
In chloroform extract : Absence of Phytochemicals

Discussion:

Phytochemical screening of medicinal plants is very important in identifying newsources of therapeutically and industrially important compounds. Kamboj (2000) stated that the bioactive extract should be standardized on thebasis of phytochemical compounds. It is imperative to initiate an urgent step forscreeningofplantsforsecondarymetabolites.Theresultsofpreliminaryphytochemicalscreening of leaves showed the presence of alkaloids, carbohydrate, cardiac glycoside, flavonoids, phenols ,paleobotanies, Sterols, terpinoids, tannins, quinones, saponins, terpenoids. Many of these phytochemical have different medicinal properties and it is used for making anti-inflammatory agents, anti-microbial agents, antiseptic, etc. Due to the presence of these compounds, the extracts revealed itsmedicinal potential to develop novel therapeutic agents.

Conclusion:

From the phytochemical screening results the carbohydrate, Cardiac glycosides, Phenols, Sterols, Tannins andTriterpenoids are present with high quantitates phytochemicals are consist high anti- inflammatory agents and prevent heart failure also. Anti – Inflammatory agents can reduce redness, swelling and pain in our body and also block certain substances in the body that cause inflammation. So, we can prefer this for making anti-Inflammatory ointment or ayurvedic drugs against inflammation.

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Isolation And Identification Of Bacteria From Local Market Fresh Water Crab *Paratelphusa Jacquemontii* From Amravati District, Maharashtra, India

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Abstract
The present study was conducted to evaluate the hygienic quality and freshness of crab Paratelphusa jacquemontii (Rathbun) through the investigation of the occurrence of bacteria which is an indicator for crab quality. Crabs were collected every week from local crab market. Carapace and gills of the crab was examined. Escherichia coli, Proteus vulgaris, Bacillus subtilis, Klebsiella pneumonia, Pseudomonas aeruginosa, Vibrio parahaemolyticus and Staphylococcus aureus were identified by Biochemical tests (IMViC Tests). The result of this study revealed that raw crab sold in local crab market has high contamination of human pathogenic bacteria, so strongly suggested that there is need for innovative measures to discourage the local population from eating improperly cooked crabs.
Keywords: *P. jacquemontii, Bacterial isolation, Fresh water crab.*

Introduction
Fresh water crab provides high quality protein and it also contains Omega-3 fatty acids that afford potential health benefits. Crab meat contains several essential vitamins and minerals, such as vitamin B12, which is necessary for proper nerve function. These crustaceans are rich in the minerals, zinc and copper, which are important for various vital bodily functions. Consumption of infected crab may cause diseases due to infection or intoxication. Some of these diseases are caused by the microorganisms present on the external surfaces including carapace, gills and the gut of the crab. In water microorganisms are kept away from invading by the normal defense mechanism of crab, when they are alive. Outside the water or on death, the microorganisms or the enzymes they secrete are free to invade or diffuse into the body parts where they react with complex mixture of natural substances present resulting in a well- defined sequence of changes in odoriferous and flavourous compounds. The bacteria present on the crab are normally associated with those found in their natural environment and influenced by the season and the harvesting conditions (ICMSF 2007). The outlined and discussed the hazards and challenges associated with handling crab during farming, capture and the environmental contaminants in seafood that may pose a risk to human health (Yagoub 2009). The quality of the raw crab (fresh or iced) at markets varies so widely that there is an obvious need for developing quality standards. There is no study on Microbial identification of these crabs. Therefore this study was carried out to identify certain microbial analysis to assess the quality and freshness of raw crab (*P.jacquemontii*) sold at a market in Amravati, Maharashtra, India.

Materials and methods
Laboratory analysis
Crab samples
Crabs (P.jacquemontii) were collected from a local crab market in Amravati. Totally 10 numbers of sample animals were collected every week from November 2019 to February 2020. The collected samples were aseptically and immediately transported in a thermal bag to the laboratory and processed within 3 h of acquisition, and samples were kept in the refrigerator (4–8 °C).

Sample preparation
The 10 g of the crab body parts sample was cut with a sterile knife. The cut body parts were crushed into small pieces in a sterile mortar with about 10 ml sterile water. From the crushed sample, 1 ml aliquot volume was measured out and homogenized in a clean, dry sterile beaker containing 9 ml of distilled water giving a 1:10 dilution. This was done for the 10 crab samples.

Isolation and identification bacteria form crab body sample of *P.jacquemontii*
The collected samples were processed in the laboratory according to the standard microbiological methods under complete aseptic conditions. The swabs were inoculated on nutrient agar and incubated at 37 °C under aerobic condition. The isolated bacterial colonies were identified on the basis of their morphological, physiological and biochemical characters. These culture were subjected to various biochemical tests such as gram staining, motility, indole, methyl red, voges proskauer, citrate, Triple sugar ion, oxidase, carbohydrate fermentation, hydrogen sulfide production tests for identification of phosphate solubilizing bacteria using

Bergey's manual of systematic bacteriology (Holt et al.1994). The bacteria such as *E. coli, K. pneumonia, P. vulgaris, B. subtilis, P. aeruginosa, Vibrio parahaemolyticus* and *S. aureus* were isolated from the crab samples.

Results and discussion

In bacteria, bio-oxidation reactions are very important. These reactions help bacteria to provide energy by oxidation of organic substances or by fermentation. Based on these reactions, the bacteria were identified and the results were presented in (Tables: 1, 2, 3, and 4)

Table-1: Bacteria isolated from fresh water crab *P.jacquemontii* purchased on first week of November 2019.

Testing	Microorganisms			
	Escherichia coli	*Vibrio parahaemolyticus*	*Klebsiella pneumonia*	*Pseudomonas aeruginosa*
Gram staining	−	-	−	+
Motility	+	+	−	−
Indole production	+	+	−	+
Methyl red	+	-	−	−
Voges-Proskauer	−	-	+	−
Citrates	−	+	+	+
Triple sugar iron	−	+	−	−
Oxidase	−	+	−	D
Carbohydrate fermentation	+	+	D	D

+: Positive, −: negative, D: different

Table-2: Bacteria isolated from fresh water crab *P.jacquemontii* purchased on first week of December 2019.

Testing	Microorganisms				
	Escherichia coli	*Vibrio parahaemolyticus*	*Klebsiella pneumonia*	*Proteus vulgaris*	*Bacillus subtilis*
Gram staining	−	-	−	−	+
Motility	+	+	−	+	−
Indole production	+	+	−	+	+
Methyl red	+	-	−	+	−
Voges-Proskauer	−	-	+	−	−
Citrates	−	+	+	+	+
Triple sugar iron	−	+	−	+	−
Oxidase	−	+	−	D	D
Carbohydrate fermentation	+	+	D	D	D
Catalase	+	+	+	+	+

+: Positive,−: negative, D: different

Table-3: Bacteria isolated from fresh water crab *P.jacquemontii* purchased on first week of January 2020.

Testing	Microorganisms			
	Escherichia coli	*Vibrio parahaemolyticus*	*Klebsiella pneumonia*	*Proteus vulgaris*
Gram staining	−	-	−	−
Motility	+	+	−	+
Indole production	+	+	−	+
Methyl red	+	-	−	+
Voges-Proskauer	−	-	+	−
Citrates	−	+	+	+

Triple sugar iron	−	+	−	+
Oxidase	−	+	−	D
Carbohydrate fermentation	+	+	D	D
Catalase	+	+	+	+

+: Positive, −: negative, D: different

Table-4: Bacteria isolated from fresh water crab *P.jacquemontii* purchased on first week of February 2020.

Testing	**Microorganisms**				
	Escherichia coli	*Vibrio parahaemolyticus*	*Klebsiella pneumonia*	*Pseudomonas aeruginosa*	*Staphylococcus aureus*
Gram staining	−	-	−	+	+
Motility	+	+	−	−	−
Indole production	+	+	−	+	−
Methyl red	+	-	−	−	−
Voges-Proskauer	−	-	+	−	−
Citrates	−	+	+	+	+
Triple sugar iron	−	+	−	−	−
Oxidase	−	+	−	−	−
Carbohydrate fermentation	+	+	D	D	D
Catalase	+	+	+	+	+

+: Positive, −: negative, D: different

In this study, *E. coli, Vibrio parahaemolyticus ,K. pneumonia, P. vulgaris, B. subtilis, P. aeruginosa* and *S. aureus* were identified from the crab. *E. coli, Vibrio parahaemolyticus* and *K. pneumonia* were found in all the monthly samples (Tables: 1, 2, 3, and 4) Whereas, *B. subtilis* (Tables: 2) and *P. aeruginosa* (Tables: 1 and 3) were identified two times. *P. vulgaris* (Tables: 2 and 3) and *S. aureus* (Tables: 4) was identified. The crabs are highly consumable and prone to vast variations in quality due to differences in species, environmental habitats, and feeding habits. They can also function as carriers of several microbial and other health hazards. Therefore maintenance of quality is most important in production and trade of crab products. Although only a few infectious agents in crab are able to infect humans, some exceptions exist that may result in fatalities. However, the greatest risk to human health due to the consumption of raw or insufficiently processed crabs and crab products. In this study, *E.coli., Vibrio Parahemolyticus,* and *Klebsiella pneumonia* sp. were isolated from all of collected crab samples is of highly importance because this bacterium plays a considerable role as potential pathogenic bacteria for human and as an indicator of food quality as spoilage organism. The consumption of these disease or infected crabs possesses greater health risks than the consumption of apparently healthy ones. The general public and consumers of crabs should therefore ensure that they do not buy or consume disease or injured crabs. Organic materials of any type are suitable foodstuffs for bacteria growth. A case of cholera occurred in a patient in Maryland, who had eaten crab harvested commercially along the Texas coast in October 1984. Findings of *Vibrio sp.* in the tissue of crabs of present studies are considered to be correlated with the epidemiology and transmission of cholera in the aquatic environment.

This is previously mentioned by (Jeyasekaran *et al*. 2006, and Koutsoumanis and Nychas 2000). In this study seven bacterial species were isolated form *P.jacquemontii.* Among the seven bacterial species *E. coli. V. parahaemolyticus* and K. *pneumonia* were found in all the samples and others were not found. Apart from the enteric- organisms, *S. aureus* encountered in this study are known enterotoxin producing agent and a microorganism which is poisonous. This is in agreement with the previous study by some authors in Nigeria and outside Nigeria (Okonko et. al.2008, 2009).

The results from this study and according to published microbiological guidelines as cited by (Gilbert et al.1996) suggest that the microbiological quality of the crab examined is unacceptable and pose a potential risk to public health. The diversity of potential pathogens from the samples of crab is of concern particularly at a time when many in our communities are immunologically compromised as a result of various illnesses (Mhango et al.2010). From this investigation, it can be concluded that these characteristics of water bodies are influenced by seasonal variations. It is recommended that the proper maintenance of the captured crabs is

necessary. Proper sanitation measures and environmental education to public care essential to keep these water bodies clean and safe. There is need for innovative measures to discourage the local population from eating improperly cooked crabs.

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Spider's Diversity in Agro-ecosystems of Murtizapur Tahsil, District Akola (Maharashtra State)

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Abstract

Spiders are widespread and diverse predators that are part of terrestrial Arthropod. Spiders are one of the most diverse animal groups in the World. Spiders play an important role as stabilizing agents or regulators of insect populations in agro, forest and other terrestrial ecosystems. Thus their presence in an ecosystem may well influence the population dynamics of other arthropods present. They mostly feed on insects, even though they may also feed on various other kinds of prey. Spider's predatory capacity can have an effect in decreasing densities of insect pests, when they are used to balance the effect of insecticides and Pesticides. If pesticides are avoided, spiders can invariably take shelter in the fields, feed on the pests and increase the productivity. The role of spiders as generalist predator in an agroecosystems is well recognized.

Spider species abundance in agro-ecosystem can be high as undisturbed natural ecosystem. Spiders act as pest control creature, which feeds on crop destructive insects. Spiders are beneficial bio-control agent of insect pest in agro-ecosystem. A survey of Spiders was carried out in Agro-ecosystems of Murtizapur, District Akola, during November 2020 to November 2021 in the present study I have reported 148 species of Spiders belonging to 13 Families and 65 genera. Spiders of Families ARANEIDAE, CLUBIONIDAE, ERESIDAE, GNAPHOSIDAE, LYCOSIDAE, OECOBIIDAE, OXYOPIDAE, SALTICIDAE, SPARASSIDAE, TETRAGNATHIDAE, THERIDIIDAE, THOMISIDAE, and ULOBORIDAE were recorded during the investigation.

Keywords: *Diversity, Agro-ecosystems, Spider, Murtizapur.*

Introduction

Spiders are among the most abundant insectivorous predators of Terrestrial ecosystem. Biodiversity can be simply defined as the variety of all types of living organism. Spiders are among the most diverge group on earth, which received the sixth ranking in global diversity after the sixth largest insect orders. Spiders belonging to the order Araneae, which is one of the major group of creature Spiders are one of the most important Arthropods group in agroecosystems. They colonize almost all habitats and have great ability in resisting to adverse ecological conditions. Spiders are carnivorous creature. Spiders are among the most abundant predators of insects of terrestrial agro-ecosystem.

Spider species abundance in agro-ecosystem can be high as undisturbed natural ecosystem. Spiders act as pest control creature, which feeds on crop destructive insects. Spiders are beneficial bio-control agent of insect pest in agro-ecosystem. A survey of Spiders was carried out in Agro-ecosystems of Murtizapur Tahsil, district Akola. Spiders act as natural biological control agent in ecosystem. Some recent workers on Indian spiders include Majumdar and Tikader (1991), Reddy and Patel (1992), Biswas and Biswas (1992), Sadana and Goel (1995), Biswas et al. (1996), Gajbe, U. A. (1999), Biswas and Majumdar (2000), Biswas B. and K. Biswas (2003).

Material and Method:

Study Area:

Murtizapur is located between N20.73° and E77.51° with an elevation on 308 meters. Summer is hot temperate as compared to other Vidarbha regions. The annual rainfall averages 700 mm. The area receives rainfall during southwest monsoon. Average temperature of the district ranges from minimum of 10°C in winter to a maximum of 45°C in summer with the relative humidity varying from 10-17% to 60-90%.

The spider inventory studies were conducted from November 2020 to November 2021 in the ten different localities of Murtizapur, Akola district from Maharashtra state. I have selected Ten microhabitats for observations in the study area viz; agricultural land.

Sampling methods:

Spider Inventory work was conducted at the agro-ecosystems by different groups of workers. Four surveys were conducted per season at all study sites. Five 30 x 30 m quadrates were taken for extensive surveys. All surveys were conducted in the morning hours between 7:00 am to 9:00 am Spiders were collected by adopting standard sampling techniques as described below.

1. Sweep netting: Spiders from herbaceous-shrub-small tree vegetation were collected using standardized insect-collecting net. This method is used to collect the foliage spider by this method from herbs and shrubs.
2. Active searching: Spiders from all three layers were collected using this method. In this method spider specimens were actively searched for 30 minutes per quadrat for active searching.

3. Beating sheets: Spiders from trees and woody shrubs were dislodged and collected on a sheet by beating trees and shrubs with a standard stick 10 beats per tree or shrub were employed in each quadrat.
4. Litter Sampling: Litter i.e. deciduate from the ground was collected by hand and was put in big tray. Litter sampling involved in sorting of spiders.
Collected spiders were photographed in life and later preserved in 70% ethyl alcohol. Identification: Spiders were observed using dissecting stereo zoom microscopes for studying identification keys. All specimens were initially separated from other material and identified to the family level. Spiders were identified upto species level using the standard monographs, Majumder S.C. and Tikader B. K. (1991).

Result:

During the present survey, I have reported 148 species of Spiders belonging to 13 Families and 65 Genera. Spiders of Families ARANEIDAE, CLUBIONIDAE, ERESIDAE, GNAPHOSIDAE, LYCOSIDAE, OECOBIIDAE, OXYOPIDAE, SALTICIDAE, SPARASSIDAE, TETRAGNATHIDAE, THERIDIIDAE, THOMISIDAE and ULOBORIDAE were recorded during November 2020 to November 2021 in my investigation.

Table 1: Checklist of Spider fauna from Agro-ecosystems of Murtizapur in Akola district of Maharashtra State

Sr. No.	Family	Species	Common Name of Spiders	Habitat
01	ARANEIDAE(42)	*Araneus cucurbitinus* ♀	Orb Weaver	Cotton Field
02		*Araneus cucurbitinus* ♂	Orb Weaver	Cotton Field
03		*Araneus mitifica* (Simon) ♀	Orb Weaver	Cotton Field
04		*Araneus mitifica* (Simon) ♂	Orb Weaver	Cotton Field
05		*Araneus pachganiensis* ♀	Orb Weaver	Cotton Field
06		*Araneus pahalgaonensis* ♀	Orb Weaver	Cotton Field
07		*Argiope aemula* ♀	Orb Weaver	Cotton Field
08		*Argiope aemula* ♂	Orb Weaver	Cotton Field
09		*Chorizopes anjanes* ♂	Orb Weaver	Cotton Field
10		*Chorizopes anjanes* ♀	Orb Weaver	Cotton Field
11		*Chorizopes calciope* ♀	Orb Weaver	Cotton Field
12		*Chorizopes calciope* ♂	Orb Weaver	Cotton Field
13		*Cyclosa bifida* (Doleschall)♀	Orb Weaver	Cotton Field
14		*Cyclosa bifida* (Doleschall)♂	Orb Weaver	Cotton Field
15		*Cyclosa confraga* (Thorell)♀	Orb Weaver	Cotton Field
16		*Cyclosa confraga* (Thorell)♂	Orb Weaver	Cotton Field
17		*Cyclosa fissicauda Simon* ♀	Orb Weaver	Sunflower Field
18		*Cyclosa fissicauda Simon* ♂	Orb Weaver	Sunflower Field
19		*Cyclosa insulana* (Costa) ♂	Orb Weaver	Sunflower Field
20		*Cyclosa insulana* (Costa) ♀	Orb Weaver	Sunflower Field
21		*Cyclosa moonduensis* ♀	Orb Weaver	Sunflower Field
22		*Cyclosa moonduensis* ♂	Orb Weaver	Sunflower Field
23		*Cyclosa mulmeinensis* ♀	Orb Weaver	Sunflower Field
24		*Cyclosa mulmeinensis* ♂	Orb Weaver	Sunflower Field
25		*Cyclosa neilensis* Tikader ♀	Orb Weaver	Papaya Field
26		*Cyclosa neilensis* Tikader ♂	Orb Weaver	Papaya Field
27		*Cyclosa simoni* ♀	Orb Weaver	Papaya Field
28		*Cyclosa simoni* ♂	Orb Weaver	Papaya Field
29		*Cyrtophora bidenta* ♀	Orb Weaver	Cotton Field
30		*Cyrtophora bidenta* ♂	Orb Weaver	Cotton Field
31		*Cyrtophora cicatrosa* ♀	Orb Weaver	Cotton Field
32		*Cyrtophora cicatrosa* ♂	Orb Weaver	Cotton Field
33		*Cyrtophora citricola* ♀	Orb Weaver	Tur Field
34		*Cyrtophora citricola* ♂	Orb Weaver	Tur Field
35		*Larinia chloris* (Audouin) ♀	Orb Weaver	Tur Field
36		*Larinia chloris* (Audouin) ♂	Orb Weaver	Tur Field

37		*Neoscona achine* ♀	Orb Weaver	Tur Field
38		*Neoscona achine* ♂	Orb Weaver	Tur Field
39		*Neoscona bengalensis* ♀	Orb Weaver	Tur Field
40		*Neoscona nautica* ♀	Orb Weaver	Jawar Field
41		*Neoscona theis* ♀	Orb Weaver	Jawar Field
42		*Zygiella indica* Tikader ♀	Orb Weaver	Jawar Field
43	CLUBIONIDAE(3)	*Clubiona acanthochemis* ♀	Sac Spider	Cotton Field
44		*Clubiona analis* Thorell ♀	Sac Spider	Cotton Field
45		*Clubiona analis* Thorell ♂	Sac Spider	Cotton Field
46	ERESIDAE(2)	*Stegodyphus sarasinorum* ♀	Colonial Spider	Lemon Field
47		*Stegodyphus sarasinorum* ♂	Colonial Spider	Lemon Field
48	GNAPHOSIDAE(8)	*Drassodes lubrica* Simon ♀	Ground dwelling	Cotton Field
49		*Drassodes sagarensis* ♀	Ground dwelling	Cotton Field
50		*Gnaphosa poonaensis* ♀	Ground dwelling	Jawar field
51		*Gnaphosa poonaensis* ♂	Ground dwelling	Jawar field
52		*Sosticus nainitalensis* ♀	Ground dwelling	Jawar field
53		*Sosticus nainitalensis* ♂	Ground	Jawar field
54		*Zelotes poonaensis* ♂	Ground	Cotton Field
55		*Zelotes sajali* Tikader♀	Ground dwelling	Cotton Field
56	LYCOSIDAE(25)	*Hippasa greenalliae* ♀	Wolf Spider	Cotton Field
57		*Hippasa greenalliae* ♂	Wolf Spider	Cotton Field
58		*Hippasa partida* ♂	Wolf Spider	Tur Field
59		*Hippasa pisaurina* Pocock ♀	Wolf Spider	Tur Field
60		*Hippasa pisaurina* Pocock ♂	Wolf Spider	Tur Field
61		*Lycosa barnesi* Gravely ♀	Wolf Spider	Cotton Field
62		*Lycosa bistriata* Gravely ♀	Wolf Spider	Cotton Field
63		*Hippasa partida* ♀	Wolf Spider	Cotton Field
64		*Lycosa choudhuryi* ♀	Wolf Spider	Cotton Field
65		*Lycosa fuscana* Pocock ♀	Wolf Spider	Cotton Field
66		*Lycosa poonaensis* ♀	Wolf Spider	Cotton Field
67		*Lycosa poonaensis* ♂	Wolf Spider	Cotton Field
68		*Lycosa prolifica* Pocock ♀	Wolf Spider	Jawar Field
69		*Pardosa birmanica* Simon ♀	Wolf Spider	Jawar Field
70		*Pardosa birmanica* Simon ♂	Wolf Spider	Jawar Field
71		*Pardosa timida* (Simon) ♀	Wolf Spider	Jawar Field
72		*Pardosa timida* (Simon) ♂	Wolf Spider	Jawar Field
73		*Pardosa minutus* Tikader ♀	Wolf Spider	Cotton Field
74		*Pardosa minutus* Tikader ♂	Wolf Spider	Cotton Field
75		*Pardosa timida* (Simon) ♀	Wolf Spider	Cotton Field
76		*Lycosa fuscana* Pocock ♂	Wolf Spider	Cotton Field
77		*Lycosa barnesi* Gravely ♂	Wolf Spider	Cotton Field
78		*Lycosa bistriata* Gravely♂	Wolf Spider	Cotton Field
79		*Lycosa prolifica* Pocock ♂	Wolf Spider	Cotton Field
80		*Lycosa choudhuryi* ♂	Wolf Spider	Cotton Field
81	OECOBIIDAE(2)	*Oecobius* marathaus ♀	Tiny Spider	Jawr Field
82		*Oecobius* marathaus ♂	Tiny Spider	Jawr Field
83	OXYOPIDAE(13)	*Oxyopes bharatae* Gajbe ♀	Lynx Spider	Cotton Field
84		*Oxyopes biharensis* Gajbe ♀	Lynx Spider	Cotton Field
85		*Oxyopes burmenicus* ♀	Lynx Spider	Cotton Field
86		*Oxyopes chittrae* Tikader ♀	Lynx Spider	Cotton Field
87		*Oxyopes elongatus* Biswas.♀	Lynx Spider	Cotton Field
88		*Oxyopes pankaji* Gajbe ♀	Lynx Spider	Cotton Field

89		*Oxyopes pankaji* Gajbe ♂	Lynx Spider	Cotton Field
90		*Peucetia viridana* ♀	Lynx Spider	Cotton Field
91		*Peucetia viridana* ♂	Lynx Spider	Cotton Field
92		*Oxyopes burmenicus* ♂	Lynx Spider	Jawar Field
93		*Oxyopes chittrae* Tikader ♀	Lynx Spider	Jawar Field
94		*Oxyopes elongatus* Biswas.♀	Lynx Spider	Jawar Field
95		*Oxyopes pankaji* Gajbe ♀	Lynx Spider	Jawar Field
96	SALTICIDAE(23)	*Phidippus pateli* ♂	Jumping Spider	Cotton Field
97		*Marpissa decorata* Tikader♂	Jumping Spider	Cotton Field
98		*Marpissa decorata* Tikader♀	Jumping Spider	Cotton Field
99		*Marpissa dhakuriensis* ♀	Jumping Spider	Tur Field
100		*Myrmarachne maratha* ♀	Jumping Spider	Tur Field
101		*Myrmarachne maratha* ♂	Jumping Spider	Tur Field
102		*Phidippus pateli.* ♀	Jumping Spider	Tur Field
103		*Phidippus paykulli* ♀	Jumping Spider	Tur Field
104		*Plexippus paykullii* ♀	Jumping Spider	Tur Field
105		*Plexippus paykullii* ♂	Jumping	Cotton Field
106		*Rhene indicus* Tikader ♀	Jumping Spider	Cotton Field
107		*Telamonia dimidiata* ♀	Jumping	Cotton Field
108		*Telamonia dimidiata* ♂	Jumping Spider	Cotton Field
109		*Phidippus paykulli* ♂	Jumping Spider	Jawar Field
110		*Rhene indicus* Tikader ♂	Jumping Spider	Jawar Field
111		*Marpissa dhakuriensis* ♂	Jumping Spider	Cotton Field
112		*Phlegra dhakuriensis* ♀.	Jumping Spider	Cotton Field
113		*Salticus ranjitus* Tikader ♂	Jumping Spider	Cotton Field
114		*Thiania* sp. nov. ♂.	Jumping Spider	Cotton Field
115		*Euophrys* sp. nov. ♀.	Jumping Spider	Cotton Field
116		*Harmochirus* sp. nov. ♂.	Jumping Spider	Cotton Field
117		*Harmochirus* sp. nov. ♀.	Jumping Spider	Cotton Field
118		*Salticus ranjitus* Tikader ♀.	Jumping Spider	Cotton Field
119	SPARASSIDAE(2)	*Heteropoda venatoria* ♀	Giant Crab	Cotton Field
120		*Heteropoda venatoria* ♂	Giant Crab	Cotton Field
121	TETRAGNATHIDAE (4)	*Leucauge decorata*♀	Water orb weaver	Tur Field
122		*Leucauge fastigata* ♀	Water orb weaver	Cotton Field
123		*Tetragnatha mandibulata*♀	Water orb weaver	Cotton Field
124		*Tetragnatha mandibulata*♂	Water orb weaver	Cotton Field
125	THERIDIIDAE(4)	*Argyrodes gouri* ♀	Cob web Spider	Papaya Field
126		*Argyrodes gouri* ♂	Cob web Spider	Cotton Field
127		*Theridion manjithar* ♀	Cob web Spider	Cotton Field
128		*Theridion manjithar* ♂	Cob web Spider	Cotton Field
129	THOMISIDAE(17)	*Thomisus pugillis* ♀	Crab Spider	Sunflower Field
130		*Thomisus pugillis* ♂	Crab Spider	Sunflower Field
131		*Thomisus whitakeri* ♀	Crab Spider	Sunflower Field
132		*Tmarus pachpediensis* ♀	Crab Spider	Sunflower Field
133		*Tmarus pachpediensis* ♂	Crab Spider	Sunflower Field
134		*Xysticus jayantius* ♀	Crab Spider	Sunflower Field
135		*Xysticus minutes* ♀	Crab Spider	Sunflower Field
136		*Xysticus minutes* Tikader ♂	Crab Spider	Sunflower Field
137		*Synaema decorata* ♀	Crab Spider	Sunflower Field
138		*Synaema decorata* ♂	Crab Spider	Sunflower Field
139		*Thomisus elongates* ♀	Crab Spider	Sunflower Field
140		*Thomisus elongates* ♂	Crab Spider	Sunflower Field
141		*Thomisus memae* ♀	Crab Spider	Sunflower Field
142		*Thomisus beautifularis*♀	Crab Spider	Sunflower Field

143		*Thomisus pooneus* ♂	Crab Spider	Sunflower Field
144		*Thomisus projectus* ♀	Crab Spider	Sunflower Field
145		*Thomisus projectus* ♂	Crab Spider	Sunflower Field
146	ULOBORIDAE(3)	*Uloborus danolius* ♀	Feather leg Spider	Cotton Field
147		*Uloborus danolius* ♂	Feather leg Spider	Cotton Field
148		*Uloborus khasiensis* ♀	Feather leg Spider	Cotton Field

♀- Female, ♂- Male.

Table 2: Checklist of Spider fauna from Agro-ecosystems of Murtizapur in Akola district of Maharashtra State

Sr. No.	Family	Genera	Species
01	Araneidae	19	42
02	Clubionidae	01	03
03	Eresidae	01	02
04	Gnaphosidae	03	08
05	Lycosidae	12	25
06	Oeceobiidae	01	02
07	Oxyopidae	04	13
08	Saltisidae	11	23
09	Sparassidae	01	02
10	Tetragnathidae	02	04
11	Theridiidae	02	04
12	Thomisidae	07	17
13	Uloboridae	01	03
Total		**65**	**148**

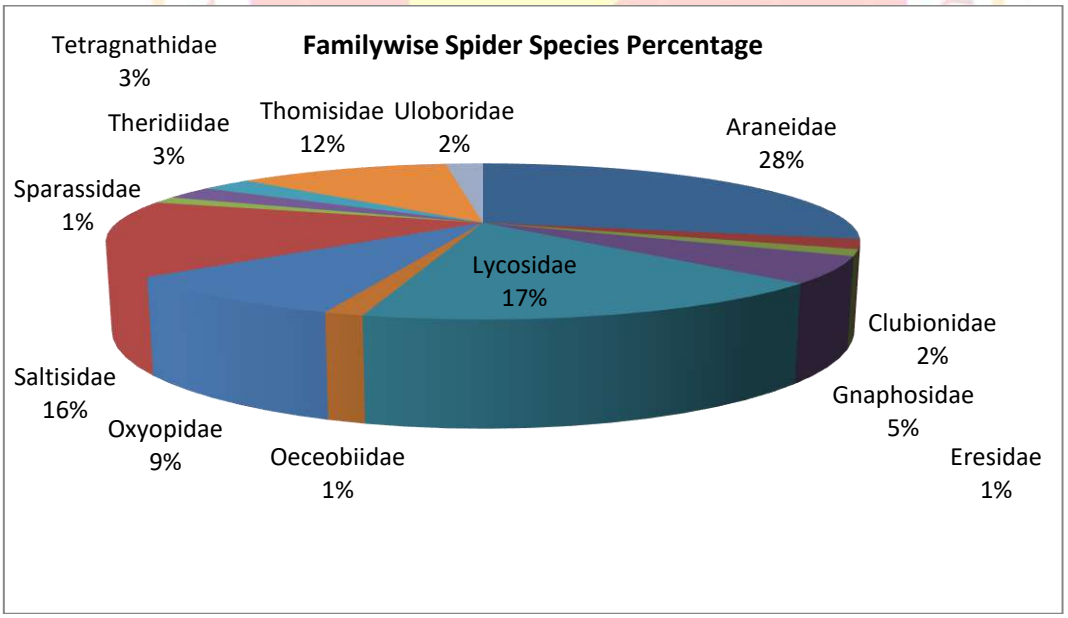

Fig.1. Graph showing Family wise Spider Species Percentage of Agro-ecosystems from Murtizapur, District Akola

Discussion:

In the present study, 148 species of spiders belonging to 65 genera of 13 families in agro-ecosystem of Murtizapur, district Akola collected and identified. These spiders were belonging to the family Araneidae, Clubionidae, Eresidae, Gnaphosidae, Lycosidae, Oecobiidae, Oxyopidae, Salticidae, Sparassidae, Tetragnathidae, Theridiidae, Thomisidae, and Uloboridae. In this study two species of spiders were observed,

one is web weaver and another one is non web weaver. The web weaving spiders were belonging to the family Araneidae, Eresidae, Oecobiidae, Tetragnathidae, Theridiidae, and Uloboridae. The non web weaving spiders were belonging to the family Clubionidae, Gnaphosidae, Lycosidae, Oxyopidae, Salticidae, Sparassidae and Thomisidae. The increase in the spider density suggests that spider density in influenced by the increase in prey density. In particular, the interaction of prey and predator shows a constant numerical interaction about these relationships which is fundamental to biological control.

OrbWeaver(ARANEIDAE)>WolfSpider(LYCOSIDAE)>JumpingSpider(SALTICIDAE)> Crab Spider(THOMISIDAE)> Lynx Spider(OXYOPIDAE)

On the basis of Family wise Spider Species the abundance of the Spider Family are represented respectively. In my investigation I have seen that the abundance of Five Family Spiders species were more. The Orb waver spiders of Family Araneidae and Wolf spiders of Family Lycosidae are widely distributed. The Orb waver spiders of Family Araneidae form web and the insect pest entangled in web spiders feeds on them. The members of family Lycosidae and Salticidae spiders they directly capture the insect pest and feeds on it.

Conclusion:

In my investigation I have studied 148 species belonging to 65 genera of 13 Spider Families during November 2020 to November 2021, on the above result and discussion it is clear that the Spiders are very much important creature. Species abundance of spider in agro-ecosystem can be high. The present work includes the Taxonomic position and list of diversified species of spiders. The major families abundant in this agro-ecosystem are ARANEIDAE 42(28%), LYCOSIDAE 25(17%), SALTICIDAE 23(16%), THOMISIDAE 17(12%) and OXYOPIDAE 13(9%). Spiders are act as good Pest controller. Avoid the regular use of pesticides in agricultural fields which decreases the spider populations, so species abundance of spider in agro-ecosystem can be high. Spiders are beneficial bio-control agent of insect pest in agro-ecosystem.

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Flowering Phenology and Histochemical Analysis of Cotton Varieties

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Abstract:

Phenology is the study of timing of vegetative activities, flowering and fruiting and their relationships to environmental factors."Flowering Phenology" refers to the seasonal timing of flowering. Another event under phenology is opening of flower, anther dehiscence, pollen presentation and stigma receptivity. Flower opening in all cotton varieties starts during 06.45 to 09.45 hours followed by anther dehiscence, which starts, from 07.00 hours depending on the weather conditions. In all selected varieties of cotton, it is observed that the flowering starts during 1st to 19th of September and full blooming was from 9th October to 28th November. In histochemical test, Pollen grains of all the varieties of cotton studied showed the presence of both starch and lipids. Thus the Pollen grains of all cotton varieties belong to the class of starchy pollen as in all varieties it showed positive test.

Keywords: *Cotton varieties, flowers, starch, lipids, phenology.*

Introduction:

Cotton is one of the most commercial crops playing a key role in economic, political and social affairs of the world. Cotton is a tropical and subtropical crop grown on a variety of soil. The predominant types of soil on which the crop is grown are the black cotton soil and red sandy loams to loams found in the state of Gujarat, Maharashtra, Madhya Pradesh, Andhra Pradesh, Karnataka and Tamilnadu. The sowing season of cotton varieties differs considerably in different regions for obtaining maximum yield of cotton. The crop yield is depending on reproductive success of the plant. During the process of reproduction the pollen grains plays very important role. Therefore, the Palynological investigations of cotton varieties H-8, NHH-52, BT-162, LRA-5166, Kaveri Kurnel, Ankur-216, Binni and Ajeet-11 were proposed to undertake for the investigations on flowering phenology, pollen histochemistry. Phenology is the study of timing of vegetative activities, flowering and fruiting and their relationships to environmental factors (Mori and Prance, 2005). "Flowering Phenology" refers to the seasonal timing of flowering.

A phenological record depends on parameter chosen by the various investigators and depends on the research levels, the aim of the research, and the type of analysis. The main events are the timing, duration, sequence, intensity and timing of flowering, which can determined by the physical environment factors like temperature, rainfall and day- length (Dafni, 1992). Plants reproductive characteristic can affect the flowering phenology, mode of seed dispersal and fruiting seed set efficiency. A wide variety of environmental factors may select for one or more reproductive characteristic in plant population (Smith *etal*, 1986) and such factors include seasonal climatic events (Schemske, 1977).

Pollen histochemical analysis are carried out for the following reasons i) possible relation between the pollen content and the mode of pollination ii) study of pollinator foraging behavior, nutritional demands, pollination mode, pollen content and iii) composition in relation to phylogeny (Dafni, 1992). Lipids and starch are important constituents of the pollen grains to establish the relations with flower foragers.

Materials and Methods

For the collection of phenological data of selected cotton varieties, field trips were undertaken daily or on alternate days. Events and the changes of the single flower are recorded to study the flowering phenology in relation to geographical (latitudinal and altitudinal) and climatic variables, the time and duration of pollen exposure and the interrelations among environmental variables (temperature and humidity) and flower development were noted.

Plants were observed from the beginning of flowering stage up to the opening of last flower. Flowering period was taken as the period from the opening of first flower up to the opening of last flower. The timing of onset, progress, termination and blooming of selected varieties under study were noted.

For the histochemical tests fresh and mature pollen grains were collected from freshly dehisced anthers. For the test of starch method proposed by Baker and Baker (1979) was followed. Pollen samples were immersed in to IKI solution and examined under the microscope for the change in colour. Dark bluish-black color indicates the presence of starch. For the estimation of lipids pollen sample were kept in freshly prepared stock solution of Sudan IV and treated pollen sample was observed under microscope within 2-3 minute to note the change in colour. A red color indicates the presence of lipid (Baker and Baker, 1983).

Observation:

In all selected varieties of cotton, it is observed that the flowering starts during 1st to 19th of September and full blooming was from 9th October to 28th November. Full blooming in all cotton varieties was observed when the temperature was in the range of 23^0C to 30^0C The range of % humidity during full bloom period was 74.6 to 82.0 and 55.4 to 87.7. In all varieties the flowering stands to terminate towards the end of month of December .

Flower opening in all varieties starts during 06.45 to 09.45 hours depending on the weather conditions. During cloudy and rainy days flowers starts to open after 07.30 hours depending on prevailing temperature. The anther dehiscence in all varieties was observed during 07.00 to 08.30 hours. The stigmas become receptive before anther dehiscence. The stigmas were viscid and shiny and remained receptive for about 8 hrs. After 03.00 hours it become blackish in colour indicating loss of receptivity. The opened flowers start to withered by the evening on same day.

At the full bloom time the plants of cotton variety Ajeet-11 were with maximum height of 111 cm having up to 150 leaves per plant, however, in Ankur-651 height was 72 cm with 80 leaves. The number of leaves, more or less correlates with the height of plant. For each variety parameters like height, number of leaves, number of balls, number of flowers open per day, and number of anthers per flower showed variations for each parameter.

From the histochemical tests it was noted that the pollen grains of all cotton varieties contains starch and lipids.

Conclusions:

In all selected varieties of cotton, it is observed that the flowering starts during 1st to 19th of September and full blooming was from 9th October to 28th November. Full blooming in all cotton varieties was observed when the temperature was in the range of 23^0C to 30^0C. The range of % humidity during full bloom period was 74.6 to 82.0 and 55.4 to 87.7 In all varieties the flowering stands to terminate towards the end of month of December.

Flower opening in all varieties starts during 06.45 to 09.45 hours depending on the weather conditions. During cloudy and rainy days flowers starts to open after 07.30 hours depending on prevailing temperature. The anther dehiscence in all varieties was observed during 07.00 to 08.30 hours. The stigmas become receptive before anther dehiscence. The stigmas were viscid and shiny and remained receptive for about 8 hrs. After 03.00 hours it become blackish in colour indicating loss of receptivity. The opened flowers start to withered by the evening on same day.

From the observations on flowering phenology, it is noticed that the flowering phenology is related with seasonal variations and environmental conditions and has an impact of different environmental factors.

From the histochemical tests it was noted that the pollen grains of all cotton varieties contains starch and lipids. Pollen histochemistry is possibly related to pollination mode, pollinator foraging behavior and phylogeny. The nutritive value of pollen also influences the behaviour of flower visitors.

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Phytochemical Screening for Secondary Metabolites from Medicinal Plants of Wan Sanctuary, Akot Wildlife Division,(M.S.)

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Abstract

Phytochemical screening of secondary metabolites in some selected medicinal plants of Wan Sanctuary of Akot Wildlife Division was carried out for to know the presence of medicinally important chemical compounds in the plants. The conventional medicines involve the leaf extracts of various plants having different bioactive compounds which work in the curing of various health problems. Qualitative phytochemical screening of these selected medicinal plants helps to know the presence of different chemicals like phenols, alkaloids, tannins, saponins, anthocyanin,leuco-anthocynin and steroids. By knowing the presence of such different secondary metabolites in plants, these plants will be used for the extraction and isolation of phytochemicals which is use in the curing of various health problems.

Key words- *Phytochemical screening; Bio-active compounds; Medicinal plants; Secondary Metabolites*

Introduction:

From the ancient time Phytomedicenes are extracted from different parts of Plant are popularly used by local communities for cure from various health problemsin last few years our interest has been increases in the study of conventional medicine in all over the world. So that the countries have look around for cooperation in investigation and identification of safe positive components used in conventional medicine. [1]

According to World Health Organization (WHO), medicinal plants would be the best source to obtain variety of medicines. About 80% of individuals from developed countries use traditional medicines, which has compounds derived from medicinal plants. However, such plants should be investigated to better understand their properties, safety, and efficiency [2]almost 95% of the prescriptions in our India have been reported to be plant based phytomedicines in the traditional systems of Unani, Ayurveda, Homeopathy and Siddha. [3-4]

Plants can produce different kind of natural products also known as primary metabolites and secondary metabolites they induced effects on other organisms. The primary metabolites are amino acids, simple sugars (glucosides), proteins and lipids are involved in cellular processes. Secondary metabolites are chemically active compounds i.e. (Phenols, flavonoids, alkaloids, steroids, terpenoids, saponins, etc.), which are produced in the response of various kind of stresses with complexity in structure and distributions are more restrictedly than the primary metabolites.[5]

From the ancient time Phytomedicenes are extracted from different parts of Plant are popularly used by local communities for cure from various health problems. These can be obtained from different parts of the plant like bark, stem, leaves, flowers, fruits, seeds, etc. i.e. the bioactive compounds are present in any part of the plant. Such phytochemical screenings of different plants or from the different regions are reported by many researchers and determine the presence of primary and secondary metabolites in plants. They explore the plants in nature for the search of novel medicines, the number of plant having the medicinal components which are therapeutically used in the curing of various health problems. [6 - 7]

Materials And Methods:

Collection and Identification: The dust free and microbes free fresh leaves of 15 different plant species were collected from Wan Sanctuary, Akot Wildlife Disvision (M.S.). Taxonomic identification of plants was carried out by using publishedfloras.

Extraction: The leaves of 15 selected Plants listed in Table 1 were thoroughly washed 3-4 times in running tap water, and then the leaves are shade dried. After complete shade drying, the leaves were grinded in mixer; the powder was stored in small polyethene bags. The powdered material of 5gm was taken by weighing balance and crushed in 50 ml of distilled water then boiled at 50-60˚ C for 30 – 40 minutes in water bath and filtered through Whatman No. 1 filter paper. The filtrate was centrifuged at 2800 rpm for 10 minutes then the filtrate was stored in sterile bottle in deep freezer at 5ºC for further use. The plants studied are listed below in Table 1.

Table 1: Selected Medicinal Plants for Phytochemical Screening.

Sr. No.	Botanical Name	Family	Common Name
1.	*Alstoniascholaris* L.	Apocynaceae	Devil tree
2.	*Oxalis corniculata* L.	Oxalidaceae	Yellow wood sorrel
3.	*Vitexnegundo* L.	Verbenaceae	Five leaved chaste tree

4.	*Polyalthialongifolia* (Sonn)	Anonaceae	Thwaites False ashoka
5.	*Terminalia catappa* Linn.	Combretaceae	Indian almond leaf
6.	*Sizygiumcuminum* L.	Myrtaceae	Jamun
7.	*Achyranthisaspera* L.	Amaranthaceae	Chaff-flower
8.	*Murrayakoenighii* L.	Rustaceae	Curry leaf
9.	*Wedelleawallichi* L.	Asteraceae	Wedellea
10.	*Lantana camara* L.	Verbenaceae	Lantana or wild saga
11.	*Ficusreligiosa* L.	Moraceae	Peepal tree
12.	*Cassia fistula* L.	Caesalpinaceae	Golden shower
13.	*Vernoniacinerea* L.	Asteraceae	Dandotapala, sadodi
14.	*Tinosporacardifolia* (Willd.) Miers.	Menispermaceae	Giloy
15.	*Catharanthusroseus* L.	Apocynaceae	Sadabahar

Phytochemical screening: Preliminary phytochemical screening (qualitative) was carried out by using following methods:

Terpenoids: 2ml of leaf extract was added to 2ml of acetic anhydride and concentrated H2SO4. The blue, green ring is form which shows the presence of terpenoids.[8]

Tannins: 2ml of the leaf extract was added a few drop of 1% lead acetate. A yellowish colour precipitate is formed which shows the presence of tannins.[9]

Saponins: 5ml of leaf extract was mixed with 20 ml dist. water and continuously shake it for 15 min. the foam is form which shows the presence of saponins.[10]

Anthocyanins: 2ml of leaf extract is added to 2 ml of 2N HCL and ammonia. The pink-red colour change to blue-violetcolor which showsthe presence of anthocyanins.[11]

Leucoanthocyanins: 5ml of leaf extract added to isoamyl alcohol. Formation of red colour Upper layer shows the presence of leucoanthocyanins.[11]

Steroids: 1ml of leaf extract was dissolved in 10ml of concentrated sulphuric acid and equal volume of chloroform was added by sides of the test tube. The upper layer turns red in colour and sulphuric acid layer showed the yellow with green fluorescence. Which shows the presence of steroids.[12]

Results And Discussion:

Preliminary Screening of Secondary Metabolites (Qualitative) - The phytochemical screening and qualitative analysis of 15 selected medicinal plants showed the presence of Terpinoides, Tannins, Saponins, Anthocyanins, Leucoanthocyanins and Steroids in leaves (Table 2).

Table 2: Result of the Phytochemical Analysis of 15 Selected Medicinal Plants

Sr. No.	Name of plant	Terpinoi-des	Tannins	Saponins	Antho-cyanins	Leucoantho-cyanins	Steroids
1.	*Alstoniascholaris* L.	-	-	-	-	-	+
2.	*Oxalis corniculata* L.	-	+	-	-	-	-
3.	*Vitexnegundo* L.	-	+	+	-	-	+
4.	*Polyalthialongifolia* (Sonn)	+	-	-	-	-	+
5.	*Terminalia catappa* Linn.	-	+	+	-	+	+
6.	*Sizygiumcuminum* L.	+	+	+	-	-	+
7.	*Achyranthisaspera* L.	+	+	+	+	-	+
8.	*Murrayakoenighii* L.	+	+	+	+	-	+
9.	*Wedelleawallichi* L.	-	-	-	+	-	+
10.	*Lantana camara* L.	-	+	+	-	-	+
11.	*Ficusreligiosa* L.	+	+	+	-	-	-
12.	*Cassia fistula* L.	-	+	+	-	-	-
13.	*Vernoniacinerea* L.	+	-	-	-	-	+
14.	*Tinospora cardifolia* (Willd.) Miers.	+	-	-	-	-	+
15.	*Catharanthusroseus* L.	+	+	+	-	+	+

(+ = Present and - = Absent)

Terpenoids are found in 8 plants and Tannins are found in 10 plants out of 15 selected plants. Terpenoids and tannins are mostly used foranti-inflammatory and analgesic activities. Tannins contribute property of astringency i.e faster the healing of wounds and inflamed mucous membrane also inhibited the growth of many bacteria and fungi, viruses and yeast[13 – 14]. Saponins are present in 9 plants out of 15 plants. Saponins have industrial uses as serface active and foaming agent also use in detergent and pesticides and it have many helpfull health effects. Anthocyanins are present in 3plants out of 15 plants and it is use against bacterial and viral infections also it increases the immunity.Leucoanthocyanins are found in only 2 plants out of 15 plants. Steroids are found in 12 plants out of 15 medicinal plants. Steroids are mostly use in pharmaceuticals as aphrodisiac. In most of the plants Terpenoids, tannins, saponins and Steroids are found in the present study.
The presence ofveriuos bioactive compounds shows the medicinal value of those plants.The antioxidants,antibacterial and antifungal properties of various plant extracts have increasing interest in both research and the food industry as they are better than the synthetic components.
The traditional medicinal knowledge is restricted to only few communities so that the phytochemical screenings of medicinal plants are very important in identifying novel sources of therapeutic phytomedicines and industrially important compounds also use in nutraceuticals and pharmaceutical industries.

Conclusions

The plants which are rich source of secondary metabolites are the medicinal plants are widely used in traditional medicine as phytomedicines to cure various ailments. The different extracts of leaves of medicinal plants contained many bioactive chemical constituents including Terpinoides, Tannins, Saponins, Anthocyanins, Leucoanthocyanins and Steroids. The anti-inflammatory, antimicrobial effects can be attributed to the high steroids, tannins, terpenoids, and saponins and present in medicinal plants. It has been used as aphrodisiac, liver tonic, neuroprotecter, astringent, and to treat bronchitis, ulcers, asthma, and insomnia.
While medicinal plants are used in Ayurvedic medicine form ancient time, more clinical and laboratory trials should be conducted to help and support its therapeutic use,which provide strong evidences in search of novel phytomedicines.

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Cestodes Infection In Species *Mastacembelus armatus.*(Histopathological Study) From Nilona Dam, Yavatmal District, M. S.(INDIA)

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Abstract

*The present paper is discussion on histopathological study of cestode infection in species **Mastacembelus armatus** from Nilona Dam, Yavatmal District, M. S. India .Nilona Dam is situated in Akola Bazar road, Sawargaon, Yavatmal, District, Maharashtra 445002. The size of the area is about 5.99 square kilometer. The fish **Mastacembelus armatus** [Lecepede, 1800] Examined for gastrointestinal Ptychobothridian cestode parasitic infections. The histopathological study of the fish tissues shows huge damages caused by the tapeworm .loss of host include destruction and extrusion of the intestinal villi, fibroblast cell and plasma cell. Farther observation shows in T.S. of intestinal tissue showed that cestodes attached to mucosal, sub-mucosal and muscularis mucosa of intestine with scolex and damaged host intestinal villi, invaded deep forming cyst. Cestode Parasite derives nutritive material, required for growth, from host tissue by causing damage to it. Tape worm have also been found to infect many other freshwater fishes and cause pathological effects on the host as irritation, injury or atrophy of tissues and occlusions of alimentary canal, blood vessels or other ducts. Hence author has been needed to study on parasitism.*

***Keywords**: - Histopathology, Mastacembelus armatus, Nilona Dam, Tape worm, Parasitism.*

Introduction

Fishes are playing an important role in nation's economy. As a nutritional point of view, fishes give high content of proteins to us, it said to be Gold in water, earlier study the pathogenicity of cestode adjacent various order described by (Rees, G. in 1967) study of host parasite relationship described in fishes (Mcvicar 1972) Acanthobothrium, Phllobothrium, Echinobothrium, (Murlidhar and Shinde 1987) observed histopathology of ***Acanthobothrium uncinathum*** from the fish ***Rhynchobatus ajeddensis*** (Borucinska and Caira, 1993) Subsequently described the histopathogenicity of two adult Trypanorhynchs from the muscosa of the nurse shark. Never the less quit of few reports on the pathogenicity of cestode on fishes are available i.e. (Sinde1970, Bylund 1972).

The present research work deals with the study of histopathology of Ptychobothridian cestode *Circumoncobothrium chandrabhagae* n.sp. Intestinal tape worm of host ***Mastacembelus armatus.*** Parasites affect the productivity of the fish in the systems through mortalities, by decreasing growth rate, reducing the quality of the flesh and making the hosts more susceptible to more pathogens. It is concluded that the ***Circumoncobothrium chandrabhagae*** **n.sp.** Cestode contact with host tissue and utilize the nutritive material to the favorable for its nourishment and growth from the host tissue and make host weak affecting the growth of host causing damage to intestinal tissue of host.

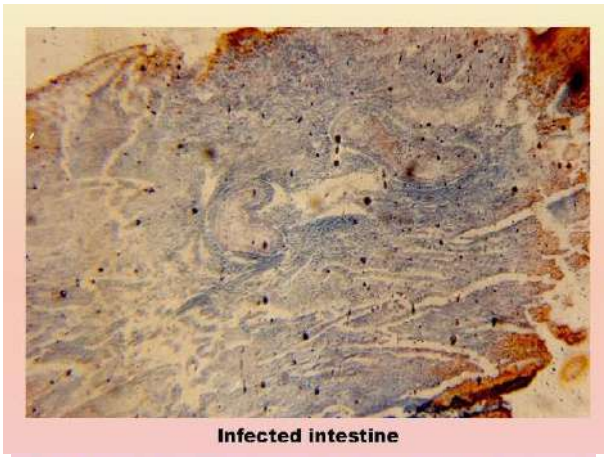
Material And Methods

The histopathological study, ***Mastacembelus armatus*** of freshwater fishes were collected from local fisherman of Nilona Dam, Yavatmal District. M. S. India. These fishes were brought to the laboratory, dissected out the intestine, examined for the cestode infections. Some fishes were found to be infected whereas few were not. Both infected and normal hosts intestine were cut and fixed in **Bouin's fluid** to study histopathological changes. The fixative inhibits the post mortem changes of the tissues. Then tissues were washed, dehydrated through alcoholic grades, cleared in **xylene** and embedded in **paraffin wax** (58-62°C). The blocks were cut at **7µ** and slides were stained in Eosin and **Haematoxylin** double staining method. Best slides or sections were selected and observed under the microscope for histopathological study. The photomicrographs were taken with the help of camera. These slides were identified by using keys "Systema Helminthum" (Yamaguti, 1956[8]).

Results And Discussion

After histopathological observational study indicate that some of the intestines were found to be infected with cestode parasite. The (Photograph - A) Shows the healthy intestine, in which villi and all layers are clearly observed, While in (Photograph - B) Infected intestine shows that the worm attached to the mucosal layer of intestine and slowly invades to the deeper layers of the host tissue.

A **B**



The tape worm ***Circumoncobothrium chandrabhagae*** **n. sp**. is having

1] Scolex large, triangular.
2] Hooks 26-30 in numbers, arranged in single circle.
3] Neck absent.
4] Mature Segment broader than long, with slightly convex margin
5]Testes 120-130 in numbers, Oval in shape, unevenly distributed.
6] Ovary distinctly bilobed transversely placed at posterior margin of the segment.
7] Vitellaria follicular, small, oval in shape, arranged in two rows on each lateral side of the segment.
Host:- *Mastacemballus armatus* (Lacepede, 1800)
n.sp *C. chandrabhagae* n.sp.

Conclusion:-

The present research work deals with the study of histopathology of Ptychobothridian cestode ***Circumoncobothrium chandrabhagae*** n .sp. Intestinal tape worm of host ***Mastacembelus armatus.*** Parasites affect the productivity of the fish in the systems through mortalities, by decreasing growth rate, reducing the quality of the flesh and making the hosts more susceptible to more pathogens. It is concluded that the ***Circumoncobothrium chandrabhagae*** **n.sp.** Cestode contact with host tissue and utilize the nutritive material to the favorable for its nourishment and growth from the host tissue and make host weak affecting the growth of host causing damage to intestinal tissue of host.

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Spider Fauna from the Cotton Fields of Vitala Village Near Wardha River Pulgaon, India

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Introduction;-

In a faunistical investigation in the Indian cotton fields, the most abundant species were belonged to Clubionidae, Lycosidae, Theridiidae, Thomisidae, Heteropodidae, Araneidae, Oxyopidae and Filistatidae families too. The most population of spiders was in September and October. They were one of the important predators in these fields and they play an important role in cotton pest's control.

Before attempting to assess the role of spiders in suppressing pest populations in a given agricultural situation, there must be available sufficient information on their taxonomic diversity and abundance habitat preferences in space and time, hunting strategy, body size of species, predators and prey items and the rate of their consumption, and reproduction. Information on these aspects is essential for the formulations of ecological concepts and conclusions (Berry, 1970; Horner & Starks, 1972).

Because of their high abundance and predominantly insectivorous feeding habits, spiders are suspected to play an important predatory role in agroecosystems, woodlands, and other terrestrial ecosystems (Nyffeler and Benz, 1987; Nyffeler, 2000a,b). They are one of the major groups of generalist predators that are needed in the development of efficient, sustainable, low- input agricultural systems (Ekschmitt et al., 1997).

The population densities and species abundance of spider communities in agricultural fields can be as high as in natural ecosystems. Spiders are important predators of pests on cotton, rice, apple, banana, citrus, soybean, and various other crops and plantations. The use of spiders as biological control agents depends mainly on the conservation and increases in numbers through the use of agricultural practices such as selective spraying rather than on mass rearing and release. The extent, to which spiders can contribute to agricultural pest control, is however limited by the disruptive effect of insecticide applications. The selective use of pesticides to prevent elimination of natural enemies; restricting insecticide usage during crucial periods in the life cycle of the pest; limiting spray application to midday when spiders are less active and shelter; application of pesticides as spot treatments to permit spiders to recolonize in treated areas immediately are important to conserve the predator spiders.

Materials and Methods: Study Area:

In the district Wardha, a village Pulgaon is located at 20°43′34″N to 78°19′01″E at an elevation of 935 ft. A village Pulgaon is well associated with many small villages with dry deciduous forest area. A Pulgaon is well known for the Wardha River which passes through the Pulgaon village and provide suitable environment for the cotton based agricultural field. Vitala village is one of the nearer villege from pulgaon with abundant number of Spiders.

Study Period, sampling and identification

The current study was carried out for a period of eight months from August 2018 to March 2019. Sampling was conducted in six months at the randomly selected cotton field.

Spiders were collected by various methods like insect nets, pitfall trap, visual searching, beating, sweeping, and stroking sticks. Sampling was done in each month by plotting the quadrates method i.e. (1sq. m × 1sq.). Attempts were made to carefully scan the leaf litter surface, tree bark, foliage (Including the under – surface of leaves when traces of webs were found) twigs, and branches of the vegetation (up to 1.5m height) along the transect. Specimens from each quadrate were preserved in 75% alcohol in the field and observed under a stereozoom microscope in the laboratory.

Methodology:

To document spider diversity of agriculture ecosystem:

The detailed descriptions of the collection techniques are as follows.

1) Pitfall Trapping -- Pitfalls will be used to trap the ground dwelling spiders. The pitfall traps consists of a 9 cm wide by 10 cm deep plastic jar, one-third filled with 30% ethyl acetate and a few drops of liquid soap/detergent. The pitfall traps will be left open for a period of one week, as this allows maintaining the spider specimens in good condition before processing in the laboratory for their identification.
2) Visual Observation – This method of sampling is used to collect the spiders by visual observation.
3) Ground Hand Collecting – Ground Hand collection involves the collection of spider samples from ground to knee level. This method of sampling is used to collect the spiders, which are found to be visible in the ground, litter, in broken logs, rocks etc.

4) Aerial Hand Collecting – Aerial Hand collection involves the collection of spiders samples from knee level to arm length level. This method accesses web-building and free-living spiders on the foliage and stems of living or dead shrubs, high herbs, tree trunks etc.
5) By visual observation of small webs
6) Preservation and Identification of specimens - Collected adult mature specimens will be photographed, analyzed and then will be transferred to 70% alcohol. All adult specimens will be identified at family, genus and species level. Species will be distinguished by examination of external genitalia. Sexes will be matched by colour pattern and somatic features. Identification will be done on the basis of morphometric characters of various body parts.

Results And Discussion

Collected data representing 10 families, 31 genera and 60 species were recorded from agricultural lands adjoining to the Wardha river. Family Araneidae and Thomisidae forms the dominant group (Table 1). i.e. 17 species in both families with 8 and 6 genera respectively. The large number of Thomisidae and Araneidae species found in this region is due to the availability of flowering plants with the deep vegetation at the border of agricultural and forest area. The Saltisidae represent 12 species and 7 genera. Lycosidae and Tetragnathidae also found in decreasing species number which is due to their specific habitation. The analysis of guild structure (Uetz, et al.,1999) revealed six feeding guilds i.e. orb web weavers, Foliage hunters, Sheet web weavers, Ground runners, Stalkers and Ambushers (Table 1). Orb web weavers constituted the dominant feeding guild representing 33% of the total collection. Stalkers and ground runners represent 20% and 17% respectively.
This study brought out the fact that agricultural fields adjoin to the forest has the potential to maintain the richness of spider diversity in the agricultural fields. This rich diversity of spiders indicate useful indicator for the species richness related to agro-ecosystem (Noss, 1990).

SR. NO.	FAMILY	NUMBER OF GENERA	NUMBER OF SPECIES	GUILD	HABITAT
1	Aranaidae	08	15	Orb web weavers	**Tropical forest, foliage, dry forests, ground.**
2	Clubionidae	01	02	Foliage hunters	**Under stones**
3	Eresidae	01	02	Sheet web weaver	**Tree trunk**
4	Gnaphosidae	03	03	Ground runners	**Stones**
5	Hersiliidae	01	01	Foliage hunters	**Under stones**
6	Lycosidae	04	04	Ground runners	**Dunes**
7	Miturgidae	01	01	Foliage hunters	**Foliage**
8	Oxyopidae	1	6	Stalkers	**-Grass land**
9	Saltisidae	7	10	Stalkers	**Tropical forest**
10	Tetragnathidae	2	5	Orb web weavers	**Low**
11	**Thomisidae**	**2**	**11**	**Ambushers**	**Forest grass, Flowering plants**

Table 1. Total number of families, genera and species of spiders with their guild and habitat collected from agriculture lands of Pulgaon, Maharashtra-India.

Family	Genus/ Species
Araneidae	***Aranus mitifica*- male** ***Aranus cucurbitinus*- female** ***Argiope pradhani*-female *Argiope aemula* -Female** ***Cyclosa hexatubulata*- female *Cyclosa mooduesis*-female *Cyclosa spirifera* -Female *Cyclosa insulana* -Male *Cryptophora citricola*-female *Leucange decorate*-female *Neoscona theis*-female *Neoscona excelsus*-male *Neoscona mukergai*-male *Neoscona rumpfi*- Female *Neoscona nautica* –Male** ***Poltys nagpurensis* -Tikader *Female Zygeilla indica*-female**
Clubionidae	***Clubiona drassodes* Cambridge male**

Eresidae **Gnaphosidae**	***Clubiona tikaderi* female *Callilepis rukminiae* female *Stegodyphus sangivani*- female** ***Stegodyphus mirandus*- Pocock Female** ***Gnaphosa pauriensis* Tikader female**
	***Megamyrmecion ashae* Tikader female *Zelotes chandosiensis* Tikader female *Zelotes mandlaensis* Tikader female**

Table 2. Checklist of spiders collected from agriculture lands of Vitala, Maharashtra-India

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Gymnanthemum amygdalinum (Delile) Sch. Bip. ex Walp (Asteraceae): A new distributional record to Adilabad District of Telangana state, India.

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Abstract

The present paper deals with an addition of new taxa of flowering plant to the Adilabad District of Telangana State. Updated information on nomenclature, correct description and locality is provided. This is a new distributional record for this area.

Key Words:*Gymnanthemum amygdalinum Asteraceae, new distributional record, Adilabad District, Telangana.*

Introduction

The genus *Gymnanthemum* was described by Cassini in 1817 and was transferred to *Vernonia* by Candolle in 1836. Many of the taxonomists *viz*., Bentham (1873), C.B.Clarke (1876), Hook.f. (1881) and Gamble (1921) followed the Candolle treatment since 1986. Later, Robinson and Kahn (1986) and Robinson (1999) resurrected the genus based on the studies of pollen grains, chromosome numbers and chemical compounds. At present the genus is distributed in sub-Saharan Africa, Madagascar, Southern Asia with more than 43 species (Robinson & Funk 2014). Of which 2 species *viz*., *G. extensum* (Wall. ex DC.) Steetz and *G. pectiniforme* (DC.) H. Rob. are distributed in India.

Materials and Methods

During the floristic survey of Adilabad district, collection of an interesting specimen belonging to the family Asteraceae has been collected while going through the cross examination with the other species of *Gymnanthemum,* the specimen identified as *G. amygdalinum*. Scrutiny of literatures revealed that this species has been so far reported from Bihar, Madhya Pradesh, Odisha and West Bengal of North India, **Bhattacharjee *et al.* 2013**, from Warangal district of South India, **Swamy. *et al.* 2015** and **Apurba Kumar Das and C. Sivaperuman,2020.** The critical revise of this specimen and pertinent literatures **(Santapau, 1948, Pullaiah *et al*., 1992;** Martínez's**, 1993; Pullaiah and Chennaiah, 1997; Almeida, 1998; Reddy *et. al*., 2001, Singh & Karthikeyan ,2001, Singh *et. al*., 2001; Raju *et. al*., 2007,**) exposed that the identity of the specimen as *G. amygdalinum.*

The authors concluded it as *Gymnanthemum amygdalinum* which has reports new distributional record for the Adilabad district of Telangana State.

A concise taxonomical description along with phenology, distribution, nomenclature and photographs are provided here. The processed specimen (Voucher No. 289) of the plant is deposited in the Department of Botany, Baliram Patil Arts, Commerce and Science College, Kinwat, Nanded District, Maharashtra, India.

Result and discussion

Taxonomic Description:

The genus *Gymnanthemum* comprises 49 species in the world, genus is commonly distributed in tropical Africa, America, and tropical Asia. In mainland India, the genus is represented by three species *G. extensum* (Wall. ex DC.) Steetz, G. pectiniforme (DC.) H. Rob.

Gymnanthemum amygdalinum(Delile) Sch. Bip. ex Walp., Repert. Bot. Syst. (Walpers) 2: 948. 1843. *Vernonia amygdalina* Delile, Cent. Pl. Afr. Voy. Meroe: 41. 1826; Bhattacharjee *et al.*, Zoo's Print 28(5): 18. 2013. *Keringa amygdalina* (Delile) Raf. Sylva Tellur. 144. 1838. **(Figure-1).**

Large shrubs or small trees to 3-5 m high; branches terete, densely glandular pubescent. Leaves alternate, elliptic, elliptic-lanceolate, ovate, obovate, higly variable, 5-20 x 2-6 cm, cuneately attenuate at base, acuminate, mucronulate rarely obtuse at apex, serrate or entire along margins, adaxial surface dark green when

dry, sparsely puberulent; abaxial surface pale green, glandular, densely puberulent and hairy along veins; lateral veins 5-15 pairs, slightly curved; petioles up to 4.5 cm long, densely puberulent. Inflorescence terminal corymbose panicles, 20 x 15 cm; peduncles densely puberulent and glandular. Heads homogamous, many, 13 x 11 mm; bracteoles 1 or 2, densely puberulent. Involucre campanulate, 6-7 x 6 mm; phyllaries imbricate, 5-seriate, yellowish green with purple tip, concave, 1.2-4 x 0.6-1.2 mm, outer most very short, the inner ones longest, elliptic-oblong, obtuse or rounded at apex, hairy along margins, puberulent above, glabrous- puberulent beneath. Receptacle 2 x 2 mm, flat, foveolate, brown. Florets 16-17 in each capitulum, up to 2 cm long. Corolla creamy-white, 7- 8.5 x 1-1.2 mm, tubular, 5-lobed; lobes 3 x 0.8 mm, rounded at apex. Stamens 5, 5 mm long; filaments glabrous, 2 mm long; anthers 3 x 0.2 mm, sagittate at base, rounded to subacute at apex. Gynoecium 10.5 mm long; ovary 1.5-1.8 x 0.2-0.4 mm, hairy; style 5 mm long, glabrous at base, hairy at apex; stigma subulate, unequal, 3-3.5 mm long, hairy. Achenes 3 mm long, oblong, slightly cuneate at base, 10-ribbed, glandular between the ribs, numerous spreading hairs on the ribs; pappus in 2-series of bristles, white, persistent, outer ones few, *c*. 2 mm long, inner ones *c*. 7 mm long.

Figure No.1*Gymnanthemum amygdalinum.* Habit.,Flowering twigs and Inflorescence.

Flowering & Fruiting: November-April.
Specimens Examined: Old housing board colony, Adilabad District, Telangana State, India.
G.P.S.Location: N "19039'54.91836", E 78031'54.45948"
Collected by: E. Srinivas Reddy and S. R. Shinde on dated 15 December 2020.(Voucher No. 289).
Ethnomedicinal Uses
Two spoons of leaf powder in one glass of milk orally taken for the treatment of diabetes.
The plant is traditionally used in the treatment of diabetes in Africa (Atangwho *et al*. 2012). The plant is also used by the traditional medical practitioners to cure malaria, helminth, laxative, digestion, wounds, appetizer and febrifuge (Ijeh & Ejike 2011).

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Investigation on study of wild relatives of grasses and their importance for grazing habitat of wild Herbivores in Tadoba Andhari Tiger Reserve Maharashtra State

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Abstract:

Wild Relatives of grasses are naturally distributed in the grasslands of TadobaAndhari Tiger Reserve, the wild relatives are the parental genera of cultivated crops, the diversity of wild relatives of grasses variable with the change in soil texture and soil ecology , soil physical properties. The important wild relatives of grasses reported fromTadobaAndhari Tiger Reserve are Setariapumilla , Setariaitalica , Sorghum halpens , Panicumscorbiculatum , Oryzaruphipogon , Elusineindica , Panicummilliaceum , Paspalumcanare , Panicumnotatum , PaspalumPaspalodes , Panicumsumatrense , Saccharumspontanium , Sorghum contraversum , Sorghum deccanense , Urochloapanicoides.wild relatives of grasses identification and conservation by seeds collection and enrichment useful to maintain composition of grasslands in Protected Areas. Wild relatives of grasses are nutritive and having good forage value with reference to grazing habitat of wild herbivores and play vital role in grasslands management.

Key Words: *Wild relatives of grasses ,TadobaAndhari Tiger Reserve , grasslands Management and conserve diversity of wild relatives.*

Introduction:

Grasses are one of the largest and most valuable groups of flowering plants, consisting of 610 genera and 10,000 species (Cope, 1982). Clayton and Renvoize (1986) put the total number of grasses in the world about 10,000 species, 651 genera were recognized and assigned numbers indicating their phylogenic status based upon various evidences. It ranks third in number of genera after the Compositeae and Orchidaceae and fifth in number of species after the Compositeae, Orchidaceae, Leguminoseae and Rubiaceae (Good, 1953). Grasses are widespread than any other family of flowering plants. The great adaptability of different species has enabled them to thrive under the most varied conditions. They form the climax vegetation of the semiarid prairies of the American continent, the steppes of Asia and the savannas of Africa. Grasses exceed all other in the importance of its products. It provides food in the form of cereals for man and forage for most animals. Many species of native and introduced grasses are utilized in improved pastures (Salter, 1952).

A grass is taxonomically defined as any species within the large family (Gramineae or Poaceae) of monocotyledonous plants having narrow leaves, hollow stems, and clusters of very small, usually wind-pollinated flowers. Grasses include many varieties of plants grown for food, fodder, and ground cover (Grass 2014). Grasses are often confused with sedges (Cyperaceae family) and reeds (Restionaceae family. However, sedges do not have a leaf sheath and their leaves are attached directly to the culm—a diagram of grass anatomy is provided in Appendix C. The culms of sedges are also angular, while grass culms are circular. The grass family is the fifth largest plant family on earth with over 700 genera and 9700 species. About ten percent of the grass species worldwide can be found in southern and tropical Africa; the major genera of which are Eragrostis, Pentaschistis, Panicum, Sporobolus, Aristida, Digitaria, Stipagrotis, Setaria, Brachiaria, and Hyparrhenia (Van Oudtshoorn 2009).

Almost all animal species and food chains depend on grass because grass occurs across the world and is almost always edible. The groups of animals that depend most directly on grass for food are birds, insects, rodents, and grazers. There are many bird species, such as Quelea finches, the most common bird on earth with a population of over 1.5 billion in Africa alone, that solely eat grass seeds. Grass provides the only food source for seed-eating birds, and the birds play an integral role in seed dispersal. Insects use grass for both food and shelter. Disruption of these grassland ecosystems can cause a dangerous under or overabundance of insect species. Rodents consume grass seeds or the base of the plant where the most nutrients are stored. Grazers have the largest impact on grasslands and typically graze in large herds which makes spatially expansive impact.. Grazers remove old plant material, stimulate new growth, and provide nutrients in the form of manure. Although predators and decomposers are also ultimately dependent on grass species, it is primary consumers- specifically herbivores- that have the biggest causal relationship with grass species. Herbivores and grass species composition are highly interdependent.

Evaluating a Grassland There are four main measures to evaluate a grassland: grazing value, ecological indicator status, succession stage, and perenniality. Several factors that can help conservation managers determine whether their area is providing valuable grazing material. By identifying grass species in the area, grazing value can be determined. Grazing value is defined as the quality and quantity of material from an individual available for grazing (Van Oudtshoorn 2009).

Grasses inhabit the earth in greater abundance than any other comparable group of plants. Some are adapted to warm, humid and tropical climate while others are established in the polar regions, where the growing season is two months or less and direct sunlight is absent for many months of the year. Some are important elements of marsh and swamp vegetation, and other inhabit desert regions where the annual precipitation is 5 inches or less. Even before the time of recorded history, the grains of grasses provided a staple food supply or the human race (Gould, 1968). The members of this group are present in all the conceivable habitats, suitable for growth of plant communities (Mitra and Mukherjee, 2005). Grasses are used as forage for domesticated, wild animals and soil conservation (Gould, 1968).

TadobaAndhari Tiger Reserve Forest Diversity :

"Tadoba" is taken from the name of the god "Tadoba" or "Taru", worshipped by the tribes who live in the dense forests of the Tadoba and Andhari region, while "Andhari" refers to the Andhari river that meanders through the forest.

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.Tadoba National Park and Andhari wildlife sanctuary together form the Tadoba-Andhari Tiger Reserve. The total area of the Tadoba-Andhari tiger reserve is about 1,727 km^2.

Tadoba National Park was established in the year of 1955. Total area of the park is 116.55 Km^2.The Andhari Wildlife Sanctuary was formed in the year 1986. Total area of the Andhari Wildlife Sanctuary is 508.85 Km^2.

Total core area of the tiger reserve is 625.40 Km^2. Total buffer area of the tiger reserve is 1101.60 Km^2. The reserve also includes 32.51 Km2 of protected forest and 14.93 Km2 of other areas.
The monsoon season begins in June; the area receives heavy rainfall during this season (approx.1275 mm) and humidity around 66-70%.

TadobaAndhari TigerReserve is a predominantly southern tropical dry deciduous forest with dense woodlands comprising about eighty seven per cent of the protected area. Teak is the predominant tree species. Other deciduous trees found in this area include ain (crocodilebark), bija, dhauda, salai, semal and tendu. Beheda, hirda, karayagum, mahuamadhuca (cr epe myrtle), palas (flame-of-the-forest, Buteamonosperma) and Lanneacoromandelica (wodier tree). Axlewood (Anogeissuslatifolia, a fire-resistant species), black plum and arjun are some of the other tropical trees that grow in this reserve.

Aside from the keystone species, the Bengal tiger, Tadoba Tiger Reserve is home to ther mammals,including: Indianleopards,sloth bears, gaur, nilgai, dhole, striped hyena, small Indian civet, jungle cats , sambar,barking deer, chital, chausingha and honey badger . Tadoba lake sustains the marsh crocodile,which was once common. Indian star tortoise, Indian cobra and Russel's viper also live in Tadoba.The lake contains a wide variety of water birds, and raptors. 195 species of birds have been recorded, including three endangered species. The grey-headed fish eagle, the crested serpent eagle, and the changeable hawk-eagle are some of the raptors seen in the park.

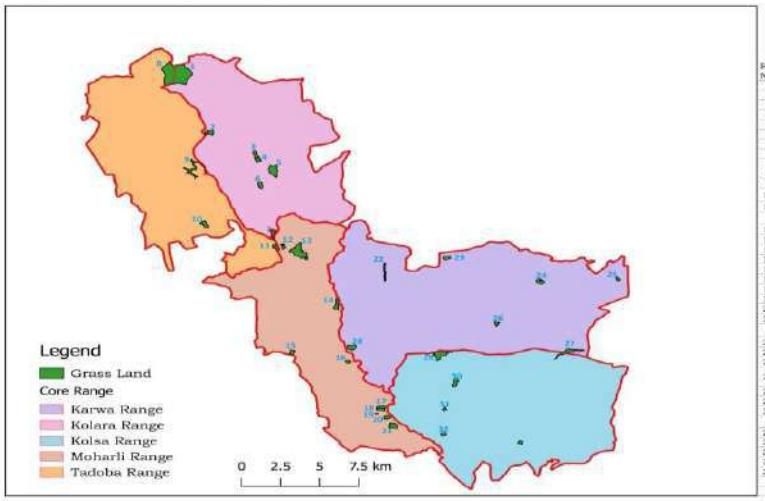
Poaceae is the one of the largest family among the monocotyledons in the world .The grass vegetation broadly divided into two types depending upon their life-span, Ephemeral vegetation consisting mainly of the grasses that complete the life cycle during rainy season or after rainy season. Grasses autumn or long lived vegetation with species that grow with the rains but complete their life-cycle after rains. The species like *Arthraxonlancifolius ,Arundenellapumila, Sporoboluscoromondelianus , Digitariaternata,* are the chief components of farmers category. On the conterary the species like *Heteropogoncontortus ,Andorpogonpumulus , Chrysopogonfulvus , Dicanthiumcaricosum , Setariaforbesiana , Pennisitumhohenackeri* which form the autumn vegetation are either perennial vegetation forming large tufts.

Tadoba-Andhari National Park/Coordinates 20.2484° N, 79.3607° E

Sr. No.	Name of grassland	Area in Hectares
	Kolara Range grasslands	
1	**Navegaon part 1 (Rehabilated Site)**	235 Hectare
2	Kosekanar	10 Hectare
3	Pandharpauni	30 Hectare

4	Jamni**(Rehabilated Site)**	47 Hectare
5	Samadhi	08 Hectare
6	Rampur	12 Hactre
7	Saradh	10 Hectare
	Tadoba Range Grasslands	
1	Navegaon part 2	40 Hectare
2	Tadoba beat Comp. No. 90	33 Hectare
3	Khatoda	10 Hectare
	Mohrli Range Grasslands	
1	Palasgaon (**Rehabilated Site**)	95 Hectare
2	Girghat	58 Hectare
3	Astkoni Com. No. 146	20 Hectare
	Karwa Range	
1	Sukdobodi	10 Hectare
	Kolsa Range Grasslands	
1	Botezari	41 Hectare
2	Kohapari	11 Hectare
	Doni	65 Hectare
	Kolsa (**Rehabilitated village**)	150 Hectare

Map Showing Campa Work Year 2020- 21 in TATR Core area



Sl. No.	Grass Land Name	Area	Actual work done
1	Navegaon Grass Land	235 Ha.	235 Ha.
2	Pandharpauni G. Land	30 Ha.	30 Ha.
3	Saradh Grass Land	10 Ha.	10 Ha.
4	Samadhi Grass Land	8 Ha.	8 Ha.
5	Jamni Grass Land	47 Ha.	47 Ha.
6	Rampur Grass Land	12 Ha.	12 Ha.
7	Kaschmar Grass Land	10 Ha.	10 Ha.
	Kolara Range- Total	**352 Ha.**	**352 Ha.**
8	Navegaon Grass Land Part- 2	40 Ha.	34 Ha.
9	Tadoba beat C.No. 90	33 Ha.	33 Ha.
10	Ghosari Beat C.No. 114	17 Ha.	17 Ha.
11	Khatoda Grass Land	10 Ha.	10 Ha.
	Tadoba Range- Total	**100 Ha.**	**94 Ha.**
12	Palsgaon C. No. 128	10 Ha.	10 Ha.
13	Palasgaon Grass Land	85 Ha.	85 Ha.
14	Astkoni C. No. 146	20 Ha.	20 Ha.
15	Andhari C.No. 150	10 Ha.	10 Ha.
16	Andhari C. No. 151	7 Ha.	7 Ha.
17	Girghat C.No. 157	13 Ha.	13 Ha.
18	Girghat C. No. 157	11 Ha.	11 Ha.
19	Girghat C.No.158	2 Ha.	2 Ha.
20	Girghat C.No.158	12 Ha.	12 Ha.
21	Girghat C.No.158	20 Ha.	20 Ha.
	Moharli Range- Total	**190 Ha.**	**190 Ha.**
22	Karwa-II C.No. 251	10 Ha.	
23	Amanlgaon C.No. 254	10 Ha.	
24	Piparheti-II C.No. 260	15 Ha.	
25	Pandharwani C.No. 267	5 Ha.	32 Ha.
26	Ramtalidhi-I C.No.284	7 Ha.	
27	Sukadi Bodi G. Land	10 Ha.	
28	Zingonal-I C. No. 299	20 Ha.	
	Karwa Range- Total	**146 Ha.**	**32 Ha.**
29	Botezari Grass Land	41 Ha.	
30	Kohapari C.No.311	11 Ha.	
31	Pulsari Lelec G. Land	5 Ha.	32.50 Ha.
32	Panghat Hut Road	6 Ha.	
33	Belan Square C.No.342	6 Ha.	
	Kolsa Range- Total	**69 Ha.**	**32.50 Ha.**
	Grand - Total	**857 Ha.**	**700.5 Ha.**

Objectives :

- Identification and Enumeration of Wild Relatives grasses plants.
- To identify the wild grasses plants from open grasslands with the help of morphological study by using regional floras.
- Exploration of plants from forest areas.
- To determine diversity of wild grass plants and its ecological significance in forest ecosystem.
- Floral association in grassland ecosystem and its role in forest Ecology.
- Phenological study of the wild grasses plants.
- Conservation and propagation of plants.
- In-situ conservation of plants , seed collection and enrichment in grasslands
- Ecological and morphological study of plants

Methodology

- To select the sites /area for the study of wild grasses plants present in forest and grasslands ecosystem of Madhya Pradesh State.
- To arrange the regular field visits in three different seasons of the year, Rainy season , Winter season and Summer season.
- To observe the open grassland with special reference to phytosociology .
- G.P. S. study of grasses plants of Madhya Pradesh.
- Grasses distribution and their ecological and environmental study.

- Ecological significance of grasses in forest ecosystem.
- To prepare the photographic album of wild grasses plants.

Recognising the morphology of plant species

By using regional, local and national floras, the data from the herbarium specimens, the accounts on morphological details, diagnostic characters and range of variation studied. The grasses plants are observed at different stages vegetative and reproductive stages of the plants. The roots are observed from morphological point of view , to study the role of grasses in forest ecology and to modify the texture of soil. Observation of morphological characters under dissecting microscopes and magnifying lens. Study of root, stem , leaf and flowers morphology of the plants in specific season. Identification of grasses plants by using regional floras or national floras. To take the GPS coordinates of the plants at the different sites.

Their identity requires a skill in systematic botany. This is perhaps the reason why wild relatives are meagrely represented in the germplasm collections. The wild relatives of crop plants by and large, occur as component of disturbed habitats within the major vegetation types. The information on their occurrence is available from different herbaria floristic accounts, floras, etc

Use of herbaria

Herbaria with large collections of plant genetic resources including wild relatives of grasses assist the explorers in having an idea about the species diversity of a region. Herbarium field notes and associated data such as root , stem , leaf , flowers , fruits morphology and ecological characters with GPS coordinates seed maturity of wild relatives from the locality of collection help in planning the duration of exploration. Since the herbarium specimens are generally collected during flowering, this information can be considered to be optimal for seed collection.

Collection and Conservation of plants

Observations and collection of plants before approaching for the field collection directly. On spot identification of target species and seed collection, drying storage and broadcasting in different grasslands for the insitu conservation purposes in forest ecosystem or new species to the collection ofvaluablegermplasm of wild species for gene bank conservation.

Collection of Wild Relatives

The collection missions are primarily aimed at tapping germplasm variability in Plant Genetic resources of different agri-horticultural Wild relatives of Grasses in the entire genepool. The germplasm is collected on the basis of priority for collection from targeted regions, and of species. The information on ecological distribution with precise location of species helps in collection of targeted gene pool

Study area : Core area grasslands of TadobaAndhari Tiger Reserve .

1. Palasgaon grassland 2. Navegaon grassland 3. Jamnigrassland 4. Pandharpauni grassland 5. Botezari grassland.

Observations:

Finger Millet (EleusineCoracana (L.) Gaertn.)

Finger millet is commonly known as Ragi . It is a staple food for many people. There are two sub species - E. africana and E. coracana. Eleusine having only one wild relative in Madhya Pradesh Eleusineindica (L.)Gaertn. E. indica is the only wild species widely occurring which is morphologically and cytologically similar to E. coracana (Krishnaswamy,1951). E. indica is of Indian origin and may be the immediate ancestor of finger millet (Mehra, 1963)

Prosomillet (Panicummilaceum L.)andLittleMillet (PanicumSumatrense Roth. ex RoemetSchult.)

Prosomillet is commonly called kodo. It is supposed to be one of the oldest grain crops and is grown extensively in India. It is a quick growing drought resistance crop. It has two sub-species psilopodium and sumatrense.It is classified as race- nana and robusta, sub races-laxa,erecta and compacta. In Madhya Pradesh, Panicum maximum Jacq., P. milare L., P. notatum Retz., P. psilopodiumTrin (related to P. milare), P. repens L., are present. Out of these species, P.psilopodium which is similar to the wild forms of P.sumatrense from which the later species might have originated (Anonymous, 1966).

Kodo Millet (Paspalumscrobiculatum L.)Kodo millet is locally called kodokutki. It has three races viz.,regularis, irregularis and variables. In Madhya Pradesh wild related species, Paspalumcanarae (Steud.) Veldk.,P. paspaloides (Michx.) are present

Foxtail Millet (Setariaitalica (L.) P. beauv)

Foxtail millet is considered to be sweet, is used as a sedative to the gravid uterus.The grain is said to possess heating properties and when taken alone sometimes causes diarrhoea. The grain is astringent, diuretic and laxative and is useful externally in rheumatism. It is a popular remedy for alleviating the pains of

parturition (Kirtikar and Basu, 1935). Foxtail millet is locally called as wild baara. It is also known as Italian millet. Cultivation of foxtail millet dated back to the third millennium BC. S. italica is not known in the wild state except as a weed which escapes from cultivation. S. italica is divided into sub species viridis and italica. S. italica is further classified into three races moharia, maxima and indica, viridis is the ancestral form of S. italica on the basis of chromosome number.

Sugarcane (Saccharumofficinarum L.)

Sugarcane is derived from the sanskrit word shakkara.This crop from the east provides a linguistic evidence of Indian origin of sugarcane. In Madhya Pradesh, many sweet based products are prepared from sugarcane. There is only one wild relative Saccharumspontaneum L. is present in TATR.

Echinochloacolona(L) Link , hort. Berol.2: 209. 1833: Blatt. &McC. Bombay Grass.148.1935; Bor, Grass.Ind.308.1960. *Panicumcolonum* L. Syst. Nat. ed. 10.2:870.1759; Hook.f.Fl.Brit.India 7:32. 1896; Cooke, Fl. Pres. Bombay 3: 447.1958 (Repr. ed.).wildnachanigrass.

Herbs, annual, decumbent- ascending; culms 40-90 cm long, rooting at base. Leaves 3-30 x 0.4-2.0 cm, linear – lanceolate, scabrid,apex acute to acuminate. Racemes spiciform, distant, 5-10, 1.5-2.0 cm long.Spikelets c 0.3 cm long ovoid; lower glume ½ as long as lower lemma, broadly ovate; upper glume cuspidate, hairy; lower lemma ovate, hairy;upper lemma polished. (Plate VI, Fig. 35)

- Palatable grass
- Flowering Season : September – November.
- Fruiting Season : December
- Ecological data : Common weed, best soil binder grass in forest.

Soil pH range required – 7.2 – 7.6

- Rainfall range : 950 mm – 1078 mm.
- Temperature range : 26 ^{o}c – 39 ^{o}c.
- Humidity required : 51 % - 67%.

EleusineGaertn. Fruct. Sem.Pl.1:7.1788

Eleusineindica(L) Gaertn. Fruct.1:8. 1789: Hook.f. Fl. Brit. India 7: 293. 1896; Cooke, Fl. Pres. Bombay 3:560.1958 (Repr.ed.); Blatt.&McC. Bombay Grass. 259. 1935; Bor,Grass. Ind. 493. 1960. *Cynosurusindicus* L. Sp.Pl.72.1753. '*Nachni'*.(WILD NACHANI)

Herbs, annual, erect, tufted c 25 cm high; culms slightly compressed. Leaved 8-12 x 0.2-0.3 cm, linear, flat.Spikes 2-7 or more, 4.0.5-5 cm long.Spikelets c 0.3 cm long, ovoid or oblong, green. Grains oblong or globose.

- Palatable grass
- Flowering Season : September – November.
- Fruiting Season : December
- Ecological data : Sporadic annual grass grows in cultivated soil.

Soil pH range required – 7.2 – 7.6

- Rainfall range : 950 mm – 1078 mm.
- Temperature range : 26 ^{o}c – 39 ^{o}c.
- Humidity required : 51 % - 67%.

Field Note – Grass of dry soil ,non palatable grass found in smaller grasslands.

ORYZA L.Sp. Pl.1:333.1753

OryzarufipogonGriff.Notul.3: 5.1851; Bor, Grass.Bur. Cey.Ind. Pak. 605.1960; Laxmi.in Sharma *et al.* (eds.), Fl. Maharashtra, Monocot. 545. 1996; 151 Moulik, Grass. Bam. India 1: 47. 1997; Naik, Fl. Marathawada 2: 1065. 1998.

Annual, culms 30-70 cm tall, tufted, terete, erect or decumbent, spongy, rooting at lower nodes, nodes glabrous.Leaf sheath 6-09 cm long, tereteorcompressed, keeled, glabrous, smooth. Ligule 15-31 mm long, membranous, Leaf blade 15-30 x 0.6-1.6 mm, flat, linear to ovate, keeled,scabrid on nervesand margins, apex acuminate. Panicles 10-22 cm long.

- Palatable
- Flowering Season : October.
- Fruiting Season : November
- Uses : Seeds edible grass.
- Ecological data : Common in marshy places.

Soil pH range required – 7.1 – 7.5

- Rainfall range : 950 mm – 1180 mm.
- Temperature range : 26 ^{o}c – 39 ^{o}c.

- Humidity required : 68 % - 71%.

PanicumantidotaleRetz. Obs. Bot. 4:17. 1786.Hook.Fl.Brit. India 7: 52. 1896; Cooke , Fl. Pres. Bombay 3:453.1958 (Repr.ed); Blatt.&McC.Bombay Grass.163.1935. Bor,Grass.Ind.322.1960.

Annual erect , diffusely branched, 1-2 mtr tall , creeping , grass. Leaves 10-40 cm long , linear – lanceolate . Panicle 15-22 cm long , Spikelets ovoid.

- Palatable
- Flowering Season : Septeber – November.
- Fruiting Season : December
- Uses : Seeds edible, Best soil binder grass.
- Ecological data : Common in marshy places.

Soil pH range required – 7.1 – 7.5

- Rainfall range : 950 mm – 1000 mm.
- Temperature range : 26 ^{o}c – 39 ^{o}c.
- Humidity required : 68 % - 71%.

Panicum maximumJacq. Ic. Pl.Rar.1:2, t. 13. 1781-86 7 Coll. Bot. 1:76.1786. Hook.Fl.Brit. India 7: 52. 1896; Cooke , Fl. Pres. Bombay 3:453. 1958 (Repr.ed); Blatt.&McC.Bombay Grass.163.1935. Bor,Grass.Ind.322.1960.

Perennial denslytufted , erect , branched, 1-2 mtr tall , grass. Leaves 10-40 cm long , linear – lanceolate . Panicle 30-55 cm long , Spikelets oblong.

- Palatable cultivated grass.
- Flowering Season : November.
- Fruiting Season : December
- Uses : Fodder grass,
- Ecological Data : Common in marshy places.

Soil pH range required – 7.1 – 7.5

- Rainfall range : 950 mm – 1000 mm.
- Temperature range : 26 ^{o}c – 39 ^{o}c.
- Humidity required : 68 % - 71%.

Saccharumspontaneum L. Mant. Alt. 2: 183. 1771. Hook. f. Fl.Brit. India 7: 118. 1896; Cooke , Fl. Pres. Bombay 3:465. 1958 (Repr.ed); Blatt.&McC.Bombay Grass.45.1935. Bor,Grass.Ind.214.1960. **Kans grass Wild relative of Sugarcane**

Perennial rhizomatous tall tufted , 1-2.5 m tall, erect grass. Leaves narrow linear , sheath smooth , ligule ovate.Panicle large , silvery , Spikes with silver hairs, spikelets sessile.

- Palatable grass.
- Flowering Season : October.
- Fruiting Season : December
- Uses : Soil binder grass
- Ecological Data : Distributed in moist, marshy soil along the bank of river.

Soil pH range required – 7.5 – 7.8

- Rainfall range : 950 mm – 1000 mm.
- Temperature range : 28^{o}c – 39 ^{o}c.
- Humidity required : 68 % - 71%.

Field Note – Grass indicator of wet soil with more water holding capacity.

Setariapumila(Poir.) R. & S. Syst. Veg. 2:481.1817; T. A. Cope in Nasir Ali, Fl. Pak.143:181. 1982. Panicumpumilum Poir.in Lam. Encycl. 4:273.1816. Setaria pallid-fusca (Schumach.)Stapf& C.E. Hubb.in Kew Bull.1930: 259.1930; Bor,Grass.Ind.363.1960.S. glauca non (L.)P.Beauv.1812;Hook.f.Fl.Brit.India 7: 78.1960; Cooke,Fl.Pres.Bombay 3: 435.1958 (Repr.ed.); Blatt.&McC.Bombay Grass.172.1935;bor,op.cit.360. 'Kolu'.

Herbs,20-60 cm high,tufted;culmsmany,spreading,ascending.Leaves 3-10 X 0.2-0.5 cm , linear. Spikes 1.5-5.0 X 0.3-0.7 cm. Spikelets 0.2-0.3 cm long, ovoid or ellipsoid, subacute;upper lemma rugose. Grains plano-convex.)

- Palatable grass
- Flowering Season : August – October
- Fruiting Season : December
- Uses : Fodder grass

- Ecological data : Soil pH range required – 7.5 – 7.8
- Rainfall range : 950 mm – 1270 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 68 % - 71%.

Field Note – Annual , palatable grass , grains are edible , grass of smaller grassland , distributed in acidic soil.

Setariaverticillata (L.) P. Beauv. Ess. Agrost.51,178.1812; Hook. f. Fl. Brit.India 7:80.1996; Cooke, Fl.Pres. Bombay 3:436 .1958 (Repr.ed.); Blatt.&McC. Bombay Grass .174.1935; Bor, Grass. Ind. 365.1960. PanicumverticillatumL.Sp.Pl.ed. 2:82.1762. (Chiktnagawat)

Annual herbs, 1m high, erect, rooting at lower nodes.Leaves 8-20 X 1.2-4.0 cm, linear or linear-lanciolate .panicals 2.5-9.5 cm long. Spikelets c 0.2 cm long, ovoid, sub acute ; upper lemma finely rugose. Grains 0.2-0.23 cm long, ellipsoid.

- Palatable grass.
- Flowering Season : August – October
- Fruiting Season : December
- Ecological data : Soil pH range required – 7.5 – 7.8
- Rainfall range : 950 mm – 1270 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 68 % - 71%.

Setariaitalica(L.) P. Beauv. Ess. Agrost.51,170,178.1812; Hook .f.Fl.Brit.India 7:78.1896; Cooke,Fl.Pres.Bombay 3:437.1958 (Repr.ed.); Blatt.&McC. Bombay Grass.175.1935;Bor,Grass.Ind.362.1960.Panicum italicum L.Sp.Pl.56.1753.

Erect annuals,60-100cm tall. Leaves 15-30 X 0.4-2.5 cm, Linear-lanceolate, minutely scaberulous on both sides and along margin.Panicles 8-12 cm long, compact.Spikelets 0.25 cm long, ellipsoid; lower glumes c 0.05 cm long, ovate,1- nerved, upper glumes c 0.15 cm long, ovate, glabrous,rounded**.**

- Palatable grass.
- Flowering Season : August – October
- Fruiting Season : December
- Ecological data : Soil pH range required – 7.5 – 7.8
- Rainfall range : 950 mm – 1270 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 68 % - 71%.

SORGHUM Moench. Methodus207.1794

Sorghum halepense (L.)*Pers.Syn.Pl.1:101.1805;Blatt.&McC.Bombay Grass.5.1953;Bor,Grass.Ind.222.1960; T.A.Cope in Nasir& Ali, Fl. Pak.143: 295.1982. Holcushalepensis L.Sp.Pl.1047.1753. Andropogonhalepensis(L.) Brot.Fl.Lusit.1:89.1804; Hook.f.Fl.Brit. India 7: 182. 1896; Cooke,Fl.Pres. Bombay 3: 502.1958 (repr.ed.).Sorghum miliaceum (Roxb.)Snowden in J. Linn.Soc. 55:207.1955; Bor, op.cit.223. S. miliaceumvar.parvispiculum Snowden,op.cit.209; Bor,op.cit. 'Boru'.(Ran Jawari)*

- Perennial, 3 m high,erect; culms simple or branched, solid.Leaves 10-45 x 1.5 cm, linear-lanceolate; sheaths striate; ligules short,membranous, ciliate.panicles 15-35 cm long,decompounds. Sessile spikelets 0.4-0.5 cm long,ovoid-lanceolate; pedicelledspikelets as long as sessile but narrower.Grainsterete,dark brown.
- *Flowering Season : August – October*
- *Fruiting Season : December*
- *Ecological Data : Soil pH range required – 7.5 – 7.8*
- *Rainfall range : 950 mm – 1270 mm.*
- *Temperature range : 26 °c – 39 °c.*
- *Humidity required : 68 % - 71%.*

Conservation of wild relatives of crops is the most important task to match the challenges of erosion of species. The existence of these wild relatives are shrinking fast due to various bio-edaphic factors and disturbed habitats. In the present rate of threat of genetic erosion, we must collect all requisite information of the wild relatives to make use of their wider adaptability/tolerance/resistance to diseases and insect-pests, yield, quality attributes and other biotic and abiotic characters. In comparison to the cultivated land races, conservation and utilization.

Wild Relatives of Grasses of TadobaAndhari Tiger Reserve

Sr. No.	Botanical Name	Common Name	Vernacular Name	Flowering Season	Fruiting Season
1	Brachiariareptans	Sawa/ sama	Ran Sama	August	Sept. –Oct.
2	Brachiariadistachya	Sama grass	Ran Sama	August	October
3	Setariaintermedia	Chikta	Ran Bajara	August	October
4	Setariaverticellata	Chikta	Ran Bajara	August	October
5	Sorghum halpens	Wild Jawar	Ban Jawar	September	November
6	Echinochloacolona	Wild sama	Ban sama	August	October
7	Elusineindica	Wild Nachani	Ban Nachani	September	November
8	Panicumsumatrense	Wild kutki	Ban Kutki	August	November
9	Panicumnotatum	Wild Kutki	Ban Kutki	September	November
10	Oryzaruphipogon	Wild Rice	Ban Dhan/ Chawal	August	November
11	PaspalumPaspalodes	Wild Kutki	Ban Kutki	kutki	October
12	Paspalumcanare	Wild kodo	Ban Kodo	August	October
13	Saccharumspontanium	Wild Sugarcane	Ganna origin	September	November
14	Setariapumilla	Wild Bajara	Ban Bajara	August	September
15	Urochloapanicoides	Wild Kutki	Ban Kutki	August	October

Diversity in Wild Relatives

- Finger Millet (*Eleusinecoracana*) – *Eleusineafricana*
- Barley (*Hordeumvulgare*) – *Hordeumarizonicum*
- Rice (*Oryzasativa*) – *Oryzarufipogon*
- Pearl Millet (*Pennisetumglaucum*) – *Pennisetumpurpureum*
- Sorghum (*Sorghum bicolor*) – *Sorghum halepense*
- Broom millet (*Panicummiliaceum*) – *Panicumfauriei*

Results and discussion :

Findings of research work in grasslands of TATR :

In the current exploration of wild relatives of grasses from the different grasslands of TadobaAndhari Tiger Reserve the genetic and species diversity is in the following manner.

Sr. No.	Name of grass genera	Number of spesies
1	*Brachiariareptans* *Brachiariadistachya*	Two species
2	*Setariaintermedia* *Setariaverticellata* *Setariapumilla*	Three species
3	*Panicumsumatrense* *Panicumnotatum*	Two species
4	*PaspalumPaspalodes* *Paspalumcanare*	Two species
5	*Urochloa*	One species
6	*Echinochloa*	One species
7	*Elusine*	One species
8	*Oryza*	One species
9	*Sorghum*	One species

In the present research study it is observed that the species diversity of wild grass genera depends upon the soil texture,moisture , humidity , water holding capacity. The composition and association of grasses also determines the wild relatives of grasses diversity. Generally it is found that the wild relatives of grasses are associated with soft palatable grasses with high percentage of fibre , ash , protein and moisture. The associates of wild relatives of grasses are :*Dicanthiumannulatum* , *Digitariastricta* , *Digitariaabludens* , *Iselimalaxum* , *Cynodondactylon* , *Ischemumindicum* .

The herbivores depend on soft palatable grasses as a primary consumers, Spotted deers , Barking deers , Chousinga , Black bucks mostly feed on soft palatable grasses which play an important role in grazing habitat of soft feeding herbivores.Grazing habitat of soft feeding herbivores associated with composition of grasslands, the grasslands are of three types ; smaller , intermediate and taller grasslands. Wild relatives of grasses shows distribution in smaller and moist grasslands.

Threats to wild relatives of grasslands are : loss of natural habitats due to soil degradation , fragmentation of grasslands , loss of soil moisture due to climate change , changes in composition of grassland , invasion of woody species in grasslands , soil microbial composition and associates which grasses i,e soil mychorhiza and microorganisms which promotes the growth of grasses.

Conservative measures for wild relatives of grasses :

Loss of habitat: Many of the accessions currently held ex situ are from regions that have undergone significant land-use change over the past 50 years. The urban expansion in South and Central America has seen forests, grasslands and savannahs replaced by urban space. The expansion of agriculture, especially in Brazil, has resulted in vast areas of natural forests and grasslands being substituted by intensive production of crops such as soybean and improved monospecific pastures. There are ~ 60 million ha of Brachiariabrizantha cv. Marandu in Brazil, which is a dangerously narrow genetic base highlighting the importance of germplasm diversity. Similarly development and population growth in many parts of Africa have resulted in expansion of cropping and overgrazing of rangelands with associated loss of biodiversity. The changes in the economies and populations across the tropics have made the TSTF germplasm already held ex situ extremely valuable (sometimes irreplaceable) and in need of a particular focus on conservation.

Conservation of wild relatives of grass genetic resources

Secure conservation is at the heart of the Centres' stewardship of their collections and depends on the application of technical practices of high standard, based on an accurate assessment and appropriate management of risks.

The adequacy of the conservation technologies in use is key to meeting the objectives of long-term conservation of genetic diversity:

- As more land is coming under intensive cultivation, much of the natural diversity of species will be lost.
- Demand for use of forage genetic resources for increasing livestock production, as well as to maintain a more sustainable agricultural system, is expected to increase.
- The further study of the conserved germplasm will allow the easier identification of genotypes with potential for livestock feed for specific environments, as well as adequate germplasm to be re-established in degraded areas and also adapted to future climate changes.
- The adequate long-term conservation of germplasm will allow the preservation of essential forage biodiversity for current and future generations as global public goods.

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Diversity Of Diatoms Inwater Reservoirs of Washim District of Maharashtra in India

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Abstract
Present paper deals with the study of members of Bacillariophyceae collected from different water reservoirsofWashim district, Maharashtra state, India viz. DevTalaw, Narayan Baba Talaw, Ekburji DamandPadmtirthTalaw. This study has shown Identification and presence of eightdifferent diatoms up to genus level. These diatoms are being reported for the first time from the study areas.
Keywords: Biodiversity, algae, diatoms, etc.

Introduction:
Diatoms (Division Bacilliarophyta), one of the largest groups of photosynthetic eukaryotic micro-organism. They occur in almost all wet/damp places with a diverse range of habitats across continents. Diatoms grow as single cells, or form simple filaments or colonies. They form the base of aquatic food webs in marine and freshwater habitats. Diatom communities respond directly to physical and chemical changes in the environment. Diatoms are a very important group of algae as they are the most common producers of organic matter in water bodies. Diatoms are used to track the effect of climate (1). They also often dominate the algal communities in many freshwater systems. During the 19th century, diatoms were studied for the first time in India by Ehrenberg [2]. Subsequent notable works were made by Skvortzow [3], Biswas [4], Krishnamurthy [5],Venkataraman [6], and Sarode and Kamat [7]. The work on Indian fresh water diatoms is still in an early stage.
The main purpose of this study was to examine the diatomdiversity

Materials And Methods:
The study area covered small four different sites viz. *DevTalaw, Narayan Baba Talaw, Ekburji Dam and PadmtirthTalaw* in Washim district in Maharashtra, India. Study area is situated at 20.099928◦N latitude and 77.13338◦E longitude, 20.099899◦N latitude and 77.133352◦E longitude, 20.048256◦N latitude and 77.1014◦E longitude and 20.107783◦N latitude and 77.126652◦E longitude, respectively. Diatom materials were collected in the month of March, 2022 and preserved in 70% ethanol.
Identification of Diatoms upto genus level were made with the help of monograph and relevant literature(8, 9, 10, 11).

DevTalaw

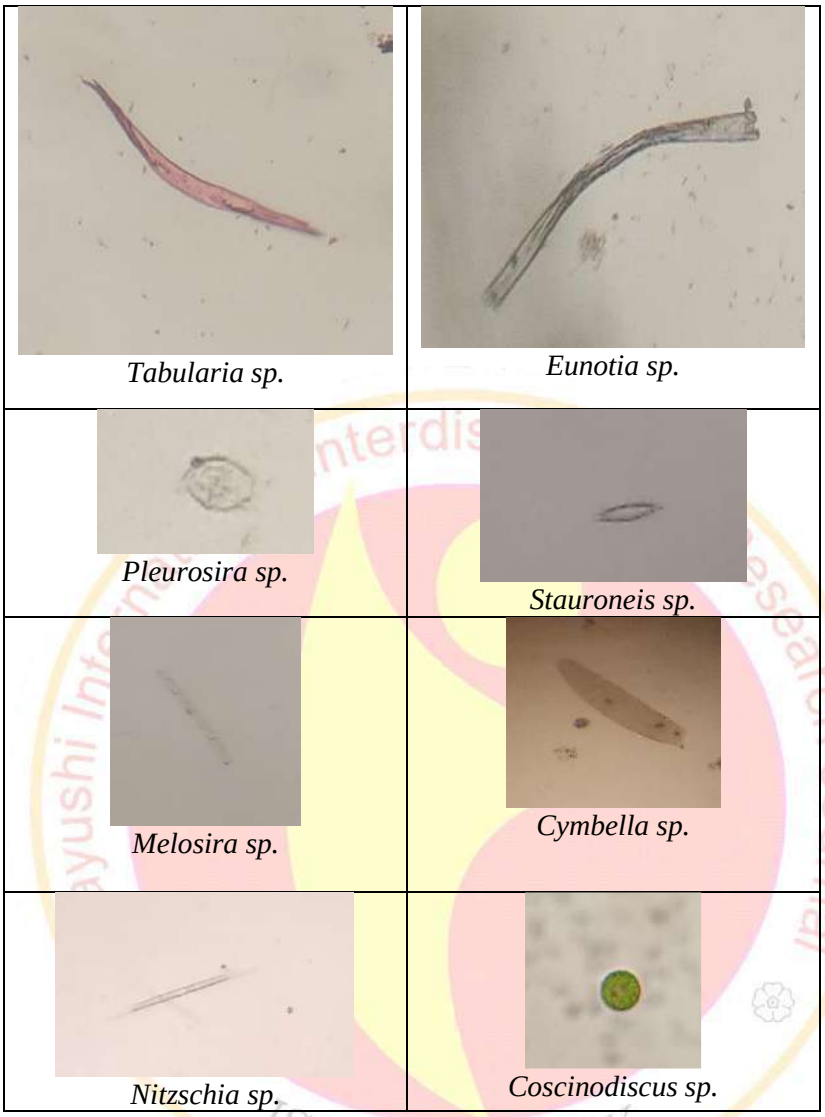
Narayan Baba Talaw

Ekburji

PadmtirthTalaw

Results:

The present investigation is the outcome of Biodiversity of diatoms. Such taxonomical study of diatoms is basically useful to taxonomists and researchers of algae for future research work. Present study also useful for science and society to know what type of diatoms are available from this area. The available diatoms areenlisted in following table.



Disscussion:

The present investigation is the outcome of Biodiversity diatoms. Such taxonomical study of diatoms is basically useful to taxonomists and researchers of algae for future research work. Present study also useful for science and society to know what type of diatoms are available from this area. As diatoms are concerned with pollution it certainly helpful to environmental scientists.

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Economic Interest Of Lac Culture In India – An Overview

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Abstract:
Lac culture is the systematic rearing of lac insects on their host plants for sustainable production of commercial lac. The lac harvested from host plants is then processed by using various techniques to produce different kinds of lac resins, lac dye and lac wax. There are versatile applications in many fields of lac resins and lac byproducts generated while processing raw lac. India is among the topmost country in the world for lac production. Comparatively less investment is required for lac culture, and it provides economic benefit to farmers and livelihood to tribal people. lac processing techniques, products and by-products produced by lac culture and their applications, Indian institutes involved in research and development of lac culture, current research for applications of lac.
Keywords: lac culture, host plants, raw lac, lac resin, lac dye, lac wax, etc.

Introduction:

Lac insects are reared systematically on their host plants to produce resin is called lac culture. Lac insects are found throughout the tropical and subtropical regions of the world. However, they are found abundantly in the tropical forest of India, Thailand, China and Vietnam. In European countries, these insects are not found due to the very cool climate during winter[9]. India is among the topmost countries in lac production and contributes about 80%. The production of raw lac in India is near about 20,000 metric tons and earns a huge amount through export about Rs. 120-130 crores of foreign currency per year[7].According to 2018-19 statistics, Jharkhand is the topmost state in lac production followed by Chhattisgarh, Madhya Pradesh, West Bengal, Maharashtra, Odisha and Assam[13]. Lac culture requires comparatively less investment and provides good economic return if it is carried out systematically and scientifically. It is the source of livelihood for tribal people and farmers, it is a side income source with good economic returns.

Lac insects belong to the family Tachardiidae (Kerriidae) and are from the order Hemiptera[8]. Lac insects are parasitic they feed by sucking juices of various plants called host plants. A particular type of lac insect species feeds on the particular host plant. Some species of lac insects in India are listed in the table with the region of occurrence and their host plants. In India, there are 16 species under the genus Kerria and 6 under the genus Paratachardina are recorded[5,7].*Kerria lacca* (Kerr) is the most widely occurring species in India, which produces the bulk of commercial lac. [8]

Sr. No.	Species in India	States	Host trees
1.	*Kerria chmaberlini*	Gujarat West Bengal	*Flemingia religiosa* (Pipal) *Butea monosperma* (Palas)
2.	*Kerria fici*	Panjab	*Adansonia digitata* (Imli)
3.	*Kerria indicola*	Andhra Pradesh	*Peltoforum ferrugineum* (Peela Gulmohar)
4.	*Kerria brancheata*	Jammu & Kashmir Jharkhand	*Ziziphus mauritiana* (Ber) *Schleichera oleosa* (Kusum)
5.	*Kerria lacca*	Rajasthan Gujarat Maharashtra Jharkhand West Bengal	*Flemingia religiosa* (Pipal) *Ziziphus mauritiana* (Ber) *Acacia arabica* (Babool) *Peltoforum ferrugineum* (Peela Gulmohar) *Butea monosperma* (Palas)
6.	*Kerria sharda*	Orissa	*S. Oleosa* (Kusum)
7.	*Kerria nagoliensis*	Maharashtra	*Schleichera oleosa* (Kusum)
8.	*Paratachardina lobata*	Andhra Pradesh	*Peltoforum ferrugineum* (Peela Gulmohar)
9.	*Kerria communis*	Goa	*Acacia catechu* (Khair)

Lac insects feed by sucking juices from host plant tissues. Lac is secreted by lac insects through specialized glands, to get protected from their predators. Lac resin is viscous at the time of secretion and gets hardens after coming in contact with air formingencrustations around the body of insects. The encrustations on the branches of a tree are then removed by scrapping this lac is known as stick lac, crude lac, or raw lac. It

contains resin, wax, dye, insect body, the bark of host trees as well as other impurities[14]. Stick lac is then processed in various ways to obtain pure lac and different by-products.

This paper provides an overview of lac processing techniques, products and by-products produced by lac culture and their applications, Indian institutes involved in research and development of lac culture, and current research for applications of lac.

Lac processing techniques / Products by- produced

First, the stick lac (raw lac) that is obtained by removing lac encrustations from host plants is processed to obtain seedlac. For this sticklac is dried first to remove moisture. Sticklac cannot be stored for a long time as it contains moisture along with other impurities it forms lumps and hence lowers the crop quality. Followed by drying stick lac is sieved and crushed to obtain sand and dust this process removes sand, dust. This powdered form of crude lac is then washed to remove embedded insect bodies and host trees debris. Decaying bug bodies impart a red color to water this is processed to obtain a by-product that is lac dye. The remaining resin is dried, thresh to gain seedlac. Seedlac is a commercial variety product and can be stored for a long duration. From seedlac by hot filtration purified lac is obtained called shellac. Seedlac is processed by country process or in mechanized factories to obtain shellac. Shell lac obtained by country process (Bhatta) process is called button lac whereas processed from mechanized factories is called machine-made shellac [15].

Fig.1 - Lac processing to different products and by products

Seedlac is processed by solvent method to obtain dewaxed decolorized lac (DDL) and bleached lac. For making dewaxed decolorized wax, seedlac is dissolved in cold alcohol to render wax insoluble and filter through a filter press to remove wax and impurities. The color may be removed to any required standard by charging with the activated carbon and then alcohol is recovered. The molten shellac is stretched with a roller. This form of lac has high demand in the western market. For obtaining bleached lac many methods are available but the most commercially adopted method is sodium hypochlorite (NaOCl) with some recent modifications [13,15]. Bleached lac is white. It has specialized demand and is manufactured commercially in two grades- Dewaxed bleached shellac and Waxy bleached shellac. The commercial grades of seedlac, button lac, shellac, dewaxed decolorized lac (DDL) and bleached lac available on market are listed in table 2 [13,15].

Sr. No.	Type of lac	Commercial grades
1.	Seed lac	Ordinary/ Genuine bysakhi, Fine bysakhi, Golden bysakhi, Golden kusumi, Golden bysakhi – bold grain, Golden kusumi – bold grain, Golden kusumi seedlac – Medium, Manbhum fine seedlac.
2.		Lemon one shellac, Lemon tow shellac, Standard one shellac, Superior shellac, Superior kusumi lemon, Kusumi button lac,

	Shellac	Button lac	superior kusumi button lac, light pure button lac, Pure one button lac
		Machine-made shellac.	Orange shellac, Lemon one shellac, Lemon two shellac, standard one shellac, Black T.N. shellac, Kusumi lemon shellac, Orange fine shellac
3.	Dewaxed decolorized lac (DDL)		Dewaxed platina, Dewaxed blonde Dewaxed super blonde, Dewaxed lemon, Dewaxed orange, Dewaxed Garnet
4.	Bleached lac		Dewaxed bleached shellac and Waxy bleached shellac

Applications

Lac is the only resin of animal origin, and it is Nature's gift to mankind. At present, its importance has been raised in industries, pharmaceuticals, food processing, and textiles being an eco-friendly, biodegradable, and self-sustaining natural material. In India lac is used since ancient times for medication. It is profusely used in ayurvedic treatment for treating various illnesses. It is widely used on open wounds for quick healing and tissue generation.A slurry of lac paste in water mixed with butter oil and milk was commonly taken orally by sick or wounded persons. For controlling blood pressure Lac resin was used for oral administration with fresh goat's milk. It forms one of the main ingredients of a medicated oil known as Lakshadi taila which is reputed to bring down chronic fever and cure rheumatic pain. In modern pharmacy, it is commonly employed as a demulcent in preparations which is designed to treat diarrhea, dysentery, coughs, throat irritation and fevers. It serves as an emulsifying agent and gives viscosity to powdered drug materials.

Lac has innumerable applications in various fields. More than 50% consumption of shellac is in the surface coatings in paints and varnishes due to its properties such as forming UV resistance of the film, smooth, decorative and durable films formation in alcoholic solutions, which dry rapidly as well ability to form solution in alkaline medium. Applications of shellac in the various field are enlisted in the table [13].

Fieldof application Specific application area	**Field of application Specific application area**
Pharmaceuticals	Coating for tablets; enteric (digestive fluid proof) coating for tablets, pills, etc. Removing agent for medicinal odor. Enteric pills for sustained release medication
Electronics	Lamps, fluorescent lamps, insulating agent for parts, insulating varnish, PCB coating.
Polishes	Fruits, furniture, floors, shoes, stain sealer, wallboard primer, knot and sap sealer on wood
Food	Chestnuts, healthy foods, glazing agent for chocolates and sweets, protective coating for oranges, lemons, apples, etc. Binding agent for stamp inks for lemons, eggs and cheese. Barrier coating for feeds and seeds. Protective candy coating or glazes on candies. Coating of apples and other fruits. Coating of food materials
Printing ink	Felt pen inks, binder for flexographic inks for paper, cardboard, non-toxic printing ink for food packaging
Paint and varnishes	Wood finishing, metal foil, sealers, leather, rubber, car tyre.
Cosmetics	Additive and binder for manicure, mascara, eye shadow and conditioning shampoo for personal care. Setting agent for hairspray, microencapsulation for perfumes for longer stay
Rub stones	Grinding wheel
Others	Felt hats, pyrotechnics, gunpowder, strippable paints, cards, stiffening felt in hat manufacture and also in textile industries

Lacbyproduct	**Applications**	**Referenceused**
Lac dye	Food grade lac dye in manufacture of skin creams, food and drug manufacturing and technical grade lac dye in textile industries for coloring silk and wool.	5, 8, 13,14
Lac wax	Electrical industry, shoe creams, floor and car polishes, food, confectionery and tablet finishing, lipsticks, crayons and tailor's chalk	8,13
Isoambrettolide	Perfumery industry	5,14
Mollama	For production of standard quality bleached lac	5

Indian institutes involved in research and development of lac culture

Indian Institute of Natural Resins and Gums (IINRG) was formerly known as Indian Lac Research Institute (ILRI)) is a nodal Institute at the national level for research and development in arid, semi-arid, plateau and hilly regions of the country that help to improve the livelihood of local communities[2].It was established at Namkun Ranchi in 1924 with the prime motto of research on lac in India and to increase lac production. Indian Institute of Natural Resins and Gums (IINRG) is then handed over to the Indian Council of Agricultural Research, New Delhi in 1966 [3]. This institution is fully devoted to the research and development of lac and succeed in increasing enormous lac production in India. Institute entailvarying objectives such as lac and other natural gums & resins (excluding production) such as harvesting/ tapping, processing, product development, training, information repository, technology dissemination and national/international cooperation. There is an increase in lac production in several regions of the country through training programs, capacity building programs run by this institution throughout India to make skilled individuals who can do scientific lac cultivation[4]Scientific cultivation with integrated pest management, enhancing exploitation of unexploited host plants, and cultivation through 'Joint Forest Management' program helps cultivars in raising production and gaining good economic returns. This institute also supports by providing financial assistance to lac cultivars. [2]

Current lacresearch

Yan, X., *et al.*, prepared color-changing and self-repairing dual-function paint film with Lac Resin microcapsules and Fluorane microcapsules They found that paint film with lac resin microcapsules had a better crack inhibition effect. The results obtained are useful as a manufacture reference for multifunctional wood coatings[16].

Lu, J et al., et al., extracted Shellolic esters and Lac dyes from methanol extract of the secretions of *Laccifer lacca* and studied their biological activity. They found some of the compounds considerable active against *Bacillus subtilis, Escherichia coli* and *Streptococcus aureus* microorganisms.[6]

Chowdhury, S.,put forth the concept of establishment of Brood Lac bank in Chhattisgarh, inspiredbyan idea of preserving and maintaining local biodiversity along with enhancing forest-based livelihoods. The idea of the Brood Lac Bank has been further extended to envision "Lac Clusters" which would not only sustainably produce lac but also add value though local processing, enabling rearers to produce raw industrial lac through local lac-based networks to directly engage with the market [1].

Mohanasundaram, A. *et al.*, evaluated chemical communication between the lac insect-associated products and the lac predators under the laboratory condition. They found that *Eublemma amabilis* showed a great response to lac insect whole-body extract. Another lac insect predator *Pseudohypatopa pulverea* also showed higher response to lac insect whole body extract than resin, wax, crawler and lac insect female extracts. [10] Along with this much research about lac cultivation, pest management, marketing and application based research has been taking place contributing enormous fruitful knowledge to this area [11,12,18].

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Preliminary phytochemical analysis of *Iphigenia indica*

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Abstract:

Present study was carried out to determine the presence of various phytochemical compounds from Iphigenia indica corm. Ethnomedicinal information was obtained from tribal people as well as traditional healers and confirmed the used of plant for various purposes such as, corm used as food, eaten as raw, to get relief from colic and headache. Phytochemical analysis was performed by using a series of solvents such as petroleum ether, chloroform, ethanol and acetic acid by soxhlet extractor. Qualitative phytochemical analysis confirmed the presence of alkaloids, carbohydrates, glycosides, saponins, proteins, phytosteroids and terpenoids, flavonoids, fixed oil and fats, etc. Presence of various phytochemicals strongly support the medicinal properties of this plants. Hence further investigation is required for isolation, characterization and structural determination of new natural bioactive compounds from this medicinal crude drugs.

Key words: *Qualitative phytochemical, Iphigenia indica, Ethnomedicinal, soxhlet extractor, crude drugs.*

Introduction:

Human beings have been dependent on plants for medicine to complete their health care needs from the beginning of civilization [(1)]. Medicinal plants naturally contain certain chemical constituents having therapeutic properties [(2)]. Traditional and folklore medicines have a significantly participates in health care practices around the world. Ethnic medicines are highly suitable and comparatively having very less side effects [(3)]. Phytochemical constituents derived from plants are advantageous as such data become valuable for the production of different complex chemical substances [(4)].

Iphigenia indica (L.) belongs to Liliaceae family is mostly occurs on hillside among grassland area. Flowering and fruiting mostly occurs during july to september months. It is an erect herb, which grows up to 10-18 cm tall in height. Its corms are mostly ovoid, subglobose or tunicated shape with presence of brownish sheaths. Leaves are alternately arranged, sessile or subsessile, having linear or linear- lanceolate shape with coriaceous or subcoriaceous texture. Flowers are brown, purple or pale purple in color, axillary and extra-axillary in position on terminal zigzag stems. Fruit is capsule type with elliptic-oblong shape along with presence of groove. Seeds are many, brown in color and globose or subglobose.

Peoples of some tribal communities located in Buldana district use corm of this plant as food and eaten as raw. They also used it to get relief from colic and headache. Hence present investigation was focused on preliminary phytochemical analysis of *Iphigenia indica.*

Materials and Methods:

Collection of plant material:

Plant material of *Iphigenia indica* was collected from rural area of Buldana district, Maharashtra, India. Plant was identified by using various floras [(5,6)] and also from the experts of region. Plant material was brought to the laboratory, thoroughly washed with water to remove foreign matter, shade dried and then grind into fine powdered by using mechanical grinder.

Extraction of plant material:

Grinded fine powder of *Iphigenia indica* corm was subjected to solvent extraction by using series of different solvents such as petroleum ether, chloroform, ethanol and acetic acid by soxhlet apparatus. Each time before extracting with next solvent, the powder residue was dried properly. Extract obtained in each solvent was concentrated, solidified, determined yield percentage and used for preliminary phytochemical analysis.

Phytochemical evaluation:

For preliminary phytochemical analysis, each extract of corm was subjected to various qualitative test and determine the presence of different phtoconstituents.

Preliminary phytochemical analysis was carried out of all the extracts as per the standard methods of Brain and Turner, (1975); Harborne, (1994); Trease and Evans, (1996); Khandelwal, (2006) and Kokate *et al*, (2010).

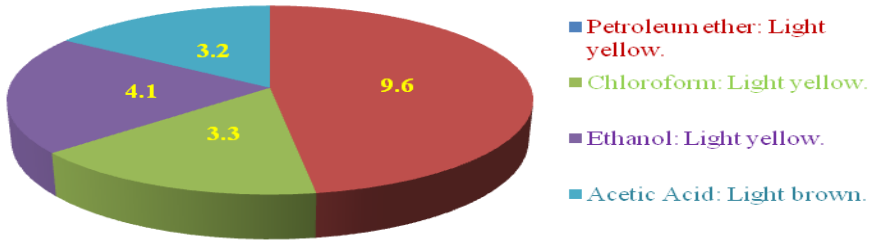
Results and Discussion:

Crude extract of medicinal plants is biologically more active than isolated compounds due to their synergistic effects. Hence phytochemical analysis is very useful in identifying new sources of important compounds like alkaloids, flavonoids, phenolic compounds, saponins, steroids, tannins, terpenoids, amino acid, etc. During phytochemical analysis, yield percentage of successive solvent extracts of *Iphigenia indica* corm were found as; petroleum ether extracts: 9.6%, chloroform extract: 3.3%, ethanol extract: 4.1% and acetic acid extract: 3.2% (as shown in table 1. and fig.1).

Table 1: Successive solvent extracts of *Iphigenia indica* corm

Sr. No.	Solvent extract	Color	Yield percentage
1	Petroleum ether	Light yellow	9.6%
2	Chloroform	Light yellow	3.3%
3	Ethanol	Light yellow	4.1%
4	Acetic Acid	Light brown	3.2%

Fig. 1 Successive extractive values of *Iphigenia indica* corm



Preliminary phytochemical analysis of *Iphigenia indica* corm was carried out in petroleum ether, chloroform, ethanol and acetic acid extracts. Phytochemical screening was revealed the presence of alkaloids, carbohydrates, glycosides, saponins, proteins, phytosteroids and terpenoids, flavonoids, fixed oil and fats, etc. as shown in table 2.

Table 2: Phytochemical analysis of *Iphigenia indica* corm extracts

Sr. No.	Test For Phytochemical	Test	Pet. ether extract	Chloroform extract	Ethanol extract	Acetic acid extract
I	Alkaloids					
1		Dragandorffs Test	+	+	+	+
2		Hager's Test	+	+	+	+
3		Mayer's Test	+	-	+	-
4		Wagner's Test	+	+	+	+
II	Carbohydrates					
1		Fehling's Test	+	+	-	-
2		Molisch's Test	-	+	+	+
3		Benedicts Test	+	-	+	-
III	Glycosides					
1		Borntrager's Test	+	+	+	-
2		Legal's Test	-	+	+	-
IV	Saponin					
1		Foam Test	+	+	+	+
V	Tannin and Phenolic compound					
1		5% Ferric chloride Test	-	-	-	-
VI	Proteins					
1		Millon's Test	-	-	+	+
2		Biuret's Test	-	-	-	-
VII	Amino Acid					

1		Ninhydrin Test	-	-	-	-
VIII	Phytosteroids and Terpenoids					
1		Lieberman-Burchards Test	-	+	-	-
2		Salkowski Test	+	+	+	+
IX	Flavonoids					
1		Alkaline reagent test	-	+	+	+
X	Gums and Mucilage					
1		Alcohol test	-	-	-	-
XI	Fixed oil and fats					
1		Stain test	-	-	+	-

Conclusion:

Presence of various phytochemicals strongly support the medicinal properties of this plants. Hence further investigation is required for isolation, characterization and structural determination of new natural bioactive compounds from this medicinal crude drugs.

Where, **+** = present, **-** = absent.

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Studies on Benthic Macroinvertebrate of Lower Wardha Project, Shahanur Dam, and Ghoddev Dam, Amravati District, (MS), India

Dr. K. E. Landge

Abstract:-

The present communication is aimed at studies of some benthic fauna at Lower Wardha project, Shahanur dam, Ghoddev dam, District Amravati for one year from August 2015-July 2016.The benthic organisms are reported as main components of the food chain. It was therefore, thought worth benthic species diversity. The present study is focused on biodiversity of the benthic community of lower Wardha project, Shahanur dam, and Ghoddev dam. The present investigations deals with the population density and species diversity of aquatic benthic macro-invertebrate fauna.

Key Words:- Benthic Fauna, Biodiversity, Species diversity, Population diversity.

Introduction:-

Fresh water macro-invertebrate are animals without backbone that live near the bottom of freshwater. The concept of biodiversity includes the entire biological hierarchy from molecule to ecosystem, or the entire taxonomic hierarchy from Allele to Kingdom. The current textbook definition of "biodiversity" is variation of the life at all levels of biological organization (Kevin et al., 2004). Benthic macro-invertebrates are best indicators for Bio-assessment (Kumar 2003). The abiotic environment of water body directly affect in the distribution, population density and diversity of the macrobenthic community (Zweig and Rabeni 2001; Sharma and Rawat 2009, Sharma and Choudhary 2011). Benthic fauna are especially of great significance for fisheries that they themselves act as food of bottom feeder fishes (Sharma et al., 2013). The mollusca component an important component of the macrobenthic invertebrate community of the stream (Bangotra 2012) freshwater macro-invertebrates are generally group by two characteristics; how they feed and how they move within the aquatic environment. The present studies deals with the population density and species diversity of aquatic macro-invertebrate fauna have been discussed.

Materials and Methods:-

Benthic communities along the lower Wardha project Shahanur dam, and Ghoddev dam were sampled collected monthly from August 2015-July 2016. The sample were collected by a bottom kick net (500 µm mesh). The samples were taken from an area of nearly 100 m2 in order to include all possible microhabitats. All the animals collected were immediately fixed in formaldehyde (4%) in the field and then transferred to 70% ethyl alcohol. Collection and identification of Benthic macro-invertebrate with the help of standard books Needham (1969), Pennak (1989), Tonapi (1980), Welch (1998). The organisms were identified from standard taxonomics keys (e.g. Pennak 1989).

Result and Discussions:-

. Benthic macro-invertebrates biodiversity recorded in Lower wardha project(I), Shahanur dam, Ghoddev dam during August 2015 to July 2016. A total of forty six (46) species recorded of Benthic macro-invertebrates fauna belonging three (3) phylum- Mollusca, Arthropoda, ,Annelida 7 (seven) classes-Gastropoda, Bivalvia, Crustacea, Arachnida, Insecta, Oligochaeta, Hiradinea.

In the present study total 46 species of Benthic macroinvertebrate were identified. Out of 46 species Phylum- Mollucans represents 20 species from two classes as Gastropoda, and Bivalvia. Phylum-Arthropoda encompassing 24 species from three classes as Crustacean, Arachnida, and Insecta while 2 species belonged to Phylum- Annelida representing a two class Oligochaeta, and Hiradinea. The dominants class was Insecta representing 13 species and Gastropoda 12 species.

20 species of **Phylum-Mollusca** 12 species **Class-Gastropoda** [Lymnea accuminata, Lymnea auricularis, Lymnea peregra, Lymnea palustris, Lymnea luteola, Melanoides tuberculata, Bellamya bengalensis(Lamark), Gyraulus ladacensis, Thiara tuberculata(Mueller), Gabbia orcula, Pila globosa, Dwarf pond snail(Galba truncatula)]. 8 species **Class-Bivalvia** [Lamellidens corrianus(Lea), Lamellidens marginalis(Lamark), Parreysia cylindrica (Lea), Parreysia favidens(Benson), Parreysia Khadakvaslaensis, Parreysia shurtleffiana, Parreysia corrugate(Mueller), unio] was found.(Table 29).

24 species of **Phylum-Arthropoda** 4 species **Class-Crustacea** [Cancer(Crab), Daphnia, Nauplius,Cyclops]. 7 species **Class-Arachnida** [Araneus, Hydracarina sps., Neoscona sps., Zygeilla sps, Leucage sps., Stegodyphus sps., Hippasa sps.].

13 species **Class-Insecta** [*Notonecta sps,* Orthetrum sps, Chironomus Sp., Dragonfly larvae, Damselfly nymph, Soldiar fly larvae, Mayfly larvae, Anopheles larva, Cybister tripunctatus, Cybister confuses, Erectes sticticus, Hydaticus fabricii, Dineutus indicus] was found.
2 species of **Phylum-Annelida** 1 species of **Class-Oligochaeta** [Pheretima posthuma]. 1 of species **Class-Hiradinea** [Hirudinaria] was found.

Analysis of numerical superiority of macroinvertebrates of all three dams are revealed that Mollusca was dominant [68.40%] followed by Arthropoda [27.82%] and Annelids [3.77%] (Table No 24) (Figure No 17) Dominant species were reported to be the most important ecological indicators as they received the full impact of the habitat for the over longer period and manifest different level of sensitivity. The present investigation is well in agreement with the study Sharma et al., (2013).

Their abundance fluctuation depending upon environmental conditions and physico-chemical parameter of water.

The insect are having the capability of various adaptive habitates due to their extra ordinary structural organization Vinson (1998), Merrites and Cummines (2008) and Tali (2013). Most of the Insect larval forms have been reported to be tolerant too wide range of Physico-chemical parameters (Sarkar -2012). The benthic macro-invertebrates population of Insect was dominated by diptera and Ephemeroptera.

The mollusca fauna of Kishanpura Lake include genera out of which T. Scabra, P. Clarknum, L. Aluminat, vivapora bengalensis dominated the population (Sharma et al, 2007). Sharma (2003) reported 11 genera of mollusca from sirpur Lake Indore. Similar also reported to Oomachan and Belsare (1985); Rosenberg and Resh (1993) and Sharma (2009), and Sharma(2013).

Conclusion :-

This study help in studing aquatic Macro-invertebrate i.e. biodiversity of macro-invertebrates. Biomonitoring is good tool for the assessment of our body.

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Phytochemical Analysis, Antioxidant and Tyrosinase Inhibition Potential of Aqueous Extract of *Lepidiumsativum* L. Seeds.

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Abstract:
The present study was to evaluate the phytochemical constituents, antioxidant and tyrosinase inhibition activities of aqueous extract of LepidiumsativumL. seeds. Phytochemical screening revealed the presence of alkaloids, carbohydrates, flavonoids, glycosides, amino acids, reducing sugars, saponins etc. Antioxidant activity was evaluated by using an in-vitro antioxidant assay model like DPPH assay and percentage of activity of plant sample was calculated. The present study was revealed that LepidiumsativumL.shows significant antioxidant activity. The tyrosinase inhibition activities were also done by using the modified dopachrome method with L-DOPA as a substrate. Assay was conducted in a 96-well microtitle plate and a plate reader was used to measure the absorbance at 417 nm. This study of tyrosinase inhibition assay was clear that seeds of LepidiumsativumL. were shown inhibition activity against tyrosinase. The phytochemical composition of these plantseeds were tyrosinase inhibition activities due to busting the inclusion of an antioxidant composition.
Keywords:*Phytochemical, Antioxidant Assay, Tyrosinase, L-DOPA.*

INTRODUCTION:

*Lepidiumsativum*L. is a yearly herb locally known as halim in India but commonly known as cress. Cress, otherwise known as garden cress, garden pepperwort or garden cress pepper weed, in India in Hindi it is called Halim, Chandrashoor or Asalu. It's a fast growing herb belonging to the family Brassicaceae that is native to Egypt and west Asia but is widely cultivated in temperate climates throughout the world for various culinary and medicinal uses (Gokavi, S. S.et. al, 2004). *Lepidiumsativum* L. Since old times in India, seeds have been used in traditional medicine (McConnell et al., 2007). Numerous studies on plant derivatives suggest that diets rich in phyto constituents and antioxidants have protective roles against various health troubles and diseases (Lampe JW, 1999). Herbal drugs are the oldest form of health care known to mankind (De-Smet and PGAM, 1997). Plants are a rich source of natural antioxidants. Natural antioxidants or phytochemical antioxidants are the secondary metabolites of plants (Sofowora, 1993). These plant derived antioxidants might play an important role in combating oxidative stress associated with many degenerative diseases such as cardiological diseases, diabetes, cancer, Alzheimer's disease, diabetes and aging (Wong SP et.al., 2006; Naczk M and Shahidi F,2006.) In India, the plant is regarded as a cure for asthma, dysentry, bleeding piles, as a diuretic, and to enhance sexual desire (Dymock, Warden and Hooper, 1890; Chopra, Nayar and Chopra, 1956). Herbal drugs are the therapeutic herbs used to prevent and treat diseases and ailments or to support health and healing (Gossell et al., 2006).

Materials And Methods:

Collection of plant material:

The*Lepidiumsativum*L. seeds under investigation were collected from the local villages of Nanded during 2015. The collected seeds were washed thoroughly first in tap water and then rinsed with distilled water. After this, it was sterilized by using absolute alcohol and dried completely in shade at room temperature. The plant seeds were crushed and blended to fine powder in an electronic grinder and stored in a polythene bag till further use.

Preparation of extract:

The seeds of the *Lepidiumsativum* L. were collected, dried, powdered and did soxhlet extraction successively with distilled water. The extract was evaporated to near dryness in a water bath, weighed and kept at 4 °C in the refrigerator until further use.

Phytochemical screening:

The presence of various phytochemicals in the plant extract was determined by preliminary phytochemical analysis as per Thimmaiah (2004).

DPPH radical scavenging activity:

The antioxidant activity of the extracts was measured in terms of hydrogen-donating or radical scavenging ability, using the DPPH method (Brand-Williams *et al*., 2007) with slight modification. Briefly, 2 mL of DPPH solution (0.1mM in methanol) was incubated with 1mL of extract at concentration of (20 mg/ mL). The reaction mixture was shaken and incubated for 30 min.in dark condition and at room temperature. The control was

prepared as above without plant extract. The absorbance of the solution was measured at 517 nm against a blank. The free radical scavenging activity was measured as a decrease in the absorbance of DPPH and was calculated.

Scavenging effect (%) = $[(A_{control} - A_{sample}) / A_{control}] \times 100$.

Ascorbic acid (0.1mM) was used as a reference standard.

Results And Discussion:

Phytochemical screening:

Preliminary phytochemical screening revealed the presence of alkaloids, flavonoids, glycosides, carbohydrates, reducing sugar, saponins and amino acids in aqueous extracts of*Lepidiumsativum*L. seeds. These results exposed that the plant has quite a number of chemical constituents, which may be responsible for the many pharmacological actions. Although their specific roles were not investigated in this study, it was reported that most active components in plants are mostly flavonoids, saponins, glycosides and alkaloids. Further work will be possible to investigate the specific phytoconstituents responsible for these activities (Table- 1).

Table 1: Preliminary phytochemical screening of aqueous seed extract.

Sr. No	Phytochemical test	Aqueous extract	Mucilage extract
1	Alkaloids	++	++
2	Carbohydrates	++	--
3	Flavonoids	++	++
4	Glycosides	++	++
5	Reducing sugars	++	--
6	Saponins	--	--
7	Steroids	--	--
8	Tannins	--	--
9	Amino acids	--	++

++ Presence of constituent; -- Absence of constituent.

DPPH radical scavenging activity (Antioxidant activity):

The DPPH radicals scavenging assay were used for preliminary screening of the aqueous seed extract for the antioxidant activity. The free radical scavenging activity is known as an important mechanism of antioxidants. These results indicated towards the seed extract were found to interact with the stable free radical DPPH, which indicates their potent radical scavenging ability. The aqueous extract exhibited antioxidant properties (71.17%), whereas, Mucilage extract showed (60.84%) and the standard used ascorbic acid showed (86.12%) (Table- 2).

Table 2: Percentage of antioxidant activity of seed extracts.

Sr. No.	Plant Name	% Antioxidant Activity
1	*LepidiumSativum*L. (Aqueous extract)	71.17±0.31
2	*Lepidiumsativum*L. (Mucilage extract)	60.84±0.28
3	Ascorbic Acid (Standard)	86.12±0.22

Values are expressed in means ± S.D. of two separate experiments.

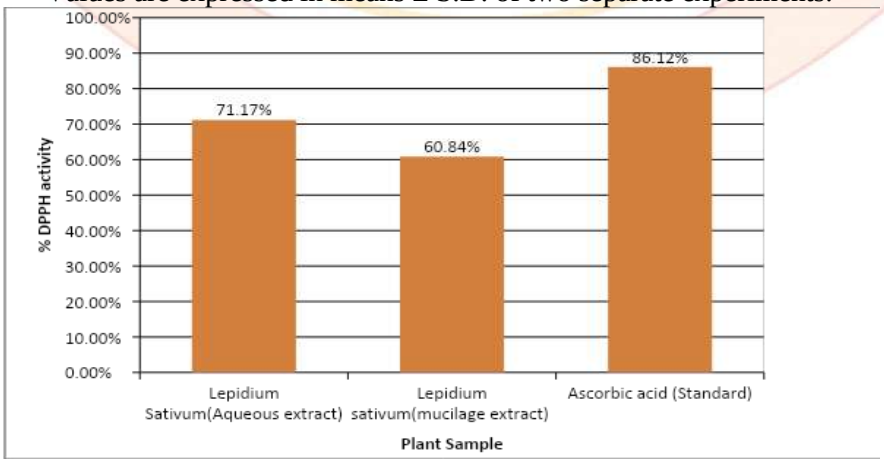

Fig: Graph showing percentage of antioxidant activity of seed extract.

Tyrosinase inhibition:

Tyrosinase involved in the formation of melanins because it facilitates melanin synthesis by catalyzing reaction from tyrosinase to DOPA and from DOPA to DOPA -quinine. Tyrosinase inhibitors have become more important as cosmetic and medicinal products, primarily to control melanin pigmentation. Melanin synthesis inhibitors are typically used for treating localized hyperpigmentation in humans such as lentigo, nevus, ephelis, post inflammatory state and melanoma of pregnancy. Mushroom tyrosinase enzyme was used for the assay because it is gamely available. Since the mode of reticence depends on the structure of both the substrate and inhibitor, L-DOPA was used as the substrate in this experiment, unless otherwise specified. So, the inhibitors discussed in this method are inhibitors of diphenolase activity of mushroom tyrosinase, and their inhibition activity on the enzyme was determined by spectrophotometry, based on dopachrome formation at 417 nm. In the present study the aqueous seed extract exhibited almost a good percentage of inhibition for Mushroom tyrosinase at (31units/ml) (Table- 3).

Table 3: Tyrosinase inhibition activity of seed extract.

Sr No.	Plant Species	% Tyrosinase Inhibition At Conc.(mg/mL)					
		4	**2**	**1**	**0.5**	**0.25**	**0.125**
1	***Lepidium sativum*L.**	81.02±0.12	67.35±0.22	62.12±0.14	56.65±0.30	31.28±0.26	13.85±0.02
2	**Ascorbic acid (Standard)**	85.74±0.21	73.86±0.13	68.23±0.23	60.70±0.32	37.66±0.25	18.23±0.22

Values are reported as means ± S.D. of two separate experiments.

Conclusion:

The present study shows aqueous seed of *Lepidiumsativum* L. could be used as a food supplement in human diet as it possesses potent antioxidant activity. It also helps to reduce oxidative stress in the human body. The tyrosinase inhibitory activity of *Lepidiumsativum* L. seed extract was increased with increasing concentrations. The inhibition of tyrosinase activity might depend on the hydroxyl group on the phenolic compounds of the seed extract, which may form hydrogen bonds with an enzyme site, leading to lower enzymatic activity. Some tyrosinases act through hydroxyl groups that bind to the tyrosinase active site, resulting in altered conformation. Ascorbic acid is an effective tyrosinase activity inhibitor. The antioxidant activity mechanism may also be an important reason for tyrosinase inhibition activity. Further pharmacological and clinical studies are required to understand the actual efficiency of these herbal extracts and in future it may be used for ingredients in the formulations of cosmetics and skin whitening agents.

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Effect of Weed – *Euphorbia Geniculata* L. On Biological Parameters of Chick PEA

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Abstract

In present investigations, the effects of Euphorbia geniculata L. on various biological parameters of chick pea were assessed. The healthy seeds of chick pea were treated with different concentrations of leaf, stem and root extracts of Euphorbia geniculata L. The effects on seed germination percentage, seedling groth and seedling vigour were assessed. The inhibitory as well as stimulating effect of weed extract on various biological paramters could be noticed.
Key words: *Euphorbia geniculata L., chick pea, inhibitory*

Introduction:

A weed is considered as unwanted plant in a particular situation and a plant in a wrong place. The weeds examples are those unwanted plants, which are growing in human-controlled setting such as farm fields. The term weed also is used to desribe any plant that grows or reproduces aggressively or is an invasive outside its native habitat. Besides competing for moisture, nutrients and light, weeds can also affect a crop growth by releasing chemicals into the growing environment (Rice 1984; Kadioglue *et al.*, 2005). All the plant parts of weeds such as root, stem, leaf, flower and fruit have allelopathic potential (Alam and Islam 2002). Different types of effects are exerted by different parts of weeds. Weeds interfere with crop plants through dominance, competition and allelopathy, which lead to decrease in quantity and quality of product of crop plants. The weeds affect the crop plants by releasing the various water-soluble allelochemicals (Batish *et al.*, 2007). These allelochemicals reported to be present in almost all plant parts including stem, leaves, buds, flowers, pollen grains, seeds, fruits, roots and rhizomes (Rice, 1984). Euphorbia geniculata is native to tropical and subtropical America but is now widespread throuhout the tropics. Many herbicides failed to control it and hence it has spread rapidly in many parts of the word. The present studies were undertaken to assess the effect of *Euphorbia geniculata* L. on popularly grown crop plant Chick pea (*Cicer arientinum* L.).

Materials And Methods:

The weed plant material used to study the effects on chick pea was collected and identified with the help of standard flora (Naik, 1998 and Dhore, 2020). Mature leaves of *Euphorbia geniculata* were collected from the agricultural fields in Amravati and aqueous extracts were prepared. Aqueous extracts of various concentrations *viz* 5%, 10%, 20% and 40% (v/v) were prepared. The seeds of chick pea were collected from Krishi kendra in Amravati. Healthy seeds were first prsoaked in distilled water for 6 hours. The presoaked seeds were treated with aqueous leaf extracts prepared freshly. The treatment was given at room temperature on rotatory shaker. The trartment was given for 6 hours. 200 seeds were used for each treatment along with control. The treated seeds along with control were studied for various parameters like germination percentage, seedling height and seedling vigour index. All the calculations were carried out by using standard formulae.

Results And Discussion;

The effects of weed extracts on chick pea are shown in table 1. The germination percentage in control was 80%. The maximum inhibition was observed in 10% treatment. In all treatments, inhibition was recorded. Germination is an important indicator which shows the plnat's response to changes in the environment or any allelopathic stress indicated as a result of allelochemicals released from donor plants (Hussain *et al.*, 2010). Similar inhibitory effects on seed germination were also recorded by Neelamegam *et al.*, 2012 in Paddy variety 5016 due to effect of Ipomea treatments.

Table 1: Effects of aqueous leaf extract of *Euphorbia geniculata* on various biological parameters of chick pea.

Treatment	Seed Germination (%)	Shoot length (Cm)	Root length	Seedling Vigour Index (SVI)
Control	80	17.70	16.70	1336
5%	65	21.60	23.00	1495
10%	50	14.60	12.80	640
20%	55	21.00	17.60	968
40%	65	18.60	10.80	702

Both inhibition and stimulation in root length and shoot length was noticed. Maximum inhibition in shoot length was induced by 10% treatment while maximum stimulation was recorded in 5% and 20% treatments. In addition, the stimulation and inhibition in root length could be observed. Maximum decrease in root length was observed in 40% treatment whereas the 5% treatment stimulated the root length. Stimulation in root and shoot length were also reported in *Oryza sativa* by Prasad and Subhashini (1994). Most of the treatment decreased the seedling vigour index. Only slight stimulation was found in 5% treatment as compared to control. Maximum reduction in seedling vigour index was found in 10% treatment.

Conclusion:

The aqueous leaf extracts of *Euphorbia geniculata* L. has shown both inhibitory and stimulatory effects on chick pea.

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Investigation of Taxonomic Morphology and Phytochemical analysis of *Cassia fistula* L.

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Abstract

*The qualitative phytochemical studies were carried out in the solvents viz. Methanol, Chloroform and Petroleum ether. The Methanol, Chloroform and n-Butanol Leaves extract of **Cassia fistula L.**shows the presence of alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols but high intensity of phytochemicals in leaves showed in table no.1 by twice and petroleum ether extract of leaves.*
***Keyword:** -Morphology, qualitative,phytochemical,Cassia fistula L.,n-Butanol etc*

Introduction

Medicinal Plants or Medicinal herbs are essence of Traditional medicine practice. Treatment using herbs developed different parts of world in different names. Herbalism is the systematic study of medicinal herbs and its botany. Mainly focusing its medicinal uses. Ethnomedicine is the study of traditional medicine. Researchers identify and separate various active chemicals in the medicinal plants.

Indian medicinal plants or Ayurvedic medicinal Plants are the essence of Ayurveda and Ayurvedic treatments. When used judicially and clocking with the basic principles they produce miraculous effects. Their role cannot be confined to mere curative of disease but they also used to be of human body. Hence, Ayurvedic drugs are rightly called the elixirs of life. Ayurvedic Herbs played important role in Ayurvedic treatment, from ancient time to this most modern time.

History of Medicinal Plants

The uses of medicinal plants can even see in pre historic time from the Sumerian civilization. In Sumerian civilization medicinal plants listed in clay. They mentioned about 100 medicinal plants. Ancient Egyptians documented about 800 medicinal plants in 'Ebers Papyrus'.

'Shennong Ben Cao Jing', is the Chinese pharmacopeia of medicinal plants, which helped Chinese Traditional healers to treat patients. 'Discords' was a Greek physician; he wrote a pharmacopeia of medicinal plants called 'De materia medica'. which described 600 medicinal plants and its various combinations useful in treatments.

Aristotle's and his student, Theophrastus wrote the first systematic botany text called 'Historia plantarum'. That was the first book in botany which classified plants into systematic groups.

In India, various traditional system of medicine is Sidha are well known, now commonly called Indian System of Medicine. Treatments based upon medicinal herbs and herb mineral combination are essence of Ayurveda and Sidha. Medicinal plants listed in Ayurvedic text books or coming under ayurveda listed as Ayurvedic Medicinal Plants. Ayurveda books classified medicinal plants according to its uses and properties. About 800 medicinal plants were listed.

Herbalism

From historical time, medicinal plants used for medical purpose. It is believed that about 50 thousand before herbalism existed. Written history could be seen in sumariencivilization, which was 5000 years old. Herbalism may apply modern standards of effectiveness testing to herbs and medicines derived from natural sources because many modern medicine compounds are derived from plants. It referred as phytomedicine, phytotherapy or Para herbalism. Nutrient supplements prepared from herbs classified under phytotherapy.

According to WHO (World Health Organization) 80 % of Asian and African population uses herbal medicine due to its low expense. About 25% of drugs using in USA derived from medicinal plants. 7,000 medical compounds and 120 active compounds currently isolated from herbs.

Herbal preparations

Single plant or multiple plant combinations are used. It Prepared in many forms. Herbal juice extract, dry powder, tea, decoction, Tinctures, alcoholic preparation and oil or ghee preparations are available.

Ethnomedicine

Ethnomedicine is a study or comparison of the traditional medicine based on bioactive chemicals in the herbs and animals and practiced by various ethnic groups. ethnobotany and medical anthropology are the tools using in Ethnomedicine. The purpose of the research is to identify and develop a marketable pharmaceutical product. From Chinese medicine 'Yu' identified 'Artemisin' named chemical compound useful in Malaria disease.

Phytochemicals

These are chemical compounds synthesized by plants as its part of metabolism, may be part of defensive mechanism. Alkaloids, Glycosides, Glycosides, Terpenes are main Phytochemicals. Alkaloids are bitter-tasting chemicals examples are atropine, scopolamine, hyoscyamine, caffeine, cocaine, ephedrine (Ephedra), morphine. Anthraquinone glycosides are found in medicinal plants such as rhubarb, cascara, and Alexandrian senna. Polyphenols of several classes of chemicals, useful defenses against plant diseases and predators. examples are phytoestrogens and astringent tannins. Terpenes and terpenoids are found in resinous plants such as the conifers.

Present investigation on Taxonomic morphology and phytochemical analysis of Cassia *fistula* L. with following aims and objectives.

Material and Methods

Collection of Plant

Collection of *Cassia fistula* L. plant part were collected from botany garden Manora, washim Maharashtra state, India. Plant part i.e., fruit and leaves cleaned soil dust with tap water. The plant material and specimens were identified by using standard floras like Cook 1907, Dhore 2005, Naik 1989, Yadav and Sardesai 2002.

Preparation of Plant Part Extract

Preparation of plant part leaves dried under shade and prepared fine powder, plant part extraction according to previously method used by Megala, and Elango, 2012, but were used some modified method in which the 5 gram of leaves dried powder extracted with 50 ml of three different solvent i.e. methanol, chloroform and petroleum ether , 24 hrs at room temperature and shaking constant and then filter with whatman filter paper no.1, excess solvent in extract evaporated and extract used for Qualitative evaluation of phytochemicals. The preliminary screening test were performed for the presence of following secondary metabolites such as alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols (Harborne, 1973) and Sofowara (2005).

According to Budhiraja, 2012, leaves powder extract in Chloroform and n-butonol solvent shows positive results of phytochemicals constituent and their activities against the anticancer and antibacterial so were used chloroform and n-butonol solvent.

Qualitative analysis of *Cassia fistula* L.

Alkaloids test

The plant extract was evaporated to dryness and the residue was heated on a boiling water bath with 2% hydrochloric acid. After cooling, the mixture was filtered and treated with a few drops of Mayer's reagent. Formation of turbidity or yellow precipitation showed the presence of alkaloid.

Glycosides

Glycosides are compounds which upon hydrolysis give rise to one or more sugars (glycones) and a compound which is not a sugar (Glycone or Genine). To the solution of the extract in glacial acetic acid, few drops of ferric chloride and concentrated sulphuric acid are added, and observed for a reddish-brown coloration at the junction of two layers and the bluish green colour in the upper layer.

Terpenoids and steroids

Four milligrams of extract were treated with 0.5 ml of acetic anhydride and 0.5 ml of chloroform. Then concentrated solution of sulphuric acid was added slowly and red violet colour was observed for terpenoid and green bluish colour for steroids.

Flavonoids

4 ml of extract solution was treated with 1.5 ml of 50% methanol solution. The solution was warmed and metal magnesium was added. To this solution, 5 – 6 drops of concentrated hydrochloric acid was added and red colour was observed for flavonoids and orange colour for flavones.

Saponins

0.5 g of extracts was added to 5 ml of distilled water in a test tube. The solution was shaken vigorously and observed for a stable persistent froth. The frothing was mixed with 3 drops of olive oil and shaken vigorously after which it was observed for the formation of an emulsion.

Phenols

The extract (50 mg) is dissolved in 5 ml of distilled water. To this few drop of neutral 5% ferric chloride solution are added. A dark green colour indicates the presence of phenolic compounds. 3

Tannins

To 0.5 ml of extract solution 1 ml of water and 1-2 drops of ferric chloride solution was added. Blue colour was observed for gallic tannins and green black for catecholic tannins.

Results and Conclusion

Taxonomic Morphology of Cassia fistula *L*. Plant

Habit: A small tree.

Stem: Aerial, erect, woody, branched, cylindrical, solid and glabrous.

Leaves: Alternate, unipennate par pinnately compound, stipules small, leaflets 4-8 pairs, large, ovate, entire or wavy, acute, base wedge-shaped.

Inflorescence: Long drooping racemes.

Flowers:

1. Bracteate, pedicellate, complete, zygomorphic, bisexual, yellow.
2. Calyx made up of 5 sepals, divided to the base, imbricate, oblong.
3. Corolla made up of 5 petals, clawed, obovate, veined.
4. Stamens 10, the 3 longest stamens are much curled and bear large, oblong, much curled anthers, the 4 median stamens are straight and the 3 remaining are very short and erect, staminodes. Ovary free at the bottom of the calyx, superior, monocarpellary, unilocular, ovules many, marginal placentation.

- **Fruit:** A legume, long, cylindric, pendulous, indehiscent.
- **Seeds:** Ovate, many, imbedded horizontally in sweet, dark-coloured pulp, separated by transverse dissepiments called phragmatas.
- **Flowering and Fruiting Time:** March-July (fruiting throughout the year)

Figure:-Stem(Arial erect woody and Branched

Figure: - Leaves (Bracteate, pedicellate)

Figure:Inflorences (Racemose)

Figure:- flower(Bracteate, pedicellate)

Figure:-Fruit (A legume, long, cylindric)

Figure :- Seeds (Ovate, dark-coloured pulp)

Table No. 1 Qualitative analysis of Cassia fistula L.leaves

Sr. No.	Phytochemical	Plant extract of leaves in		
		Methanol	Chloroform	Petroleum ether

1.	**Alkaloids**	++	++	++
2.	**Glycosides**	++	+	++
3.	**Terpenoids**	+	++	+
4.	**Steroids**	++	+	++
5.	**Flavonoids**	++	++	++
6.	**Saponins**	++	++	++
7.	**Phenols**	++	+	++
8.	**Tannins**	++	++	++

Results taken average of triplicates for different concentration of plant extract.

The qualitative phytochemical studies were carried out in the solvents viz. Methanol, Chloroform and Petroleum ether. The Methanol, Chloroform and n-Butanol Leaves extract of ***Cassia fistula* L.**shows the presence of alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols but high intensity of phytochemicals in leaves showed in table no.1 by twice and petroleum ether extract of leaves.

Conclusion

***Cassia fistula* L**. is the rich source of phytochemicals, alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols. Its extraction in petroleum ether solvent shows highest intensity and content of phytochemicals.

So, ***Cassia fistula* L**. of plant presence different phytochemical compounds useful for Further purification, identification and characterization of the active compounds of would be our priority in future studies.

Medicinal uses of Cassia ***fistula* L**.

Cassia species worldwide which are used in herbal medicine systems. These particular families of plants are used widely for their laxative actions. *Cassia fistula* is no exception... it is often used as a highly effective moderate laxative that is safe even for children.

However, in large doses, the leaves and bark can cause vomiting, nausea, abdominal pain and cramps. *Cassia fistula* is also employed as a remedy for tumours of the abdomen, glands, liver, stomach, and throat, for burns, cancer, constipation, convulsions, delirium, diarrhoea, dysuria, epilepsy, gravel, haematuria, pimples, and glandular tumours. In Ayurvedic medicine systems, the seeds are attributed with antibilious, aperitif, carminative, and laxative properties while the the root is used for adenopathy, burning sensations, leprosy, skin diseases, syphilis, and tubercular glands. The leaves are employed there for erysipelas, malaria, rheumatism, and ulcers. In Brazilian herbal medicine, the seeds are used as a laxative and the leaves and/or bark is used for pain and inflammation.

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Diversity of Asterinaceous Fungi from Mahabaleshwar, Maharashtra

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Abstract

The Asterinaceous fungi is the second largest group of black mildews and are characterized by having shield-shaped thyriothecia, which split radially like a star or either opening by stellate dehiscence or by longitudinal splits; bitunicate asci and transversely uniseptate ascospores; with or without their anamorph. The asterinaceous group belonging to order Asterinales and having two families namely, Asterinaceae and Lembosiaceae. The present paper gives the checklist of Asterinaceous fungi from Mahabaleshwar, Maharashtra State, India. The 31 species of genus Asterina, 2 species each from Lembosia and Asterostomella and single species from Asterostomula are arranged in alphabetically.

Key words: *Black Mildew fungi, Asterinales, foliicolous fungi.*

Introduction:

The documentation of biodiversity, its conservation and sustainable utilization is the major theme of research in life sciences. The fungi are the important biotic group in the biodiversity and they are an extremely important part of the ecosystem. They have significant role in recycling of minerals and carbon; as a source of food, medicines and chemicals; as important models in scientific research; and have received much attention by scientific society as they cause plant and animal disease (Hosagoudar, 2012). The microfungi have great diversity in ecosystem but they are less studied because of its inconspicuous nature. Black mildews are one of the neglected group but having large number of species contribution in fungal diversity from tropical and subtropical regions of the world. Most of these fungi are either saprophytic or obligate parasites and residing on the surface of the leaves and producing special organs (haustoria) and opting special adaptation (Hansford, 1946a). These fungi are very specific in their structural characters; produce thin to dense black colonies on the surface of the leaves, contain conspicuous superficial appressoriate mycelium, forming fruiting bodies with asci and ascospores at their maturity (Hansford, 1961; Hosagoudar, 2012).

Among the black mildews, the Asterinaceous fungi are the second largest group of black mildews and are characterized by having shield-shaped thyriothecia, which split radially like a star or either opening by stellate dehiscence or by longitudinal splits; bitunicate asci and transversely uniseptate ascospores; with or without their anamorph. Asterinaceous fungi are usually more or less inconspicuous, superficial, obligate biotrophs, infecting wide range of flowering plants and existed with or without their anamorph. These fungi produce thin to dense black colonies on the surface of the leaves. These are characterized by superficial mycelium with one to two celled appressoria; at the maturity of colony, they formed flattened fruiting bodies with radiating cells known as thyriothecia, which splits radially like a ‘star’ and hence known as ‘Asterinaceous fungi’ or by longitudinal slits (Lembosiaceae); the bitunicate asci formed within the thyriothecium, contain transversely uniseptate ascospores. These are usually flourished with or without their respective anamorph (Hosagoudar, 2012).

Following are the significant taxonomic characters which facilitate the identification and separation of genus and species of this group of fungi.

1.1. Host identity

As the black mildew fungi are obligate parasite and considered as host specific, it is essential to know the correct identity of the host plants, preferably up to species level. This is an important taxonomic tool, used to keyout these fungi (Hosagoudar, 2012). Most of the authors have described the species key for asterinaceous fungi on the basis of families and genus of host plant.

1.2. Colony

Generally, the asterinaceous fungi produce typically thin to dense, dark-black colonies superficially on living leaves of plants. Mostly, the colony formed on leaves (foliicolous), and rarely on soft stem (caulicolous) and on young branches (ramicolous). If the colonies are on the leaves, they may be exclusively on the upper surface of the leaf (epiphyllous), or they may be exclusively lower surface of the leaf (hypophyllous) or they may be on both surfaces of leaf (amphigenous) (**Plate-1, Fig. 1-4**). The nature of the colony may be thin, crustose (crust like) or dense. Colonies grow radially and may be developed solitary (isolated) or scattered or confluent (scattered colonies spread to join together). Radiate growth results in the formation of a more or less circular colony that sometimes becomes confluent with neighboring colonies of the same fungal species. Confluent colonies can form colonization on large leaf surface by a single fungal species. So, the infection site, nature and size (in diameter) of colony are usually uniform in particular species or may not be uniform in different species and are significant for species delimitation (Hosagoudar, 2012). However, features of colony

appearance in combination with other morphological characters can facilitate the identification process at species level.

1.3. Mycelium

The species of asterinaceous fungi develop superficial, dark pigmented, filamentous, septate, branched, appressoriate mycelium or lacking appressoria, invade the host plant surface and form specialized structures for host infection (haustorium). Mycelium consists of brown to black, cylindrical cells with thick cell wall. It may be straight, substraight, undulate or zigzag, flexuous or crooked in nature. The branching may be opposite, alternate or irregular in the arrangement and branched at acute angles (around 45° or less than that) to wide angles (more than 45°) (**Plate-1, Fig. 5-8**). Branched hyphae may be loosely or closely reticulate and form a solid mycelial mat by compactly placing the individual mycelial threads. Therefore, the appearance of mycelium, branching pattern and angle, density of mycelium, length and diameter of hyphal cells are important taxonomic characters for species segregation in Asterinaceous fungi (Hosagoudar, 2012).

1.4. Appressoria

In this group of fungi, generally single to two celled appressoria are formed laterally on hyphae, but, sometimes these are absent (*Asterostomula*). The arrangement of laterally formed appressoria may be strictly opposite or alternate, unilateral or irregular and closely or moderately to distantly placed. These may be straight to curved, antrorse (directed towards the growing tip) to retrorse (turned opposite to growing tip), subantrorse (making more than 45° angle to the mycelium) or spreading (having mixed characters of all these). The lower cells or stalk cells in bicelled appressoria are mostly unicellular and are cylindrical to cuneate in shape. The unicellular appressoria or the head cell of bicelled appressoria may be globose, oblong, ovate, clavate, pyriform and may be entire, angular, sublobate to lobate at margin (**Plate-1, Fig. 9-13**). So, the arrangement, position, nature, size, shape and margin of appressoria are the important criterion for species segregation in asterinaceous fungi.

1.5. Thyriothecia

Thyriothecia of asterinaceous fungi are dimidiate type, flattened and typically circular in outline, orbicular or rarely elongated, L-, Y- or X-shaped. The development of a thyriothecium is initiated by directly below or lateral outgrowths from a surface hyphae and it grows radially. At the maturity, the thyriothecia dehisced or splits stellately at the center or dehisced vertically or longitudinally at the center (**Plate-1, Fig. 14-17**). The shape of the thyriothecia and their dehiscence pattern are an important criterion to delineate families and genera of Asterinales. Hosagoudar *et al*. (2001) used these characters to introduce a new family Lembosiaceae, for the genera having thyriothecia oval to elongate, X or Y shaped and dehisced longitudinally at the center. However, the flattened and typically circular thyriothecium with stellate dehiscence are the characters of family Asterinaceae (Hosagoudar, 2012).

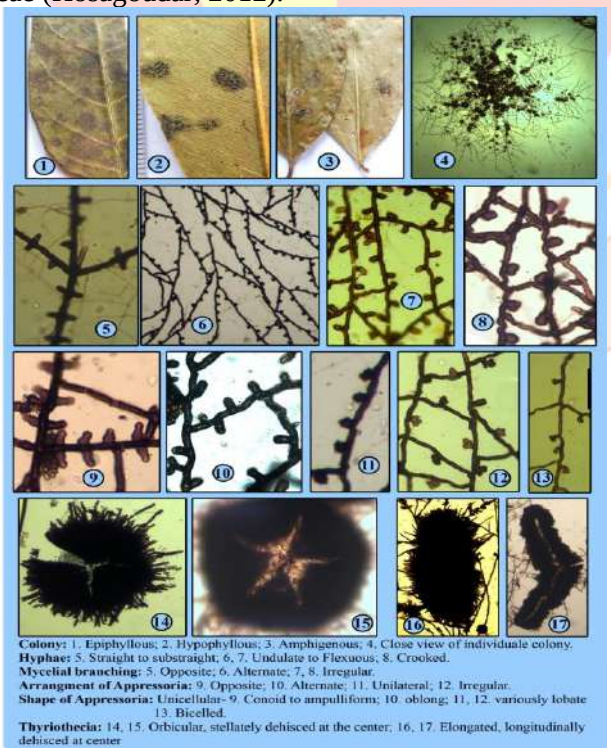

Plate 1. Colony, Hyphae, Mycelial branching, Appressoria & Thyriothecia in Asterinaceous fungi

1.6. Asci

The asci in asterinaceous fungi are bitunicate, globose, subglobose, ovate to broadly clavate. The ascus shape is relatively constant within the particular species of this group (Hosagoudar, 2012). The bitunicate asci have a distinctly thickened endotunica and it can be clearly visible when stained with cotton blue. Generally, thyriothecia are filled with numerous asci and contain 8 ascospores per ascus, more rarely 4 or 6 ascospores (**Plate-2, Fig. 1-4)**. So, the ascus numbers, shape and size are important taxonomical criteria for separation of species of asterinaceous fungi.

1.7. Ascospores

The ascospores of asterinaceous fungi are almost uniformly two-celled with one transversal septum at the center. At the region of the septum, the spores can be more or less constricted and the apices are mostly rounded or slightly acuminate to tapering. In general, the ascospores are almost oblong to ellipsoidal with equal cells or with the upper cell slightly longer and broader. Ascospore size is significant at species level (Hosagoudar, 2012). Ascospores are often pigmented and smooth-walled or more or less distinctly ornamented. The ornamentation pattern varies from warty or verrucose, truncate to echinulate (**Plate-2, Fig. 5-10**). Also, the germination pattern of ascospores is an important character for species segregation (**Plate-2, Fig. 11-13**). However, the ascospore shape, size, colour, absence or presence of ornamentation and its pattern are important criteria for species delimitation in asterinaceous fungi.

1.8. Anamorphic stages

The several numbers of genera of asterinaceous fungi produce anamorphic stages and are thought to be valid and important features in the classification of bitunicate ascomycetes. The asexual states (anamorphs) of several genera of Asterinales are present either along with teleomorph (sexual state) or develop isolated without respective teleomorph, and develop on the same surface mycelium forming conidia known as 'pycnothyriospores' within superficial Pycnothyria. Pycnothyria are always structurally similar to the thyriothecia, but usually smaller in size (Hosagoudar, 2012). The numerous pycnothyriospores are formed within the pycnothyria and are may be spherical, ovate, oblong, cylindrical, pyriform, angular to truncate (**Plate-2, Fig. 14-16)**. So, the presence or absence of anamorph, size and shape of pycnothyria and pycnothyriospores are the important taxonomic characters for species delimitation in asterinaceous fungi.

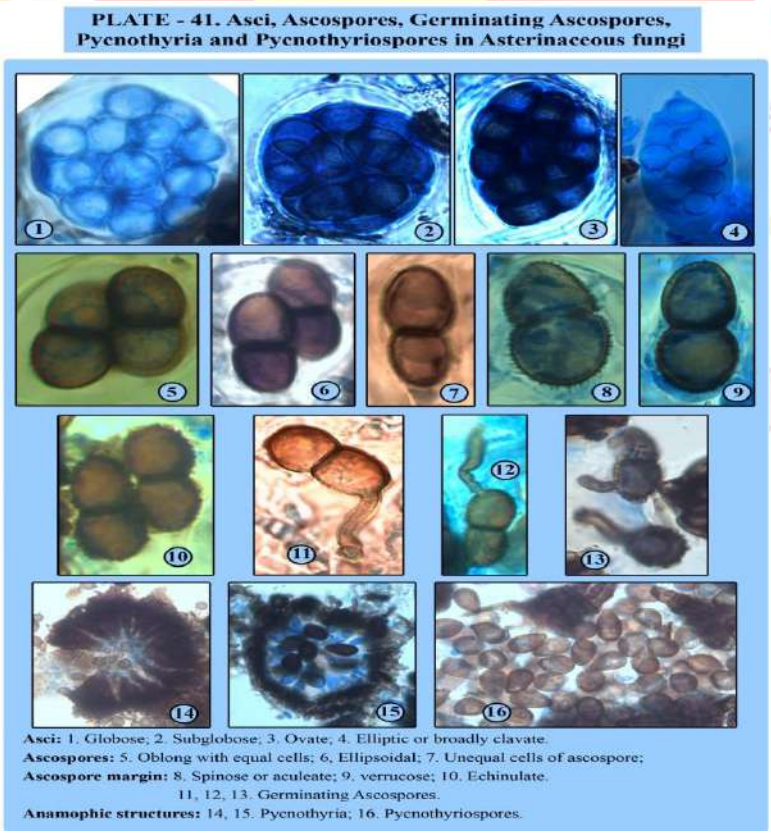

Plate 2. Asci, Ascospores, Pycnothyria & Pycnothyriospores in Asterinaceous fungi

Materials and Methods

The leaves and twigs of plant species infected with black mildew were collected from study area, during winter season (2012–2014). The infected host twigs were collected separately in sterilized polythene bags, tagged with field number, brought in the laboratory and pressed neatly to dry in between blotting papers. The well dried specimens were enclosed in butter paper and preserved in standard size herbarium packets. The host plants were identified by referring the regional flora (Deshpande *et al.*, 1995; Singh *et al*. 2000, 2001). Both macro and micro-morphological characters are used to taxonomical study of collected fungi. The fungal micro–morphological structures were mounted in lactophenol, stained with cotton blue and observed under compound light microscope. To observe mycelial branching and position of appressoria, a drop of peeling solution (Xylene–Thermocol solution) was applied on selected areas of the colonies, and after drying the film was mounted directly in again the same peeling solution. Biometric data were based on at least 10 measurements of structures; illustrations were prepared with Camera Lucida and photographed under Leica DM2000 fluorescence microscope equipped with digital camera. The fungal specimens were identified by using respective standard literature (Hansford, 1961; Hosagoudar, 2012; Patil *et al.*, 2014). Identified fungal specimens were deposited in Herbarium Cryptogamae Indiae Orientalis (HCIO), IARI, New Delhi (India) for their accession. The detail checklist of Asterinales group from Mahabaleshwar, Maharashtra state has been provided in present paper.

Enumerations of species: Family-Asterinaceae

Genus- *Asterina*

1. *Asterina atalantiae* Hosag. & Agarwal, Indian Phytopath. 56: 98, 2003; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala, p.41, 2011; Hosag., Mycosphere 2(5): 642, 2012.
Specimens examined: On leaves of *Atalantia racemosa* Wight (Rutaceae), Kate's Point, Mahabaleshwar, 17°55'78.2"N, 73°36'26.3"E, elev. 930 m, 12.12.2013, Bhise M.R., HCIO 51712; Ambenalighat, Mahabaleshwar, 17°53'39.9"N, 73°37'02.6"E, elev. 911 m, 15.03.2014, Bhise M.R., MHB 0602.
2. *Asterina beilschmiediae* Bhise, Patil & Salunkhe, Int. J. of Life Sciences 3(1): 68, 2015.
MycoBank No.: MB 811704
Specimens examined: On leaves of *Beilschmiedia dalzellii* (Meissn.) Kosterm. (Lauraceae), Mahabaleshwar, 17°55'25.6"N, 73°38'16.5"E, elev. 1289 m, 05.02.2014, Bhise M.R., HCIO 51713.
3. *Asterina casearíae* Hansf., Proc. Linn. Soc. London 156(2): 113, 1944; Hosag., Mycosphere 2(5): 650, 2012.
=*Asterina casearíae* Yamam., Sci. Rep. Hyogo Univ. Agric., Agric. Biol. Ser. 2:35, 1956.
Specimens examined: On leaves of *Caesearia graveolens* Dalz. (Flacourtiaceae), Hatlote, 17°51'43.6"N, 73°35'33.8"E, elev. 742 m, 06.02.2014, Bhise M.R., HCIO 51766; Renoshi forest, 17°47'43.1"N, 73°40'29.5"E, elev. 676 m, 13.03.2014, Bhise M.R., HCIO 51767; Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 10.12.2013, Bhise M.R., MHB 0235.
4. *Asterina chukrasiae* Hosag. in Hosag., H. Biju & Appaiah, J. Mycopathol. Res. 44: 40, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala, p.47, 2011; Hosag., Mycosphere 2(5): 653, 2012.
Specimens examined: On leaves of *Aglaia lawii* (Wight) Sald. (Meliaceae), Birmanwadi River side, 17°53'17.8"N, 73°37'20.5"E, elev. 676 m, 14.03.2014, Bhise M.R., HCIO 51768.
5. *Asterina combreti* Sydow, Engl. Bot. Jahrb. 45: 264, 1910; Hosag. & Abraham, Indian Phytopath. 51: 389, 1998; Hosag. & Appaiah, J. Mycopathol. Res. 43:172, 2005; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.55, 2011; Hosag., Mycosphere 2(5): 659, 2012.
Specimens examined: On leaves of *Terminalia elliptica* Willd. (Combretaceae), Par, 17°55'25.1"N, 73°40'26.2"E, elev. 732 m, 17.02.2013, Bhise M.R., HCIO 51769; Gonoshi forest, 17°55'22.3"N, 73°36'04.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51770.
6. *Asterina disciferae* Hosag. in Hosag., Balakr. & Goos, Mycotaxon 59: 172, 1996; Hosag., Mycosphere 2(5): 670, 2012.
Specimens examined: On leaves of *Syzygium caryophyllatum* (L.) Alst. (Myrtaceae), Pratapgad, 17°56'10.6"N, 73°35'06.5"E, elev. 836 m, 10.02.2013, Bhise M.R., HCIO 51651; *Syzygium cumini* (L.) Skeels, Gonoshi forest, 17°55'22.3"N, 73°36'06.2"E, elev. 696 m, 14.02.2014, Bhise M.R., HCIO 51653; *Syzygium rubicundum* Wight & Arn., Birmani–Bhairijogeshwari, 17°54'08.2"N, 73°36'45.8"E, elev. 705 m, 10.12.2013, Bhise M.R., HCIO 51454.
7. *Asterina dissiliens* (Sydow) Doidge, Bothalia 4: 287, 1942; Hosag. & Goos, Mycotaxon 52: 467, 1994; Hosag., Balakr. & Goos, Mycotaxon 60: 174, 1996; Hosag., Mycosphere 2(5): 671, 2012.
=*Asterinella dissiliens* Sydow, Ann. Mycol. 22: 425, 1924.
=*Parasterina reticulata* Doidge, Bothalia 1: 200, 1924.
Specimens examined: On leaves of *Maytenus rothiana* (Walp.) Lobreau–Collen (Celastraceae), Par, 17°55'22.3"N, 73°36'02.2"E, elev. 762 m, 17.02.2013, Bhise M.R., MHB 0162; Mahabaleshwar,

17°56'52.4"N, 73°40'16.4"E, elev. 1409 m, 19.02.2013, Bhise M.R., MHB 0208; Kate's point, Nakinda, 17°56'11.3"N, 73°35'06.6"E, elev. 1251 m, 18.10.2013, Bhise M.R., HCIO 51714, MHB 0339; *Maytenus senegalensis* (Lam.) Excell., Bhekawali, 17°56'11.3"N, 73°35'06.6"E, elev. 1251 m, 26.11.2012, Bhise M.R., MHB 0042.

8. *Asterina elaeagni* Sydow, Ann. Mycol. 29: 225, 1931; Hansf. & Thirum., Farlowia 3: 306, 1948.
=*Asterina elaegni* (Sydow) Sydow & Petrak, Hosag., Mycosphere 2(5): 672, 2012.
Specimens examined: On leaves of *Elaeagnus conferta* Roxb (Elaeagnaceae), Par, 17°54'86.9"N, 73°35'96.7"E, elev. 708 m, 10.12.2013, Bhise M.R., HCIO 51771; Gonoshi forest, 17°55'22.3"N, 73°36'02.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51772; Birmanwadi Road, 17°54'08.1"N, 73°36'45.8"E, elev. 712 m, 10.12.2013, Bhise M.R., MHB 0387.

9. *Asterina erysiphoides* Kalch. & Cooke, Grevillea 9: 32, 1880; Doidge, Trans. Roy. Soc. South Africa 8: 256, 1920; Hansf. & Thirum., Farlowia 3: 306, 1948; Hosag., Balakr. & Goos, Mycotaxon 59: 175, 1996; Hosag., H. Biju & Appaiah, J. Mycopathol. Res. 44: 7, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.72, 2011; Hosag., Mycosphere 2(5): 677, 2012.
Specimens examined: On leaves of *Jasminum malabaricum* Wight (Oleaceae), Par, 17°54'82.1"N, 73°35'92.1"E, elev. 720 m, 17.02.2013, Bhise M.R., HCIO 51699; Birmanwadi road, 17°54'08.1"N, 73°36'45.8"E, elev. 712 m, 10.12.2013, Bhise M.R., MHB 0385(b); Machutar-Tetawali, 17°53'98.5"N, 73°42'29.6"E, elev. 1265 m, 11.12.2013, Bhise M.R., MHB 0398(c).

10. *Asterina helicanthis* *sp. nov.*
MycoBank No: MB 811795
Specimens examined: On leaves of *Helicanthes elastica* (Desr.) Danser (Loranthaceae), Mahabaleshwar, 17°55'25.6"N, 73°38'16.5"E, elev. 1289 m, 05.02.2014, Bhise M.R., HCIO 51773; Dudhoshi, 17°55'15.6"N, 73°36'59.2"E, elev. 734 m, 15.03.2014, Bhise M.R., HCIO 51774.

11. *Asterina hibisci* (Doidge) Hosag. in Hosag., C. K. Biju & Abraham, J. Econ. Taxon. Bot. 28: 175, 2004; Hosag., Zoos' Print J. 21: 2327, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.88, 2011; Hosag., Mycosphere 2(5): 693, 2012.
=*Asterina diplocarpa* Cooke var. *hibisci* Doidge, Botahalia 4: 331, 1942.
Specimens examined: On leaves of *Hibiscus rosa-sinensis* L. (Malvaceae), Pratapgad, 17°56'12.1"N, 73°35'26.2"E, elev. 818 m, 15.03.2014, Bhise M.R., HCIO 51775.

12. *Asterina hosagoudarii* Bhise, Patil & Salunkhe, Int. J. of Life Sciences 3(1): 71, 2015. **MycoBank No.:** MB 811705
Specimens examined: On leaves of *Litsea josephii* S. M. Almeida (Lauraceae), Gureghar, 17°55'19.23"N, 73°44'22.79"E, elev. 1284 m, 19.11.2012, Bhise M.R. HCIO 51658 (holotype); HCIO 51657 (Isotype).

13. *Asterina jambolanae* Kar & Maity, Trans. Brit. Mycol. Soc. 54: 438, 1970; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.96, 2011; Hosag., Mycosphere 2(5): 701, 2012.
Specimens examined: On leaves of *Syzygium caryophyllatum* (L.) Alst. (Myrtaceae), Pratapgad, 17°56'12.7"N, 73°35'08.5"E, elev. 825 m, 20.11.2012, Bhise M.R., HCIO 51659; Gonoshi forest, 17°55'22.3"N, 73°36'06.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51660.

14. *Asterina laxiuscula* Sydow, Phillipine J. Sci. 8: 276, 1912; Patil & Pawar, Indian Phytopath. 42: 248, 1989; Hosag., Mycosphere 2(5): 708, 2012.
Specimens examined: On leaves of *Xantolis tomentosa* (Roxb.) Raf. (=*Sideroxylon tomentosa*, Sapotaceae), Gonoshi forest, 17°55'22.3"N, 73°36'00.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51776.

15. *Asterina litseae* Yates, Philippine J. Sci. 13: 373, 1918; Hosag., Balakr. & Goos, Mycotaxon 59: 180, 1996; Hosag., Mycosphere 2(5): 710, 2012.
Specimens examined: On leaves of *Litsea deccanensis* Gamble (Lauraceae), Chaturbet, 17°50'37.7"N, 73°38'10.8"E, elev. 677 m, 05.02.2014, Bhise M.R., HCIO 51716.

16. *Asterina lobulifera* Sydow in Sydow & Sydow, Philippine J. Sci. 9: 181, 1914; Hosag., C. K. Biju & Abraham, J. Mycophathol. Res. 40: 195, 2002; J. Econ. Taxon. Bot. 28: 175, 2004; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.108, 2011; Hosag., Mycosphere 2(5): 712, 2012
Specimens examined: On leaves of *Glochidion ellipticum* Wight (Euphorbiaceae), Birmani, 17°53'54.8"N, 73°36'41.4"E, elev. 720 m, 14.03.2013, Bhise M.R., HCIO 51717.

17. *Asterina macrosolenae* *sp. nov.*
MycoBank No: MB 811796
Etymology: The specific epithets based on the genus of host plant.
Specimens examined: On leaves of *Macrosolen capitellatus* (Wight & Arn.) Danser (Loranthaceae), Gonoshi, 17°55'22.3"N, 73°36'00.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51777; Birmani-Bhairijogeshwari,

17°54'08.2"N, 73°36'45.8"E, elev. 704 m, 10.12.2013, Bhise M.R., HCIO 51778; Dhudhgaon, 17°50'55.7"N, 73°37'36.0"E, elev. 772 m, 14.02.2014, Bhise M.R., MHB 0587.

18. ***Asterina morellae*** Hosag., C. K. Biju & Abraham, Indian Phytopath. 54: 137, 2001; Hosag., Zoos' Print J. 21: 2328, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.123, 2011; Hosag., Mycosphere 2(5): 726, 2012.

Specimens examined: On leaves of *Garcinia indica* (Du Petit-Thou.) Choisy (Clusiaceae), Pratapgad, 17°56'10.5"N, 73°35'04.3"E, elev. 848 m, 13.12.2013, Bhise M.R., HCIO 51779; Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., MHB 0420.

19. ***Asterina myrtacearum*** Bhise & Patil, in Bhise *et al*., Phytotaxa 184 (5): 284, 2014. **MycoBank No.:** MB 809993

Specimens examined: On living leaves of *Syzygium caryophyllatum* (L.) Alst. (Myrtaceae), Renoshi forest, 17°47'43.10"N, 73°40'29.50"E, elev. 676 m, 13.03.2014, Bhise M.R., HCIO 51664 (holotype); *Syzygium cumini* (L.) Skeels, Old Mahabaleshwar, 17°57'50.44"N, 73°39'12.47"E, elev. 1339m, 18.10.2013, Bhise M.R., MHB 0313(a).

20. ***Asterina nothopegiae*** Ryan, Mem. Dept. Agric. India 15: 104, 1928; Patil & Thite, J. Shivaji Univ. 17: 152, 1977; Hosag., Balakr. & Goos, Mycotaxon 59: 182, 1996; Hosag., C. K. Biju & Abraham, J. Econ. Taxon. Bot. 25: 305, 2001; Hosag., Zoos' Print J. 18: 1280, 2003; Hosag., Zoos' Print J. 21: 2328, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.128, 2011; Hosag., Mycosphere 2(5): 732, 2012.

Specimens examined: On leaves of *Nothopegia castaneifolia* (Roth) Ding Hou. (Anacardiaceae), Par, 17°55'22.4"N, 73°36'06.2"E, elev. 745 m, 17.11.2013, Bhise M.R., HCIO 51718; Par, 17°55'22.5"N, 73°36'05.2"E, elev. 462 m, 17.02.2013, Bhise M.R., MHB0160 (b); Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., MHB0418 (b).

21. ***Asterina oxyceri*** Bhise, Patil & Salunkhe, Int. J. of Life Sciences 3(1): 73, 2015.

MycoBank No.: MB 817106

Specimens examined: On leaves of *Oxyceros rugulosus* (Thw.) Tirveng. (Rubiaceae), Hatlote, 17°51'43.6"N, 73°35'33.8"E, elev. 742 m, 06.02.2014, Bhise M.R., HCIO 51719.

22. ***Asterina piperina*** Sydow, Ann. Mycol. 15: 243, 1917; M. S. Patil & Pawar, Indian Phytopath. 42: 251, 1989; Hosag., Mycosphere 2(5): 740, 2012.

=*Asterina piperis* Yates, Philippine J. Sci. 13: 374, 1918.

Specimens examined: On leaves of *Piper trichostachyon* (Miq.) C.B.Cl. (Piperaceae), Ghonaspur, 17°48'16.5"N, 73°39'25.7"E, elev. 696 m, 13.03.2014, Bhise M.R., HCIO 51720; Mahabaleshwar, 17°56'52.4"N, 73°40'16.4"E, elev. 1409 m, 12.03.2013, Bhise M.R., MHB 0203; Kate's Point, Mahabaleshwar, 17°55'78.2"N, 73°36'26.3"E, elev. 930 m, 12.12.2013, Bhise M.R., MHB 0414; Gonoshi, 17°52'46.5"N, 73°37'26.0"E, elev. 674 m, 04.02.2014, Bhise M.R., MHB 0472.

23. ***Asterina prataparajii*** Hosag. Robin & Archana, J. Appl. Nat. Sci. 2: 93, 2010; Hosag., Mycosphere 2(5): 745, 2012.

Specimens examined: On leaves of *Tylophora dalzellii* Hook. *f*. (Asclepiadaceae), Gonoshi, 17°52'46.5"N, 73°37'26.2"E, elev. 674 m, 04.02.2014, Bhise M.R., HCIO 51721; Pratapgad, 17°56'10.3"N, 73°35'17.1"E, elev. 832 m, 10.02.2013, Bhise M.R., MHB0243; Par, 17°54'86.9"N, 73°35'96.7"E, elev. 708 m, 10.12.2013, Bhise M.R., MHB0372; Hatlote 17°5'43.6"N, 73°35'33.8"E, elev. 742 m, 06.02.2014, Bhise M.R., MHB520; Chaturbet 17°50'37.5"N, 73°38'10.1"E, elev. 686 m, 07.02.2014, Bhise M.R., MHB547.

24. ***Asterina radians*** Ellis, Journal of Mycology 7 (3): 276, 1893; Kaul & Nair, Acta Botanica Indica 11: 227-229, 1988.

Specimens examined: On leaves of *Capparis rotundifolia* Rottl. (Capparaceae), Wilson point, Mahabaleshwar, 17°55'25.1"N, 73°40'26.2"E, elev. 1326 m, 03.02.2014, Bhise M.R., HCIO 51780; Cannot pick point, Mahabaleshwar, 17°56'52.4"N, 73°40'16.4"E, elev. 1409 m, 04.02.2014, Bhise M.R., HCIO 51781; Tapola Road, Mahabaleshwar, 17°56'52.4"N, 73°40'16.4"E, elev. 1409 m, 22.03.2013, Bhise M.R., MHB 0217.

25. ***Asterina rhamni*** Kar & Ghosh, Indian Phytopath. 39: 206, 1986; Hosag., Mycosphere 2(5): 747, 2012.

Specimens examined: On leaves of *Ventilago maderaspatana* Gaertn. (Rhamnaceae), Hatlote, 17°51'43.6"N, 73°35'33.8"E, elev. 742 m, 06.02.2014, Bhise M.R., HCIO 51722; Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., MHB 0416.

26. ***Asterina rubiacearum*** Bhise, Patil & Salunkhe, Phytotaxa 511 (3): 283-288, 2021.

MycoBank No: MB 811797

Etymology: the specific epithet refers to the host plant family–Rubiaceae.

Specimens examined: On living leaves of *Canthium dicoccum* (Gaertn.) Teijsm. & Binn. var. *umbellatum* (Wight) Sant.& Merch. (Rubiaceae), Machutar-Tetawali, 17°53'98.5"N, 73°42'29.6"E, elev. 1265m, 11.12.2013, Bhise M.R., HCIO 51666 (holotype); Linghmala, 17°55'15.1"N, 73°36'59.3"E, elev. 1177 m,

22.12.2012, Bhise M.R., HCIO 51665; Kharoshi, 17°50'10.4"N, 73°38'12.8"E, elev. 628 m, 07.02.2014, Bhise M.R., HCIO 51667.

27. ***Asterina tertia*** Racib. in Theiss., Die Gattung Asterina 7:103, 1913; Sacc., Sylloge Fungorum 24: 443, 1926; Hosag. & Abraham, J. Econ. Taxon. Bot. 4: 558, 2000; Hosag., Biju & Appaiah, J. Mycopathol. Res. 43: 204, 2005; 44: 12, 2006; Hosag., Zoos' Print J. 21: 2329, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.147, 2011; Hosag., Mycosphere 2(5): 755, 2012.

Specimens examined: On leaves of *Rhinacanthus nasuta* (L.) Kurz (Acanthaceae), Ambenalighat, Mahabaleshwar, 17°53'39.9"N, 73°37'02.6"E, elev. 911 m, 17.10.2013, Bhise M.R., HCIO 51723; *Asystasia dalzelliana* Sant., Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., HCIO 51724.

28. ***Asterina trichiliae*** Doidge, Trans. Royal Soc. South Africa 8: 253, 1920. Hosag. & Goos, Mycotaxon 60: 161, 1996; Hosag., Mycosphere 2(5): 765, 2012.

Specimens examined: On leaves of *Trichilia connaroides* (Wight & Arn.) Bentv. (Meliaceae), Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., HCIO 51782; Pratapgad, 17°56'10.9"N, 73°35'09.4"E, elev. 821 m, 15.03.2014, Bhise M.R., MHB 0621.

29. ***Asterina wingfieldii*** Hosag., Balakr. & Goos, Mycotaxon 59: 184, 1996; Hosag., Mycosphere 2(5): 672, 2012.

Specimens examined: On leaves of *Grewia abutilifolia* Vent. ex A. Juss. (Tiliaceae), Gonoshi, 17°55'22.3"N, 73°36'00.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51783; Birmani, 17°53'41.4"N, 73°36'41.4"E, elev. 720 m, 14.03.2014, Bhise M.R., MHB 0593; Dudhoshi, 17°55'15.6"N, 73°36'59.2"E, elev. 734 m, 15.03.2014, Bhise M.R., MHB 0610; *Grewia serrulata* DC., Hatlote, 17°51'43.6"N, 73°35'33.8"E, elev. 687 m, 06.02.2014, Bhise M.R., HCIO 51784.

30. ***Asterina woodfordiae*** Sahni, Mycopath. Mycol. Appl. 23(4): 330, 1964; Patil & Thite, J. Shivaji Univ. 17: 152, 1977; Hosag., Mycosphere 2(5): 771, 2012.

Specimens examined: On leaves of *Woodfordia fruticosa* (L.) Kurz. (Lythraceae), Gonoshi, 17°52'46.5"N, 73°37'26.0"E, elev. 674 m, 04.02.2014, Bhise M.R., HCIO 51725; Ambenalighat, Mahabaleshwar, 17°53'39.9"N, 73°37'02.6"E, elev. 858 m, 17.10.2013, Bhise M.R., MHB 0294; Par, 17°54'86.9"N, 73°35'96.7"E, elev. 708 m, 10.12.2013, Bhise M.R., MHB 0368; Hatlote, 17°51'43.6"N, 73°35'33.8"E, elev. 742 m, 06.02.2014, Bhise M.R., MHB 0527.

31. ***Asterina wrightiae*** Sydow in Sydow & Petrak, Ann. Mycol. 29: 236, 1931; Hosag. & Abraham, Indian Phytopath. 51: 390, 1998; J. Econ. Taxon. Bot. 4: 560, 2000; Hosag., C.K. Biju & Abraham, J. Econ. Taxon. Bot. 25: 305, 2001; Hosag., Zoos' Print J. 18: 1280, 2003; Hosag., Zoos' Print J. 21: 2329, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.160, 2011; Hosag., Mycosphere 2(5): 769, 2012.

Specimens examined: On leaves of *Wrightia tinctoria* R. Br. (Apocynaceae), Kharoshi, 17°50'10.4"N, 73°38'12.8"E, elev. 628 m, 07.02.2014, Bhise M.R., HCIO 51726; Chaturbet, 17°52'01.3"N, 73°38'10.1"E, elev. 652 m, 07.02.2014, Bhise M.R., MHB0550.

Genus- *Asterostomella*

Enumeration of the species

1. ***Asterostomella flacourtiae-montanae*** V.B. Hosagoudar & A. Sabeena, in Hosag., Mycosphere 2(5): 827, 2012.

Specimens examined: On leaves of *Flacourtia indica* (Burm. f.) Merr. (=*Flacourtia montana*, Flacourtiaceae), Machutar-Tetawali, 17°54'32.5"N, 73°41'29.9"E, elev. 1306 m, 12.03.2014, Bhise M.R., HCIO 51785.

2. ***Asterostomella nothopegiae*** *sp. nov.* **MycoBank No:** MB 811798

Etymology: The specific epithets based on the genus of host plant.

Specimens examined: On leaves of *Nothopegia castaneifolia* (Roth) Ding Hou. (Anacardiaceae), Dudhoshi, 17°55'15.6"N, 73°36'59.2"E, elev. 734 m, 15.02.2014, Bhise M.R., HCIO 51727; Par, 17°55'22.3"N, 73°36'00.2"E, elev. 762 m, 17.02.2013, Bhise M.R., MHB0160 (c); Par, 17°55'22.6"N, 73°36'01.2"E, elev. 768 m 17.12.2013, Bhise M.R., MHB0305 (c); Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., MHB0418 (c).

Genus- *Asterostomula*

1. ***Asterostomula pavettae*** Hosagoudar & Sabeena in Hosag., Mycosphere 2(5): 837, 2012.

Specimens examined: On leaves of *Pavetta concanica* Bremek. (Rubiaceae), Par-Wada, 17°55'25.1"N, 73°40'26.2"E, elev. 732 m, 23.12.2012, Bhise M.R., HCIO 51786.

Family- Lembosiaceae
Genus- *Lembosia*

1. *Lembosia mahabaleshwarensis* Bhise & Patil, in Bhise *et al*., Phytotaxa 184 (5): 284, 2014. **MycoBank No.:** MB 809994

Specimens examined: On living leaves of *Syzygium rubicundum* Wight & Arn. (Myrtaceae), Par, 17°55'22.30"N, 73°36'00.20"E, elev. 762m, 17.10.2013, Bhise M.R., HCIO 51673 (holotype); Pratapgad, 17°56'10.70"N, 73°35'07.50"E, elev. 829m, 13.12.2013, Bhise M.R., HCIO 51674.

2. *Lembosia memecylicola* Hosag., J. Mycopathol. Res. 43(2): 204, 2005; Hosag., Mycosphere 2(5): 814, 2012.

Specimens examined: On leaves of *Memecylon umbellatum* Burm. f. var. *umbellatum* (Melastomataceae), Ambenalighat, Mahabaleshwar, 17°53'39.9"N, 73°37'02.6"E, elev. 858 m, 06.01.2013, Bhise M.R., HCIO 51790; Old mahabaleshwar, 17°57'50.4"N, 73°39'12.4"E, elev. 1339 m, 18.10.2013, Bhise M.R., MHB 0320; Wilson point, Mahabaleshwar, 17°55'25.3"N, 73°40'26.4"E, elev. 1331 m, 19.10.2013, Bhise M.R., MHB 0348.

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12. Singh, N. P., Lakshminarasimhan, P., Karthikeyan, S. and Prasanna, P. V. 2001. *Flora of Maharashtra State: Dicotyledones*, vol. II. Botanical Survey of India, Calcutta.

Observations on Floral Nectar and Flower visitors in *Hamelia patens* Jacq. (Rubiaceae)

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Abstract

The present paper deals with the study of flowering phenology, flower dynamics, nectar production, chemical composition and flower visitors of Hamelia patens Jacq.(Rubiaceae)

Hameliapatens is large perennial shrub or small treein the family Rubiaceae that is native to the American subtropics and tropics.The common name of this plant is firebush, hummingbird bush,scarlet bush and redhead.Flowering season of this plant is throughout the year. The flowers are bright reddish-orange or scarlet tubular.And last for 2days.Anther dehisces in the mature bud. Nectary gland present at the base of ovary. The amount of nectar and nectar concentration from flowers was recorded after every two-hour interval from 08.00hrs -17.00hrs. The average volume of nectar was found to be 1µl. The average nectar concentration was found to be 15%. Sugars from floral nectars were detected by one directional thin layer chromatography. Nectar showed the presence of three sugars sucrose glucose and fructose. Flower visitors were observed for their visits and behaviour during the flowering period. Butterflies, sun birdwasps and ants were the main flower visitors.

Key words: Hamelia patens, Nectar, Sugars, Pollinators.

Introduction

*Hamelia patens*is a large perennial shrub or small tree that is native to the American subtropics and tropics.*Hamelia. patens* belonging to family Rubiaceae .The flowers of the *H. patent* are orangish-red tubular which recruit hummingbirds and butterflies for pollination.(Welch and willam C. 2003). Tha family Rubiaceae has 10,700 species consisting treem shrub and hurbs (Robbrecht 1998). Nectary gland presentat the base ovary. Presence of nectaries is a biological character as it is related to a vital function of pollination.Pollination is successful in many plant species as consequences of pollinators seeking nectar.(Southwick*etal*, 1981).Sucrose-rich nectar present. (Faegri and Van der pijl 1980). Floral nectar provides food for insect and birds pollinators.(Baude et al 2016;Carvell et al 2006).Nectar characteristic patterns of nectar secretion and availability, flower production spatial arrangement and morphological aspects of flowers and flower -visiting birds are important in order to understand the foraging behaviour of birds on flowers (Waser, 1982; Kearns and Inouye, 1993). This phonological pattern is associated with long-lived pollinators that set fixed daily foraging routes (Gentry 1974). Bird-pollinated plants are usually characterised by having brightly colour, odourless flowers, tubular and evenly curved corollas,diurnal anthesis(Faegri and Van der Pijl 1980).Flowers produce nectar and are adapted for pollination.In *H.patens* due to bright oranges tubuler colour of flower maximum butterflies, bees and birds are attracted. Ants and house flies are robbers.

Thus, the aim of the present work was to study flowering phenology, the nectar volume (µL), nectar concentration, chemical composition of sugars and flower visitors in *Hamelia patens*.

Material and Methods

Study Area

The present study was carried out in the campus of Shri Shivaji Arts, Commerce and Science College, Akot during February to April 2021.

Flowering phenology

A cultivated population of *Hamelia patent*in college campus was chosen for observations. Flowering phenology, time of anthesis and time of anther dehiscence was recorded during the peak flowering period.

Nectar Analysis

The time of nectar secretion was noted during the peak flowering period. The amount of nectar from flowers was recorded at 2hrs intervals during the flowering period. Nectar was extracted with micro-capillary tubes. Nectar concentration was determined using a hand-held sugar refractometer (Erma Japan) from 8.00hrs to 17.00hrs for 5 days during the peak bloom. For the analysis of sugar and nectar samples preserved in isopropanol as well as fresh nectar samples were used. The sugars present in nectar were studied by using thin layer chromatography. Nectar sample was loaded on the plate along with standard sucrose, fructose and glucose keeping a comfortable distance between the loaded nectar sample and standard sugars. Later the plates were run in a solvent prepared by mixing butanol-4 parts + acetic acid 1 parts + distilled water 5 parts (4:1:5). After solvent run, the silica gel plate was allowed to dry, sprayed with 1% aniline, 1% diphenylamine and 85% Ortho-phosphoric acid prepared in 100 ml acetone.

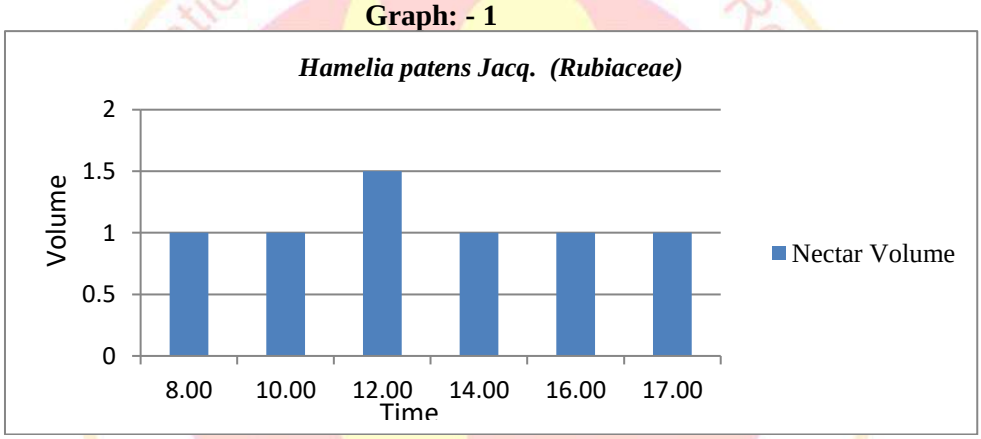
Flower Visitors

Observations were made on the type of flower visitors during the peak flowering period. The duration of visits, number of flowers was recorded at 2hrs interval.

Table 1.Nectar Volume and Nectar Concentration in*H. patens*

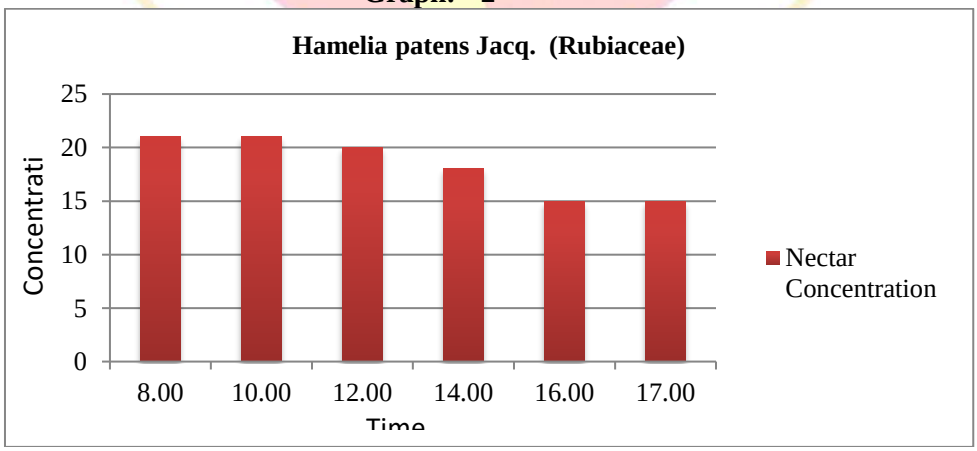
Time	Nectar Volume	Nectar Concentration
8.00	1µl	21%
10.00	1µl	21%
12.00	1.5µl	20%
14.00	1µl	18%
16.00	1µl	15%
17.00	1 µl	15%

Graph: - 1



Nectar Volume in *Hamelia patens Jacq. (Rubiaceae)*

Graph: - 2



Nectar Concentration in*Hamelia patens Jacq. (Rubiaceae)*

Table 2 : Flower visitor's census in *H.patens*

Flower visitors	Forage type	Time of visit	Flower visited
Bees and wasps	Nectar	08.00-1.00hrs	5-6
Butterflies	Nectar	08.00- 11.00hrs	2-3

Ants	Nectar	Throughout day	4-5
Sunbirds	Nectar	14.00- 16.00hrs	4-5
Houseflies	Nectar	11.00-12.00 hrs	2-3

Fig:1.Ant feeding on nectar.

Fig:2.housefly collecting nectar from flower.

Fig:3.Butterfly visiting the flower for nectar

Fig:4.Ant feeding on nectar.

Fig:5.wasp collecting nectar from flower

Result and Discussion

In *Hameliapatens*flowering period throughout years and but the peak flowering period was observed during month of April and september. However, flowering phenology quit variable and under the control of environmental conditions.The inflorescence is polychasial cyme. Flowers open daily 7.00hrs-800hrs. Anther dehiscence takes place between 11.00hrs-1200hrs in the mature bud. During the period of September-february, the flowers start to open around 03.00hrs and are fully open at 03.30hrs.The anther dehisce by longitudinal slits prior to anthesis. And anther dehisce inside the buds.(Chauhan and Galetto L. 2009).Nectar secreation begins before anthesis. The open flower produce 1.2ul nectar and fructose Glucose and sucrose sugars present in the nectar of *H. patent*(Chauhan and Galetto L.).Floral nectar is secreted by plants to attract and reward of pollinators, and it plays a key role in the functional ecology of plants (Baker and Baker, 1983; Gonzalez-Teuber and Heil, 2009). In *Hameliapatens* nectar secretion begins in the buds during morning 7.00hrs-8.00hrs. The quantity of nectar was measure on the day of flower opening at two hours intervals between 8.00hrs-17.00hrs. On an average the total amount of nectar measure during this period in each flower was 1µl (Table 1 & Graph 1). Maximum nectar production occurred during 12.00hrs-15.00hrs.The average nectar concentration was found 18.33% during the peak flowering period (Table 1 & Graph 2).Galetto(1998) made similar observations in H. patentconcentration of nectar 16% and later between 20-25%. The three nectar sugars fructose glucose and sucrose were identified. Sucrose present in abundant amount. Sucrose-rich nectar is present. (Faegri and Van der pijl 1980). The flowers are nectar-rich, orange colour and tubular serve as strong visual cues to attract the butterflies bees and Ants. The present observations showed that in *H. patens* butterflies bees and ants were the main pollinators. Among the peak flowering period observed in the study, in

morning between 07.00hrs -11.00hrs had greater number of pollinator visits per bout.Coloured butterflies and ants visited the flower throughout the day. Most of the bees and wasps visited in between8hrs-1.00hrs.Houseflies visited in between 11.00-12.00hrs. (Table 2).Thomas et,al (1986) studied the interaction between the butterflies and hummingbirds in *Hameliapatens*. While sunbirds are seen in the afternoon between 15.00hrs-17.00hrs. It is interesting observed that the butterflies visit in the morning hours 08.00hrs-11.00hrs. (Chauhan and Galetto L. 2009).

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In vitro evaluation of cytotoxic activity of *Curcuma inodora* Blatt. Rhizomeagainst (Miapaca-2) human pancreatic carcinoma cell line

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Abstract:

To determine the in vitro cytotoxic activity of Curcuma inodoraBlatt.,crude aqueous extract of rhizome against thehuman pancreatic carcinoma cell lines (MiaPaca-2). The cytotoxic activity was evaluated by the tetrazolium salt reduction assay (MTT)at different concentrations(10, 20, 30, 40 and 50µg/ml) of aqueous extract of rhizome for 48 hrs. with standard positive control chemotherapeutic agent viz. 5-Flurouracil.The aqueous extracts showed growth inhibition 26.24 ± 1.81 at highest 50µg/ml. IC_{50} for the 5-FU standard control was 25.9 ±0.68µg/ml. Crude aqueous extract of rhizome Curcuma inodoraproduced IC_{50} value 97.58 ± 2.45 µg/ml.Rhizome aqueous extract of Curcuma inodorashowed a significant reduction in growth of cancerous cells indicate the potential of anti-proliferative growth.

Keywords: *Curcuma inodora, rhizome, Cytotoxicity, Pancreatic cancer cells, MTT assay, 5-Flurouracil.*

Introduction:

Pancreatic cancer (PC) is a highly invasive human malignancy globally with an extreme poor prognosis (Siegel *et al*., 2016). Pancreatic cancer is seventh leading cause of cancer related death all over the world. However, mortality rate of pancreatic cancer are not completely clear. For the majority of concerning PC sufferers, the only therapeutic promise is cytostatic remedy using standard chemotherapeutic drugs such as gemcitabine and 5-FU (5-fluorouracil) or their combination (Michl and Gress, 2013). However, the median progress time of PC sufferers is only about 6 months usually due to an almost complete chemotherapy resistance, and the dismal 5-year survival is currently approximately 2% (Ramfidis*et al*.,2014) Therefore, there may be a great need for each new biomarkers with prognostic and predictive value and newer therapeutic preferences for this disease. MIA PaCa-2 cell line is a prime tumor currently used in vitro models to observe pancreatic carcinogenesis. Wild plants in nature have bioactive phytochemicals that have anti-carcinogenic property.

Curcuma inodora Blatt. belongs to family-Zingiberaceae, commonly known as scentless turmeric. Traditionally, it is used in the treatment of muscular pain, psychosomatic disorders and constipation. Scentless turmeric is used by the tribal as a hair tonic and to cure wound. Tribal uses of *Curcuma inodora* gives an importance to this plant to scientific community and no scientific literature is available to explore the use of anticancer effect of *Curcuma inodora*. Therefore, the aim of this research was to determine the cytotoxic assay in vitro effect of crude aqueous extract of *Curcuma inodora* rhizome.

MATERIALS AND METHODS:

Selection and Collection of Plant: *Curcuma inodora*rhizomes were collected from Melghat region of Amravati District in the month of June to September (Fig.1).

Identification and Authentication of plants: *Curcuma inodora* identification carried out using different

Fig.1. a)*Curcuma inodora* habitat **b)** Rhizome

methods with the help of standard floras (Sharma *et al*., 1996; Dhore, 2002) and authenticated by Taxonomist Dr. S.P. Rothe Professor and Head Department of Botany, Shri. Shivaji Science College, Akola.

Preparation of test solution: Rhizome 1 gm powder crushed in mortar and pestle by adding 10 ml. DW, then centrifuge at 4000 rpm for 10 min. Supernatant concentrations (10-50 µg/ml) prepared by serial dilution method.

In-vitro Cytotoxic Activity Assay: The human pancreatic carcinoma cells (MiaPaCa-2) wereprocure from the National Centre for Cell Sciences (NCCS), Pune, and Maharashtra. Cells were grow in Dulbecco's minimum essential medium (DMEM).MiaPaCa-2 cells were maintain at 37°C, 5% CO_2, in a 90% humidified atmosphere in CO_2 incubator (Galaxy Make). Cells were pass after every 5th days. Experimentation carried out in 96 well Microtiter plates. The cytotoxic activity was measured using MTT (3-(4,5dimethylthiazol- 2-yl)-2,5-diphenyltetrazolium bromide) assay Berridge MV- A new class of cell surface antigens. Quantitative absorption studies defining cell-lineage-specific antigens on hemopoietic cells.Briefly, 2 X 10^4cells/well were seeded in 96-well microliter plates.

Cell Treatment Procedure: Cells were treated with various working concentrations (10-50 µg/ml) of aqueous extract of rhizome and standard anticancer drug i.e. 5-Fluorouracil (5-FU) (10-50 µg/ml) for 48 hours. At the end of incubation period, the medium was replaced by 150µl fresh medium and 50 µl MTT (1mg/mL) was added to each well, followed by an incubation period for a further 4 hours at 37^{0}C. Later, 150 µl of DMSO added to each well for solubilization of the formazan products. Absorbance was taken at 630 nm using a Bio-Tek microplate reader. The percent cell cytotoxicity calculated by using the following formula.

$$\% \text{ Cytotoxity} = \frac{(\text{Absorbance of control sample} - \text{Absorbance of treated sample})}{Absorbance\ of\ control\ sample} X100$$

Statistical Analysis: The results presented as means ± SD of three independent experiments. Statistical differences among means were determined by one way ANOVA. Differences were considered significant at P<0.05. The IC_{50} values were calculated using Graph Pad Prism 5.0 (Graph Pad Software Inc., San Diego, CA). Every experiment included a set of negative controls (untreated cultures) and positive control treated with 5-Flurouracil.

Results And Discussions:

The results for cell growth inhibition by aqueous extracts of the rhizome against MIAPaCa-2 cell lines at 10-50µg/ml concentrations tabulated in Table 1 and graphically represented in Fig. 2. Aqueous extract of rhizome tested *in vitro* for their potential human cancer growth inhibitory effect on MIAPaCa-2 cancer cell lines at various concentrations ranging from 10-50µg/ml. Results obtained that aqueous extract inhibited the growth of cells in concentration dependent manner and showed the positive inhibitory effect on cell growth (Table 1 and Fig. 1). The aqueous extracts showed growth inhibition 26.24±1.81% at highest concentration of 50 µg/ml (Table 1). However, deviation seen when IC_{50} value was calculated. From the figure, it was found that the IC_{50} value with 97.58 ± 2.45 µg/mlrecorded in aqueous extract showed a significant reduction in growth of cancerous cells indicating the potential of anti-proliferative growth (Table 1, Fig.2). IC_{50} for the 5-FU standard. Control showed 25.9 ±0.68µg/ml. inhibition.

Table 1: Effect of aqueous extract of *Curcuma inodora*rhizome on growth of MIAPaCa-2 cell line after the incubation for 48 hrs.

Concentration (µg/ml)	% Inhibition	
	AQ	**5-FU**
Control	0	0
10	4.72 ± 4.16	43.02 ±1.00
20	10.76 ± 1.20	45.78 ± 0.10
30	14.69 ± 2.27	51.02 ± 0.36
40	19.42 ± 1.20	59.37 ± 0.72
50	26.24 ± 1.81	61.07 ± 0.52
IC_{50}	**97.58 ± 2.45**	**25.9 ± 0.68**

*Results represented as an average of three± replicates
[**AQ**-Aqueous extract; 5-FU- 5-Flurouracil]

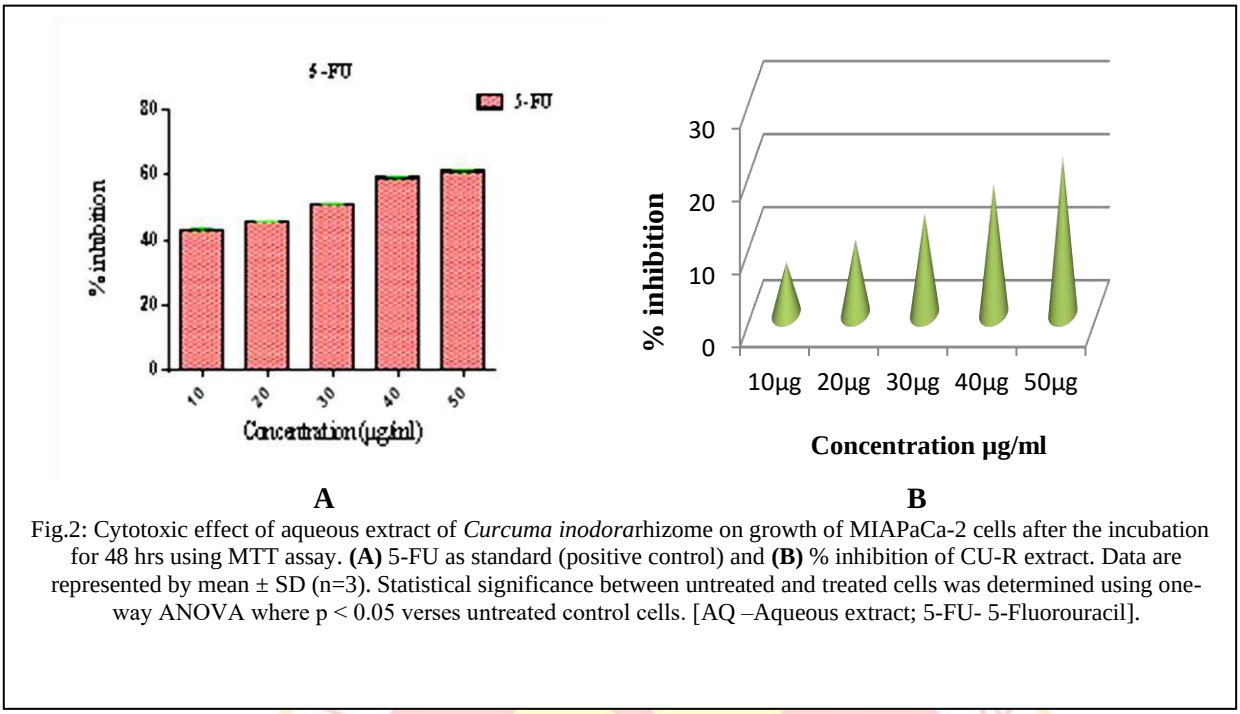

Fig.2: Cytotoxic effect of aqueous extract of *Curcuma inodora*rhizome on growth of MIAPaCa-2 cells after the incubation for 48 hrs using MTT assay. **(A)** 5-FU as standard (positive control) and **(B)** % inhibition of CU-R extract. Data are represented by mean ± SD (n=3). Statistical significance between untreated and treated cells was determined using one-way ANOVA where $p < 0.05$ verses untreated control cells. [AQ –Aqueous extract; 5-FU- 5-Fluorouracil].

The cytotoxicity assay is based on the capacity of mitochondria succinate dehydrogenase enzymes in living cells to reduce the yellow water soluble substrate tetrazolium salt 3-(4,5 dimethyl thiazol-2-yl)-2-5-diphenyl tetrazolium bromide (MTT) into a blue colored i.e. formazan crystals which is measured by spectrophotometer (Masters, 2000; Mosmann, 1983). Since reduction of MTT can only occur in metabolically active cells, the level of activity is a measure of the viability of the cells. The number of cells was found to be proportional to the extent of formazan production by the cells used (Francis and Rita, 1986).

MTT proliferation assay was carried out to determine the growth rate of cells. In the present study, the aqueous extract of *Curcuma inodora*rhizome has indicated significant growth inhibition on Miapaca-2 cell line. The aqueous extract treatment on Miapaca-2 cells lines showed significant decrease in growth rate compared with control. The qualitative phytochemical analysis of aqueous extract of *Curcuma inodora*rhizome detected the presence of carbohydrate and glycosides, protein and amino acids, alkaloids, phenolic compounds & flavonoids, phytosterols, saponins and terpenoids (Ghurde, 2018). Besides this polyphenol, curcumin has anti-inflammatory and anti-cancer properties, modulating the epigenetic alterations typically associated with cancer (Mazidi et al. 2016). Which could be responsible for anti-carcinogenic property. Flavonoids found to possess anti-mutagenic and anti-malignant effects (Masmaan, 1983). Moreover, it has protective effect against cancer by their effect on signal transduction in cell proliferation and angiogenesis.

Conclusions:

The present study revealed that the aqueous extract of *Curcuma inodora* Blatt. rhizome was found to be cytotoxic towards human pancreatic cancer cell line in MTT assay. The 50% cytotoxic effect (IC_{50}) of aqueous rhizome extract of *Curcuma inodora* found to be 97.58 ± 2.45µg/mlmay be due to thebioactive compounds. Hence, present study shows the positive efficacy of rhizome for cytotoxicity towards MIA PaCa-2 cells thus suggesting scientific community to carry out further after animal experimentation to evaluate the potentialtherapeutic agent in pancreatic cancer treatment.

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In vitro anthelmintic activity and phytochemical analysis of Crude Extracts of Aerial Parts of *Tridax procumbens* (L.) against *Pheretima posthuma.*

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Abstract –
The aim of the present study was to evaluate the anthelmintic activity of different extract of Aerial Parts of Tridax procumbens(L.) against Pheretima posthuma. as test worms. The time of paralysis and time of death were studied and the activity was compared with Albendazole as reference standard. The methanolic extract exhibited significant anthelmintic activity as evidenced by decreased paralyzing time and death time. The results thus support the use of Tridax procumbens (L.) as an anthelmintic agent.
Keywords: *Anthelmintic activity,* Pheretima posthuma, *piperazine citrate, Tridax procumbens (L.) Albendazole,*

Introduction-

Traditional knowledge, specific for particular society and community, it become a part of its cultural identity. All these information are unique for every society. in use and majority are still being used by the members of the society. It embraces information on the use of biological and other materials for medical treatment and agriculture, production processes. Use of plant as a source of medicine has been inherited and is an important component of the health care system in India. Herbal medicine claimed for the treatment of parasitic diseases in human and even animals. Helminthes are parasitic worms; which are among the most widespread prevalence in human as well as livestock. Helminthiasis is being endemic**.** It is found that about half (50%) of world population suffer from the Helminthiasis and the numbers are increasing day by day **(Sirama *et al.*, 2015).** According to World Health Organization (WHO) parasitic worm infection are more than (1.5) billion that is (24%) of world population **World Health Organization (2017).**

Few number of Anthelmintics drugs are available in the market, Benzimidazoles (BZD) is the past ones primes anthelmintics commonly called as 'White' dewormers. This class involved ; albendazole, fenbendazole, and oxfendazole, Piperazine citrate, livamizole, morantel and pyrental are chemical dewormers. The common side effects include nausea, vomiting, stomach and abdominal pain, headache, dizziness or temporary hair loss (**Saliha Siddiqui and Kalpana Patni 2018.).** Chemical control of helminthes coupled with improved management has been the important worm control strategy throughout the world. However, increasing problems of development of resistance in helminthes against anthelmintics have lead to the proposal of screening medicinal plants for their anthelmintic activity. Many researchers are screening the traditional herbal system in search of the anthelmintic herbal constituents which overcome all the problems of synthetic drugs. The present study was aim to investigate the "**Anthelmintic Activity**" of plants ***Tridax procumbens* (L.)**. It is a small attempt to find out traditional alternatives to helminthiasis

Materials and methods

Collection of plant materials

The aerial parts of *Tridax procumbens* (L.) were collected from the campus of Govt. Vidarbha Institute of Science and Humanities, Amravati India . Identification was done with the help of standard floras. The plant was identified and authenticated and the voucher specimen was preserved in the Herbarium of Department of Botany.

Preparations of extracts

The crude extract was prepared by crude maceration technique. In the process of maceration, the powdered solid material is placed in a closed vessel (to prevent evaporation) and the chosen solvents were added. When the solvent is water and the period of maceration is long, a small quantity of chloroform added to prevent microbial growth.

Crude aqueous, methanol, acetone and petroleum ether extract of powdered plant were prepared, Briefly, 25gm of grind/ powdered plant material was soaked in sufficient quantity (100 ml.) of aqueous, methanol, acetone and petroleum ether separately for continuous 7 days and the filtered off by a piece of porous cloth and then filter paper. Following extraction, the liquids were concentrated to remove traces of solvents and the process was repeated for two times. The solvent from total extract was distilled off and concentrate was evaporated water bath to syrupy consistency and the evaporated to dryness. This extract was stored at 40 c until use. The crude extract (as much as needed) was dissolved in distilled water on the day of the experiment to prepare stock solution and different dilutions for the purpose of evaluating anthelmintic activity.

Anthelmintic assay: Aqueous, methanolic and acetone extracts from the plants were investigated for their anthelmintic activity against *Pheretima posthuma*. Various concentrations (10, 25 and 50 mg/ml) of each extracts were tested in the bioassay, which involved determination of time of paralysis and time of the death of the worms. The anthelmintic assay was carried as per the method of Ajaiyeoba *et al.*, (2001). with minor modifications.

In the experiment, six groups of six earthworms were released into 25ml of solutions of Albendazole, aqueous, methanolic and acetone extracts of *Tridax procumbens* (L.) (25, 50 and 100mg/ml each) in distilled water. The remaining groups were treated for different concentrations. Albendazole was used as reference standard while distilled water as control. All drug and extract solutions were freshly prepared before starting the experiment. Observations were made for the time taken to paralysis and death of individual worms. Time for paralysis was noted when the movement of any sort could be observed except when the worms were shaken vigorously. Death was concluded when the worms lost their motility followed with fading away of their body colors.

Results and Discussions

Tridax procumbens (L.) is a well known medicinal plant and is widely used in folk ayurvedic system of medicine. In the present study solvents namely methanol, acetone, petroleum ether and aqueous, were used sequentially for crude extraction of *Tridex procumbens* (L.) whole plant. To justify the ethnomedical claims of the plant.

Anthelmintic activity of *Tridax procumbens* (L.)

Table -1: Anthelmintic Activity of *Tridex procumbens* (L.)

Test Sample *(Tridex)*	Conc. (mg/ml)	*P. posthuma* Time taken for Paralysis (in min.)	*P. posthuma* Time taken for Death (in min.)
Methanol	10	114.5 ± 10.6	125 ± 8.48
	30	72.5 ± 9.19	84 ± 12.7
	50	64 ± 14.1	78.5 ± 10.6
Acetone	10	129.5 ± 12.0	145 ± 16.9
	30	100 ± 5.65	124.5 ± 6.36
	50	81 ± 5.6	90 ± 9.89
Petroleum ether	10	164.5 ± 19.0	184.5 ± 14.8
	30	100.5 ± 14.0	120 ± 15.5
	50	87 ± 5.65	109 ± 11.3
Aqueous	10	166 ± 5.65	183.5 ± 9.19
	30	100.5 ± 19.0	130.5 ± 12.0
	50	94.5 ± 13.4	122 ± 12.7
Albendazole	10	401.5 ± 4.94	418 ± 8.48
	30	381.5 ± 4.9	395 ± 5.65
	50	367 ± 8.48	389 ± 2.82

Table-1: showed that Methanolicextract of ***Tridax procumbens(L.)*** significant anthelmintic activity against **'*Pheretima posthuma'*.** Methanolic extract also proved to be efficient than the standard drug.

The **Methanolic** extract of concentration **(10, 30, 50 mg/ml)** showed the paralysis time 114.5 , 72.5 , 64 min. and death time at 125 , 84 , 78min. respectively. Methanolic extract at 50 mg/ml showed efficient paralysis effect (64 min.) than other treated groups whereas methanolic extract 50 mg/ml showed significant anthelmintic activity with death time of (78 min.). Standard drug (10, 30, 50 mg/ml) showed paralysis time 401.5, 381.5, 367 min and death time was 418, 395, 389 min. respectively. This investigation revealed that methanolic extract of *T. procumbens (L.)* showed significant anthelmintic activity against *Pheretima posthumaand* also proved to be efficient than the standard drug.

The **Acetone** extract of concentration **(10, 30, 50 mg/ml)** showed the paralysis time 129.5, 100, 81min. and death time at 145, 124, 90 min. respectively. Acetone extract at 50 mg/ml showed efficient paralysis effect (81min.) than other treated groups whereas acetone extract 50 mg/ml showed significant anthelmintic activity with death time of (90min.). Standard drug (10, 30, 50 mg/ml) showed paralysis time 401.5, 381.5, 367min. and death time was 418, 395, 389 min. respectively. This investigation revealed that acetone extract of *Tridex*

procumbens (L.) showed significant anthelmintic activity against *Pheretima posthuma*. Acetone extract also proved to be efficient than the standard drug.

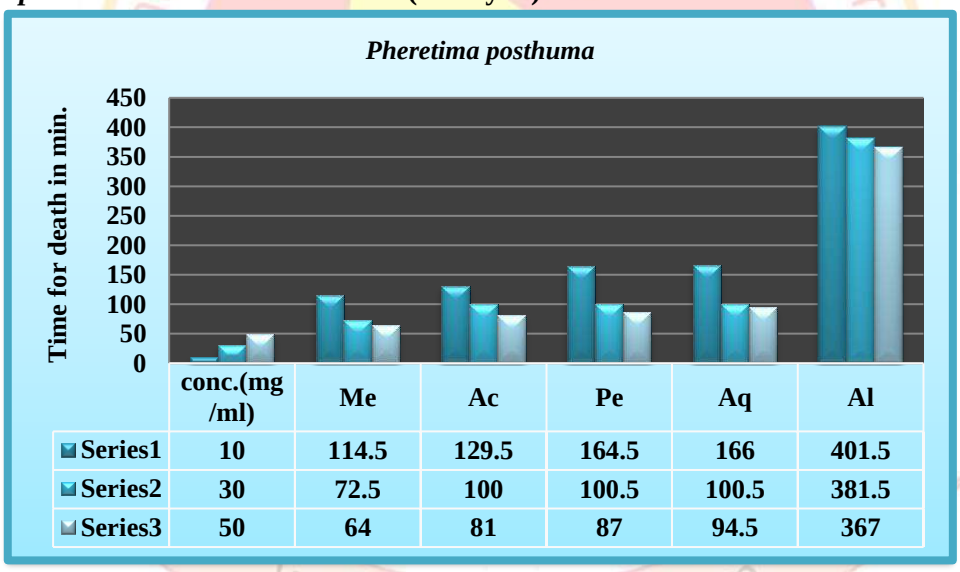
The **Petroleum ether** extract of concentration **(10, 30, 50 mg/ml)** showed the paralysis time 164.5, 100.5, 87 min. and death time at 184.5, 120, 90 min. respectively. Petroleum ether extract at 50 mg/ml showed efficient paralysis effect (87 min.) than other treated groups whereas petroleum ether extract 50 mg/ml showed significant anthelmintic activity with death time of (90min.). Standard drug (10, 30, 50 mg/ml) showed paralysis time 401.5, 381.5, 367 min and death time was 418, 395, 389 min. respectively. This investigation revealed that petroleum ether extract of *T. procumbens* (L.) showed significant anthelmintic activity against *Pheretima posthuma.* Petroleum ether also proved to be efficient than the standard drug.

The **Aqueous** extract of concentration **(10, 30, 50 mg/ml)** showed the paralysis time min. and death time at min. respectively. Aqueous extract at 50 mg/ml showed efficient paralysis effect (166, 100.5, 94.5min.) than other treated groups whereas aqueous extract 50 mg/ml showed significant anthelmintic activity with death time of (94.5min.). Standard drug (10, 30, 50 mg/ml) showed paralysis time 401.5, 381.5, 367 min and death time was 418, 395, 389 min. respectively. This investigation revealed that aqueous extract of *T. procumbens* (L.) showed significant anthelmintic activity against *Pheretima posthuma. Aqueous* extract also proved to be efficient than the standard drug.

When **Albendazole** use as a standard drug extract of ***Tridex procumbens* (L.)** plant of concentration **(10, 30, 50 mg/ml)** showed **paralysis** at **401, 381, 367 min.** and **death** at **418, 395, 389 min.** Respectively.

From the above result, it is clear that the Methanol, Acetone, Petroleum Ether, and Aqueous extracts of plant *Tridex procumbens* (L.) have significant anthelmintic activity in dose dependent manner when compared with standard anthelmintic drug. It reveals that the methanolic extracts of ***T. procumbnens*** plant took the less time to cause paralysis and death of the earthworm than that of acetone, petroleum ether, aqueous and albendazole standard drug**. (Methanl<Acetone<Petrolium ether<Aqueous)**

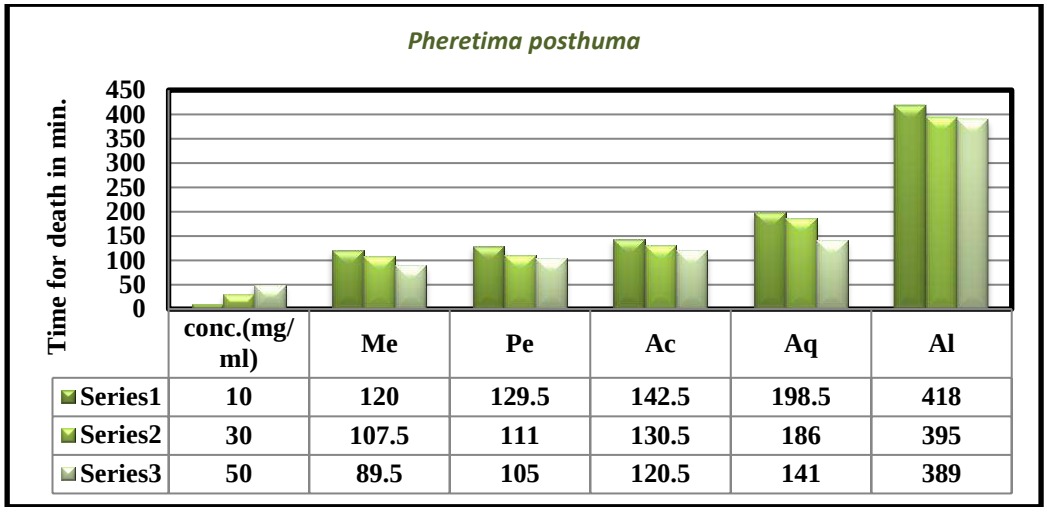
Fig-1. *Pheretima posthuma* showed the time for (Paralysis)



	conc.(mg /ml)	Me	Ac	Pe	Aq	Al
Series1	10	114.5	129.5	164.5	166	401.5
Series2	30	72.5	100	100.5	100.5	381.5
Series3	50	64	81	87	94.5	367

Where, Me: Methanol, Ac: Acetone, Pe: Petroleum Ether, Aq: Aqueous, Alb: Albendazole Respectively.

Fig. 2 :*Pheretimaposthuma*showed the time for (Death)



	conc.(mg/ml)	Me	Pe	Ac	Aq	Al
Series1	10	120	129.5	142.5	198.5	418
Series2	30	107.5	111	130.5	186	395
Series3	50	89.5	105	120.5	141	389

Where,Me: Methanol, Ac: Acetone, Pe: Petroleum Ether, Aq: Aqueous, Alb: Albendazole Respectively.

PHYTOCHEMISTRY:

Table -3 Preliminary Phytochemical Screening of *Tridax procumbens* (L.)

Tests	Aq. Extract	Alcoholic Extract
Test for Carbohydrate		
a) Molisch test	+	-
b) Benedict test	+	+
c) Fehlings test	+	+
d) Iodine test	-	-
e) Barfoeds test	+	-
f) Salwinoffs test	-	-
Test for Proteins		
a) Xanthoprotein test	-	-
b) Biuret test	-	-
c) Lead acetate	-	-
d) Millon test	-	-
e) Precipitation test	-	+
Test for Amino acid		
a) Ninhydrin test	-	-
b) Tyrosin test	-	-
c) Cysteine test	-	-
Test for Alkaloids		
a) Dragondroffs test	-	+
b) Modified dragondroffs test	-	+
c) Mayer test		
d) Hagers test	+	+
e) Wagners test	+	+
f) Krauts test	-	+
	-	-
Test for Glycosides(general)		
a) Saponin glycosides	+	+
b) Baljet test	+	-
	+	-
Test for Flavonoids		
a)alkali test	-	-
c) Lead acetate	-	-
d) Shinoda test	+	-
Test for Tannins		
a) Ferric chloride test	-	+
b) Dil. Iodine test	+	-

Test for Fatty oils	-	-

The qualitative phytochemicals analysis aqueous extract of *Tridax procumbens* (L.) showed the presence of carbohydrate, alkaloids, glycosides, flavonoids, tannins and saponins while proteins, amino acids fatty oils are completely absent. In alcoholic extract of carbohydrates, alkaloids, glycosides, and tannins are present and proteins, amino acid, flavonoids and fatty oils are completely absent. **(Table -3).**

From the above result, it is clear that the Methanol, Petroleum Ether, Acetone and Aqueous extracts *Tridax procumbens* (L.) have significant anthelmintic activity in dose dependent manner when compared with standard anthelmintic drug. It reveals that the Methanolic extracts took the less time to cause paralysis and death of the earthworm than that of acetone, petroleum ether, aqueous and albendazole. Standard.Tannis, Glycosides are known to interfere with energy generation in helminth by uncoupling oxidative phosphorylation **(Anthnasiadou *et al.*, 2001). Willam *et al.*, (2014)** reported that plant derived tannin have a definite anthelmintic effect on human intestinal parasite. Thus, these chemicals may responsible for the anthelmintic activity of the plants. Hence, it can be thought about the herbs as alternative source of anthelmintic drugs, further isolation of active constituents responsible for anthelmintic activity is needed, which would be responsible for **'Anthelmintic Activity'** and to possible mechanism of action.

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Plant Diversity of Village Pimpalgaon Chilamkha Tq. Deulgaon Raja Dist. Buldhana (MS)

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Abstract

*We have inherited a rich plant diversity with a high proportion of endemic elements. We are grateful to small, mid-sized or lofty trees who oblige us during their lifetime with oxygen,shade,food,fibre,fruits, timber and medicine. One of the major challenges of our country today is the management of plant specially tree diversity development. In a decades of years a number of very small trees have been planted in our campus. Keeping this in view, we have undertaken documentation of trees of our biodiversity rich village PimpalgaonChilmkha for the first time and we also propose to establish conservation strategies in future for tree(s). The total number of trees recorded in the village PimpalgaonChilmkha, 36 families, 48 genera and 50 species. The family Anonaceae was represented by maximum number of 110 tree genera.The genus Ficushas been represented by maximum number of 06 tree species viz. F. religiosa , F. benghalensis.*F. racemosa*. The medicinally important manyplants like Azadirachtaindica,Eucalyptus citriodora,Aloe vera,Ocimumgratissimumarepresent in village PimpalgaonChilmkha. Polyalthialongifoliais grown as ornamental or avenue tree and is represented by 110 plants followed by Albizzialebbek. As like as many ornamental plants are also present in this village.*

***Key Words**: Systematic Enumeration ,Tree Biodiversity, Village Pimpalgaon Chilmkha Tq.Deulgaon Raja*

Introduction

Ethnobotany deals with the study and evaluation of plant-human relations in all phases and the effect of plant environment on human society. Ethnobotany is considered as a branch of ethnobiology. The term "Ethnobotany" was coined by J. W. Harshberger in 1895 to indicate plants used by the aboriginals: From "ethno"-study of people and "botany" study of the plants. Ethnobotany is the study of how people of a particular culture and region make of use of indigenous plants. Ethnobotanists explore how plants are used for such things as food, shelter, medicine, clothing, hunting, and religious ceremonies. The plants growing in their natural habitat serve as raw material for industries and other local uses. Keeping these facts in view, it was undertaken to prepare an accurate and up to date inventory of trees growing in sprawling Village PimpalgaonChilmkhaTq.Deulgaon Raja is located in Buldhana district and boundryof the Vidarbha, of Maharashtra State. Deulgaon Raja is 80 Km away from district place and 90 Km also from Aurangabad. Deulgaon Raja is located in the northern part of Maharashtra. The 70% of the population is rural. The mainoccupations of these people are dairy, farming and agriculture. The famous salt water Lonar Crater is situated in this district, 90 kms from here. And, The RajmataJijabai's father LakhujiJadhav's native place is located at Sindkhed Raja which is important historical place in district also. The major crop of this district is cotton, jawar and groundnut. Several taxonomists and ethnobotanists continued to survey many areas of Maharashtra, Addition to Maharashtra Flora Vol.I (Singh N.P. &Karthikeyan S. 2000), Flora of Buldhana District (Diwakar P.G. & Sharma B.D. 2000). Saxton and Sedgwick (1918),The ethnobotanical and floristic work, were carried out by Saxton, W. T. and Sedgwick, L. J. (1918). Author also observed plant diversity of nearest college Shri Vyankatesh Arts, Com. & Science College Campus Deulgaon Raja(Mahendra S. Salve &Nilesh P. Kakde, 2017). Earlier the works were carried out ethnobotanical, medicinal and floristic aspects of plants by a good number of workers.The present research report iscarried out in Village PimpalgaonChilmkhaTq.Deulgaon Raja Dist. Buldhana (MS) to explore the diversity of plants.

Objectives of The Study

The main aim of the survey was to collect information about the vegetation of plant species which are used by local people for various purpose and also the species are identified and documented by collecting samples of plant species. Survey were made for collection of plants their identification, followed by Botanical name, Family, Habitat, Uses and Propagation. The campus was visited for the collection of medicinal plants, their digital photographs were also taken. The identification was also done based on literature study (Hooker,1875).

Materials And Methods

The field study was carried out during session 2021-2022 in the Village PimpalgaonChilmkhaTq.Deulgaon Raja Dist. Buldhana(MS). Description of habitat, material and methods as well as the methods of sample collection and identification have been described elsewhere (Bimal et al., 1991).

Table No.1: Plants diversity of Village PimpalgaonChilmkhaTq.Deulgaon Raja

Sr. No.	Tree Name	Family	Marathi Name
1	*Azadirachtaindica*	Meliaceae	Kaduneem
2	*Ficusreligiosa*	Moraceae	Pimpal
3	*Ficusbenghalensis*	Moraceae	Vad
4	*Ficusracemosa*	Moraceae	Umbar
5	*Ricinuscommunis*	Euphorbiaceae	Erand
6	*Emblicaofficinalis*	Euphorbiaceae	Awla
7	*Mangiferaindica*	Anacardiaceae	Aamba
8	*Cassia fistula*	Caesalpiniaceae	Bahawa
9	*Delonixregia*	Caesalpiniaceae	Gul Mohor
10	*Cathranthusroseus*	Caesalpiniaceae	Sadaphuli
11	*Albizzialebbek*	Mimosaceae	Siras
12	*Polyalthialongifolia*	Anonaceae	Ashok
13	*Alstoniascholaris*	Apocynaceae	Saptparni
14	*Neriumindicum*	Apocynaceae	Kanher
15	*Murrayakoenigii*	*Rutaceae*	Kadhipatta
16	*Citrus aurantifolia*	Rutaceae	Limbooni
17	*Hibiscus rosasinensis*	Malvaceae	Jaswand
18	*Bryophyllumpinnatum*	Crassulaceae	Panphuti
19	*Piper betle*	Piperaceae	Nagwel
20	*Ocimumgratissimum*	Lamiaceae	Ran Tulasi
21	*Aloe vera*	Liliaceae	Korphad
22	*Jasminumofficinale*	Oleaceae.	Chameli
23	*Jasminumsambac*	*Oleaceae*	Mogara
24	*Jasminummutiflorum*	Oleaceae	Kunda
25	*Dalbergiasissoo*	Papilionaceae	Shisam
26	*Prunusamygdalus*	Rosaceae	Badam
27	*Terminalia arjuna*	Combretaceae	Arjun
28	*Eucalyptus citriodora*	Myrtaceae	Nilgiri
29	*Zizyphus145ujube*	Rhamnaceae	Bor
30	*Micheliachampaca*	Magnoliaceae	Chafa
31	*American palm*	Arecaceae	Palm tree
32	*Moringaoleifera*	Brassicaceae	Shewaga
33	*Cupressussampervirens*	Cupressaceae	Saru
34	*Opuntiaficus*	Cactaceae	Niwdung
35	*Cereus peruvianus*	Cactaceae	Niwdung
36	*Bamboosa bamboo*	Poaceae	Bamboo
37	*Coccus nucifera*	Palmaceae	Nariyal
38	*Pongamiapinnata*	Fabaceae	Karanj
39	*Clitoriaternatea*	Fabaceae	Gokarn
40	*Abrusprecatorius*	Fabaceae	Gunj
41	*Mimosa pudica*	Fabaceae	Lajalu
42	*Spilanthesacmella*	Asteraceae	Akkalkadha
43	*Embeliaribes*	Primulaceae	Wavding
44	*Bougainvillea glabra*	*Nyctaginaceae*	BoganWel
45	*Dhaturainoxia*	Solanaceae	Dhotara
46	*Solanumtorvum*	Solanaceae	Ranwange
47	*Punicagranatum*	Lythraceae	Dalimb
48	*Musa acuminata*	Musaceae	Keli
49	*Canna indica*	Cannaceae	Kardali
50	*Cissusquadrangularis*	Vitaceae	Kandwel

Results

Floristic studies are important to understand the tree wealth as well as their biology (Panda et al., 2014) and also play an important role in developing the aesthetic values as well as ecosystem services. The present

paper is based on preliminary surveyerand serves as biodiversity data bank for biological and biotechnological applications (Uniyal and Singh, 2014). Further, it provides information related to the plant resources which is necessary for any conservation and management practices. On the basis of field survey of plant diversity in Village PimpalgaonChilmkhaTq.Deulgaon Raja, the preliminary data recorded such as botanical name of tree identified and tree count etc. It is resulted that36 families, 48 genera and 50 species showed their presence in the campus which were collected, identified and listed in Table No. 1. The inventory of tree wealth of the village shall provide the ground work for further studies.

Discussion

The data shows that maximum plant species are family Anonaceae similar result have also reported by Tirkey (2006). From these some are medicinal plant species in Village PimpalgaonChilmkhaTq.Deulgaon Raja. Similarly Ayyanar and Ignacimuthu (2005) also reported medicinal importance of plants. These plant species have Antibacterial, Insecticidal, Antiseptic, Analgestic properties and they are useful in treatment of various skin diseases,allergic reactions and diarrhea treatment. Similarly Thakur et al (1989), Jain, et al (2006), Kala (2009) have also reported antihelmintic, anticancerous, antitumour, antirheumatic, antiasthmatic and antidiarrhoeal activities of various plants .

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Phytochemical Screening and Qualitative Analysis of Medicinal Plants *Shorea robusta Gaertn*.

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Abstract

Since ancient time, Medicinal plants have been a major source of therapeutic agents to cure human diseases. Ayurveda, the traditional system of medicine using medicinal plant is highly regarded as the mother of all medical sciences. Herbal medicines are more popular than modern medicine because of their effectiveness, easy availability, low cost and for being comparatively devoid of side effects. Shorea robusta belonging to Dipterocarpaceae family is an important medicinal plant used in various Indian system of medicine. The present study was done for the qualitative analysis for primary metabolites and secondary metabolites of Shorea robusta Gaertn. F.. In this regards the phytochemical analysis of leaves extract of Shorea robusta Gaertn. Fwas done in both extract i.e, alcoholic (both ethanolic and methanolic) as well as aqueous extract. Qualitative phytochemical analysis was performed for the test of primary metabolites include protein and carbohydrate whereas secondary metabolites were phenol and tannins, flavonoids, saponins, glycosides, steroids, phlobatannins, alkaloids and terpenoids with the help of standard protocol. The qualitative phytochemical analysis revealed the presence of maximum numbers of bioactive substances such as protein, carbohydrates, phenol and tannin, saponin, glycosides, steroids, alkaloids and terpenoids in leaves extracts of Shorea robusta Gaertn. F. Therefore, it may be concluded that the medicinal value of these plants was due to the presence of these bioactive substances that has a very significant role to boost immunity and to develop therapeutics which must have a physiological action on human body that has a promising role in the treatment of various diseases. The results suggested that used of this medicinal plant in the present study provide justification for the use of medicinal plants by the local people of Kharsawan in Seraikella-Kharsawan district, Jharkhand (India) to cure many diseases.

Keywords: *Flavonoid, Phytochemical analysis, Primary metabolites, Saponin*

Introduction

Shorea robusta Gaertn.f. is very important non timber forest product. Itcovers approx. 14% of the total forest area of country and is spread across 10 million hac.It plays an important role to in the economicsof Indian states which includes Orissa, Jharkhand and Madhya Pradesh. About 20-30 million people, mostly tribal depend on Sal seeds, leaves and resigns for their livelihood. Sal is a deciduous tree that grows up to 50 m height. Under normal conditions it reaches 18-32 m height, with girth of 1.5–2 m. The bark is dark brown in colour. The average temperature required for the growth of this tree is 22-47^{O}C throughout the year. The tree requires mean annual rainfall around 3000 mm and maximum 6600mm. Sal grows in deep, well-drained, moist, slightly acid, sandy to clayey soils [2].Occurrence of this plant is in tropical Himalaya's region, central India, North-eastern and West Bengal hills upto 1,700m. [3, 4, 5]. Scientific classification of Shorea robusta is

- Kingdom: Plantae
- Division: Tracheophyta
- Class: Magnoliopsida
- Order: Malvales
- Family: Dipterocarpaceae
- Genus: Shorea
- Species: Shorea robust[6, 7]

The ethnomedicinal uses of this plants are for Jwara, Sweta pradara, rakshoghna, atisaara, hiccough, asthma, galaganda, diseases of mouth,diseases of eye, consumption[8, 9, 10, 11, 12 13, 14, 15].

Traditional folk treatment from medicinal plants has always guided researchers to search for novel medications to develop healthy life for humans and animals [16]. In addition, some medicinal plants are still obscured within the plant which need to be scientifically evaluated.Most important phytoconstituent presents in medicinal plants are alkaloids, tannins, flavonoids, terpenoids, saponins and phenolic compounds. These phytoconstituent has therapeutic activity and low toxicity, therefore Pharmacists has been shown their interest [17]. Herbal medicine is on demand due to low toxicity and no side effects in comparison to allopathic medicines [18]. The attention among population increased due to their effectiveness, lesser side effects, increasing cost of modern medicines, cultural acceptability and lack of current medical alternatives [19].

Thus, main purpose of this research work is to analyze the phytochemical screening and quantitative estimation of flavonoid, alkaloids and antioxidant activity of crude Shorea robusta extract.

Materials and Methods

The plant materials were shade dried until all the water molecules evaporated and plants became well dried for grinding. After drying, the plant materials were ground well using mechanical blender into fine powder and transferred into airtight containers with proper labelling for future use.

About 5gm dried powdered plant material was weighed and transferred into each conical flask. 250ml of water methanol and ethanol was added to these conical flasks. After that these conical flasks were heated at 30-40ºC and stirred at 350 rpm for 20 minutes. Aqueous ethanolic and methanolic extract were filtered with Whatman filtered paper. These extracts wereanalysed for the presence of bioactive compounds by using standard protocol [20, 21, 22, 23].

Preparation of plant aqueous extract:

5gm of dried fine powder of plant material was taken in a conical flask and 200ml of distilled water was added into it. This mixture was heated on a hot plate at 30º- 40ºC and stirring at 300 rpm for 20 minutes. After that this mixture of aqueous extract was filtered using Whatman filter paper. This filtered aqueous extract was used for the phytochemical analysis.

Preparation of plant ethanolic extract:

5gm of dried fine powder of plant material was taken in a conical flask and 200ml of distilled ethanol was added into it. This mixture was heated on a hot plate at 30º- 40ºC and stirring at 300 rpm for 20 minutes. After that this mixture of ethanolic extract was filtered using Whatman filter paper. This filtered ethanol extract was used for the phytochemical analysis.

Preparation of plant methanolic extract:

5gm of dried fine powder plant material was taken in a conical flask and 200ml of methanol was added into it. This mixture was heated on a hot plate at 30º- 40ºC and stirring at 300 rpm for 20 minutes. After that this mixture of methanol extract was filtered using Whatman filter paper. This filtered methanol extract was used for the phytochemical analysis.

Test for proteins

Millon's test

When 2ml of Millon's reagent was added to crude extract, white precipitate appeared which turned red upon gentle heating that confirmed the presence of protein.

Ninhydrin test

When 2ml of 0.2% solution of Ninhydrin was added to crude extract and then boiled, violet colour appeared which indicated the presence of amino acids and proteins.

Test for carbohydrates

Fehling's test

Equal volume of Fehling A and Fehling B reagents were mixed together. 2ml of this reagent was added to 2 ml of crude extract and gently boiled, a brick red precipitate appeared at the bottom of the test tube indicated the presence of reducing sugars.

Benedict's test

When 2ml of Benedict's reagent was added to 2ml of crude extract and boiled, a reddish-brown precipitate formed which indicated the presence of the carbohydrates.

Iodine test

2ml of iodine solution was added to 2 ml of crude extract, a dark blue or purple coloration appeared which indicated the presence of the carbohydrate.

Test for phenols and tannins

2ml of 2% solution of FeCl3 was added to 2 ml of crude extract, a blue-green or black coloration appeared which indicated the presence of phenols and tannins.

Test for flavonoids

Shinoda test

A fragments of magnesium ribbon was added to 2ml crude extracts (aqueous, ethanolic, methanolic) and concentrated HCl was added (drop wise) to the it. After few minutes a pink scarlet colour was appeared which indicated the presence of flavonoids.

Alkaline reagent test

2ml of 2% solution of NaOH was added to 2 ml of crude extract, an intense yellow coloured was formed, on addition of few drops of diluted acid it turned into colourlesswhich indicated the presence of flavonoids.

Test for saponins

5ml of distilled water was added to 2ml of Crude extract was and it was shaken vigorously. The stable foam formed which indicate the presence of saponins.

Test for glycosides

Liebermann's test

2ml of chloroform and 2ml of acetic acid was added to the 2 ml of crude extract. Concentrated H2SO4 was added. A colour change from violet to blue to green indicated the presence of steroidal nucleus, i.e., glycone portion of glycoside.

Salkowski's test

2ml of chloroform was added to 2ml of crude extract. After that 2ml of concentrated H2SO4 was added. A reddish-brown colour was appeared which indicated the presence of steroidal ring, i.e., glycone of the glycoside.

Keller-Kilani test

2ml of glacial acetic acid containing 1-2 drops of 2% solution of FeCl3 was added to 2 ml of crude extract. After that 2ml of concentrated H2SO4 was added to it. A brown ring at the interphase indicated the presence of cardiac glycosides.

Test for steroid

Liebermann's Test

2 ml acetic acid (CH2COOH) was added to 2 ml Crude extract. Then 1 ml of concentrated H2SO4 was added dropwise and then after 1 ml of concentrated H2SO4 was added drop wise. A blue green colour was appeared which indicates the presence of steroids.

Salkowski Test

2 ml of chloroform and concentrated H2SO4 was added to 2ml of Crude extract. A red colour developed at the lower portion of test tube that indicated the presence of steroids.

Liebermann's Bruchard Test

2ml of chloroform was added to 2 ml Crude extract. After that 2ml of concentrated H2SO4 and acetic acid wereadded into this mixture. A greenish colour developedwhich indicated the presence of steroids.

Test for Phlobatannin

2ml of 1% HCl was added to the 2 ml Crude extract (each aqueous, ethanolic, and methanolic) which gave red precipitate on gentle heating that indicate presence of phlobatannin.

Test for alkaloids

2 ml of 1% HCl was added into the 2ml Crude extract (each aqueous, ethanolic, and methanolic) and heated gently. After that Mayer's and Wagner's reagents were added into this mixture. Turbidity of the resulting precipitate was taken as evidence for the presence of alkaloids.

Test for terpenoids

2ml of chloroform was added to 2ml of Crude extract and evaporated to dryness. After that 2ml of concentrated H2SO4 was added and then heated for 2 minutes. A greyish colour was appeared which indicated the presence of terpenoids.

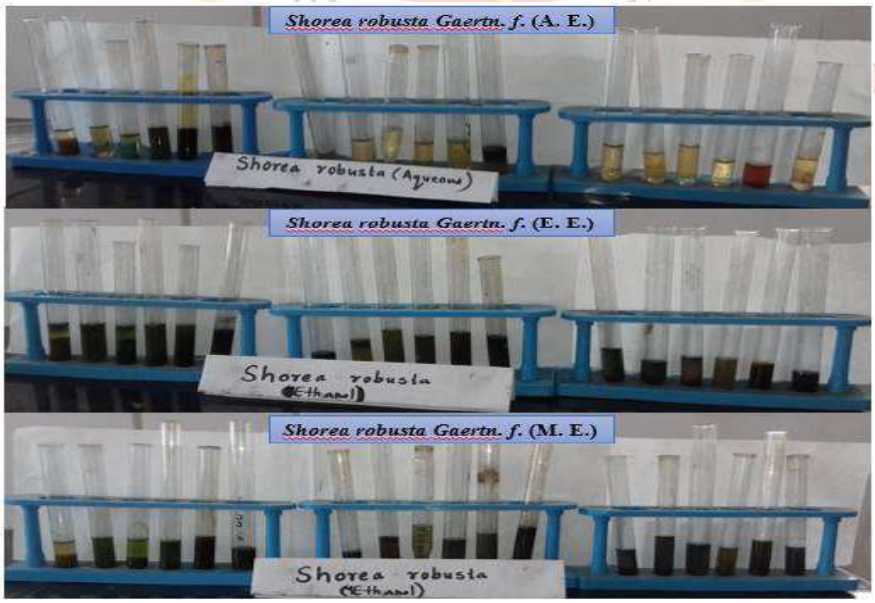

Fig.1: Phytochemical analysis of Shorea robusta Gaertn.f.

Result and Discussion

Table.1: Phytochemical analysis of Shorea robusta Gaertn. in aqueous, ethanolic and methanolic extract

Sl. No.	Phytochemical test	Shorea robusta Gaertn. F.		
		A.E	E.E.	M.E
1	Proteins	+++	+	+++
2	Carbohydrates	++	+	+
3	Phenol & Tannins	++	++	+
4	Flavonoids	++	+	+
5	Saponin	++	_	+
6	Glycosides	++	+	+
7	Steroids	+	+	+
8	Phlobatannins	_	+	+
9	Alkaloids	++	_	+
10	Terpenoids	+	+	+

A.E.=Aqueous extract, E.E.=Ethanolic extract, M.E.= Methanolic extract, (+) = Present,(-) = Absent

Phytochemical analysis of*Shorea robusta Gaertn. F*. (table 1.)revealed that primary metabolites such as proteins and carbohydrates were present in all the extract whereas secondary metabolites i.e. phenol & tannins, flavonoids, saponin glycosides, steroids,phlobatannins, alkaloids and terpenoids were present in all the three extracts except saponin is absent in ethanolic extract, phlobatannin is absent in aqueous and alkaloids is absent in ethanolic extract.

Results obtained by the phytochemical analysis of medicinal plants Shorea robusta Gaertn. F., it could be seen that carbohydrates, phenol & tannins and glycosides were present. Several reports revealed that medicinal plants are rich in phenolic compounds and have antioxidant properties [24, 25]. Phenolic compounds also possess potent antifungal, antiviral and antibacterial activity [26]. It is also mentioned that phytochemical analysis on plants extracts revealed the presence of constituents that are known to exhibit medicinal as well as physiological activities. It was reported that tannins contribute property of astringency i.e., fasten the healing of wounds and inflamed mucous membrane and have received considerable attention in the fields of nutrition.

Conclusions:

Shorea robusta is an important traditionalmedicinal plant used in wide range of medical treatments. Phytochemical analysis revealed that maximum numbers of phytochemicals e.g., flavonoid, tannin, steroid, saponin and many more were found to present in both the plants. Therefore, we can conclude that the medicinal value of these plants due to the presence of these bioactive substances which must have a physiological action on human body. The above findings, traditional uses, pharmacological activities and phytochemistry which provides preliminary information regarding this medicinal plantmight have huge potential for the pharmaceutical industry

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To study the Seasonal Variation of Rhineobothrium Linton from a Marine Fish Trygon Sephen

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Abstract: -

In seasonal variation of the fishes, to collect the different types of fishes in different areasand location. As a medicinal Point of view, fishes ProvidesVit. A, Vit. D and oil, body oil soup from fish, It is use as an Ayurvedic and medicine on color, blindness, Cold and Cough, Asthama &Tuberculasis. In this paper to study the seasonal variation of Rhineobothrium linton from a marine fish Trygon Sephen in Ratnagiri districtat Sangameshwar.
Key words: - Rhineobothrium linton, Marine Fish, TrygonSephen.

Introduction: -

Many fishes are having their high economic value as they provide the highly nutritious & delicious food for human population. These fishes are one of the components of the food cycle in ecology. Parasitology is an evergreen branch for a scientist. Parasitologist have theirpreference of studying helminth. Parasitism is a natural way of life among parasitic diseases are the major public heath Problems leading to mortality in tropical countries, including India. The differed types &several types of parasitism are recognized. Besides these intestinal Parasites there are various types of including Cestodes, Nematodes & Trematodes. Intestinal helminth infections are very common & more than 3500 million cases of helminthiasis exist atpresent either as single as mixed infection all over the world it is observe it.

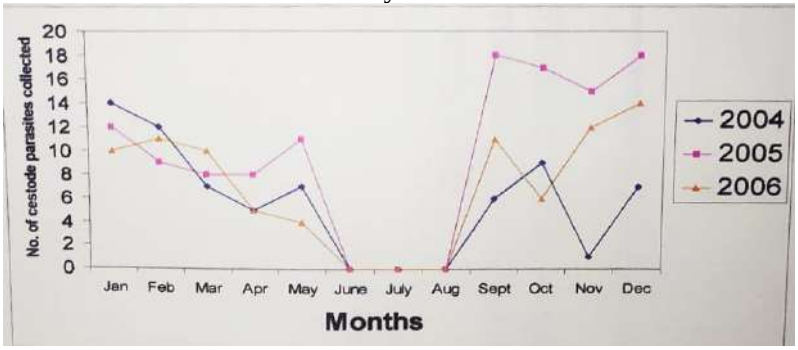
The work on the population dynamics were carried out by many workers on different hosts, Dagiel at (1958), (1964), Susheela (1987) Mittal (1908), Hopkins (1959), Anderson (1976), Pennyuick (1971), Guorder distribution of the Cestodes Parasites. The other workers also studied the effect of climatic factors on the helminthes, include Kennedy (1968-1969), Lawrence (1970), Crofton (1971), Patrick & Esch (1977) have elaborately to studied the effect of seasonal variation. on Parasite of fish.

To study the Seasonal Variation of fishes, it is highly infected to study the different types of cestodes, and the present study include application of statistical method to understand the surveyof seasonal variation is year wise or month wise. Present study includes application ofStatistical method to understand and distribution cestodes parasites both at infra andsupra population levels for each species of Parasites in three annual cycle (January to December)

Material and Methods: -To study the Seasonal Variation in Rhineobothrium linton, thequantitative analysis of helminths and structural grouping was. studied during three annual cycles i.e., January 2004-December 2006 It revealed that the cestode population was potentially dynamic with more or less durability, regularity and cyclic periodicity in the host under investigation. Each annual cycle comprises of three season 1) Rainy seasons (June to September) 2) Winter season (October to January) 3) Summer season (February to May) on the basis of incidence of the infection the influence of annual season. It was observed that the incidence of infection by Helminthes. Parasite increased with host age. The infection level low in young hosts and showed remarkable. infection rises in adults.

To show the above graphical representation in Seasonal Variation of Rhineobothrium linton, 1889. From a marine water fish Trygon Sephen (Cuvier, 1871) at Ratnagiri district for the year 2004-2006.

Graph: -Seasonal Variation of Rhineobothrium linton, 1889 From Trygon Sephen (Cuvier, 1871) at Ratnagiri district for the year 2004 – 2006



Conclusion: -

It is concluded that to study the different seasonal variation of the fishes and the. infected host is studying the different types of cestodes.

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A New Species of *Diatrypellaarborella*sp.nov. From Melghat Forest

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Abstract:
The Present communication deals with a new species of Diatrypellaarborellasp.nov from Aamdoh forest MelghatDist Amravati. Different varieties of ascomycetes and imperfect fungi were collected by the author. But after detail Morphological and cultural investigation an interesting ascomycetes Diatrypellawasincluded here as new species on new host Careya arborea Roxb.
Keywords:*Diatrypella,Ascomycets,Stroma,Ascus,Ascospores.*

Introduction :

De Notaris established the genus *Diatrypella* with type species *D.vrrucaeformis* (Ehrh.)Nitschke.Clement and Shear,Arx and Muller,included it under spheriales,whereasLutterelle,Martin considered it to be number of the order Xylariales.The first report of this genus was recored in India in 1962.There after Ramchandra Rao,Tilak, and Muthappa have reported a few species.Most of the species of this genus are saprobes in nature(Mehrabi*et a*l., 2019). The genus is characterized by conical to truncate, cushion or discoid stromata usually delimited by a black zone in host tissues,umblicate or sulcate ostiolarnecks,cylindrical,polysporales,long stalked,asci and allantoid hyaline yellowish ascospores in their sexual morph and liberatella like coelomycetes asexual morph(Kirket*et al.*,2008,Lakmali*et al.*, 2021).The species under study was compared with known species of*Diatrypella*and treated as new species, thedetailed description is given below. The result of molecular study is awaited.

Material and Methods:

The collected specimens were wrapped in butter paper and bagged in envelope. By taking hand sections, semi-permanent microscopic slides were prepared by using cotton blue as stain, sections of the material were studied with the help of relevant keys and literature (Ainsworth *et al*., 1973, Bilgrami*et al*., 1991,Chanen Yang *et al*., 2022, Dennis 1981, Jamaluddin *et al*., 2004, Mehrabi M *etal*., 2019, Pandey 2008, Shang QJ *et al*., 2017). The specimen was deposited in Ajrekar Mycological Herbarium(AMH) Agharkar Research Institute,Pune.AMH No. 9083.(Holotype)

Result and Discussion:

Ditrypellaarborellasp.nov(**Plate1.Fig;1**a,b,c,d,e)(**Fig;**2a,b,c)
(Etym: Host *Careya arborea*Roxb.)

Strom black errunpent, elliptical to cushion shaped,solitory or gregarious,oftencracked,roughened by slightly protruging,ostiolate, measure 413.0-489.6x535.5-1070 µm,perithecia globose to oblong,black,ostiolate measure 214.2-330.6x306-336.6 µm; asci cylindrical to clavate with long,tappering persistent stalk,binucliate,multisporous,measure 66-133x8-11 µm; ascosprealontoid,subhyaline, one celled,irregularlyarranged,nongutullate, measure 1.9-2.2 µm long,paraphysate.

Matrix: On dead stem of *Careya arborea*Roxb. (Fam:Lecythidaceae)) Legit N.S.D atAamdosh,Melghat Dist. Amravati on 31/7/2004 AMH No.9083.(Holotype)

Table-1: Comparison of *Ditrypellaarborella*sp.nov with related species

Species	Perithecia	Asci	Ascospore	References
***D.verrucaeformis* (Ehrh.)Nke (Type species)**	410-530 x 250-400µm	70-100 x 10-15 µm	6-8 x 1.5-2.0 µm	Subhedar(1977)
***D.citricola*El.&EV.**	315-468 µm IN diam.	81.92-126.90 x 9.0-12.83 µm	8.86-14.93 x 1.58-3.49 µm	Chitriv&Wangikar (1980)
***D.leguminacearum* Patil**	250-625 x 250-650 µm	10-20 x 80-150 µm	2.5-3.5 x 6.18 µm	Patil M.S.(1985)
***D. macroasca*M.Niranjan&V.VenkateswaraSarma**	350-520 × 330- 380 µm	115-170 × 18.75-23.75 µm	7.5-15× 2.5 µm	M.Niranjan&V.VenkateswaraSarma(2018)

***D. tectonae*M.Niranjan&V.VenkateswaraSarma**	240-440 x 255-389 ìmdiam	(107-) 120-150 (-173) x (13.5-) 15.5-21.5 (-39.5) ìm (X^{-}= 138 x 19 ìm)	(5-) 7-9 (-12) x (1.5-) 2-2.5 (-3) ìm (X^{-}= 8 x 2.3 ìm)	M.Niranjan&V.VenkateswaraSarma(2018)
***D.lijiangensis*Thiyagaraj&Wanas**	170-460 x 200-300 µm	50-90 x 6-9 µm	6-8 x 1-2 µm	Thiyagaraj&Wanas(2019)
***Diatrypellaarborella*sp.nov**	214.2-330.6x306-336.6 µm	66-133x8-11 µm	1.9-2.2 µm	Understudy

Conclusion:

On comparison with known species vide (Table1) the perithecia are smaller than *D.verrucaeformis, D.citricolaD.leguminacearum, D. tectonae*but larger than *D.lijiangensis.*Asci are larger than*D.verrucaeformis&D.lijiangensis,*the size of ascospores are smaller than the reported species therefore the species understudytreated as new species of *Diatrypellaarborella*sp.Nov

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16. **Illustration:**A New Species of *Diatrypellaarborella*sp.nov. From Melghat Forest :

Plate - 1
Fig - 1

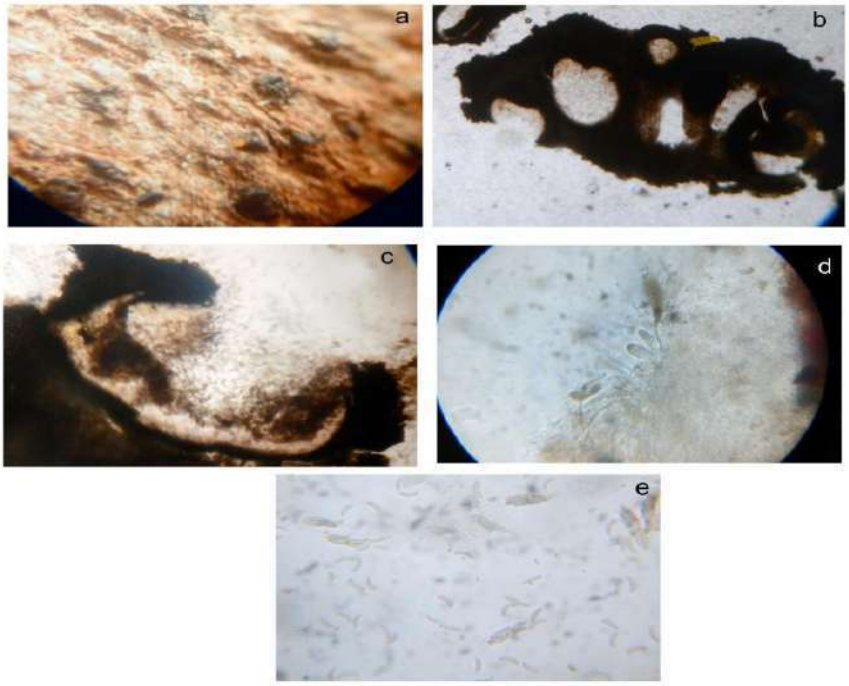

Fig - 2

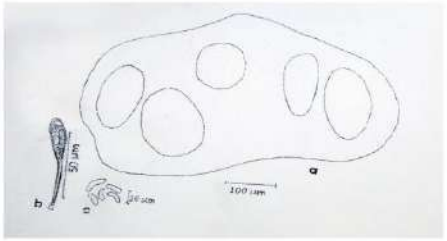

Fig1:(***Ditrypellaarborella*sp.nov)** a) Habit, b) Stroma with perithecium, c) Perithecium, d) Ascus & ascospores, e) Ascospores.

Fig. 2: a) Stroma with perithecium, b) Ascus with ascospore, c) Ascospores

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Distribution of Spider Fauna in the Agricultural Fields from Narkhed Region, District Nagpur (Maharashtra State) India

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Abstract:

Narkhed taluka has total area of 64491 Hectors. Most of the area of Narkhed taluka are under agricultural land. Some area are hilly and cover with rare forest also. Wardha river is flowing from western border of taluka. Kar river is flowing from southern border of taluka and Kolar river is flowing from eastern border of taluka. Other river are Jam, Mandakini, Wandali etc.The river Wardha flows in this region and enriches the biodiversity. Spiders are insectivorous predators on earth. They are Feed on insects and consume large number of preys without damaging the crops. Spiders, are the most common ubiquitous animals on land, constitute an essential portion of the predatory arthropods in several ecosystems. Recently in agricultural fields reduced pesticide use and ecological sustainability have lead to increased interest in spiders as potential biological pest control agents. Regularly use of pesticides in agricultural fields which decreases the spider populations. Spiders play an important role in insect pest control without any harm to ecosystem.

This article presents a study on the Diversity, distribution and current status of spider families in Narkhed of Nagpur District. During the present study, The diversity of spiders was studied during July 2021 to January 2022, using insect nets, tapping sticks and pit fall trap etc. During the survey 310 specimens were collected from agricultural field of Narkhed, 108 species were identified belonging to 10 families. Among the specimens collected most of the individuals were adult, the male–female ratio was 1:6. The Family Salticidae and Thomicidae represented 18 species each respectively, Araneidae 30, Oxyopidae and Lycosidae 6, Eracidae 4, Pholcidae 2, Uloboridae 2 species each. The population of spiders was abundant, species richness and diversity was high during the month of October to December. Spiders observed were exclusively carnivorous; mostly feed on insects and other Arthropods, naturally keeping insect population under control.

Keywords: *Spiders, Diversity, Biodiversity, Insects, Agricultural field, Narkhed.*

Intorduction:

Present study was designed to assess the diversity of spiders from Narkhed region, Most of the area of Narkhed taluka are under agricultural land. Some area are hilly and cover with rare forest also. The area extends over 100 sq.km., and lies on Wardha River, Spider species abundance in ecosystem can be high as undisturbed natural ecosystem. Spiders act as pest control creature, which feeds on crop destructive insects. Spiders are beneficial bio-control agent of insect pest in ecosystem **(**Jeyaparvathi S, et al. 2013). Spiders are known to occupying most of the terrestrial habitats. They are generalist predator, which can act against a broader range of insect pests. Spiders are considered to be of economic value to farmers as they play valuable role in pest management by consuming large number of prey in the agriculture fields without any damage to crops. Spiders are among the most abundant insectivorous predators of Terrestrial ecosystem. The current global list of spider fauna is approximately 44,234 belonging to 3928 genera and 110 families (Platnick NI 2019).

Order Araneae is a large group of animals commonly known as spiders, might have been evolved 380 million years ago during Devonian period (Penney and Seldon 2011). The current global list of spider fauna is approximately 42,055 belonging to 3821 genera and 110 families (Platnick, 2011). The spider fauna of India is represented by 1520 spider species belonging to 377 genera and 60 families (Sebastian and Peter 2009). General series on fauna published by Gazetteer of India, Maharashtra state, record a total of 90 species of spiders belonging to 14 families (Tikader and Malhotra 1974). 107 species of spiders belonging to 57 genera under 19 families have been described from Jabalpur district, Madhya Pradesh. (Gajabe, 2004).

Spiders are one of the most diverse groups in the world. Many types of spiders can easily be found even in small area. Salbardi is an untouched area, forest is dry deciduous and having rich bio-diversity. The abundance of spiders in the forest is ecologically important and may be studied for its nature of natural insecticide as well as bioindicator.

Material And Method:

Spider fauna was collected from agricultural field of Narkhed area (every weekend) from vegetation, on crop field, under stones/crevices, near water streams etc. For collection of spiders insects nets, pitfall trap and stroking sticks were used, the specimens were preserved in 70% alcohol, labeled and identified according to Barrrion and Listinger(1995), Davies and Zabka (1989), Gajbe (1987a,b), Tikader (1962,1973, 1982).

Result And Discussion:

The spiders were found abundantly in the agricultural field of Narkhed area. During the study 310 specimens were collected, of which 103 species belonging to 34 genera under 10 families were identified. The

large number of species belong to family Araneidae represented by 30 species in 08 genera, followed by Salticidae 18 species in 06 genera, Erecidae 4 species in 1genus, Gnaphocidae 06 species in 03 genera, Thomosidae 18 species in 06 genera, Tetragnathidae 02 species in 01 genera species, Lycosidae 15 species in 05 genera, Oxyopidae 06 species in 02 genus, and Pholcidae represented 02 species in 01genus and Uloboridae represented 02 species with 01 genera. The population of spiders was abundant, species richness and diversity was high during the month of October to December.

The spiders were found to be living in different types of habitats. The spiders belonging to Families Araneidae, Erecidae, Oxyopidae, Tetragnathidae, and Thomisidae, were mainly found on the vegetation, like shrubs and trees. Spiders living at the bank of rivers and swamp area belong to family Araneidae, Lycocidae, Salticidae, Uloboridae. Most spiders were found living on the ground under the crop field, foliage or in vegetation exhibiting some kind of colorations for camouflage. No exceptionally poisonous spiders were found among the species recorded. The spiders are most abundant and ecologically important, they are exclusively carnivorous and hence help naturally to control insect pest in any ecosystems and can be used as bio-indicator.

There are many environmental factors that affect species diversity (Rosenzweig 1995). Diversity generally increases when a greater variety of habitats types are present (Ried and Miller 1989). Downie et al. (1999) and New (1999) have demonstrated that spiders are extremely sensitive to small changes in the habitat structure; including habitats complexity, litter depth and microclimate characteristics. Documenting spider diversity in this ecosystem can provide important information to justify the conservation of ecosystem.

Sr. No.	Family	Genera	Species
1	ARANEIDAE	08	30
2	ERESIDAE	01	04
3	GNAPHOSIDAE	03	06
4	LYCOSIDAE	05	15
5	OXYOPIDAE	02	06
6	PHOLCIDAE	01	02
7	SALTICIDAE	06	18
8	TETRAGNATHIDAE	01	02
9	THOMISIDAE	06	18
10	ULOBORIDAE	01	02
Total		**34**	**103**

Table No. 1: Checklist of Spider Species from Agro-ecosystems of Narkhed region, District Nagpur. Maharashtra State

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Morpho-Taxonomic Studies of Diversity of Genus *Digitaria* Haller of Family Poaceae of Amravati District, Maharashtra.

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Abstract:-
Amravati is one of the 11 districts of vidarbha. It includes 14 talukas. Flora of Amravati district has been already studied by Dhore (2002) reported 84 species of grasses, during last 16 years no survey was conducted of the area. Survey of grasses conducted during 2014-2018 revealed 117 species belonging to 60 genera. Sporobolus R.Br. is a third largest genus of study area It has 5 species which belong to subfamily panicoideae and tribe paniceae. The aim of our investigation is to study morphotaxonomic revision of family poaceae. It focuses on details of macro and micro morphology of some important grasses.
Key words – Amravati , Flora, Survey, morphology.

Introduction

Grasses are most beautiful group of monocotyledonous plants. They occur on every soil, in all kind of situations and under all climatic conditions. As grasses do not like shade, they are not usually abundant within the forest. But in open places they grow very well and some times whole tracts become grasslands.

Grasses are important for entire ecosystem. Tiger is the king of forest ecosystem. If we want to save tiger, we have to save the grasses because tigers are indirectly dependant on grasses for their food. Robinson writes "Grass is king" it rules and governs the world, without it the earth would be a barren waste.

In the early days when the population was much limited and when limited land was under cultivationmuch of it was covered with plenty of green grasses. So the farmers paid no attention to the grasses. But now population has increased, open land is decreased very much and cattles have increased in number hence farmers have to pay more attentation to grasses. The present destruction of grasses is mainly due to overgrazing, increasing agricultural practices, over use of herbicides, formation of big dams, road widening, clean agricultural practices and trampling by men and cattles. Grazing needs to be inhibited in certain areas and also reduce the use of herbicides. Tender shoots of Bamboo are used as vegetables and also as pickle by locals. The grains of grasses certainly provide a staple food supply for the human beings *Oryza sativa, Triticum aestivum, Zea mays, Avena sativa, Setaria italica, Eleusine coracana, Echinochloa colonum, Sorghum* speciesand rice feeds more human beings than any other plant product. Sugarcane is main source of sugar. A high proportion of the most fertile and productive soil were developed under a vegetative covers of grasses. Root, rhizome and other part of grasses are good soil builders and effective soil stabilizers. Most of the birds and animals depend upon grassland habitat for food, shelter and normal completion of their life cycles Gould (1968).

Despite utmost importance of grasses to human beings, the study on grasses continues to be a neglected subject. This is mainly because of the feeling that it is a difficult group for identification, the leaves and branches of grasses are very much similar, Small floral organs, special terminology and variation in the structure of spikelet and inflorescence. "*Grasses of Burma, Ceylon, India and Pakistan*" studied by Bor (1960) is the main standard reference work on Indian grasses.

Study Area:-

Amravati district is located in the state of Maharashtra-India. It is at $20^0$55' and 20.93 North latitude $77^0$45' and 77.75 East longitudes. It has an average elevation of 343 meters (1125 feet). Total area of the district is 12210 sq. km. Amravati district has tropical wet and dry climate with hot, dry summer from April to June. The annual average rainfall in the district is 852.1 mm and the temperature has recorded between 18^0C to 46^0C (Falling rain Genomics, inc. 2010).

Apart from this, Amravati is one of the largest district of Maharashtra states. It includes fourteen (14) taluka namely Amravati,Achalpur,Warud,Chandurbazar,Dharni, Morshi,Daryapur ,Anjangaon Surji, Chandur Railway, Dhamangaon Railway, Teosa, Nandgaon-Khandeshwar, Bhatkuli, and Chikhaldara . Chikhaldara is the largest talukas of Amravati district and Bhatkuli is the smallest one.

Review of Earlier Work

Though botanical exploration of India has long history, Vidarbha and Marathwada regions remained somewhat neglected. A thorough exploration of Marathwada has been done by Naik and his students for nearly 30 years. Outcome of this work is *"Flora of Marathwada"* by Naik (1998) which a wonderful survey and reference flora.

The monumental work of Bor.(1953) on *"Grasses of Burma,Ceylon, India and Pakistan"*(excluding Bambusiae) published about 50 years ago has changed this scenario and created interest on the study of grasses. This resulted in publication of several books on grasses and the latest addition is *"Flora of Tamil Nadu-Grasses"* by Altaf and Nair (2009) that deals with 447 species (excluding Bamboos).

Patunkar(1980) studied *"Grasses of Marathwada"* region has also published a book "*Grasses of Marathwada*".

Recently, Potdar(2012) has published "*Grasses of Maharashtra*", the book is an outcome of exploration and detailed studies conducted on documents of grass diversity of Maharashtra for last 20 years. During this period 415 species belonging to 125 genera have been described. There are above 10,000-11,000 species belonging to 700 genera in the world (Clayton and Renvoize, 1989 and Watson and Dallwitz, 1992) in India there are more than 1200 species belonging to 268 genera (Karthikeyan *et al*., 1989, and Moulk 1997). Kamble and Pradhan (1988) reported 87 species belonging to 49 genera from Akola district. Acharya (1985) reported 100 species belonging to 57 genera from Wardha district. Deore (2010) reported 65 species of grasses from Washim district. Karthikeyan (1993) reported 81 species from Yavatmal district and Diwakar (2000) reported 60 species from Buldhana district.

Floristic surveys of different area of Maharashtra have been compiled and published by Botanical Survey of India such as *"Flora of Maharashtra state, Monocotyledon"*, Sharma *et al.*, (1996), *"Flora of Maharashtra state, Dicotyledon"*vol. I Singh *et al*., (2000), vol.II Singh *et al*., (2001).

Material and Methods

Plan of Work

1) Study of Habitat

In every season the selected areas were explored systematically. Grass covered sites were targeted for study. Grasses were collected from different habitats like irrigated fields, unirrigated fields, open grasslands, forest, bunds of field, bank of rivers, wastelands, rice fields and rocky places.

2) Sample collection and preservation-

During excursion specimens of grasses were collected and field number is given to each specimen. Field observations were noted down in field diary. After collection the samples are critically studied in laboratory . Then it is dried properly, poisoned by using 2% Mercury Chloride and mounted using conventional methods. For critical cases BSI (Pune) was consulted to match the specimens.

3) Identification-

The identification was confirmed by using floras like flora of British India(Hooker 1872-1897), Flora of Bombay Presidency (Cook 1958), Flora of Marathwada (Naik 1998), Flora of Maharashtra(Almeida,1990), Grasses of Maharashtra (Potdar, Salunkhe and Yadav, 2012) Grasses of Marathawada (Patunkar,1980). Specimens were observed under Sterioscopic binocular microscope.

Artificial keys were provided for genera and species. Population variations are critically studied. Latest nomenclature are given in detail for proper taxonomic level. Each grass specimen description was supported by a note on distribution and herbarium specimen number. Genera and species are arranged alphabetically. Floristic analysis was done to get clear picture of grass biodiversity. Grass species are arranged according to N.L. Bor. All the specimens were deposited in the herbarium of S.S.S.K.R.Innani Mahavidyalaya, Karanja(Lad), Dist-Washim.(M.S.)

4) Observations

Species of *Digitaria* and habitat.

Sr. No.	Specimen No.	Name of Species	Habitat
1	PAM 94	*Digitaria abludens (Roem. & Schult) veldkamp.*	Cultivated fields
2	PAM 25	*Digitaria bicornis (Lam.) Roem & Schult.*	Cultivated fields
3	PAM 97	*Digitaria ciliaris (Retz.) koeler.Descr. Gram.*	Unirrigated fields
4	PAM 84	*Digitaria ischaemum (Schreb.)Muhl.*	Forest
5	PAM 58	*Digitaria stricta Roth.*	Cultivated fields

Key for the species of *DIGITARIA*

1a -	Hairs on the spikelet clavate	2
1b -	Hairs on the spikelet not clavate	4
2a -	Spikelets in triads	*D. ischaemum*
2b -	Spikelets in pairs	3
3a -	Tips of pedicels some what thickened without a rim of hairs	*D. abludens*

3b - Tips of pedicles cupuliform with a hair of rim *D. Stricta*
4a - Spikelets of each pair heteromorphous sessile of spikelets nearly glabrous in front the pedicelled coated with long hairs often. Spreading at maturity *D. bicornis*
4b - Spikelets elliptic to elliptic lanceolate spikelets appressed. glabrous when young with spreading white tomentum at maturity *D. cillaris*

Conclusion:-

Present study is the outcome of exploration tours conducted to document the grass diversity of study area from 2014-2018 and visited different areas of Amravati district in different seasons. During this period over 600 specimens were collected from the study area. During the study 117 species belonging to 60 genera were collected.

Out of 60 genera *Eragrostis* is the largest genus belonging to sub-family pooideae. The 35 species collected from study area were found to be monotypic. In Amravati district pure patches of *Aristada, Ischaemum, Themeda, Andropogon, Heteropogon, Dicanthium, Cynodon and Saccharum* were observed.

Though grasses are herbaceous in nature, but are tough in texture so it is easy to prepare herbarium speciman. Some of the beautiful grasses are *Thelepogon elegans, Mnesithea granularis, Chrysopogon fulvus, Ischaemum rugosum and Dichanthium species.*

Some dominant genera are *Apluda, Aristada, Dicanthium, Cynodon, Dinebra, Eragrostis, Ischaemum, Rottboellia, Heteropogon, Ophiuros, Setaria*.Some grasses have underground rhizomes i.e. *Ischaemum pilosum, Cynodon dactylon, Saccharum spontaneum* whichcan not be eradicated hence the productivity of crops decreases. *Cynodon* is the first class fodder grass present throughout study area. It is palatable and resistant to grazing and trampling because of underground rhizomes. *Dactyloctenium aegyptium* , *Chrysopogon fulvus* are other palatable species of grasses. *Cymbopogon martini*,*Vetiveria zizanioides, Saccharum spontaneum* and *Cynodon dactylon* are the medicinal grasses. Hollow internodes of *Arundo donax* are used formaking pens and musical pipes by locals. The forest areas of Melghat (Chikhaldara and Dharni) are of mixed dry deciduous type with teak as dominant species.

Saccharum spontaneum, Vetiveria zizanioides, Arundo donax present along the sides of rivers and stream which reduce the pressure of flood. The dominant tribes of Melghat are Gond, Korku and Gawali. Gond, and Gawali are the tribal residents of Melghat forest range are the consumers as they feed their livestock mainly by grazing of grasses. Efforts are required to prevent free grazing as once vegetation is lost, it is very difficult to restore.

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Qualitative Phytochemical Screening And Antimicrobial Activity of *Oxalis Corniculata* L.

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Abstract
Medicinal plants have been a valuable source of natural active phytoconstituents that play an important role in treatment of many human ailments. In the present study, Oxalis corniculata L. (stem, leaves, roots and flowers) was evaluated for its phytochemicals and antibacterial potential. The Soxhlet extraction was done by using three different solvents viz. acetone, methanol and water. Qualitative phytochemical analysis showed the presence of various phytoconstituents. The antimicrobial activity was evaluated by disc diffusion method against four bacterial strains (Enterobacter aerogenes, Pseudomonas aerogenosa, Escherichia coli and Staphylococcus aureus) and two fungal strains (Fusarium oxysporum and Fusarium proliferatum). The methanol extracts showed better antimicrobial activity than acetone and aqueous extracts. This may be because of the difference in the presence of various phytoconstituents in them.
Key Words: *Oxalis corniculata, herbal medicine, phytochemical analysis and antimicrobial activity, etc.*

Introduction
Medicinal plants have been useful in the development of new drugs and continue to play a valuable role in the drug discovery process [1]. Herbal medicines have already formed the basis of therapeutic use in developing countries, but recently have also seen an increase in the use of herbal medications in the developed world as well. The biogeographic position of India is unique which makes India rich in all the three levels of biodiversity [2]. Some studies focusing on the investigation of traditional Indian medicinal plants have resulted in the identification of new sources of therapeutic agents [3]. Plants are recognized for their ability to produce a wealth of secondary metabolites and mankind has used many species for centuries to treat a variety of diseases. Many of these natural products have been shown to present interesting biological and pharmacological activities and are used as chemotherapeutic agents or serve as the starting point in the development of modern medicines [4, 5].

In addition, in developing countries, synthetic drugs are not only expensive and inadequate for the treatment of disease, but are also faced with adulteration and side effects. Therefore, there is a need to search new safe infection fighting strategies to control microbial infection. Natural products, either as pure compounds or as standardized plant extracts, provide unlimited opportunities for new drug leads because of the unmatched availability of chemical diversity. There is a continuous and an urgent need to discover new antimicrobial compounds with diverse chemical structures and novel mechanisms of action for new and re-emerging infectious diseases [6]. Therefore, researchers are increasingly turning their attention to folk medicine, looking for new leads to develop better drugs against microbial infections. The increasing failure of chemotherapeutics and antibiotic resistance exhibited by pathogenic microbial infectious agents has led to the screening of several medicinal plants for their potential antimicrobial activity.

So, the present study deals with the evaluation of phytoconstituents and antimicrobial efficacy of *O. corniculata*.

Materials And Methods
Collection of Plant Materials: Collection will be carried out from garden of Shivramji Moghe College Kelapur (Pandharkawada). Identification will be made with the help of standard floras [5, 6, 9, 12].

Preparation of Powder and Extract: The collected plant materials will be shade dried and mechanically powdered and stored in an airtight container. Various extracts will be prepared according to the methodology [11], will be subjected to our entire studies. The shade dried plants parts will be allowed to pulverization to get coarse powder. The coarse powder material will be subjected to Soxhlet extraction successively with acetone, methanol and aqueous extracts. These extracts will be concentrated to dryness in flash evaporator.

Qualitative Phytochemical Analysis: The study of bioactive component will be made to understand the medicinal values of the plant materials will be screened for bioactive compounds like, proteins, amino acids, carbohydrates, alkaloids, steroids, cardiac glycosides, anthroquinone, glycosides, saponine, flavonoids, terpenoids, quinine and coumarins. The qualitative phytochemicals analysis will be carried out using standard procedure [4, 7, 11].

Antimicrobial Activity: Antimicrobial activity will be carried by using antibiotic sensitivity Agar (Hi-Media) by disc diffusion method [3] against four bacterial (*Enterobacter aerogenes, Pseudomonas aerogenosa, Escherichia coli* and *Staphylococcus aureus*) and two fungal strains (*Fusarium oxysporum* and *Fusarium proliferatum*).

Results And Discussion

Phytochemical study of *Oxalis corniculata* L. showed the presence of carbohydrate, proteins, alkaloid, flavonoids, steroid and saponin. Alkaloid and steroid present in all parts of plant extract except in acetone extract of fruit and methanol extract of leaf respectively. Flavonoid present only in methanol extract of fruit and aqueous extract of leaf. Tannin and Phenolic compound present in all plant extract except acetone extract of fruit (Table-1). For antimicrobial activity, methanol, acetone and aqueous extract of all parts of plant extracts were tested with four bacterial strains - *E. aerogenes, P. aerogenosa, E.coli, S. aureus* and two fungal strains- *F. oxysporum* and *F. proliferatum* (Table-2). Methanol extract shows better antimicrobial activity than acetone and aqueous extract. Methanol extract of stem, leaves, roots and fruits shows a higher zone of inhibition for *S. aureus* than other microbes. This is because of the difference in the presence of phytoconstituents present in them.

Table 1. Qualitative phytochemical analysis of *O. corniculata*

Sr.No.	Phytoconstituents	Test	Plant parts	Acetone extract	Methanol extract	Aqueous extract
1	Carbohydrate	Benedict's Test	St	+	+	-
			Lf	+	+	+
			Rt	+	+	-
			Fl	+	+	-
2	Protein	Million's Test	St	+	+	-
			Lf	-	+	+
			Rt	-	+	+
			Fl	-	+	-
3	Antraquinone glycoside	Borntrager's Test	St	-	+	-
			Lf	+	-	+
			Rt	-	+	-
			Fl	-	-	-
4	Cardiac glycoside	Kellar-Killiani Test	St	+	+	+
			Lf	+	+	+
			Rt	+	+	+
			Fl	+	+	+
5	Coumarins		St	-	-	-
			Lf	+	-	-
			Rt	-	-	-
			Fl	-	-	-
6	Quinone		St	+	+	+
			Lf	+	+	+
			Rt	-	+	+
			Fl	+	+	+
7	Steroids	Salkowski Test	St	-	-	-
			Lf	-	-	+
			Rt	-	-	-
			Fl	+	-	-
8	Alkaloids	Hager's Test	St	+	+	+
			Lf	+	-	+
			Rt	+	+	+
			Fl	+	+	+
9	Flavonoids	Lead acetate Test	St	-	+	-
			Lf	-	-	-
			Rt	-	-	-
			Fl	+	+	-
10	Tannins and Phenolic compounds	$FeCl_3$ Solution Test	St	+	+	+
			Lf	+	+	+

			Rt	+	+	+
			Fl	-	+	+
11	Saponin	Foam Test	St	+	+	+
			Lf	+	-	+
			Rt	+	+	+
			Fl	+	-	+

[Note : St - Stem , Lf – Leaf , Rt – Root , Fl – Flower , Aq – Aqueous , Ac – Acetone , Me – Methanol]

Table 2. Antimicrobial activity of *O. corniculata*

Sr.No.	Name of Microorganism	Extract	Diameter of Zone of Inhibition in mm			
			St	Lf	Rt	Fl
1	*Enterobacter aerogenes*	Aq	6	11	12	10
		Ac	12	14	16	15
		Me	14	14	16	15
2	*Pseudomonas aerogenosa*	Aq	6	13	11	17
		Ac	10	17	16	20
		Me	12	18	17	21
3	*Escherichia coli*	Aq	6	6	10	14
		Ac	13	12	15	16
		Me	15	14	16	16
4	*Staphylococcus aureus*	Aq	6	10	13	15
		Ac	15	21	20	20
		Me	16	21	24	22
5	*Fusarium oxysporum*	Aq	11	6	10	11
		Ac	14	14	11	13
		Me	14	15	13	16
6	*Fusarium proliferatum*	Aq	8	6	10	9
		Ac	10	12	14	10
		Me	10	14	15	16

[Note : St - Stem ,Lf – Leaf ,Rt – Root ,Fl– Flower , Aq – Aqueous , Ac – Acetone , Me – Methanol]

Conclusion

The results obtained from the present investigation indicate that, the plant *O. corniculata* rich in alkaloids, flavonoids, steroids and saponin. They are known to show medicinal potential and antimicrobial activity for selected microbes. Thus, the plant under investigation showed their medicinal potential and can be a source of useful drugs. More phytochemical research work is required for isolation, purification and characterization of biologically active compounds. Since the plant *Oxalis corniculata* L. is useful in traditional medicine for the treatment of various ailments; it is need of time to standardize the plant for development of quality control parameters.

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Ethno-Medicinal Uses of Some Selected Medicinal Plants of Pusad Forest Ranges, Maharashtra

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Abstract:
Pusadtalukais enclosed within hilly region with forest vegetation consisting of medicinal and aromatic plants which have traditionally used by local peoples from 100 of years. Traditional indigenous knowledge reveals the immense value of almost all parts of the plant i.e. roots, leaves, fruits, seeds and gum for various medicinal uses. These species has high socioeconomic value providing livelihood to tribal population of the area and has high potential as commercial value.
***Keywords**: Pusad, Ethno-medicnalroperties, Medicinal plants.*

Introduction

Pusadtaluka is situated on the bank of river Pus and in the mountainous hilly region in Yavatmal district of Maharashtra state. Pusad is located at 19°54′N77°35′E19.9°N 77.58°E. It has an average elevation of 315 metres (1033 feet). River Pus flows very near to the town that is why the city was named as Pusad. Climate of Pusad is very high with the temperature going as high as 49 degree Celsius during summers and as low as 5 degree during the time of winters. It receives an average rainfall of about 471mm per year. Pusad is well furnished with hilly region with forest vegetation and separated forest divisionPusad; which is surrounded by hills from almost all the sides and is at little lower elevation than these hills. The name of the city originates from the name of the adjoining river called Pus river.

Plants provide the predominant ingredients of medicines in most medical traditions while the demand for medicinal plants is growing hence, some of them are increasingly being threatened in their natural habitat. Threats can be human-induced such as clearing of habitat, pollution, overharvesting, introduced species, or random natural events such as cyclones, floods, droughts, fire. Traditional methodologies cannot provide the increasing demand of worlds need in medicinal plants and hence there is urgency of development of new technologies to fluffiness of present requirements.

Traditionally from prehistoric times, the use of different parts of medicinal plants was practiced to cure specific ailments evidently due to presence of some bioactive compounds like alkaloids, flavonoids, essential oil, glycosides, tannins, terpenoids, steroids and others. Many of the drugs, currently in use have been isolated from natural sources based on information about curative agent in folklore medicine (Sameera and Mandakini, 2015). About 47000 plant species are found in different parts of India, of them 17,000 flowering plants, 6850 species are endemic to India and 8000 are ethnobotanically important (Wildlife Institute of India, 2007). Singh (1999) reported that out of 250,000 to 300,000 total plants of the world, India harbors' about 45,000 plants. Out of 20,000 medicinal plants of the world, India contributes about 3000-5000 plants. Biodiversity is one of the key components of our basic life support system. The traditional herbal medicines are still practiced in large part of our country in tribal and rural areas. The present attempt is to survey of different regions of Pusad and its surrounding area for medicinal plants and contribution to the knowledge of traditional uses of medicinal plants of this region.

Materials and Methods

For the study of different types of plants author visited different localities of Pusad and adjoining hilly region during all seasons of year. During visits various types of plant were found viz., trees, shrubs, herbs, grasses, ornamentals & medicinal and aromatic plants. For collection of these plants the author was plan to visit different localities at different times. The collected plants at the time of flowering were identified with the help of Botanical flora (Ugemuge, 1986). The medicinal uses of plants and plant parts were recorded from local peoples and the literature.

Observations and Results

S.N.	Botanical Name	Common Name	Family	Category	Locality
1	*Curcuma*aromatica	Ranhalad	Zingiberaceae	Threatened	Isapur
2	*Iphigenia indica*	Ranlasun	Liliaceae	Threatened	Khandala, Dhundi, Isapur,
3	*Gloriosasuperba*	Kal-lawi	Liliaceae	Threatened	Dhundi, Khandala, Belghavhan, Isapur, Katkheda, Harshi
4	*Withaniasomnifera*	Ashwagandha	Solanaceae	Rare	Pusad, Belghavhan, Khandala,

					Katkheda
5	*Vitexnegundo*	Nirgundi	Lamiaceae	Rare	Khandala, Dhundi, Belghavan, Isapur
6	*Amorphophallous* sp.	Dukkarkand	Araceae	Threatened	Khandala
7	*Terminaliaarjuna*	Arjun	Combretaceae	Rare	Khandala, Dhundi, Belghavhan, Harshi, Isapur, Khandala
8	*Buchananiacochinchinensis*	Charoli	Anacardiaceae	Rare	Belghavhan, Isapur, Khandala, Dhundi,
9	*Asparagus racemosus*	Shatawari	Liliaceae	Rare	Khandala, Dhundi, Belghavhan, Harshi, Isapur,
10	*Buteamonosperma*	Palas	Fabaceae	Rare	Khandala, Dhundi, Harshi,
11	*Bombaxceiba*	Katesawari	Malvaceae	Rare	Khandala, Dhundi, Harshi,Isapur
12	*Madhucaindica*	Moh	Sapotaceae	Rare	Khandala, Dhundi, Harshi,Isapur

Medicinal uses

1) *Curcuma aromatic*: It is used traditionally for eliminating blood stasis, delaying the ageing process, pain relief, liver disease, tonic, skin ailments, antidote for snake bite, wound healing, dysentery, indigestion, cosmetics, skincare, anticancer.
2) *Iphigenia indica*:The plant body is useful in damaged breast cancer, against different tumours, gout, skin infections, scrofula, snake bite, rheumatism, as a laxative; used against different types of cancers namely, thyroid, skin, cervix etc.
3) *Gloriosasuperba*: All the plant parts are useful as an abortifacient, tonic, in the treatment of ulcers, leprosy, piles, abdominal pains, itching, and indigestion.
4) *Withaniasomnifera*: In traditional medicine, the consumption of the roots improves cardiovascular health, reduces swelling and stress, strengthens heart muscles, regulates cholesterol, and reduces hair loss in the human body, bronchitis and malaria.
5) *Vitexnegundo*: The plants root, bark, leaves, fruits are useful as antiseptic, bronchitis, asthma, tonic anti-rheumatic, diuretic, wound , ulcers, muscle relaxant, cardiac disorder,
6) *Amorphophallous*sp.: The plant is useful in gastrointestinal diseases viz. haemorrhoids, vomiting, abdominal pain, liver tonics, digestive, bronchitis, asthma, cough and anaemia.
7) *Terminaliaarjuna*: The bark and fruits are used traditionally as cardio-tonic, tonic in fracture, ulcers, spermatorrhoea, diabetes, cough, tumour, asthma, skin disorder, provide energy to heart muscle.
8) *Buchananiacochinchinensis*: All parts of plant body use in the treatment of various disorders diarrhea, inter costal pains, relive itching, blood disorder, fever, ulcers, dysentery, asthma, snakebite.
9) *Asparagus racemosus*: This plant is recommended in Ayurvedic tests for prevention and treatment of gastric ulcers, inflammation, nervous disorder, liver diseases dyspepsia and as a galactogogue.
10)*Buteamonosperma*: Flowers are astringent to bowel, in cure "Kapha", leprosy, strangury, gout, skin diseases, thirst; flower juice is useful in eye diseases. Flower is bitter, aphrodisiac, expectorant, tonic, diuretic, and good in biliousness, inflammation and gonorrhoea.
11)*Bombaxceiba*: The plant has been used extensively for treatment of some diseases like anti-inflammatory, anti-HIV, hepato-protective, hypotensive, antiangiogenic, antioxidant activities
12. *Madhucaindica*: It is used as Anti diabetic, antiulcer, antiulcers, antipyretic, antifertility, analgesic, antioxidant, swelling, inflammation, piles, wound healing, dermatological, laxative, tonic, antiburn, headache and many more problems.

Conclusion

The plants collected and reported from Pusad, District Yavatmal in the present study are used by the local peoples and tribal in their routine treatment practices. All the traditional drugs obtained from different medicinal plants studied in present attempt are very effective, cheap and available around agricultural fields and in wastelands. So the tribals are using these plants as alternative to allopathic medicines. Further research on these plants on scientific lines may help in developing effective drugs for human health care.

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Ethno- Veterinary Plants Used in Animal Health Care Practices by Livestock Owners From Katepurna Region Dist- Akola (M.S.) India

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Abstract
Livestock economy forms a major part of our agriculture economics. Tribals in far flung rural areas are still depending upon plant and household remedies for curing various veterinary ailments. The folk knowledge of ethno-veterinary significance has been identified by tribals through a process of experience over hundreds of year. The present study throws a light on herbal remedies used in animal health care of Katepurna region district Akola, Maharashtra, India. The paper deals with 15 diseases of domestic animals and their treatments by 50 plant species found in close vicinity of the rural peoples of the study area.
Key Words: Domestic animals, herbal medicines, animal healthcare and Katepurna region.

Introduction
In India enough attention has not been given to the traditional veterinary herbal remedies (Boddings, 1927; Bandyopadhyay *et. al*., 2005 and Prajapati & Kumar, 2005). The use of plant and animal parts for medicines long been in existence and documented in records kept in ancient China, India and Egypt. These ancient indigenous practices were discovered by a series of trial and error which then could not be substantiated by proven scientific theories. However, these practices have produce result of proven efficacies compared to conventional modern medicines (Chopra *et. al*., 1956 and Prajapati *et. al*., 2003).

In recent times, herbal medicines have become indispensable and are forming an integral part of the primary health care system of many nations. There has been rich tradition and indigenous knowledge about animal healthcare in India (Raja Reddy, 1987; Sharma, 1993 and Bhattacharjee, 2001). Modern healthcare in the tribal and rural areas of Katepurna region is characterized by the deficiency of infrastructure, of qualities personal and of medicine. So, the present study was undertaken in rural as well as in forest areas of Katepurna in Akola district.

Methodology
The traditional knowledge of plant base remedies for the treatment of ailments rests with the medicine man, all of which belong to one family of hereditary indigenous practitioners. Skill and experiences are passed on from one generation to the next by word of mouth and guarded like secrets. In view of secretiveness of traditional men and women, it was decided to interview a number of elderly people, who have a great deal of practical knowledge about the plants and animal products used as medicine in the native system. Before actually launching into the field work, rapport was established with tribals of the locality. Experienced people, such as some elders, professional healers, medicine men can provide important information on useful medicinal plants.

To determine the authenticity of information collected during field work, repeated verification of data from different people and at different times was done. The collected plants were identified up to species level with the help of flora (Kamble & Pradhan, 1988; Karthikeyan & Kumar, 1993; Naik, 1998; Singh & Karthikeyan, 2000 and Singh *et. al.*, 2001). The information presented includes the name of ailment, plant parts, animal product or chemical used, their scientific names and mode of usage. The data are presented alphabetically disease and disorder wise.

Observations
In all 50 plant species are used by the natives in the treatment of domestic animals.

1] Anorexia: 50 gm tuber powder of *Corallocarpus epigaeus* Rottl.et Willed. mixed in 250 ml wine is given in anorexia for Loss of appetite.

2] Bloat: Leaves of *Ocimum basilicum* L. crushed with sugar and the decoction in water is given for blood purification. Tuber of *Discorea bulbifera* L. rubbed in cow urine and paste is applied over bloat. Inflorescence of *Mangifera indica* L. crushed in cow urine and the paste applied thrice a day on bloat. Tuber paste of *Corallocarpus epigaeus* Rottl.et. willd. Clarke made in cow urine administered over bloat.

3] Blood purification: Agents believed to remove impurities or deficiencies from blood. Leaves of *Ocimum basilicum* L. crushed with sugar and the decoction in water is given for blood purification.

4] Bone fracture: The stem branches of *Viscum articulatum* Burm. f. given orally or mixed with fodder. Warm leaves of *Soymida febrifuga* (Roxb.) A.Juss applied on fracture part. Poweder of leaves of *Blepharis repens* (Vahl) Roth. mixed with whey or pulses of black gram given for healing bones. Stem bark paste of *Terminalia arjuna* (Roxb.ex DC.) Wight & Arn. applied over bone fracture . Root powder of *Bauhinia racemosa* Lamk. with butter and rice given to animals to join the bones. Leaves of *Capparis zeylanica* L. crushed within castor oil, mixed with bulk of egg and sieve white soil. Paste prepared is plastered around fracture bone bandage with the help of hairs, cloth strips and wooden splints made of lightwood.

5] Cough, Cold and pneumonia: This disease makes the animal to cough continuously due to climate change or by grazing newly raised grasses on the ground. Warm vapour of *Eucalyptus globus* given to the animal in cough and cold.

6] Constipation: Constipation is a condition of bowels when defecation of faeces is irregular or difficult. *Abrus precatorious* L. seeds powder are used orally along with water. Crushed seeds of *Jatropha curcas* L. after removing epicarp are given to animals for same.

7] Dysentery: A disease caused by bacteria or protozoa, causing inflammation of mucus membrane and glands of large intestine, resulting in painful dysentery. The stool often accompanied by mucus or blood. Decoction of leaves of *Eucalyptus globules* Labill mixed with water and by adding by camphor given to animals. Decoction of leaves *Embelia ribes* N. Burm mixed with boiled fruit in water given to animals in dysentery. Dried fruits of *Cucumis melo* L. var. crushed and mixed with wheat for three days in morning given to cattel. Decoction of leaves of *Dolichondrone falcata* (Wall. Ex DC) Seem. after sieving through piece of cloth mixed with butter and given to animals. Decoction of pods of *Cassia fistula* L. mixed with water given to animals. Crushed leaves of *Cardiospermum halicacabum* L. mixed with butter milk given to animals against dysentery. Fruits of *Aegle marmelos* (L.) fed to animals to cure. Fruit powder of *Careva arborea* Roxb., *Sappindus emarginatus* Vahl mixed with *Curcuma longa* L. and decoction is prepared in ghee and 1 lit. decoctions given to cure dysentery.

8] Diarrhoea: A common symptom of gastro- intenstinal diseases resulting infrequent discharge of watery stool. Bark of *Ixora arborea* Roxb. Ex Smith soaked with pulses of *Phaseolus mungo* L. overnight in water then next day mixture is crushed together and mixed with 1 litre whey and given twice a day to cure body diarrhoea. The decoction of leaves of *Barleria prionitis* L. mixed in water is given to animals. Leaves and flowers of *Madhuca indica* J. The decoctionis given to cure body diarrhoea. Crushed leaves of *Cayratia auriculata* (Wall. Ex Wight & Arn.) Gamblle mixed with one liter butter milk and sieving through a piece of cloth is given to animals. The decoction of leaves and young pods of *Acacia nilotica* (L.) Willd. Ex Del. is given to animals against diarrhoea.

9] Eye diseases: Seed paste of *Balanites aegyptiaca* (L.) Del. Applied to eyes to cure corneal opacity. Seed paste mixed with juice of *Citrus limon* L. and *Curcuma aromatic* Salisb. Applied to cure injury of eyes. Fruit paste made in cow urine applied to cure redness of eyes. Latex from leaves of *Ficus benghalensis* L. applied in eyes to cure corneal opacity and watering of eyes. Fruits of *Semecarpus anacardium* L. f. crushed in cotton and soaked cotton is moved in eyes two to four times to cure redness in eyes.

10] External parasites: The leaf juice of *Ailanthus excels* Roxb. is used to kill external parasites like lice and ticks.

11] Fever: Body temperature increases, which can be judge b the touching the animals ear. Decoction of roots or leaves of *Trianthema portulacastrum* L. given to cure fever after worm infection. Decoction of crushed roots of *Marsdenia tenacissima* (Roxb.) Moon. given to cure fever. Bark of *Butea monosperma* (Lamk.) Taub. crushed in cow milk, mixed in cow milk , mixed in water and given to cure fever of bullocks. Leaves and flowers of *Madhuca indica* J.F. Gmel and *Tamarindus indica* L. crushed together and decoction is given to cure fever of Goat.

12] Maggoted wounds: Root powder of *Gloriosa superba* L. is dusted on maggoted wounds to kill worms. Leaf decoction of *Alianthus excels* Roxb. is applied on the wound to remove maggot. Decoction of leaves of *Datura metel* L. used to cure maggot wounds. Decoction of leaves of *Cleome viscosa* L. applied on sores for killing maggots. Decoction of leaves of *Clerodendrum multiflorum* (Burm. f.) O. Ktze. droped on worm infested wounds and crushed leaves are also applied to kill worms.

13] Hebicide poisoning: Roots of *Baliospermum montanum* (Willd.) Muell. – Arg. Are crushed and put under canine tooth in herbicide poisoning. Whole plant of *Cuscuta reflexa* Roxb. Crushed and mixed with 250 gm butter is given orally in herbicide poisoning.

14] Itch: Sense of irritation on skin. Inner bark of *Acacia nilotica* (L.) Willd. Ex. Del. *Emblica officinallis* Gaertn. *Ziziphus nummularia* Burm. f. and leaves of *Feronia elephantum* Corr. Boiled together . The

decoction is sieved through a piece of cloth, one spoon of pepper powder mixed with two spoon hot butter is added into above decoction and one bottle is given twice a day in itching.

15] Repeat breeder: Crushed fruits of *Thespesia populnea* (L.) Soland. Ex Corr. Boiled, mixed with half litter water and given orally for three days in repeat breeder or anestrus.

Discussion

The present study included extensive survey and research work regarding the use of herbal medicine in the Akola district. As observed in most of the cattle owners and common peoples, first choice of treating their animals is traditional herbals remedies. On field tests, it is revealed that the above common ailments were cured fully in all the cases excepting the few negligible. There were no side effects. Further, the costs of all these herbal remedies were negligible in comparison to modern veterinary medicines as prescribe by the veterinarians. As majority of the inhabitant of the Katepurna region solely depends on agriculture and animal husbandry sectors, their poor economic condition does not permit them to meet the cost of allopathic medicines. Hence, they strongly believe and rely upon their traditional herbal medicines.

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Impact of Laser Irradiation on Germination of Seeds

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Abstract

Majority of the population of India has agriculture as the source of their livelihood and it cannot be underestimated. The increasing population and globalization effects demands increase in quality as well as quantity of food along with its variety. Along with that food safety and security is essential factor to be consider. Since decades, novel techniques and technologies are employed to fulfill these demands. Laser technologies have been proved trustworthy in field of agronomy. This article represents the review on impact of laser irradiation on germination of seeds. It includes Laser applications namely impact of coherent laser irradiation on germination of seeds, effect of laser on fresh and dry weight, irradiation effects at different wavelengths on phenology and yield components of pretreated seeds. Herein the review of above mentioned applications of Laser technology in agriculture, its advantages, challenges and possible future work as well as impact of Laser irradiation on germination of seeds is included.

Keywords: *Laser, agriculture, coherent, irradiation.*

Introduction

Agriculture is the means of livelihood of majority of population of India. Even in twenty first century the agriculture field is facing challenges like water shortage, lack of use of technology, energy resources constraints, less availability of land under cultivation. The increasing world population demands increase in availability of foodgrains. Some innovative methods and smart use of available technology should be the wise way to overcome these issue. Along with that food safety and security is the major factor to be consider. Overuse of fertilizers, pesticides, fungicides makes the land infertile. Moreover, many climate changing activities making hazardous effect on environment. Thus there is need of use of novel techniques to fulfill the demands. Sustainable agriculture is a management system for renewable natural resource for food production income and livelihood for present and future generations, maintaining and improving in comic productivity and the ecosystem. (10)

Laser means Light amplification by stimulated emission of radiation. It is an optical device that can generate monochromatic and highly coherent light. (1). The laser discovery in the past century has been of great impact and applied in the society from its conception until today. Among its applications, its use in agriculture as a biostimulator device. The laser light of low intensity produces bio stimulation when used on seeds, seedlings and plants. (9)

Impact of coherent Laser irradiation on germination of seeds

Laser technology is mainly used for pre-sown seed exposure in order to achieve better and faster germination in various, often unfavorable, habitat conditions.Experiments were done on Soybean seeds which includes exposure of seeds to Laser light of different intensities in combination with bacterial vaccine dose. The samples were exposed to two types of laser, a Helium-Neon laser comprised of red light with a wavelength of 632.8 nm and irradiation density of 2 W m^{-2}, and an Argon laser with a blue light, a wavelength of 514 nm and irradiation density of 5W m^{-2}. After performing experiments, the morphological analysis, Isolation and identification of fungi colonized seeds and statistical analysis of the experimental soybean seeds were done. For 21 days the seeds were kept in chamber and effects on germination were observed. It was found that of all the examined cases, seeds germinated best after being photo stimulatedwith a red or blue laser. The highest number of germinating seeds was found in the case of irradiation of the seeds plus vaccine. This is an effective technique in protecting germinating soybeans and the roots of older plants against infestation by soil-borne pathogenic fungi(3)It is observed that the absorbed energy from laser light increased activities of biochemical and physiological process of seeds by the transformation of light energy into chemical energy(9)

Irradiation effects at different wavelengths on phenology and yield components of pretreated seeds

The aim of the study was to determine effects of different dose and different wavelengths on irradiation . The maize was chosen as experimental material. Three types of laser were used: He–Ne (red), Nd:YAG second harmonic generation (green), and diode (blue), generated at 632.8, 532, and 410 nm, respectively. It was found that with different exposure time and power density of the laser the maize plant showed remarkable effects. The irradiation of the sowing material hada positive influence on the seed yield of maize. (4).

Effect of laser on fresh and dry weight, root length, hypocotyl length

In the simple optical experiments of pretreating mug beans with laser of wavelength 632.8 and 488nm shows improvement in root length, hypocotyl length by 28% and 22% respectively (5). Researcher has exposed seeds of pea to helium neon rays for 10 min. gave the highest values of plant dry weight compared to untreated plants and other period (2 and5 min). (6)

Laser treatment for resistance to fungal and bacterial infection

Experiment were performed on wheat. As wheat is the major part of our daily food Development of new alternative therapeutic approach is necessary to curtail fungi infection. This invitro study demonstrated that pre sowing exposure to SHG Nd-YAG laser in wet and dry condition was able to sterilize wheat seeds, improve its growth and development, and may be a good candidate for novel treatment of fungal infected wheat seeds. (8). the irradiation of seeds with 660 nm laser light seems to induce resistance against diseases caused by microorganisms in seedlings (7), which could be an interesting and sustainable area of research. Furthermore, irradiatingseeds with red laser light seems to improve the nutritional value of seedlingsthrough the accumulation of vitamins, minerals, pigments and antioxidants, and isalso capable of boosting both the antioxidant capacity and anti-inflammatory activities(2)

Future Scope and limitations

Herein this review paper presented the impact of irradiation of deed germination of seeds. It is effective for enhancing the agricultural production. The above mentioned study shows the effect of pretreatment to seeds by laser with coherent sources, with sources of different wavelength as well as the use of laser for proper maintenance of water and fertilizers in field. But there are few limitations also. Laser induced changes are positive as well as negative. Bio stimulation by lasers may cause negative effects as well. Thus further study and investigation is needed in this field. This may offer us new horizons to explore and will prove worthy in fulfilling the demand of sustainable growth.

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ORB Weaver Spiders Fauna of Sugarcane Agroecosystems of Mahagaon Taluka Maharashtra, India

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Abstract: -

Spiders play a significant role in ambiguous insect pests in agricultural ecosystem. Modern trends in farming towards condensed pesticide use and natural sustainability lead to enlarged importance in spiders as potential biological control agents.

The association of a powerful involvement among species richness and an exchange the catalog is a serious issue in conservation biology. Such a association could gives the foundation for the association of commercial and easy-to-monitor methods intended for measuring biodiversity, given that an another prioritization of sites for conservation. Together family and genus richness are studied for their capability to calculate the number of spider species self-sufficient of diversity. Genus only is found to be trustworthy sign for ranking sites according to species richness. This study recommends accomplishment of higher taxonomic level as a hopeful loom for calculation of spider species richness or estimation and standing of areas according to conservation significance. This paper is an attempt to understand the diversity and assemblage of spider's fauna from Sugarcane argoecosystem of Mahagaon taluka of Yavatmal district. Out of 154 spider population Total 17 species were observed from 7 genera from Aranidae family.

Keywords:- Agroecosystems, Aranidae Integrated Pest Management ,Spiders, Sugarcane.

I. Introduction:-

ORB Web Spiders is the biggest family amongst spider's world. All species from this family spins web the particular structure of the web is useful for identification of species. Spiders from this family having flat cephalothorax; thoracic region is oval, or almost spherical, divided from head by tilted depression. Eyes are not different in size. Legs are covered with lots of hairy spines, with three tarsal claws. The legs are also varies greatly in length. When spider is in resting stage legs are likely to be drawn up tightly against carapace, which may be completely hidden. In this family male is much smaller and very differ from female and has large, rounded tarsal bulb on the end of each palp. Sternum is triangular or may be heart shaped and coxa IV is being next to it.

The biodiversity of invertebrate species on agricultural land is very important in terms of pest control and conservation. Spiders are principal predator found in Arthropods communities (Gertssch, 1979).

Spiders are significant but in general disappointingly studied arthropods due to unawareness, lack of knowledge, fear and general dislike towards them. The broadly spread concept that spiders are toxic and dangerous, may be the one of reason to stay away from them. All spiders are not venomous only a small number of species such as Black Widow spider, Recluse spider or Red Back spiders bite is harmful for human beings, and sometime they may cause allergic reactions. Venom produced by spiders is poisonous to their common pray like insects, mites and other small Arthropods; venom is inserted to pray through the fangs to immobilize them. Spiders only use their venom to immobilize their prey and hence they act as natural pest controller, so the study of diversity and variety of spiders in agro ecosystem is useful for determination of the benefits of agricultural practices for conservation of spiders, important for pest control (Eyre *et al.*, 1989). Spiders are wide spread in agro ecosystems making up to 20-80% of predatory fauna (Legotay, 1980; Zhang, 1992). To control effects of pests various pesticides are regularly been used by farmers, but these pesticides are having various adverse effects on non target fauna, sometimes these pesticides are harmful to human beings also, therefore more emphasis should be given on bio-pesticides, spiders plays major role in controlling population of insect pests.

II. Material & Method

A. Study Area:-

The area selected for collection of orb weaver's spiders is Sugarcane agroecosystems of Mahagaon Taluka of Yavatmal District (Maharashtra state). Mahagaon and nearby areas habitually depend on agriculture as the main resource of income. The land in the region is very well irrigated because of Pus dam, Veni Dam, Senad Dam, Pimpalgaon Dam And Mudana dam which provide multipurpose benefits of irrigation, drinking water supply, flood control and hydropower generation.. Pus River also provides direct irrigation water to farms. Drinking water is also sourced from this canal. The catchment area is hilly and forested in its upper niches from its source and the lower niches are flat wide valleys. (Rivers, Government of India 2010). Main

crops include Sugarcane, Cotton, Soybean, Bengal gram, Jawar, and Wheat.sugar cane is an irrigated crop, it *can* be *cultivated* on almost all types of soils provided sufficient organic matter is applied under rained conditions.

Mahagaon taluka of Yavatmal district, (Maharashtra) is located at the latitude of 19.7877244, and the longitude is 77.772378**. Mahagaon , Maharashtra, India** is located at *India* country in the *Cities* place category with the GPS coordinates of 20.7277° N and 80.0591° E. **Mahagaon , Maharashtra, India** 398 meters. Above Sea level, that is equal to 1,167 feet. Mahagaon taluka has an extreme variation in temperature with hot summer and cold winter. The rainfall comes from South Western called monsoon mainly in the month of June, July, August and September. The annual average rainfall in the Morshi is 738.40mm and temperature recorded between 17^0C to 45^0C.

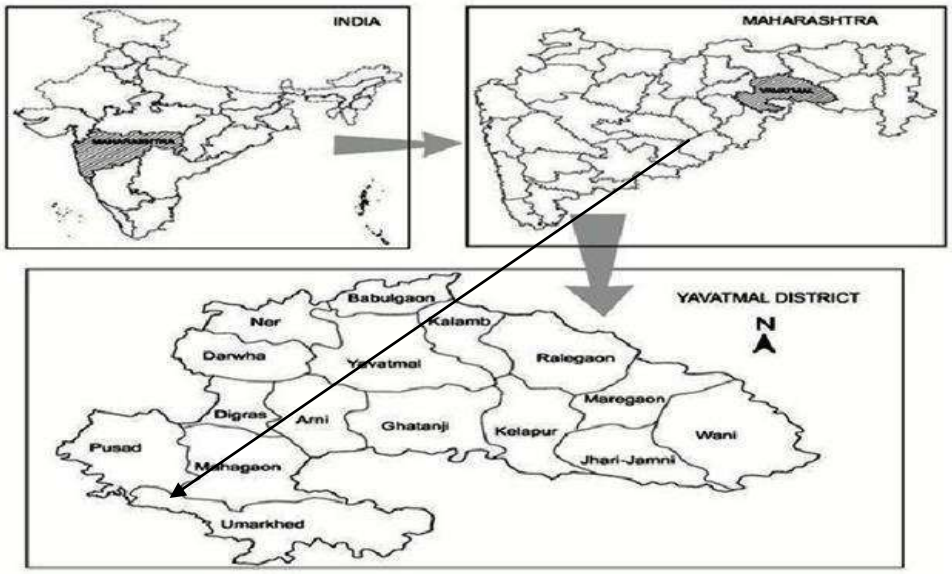

Fig: - Study Area

B. Method

a) Study Period

The investigation was carried out for a period of six months from September 2020 to February 2021. Sampling was conducted in six months at the randomly selected sugarcane field.

b) Sampling

Sampling was done every Saturday - Sunday from quadrates. Spiders were collected only for photographic purpose and released immediately in their natural habitats. Quadrates (1sq. m × 1sq m) placed at four corners and one centre of 10 sq. m × 10 sq. m region by visual search process between 8.00 Am to 12 PM 4 hours in morning and 4 to 6 PM 2 hours in Evening. An adequate interior part was left to avoid boundary possessions. All 1 quadrates were searched. Spiders were collected from the ground stratum and from the terminals of crops. Total 15 Villages were visited consistently for study of spiders.

c) Identification:

Identification of spiders is done with the help of keys available. The specimens were observed for their preserved or photographed. For identification keys of Tikader (1963), Gajabe (2005), Z.S.I. and other literature.

The family wise identification was mainly done with the help of eye position as well as other morphological characters.

III. Result & Discussion:-

Aranidae was the most dominant family in both the study areas as they are very good predators on web. They control the insect and other harmful arthropods which get entangled in the webs. Aranidae shows great predation towards *Leptocorisa acuta* (bugs), and White grubs than the other spider species. Various other observations suggested that spider distribution and re-colonization in fields are important aspects of spider population dynamics in agro ecosystems. (Bishop, L.and S.E. Riechert, 1990). Genus Araneus was dominant during winter followed by Cyclosa these two genera were represents 37% species richness from Aranidae family during 2020-21 but in 2022 the number reduced up to 26% from Sugarcane argoecosystem as the result of pesticide, burning of raw residues of sugarcane and human encroachment in study area.

Family	Species in Sugarcane agroecosystems	Population	Region	Meta- Region
1. ARANEIDAE	*Araneus mitificus* (Female)	9	Site 4	Sawana
	Araneus pahalgaonensis (Female)	11	Site 4	Kalgaon
	Araneus sp.(Female)	10	Site 2	Veni
	Araneus sp.(Male)	12	Site 4	Sawana
	Argiope sp. (Male)	8	Site 1	Pedhi
	Argiope aemula (Male) and (Female)	9	Site 2	Sawna
	Argiope anasuja (Thorell) (Female)	5	Site 3	Mahagaon
	Chorizopes calciope (Female)	6	Site 3	Malkinhi
	Cyclosa hexatuberulata (Female)	7	Site 1	Leva
	Neoscona nautica (Female)	10	Site 2	Tembhi kali
	Neoscona theis (Female)	16	Site 2	Gunj
	Neoscona mukharjee (Female)	11	Site 3	Bhosa
	Neoscona sp. (Male)	14	Site 4	Bori Ijara
	Telacantha brevispina (Female)	12	Site 1	Amni
	Telacantha sp.(Female)	5	Site 2	Amboda
	Zygeilla sp. (Female)	5	Site 4	Kalgaon
	Zygeilla sp.(Male)	4	Site 4	Veni

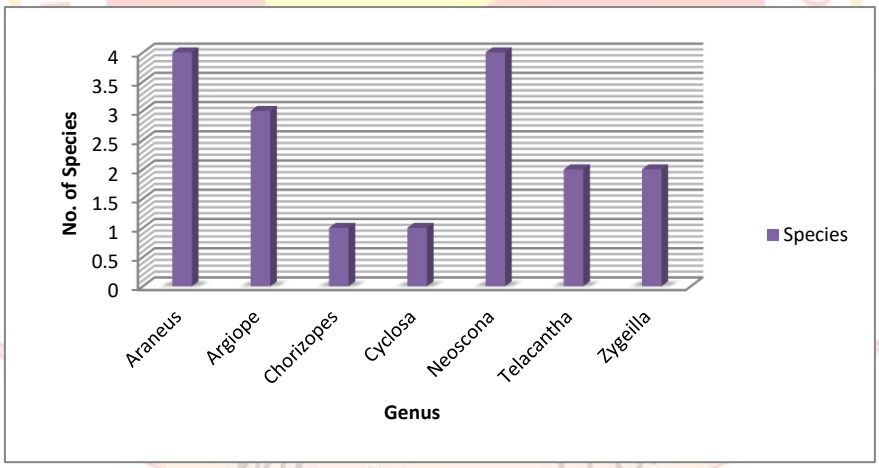

Chart No of Species against Genus of Aranidae Family.

Statistical Analysis:-

Total number of Organisms:-	**154**	Total number of Species	**17**
Average population size: -	**9.059**	Decimal Accuracy: -	4
Number of Regions	**15**	Region sets	6

Alpha Biodiversity [α]

Simpson Index $\frac{\sum_i n_i(n_i-1)}{N(N-1)}$ 0.06069 Simpson Index Approximation $\frac{\sum_i n_i^2}{N^2}$ 0.06679

Beta Biodiversity [β] Comparing two sample areas

Absolute beta Value ($(S_0$-c)-(S_1-c)…): **208** Whittaker's Index (S/alpha): **15**

Sorensen's similarity index: **0** Alternate Whittaker's Index (S/alpha-1):**14**

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Ethnomedicinal Study &Qualitative Analysis of Jatamansi- A Case Study in Lanku valley, Darjeeling, West Bengal.

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Abstract

Medicinal plants have important contribution in the healthcare system of local communities as the main source of medicine for the majority of rural population. The paper is about treatment of various diseases using ethno medicinal practices of Jatamansi. Nardostachysjatamansiis a flowering plant belonging to family Caprifoliaceae. This plant is also known as "Tapaswani" in Ayurveda. It is a perennial, dwarf, hairy, herbaceous and endangered plant species. According to herbal practitioners the plant is used in various herbal formulations to treat epilepsy, hysteria, convulsions, mental weakness, anxiety and insomnia. The study is conducted in Lanku valley, Darjeeing, West Bengal and it is located 60 kms. from the city of Siliguri. The main population of this area is tribal communities and they have their distinct knowledge of language, culture and food habits. In spite of availability of modern medicines, the tribes of Lanku valley region use plant therapy for treatment of various diseases. One of the main reasons of this is rich plant diversity of Lanku valley. Jatamansi is used for various medical purposes by tribes of Lanku valley. The phytochemicals obtained from the plant are widely applied in the traditional herbal medicines. This paper deals with the ethnomedicinal practices of Nardostychysjatamansiand its phytochemical analysis.

Key Word *Nardostychysjatamansi, Ethno Medicine, Traditional Knowledge, Tribal*

Introduction

Human civilisation have used plant for different purposes for centuries. They also found use of plants in treatment of health problems. Systematic study of ethnomedicinal plants are important to find new drugs from indigenous knowledge of medicinal plants. [1] This paper deals with the medicinal importance and preparation, extraction, and qualitative analysis of phytochemicals present in *Nardostachysjatamansi* DC belonging to the familyCaprifoliaceae. It is an endangered, therapeutic herbal plant mostly grows in moist, rocky and steep slopes of undisturbed grass in India, Nepal, Bhutan and China in Himalayan region from 2300 to 6000 m above sea level. The root of this perennial small rhizomatous herb has thick, short dark grey rhizomes which are crowned with fibrous remains of reddish brown petioles of the radical leaves. Different medicinal systems use these rhizomes in traditional medicines as tonic, laxative, antiepileptic, stimulant and antispasmodic. [2]In traditional herbal medicines It is used to treat neurological disorders like hysteria, epilepsy, convulsions and mental weakness. The decoction of its rhizomes also used in treating insomnia and cardiovascular system. [3]*Nardostachysjatamansi* is an endangered aromatic herbal plant is on the verge of extinction due to over-utilization. [4] The study was conducted in Lanku valley it is a village located in Kurseong block of Darjeeling district, West Bengal. The valley is covered with dense forest of both deciduous and evergreen trees, herbs, shrubs and thousands of varieties of flowerless plants like mosses lichens and ferns. [5] In spite of availability of modern medicines People prefer plant therapy for treatment of various diseases. This paper deals with the ethnomedicinal practices of Jatamansi used for the treatment of some selected health problems like insomnia, epilepsy, anxiety and depression. This paper also deals with the preparation, extraction and qualitative analysis of phytochemicals present in this plant.

Objective

To gather information about traditional knowledge aimed at redressing some medicinal value of Jatamansi used by local baidya of Lanku valley, Darjeeling, West Bengal.Authentic documentation of medicinal role of Jatamansi, reefing the existing knowledge and exploring future aspect of this medicinal plant.To provide a new interpretation of Jatamansi with respect to cultural, economic, ecological and conservational point of view.To motivate local people on conservation of JatamansiinLanku region. Phytochemical analysis ofJatamansi has also been performed.

Materials And Methods

For case study and collection of the data semi-structured interviews, questionnaire and direct observation were used. The information was gathered and confirmed by repeated queries raised time to time among the local herbal practitioners and the users as well.Healers have been registered for documentation.

The qualitative analysis has been done to identify the phytochemical constituents present in *Nardostachysjatamansi*DC . The preliminary phytochemical analysis for Proteins, Carbohydrates, Phenol & Tannins, Flavonoids, Saponins, Glycosides, Steroids, Phlobatannins, Alkaloids and Terpenoids has been done. [6]

Collection of plant material

The dried form of roots of Jatamansi is collected from local herbal practitioner of Lanku valley of Drajeeing District. The practitioner collects plant material from different parts of Sikkim that is Nathang, Tamsay and Kisheong.

Extraction of plant material

The extraction of plant material was done by hot water extraction method. The dried plant material was grinded and powder was kept in an appropriately labelled air tight bottle. To get aqueous extract 5gms of powdered material was weighed using an electronic weighing balance. Then it was taken in a beaker and 100 ml of distilled water was added. The mixture was heated on a hot plate with continuous stirring at 30°-40°C for 20 minutes. [7]Then water extract was filtered through filter paper and filtrate was used for the phytochemical analysis. Same process was repeated to get ethanolic and methanolic extract using ethanol and methanol in place of distilled water.

The Plant extract was tested for the presence of bioactive compounds by using standard methods of: *Sofawora,A.1993, *Trease,G.E, *W.C.1989, *Harborne,J.B.1973

Photochemical Analysis of: *Nardostachysjatamansi*
Family-Caprifoliaceae

Phytochemical analysis	**Plant Part used: Roots**
Proteins	**(a) Million's test: 2ml Ext.+2ml Million's reagent Δ→white/ red ppt**
	(b) Ninhydrin test: 2ml Ext.+2ml of 2% Ninhydrin sol. Δ→violet
Carbohydrates	**(a) Fehling's test: 2ml Ext.+(1ml Fehl.A+1ml Fehl.B) Δ→Brick red ppt**
	(b) Benedict's test: 2ml Ext.+2ml Benedict's reagent Δ→Reddish brown
	(c) Iodine test: 2ml Ext.+2ml Iodine solution →Dark blue/ purple
Phenol & Tannins	**2ml Ext.+2% $FeCl_3$ sol. →Blue/ Green or Black**
Flavonoids	**(a) Shinoda test: 2ml Ext.+few fragments magnesium ribbon + conc. HCl→Scarlet pink**
	(b) Alkaline reagent test: 2ml Ext.+2% NaOH Sol. →Intense yellow → few drops dil. H_2SO_4→Colourless
Saponins	**Foam test: 2ml Ext.+ 5 ml distilled water → Foam**
Glycosides	**(a) Liebermann's test: 2ml Ext.+ 2ml chloroform + 2ml acetic acid + conc. H_2SO_4→V/B/G**
	(b) Salkowski's test: 2ml Ext+2ml chloroform+2ml conc. H_2SO_4→Reddish brown
	(c) Keller-kilani test: 2ml Ext+2ml acetic acid+1-2 drops $FeCl_3$→2 ml conc. H_2SO_4→Brown ring
Steroids	**(a) 2ml Ext. + Acetic acid + conc. H_2SO_4→Blue green**
	(b) 2ml Ext. + Chloroform + conc. H_2SO_4→Red
	(c) 2ml Ext. + Chloroform ← Acetic acid + conc. H_2SO_4→Greenish
Phlobatannins	**2ml Ext.+1% HClΔ→Red ppt**
Alkaloids	**2ml Ext.+1% HClΔ + Mayer's reagent + Wagner's reagent →Red ppt**
Terpenoids	**Ext.+Chloroform+ conc. H_2SO_4Δ→Greyish**

(Δ)= Heat Ext=Extract

Case Study

For the case study the semi structured interviews and questionnaire are prepared and the questionnaire was designed to gather information regarding patient's description, case history, their believes and practices, treatment plan, expected outcome of the treatment and actual outcome. This case study was conducted between the month of October (14.10.2020) to April (15.04.2021) and the three patients were under observation.

s. no.	Name of the patient	Age	Disease/ Health problem	Doses	Duration	outcome
1.	Dil Kumar Biswakarma	44	Insomnia	½ tea spoon Jatamansi powder with honey twice a day	Three Months	No symptoms observed
2.	Salim Thapa	58	Epilepsy	1 tea spoon Jatamansi powder with honey or luke warm water twice a day	Four Months7 days	asymptomatic
3.	GhanshyamChhetri	24	Anxiety & Depression	½ tea spoon Jatamansi powder with honey twice a day	Two Months	No symptoms observed

Table.1: Phytochemical analysis of *Nardostachysjatamansi*. in aqueous, ethanolic and methanolic extract

Phytochemical Analysis of: *Nardostachysjatamansi* **Family-Caprifoliaceae**				
Phytochemical analysis	**Plant Part used: Roots**	**Aqueous extract**	**Ethanol extract**	**Methanol extract**
Proteins	**(a) Million's test**	++	++	_
	(b) Ninhydrin test	_	_	_
Carbohydrates	**(a) Fehling's test**	++	_	++
	(b) Benedict's test	_	++	_
	(c) Iodine test	_	_	_
Phenol & Tannins	**Ferric Chloride Test**	++	_	++
Flavonoids	**(a) Shinoda test**	_	++	_
	(b) Alkaline reagent test	++	++	_
Saponins	**Foam test**	++	_	++
Glycosides	**(a) Liebermann's test**	++	_	++
	(b) Salkowski's test	_	++	++
	(c) Keller-kilani test	_	_	++
Steroids	**(a) Liebermann's test**	_	++	++
	(b) Salkowski's test	++	_	++
	(c) Keller-kilani test	++	_	++
Phlobatannins	**1% HCL Test**	_	++	++
Alkaloids	**Mayer's & Wagner's reagents test**	_	_	++
Terpenoids	**Salkowski's test**	++	++	++

(+)= Trace (++)= Present (+++)= Strongly present (--)= Absent (Δ)= Heat Ext=Extract

Result And Discussion

The case study was conducted by selecting three patients randomly who were visiting to local Baidya of Lanku valley and being administered roots of Jatamansi in powdered form. These patients are of different age group who were suffering from different health problems. The method of administration and doses of the plant product was almost same. By certain courses and duration, it was found that the treatment was successful for all the cases.

The qualitative analysis has been done to identify the chemical constituents present in *Nardostachysjatamansi*. Here the + symbol indicates the presence of phytochemical in trace amount, ++

indicates in adequate amount, +++ indicates strong presence of phytochemicals, and -- indicates absence of phytochemicals.

Fig.1: Phytochemical analysis of *Nardostachysjatamansi*, Aqueous Extract

Fig.2: Phytochemical analysis of *Nardostachysjatamansi,* Ethanolic test

Fig.3: Phytochemical analysis of *Nardostachysjatamansi*, Methanolic test

Conclusion

The information gathered from local Baidya and three patients who were suffering from different health problems were consulted and it was found that treatment was successful for all the patients.Despite having modern medical facilities people of Lanku valley used plant therapy to a considerable extent. The phytochemical analysis of *Nardostachysjatamansi*suggested the plantcontains all the primary metabolites and one or other active secondary metabolites like phenol, tannins, Flavonoids, saponin, steroids, phlobatannins, alkaloids and terpenoids. The presence of such secondary metabolites in *Nardostachysjatamansi* shows it has very significant role in the treatment of various diseases in human being.

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Dioscorea bulbifera : A Review of its Phytochemical analysis of some Phenolics & Pigments by spectrophotometric method

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Abstract:

The present study was undertaken to find out phenolic compound content and pigments of leaves of Dioscorea bulbifera L. Collection of plant material were done from Melghat forest region, Dist.- Amravati, Maharashtra. Dioscorea bulbifera L. is tuberous climbing herb,it is commonly known as air potato. its leaves and bulb used in traditional medicine . Dioscorea bulbifera is effective against several therapeutic diseases such as cancer, skin infection,goiter and orchitis.Plants were identified with the help of the standard floras.1gm of were leaves used for determination of Phenolic compounds & some pigments. Phenolic compound act as antioxidant. Antioxidants have been reported to prevent oxidative damage caused by free radical. Estimation of total phenol, quinones, flavonols and tannins were done and estimation of some pigments Anthocyanin, Leuco-anthocyanins and Total carotenoids were done.

Keywords: *Dioscorea bulbifera L, Phenolic compounds, pigments, Spectrophotometer.*

Introduction

Ayurveda, the Indian system of medicine mainly uses plant based drugs or formulations to treat various human ailments because they contain the components of therapeutic value. In addition, plant based drugs remain an important source of therapeutic agents because of the availability, relatively cheaper cost and non-toxic nature when compared to modern medicine.Plant produces these chemicals to protect itself but recent research demonstrates that many phytochemicals can protect humans against diseases.

An ever increasing demand for herbal medicines due to its safety and less side effective has led to usage of medicinal plants worldwide(Kumar et al.,2016). D*ioscorea bulbifera* L. (family: Dioscoreaceae) commonly known as "air potato "is an important edible medicinal plant. Tuber, Bulbils, Leaves, Inflorescence and Flowers are edible, Cooked asVegetable. It is Considered as a very delicious dish by local as well as Trible People.

A variety of plant secondary metabolites have been reported to act as antioxidants and amongst them phenolic compounds from a major group. There are several reports on the contribution of phenolic compounds to the antioxidant potential of different plant species (Cai *et al.*, 2004). flavonoids are naturally occurring phenolic compound which largely include anthoxanthins (flavones, flavonols, flavanones, flavanols, chalcones and isoflavones), anthocyanins, leucoxanthins and flavonoidal alkaloid (Houghton, 2002).

Yam leaves and tubers used are to treat a variety ofaliments. the leaf of aerial yam is used as a poultice for pimples and tumors and inbath water to soothe skin irritations and stings.(Gao *et al*., 2002).D*ioscorea bulbifera* tubers contain furanoid, norditerpenes, norditerpene, norditerpene glucosides,diosbulbinoside D and F and diosbulbin B and D (Su *et al*., 2003).

Dioscorea bulbifera has gained less attention and an organized synthesis of literature is still missing. therefore ,this study helps to other researchers. According to traditional medicine *D. bulbifera* has used to treat several diseases and detoxify poison and clot blood to stop bleeding.(vasanthi et al.,2010).

Materials and Methods:

Plant material

***Dioscorea bulbifera* L.**

A genus belonging to Discoreaceae family, Large unarmed, tuberous climbing herb, tubershairy stem terete with bulbils in the leaf axils, leaves alternate, broadly ovate to orbicular reniform.flowers small, green, turning purplish with maturity male flowers in short slender, axillary, solitary or fascilated pendulousspikes. perianth

white, stamens 2-2.5 mm long,acute,staminodes 6;styles short;stigmas 3.capsule ablong 1.5-2 0.5-1.2 cm,reflexed 3-winged.seeds winged at one end only.

Flowers and Fruits- August to October

Flowers and fruits : October to January

Uses

Tuber, Bulbils, Leaves, Inflorescence and Flowers are edible, Cooked as Vegetable. It is Considered as a very delicious dish by local as well as Trible People.

Tubers use as Medicinal Properties like dispersing Tonic Intiflamatory, Cough, Bile, Bronchial, Asthma, Rheumatism, Swelling and bone Fracture. (Shkirsagar, 2010).

Preparation of plant material

Fresh leaves were collected and the dried in sunlight. After them powdered with mechanical grinder and stored in airtight container. samples were powdered separately. 1gm each of samples were taken for estimation of Phenolic compounds and pigments grm/ µgm.

Methods:

Estimation of Phenolics such as total phenol, Quinones, Flavonols and Tannins were done according to the methods prescribed by Thimmaiah (1999), which are given below.

Estimation of Total Phenols

1gm of sample was grind with the help of mortar Pestle with 10 ml of 80% ethanol. The homogenate was centrifuged for 20 mininutes at 10,ooo rpm. Supernatant was collected. Supernatant was Evaporate to dryness.

Then after dryness residue was taken and make up the volume with 5ml distilled water. 1 ml aliquate was Pippette out in test tube , and volume make up 3 ml with distilled water . To it 0.5 ml of Folin-Ciocalteu reagent was added. After 3 minutes, 2 ml of 20% Na_2CO_3 solution was added into each tube.

Mixed thoroughly and tubes was kept in boiling water for 1 minute, then allowed to Cool and absorbance at 650 nm was measured against reagent blank.

Standard curve was prepared using different concentrations (0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, and 1 ml) of catechol. (Thimmaiah S. R. 1999)

Estimation of Quinones

1gm sample was grind with the help of mortar and pestle with using chilled phosphate buffer (5ml for each gm of tissue). The supernatant was collected by

Centrifugation for 30 minutes this was used as enzyme extract. 3ml of buffer, 3ml of standard catechol and 1.5 ml of enzyme extract was pipette in a test tube. It was shaken gently and incubated in water bath. 4ml of TCA (Trichloro acetic acid) reagent (without ascorbic acid) to one and 4ml of TCA reagent (with ascorbic acid) was added. Precipitate was filtered. Absorbance was measured at 400 nm against a reagent bank lacking only extract.

Standard curve was prepared using different concentrations (0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, and 1 ml) of working standard catechol. (Thimmaiah S. R. 1999)

Estimation of Flavonols :-

1gm sample was grind with the help of mortar and pestle with 10ml of ethanol and the supernatant was collected by centrifugation for 20 minutes.The supernatant was evaporated to dryness; then the residue was dissolved in 5 ml distilled water. 1ml of extract was pipette out into 25ml conical flask and 1 ml of distilled water was added.

Then 4ml of vanillin reagent was added from a burette rapidly within 10-15 sec to flask A and 4ml of 70% H_2SO_4 to flask B.

A blank was prepared in flask C containing 4 ml of vanillin reagent and 2ml of distill water. Shaken the both flasks A and B in a water bath at the temperature below 35^0C. Keeping the flasks at room temperature for exactly 15min. Absorbance was measured flask A, B and C at 500 nm against 47%. H_2SO_4 (flask D).

The absorbance of the flasks B and C from that of A.The flavonol content was calculated using a standard curve prepared from phlorogucinol or kaempferol (100 µg/ml). (Thimmaiah S. R. 1999)

Estimation of Tannins :-

Vanillin hydrochloride method was used. 1 gm of sample was mixed in 10ml methanol after 20-28 hrs. centrifuged and supernatant was collected .pipette out 1ml supernatant into test tube and quickly 5ml of vanillin hydrochloride reagent was added and mixed. After 20 min absorbance was read at 500nm. A reagent blank was prepared with vanillin hydrochloride reagent alone. A catechin standard graph was prepared from working standard (100µg/ml) of catechin and amount of tannins was calculated. (Thimmaiah S. R. 1999)

Estimation of Anthocyanins

1 gm of sample was grind with the help of mortar and pestle by using absolute alcohol. Centrifuge and the extract was collected. 1ml of alcohol extract was pipette in test tube and 3ml of HCL in aqueous methanol was added. 1ml of anthocyanin reagent was add in the samples. The Blank was prepared in the same manner by adding 1 ml of methanol - HCL instead of anthocyanin reagent.

After 15min of incubation in dark, Absorbance was measured at 525 nm After 15min of incubation in dark, Absorbance was measured at 525 nm against the bank laking only extract. (Thimmaiah,S. R. 1999)

Estimation of Leuco-Anthocyanins

1gm of sample was grinded with the help of mortar and pestle by using 10 ml methanol. Centrifuge and supernatant was collected. Pipette out 1ml of extract in test tube and volume was reduce to 0.5 ml on a hot water bath.0.5 ml of distill water and 10ml of anthocyanin reagent was mix thoroughly in reduced extract.

The tubes was heated in water bath for 3 min without covering and with covering total for 40 minute. After heating cool under a running tap. Absorbance was measured at 550 nm against a reagent blank laking only extract. (Thimmaiah, S. R.1999).

Estimation of Total Carotenoids

1 gm of sample was grinded with the help of mortar and pestle by using 10ml of acetone. Extract was filter on Buchner Funnel through whatman no. 42 filter paper. The extraction was repeated until the tissue was free from pigments. Pool the filtrates and partition thrice equal volume of peroxide free ether was using seperatory funnel. For producing two layers during initial ether extraction distilled water was added. Hot water bath was used for evaporation of the combined ether layer which contains carotenoid. The residue was dissolve in 5ml of ethanol. 0.5 ml of 60% aqueous KOH was used for 10 ml of the ethanol extract to saponify.,The mixture was kept in the dark forovernight at room temperature. After overnight equal volume of water and equal volume of diethyl ether was used for partition. Evaporate the combined ether layer as before and the residue was added in minimum volume of ethanol. Absorbance was measured at 450 nm against a reagent blank lacking only extract. Standard curve was prepared using different concentrations (0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, and 1ml) of β-carotene. (Thimmaiah,S. R. 1999) After 15min of incubation in dark, Absorbance was measured at 525 nm against the bank laking only extract. (Thimmaiah,S. R. 1999)

A standard curve is the plot obtained by plotting concentration of a given standard along X- axis and the corresponding absorbance values along Y- axis on a graph sheet resulting a straight line which passes through the origin. It is used to quantify the amount of a given compound present in an unknown sample whose absorbance value is matched against that of standard along Y-axis and a corresponding concentration could be read off along X-axis. . (Thimmaiah S. R. 1999)

Result And Discussion

Table 1: Estimation of Phenolics

Sr. No	Name of plant and part used for estimation	Total Phenol		Flavonol		Quinone		Tannin	
1	*Dioscorea bulbifera* (leaves)	Absorbance (650nm)	1900µgm /gm	Absorbance (500nm)	0.65µgm /gm	Absorbance (400nm)	520µgm /gm	Absorbance (500nm)	720µgm /gm

Table 2 : Estimation of Pigments

Sr.No.	Name of plant and part used for estimation	Total Carotenoids Absorbance at (450nm)	Anthocyanins Absorbance at (525nm)	Leuco-Anthocyanins Absorbance at (550nm)
1	*Dioscorea bulbifera* (leaves)	112µgm/gm	33µgm/gm	3.375µgm/gm

Highest amount of total phenol in leaves (1,900µgm/gm) and tanin was observed in leaves of *Dioscorea bulbifera* (720 µgm/gm) and while lowest content of flavonol in leaves (0.65µgm/gm). However there is significant amount of quinone was found (520µgm/gm). In *Dioscorea bulbifera* leaves the rich amount of (112 µgm/gm) total carotenoids was found.

Phenolic compounds and flavonoids have been reported to be associated with antioxidative action in biological systems, acting as scavengers of singlet Oxygen and free radicals. (Rice-Evans *et al.*,1997). The nitric oxide scavenging activity of flavonoids and phenolic compounds are known (Kim H. *et al.*, 2002) . *Dioscorea bulbifera* posses antitumor, anti bacteria, anti-feedant, anti-fungaland hallucinogenic activities.(Urones *et al*., 1995; Biswanath *et al*., 2005).

The significant lowering of blood glucose level shown in the alloxane–induced diabetic rats in good manifestation to show that *D*ioscorea *bulbifera* is an effective antidiabetic regimen. (Okonand Ofeni,2013).
Phenols are present in food, they may have an impact on health and most are known to have an antioxidant activity. (Demitrios 2006) .

Phenols and polyphenolic compounds such as flavonoids are widely found in plant sources and they have been shown to posse's significant antioxidant activities (Van Acker S. *et al.*, 1996). *Dioscorea bulbifera* is widely recongnized for treatment of cancer.(Li et al., 1999).

Carotenoids may also have important anti-ageing and anticancer properties such lutein, which protects the tissues of retina, while canthaxanthin has been demonstrated to inhibit cancer cell proliferation (Palozza *et al*., 1998). Anthocyanins possess a high the rmost ability and contribute towards antioxidative, antiflammatory, cardioprotective and hepatoprotective activities. The mechanisms behind the reduction of blood pressure by anthocyanins were reported due to their antioxidantactivity (Shindo *et al.*, 2007). Extracts of *D. bulbifera* has a strong antibacterial activity(Hu et al.,2005). Pharmacologist studies and ethanobotanical studies and conservation reviews of *Dioscorea bulbifera* given by(Bishwa Bhushan kundu et al.,2020). According to

Conclusion

This study revels that the leaves of *Dioscorea bulbifera* L**.** contain rich total phenol, quinone and tannin, flavonoids and pigments which are known to posses good source of antioxidant ,anticancer activity and anti-inflammatory, antibacterial, anti obesity, antiviral activity. The reported phytochemical studies support its traditional uses and may prove to be useful for clinical evaluation. The use of natural antioxidants has been promoted because of the concerns on the safety against synthetic drugs.

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Behavioral Study of Parrots Around Gram Takarkheda Dharni Region of Western Melghat

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Abstract:

This study make known that the every day flight activity rose ringed parrots at early morning with massive flocking of parrots, and they find the foodstuff around farms located at Dharni region nearer to the small village Takarkheda. Similarly the flight activities at evening time the pattern of flight were in a different way acted, when they back towards the nesting. The intension following the significant learning of flight activity of Adults and younger parrots showed special difference in their behavioral patterns of early morning and evening instance.

This study recommended that the daily observation of flight activity of rose ring neck parrots move early in the morning form their nesting towards the food searches in the forest, farm etc. and vice versa again towards the nesting areas when they get back flight activity of flocking at evening time.

Key words: *Behavior, Flocking, Rose ring Neck Parrots, Nesting, Food, Flight Patterns.*

Introduction:

Behaviour patterns illustrate Most of the time parrots are not easy to catch. Even after being pets, they have a bad mannerism if not maintained properly. Some researchers state that most wild birds can be controlled by banding or wing tagging, but parrots are not birds to be easily trifled with; they chew off such affections. The behaviour of parrots differs from type to type. Some of them are strong and have direct flight whereas most of the species spend their time perching or climbing.

The habitat of African grey parrots is usually moist lowland forests, although they are found up to 2,200 m altitude in the eastern parts of the range. They are commonly observed at forest edges, clearings, gallery forests, mangroves, wooded savannahs, cultivated areas, and gardens Athan and Deter, (2000). African grey parrots often visit open land adjacent to woodlands, they roost in trees over water and may prefer roosting on islands in rivers. These parrots make their nests in tree holes, sometimes choosing locations abandoned by birds like woodpeckers. In West Africa, the species makes seasonal movements out of the driest parts of the range in the dry season **Melo and O'Ryan (2007).**

They are highly social and nest in large groups, although family groups occupy their own nesting tree. They are often observed roosting in large, noisy flocks calling loudly during mornings and evenings and in flight. These flocks are composed parrots, unlike other parrots that are often found in mixed flocks. During the day, they break into smaller flocks and fly long distances to forage**.** They often roost in trees over water and are said to prefer roosting on islands in rivers. Young birds stay with their family groups for a long period of time, up to several years. They socialize with others of their age in nursery trees, but remain in their family group within the larger flock. Young parrots are cared for by older birds until they are educated enough and old enough to become independent flock members. Young exhibit appeasement behaviors towards older members. As they mature, birds become more aggressive with nonspecific, **Athan, (1999)**. Parrots in the wild must learn a complex set of skills. They need to learn how to separate desirable food plants from toxic plants, how to defend territory, how to recognize and avoid predators, how to find safe water, and how to rejoin their families when separated. Also, they must learn how to develop role-appropriate behaviors such as competing and defending nest sites and raising offspring **Galef, (2004)**. Competition for nest holes during mating season makes the species extremely aggressive. Because parrots are partial ground feeders, there is a series of behavioral events that occur before landing and safe consumption takes place **Luescher, (2006)**. Groups of parrots gather at a barren tree until it is completely filled with hundreds of birds that partake in preening, climbing, vocalizing, and socializing. Eventually the birds make their way down to the ground in waves with the entire group never being on the ground at the same time. Once on the ground, they are extremely vigilant, reacting to any movement or sound **Wright, (2002).**

Materials and Methods:

Flocking behavioral and flocking routine of rose- ringed parakeet were studied for a period of 12 weeks (November 2021 to January 2022) in irrigated farm fields of Tehsil Dharni located Village Takarkheda, where adequately bulky crops be present. Incidence of such crops largely remains experimental throughout the year, and therefore, no possibility occurs here for the limitation of food to variety of birds. Various crops *viz.* wheat, maize, rice, fodders besides fruit orchards like citrus, mango, guava, occurs in good proportions. Different trees of variable heights also perform not only as shelter for birds', but also offer appropriate a place where birds regularly settle or congregate to rest at night, and nests (hollows), maintained by them for long durations. For

the present study, surveys were conducted to flight behavioral activity of flocks of the rose-ringed parakeet within the large agricultural area of Dharni region of Melghat. The parakeet settle was quite huge and was located less than distance away from the well grown croplands. Observations were made consecutively in the present studies and were observation on the basis of bulk flocking, forward journey at early morning for the searching of food and return journey towards the nesting at evening.

Results and Discussion:

In this observational study reveal that the flocking behavioral pattern shows modest difference pertaining to the flight towards food availability at early morning at 6 to 7 am for the searching of food and *vice versa* returning journey towards nesting at evening 5 to 6 pm daily observational study through the photographic analysis or flocking size and height of the flight of rose ringed parakeets. It seems to be observed that the early morning flight showed more height approximately 90-100 feet. of flock size containing 400-500 parrots group from the land surface area with creating sound as for call and communicate to each other. But in the return journey of flocking flight behavior seems to different, flocking flight at evening time showed very less distance approximately 10-15 feet contains 200-300 parrots group. Distance from land surface to the flight area, without noising any sound as communication in between the flocks size of parakeets.

Fig. 1. Map view of Dharni region of Amravati District

Fig. 2- Map view where the Observational study were performed

(Note: study area were noted with red colour arrow mark)

Fig. 3. Monthly parrots flights of flocking behavior and size
(November & December-2021 at Morning & Evening flight)

Fig. 4. Monthly parrots flights of flocking behavior and size
(December and January-2022 at Morning & Evening flight)

Table-1 Monthly noted flocking behavior and size of parrots (2021):

Months	Morning Time (Forward Journey from the Nesting) 6:00 to 7:00 am	Evening Time (Back Journey towards Nesting) 5:00 to 6:00 pm
November	400-500*	200-300*
December	400-500*	200-300*
January	400-500*	200-300*

**Note: approximate number of parrots in flight as per photographic collection may vary.*

Present reading circumstances showed that observation on the basis of the flock size of parrots in their natural habitats and behavioral patterns characteristically appears as in morning flight had a dispersed patterns in flight as shown in photo plates which indicates that random flight in parrots, more height than that of evening flight in four month observation. And in the return flight of parrots towards nesting they showed very less distance flight, and made pattern of flight were 'V' shaped noted in photograph captured.

Conclusion:

In this observational study showed that flocking size and their behavioral patterns vary. Parrots are locally common in the area of Dharni Melghat region; it appears seasonally available with the great quantity of nourish in surrounded areas such as, maiz, rice, cajanus, chickpea, and wheat as well as fruits such as guava, berry etc. conventionally yield taken by the Melghat peoples. This observation may show in the futuristic development and identified the issue act as pest for cropping because they feed voraciously on available food in their farm field. This available basic information of theirs seasonal flight and behavioral patterns seems to be identified as their habits and habitat learning in the additional improvements.

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Alteration In Enzyme Of Freshwater Fish,*Channa Orientalis*(Sch.), Exposed To Cyppermethrin And Fenvalerate

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Abstract:
Toxicity study was conducted on Freshwater Fish Channaorientalis to evaluate the enzyme activity of two Pesticides, Cypermethrin and Fenvalerateupto 96 hrs at a duration of 24, 48, 76, and 96 hrs, which shown toxic effect of Cypermethrin and Fenvalerate on Glutamate Oxaloacetate Transaminase. In present study Cypermethrin was found to be more toxic than Fenvalerate to the experimental fish, Channaorientalis.
***KeyWords** : Alterations in Glutamate Oxaloacetate Transaminase, Channaorientalis .*

Introduction:

In Vertebrates and Invertebrates, Cypermethrin acts mainly on nervous systym. Cypermethrin is both stomach and Contact poison(Jin and Webster, 1998).It has been shownto inhibit ATPase enzyme involved in movement of ions against a concentration gradient which are regulated by active transport, this action is especially critical to fish and aquatic insect, where ATPase enzyme provide the energy to active transport, are very important at the sites of oxygen exchange. ATPase inhibition and disruption of active transport, possibly affect ion movement and ability to maintain ion balance and disrupt respiratory surfaces, indicating that Cypermethrn is inherently more toxic to aquatic organism (Siegfried,1993). In pond water that contained apparantly lethal concentration of Cypermehrin(5ppb) because the chemical was absorbed on to suspended solids(Crossland,1982).

The use of synthetic pyrethroids for control various pests is regularly increasing. They are drained into rivers, tanks and pools resulting to pollute aquatic environment. Such chemicals are toxic to non target species and hamper human health too via ecological cycling and biological magnification. Aquatic pollution is greatly affecting the metabolism of fishes and some time heavy mortality has been experienced. A major part of worlds food is being supplied fish source, so it is essential to secure the health of fishes. Among the pyrethroids, Fenvalerate is widely used as synthetic toxicant that causes severe metabolic disorders in fishes(Coats et.al., 1979, Reddy et.al.,1989, Reddy and Philip, 1994,Thakur and Bais 2000).It has been extensively popularised because because of high insecticidal potency, low mammalian toxicity and very short persistance. However, Fenvalerate is extremely toxic to fish. The extreme toxicity of Fenvalerate to fish may be due to efficient gill uptake in efficient detoxification, elimination and sensitivity at the site of action(Bradbury et.al., 1997, Coats et.al.,1989,Tripathi et.al.,2001). Thus low rate of Fenvalerate elimination and metabolism appears to play an important role on the piscidal activity of this insecticide(Bradbury et.al.,1986).So for there are much limited response dealing with the effects Cypermethrin&Fenvalerate on enzyme activity of freshwater fish. Therefore, it is considered of an interest to analyse the effect of CypermethrinandFenvalerate on fish enzyme, Glutamate Oxaloacetate Transaminase.

Materials and Methods:

The freshwater fish, *Channaorientalis* were collected from Amravati local market and Rushi lake of Karanja (lad),(M.S.), and maintained in the laboratory conditions in large aquarium to the maximum number 2 lit/g of fish weight for a period of one month for acclimatization in aerated well water. Fishes were fed daily with ad-libitum and boiled eggs. Fishes weighing about 15 g and 10 cm in length were selected for evaluation or actual toxicity study. Fishes were starved for 48 hrs. Before the start of experiments and kept separately in a group of 10 fishes in each aquarium(test container about 20 lit. capacity). They were kept clean and away from visual and mechanical disturbances. The various physicochemical parameter of test water such as temperature, pH(by pH meter\) Conductivity (byConductometer), Acidity, Alkalinity, Hardness ,dissolved Oxygen and salinity were calculated daily during the toxicity test(following the method described in APHA). The test water was changed every day.Average value of all those environmental parameters were recorded. The pesticides Cypermethrin and Fenvalerate were added to the test water to obtain the described concentration. Then healthy fishes were exposed to various concentration of pesticides for 24, 48, 64, 72, 96 hrs. period respectively. Simultaneously the control aquarium was also maintained without pesticide concentrations. The fishes that survived for the test were sacrificed, by pitching, their different tissues like Liver, Kidney, Brain, Muscle and Gill were taken out for enzyme study. The required tissues from fish were immediately removed and weighed. The extracts were prepared in Mortar&Pestle using ice cold 0.25 m sucrose solution. All extracts were used as

early as possible and stored in the deepfreeze when required too. Substrate buffer (pH 9.0) was prepared by mixing 3ml.of petroleum ether,80 ml. of distilled water, 0.5 g of Sodium glycerophosphate and 0.0424 g. of sodium barbiturate.

The effect of Cypermethrin Glutamate Oxaloacetate Transaminase enzyme in different experimental fish groups (values are significant between p<0.01 to p<0.001).

Sr. No.	Group	Liver		Kidney		Muscle	
		Control	Expt.	Control	Expt.	Control	Expt.
1	Normal Pesticide	56.16± 3.32	53.53± 3.40	40.58± 2.86	38.32± 2.56	40.22± 3.78	39.92± 3.10
2	Low pH Alk. 8.5pH	58.28± 2.125	55.38± 2.39	42.21± 1.38	40.32± 1.37	41.35± 1.35	38.72± 2.82
3	Acidic pH 6.5	52.39± 2.38	51.29± 1.28	37.52± 2.35	35.25± 1.29	38.23± 1.72	36.85± 1.25
4	Hardness (100-200ppm)	48.35± 1.35	46.21± 2.73	33.72± 1.42	32.38± 1.25	35.29± 1.38	33.27± 2.38
5	Salinity (1.2%)	45.27± 2.35	42.6± 2.12	30.92± 1.82	28.28± 2.38	31.32± 01.25	28.65± 2.65

The effect of Fenvalerate on Glutamate Oxaloacetate Transaminase enzyme in differentexperimentalgroup (values are significant between p<0.01 to p<0.001).

Sr. No.	Group	Liver		Kidney		Muscle		
		Control	Expt.	Control	Expt.	Control	Expt.	
1	Normal Pesticide	57.28± 40.10	55.38± 9.88	40.66± 2.442.00	40.26±	40.88± 2.36	36.210± 3.32	
2	Low pH Alk. 8.5pH	58.28± 21.251.28	56.37±	42.21± 1.38	41.05± 1.28	41.35± 1.35	39.76± 2.21	
3	Acidic pH 6.5	52.39± 2.381.35	50.28±	37.9± 2.35	35.23± 2.25	38.73± 1.38	36.72±	1.72±
4	Hardness (100-200ppm)	48.35± 1.95 1.72	45.39±	33.72± 1.41	32.28± 1.27	28.29± 1.38	32.65± 1.25	
5	Salinity (1.2%)	45.27± 2.351.32	43.72±	30.92± 1.821.36	29.35±	31.32± 1.25	30.25± 1.72	

Result andDiscussion:

The Glutamate Oxaloacetate Transaminase activity was decreased in the tissues of *Channa oriental*streated with Cypermethrin and Fenvalerate. In control fishes the Glutamate Oxaloacetate Transaminase activity was maximum at 24 hrs. thengradually reduced upto 96 hrs. Maximum activity was recorded in liver,then followed by Kidney and Muscle. In experimental group of fishes the Glutamate Oxaloacetate Transaminase activity was significantly reduced in liver, kidney and muscle.

Conclusion:

Over all view concluded that very low quantity of pesticides affects aquatic organism and their metabolic activity.

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Histological changes in the ovary of *Catlacatla*exposed to lethal concentration of *B. aegyptiaca* root.

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Abstract:
20 fresh water fish Catlacatla of both sexes were purchased from local fisherman. They were kept in aquaria and well aerated. The differential acute toxicity of water extracts of B. aegyptiaca root on fish C. catla were carried out under laboratory conditions. The LC_{50} after 96 h of exposure for water extracts of Balanites aegyptiaca root were9.00, 11.00 and 13.00 mg/L, respectively. These values showed that water extracts of Balanites aegyptiaca root was more toxic.Histological alteration in the ovary tissues showed lesion, necrosis, malignancy, cellular degeneration and inflammation, when the fish were exposed to various concentrations (9.00 mg/L, 11.00 mg/L and 13.00 mg/L) of water extracts of B. aegyptiaca root for a period of 96 h revealed that root of B. aegyptiacamay be toxic to fish C. catlaas characterized by severe degeneration ofovary cells.The study concluded that caution must be taken in the disposal of this plant in water bodies as extended exposure time and at higher concentrations could pose adverse effect on the fish Catlacatla.
Key words: Histology, Balanites aegyptiaca, Catlacatla.

Introduction:

Water pollution, has been increasing at an alarming rate due to rapid industrialization, civilization and green revolution. Urban, agricultural and industrial activities release xenobiotic compounds that may pollute the aquatic habitat. Industrialization and growth of human population have led to a progressive deterioration in the quality of the earth's environment. **(Schwarzenbach*et al.*, 2006)** reported that about 300 million tons of synthetic compounds seep annually into water systems (rivers, lakes and sea) leading to water pollution. Pollution of water sources due to chemicals plays a primary role in the destruction of ecosystems. To improve the quality of aquatic ecosystems, it is necessary to know how the rivers and lakes are impaired and what factors caused the environmental deterioration.

Acute toxicities have been measured for many species in variety of ecological systems and most of the commonly used pesticides against Rainbow trout, Blue gills, Sun fish and the gaps are being filled for other species, such as channel fish, some cyprinids and salmons was reported by some authers**(Koprucu*et al.*, 2006)**. Test organisms to be used for acute toxicity test must be ecologically important, occupy trophic position leading to humans or other important species, and have adequate background biology, be widely distributed, be genetically stable, have its early stages (larvae, fry, and juveniles) available throughout the year and be sensitive **(Ernest Hodgson, 2004)**.*Catlacatla*(Hamilton) is one of the major fresh water carps native to India, Bangladesh, Myanmar, Nepal, and Pakistan and introduced in many other countries as exotic species. *C. catla*is a very rich source of proteins and is reported to attain a maximum size of 182 cm and weight of about 50 Kilograms. It is a surface and mid-water feeder, mainly omnivorous with juveniles feeding on aquatic and terrestrial insects, detritus and phytoplankton. It has a characteristically large, upturned mouth with a prominent protruding jaw. Because of its high nutritive value, it is a highly priced food fish and of great demand in the market. The physical and chemical changes in aquatic environment often cause some physiological changes in fish, thus, the water quality of an aquatic body is very crucial because it determines the productivity and other parameters necessary for the fish survival **(Fafioye, 2001)**.

Since prehistoric times, various cultures throughout the world have used piscicidal plants for fishing. Plants are regarded as inexhaustible sources of structurally diverse and biologically active substances **(APHA, 1976)**. Fossil record dates back the use of plants by man for various purposes including medicinal use **(Bhatt, J.P. 1991)**. There are various methods to capture fish from water. These include the use of hooks, net, setting of traps with baits, use of chemical substances and the use of plants and plant products **(Fafioye*et al.*, 2004)**. These methods seem cheap and affordable hence commonly practiced by fisher's folk all over the world. Histology can be used as biomonitoring tools for health in toxicity studies. Histological alterations are biomarkers of effect exposure to environmental stressors, revealing alterations in physiological and biochemical function. Histopathology, the study of lesions or abnormalities on cellular and tissue levels is useful tool for assessing the degree of pollution, particularly for sub lethal and chronic effects. Due to residual effects of pesticides, important organs like the kidney, liver, gill are the first organs to be damaged **(Rahman *et al.*, 2002)**.

In the present study, an attempt has been made to observe possible toxicity and histological changes in vital organ such as overy of the fish *Catlacatla*(Hamilton) exposed to lethal concentrations of plant *Balanites aegyptiaca*root extract for 96h.

Material and Methods:

Roots of *B. aegyptiaca* are collected from local area near to the Daryapur. After shade drying the plant material was grounded into powder using pestle and mortar. One liter of distilled water was mixed with 200 g of powdered plant material. The mixtures were kept for 2 days in tightly sealed vessels at room temperature and stirred several times daily with a sterile glass rod. This mixture was filtered through muslin cloth. Further extraction of the residue was repeated 3-5 times until a clear colorless supernatant extraction liquid was obtained indicating that no more extraction from the plant material was possible. The extracted liquid was subjected to water bath evaporation to remove the solvent. The water bath temperature was adjusted to 400^0 C. The semi-solid extract produced was kept under a ceiling fan to dry. The extract was weighed and portion of it used for phytochemical screening while the rest was use for the susceptibility test.

The adult specimens of *Catlacatla*were collected from the local market and brought to the laboratory. So for this experiment, fish are acclimatized in glass aquarium for 10 days.The survived fish are maintained in aerated condition and are fed regularly with fish food. The water is replaced every week and replaced with declorinated water. Faecal material and debris, if any, is also removed as and when necessary.

Lethal concentration of 09.00 mg/l, 11.00 mg/l and 13.00 mg/l was selected for this experiment. Ten fishes were exposed to each concentration. Along with this, appropriate control was maintained for each test. The mortality did not exceed 5% during the test period in control. Survival and mortality percentage were tabulated after 24, 48, 72 and 96 hrs.

For the lethal toxicity test, the fresh water fishes were divided in two groups as follows.

Group I: - Control group of *Catlacatla*

Group II: - Fishes *Catlacatla*were exposed to lethal concentration of root water extract.

To determine structural changes in internal tissues such as ovaryof both control and exposed fishes of lethal concentration were examined histologically.

Result and Discussion:

For lethal concentration at control there are no lesion, no necrosis, no pigments, no malignancy, no inflammation and cellular degeneration seen for the 24hrs, 48hrs, 72hrs, and 96hrs(Fig-1.1).While at 9.00mg/l inflammation of epithelial layer for 96hrs while no lesion, no inflammation, no necrosis, no pigments, no malignancy, and cellular degradation seen for the 24hrs, 48hrs and 72hrs(Fig-1.2).At 11.00mg/l inflammation on epithelial layer for 48hrs, for 72hrs lesion occurs on epithelial layer, while for 96hrs lesion occurs in epithelial layer and follicle cells and for 24hrs no lesion, no inflammation, no necrosis, no pigments, no malignancy and cellular degradation seen(Fig-1.3).At 13.00mg/l inflammation occurs on epithelial layer for 24hrs, for 48hrs lesion occurs in epithelial layer and follicle cells while, for 72hrs necrosis occurs in epithelial layer and lesion on follicle cells and oocytes and for 96hrs cellular degradation of epithelial layer and necrosis occurs on follicle cells and oocytes(Fig-1.4).

fig-1.1: Ovary (Section) of *Catlacatla* exposed to lethal concentration (control) of root water extract of *B.aegyptiaca*.

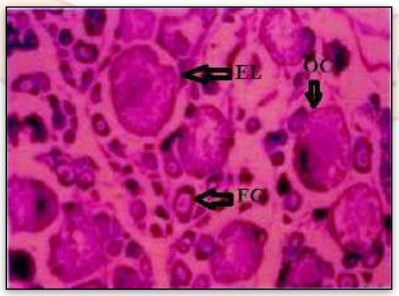


Fig.-Ovary of *Catlacatla* **(Control).**

EL: epithelial layer, **FC**: follicle cellsand**OC**: oocytes. No lesion (L), inflammation (I), pigment (P), necrosis (N), malignancy (M) and cellular degeneration(C).

Fig-1.2: Ovary (Section) of *Catlacatla* exposed to lethal concentration (9.00 mg/l) of root water extract of *B.aegyptiaca*showing lesion (L).

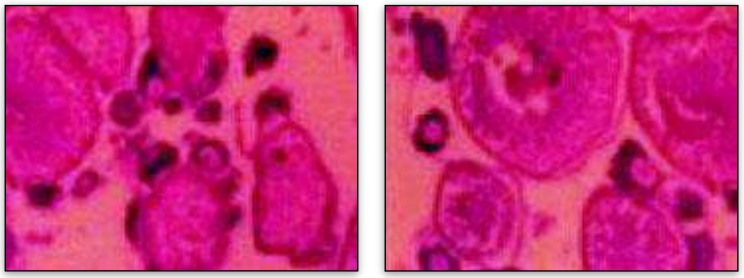


Fig.- 24hrs. **Fig.- 48hrs.**

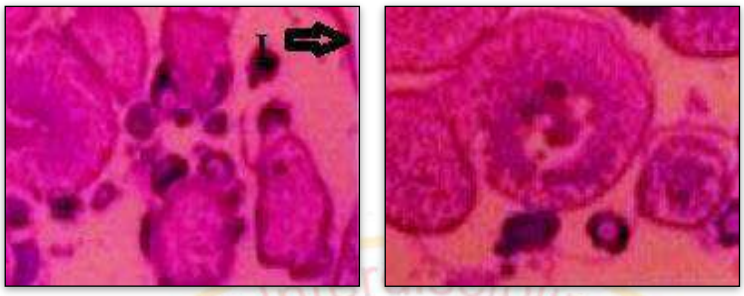


Fig.- 72hrs. **Fig.- 96hrs.**

Fig-1.3: Ovary (Section) of *Catlacatla* exposed to lethal concentration (11.00 mg/l) of root water extract of *B.aegyptiaca*showinglesion (L) andinflammation (I).

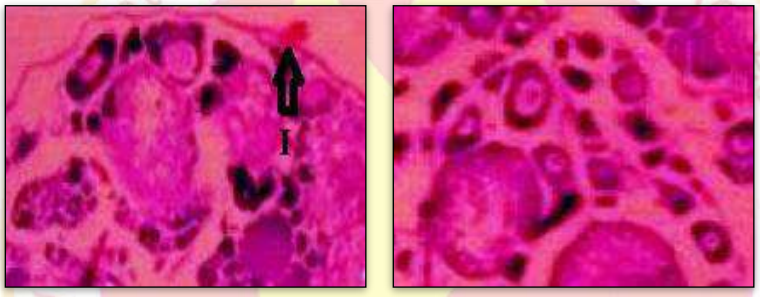


Fig.- 24hrs. **Fig.- 48hrs.**

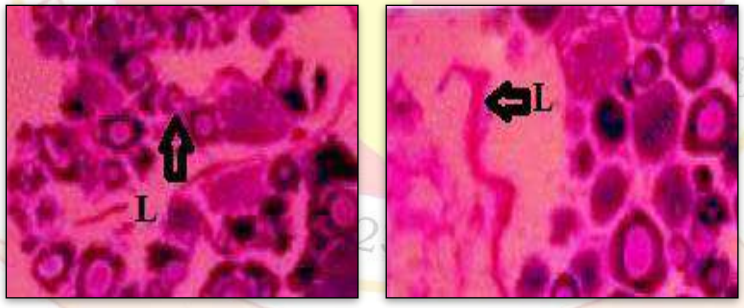


Fig.- 72hrs. **Fig.- 96hrs.**

Fig-1.4: Ovary (Section) of *Catlacatla* exposed to lethal concentration (13.00 mg/l) of root water extract of *B.aegyptiaca*showinglesion (L), inflammation (I),necrosis (N), and cellular degeneration(C).

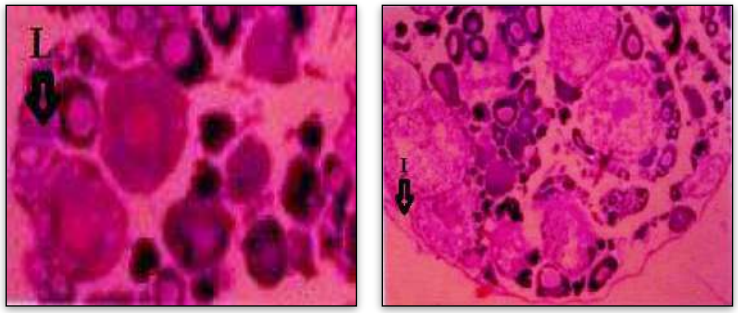
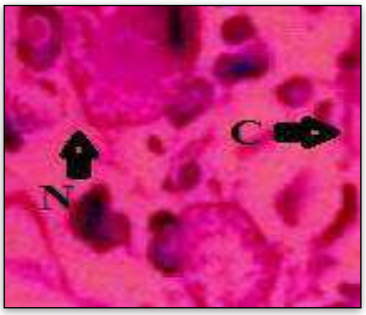


Fig.- 24hrs. **Fig.- 48hrs.**



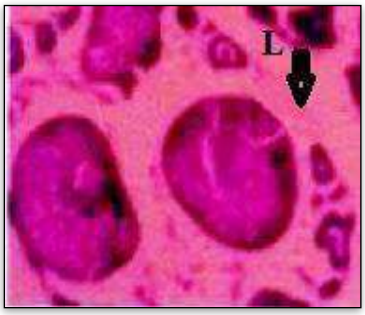


Fig.- 72hrs. **Fig.- 96hrs.**

In the present investigation the ovary of fish exposed to lethal concentration for different time exposure (24hrs. 48hrs. 72hrs. and 96hrs.) showed inflammation and lesion of epithelial layer and follicle cells during low concentration while, increasing concentration for different time exposure showed inflammation, lesion, necrosis and cellular degeneration of epithelial layer, follicle cells and oocytes were seen at later time of exposure(Fig-1.2 to 1.4).

In the present investigationshowed inflammation, lesion, necrosis and cellular degeneration of epithelial layer, follicle cells and oocytes in lethal and sub-lethal concentration. Similar observations agree with the finding of**(Khillare, 1992)** observed oocyte maturation and arrest of oocyte development in tertiary yolk stage.**(Lee and Yang, 2002)** observed at the dose of 100 ppm of sumithion, fragmented ova with abnormal shape and arrangement in the experimental fish as compaired to normal.

Conclusion:

The present study proves the toxic potential of the plant root extract and shows moderate to severe alterations inovary tissues which can lead to metabolic changes in the fish. The results of the present study clearly indicated that piscicides have a direct impact on the structural alterations in *Catlacatla*. The plant root extract is known to impair the metabolic and the physiological activities of the organism and through repeated exposure the piscicides tends to accumulate in its tissues even atlethal concentration.

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Effect of Selected Vigna Protease Inhibitors on Growth of Helicoverpa armigera, Hubner

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Abstract

Proteinase inhibitors are the most studied class of defense proteins. The genus Vigna belongs to Fabaceae, formerly called Leguminosae was used as the source material to screen for protease inhibitory activity against the polyphagous pest, H. armigera. The results showed significant reduction in weight of H. armigera larvae and more larval mortality when fed on proteinase inhibitors of studied Vigna. The LC_{50} values of V. hainiana, V. aconotifolia and V. sublobata were found to be 15%, 20% and 20% respectively after 72 hours of exposure.

Introduction:

H. armigera, Hubner (Lepidoptera: Noctuidae), is a major polyphagous pest present widespread in Asia, Africa and Oceania (EPPO, 2006) responsible for significant levels of yield losses in many economically important crops. Helicoverpa pest attack is the big problem as it has covered major part of the world from tropical climates to regions with cooler temperate climate and spread easily to natural migration. Application of huge amount of the pesticides resulted in to high levels of resistance in *H. armigera*. Some of the examples of pesticides to which *Helicoverpa* has acquired resistance are pyrethroids, endosulfan, carbamates and organophosphates (Armes, 1993 and 1995; Armes et al., 1992, 1994 and 1996; Forrester et al., 1993; Kranthi et al., 2001; Martin et al., 2000 and 2003; Torres Villa et al., 2002a). The genus Vigna belongs to Fabaceae, formerly called Leguminosae. It is found that, seeds of the Leguminosae generally contain large quantities of PIs active against insect serine proteases such as trypsin and chymotrypsin (Ryan, 1974). The earlier study indicates that wing bean proteinase inhibitors are good candidates for engineering resistance in to *Helicoverpa armigera* host plants (Harsulkar et al., 1999). Therefore, the study of interactions between such plant proteinase inhibitors and insect proteases can be useful in further insect pest management system.

Material And Methods:

Rearing of *H. armigera:*

Healthy, actively feeding H. armigera larvae were collected from the field & reared on an artificial diet (Nagarkatti and Prakash, 1974 with modification) & maintained under controlled conditions in the laboratory at Dr. Panjabrao Deshmukh Krishi Vidyapith, Akola, India. The laboratory conditions were maintained at 28±2^{0}C temperature, humidity 75±5% and 14:10 h light: dark period. The pupae were collected and disinfected with 0.02 per cent sodium hypochloride solution and transferred to the individual screw capped vials, containing soil bed. The adults emerged from the pupae after 7-10 days were then transferred to the bell jar covered with muslin cloth at its mouth. The sexes were differentiated on the basis of coloration pattern of the wings as female shows chocolate brown wings whereas male are pale brown. The adults were provided sterile cotton swabs imbibed with liquid diet of honey, sucrose and vitamin-E.

Plants for study:

The genus Vigna belongs to Fabaceae, formerly called Leguminosae was used as the source material to screen for protease inhibitory activity. Some of the wild Vigna seeds were collected from Melghat Region of Maharashtra.

Bioassay of PIs against *H. armigera* larvae:

The in vivo effect of Vigna proteinase inhibitors on larval growth of *Helicoverpa* was studied using feeding assay after screening 3 genotypes of Vigna. In spectrophotometric and electrophoretic studies, three accessions of Vigna were found to have potent proteinase inhibitors against *H. armigera*, hence these Vigna relatives were selected for bioassay studies. Early instars larvae were taken from the homogenous culture of *H. armigera* for experimental studies and were allowed to feed on chickpea-based diet having equal quantity of Vigna proteinase inhibitors. This culture was maintained in the laboratory at 27^{o}C with 80% relative humidity. The weight of larvae was taken after every 24 hrs after ingestion of food. Fresh food was given to the larvae on every alternate day to avoid the chances of microbial contamination. Control population was also maintained simultaneously on chickpea bases diet without PIs. The larval mortality and larval weight was recorded.

IC 50 Value of protease inhibition:

It is the amount of PI needed for 50% inhibition of protease activity was determined by conducting the assay. Bioassay of PIs against *H. armigera* larvae was conducted using different vigna genotypes such as *V.*

hainiana, V. aconotifolia and *V. sublobata*. The chickpea-based diet (PI removed by heat treatment) was used for feeding assay. The 10%, 15% and 20% concentrations of the PIs extracted from seed samples were made and equally added to chickpea-based diet for feeding assay. Ten neonates *Helicoverpa* larvae were released on the chickpea-based diet with PIs. The observations were recorded at 24 hours up to 3 days. The mortality data were recorded with the moribund larvae considered as dead. Water spray as control was maintained to study mortality percentage.

Results And Discussion

Bioassay of *Vigna* PIs against *H. armigera* larvae

Bioassay of PIs against *H. armigera* larvae was conducted using different vigna genotypes such as *V. hainiana, V. aconotifolia* and *V. sublobata*. The chickpea-based diet (PI removed by heat treatment) was used for feeding assay. Equal quantity of PIs extracted from seed samples was added to chickpea diet for feeding assay. The initial weights of the larvae were taken at the time of releasing the larvae on the diet and the final weights were taken on 13th day. The diet was changed on alternate day to avoid the chances of contamination. The results showed significant reduction in weight of *H. armigera* larvae and more larval mortality when fed on proteinase inhibitors of *V. hainiana, and V. aconotifolia* as compared to *V. sublobata* whereas, in control (Chickpea diet without PI) no larval mortality was recorded.

Table 1. Bioassay of PIs against *H. armigera* larvae

PI Source	Initial weight of larvae in (mg)	Final weight of larvae in (mg)	Weight gain in (mg)	Weight reduction as compare to control (%)	Mortality observed at 11th day (%)
V. hainiana	23.7	199.7	176.0	37.61%	45%
V. aconotifolia	23.7	198.3	174.6	38.05%	47%
V. sublobata	23.9	215.2	191.3	32.77%	41%
Control	24.0	320.1	296.1	0% (control)	0%

IC 50 value of protease inhibition

For determining LC_{50} values, the homogenous population of 10 *Helicoverpa armigera* neonates was subjected to chick pea-based diet having different concentrations of *Vigna* protease inhibitors as given in the chapter" Materials and Method". The observed mortality was recorded up to 72 hours at 24 hours interval. The values of median lethal concentrations (LC_{50}) of respective *Vigna* PIs were recorded and presented in the following table.

Table 2: Toxicity of *Vigna* PIs against *Helicoverpa armigera* neonates

Protease inhibitors source	LC_{50} Value in % after 72 hrs.
Vigna hainiana	15%
Vigna aconotifolia	20%
Vigna sublobata	20%
Control	No mortality on 3rd day

The LC_{50} values of *V. hainiana, V. aconotifolia and V. sublobata* were found to be 15%, 20% and 20% respectively after 72 hours of exposure.

Conclusion

Protease inhibitors are important tools for regulating the target proteases. They play a crucial role in controlling many physiological functions. The gut of this insect found to have both trypsin and chymotrypsin proteinases like activity. These proteinases were involved in protein digestion and provided the source of essential amino acids and energy to the insect. Thus, such proteinases become a target for the proteinase inhibitors having tryptic and chymotryptic inhibitory potential.

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The Study of Seed Germination. Seedling and Early Plant Growth by the Effect of Metal Ion and Their Complexes in Plumbago Zeylanica (Chitrak) Plant

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Abstract

This work investigates the usefulness of 3-(2-methoxyphenoxy)-1,2-propanediol as an alternate fertilizer by field experiments on growing Plumbago Zeylanica. Separate field experiments using 3-(2-methoxyphenoxy)-1,2-propanediol and original soil compare the effectiveness of different products for agronomic applications. Attempt has been made with the impact of heavy metals and their complexes of 3-(2-methoxyphenoxy)-1,2-propanediol on to improve the yield of economically important plant Plumbago Zeylanica (Chitrak). The seeds were immersed in Co (II), ligand and its complexes to study the seed germination and growth pattern and certain physiological processes. Effect of ligand, metal ion and complex solution on growth, determination of % of nitrogen, proteins and chlorophyll in the leaves of plants, are studied. The data harvested indicates increased germinations in all seed treatments. The changes in growth pattern of roots length and shoots length are observed in the experimental plants. However, chlorophyll content was found to be higher in plant species. The percentage of nitrogen and proteins were found affected in the leaves of Plumbago Zeylanica(Chitrak). Plant treated with 3-(2-methoxyphenoxy)-1,2-propanediol, complex and metal Co (II). Nitrogen and protein contents are found higher in the treated plants as – Complex >3-(2-methoxyphenoxy)-1,2-propanediol > Co (II).

Key words *- 3-(2-methoxyphenoxy)-1,2-propanediol, Co (II), Plant, Seed Germination of Chitrak, Chlorophyll*

Introduction:

Plant growth regulators are organic compounds, other than nutrients, that produced naturally inhigher plants, controlling growth or other physiological functions at a site remote from its placeof productionand active in minute amounts, modify plant physiological process. The plant physiologists not only to supply basic information regarding how plants growand develop but also to undertake research program undergo designed specifically to increase yield of plant products. Seed germination behavior is important for horticulture and agriculture [1-2].One of the important contributions of the 19th century experimental plant physiology to agriculture was to discovery that soil fertility and adding several nutrients to the soil could increase crop yields. Agricultural scientists realize that crop plants grow in production to the amounts of various nutrients present in soils. Today the application of various salts to soils is a basic future of agricultural practice. With the application of these and other fertilizer to soils, the large crop yields obtained in developing countries throughout the world during the past 50 years and more could not be possible. In modern agricultural practice, various chemicals in solution or aqueous suspension are sprayed on the crop plants with in the object of accelerating and modifying the plant growth and developing.

The complexes of transition metals with bi- allyl thiourea are prepared and their herbicidal and plant growth regulating activities are tested with wheat and cucumbers by Daverski et al [3] Complexes of Piperidene-2-Carboxilic acid with some bivalent metal ions have been reported to be useful in agriculture as plant growth regulators [4]. The Complexes of rare earth with peptides showed the herbicidal and plant growth regularity activity with wheat and barley plant [5].

Since 3-(2-methoxyphenoxy)-1,2-propanediol has intense biological activities, anti-inflammatory, antipyretic and analgesic activities. 3-(2-methoxyphenoxy)-1,2-propanediol inhibits the activity of the enzymes and since no work is reported on the biological application of binary complexes of Co (II), with 3-(2-methoxyphenoxy)-1,2-propanedioland comparing with pure ligand, metal and control solution (double distilled water) to study the effect of complex, metal, ligand and control solution on germination, survival seedlings height etc, on Plumbago Zeylanica (Chitrak) plant in order to make suggestion whether complex metal and ligands can be used as a plant growth regulator.

Also, biological analysis of chlorophyll contents and percentage of nitrogen and proteins in the leaves of leafy vegetables are carried out at room temperature.

Material And Experimental Methods:

Seed of Plumbago Zeylanica Species were collected from forest department Akot. Various seed characteristic like seed size, Shape, color and weight of seed/gm. would beobserved. Seed shape - oblong, Seed coat- Hard, Seed color-reddish brown,no. of seeds/gm- 47.9 andSeed size-5-6mm. The solution of Co (II) in the form of nitrate and 3-(2-methoxyphenoxy)-1,2-propanediol of the concentration of 0.01 M was prepared in

double distilled water. The applications of complex, metal, ligand solution are studied by dissolving it in proper solvent at 4, 7.00 and 9.5 pH and at constant ionic strength of 0.01 M potassium nitrate solution. Fertilized soil was collected from agricultural land. It was then grindand filtered. This soil was filled in two wooden trays and tray was moistened with water. Sowing of seeds was done in the soil after one hour.

Experiments Performed:

In general practice various chemicals are used in agriculture as an ingredient of various pesticides, insecticides, fertilizers etc, to improve the crop yield. Amongst several economical and medicinally important plants Plumbago Zeylanica (Chitrak) is selected as a plant system.

1. 20 gm healthy seeds of Plumbago Zeylanica (Chitrak) were taken 4.0, 7.00 and 9.5 pH for about three hours. These seeds soaked were taken out of each solution and sowed in the wooden tray in a row, during 14 August 2021 to 30 Sept.2021; the wooden tray was kept under atmospheric pressure at room temperature.
2. Effect of ligand, metal Co (II), complex on percentage of nitrogen, protein and chlorophyll in the leaves of Plumbago Zeylanica (Chitrak) plant. Chlorophyll pigments in fresh leaves were determined by spectrophotometric method given by Jahagirdar[21].

Parameters:

Soil pH of soil sample was measured by taking extract of mixture of soil water withpH-meter. Plant growth is decided on the basis of parameter such as percentage of germination, survival, seedling height, shoot length; root length and thickness of young leaf having high values compare to control systems. Germination was noted after $3\frac{1}{2}$ days and survival were noted after 10 days.

After noting the survival of plant, they were taken out of soil. The seedling height and thickness of leaves of survived plants were measure.

Table 1
Effect of Ligand, Metal ion and Complex on Germination, Survival, Seedling height etc. on Plumbago Zeylanica (Chitrak) Test System.

Test System	Effect of	pH	Parameters						
			%Germination after $3\frac{1}{2}$ days	% Survival after 10 days	Seedling height (cm)	Root length (cm)	Shoot length (cm)	Root / Shoot	**Width of young leaf (cm)**
Plumbago Zeylanica (Chitrak). Test System	Water (Control)	4.0	73.00	72.00	21.084	7.552	13.478	0.5603	**3.25**
		7.0	78.66	76.66	22.569	7.256	13.698	0.5415	**3.27**
	Ligand	4.0	75.66	75.33	21.964	7.698	13.852	0.5557	**3.87**
		7.0	82.00	81.66	24.214	7.963	15.108	0.5270	**3.63**
	Complex	4.0	76.00	76.00	22.458	8.748	13.563	0.6449	**3.56**
		7.0	79.66	78.00	23.569	8.986	14.231	0.6314	**3.89**
	Metal	4.0	82.00	79.33	21.483	8.698	14.125	0.6157	**3.12**
		7.0	**50.00**	**91.33**	**26.586**	**9.025**	**14.244**	**0.6336**	**3.56**

Table 2
Estimation of Chlorophyll for Plumbago Zeylanica (Chitrak) Plants System

S.No.	Treatment	Leaves of plant	Total Chlorophyll gm/Lit.x10^{-3}	Chlorophyll 'a' gm/lit.x 10^{-3}	Chlorophyll 'b' gm/lit.x10^{-3}
1	Control	Plumbago Zeylanica(Chitrak).	4.986	3.714	**1.754**
2	Ligand		5.725	4.821	**1.018**
3	Complex		5.782	3.560	**1.215**
4	**Metal**		**6.312**	**5.255**	**1.196**

Table 3
Estimation of Total Nitrogen and Proteins in Leaf Powder of Plumbago Zeylanica (Chitrak)

S.No	Plant	Treatment	% Element			% Protein
			Nitrogen	Carbon	Nitrogen	
1		Control	6.58	55.28	7.52	**44.562**

2	Plumbago Zeylanica (Chitrak).	Ligand	6.90	56.22	7.34	**42.816**
3		Complex	7.26	54.28	7.12	**46.195**
4		**Metal**	**6.02**	**52.78**	**7.01**	**41.406**

Results And Discussion:

Seed of the target species were taken to study the germination behavior under the influence pre–treatments. Germination starts when the seed shows emergence phase of growth, which begins, with penetration of embryo from the seed coat and end with the development of root and shoot system. Elongation of shoot axis follows emergence of radical.

The rate and extent of elongation is subjected to the variety of controls, including nutrition, hormones and environmental factors. Though the root and shoot development start within a fraction of time but the further developments may vary according to the nutrients required for the development of root length and length shoot independently. Therefore, root length and shoot length differs. The observation table clearly indicates that average root length in 3-(2-methoxyphenoxy)-1,2-propanediol, complex, Co(II), at all pH increase over is seen that in complex, Co(II), showed decrease in shoot length control. But in case of Plumbago Zeylanica (Chitrak) plant system shoot length increases in 3-(2-methoxyphenoxy)-1,2-propanediol, complex and Co(II), and all pH over control.

Chlorophyll pigment / chlorophyll control were found affected in Plumbago Zeylanica (Chitrak) plant by the treatments. Total chlorophyll was found to be higher in Plumbago Zeylanica (Chitrak). Total chlorophyll content in 3-(2-methoxyphenoxy)-1,2-propanediol and complex is higher than in metal and control treatment in both plant systems.

Percentage of nitrogen and proteins were found affected in leaves of Plumbago Zeylanica (Chitrak) by the treatment of 3-(2-methoxyphenoxy)-1,2-propanediol, complex, Co (II). It is observed that percentage of nitrogen and protein are higher than that of control.

Complex >3-(2-methoxyphenoxy)-1,2-propanediol > H_2O > Co (II).

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Current Study on physico –chemical characteristics and biological factors of Chargaon Lake in Warora Taluka, District-Chandrapur (M.S.). India.

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Abstract

The physico-chemical parameters are water temperature, electric conductivity, total dissolved solids, total hardness, total alkalinity, turbidity, pH, dissolved oxygen, chlorides, COD , BOD, etc. The biological factors considered were macro-zoo benthos and plankton of the lake.Chargaon Lake was constructed as part of irrigation projects by Government of Maharashtra. Nearest city to Lake is Chimur and the Lake is situated in Warora Taluka of Chandrapur District of Maharashtra in India. In the present study an attempt has been made on physico –chemical characteristics and plankton diversity and density of a sub urban perennial water body, located in Chargaon in Warora Taluka District Chandrapur of Maharashtra. The study was conducted during August-2020 to July-2021. The samples were analyzed at monthly intervals for a period of one year. Limnological parameter and plankton diversity are an important criterion for determining the suitability of water for irrigation and drinking purpose. Chargaon Lake has greatest importance for humankind. Lake was highly productive as presence of various class and order of benthos, zooplankton and phytoplankton although there were no sign of problem like eutrophication. Biological studies indicate that lake water was fit for aquatic organism, such as fishes because of there were plenty of food in the form of benthos, zooplankton and phytoplankton repectively.

Keywords:*Humankind, Irrigation, Benthos, Diversity and Eutrophication.*

Introduction:

Biological production in any aquatic body gives direct correlation with its physico-chemical status which can be used as trophic status and fisheries resources potential (Jhingran*et al.,* 1969). Life in aquatic environment is largely governed by physico-chemical characteristics and their stability. The physico-chemical as well as the biological factor of lake have vital role in aquaculture and productivity of fishes. The quality of water determines the quality of fish to be produce in it. The physical factors are water temperature, water current and turbidity of water, whereas the chemical parameter of lake comprise pH, dissolved oxygen, total alkalinity and total hardness of water. The biological factors considered were macro-zoo benthos and plankton of the lake. The seasonal changes in different physico-chemical parameters are responsible for annual variation and growth of biological factors viz., macro-zoo benthos and plankton etc.

Tepe*et al.,* (2005) found that the water quality attributes such as water temperature, light penetration, dissolved oxygen, total alkalinity and total hardness are the representative of the seasonal fluctuation. Ali *et al.,* (2006) showed that the water quality of fresh water ecosystem undergoes complex changes due to all physico-chemical factors and water quality as a sequence disrupting the aquatic life. Hayat *et al.,* (1996) and Jena *et al.,* (1998) revealed that temperature and ecological conditions are responsible for the fluctuation of salt contents, which in turn influence the production, and growth of fish .

Materials and Methods:

The sampling was carried out in ChargaonLake at five different sites monthly between August-2020 to July-2021 for one year. About 12 water sample were collected in each months.

The physico-chemical factors are water temperature, watercurrent, turbidity of water pH,dissolved oxygen, total alkalinity and total hardness of water, whereas biological factors were macro-zoo benthos and plankton of the lake. Study of physico-chemical factors was carried out by using standard methods(APHA, 1998). For the qualitative estimation safe water quality standards were use(Boyd and Tucker, 1998; Ali*et al.,* 2000). Macro-zoo benthos collected from 1m²area of lake at the depth of 15cm. The plankton was sampled at each spot by filtering 100liters of water. Preservation was made on the spot in 4% formalin. The quantitative analysis of plankton was made with the help of Sedgwick-Rafter counting slide as suggested by Welch (1952).

Result and Discussion:

Water temperature

The average water temperature of lake was found to be varying from 14.12˚c to 21.58˚c during Jan.to July respectively. Thus, water of ChargaonLake is coldest in winter and hottest in monsoon. (Table 1)

Table.1 Average monthly and seasonal variation in water temperature (˚C) of Chargaon Lake (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	12.3	14.7	15.5	17.8	20.4	21.5	21.9	20.4	19.7	17.9	14.5	12.7
Spot B	15.5	17.3	17.3	19.6	20.5	20.4	20.8	19.5	18.6	17.7	16.4	15.6
Spot C	11.2	15.6	17.2	19.7	19.5	20.7	22.4	20.6	18.8	16.9	13.4	11.6
Spot D	16.3	17.8	18.5	20.5	20.8	21.5	21.3	19.6	18.6	17.6	16.8	15.3
Spot E	16.5	17.9	18.3	20.8	20.2	20.3	21.5	19.5	18.8	17.3	16.7	15.4
Average	14.36	16.66	17.36	19.68	20.28	20.28	21.58	19.92	18.9	17.48	15.56	14.12
Season	Summer				Monsoon				Winter			

Water velocity

While calculating the velocity of water, we observed that the rate of water flow is fluctuated from a minimum value of 0.307m/s in Feb.to a maximum value of 0.899m/s in Aug. Thus the water current with a rate of 0.313m/s in winters to 0.849m/s in monsoon is useful for fish survive (Table 2).

Table.2 Average monthly and seasonal variation in water current velocity (m/s) of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	0.289	0.364	0.393	0.416	0.576	0.663	0.849	0.615	0.433	0.269	0.281	0.274
Spot B	0.304	0.337	0.393	0.428	0.438	0.864	0.957	0.813	0.522	0.391	0.324	0.314
Spot C	0.271	0.366	0.398	0.421	0.421	0.633	0.765	0.651	0.434	0.354	0.265	0.261
Spot D	0.337	0.351	0.598	0.924	0.924	0.963	0.972	0.811	0.614	0.483	0.388	0.391
Spot E	0.334	0.349	0.598	0.944	0.923	0.877	0.951	0.813	0.619	0.433	0.335	0.325
Average	0.307	0.353	0.476	0.627	0.656	0.656	0.899	0.741	0.524	0.386	0.319	0.313
Season	Summer				Monsoon				Winter			

Turbidity

It has been observed that the water is highly turbid during monsoon period (July-August) with a value of 92.9NTU. Thus is obvious because water becomes turbid due to the rainfall and flash flood. With an unusual variation water was found extremely less turbid during rest of the seasons with the minimum of 7.9NTU in winter. (Table 3).

Table.3 Average monthly and seasonal variation in turbidity (NTU) of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	09	11	17	10	12	95	86	51	31	11	08	10
Spot B	06	05	11	09	17	91	96	64	41	18	07	10
Spot C	05	08	09	11	22	88	99	59	39	14	05	07
Spot D	07	09	06	13	21	89	94	61	31	12	11	08
Spot E	09	07	05	09	19	94	97	57	27	10	09	08
Average	7.2	8.0	9.6	10.4	18.2	91.4	94.4	58.4	33.8	13	8.0	8.6
Season	Summer				Monsoon				Winter			

pH

pH fluctuation occur only within a narrow range. The pH of lake was found to be varying from 7.6 to 8.32 during July to December. Therefore, during monsoon the water is least basic and it seems more basic during winter (Table 4).

Table.4 Average monthly and seasonal variation in pH of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	8.2	8.3	8.2	8.1	8.2	7.9	7.9	8.3	8.2	8.6	8.2	8.1
Spot B	7.4	8.3	8.2	8.7	8.6	7.6	7.6	7.3	7.4	7.7	8.1	8.3
Spot C	8.1	8.6	8.2	7.9	7.9	7.2	7.8	8.2	8.3	8.1	8.7	8.4
Spot D	8.2	8.1	8.2	8.3	8.5	8.1	8.1	7.9	7.8	8.3	8.5	8.2
Spot E	8.0	8.1	8.2	8.3	8.3	8.0	8.1	7.6	7.8	8.0	8.1	8.2
Average	7.98	8.28	8.2	8.26	8.3	7.76	7.9	7.86	7.9	8.14	8.32	8.24
Season	Summer				Monsoon				Winter			

Dissolved Oxygen

In December, the oxygen content dissolved in water was found to be highest with the value of 10.72mg/l.The Lake has less D. O. content in Jun. with the value of 7.6mg/l. Thus the fish can endure water having the dissolved oxygen content from7.93mg/l (during monsoon) to 10.57mg/l (during winter). (Table 5).

Table.5 Average monthly and seasonal variation in dissolve oxygen (mg/l) of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	9.8	8.9	8.4	8.6	7.8	7.2	8.1	8.5	9.3	9.8	10.5	10.3
Spot B	11.3	8.9	7.8	7.2	7.4	7.4	7.1	8.6	9.3	10.1	10.4	10.8
Spot C	9.8	8.9	9.5	8.3	7.9	8.2	8.7	8.7	9.4	9.2	10.9	10.1
Spot D	10.4	9.3	8.7	7.4	7.4	8.2	8.3	9.3	9.9	10.5	11.1	10.9
Spot E	10.4	9.3	8.6	7.9	7.5	7.9	8.2	9.5	9.8	10.5	10.7	11.2
Average	10.34	9.06	8.6	7.88	7.6	7.78	8.08	8.92	9.54	10.02	10.72	10.66
Season	Summer				Monsoon				Winter			

Total Alkalinity

In our observation it has been observed that the lake water was alkaline and the magnitude was varying from 59.34mg/l to 100.46mg/l from Augustto February. Thus, the water ofChargaon Lake is most alkaline during winter and then with a regular decrement is least alkaline during monsoon. (Table 6)

Table.6 Average monthly and seasonal variation in total alkalinity (mg/l) of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	91.9	80.1	76.2	71.0	64.2	62.4	60.8	64.4	73.5	85.9	89.9	92.4
Spot B	96.2	87.1	80.8	74.1	63	61.7	61.8	62.5	79.8	89.1	99.2	101
Spot C	99.6	83.4	78.5	74.7	62.7	65.4	59.9	67.8	77.6	81.1	101.5	99.2
Spot D	103.3	97.1	79.7	70.2	71.1	60.1	57.6	70.4	91.1	95.3	98.2	99.8
Spot E	111.3	97.1	81.7	73.2	73.1	62.8	56.6	71.1	87.1	91.3	91.9	108.2
Average	100.46	88.96	79.38	72.64	66.82	62.48	59.34	67.24	81.82	88.54	96.14	100.16
Season	Summer				Monsoon				Winter			

Total Hardness

The degree of hardness calculated in the lake water was lowest in July (78.52mg/l) and highest in February (109.26 mg/l). The study summarized that the water in winter in highly hard, while least hard during monsoon. (Table 7).

Table.7 Average monthly and seasonal variation in total hardness (mg/L) of Chargaonlake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	101.2	93.7	91.2	89.1	75.4	77.5	78.2	77.2	82.5	90.6	92.3	97.5
Spot B	109.3	98.8	85.9	78.2	77.1	75.9	74.9	78.2	82.1	89.2	96.7	101.2
Spot C	104.3	98.5	99.8	92	90	84.4	81.7	84.9	89.6	98.4	99.6	103.1
Spot D	112.4	96.5	94.7	87.5	85.1	74.9	82.4	88.2	91.5	101.4	106.1	109.2
Spot E	119.1	107.4	96.2	86.3	84.6	79.9	84.3	86.9	87.5	98.2	106.3	108.5
Average	109.26	98.98	93.56	86.62	82.44	78.52	80.3	83.08	86.64	95.56	100.2	103.9
Season	Summer				Monsoon				Winter			

Macro-zoo benthic Density

The number ofEphemeroptera (211Units/m²in December while 12 Unit/m² in July), Trichopteran (210 Unit/m² in December while 8Unit/m² in July), Dipteran (13 Units/m ² in July while 145 Units/m² in February), Plecopteran nymphs (51Units/m²in January while 1 Units/m² in August), Coleopteran larvae (99 Units/m²in December while 9 Units/m² in July). Odonata larvae (130 Units/m² in December while 7 Units/m² in June). The average total macro-zoo benthos observed (812Units/m² in December while56 Units/m²in July) and (in winter season 646.33 Units/m² while during monsoon 114 Units/m²). (Table 8).

Table 8. Average monthly and seasonal variations in Macro-zoo benthic density (Units/m^2) (2020-2021)

Macrobenthic groups (Units/m^2)	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Ephemeroptera	149	73	52	24	21	12	35	64	110	144	211	155
Trichoptera	140	77	35	21	10	08	35	64	110	144	210	150
Deptera	145	116	63	43	34	13	29	62	88	139	142	110
Plecoptera	48	39	43	40	21	02	01	14	03	14	20	51
Coleoptera	46	61	22	38	11	09	22	22	94	88	99	39
Odonata	42	76	39	29	07	12	50	52	92	110	130	52
Total Macro-zoo benthos (Unit/m^2)	570	442	254	195	104	56	172	278	497	639	812	557
Season	Summer				Monsoon				Winter			

Plankton Diversity

The total phytoplankton were Chlorophyceae, Bacillariophyceae and Cyanophyceae (2925 Units/l in January while 400 Units/l in August). The total zooplankton were Crustaceans and Rotifers (25Units/l in August and 400 Units/l in January). The total plankton density vary (3110 Units/l in January to 425 Units/l in August. (Table9).

Table 9. Average monthly and seasonal variations of Plankton density (Units/L). (2020-2021)

Plankton group (Units/L)	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Chlorophyceae	375	725	325	510	135	275	Nil	230	475	650	500	600
Cyanophyceae	225	175	Nil	200	125	125	Nil	125	75	150	200	250
Total phytoplankton	2175	1725	1550	1420	950	802	400	1080	2850	2629	2550	2925
Crustaceans	175	100	50	175	25	75	25	75	100	225	155	125
Rotifers	Nil	100	200	220	75	Nil	Nil	25	25	175	100	60
Total Zooplankton	175	200	250	395	100	75	25	100	125	400	215	185
Total Plankton (Units/L)	2350	1925	1800	1815	1050	877	425	1180	2975	3029	2850	3110
Season	Summer				Monsoon				Winter			

In the present study, the water temperature of the lake was observed to be moderate throughout the year. This moderate water temperature is due to its spring-fed nature of origin. It is also supported by Odum (1971) that photoperiod was shorter in winter than summer which is directly related to temperature and hence water temperature is highest in June. The velocity of water current was observed to be fluctuated from a minimum of 0.307 m/s (February) to a maximum of 0.899 m/s (August). It is also obvious from our study that the average rate of water is highest in monsoon whereas lowest in winter.

In present study water was highly turbid during Monsoon (July-August) while very low during rest of the seasons with the minimum of 7.9 NTU in winter. These observations are also supported by Jhingran (1965) who reported that turbidity generally increased to a maximum value in monsoon due to the suspended solids in the flooded water whereas, during the post monsoon months the turbidity values were low but increased again during the summer months with the increase in tidal management and intensity .Upadhyay (1997) calculated the turbidity variation from 2 to 162NTU.

pH is gradually increased from a minimum of 7.83 during monsoon to a maximum of 8.28 during summer. Similar variations in pH of the lake were recorded by Kumar *et al.*,(2006) in Garhwal Himalayas. They concluded that winter maxima for pH might be due to algal growth and minima in monsoon might be due to influx of organic and inorganic ions in to the lake caused by flash flood.

In our study D O highest during winter whereas lowest during, Ali (1999) reported that the dissolved oxygen variation shows inverse relationship with water temperature variation. Bhatt *et al.*, (1984) also reported high D O and low free CO2 concentration in winter.

In present study, the water of ChargaonLake was found to be most alkaline during winter and least during monsoon. Total hardness show minimum during monsoon to a maximum during winter.
Density of total macro-zoo benthos and total plankton populations were plenty in winter while rarely during monsoon. Detritus standing stock is the main reason for high density of benthos in winter and substratum stability too. Moderate temperature low gradient of velocity favors the growth of biotic communities. Similar study was carried out by Rautela*et al.*,(2006) who reported that the macro-zoo benthos had a maximum population during winter(325 Units/m ^{2}) and the minimum (15 Units/m ^{2}) during monsoon season.

Conclusion:

Briefly, present study concluded that physico-chemical parameters levels indicate the moderate quality of water, lake water of the study area was not polluted in respect to physico-chemical assessment. But biological studies indicate that lake water was fit for aquatic organism, such as fishes because of there were plenty of food in the form of benthos, zooplankton and phytoplankton.

Chargaon lake water was habitable for fishes and fit for development of aquaculture. There were no sign of problems like eutrophication. It is also concluded that the higher growth of macro-zoo benthos and planktons in the lake is favored by low water temperature, low current velocity, and moderate turbidity with high D High alkalinity and high hardness during winter's season.

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Isozyme study in *Leucas biflora* (Vahl.) R. Br. of Lamiaceae.

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Abstract:

The present study reveals plant allozymes of family Lamiaceae (Leucas biflora) to establish the phylogenetic relationship. In the present study five allozymes were tested Viz. Superoxide dismutase, Succinate Dehydrogenase, Polyphenol Oxidases, Catalase and Rubisco and data was interpreted by using STATISTICA package. Four enzymes showed reliable polymorphism except Catalase. In Catalase monomorphic allele was elucidated. The bands were stained and allele frequency was calculated. The difference in allele frequency can be helpful to the taxonomist in establishing genetic diversity amongst the taxa of Lamiaceae.

Keywords *- Isozymes, Zymogram, Allele frequency, Polymorphism, Phylogeny.*

Introduction:

The most widespread in its distribution amongst Plant kingdom is Angiosperms. "Tubiflorae" is the largest order of Engler and Diels (1936), revised system of classification with primarily herbaceous plants, gamopetalous corolla, and epipetalous stamens.Taxonomists treated the order Tubiflorae differently. The variation in allele frequency would support as an additional taximetrics in deciding the position of the families like Acanthaceae, Lamiaceae, Scrophulariaceae and Lentibulariaceae.

Allozymes share a common substrate but differ in their electrophoretic mobility that helps in making the comparisons between the populations. In the present investigation, efforts have made to support the new taximetrics on the basis of Isozyme pattern and shared loci.

Allozyme pattern has been studied for calculating the percentage of gene loci and polymorphism per population. For out crossing plants, the numbers and frequencies of alleles detected in any one population are often very similar to another population of the taxa belonging to same family studied. Thus, the findings in the present investigation proved to be helpful to justify the position of the family in the order Tubiflorae on molecular basis.

Review of Literature

Meister (1950), studied the taxa to understand the molecular heterogenesity. Markert (1975a, b, c) published the information about isozymes in 3 volumes namely Isozymes –I, Isozymes –II, &Isozymes –III. Sonnante et al. (1997) obtained better insight into genetic relationship within and between the taxonomic entities of *Vigna luteola* and *V. marina*. Bhat et al. (1998) studied the Isozyme diversity in Indian primitive maize landraces and observed polymorphism for Peroxidase, esterase and acid phosphatase. Apavatjrut et al. (1999) carried out the study on *Curcuma* species. Volis et al. (2003), interpreted that allozyme variation in wild barley is adaptive and directly related to local environment. Soltis & Soltis (2005) gave the detailed study of isozymes in different chapters of plant biology. Isozyme used as a molecular marker to assessed the genetic diversity and structure of wild Tunisian *Thymus capitatus* of Lamiaceae (Ali et. al.2011). Gömöry *et. al.* focussed on potential discordances in spatial patterns of allozyme and quantitative phenotypic variation.

Materials and Methods

The plant material was collected from localities in and around Nagpur District. The seeds of *Leucas biflora* were randomly collected. They were sun-dried and investigation was carried out with fresh material as well as water soaked viable seeds. Band variation was studied as per the method given by Sadashivam and Manickam, 1996; Vellejos, 1983; Wendel & Weeden, 1989.The gel was photographed and interpreted by using the "STATISTICA" package.

Observations

The taxa under investigation showed reliable polymorphism except Catalase due to variation in the banding pattern. Allozyme data was analyzed through cluster analysis by simple matching coefficient method. 27 significant alleles were resolved, of which, number of alleles (bands) found in Rubisco i.e. eight, next to it is seven in Amylase followed by two in Alcohol Dehydrogenase. Catalase is the only monomorphic showing single allele. Zymogram of Rubisco is explained in the given table and scored as follows-

The isozyme pattern of Rubisco is explained below:

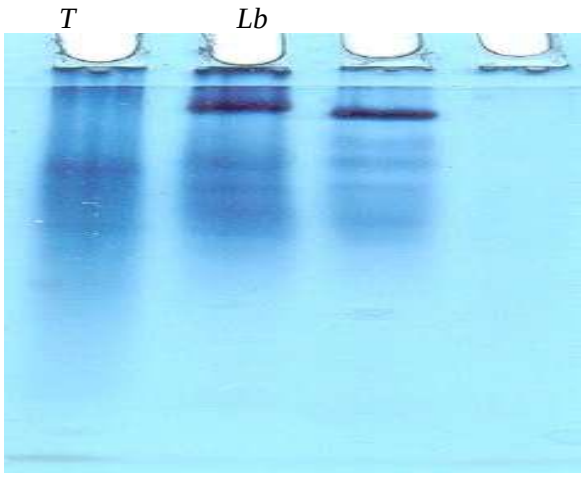

Fig: 1- Zymogram of of Rubisco

Table 1:

Name of Enzyme	**Alleles**	A	***Leucas***	B	C	**% of shared loci(P)**
Rubisco	1	1.000	1.000	1.000	0.000	75.000
Rubisco	2	0.000	1.000	1.000	0.000	50.000
Rubisco	3	0.000	0.000	1.000	0.000	50.000
Rubisco	4	1.000	1.000	1.000	1.000	100.000
Rubisco	5	1.000	1.000	1.000	0.000	75.000
Rubisco	6	1.000	1.000	1.000	0.000	75.000
Rubisco	7	0.000	1.000	1.000	0.000	50.000
Rubisco	8	0.000	0.000	1.000	0.000	25.000
Allele Frequency		**0.500**	**0.750**	**1.000**	**0.125**	

The zymogram represents various isozymes of Rubisco. Figure: 1 show 8 bands of four samples species (A, B, C) along with *Leucas biflora* studied for isozymes. The intensity of band indicates the amount of isozyme present in the sample loaded for electrophoresis. Rubisco 1,4,5,6 present in three samples. Rubisco 2, 7 reported as a single band in two taxa, while 8 in only sample C. 3 bands are shared by Maximum Species. The presence and the absence of band is stated as 1 or 0 respectively and the data is tabulated in Table- I & II. The percentage of population per sample sharing each band /allele/ locus has been calculated below.

The example studied is Rubisco. In Fig. 2 the first locus is present in 4^{th} samples and hence the distribution % among the population is 4/6 x 100 = 66.667. Second in only one sample and hence distribution % is 1/6 x 100 =16.667. Similarly the allele frequency is calculated for all the samples on the basis of enzyme locus present out of the total detected isozyme loci. Thus, the allele frequency of *Gantelbua*, *Leucas* and *Utricularia* is same i.e. 500, as far as the band pattern and sharing of loci is concern. The taxon showing more than one band is said to be polymorphic where as only one band is monomorphic by nature. The isozyme scoring and relative frequency in the taxa investigated is given in Table II.

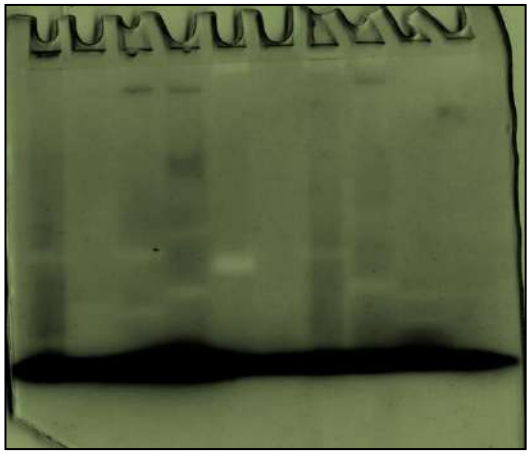

Fig2: Superoxide dismutase

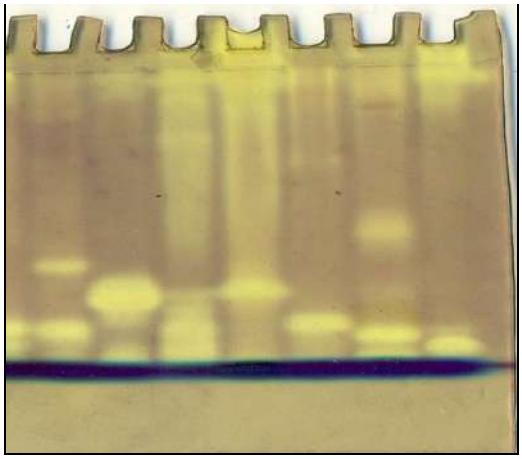

Fig3: Succinate Dehydrogenase

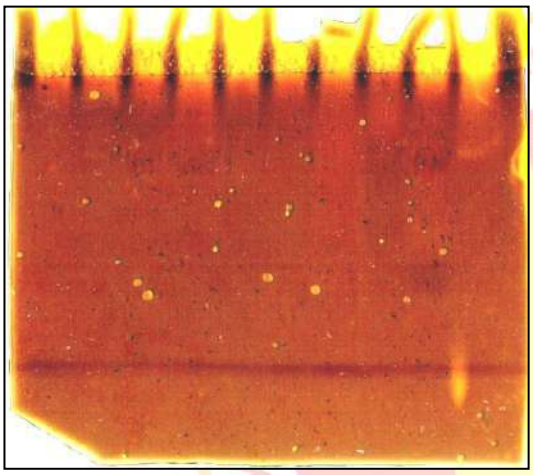

Fig3: Catalase

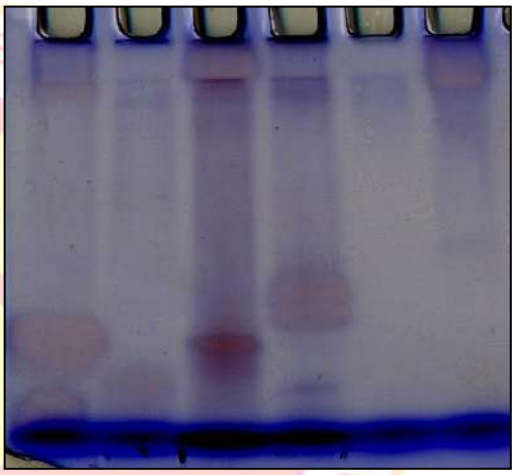

Fig4: Polyphenol Oxidases

The Rubisco shows 8 bands recorded in three taxa and roughly recorded in single taxon. The intensity of band indicates the amount of isozyme present. Rubisco 1 is shared by maximum Species present in all the four samples. Rubisco 1, 4, 5 & 6 reported in maximum taxa while 3 and 7 shared by only 2 taxa whereas 8 shared by only one percent population. In enzyme catalase, the first locus is present in all the four samples and hence the distribution % among the population is 4/4 x 100 = 100%. The allele frequency is calculated for all the samples on the basis of enzyme locus present out of the total detected allozyme loci. Thus, the allele frequency calculated of *Leucas biflora* is helpful when it is compared with the related data collected from the remaining taxa of same family. The band pattern and sharing of loci is concern. The taxon showing more than one band is said to be polymorphic where as only one band is monomorphic by nature. The isozyme scoring and relative frequency of the four other enzymes are given below:

Table: II

Name of Enzyme	A	***Leucas***	B	C	**% of shared loci(P)**
Catalase	1.000	1.000	1.000	1.000	100.000
Allele Frequency	**1.000**	**1.000**	**1.000**	**1.000**	
Polyphenol Oxidases	1.000	1.000	0.000	0.000	50.000
	1.000	1.000	0.000	1.000	75.000
	1.000	0.000	0.000	0.000	25.000
	0.000	0.000	0.000	1.000	25.000

	0.000	1.000	0.000	0.000	25.000
	0.000	1.000	0.000	0.000	25.000
	1.000	0.000	0.000	0.000	25.000
	1.000	1.000	1.000	1.000	100.000
Allele Frequency	**0.500**	**0.600**	**0.100**	**0.300**	
Superoxide dismutase	1.000	0.000	0.000	1.000	50.000
	0.000	0.000	1.000	1.000	50.000
	1.000	0.000	0.000	0.000	25.000
	0.000	0.000	0.000	0.000	00.000
	0.000	1.000	1.000	0.000	50.000
	0.000	0.000	1.000	0.000	25.000
Allele Frequency	**0.333**	**0.167**	**0.500**	**0.333**	
Succinic Dehydrogenase	1.000	0.000	0.000	1.000	50.000
	1.000	0.000	0.000	1.000	66.667
	1.000	0.000	0.000	0.000	25.000
	0.000	0.000	0.000	0.000	0.000
	0.000	1.000	0.000	0.000	25.000
	0.000	0.000	1.000	0.000	25.000
	1.000	0.000	1.000	0.000	50.000
	0.000	0.000	0.000	0.000	0.000
	0.000	1.000	0.000	0.000	25.000
	0.000	0.000	1.000	1.000	50.000
	0.000	0.000	0.000	1.000	25.000
	1.000	1.000	1.000	0.000	75.000
Allele Frequency	**0.417**	**0.250**	**0.333**	**0.333**	

Table II shows the total allele frequency in all the four taxa studied, depicting the affinity between them. It is calculated on the basis of total allozymes detected.

Discussion and Conclusions:

The investigation carried out could be helpful to find the co-relation among different families which shows affinities and to discuss the link between them. Here one taxon i.e. only Leucas biflora has been studied for five different plant enzymes so as to know about how far this data is reliable to establish the link between close families like Acanthaceae, Lamiaceae, Scrophulariaceae and Lentibulariaceae.

The use of new cladistics in taxonomy for ascertaining taxonomic similarities is recent at infra specific, generic and family level. In this aspect, the present investigation could be helpful for the taxonomists in ascertaining the new data. Earlier, in nineteenth century many taxonomists make use of phytochemical investigations, cellular details and took support of the embryological findings. The isozymes have been used for

the first time as a tool in the identification of some *Curcuma* species (Apavatjrut et al., 1999). Molecular markers proved to be effective in presenting the reliable data in deciding the positions of certain families. The isozyme data in the present investigation has been proved to be helpful in making the taxonomic clusters. For eg. One is of Acanthaceae and Scrophulariaceae and second of Lamiaceae and Lentibulariaceae .

Lange and SchifinoWittmann (2000), Batista and Sosa (2002), Fu and Dane (2003), Mateu-Andres (2004), Gonzalez Astorga et al. (2004) and Jaaska (2005). Das and Mukherjee (1997), and Kofi et al (2009) combinely analysed the isozyme data to confirm the taxonomic alignment. The isozyme data in the present investigation has been proved to be helpful in making the taxonomic clusters. For eg. One is of Acanthaceae and Scrophulariaceae and second of Lamiaceae and Lentibulariaceae .

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Ayurvedic Application of Butea monosperma and its histochemical investigation

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Abstract:
The histochemistry of plant is used to study of anatomical characters as well to find out synthesis and storage of metabolites. Each and every plant have medicinal importance but we does not know which plant parts have much more Synthesis and accumulation of actives Compounds. Plant parts like leaves ,stem ,roots bark are sources of production of one or more metabolites through this technique a correct detection of secretion and accumulation we can find out ,so we can used only that plant parts Systematic screening of them may result in the discovery of novel effective compounds. This studies helps in Histochemical investigation of Butea Monosperma, these plants have many folk medicinal used.
Key Words- Histochemistry, Butea monosperma, folk medicine

Introduction:

Histochemistry is the branch of histology handling the identification of chemical additives of cells and tissues. Starch deposition occurs extensively in the plant body, but the specifically not unusual locations of its accumulation are seeds, the parenchyma of the secondary vascular tissues within the stem and root, tubers, rhizomes and corn (V. B. Kadam, 1999) Starch and proteins are the main ergastic materials of the protoplasm (E. Kuster etal 1996). Fat are extensively distributed inside the plant frame and that they probably occurs in small quantity in every plant cellular (W. Seifriz., 1936). Fats are not unusual reserve fabric in seeds, spores and embryos in meristematic cells. Glucosides are the degradation made from the carbohydrates

Butea monosperma (Lamk.) is a quintessential tree. Tribals use its plants and younger fruits. The plant is used in Ayurveda, Unani and Siddha medicine for diverse ailments. nearly all the elements of the plant namely root, leaves, fruit, stem bark, flora, gum young branches are used as medicine, food, fiber and for other miscellaneous functions including fish poison, dye, fodder, utensils, etc. about forty five medicinal makes use of are related to the plant and out of those claims nearly half of the wide variety of claims have been scientifically studied and said these observations are noteworthy for further studies on present day medical lines. (Burli and Khade, 2007) Flowers are soaked in water in a single day and a cup of this infusion is drunk each morning towards leucorrhoea until remedy (Patil, et.al. 2006).

Histochemistry techniques:-

Fresh plant material are used for sectioning and prepare permanent for studies of histochemistry. Jeffery's fluid (Johansen, 1940) and Johansen (1940) and Gurr (1965). The specific tests achieved are indexed in Table

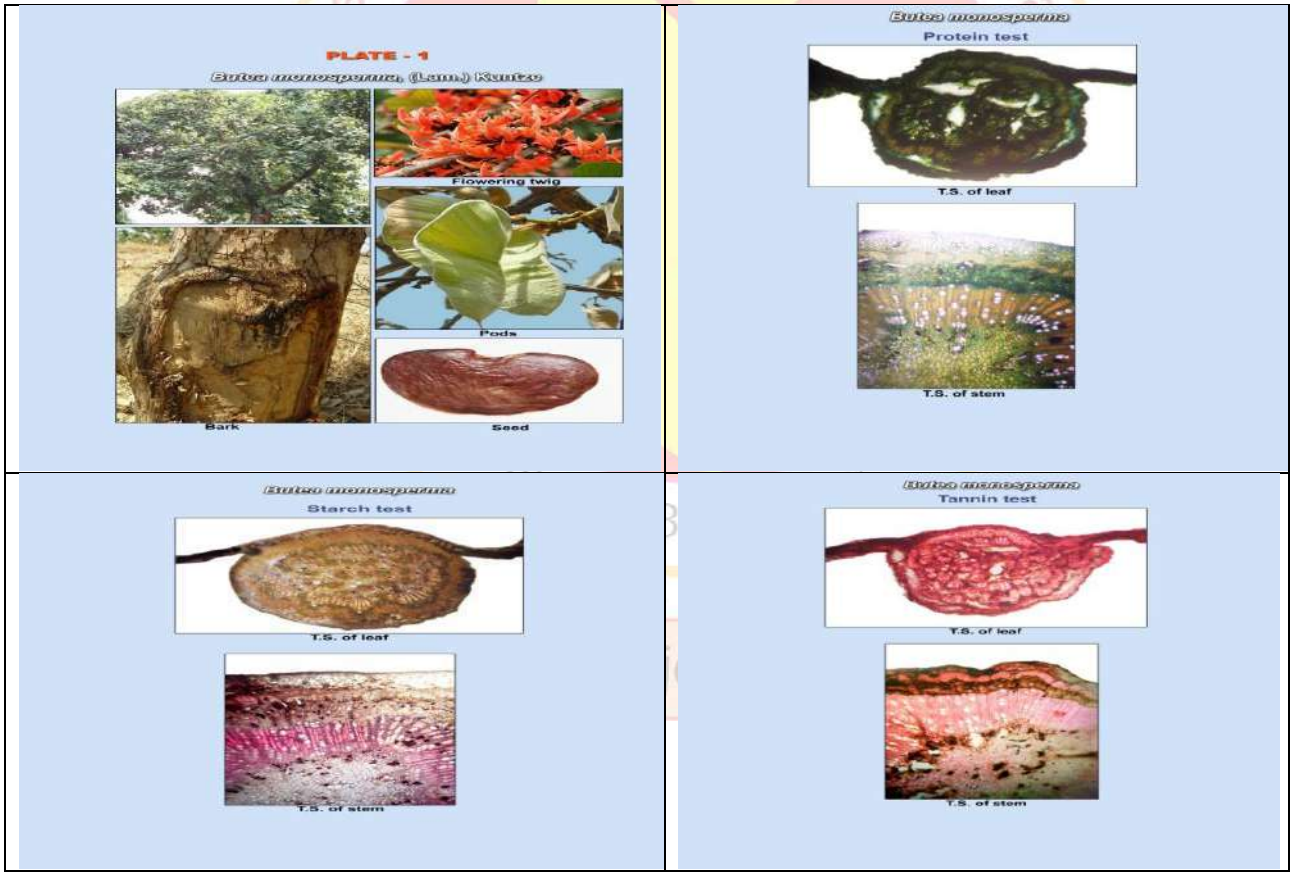
Sr. No	Erastic Content	Chemical Test	Reference:
1	Starch	Iodine, Potassium iodide soln. (IKI Solution.)	**Johansen (1940) and Gurr (1965)**
2	Protein	Potassium Ferro cyanide, Glacial acetic acid	**Johansen (1940)**
3	Tannins	10% ferric chloride solution (aq)	**Johansen (1940) and Gurr (1965)**
4	Saponin	Conc. Sulphuric Acid	**Johansen (1940)**
5	Fats	Sudan III Sudan IV	**Johansen (1940)**
6	Glucosides	Phloroglucinol in 90% alcohol+20% hydrochloric acid	**Johansen (1940) and Gurr (1965)**
7	Alkaloids	a) Idonine solution	**Johansen (1940)**
		b) dil. Nitric a cid	**Johansen (1940)**

Loose hand cutting of plants parts of Stem and leaves are used for histochemical studies with reference to Johansen and Gurr different reagent is used for study of localization of different metabolites Viz starch,

protein, tannin, saponin, fat, glucosides and alkaloids within the tissues (Johansen, 1940). The tests employed was observe:

Studies of histochemistry s of actives compound (metabolites) likes carbohydrates, protein, fats, tannin, saponin, glucoside and alkaloids reacts with specific reagent it offers diverse color stains in section through which accumulation of a few metabolites of the plant is localized in leaf and stem phase describe in table no 2 and picture plate no1

1) Most of starch accumulated in common places like in the parenchyma of the secondary vascular tissue in stem and roots, tuber, rhizome and corms inside the present work, for the taxa under examine, starch become found in leaves and timber of all of the taxa,
2) Protein have been observed within the top and; decrease dermis, scattered cells of mesophyll of leaves, pith parenchyma and cortical parenchyma inside the stem
3) Tannin additionally display distributions, taking place usually in dermis, mesophyll cortical as well as parenchymatous tissue, associated with conductive tissue. Tannins had been discovered inside the leaves
4) Saponin: were discovered within the mid-rib parenchyma of leaves and cortex and pith parenchyma of timber and inside the cells of mesophyll and xylem parenchyma in stem
5) Fats: In taxa underneath take a look at, fat was observed in cells of mesophyll and phloem parenchyma (leaves and stem)
6) Glucoside: Glucosides are the degradation production of carbohydrates glucosides were determined in the dermis ,pith parenchyma of leaves vascular bundles and scattered cells of medullary ray of stem
7) Alkaloids: have been located within the scattered cells of mesophyll of leaves and pith parenchyma of stem .In wanger's reagent, alkaloids were located inside the cells of mesophyll and cells of cortex parenchyma and pith parenchyma of stem



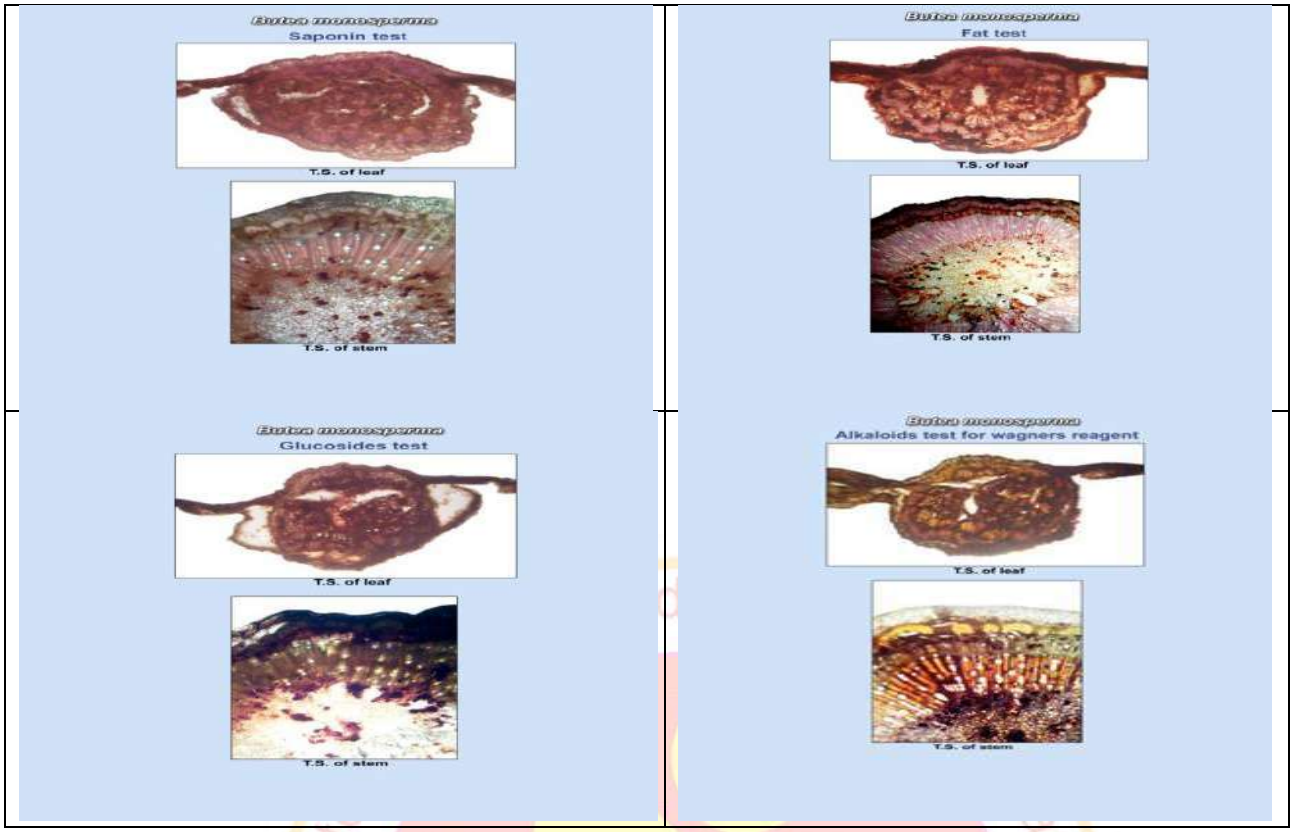


Photo plate shows slides of leaves and stem T.S of histochemistry of Butea monosperma

Sr. No.	Ergastic content	Reaction		Localization	
		Leaves	Stem	Leaves	Stem
1	Starch	$^{+}$ve	$^{+}$ve	Scattered cells of mesophyll, Mid –rib pith parenchyma,	**Cortical parenchyma, Medullary rays, Vascular bundle, and Pith parenchyma**
2	Protein	-do-	-do-	Epidermis, Scattered cells of mesophyll, mid – rib Pith parenchyma	**Epidermis, Scattered cells of Cortex and Pith parenchyma, and Phloem parenchyma.**
3	Tannin	-ve	-do-	-----	**, Scattered cells of Cortex and Pith parenchyma**
4	Saponin	-ve	-do-	----	**Epidermis, Scattered cells of Cortex parenchyma, and Pith**
5	Fat	-do-	-do-	Upper and lower epidermis, Scattered cells of Mesophyll cells and Mid –rib	**Cortical parenchyma, Medullary rays, Scattered cells of Pith parenchyma.**
6	Glucoside	-ve	-ve	-----	**-parenchyma, pith**
7	Alkaloids	-do-	-do-		
	a) Mayer's reagent	-do-	-do-	Cells of Mesophyll, Mid –rib	**Cortex, Xylem parenchyma, and Pith parenchyma.**

	b)Wagner's reagent	**-do-**	**-do-**	**Upper and lower Epidermis, Mid – rib parenchyma.**	**Epidermis, Cortical parenchyma, Medullary rays and Vascular bundle and Pith parenchyma**

Results and Discussion

Histochemical test for fresh section of leaves and stem of *Butea Monosperma*Conclusion

The present helps to save the medicinal plant through histochemical studies through this technique we find out sites of secretion and accumulation of bioactive compounds of the plant. Many plants are used as folk medicine through these techniques people get aware which plant parts are used instead of whole plants the identification of the chemical compounds of the species and its histolocalization contribute to enlarging the pharmacognostic knowledge about this species.

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Preliminary phytochemical screeningof stem bark of *Ficus hispida* L.

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Abstract

Skin infections create physiological and anatomical problems and also affect the social life of an individual. Plant medicines prove to be very effective in simple as well as chronic dermal disease.Traditional medicinal resources,especially plants, have been found to play a major role in managingdermatological ill conditions. The need of the hour is to screen a number ofmedicinal plants for promising biological activity against skin diseases. Hence the present study has been undertaken to investigate the phytochemical constituents from the extract of stem barkof Ficus hispida L.by using six solvents i.e., petroleum ether, benzene, acetone, chloroform, ethanol and distilled water.Preliminary phytochemical analysis revealed the presence of Carbohydrates, saponins, flavonoids, alkaloids, glycosoids, proteins, phytosterols, steroids, terpenoids and phenols in stem bark extracts.This indicates potential of stem bark of Ficus hispida L. in treatment of skin diseases.

Keywords *- Corticosteroids, Dematological, Leprosy, Phytosterols.*

Introduction

The skin as the largest organ of the body, play a number of vital role such as in protection, thermoregulation, percutaneous absorption, sensory and secretory activity. The acidic sebaceous secretions and surface of skin are aggressive to many pathogens. The rich blood and lymphatic supply of the dermis ensures that both specific and nonspecific immune responses can be quickly recruited against pathogens that invade the skin. The skin defense system may however, be compromised if the surface is penetrated via injury or thinned from the used of corticosteroids, excoriated by inflammatory processes (Barrister *et al.*2000). Disease of the skin may in their turn sharply and deeply affect the whole organism. General indisposition and loss of sleep in certain skin diseases which cause itching may serve as an example of such affections.

Psoriasis, Leprosy, vitiligo etc are among diseases that affect the aesthetics, appearance and social life of the patients. Use of herbal medicine can help the patient with dermatological disease to the quality of his social life which was impaired due to his disease condition. Traditional medicinal resources, especially plants, have been found to play a major role in managing dermatological ill conditions. The demand for herbal medicines is increasing rapidly due to their lack of side effects. Further as the health care costs continue to rise, there is attraction for low-cost remedies. The need of the hour is to screen a number of medicinal plants for promising biological activity against skin diseases. Hence the present study has been undertaken for preliminary phytochemical screening of *Ficus hispida* L.used for treatment of manifestations caused by microorganisms causing skin diseases.

Material and Methods

The material of study i.e., stem bark was collected and washed thoroughly with running tap water and after complete shade drying the plant material was grinded. The grinded plant material of 25 gms was taken in Whatman filter paper No.1. The extraction was done by using Soxhlet's extraction method with analytical grade refluxing solvents like.

a. Petroleum ether
b. Benzene
c. Acetone
d. chloroform
e. Ethanol
f. Distil water

The liquid extract obtained in each solvent was concentrated by distilling of the solvent and then evaporated to dryness at room temperature. At the completion of extraction process, the plant extract was used for the qualitative estimation of carbohydrates, saponins, tannins, flavonoids, alkaloids, glycosides, proteins, steroids, phytosterols, phenols and terpenoids.

Phytochemical analysis

Preliminary qualitative phytochemical screening was carried out for each solvent with the following methods.

1. **Test for Detection of carbohydrates :** Molisch's Test: To a small quantity of extract 10 ml of distil water and two drops of Ethanolic naphthol (20%) and 2ml of concentrated Sulphuric acid were added, formation of reddish violet ring at the junction indicates presence of carbohydrates.

2. **Test for Detection of Saponins :** Foam Test: 2 ml of extract was added to equal amount of distil water and shaken in a graduated cylinder for 15 minutes lengthwise. Formation of 1 cm layer of foam indicates the presence of saponins (Kumar *et al*., 2009).
3. **Test for Detection of Tannins:** Ferric Chloride Test: Small Quantity of extract was taken separately in water, 2-3 drops of 5% ferric chloride was added. Formation of black or green colour indicates the presence of tannins.
4. **Test for Detection of Flavonoids :** Sulphuric Acid Test: A fraction of extract was treated with concentrated sulphuric acid and observed for formation of orange colour.
5. **Test for Detection of Alkaloid**s : Mayer's Test: To 2ml of plant extract, 2ml of concentrated hydrochloric acid was added then few drops of Mayer's reagent were added. Presence of green colour or white precipitate indicates the presence of alkaloids.
6. **Test for Detection of Glycosides :** Sulphuric Acid Test: To 2ml of plant extract, 1ml of glacial acetic acid and 5% ferric chloride was added then few drops of concentrated sulphuric acid were added. Presence of greenish blue colour indicates the presence of glycosides.
7. **Test for Detection of Proteins and Amino acids :** Ninhydrin Test: To 2ml of plant extract, few drops of 0.2% Ninhydrin was added and heated for five minutes. Formation of blue colour indicates presence of proteins.
8. **Test for Detection of Steroids and phytosterols :** Sulphuric Acid Test: To 1 ml of plant extract, equal volume of chloroform and few drops of concentrated sulphuric acid were added. Formation of brown ring indicates the presence of steroids and formation of bluish green colour indicates the presence of phytosterols.
9. **Test for Detection of Phenols :** Ferric Chloride Test: To1 ml of plant extract, 2ml of distilled water followed by few drops of 10% ferric chloride was added. Formation of blue or green colour indicates presence of phenols.
10. **Test for Detection of Terpenoids :** Salkowski test: To 2ml of plant extract 2ml of chloroform and 3ml of concentratedsulphuric acid was carefully added to form a layer. Reddish brown coloration at theinterface is formed indicating the presence of Terpenoids.

Result and Discussion

The detail study of ethno-medicinal plants used in Skin diseases revealed that the most of these diseases remained incurable by the use of modern drugs. The treatment using modern drugs is costly, time consuming and have many side effects. Plant medicines and cosmetics are considered to be more beneficial in treatment of skin disease like psoriasis, eczema dermatitis, vitiligo, candidiasis, athlete's foot, carbuncle, ketosis, acne, pimples, wart, hives and ageing signs etc.

The observations in general revealed that mostly medicinal plants are concerned with traditional medicinal system.In the present investigation preliminary phytochemical investigation in different extracts of *Ficus hispida* L. stem bark showed the presence of phytochemical constituents namely carbohydrates, saponins, flavonoids, alkaloids, glycosoids, proteins, phytosterols, steroids, flavonoids, terpenoids and phenols.

Carbohydrates and proteins which were present in petroleum ether, benzene, chloroform and distilled water extract work together to maintain barrier functions of skin in face of everyday challenges. Saponin was extracted in all extracts except ethanol, shows protection against UV damage. Tannins and flavonoids was found in acetone and ethanol extract accountable for the potent antioxidant capacity of *Ficus hispida* L. Alkaloids showed positive test for petroleum ether, benzene, acetone and ethanol, alkaloids have extensive pharmacological activity such as antioxidant and anti-inflammatory. Glycosides are present in petroleum ether, benzene, chloroform and distilled water extract showed significant antioxidant, antifungal and antibacterial activity.

Phytosterols and steroids showed positive test for petroleum ether, acetone and ethanol. Phytosterols have anti-aging property whereas steroids are very effective in helping in itching and irritation. Phenols are present in acetone, ethanol and distilled water extract; they present antimicrobial, anti-inflammatory or anti-aging actions. Terpenoids showed positive test for petroleum ether, acetone, ethanol and distilled water extract it used to enhance skin penetration and prevent inflammatory disease.

Table 1: Preliminary Phytochemical Screening of various extracts
(Obtained by Successive solvent extraction of plant material)
Ficus hispida L.Present:- **'+ ve'** and Absent:- **'- ve'**

Sr. No	Secondary metabolite	S_1 Petroleum ether	S_2 Benzene	S_3 Acetone	S_4 Chloroform	S_5 Ethanol	S_6 Distil water
1	Carbohydrates	+	+	---	+	---	+
2	Saponins	++	+++	+	+	---	+
3	Tannins	---	---	++	---	+++	+
4	Flavonoids	+	---	+++	---	+++	+
5	Alkaloids (Mayer's test)	++	+++	++	---	++	---
6	Glycosides	+	+	---	+	---	+
7	Proteins	++	++	---	++	---	+
8	Phytosterol & Steroids	+	---	++	---	+	---
9	Phenols	---	---	++	---	+++	+
10	Terpenoids	+	---	+++	---	++	+

Conclusions

The results of phytochemical analysis of stem bark of *Ficus hispida* L. showed presence of many phytochemical constituents which has potential to cure many infectious diseases. The curative potential of ethno-medicinal plants studied during the present investigation will be helpful to evaluate the effectiveness of herbal medicine against skin diseases.

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Study of Diversity of Mollusca and Fish in Borgaon Dam District Yavatmal, Maharashtra, India

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Abstract:-

Molluscan and fish diversity of Borgaon dam Dist Yavatmal Maharashtra have been studies during June 2019 to May 2021 of Borgaon dam of Yavatmal, District Yavatmal and factor which affecting on them. Study reveals that molluscan diversity in Borgaon dam of Yavatmal region, Dist. Yavatmal, Maharashtra, India, reported that total of 18 fish species were recorded and 14 species of molluscs from the dam. The dominant class Gastropoda of Mollusca was dominated by 14 species including Pila globosa, Thiara scabra, Melanoides tuberculata, Bellamya bengalensis, Lymnaea accuminata, Lymnaea lutiola, Indoplanarbis exustus, Zootecus insularis, Tarebia lineate Cerastua maussonianus Filicaulis alte, Laevicaulis alte, Senperula maculata and Rachis punctatus.. Ichthyo fauna of Borgaon dam Dist Yavatmal Maharashtra were dominated by major carps with 10 members belonging to cypriniformes including Labeo rohita, Catla catla, Cyprinus carpeo, Cirrhinus marigala, Labeo calbasu, Labeo bata, Labeo fimbriatus, Puntius sarana followed by 6 members of family siluriformes including Clarius batrachus, Mystus bleekeri, Mystus vittatus, Ompak bimaculatus, Wallago attu, Heteropnoustes fossilis, Amblypharyngodon mola, Puntius sophore and one genera with two species of family channiformes represented by Channa punctatus and Channa striatus. The composition, distribution of benthic organisms over a period of time provide index of the ecosystem as well as sustain a rich molluscan and fish fauna.

Key Words:- Borgaon dam, Mollusca, Ichthyo fauna, cypriniformes.

Introduction:-

The Phylum Mollusca is a second largest phylum in invertebrate. Molluscan are soft bodied animals with or without calcareous shell adapted to almost all habitats with varied ecology. Molluscs are divided into freshwater, marine and terrestrial forms. It includes snails, slugs, clams, oysters, mussels, scallops, cuttlefish, squid and octopus. All the molluscan comprises in three groups, Gastropods, Bivalves and Cephalopods. The freshwater ecosystems in India harbour a rich diversity of molluscs, representing 212 species belonging to 21 families. Of these, 164 species were recorded from rivers and streams (Subba Rao, 1993). Biodiversity is one of the important lives supporting system on the earth. Molluscs are found in various habitat and are divided into freshwater, marine and terrestrial forms. The freshwater Mollusca play an important role in water ecosystem. Gastropoda is extremely diverse group in Mollusca and adapted to all habitats, includes snails and slugs. Bivalves as a group have no head and it characterized by a shell that is divided from front to back into left and right valves. They include clams, oysters, mussels and number of families that live in freshwater (Subba Rao,1989; Patil and Talmale, 2005; Kumar and Vyas 2012; Tripathy and Mukhpadhyay, 2015). Aquatic ecosystem provides a home to many species including phytoplanktons, zooplanktons, aquatic plants, insects, molluscans etc. They are organized at many levels from smallest building blocks of life to complete ecosystems, encompassing communities, populations, species and genetic levels. All aquatic ecosystems around the globe are generally colonized by the representatives of phylum Arthropoda and Mollusca. Benthic invertebrates occupy the bottom of water body. The functional role of benthic communities in the trophic dynamics of river ecosystem is well acknowledged. The composition, distribution of benthic organisms over a period of time provide index of the ecosystem. In recent years, there is a greater emphasis world over for better understanding of benthic environment, For present study the Borgaon dam is selected which was constructed as part of Irrigation Projects by the Government of Maharashtra in the year 1993. It is built on and impounds a local Nallah River. Nearest city to dam is Yavatmal in Yavatmal District of Maharashtra. The dam is an Earth fill Dam .The purpose of the dam is for Irrigation. The Length of dam is 830 m (2723.1 Feet) , while the Height of the dam above lowest foundation is 20 m (65.6168 Feet) . The above lake is used for fishing and bird watching. As per availablity of Literature no authentic data on various species of Mollusca was found Borgaon dam . So present work has carried out to study the diversity of molluscan in Borgaon dam.

Study Area:-

Borgaon dam is 10 km from city Distric Yavatmal located near village Borgaon at 20.3533°N, 78.5879°E which was constructed by the Government of Maharashtra in 1975. It contains rich treasure of flora and fauna. It is fresh water annual lake; water is used for irrigation as well as fishing Purpose by the villagers map.

Material And Method:-

The present work was carried out from studies during June 2019 to May 2020 in Borgaon dam near Borgaon . District. Yavatmal. The sample were hand picked from surface area and by fishing net submerged

surface. The few collected live samples were Preserved in 70% ethanol and dead sample were washed, dried and photographer were taken by Nikon D 5000 camera and species were identified from the handbook an Indian freshwater Mollusca by Ramkrishan and Dey,2007

Result And Discussion:-

Molluscs, a group of most diverse and dominant benthic fauna in water bodies, the Borgaon dam is harbors a number of aquatic weeds in the submerged as well as floating state. Molluscans are of great significance because they form the food of fishes and their productivity play an important link in the food chain. In present study, It was come to notice that molluscan specimens were represented in Borgaondam by only one doinated class Gastropoda. The quantitative analysis of molluscs was not done but it observed that Bellamya species, Pila globosa species and Lymnaea species was the dominant than other because the shell of these species were seen scattered throughout the margin of dam compared to other species.

Observation Table:-

Table 1. Systematic classification of molluscan species observed in Borgaon Dam during June 2019-May 2021 Class Order Family Genus and species of Gastropoda

Sr.No	Class	Order	Family	Genus and Species
1.	Gastropoda	Pectinibranchiata	Pilidae	Pila globosa (Swainson)
2	Gastropoda	Mesogastropoda	Thaiaridae	Thiara scabra (Muller)
3	Gastropoda	Mesogastropoda	Thaiaridae	Melanoides tuberculata (Muller)
4	Gastropoda	Mesogastropoda	Thaiaridae	Tarebia lineate (Benson)
5	Gastropoda	Stylommatophora	Viviparidae	Bellamya bengalensis (Lamark)
6	Gastropoda	Stylommatophora	Cerastuidae	Cerastua maussonianus (Petit)
7	Gastropoda	Stylommatophora	Veronicellidae	Laevicaulis alte (Ferrussac)
8	Gastropoda	Stylommatophora	Veronicellidae	Senperula maculate (Templeton
9	Gastropoda	Stylommatophora	Subulinidae	Zootecus insularis (Pfieffer)
10	Gastropoda	Stylommatophora	Enidae	Rachis punctatus (Anton)
11	Gastropoda	Stylommatophora	Lymnaeidae	Lymnaea accuminata (Gray)
12	Gastropoda	Stylommatophora	Lymnaeidae	Lymnaea lutiola (Gray)
13	Gastropoda	Stylommatophora	Planorbidae	Indoplanarbis exustus (Deshayes)
14	Gastropoda	Soleolifera	Veronicellidae	Filicaulis alte (Ferrussaca)

* Not directly found in water but on grass, moist soil and under rocks near Dam

Table 2. Fish species observed in Borgaon Dam during June 2019-May 2021 Family, Genus and species of Fishes .

Sr.No.	Family	Genus and Species
1	Cyprinidae	*Labeo rohita*
2	Cyprinidae	*Catla catla*
3	Cyprinidae	*Cyprinus carpeo*
4	Cyprinidae	*Cirrhinus marigala*
5	Cyprinidae	*Labeo calbasu*
6	Cyprinidae	*Labeo bata*
7.	Cyprinidae	*Labeo fimbriatus*
8	Cyprinidae	*Puntius sarana*
9	Siluriformes	*Clarius batrachus*
10	Siluriformes	*Mystus bleekeri*
11	Siluriformes	*Mystus vittatus*
12	Siluriformes	*Ompak bimaculatus*
13	Siluriformes	*Wallago attu*
14	Siluriformes	*Heteropnoustes fossilis*
15	Siluriformes	*Amblypharyngodon mola*
16	Siluriformes	*Puntius sophore*
17	Channiformes	*Channa punctatus*
18	Channiformes	*Channa striatus*.

* Directly found in Dam water collected by fisherman's.

Number of workers conducted studies on molluscan diversity in different parts of India the freshwater ecosystem in India harbors a rich diversity of molluscs representing 212 belonging to 21 families out of these 164 species recorded from river and streams. Mollusca perform key role in functioning the aquatic ecosystem. The availability of maximum molluscs during summer months could be related to two important ecological phenomenons. Kumar and vyas, reported the eleven species of molluscs from narmada sagar, out of which 8 species comprises of Rachis bengalensis, R. punctatus, Bellamya bengalensis, Melanoides tuberculatus, M. seabra, Lymnaea acuminate, L. lutola and Indoplanorbis exustus. The species of freshwater molluscs as gathered in the present study were quite different and also as reported earlier by some authors. 23 A study on the molluscan diversity of saipung wildlife sanctuary, Meghalaya. Revealed 13 species of molluscs, out of which 12 species were identified as gastropoda and 1 species of Bivalvia bengalensis, F.annadalei, Pila theobaldi, Thiara (lareba) lineata, Brotia (Antimelania) costula, Paludomus (poludomus) Conica, P. (P.) regulaa,, P. (P) Stephanus and Indoplanorbis exustus. Water temperature exhibit a positive correlation with molluscs during 2 years of present study. This shows that increase in temperature within the observed range favors. The growth of molluscs. As per the finding of researcher from above data. The generic as well as species diversity seen in freshwater aquatic ecosystem in different region, Tyagi, 2018 mentioned that there was a variation in molluscan diversity in different freshwater bodies as earlier studied by different researcher which was not due either a single factors is responsible for such variation. Malhotra et.al. 1996 reported the maximum molluscas during summer month could be related to some ecological important phenomenon's such as maximum abundance of decomposers, settled organic matter and macrophytes on bottom of water body and also increase water temperature activating the process of decomposition of organic sediments. Bath et.al. observed that the important for breeding and feeding of the molluscs. Borgaon dam is due to moderate amount of water, temperature and available micro vegetation and decomposers. The abundance of molluscan fauna from present study area indicates the rich productivity. The species inhibiting bottom of lake plays an important role in converting organic matter together with the microbenthos into a biomass, which in turn consumed by the fishes thus help in the secondary productivity and form an important component in the food web of ecosystem.

Conclusion:-

It can be conclude from the present study that among the selected site. The freshwater mollusks and fishes aid in assessment of ecological status of water bodies. The study relevant to the diversity distribution and ecology become imperative during the study. Present study observed the present status of mollusks and fish shows richness of Borgaon dam. Some anthrogenic activities may be consider as a threat to the mollusks and fishes as well as other living organisms of this dam. Hence the mollusks and fishes have a tremendous impact on Indian tradition and economy and it is also considered as bioindicatores of pollution and ecosystem health. The identification, taxonomic account and distribution of mollusks and fishes found in Borgaon dam is useful for better management and Borgaon dam region.

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Review on Effect of EMS as a Chemical mutagen for improvement of Legume Cropsvarieties

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Abstract

Mutation is defined as any heritable changes in an individual's genome and phenotype. In the hands of plant breeders, mutation breeding is the most potent and effective weapon available. It has been used to improve morphological and physiological characters, disease resistance, draught resistance and quantitative characters including yielding ability.

It is a cheap and fast method of developing new improved varieties.Plant breeding aims to generate novel, high-yielding, and improved cultivars by examining genetic variability in important qualities. The chemical ethyl methane sulfonate (EMS) is routinely used to cause mutations at loci that control economically important features.

Keywords: *Mutation, Phenotype, breeding, cultivar, EMS.*

Introductions:

Hugo de Vries first time used the term "mutation" in 1901. Mutation is described as a change in the number or sequence of nucleotides that is permanent and relatively uncommon. The genetic improvement of crop plants for various economic characters through the use of induced mutations is referred to as mutation breeding.

Mutations have been induced using physical mutagens such as X-rays, Gamma rays, fast and thermal neutrons, heavy ion beams, and chemicals such as EMS, DES, and SA. As of now, 408 mutant varieties of food legume crops from 24 distinct crop species have been released for cultivation utilising mutation procedures around the world (Kharkwal et al., 2005).

There is immense scope to enhance mineral nutrient (biofortification) and essential amino acid contents of human food as well as animal feed along with altered protein and fatty acid profiles, physicochemical properties of starch, enhance phytonutrients in fruits and reduced antinutritional factors in staple food grains. Induced mutations could play a key role in inducing mutations in crop plants to improve nutritional quality. 776 mutant varieties have been recognised for their improved nutritional qualities among the globally developed 3,000 mutant types. (Jain et. al., 2011).

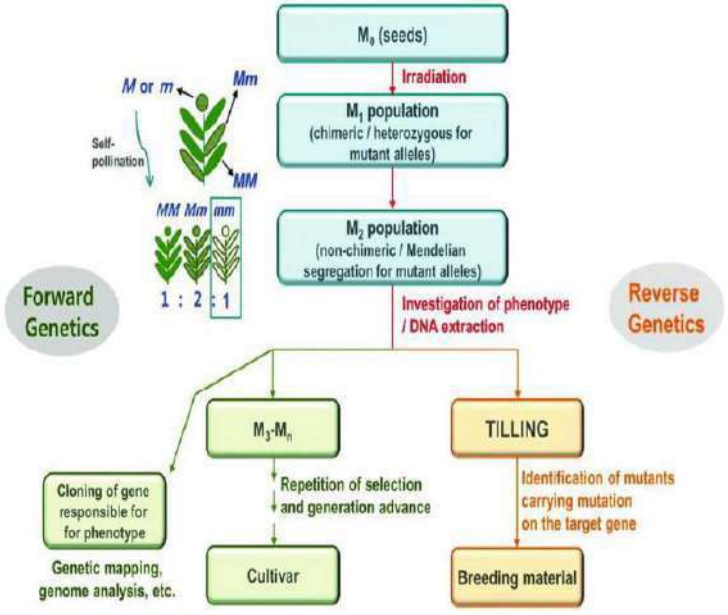

Fig.1. Mutation breeding integrated use with modern techniques.
Source: Directly taken from Jo and Kim, 2019.

Development of legume mutant varieties:

Physical or chemical mutagens can cause mutations. This is an excellent method for increasing genetic diversity for use in functional genomics and plant breeding. There have been 3,218 mutant varieties released around the world so far. Free exchange of mutant material and deployment in locations where farmers' needs are vital can maximise the use of mutant lines around the world.

Mutagenesis can be made more beneficial in the improvement of crop plants with the help of well-defined objectives in national research programmes, the availability of effective mutagenesis techniques, and efficient phenotype screening tools. Mutant identification/selection at the genotypic level, using new, high-throughput technologies, has changed the way mutations are now used in genetics and breeding.

Chemical mutagens are popular in in-vitro mutation induction, although irradiation can also be applied at low doses, EMS has become the mutagen of choice for developing mutant populations for high throughput screening such as in developing TILLING populations (Pathirana et. al. 2016)

As a result of sustained efforts through the use of physical and chemical mutagens, the IARI institute has made important contributions in understanding of induced mutagenesis(Kharkwal et al., 2004, 2005) and also achieved major success in developing eleven high yielding, disease resistant and agronomically suitable mutant varieties in several crops like chickpea,cow pea, field pea, pigeonpea and soybean(Kharkwal et al, 2004, Kharkwal et al., 2008).

Sagade (2008) used gamma rays, EMS, and MMS to achieve dramatic results in quantitative features in urdbean.

In Chickpea (Cicer arietinum L.) Var. Virat, the effect of Ethyl Methane Sulphonate (EMS) on seed germination and seeding injury was investigated. With rising EMS concentrations, the percentage of seeds germination reduced and seedling damage rose. Chickpea yield has not increased significantly in the last ten years. (Barshile et. al., 2006).

One of the reasons for chickpea's failure to achieve breakthrough productivity has been suggested to be a lack of genetic variety.Long pod mutants with greater diameter are a beneficial variant that can be used to boost seed yield by increasing the number of seeds per pod and seed size.

Long pod mutants with gamma rays, EMS, HZ, and SA in mungbean were identified by Sharma and Singh (1992) and Wani et al. (2011). while long pod mutants with EMS, gamma rays, and their combination in cluster bean were reported by Singh and Agarwal (1986) to have higher genetic variation and yield potential.

Four gigas mutant plant types were obtained from the M2 population of Chickpea cultivar Vijay; three from 300 Grey dosage and one from 0.2 percent EMS.All gigas exhibit a dominating phenotypic appearance, with 1.5 times the height of the control, an elongated, strong stem, and wider and broader leaflets than the control. The EMS gigas has fewer primary branches and larger, smooth leaves. One of the 300 Grey dose was sterile, while the other three contained flowers and pods. In comparison to the control, one gigas (EMS 0.2%) demonstrated 10 days of early flowering (Bogawar et. al. 2017).

Physical mutagen (gamma rays at 300 and 400 Gy doses) and chemical mutagen (ethyl-methane sulphonate 0.5 percent) treatments were used to mutagenize the seeds of three desi varieties of Chickpea released from Pantnagar. M1 generation showed gradual decrease in germination with increase in mutagen strength in addition to this, combination treatments caused more biological damage than individual mutagen treatment. Except for two agronomic traits, number of primary branches per plant and pod length, variation for variety demonstrated considerable differences in M2 generation..For eight traits, including yield per plant, all types of mutagenic treatments and variety treatment variance were significant (Dinkar et. al.,2020). Chickpea secondary branch number grew significantly in both the 300 Gy alone and the combination treatment with 0.5 EMS treatments. For several traits, the genotypic response was variable at different mutagenic levels.Although none of the genotypes outperformed the control for yield per plant at all of the treatment levels, one genotype, PG114, showed a substantial improvement in yield component trait pods per plant at 300 Gy + 0.5 percent EMS (Dinkar et. al.,2020).

M2 generation showed a complete positive trend of shift as a result of EMS treatment to mungbean, with lower and moderate doses of the mutagens increasing the mean number of seeds per pod and 100-seed weight, whereas M3 generation showed a complete positive trend of shift as a result of EMS treatment to mungbean. By increasing the quantity of seeds per pod and seed size, long pod and bold seeded mutants can be employed to increase yield potential The genotypic coefficient of variation, heritability, and genetic advancement in the treated population increased considerably for all of these variables, showing that mutagen-induced variability has a significant potential to improve the mungbean crop (Wani et. al. 2017).

When compared to gamma rays and combo therapies, EMS was found to be more successful at causing mutations. In this way, gamma rays were the least effective. The reaction to mutagenic efficacy was higher in the var. pusa-372 than in the var. Pusa-212 among the two Chickpea varieties (Wani 2009).

Conclusion:

From the above discussion regarding mutagens EMS (Ethyl Methane Sulphonate) is a effective chemical mutagen for the improvement of pulse crops like Chickpea, mungbean, urdbean etc. these improvement may be in the quantity or the quality of the crop.

The effect of EMS in the specified amount of dose is may be useful for the improvement of legume crops varieties and can be use as a best tool for mutational breeding to fulfil the food demand of country and having an economical value.

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Case Studies in Kidney Stone Herbal Treatment

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Abstract

The efficacy and safety of Ayurvedic drugs is a proved one, through clinical experiences, over not only hundreds but thousands of years. However, for global acceptance there is need to assess the efficacy of these drugs through scientific clinical research. A kidney stone, also known as renal calculus, is a solid concretion or crystal aggregation formed in the kidneys from minerals in the urine. If stones grow to sufficient size (usually at least 3 mm or 0.12 in) they can cause blockage of the ureter. Finally it results into renal colic. Herbal treatment was given for twelve days. Clinical follow-up was taken after 3 days, 6 days and 12 days. In all 15 studies were made to understand the efficacy of the treatment.

Keywords: *Case Studies, Kidney Stone, Herbal Treatment.*

Introduction:

During the past two decades, the cost for the development of novel drugs has tremendously increased. In parallel, the number of novel drug candidates with acceptable toxicity is decreasing. Therefore, pharmaceutical companies focused their attention on novel technologies such as genomic, bioinformatic methods and the development of macromolecular drugs (Simon, 2008; Deverka et al, 2010; Allerheiligen, 2010). The availability of sophisticated therapies developed by high-tech medical and pharmaceutical research in industrialized countries will be more and more restricted to rich elites. On the other hand, traditional medicines have been developed in almost all cultures worldwide. As a consequence, two-thirds of the world population with insufficient access to modern drugs still relies on natural medicines (Efferth, 2011).

Routine of drug development involves a synthesis of bioactive compounds (taking clues either from alternative systems or ethnobotany) and their preclinical (animal experimentation) and clinical trials before bringing the medicine in market. This is a time consuming as well as tremendously costly method. However, in the eyes of traditional healers and also researchers working in the field of ethnobotany, traditional medicines have been applied for hundreds or thousands of years in patients. Therefore, it is not obvious why the activity of natural medicines should be first tested in cell lines in-vitro or in mouse experiments in-vivo.

Uses of crude drug in treatment are almost unacceptable to the modern society. Modern society thinks that to give an 'Herbal Tea' to a patient is unethical, only because they culturally do not recognize the value of popular tradition. Best example of this mentality is the failure of herbal drug programme in Brazil. In 1970s a programme was started in Brazil to introduce the herbal preparation into primary health service. In-spite of wonderful results the programme was stopped for unknown reasons (Elisabetsky and Posey, 1994).

There has been a gradual increase in use of alternative therapy worldwide. A survey released in May 2004 by the National Center for Complementary and Alternative Medicine focused on who used complementary and alternative medicines (CAM), what was used, and why it was used. The survey was limited to adults living in the United States. According to this survey, herbal therapy, or use of natural products other than vitamins and minerals, was the most commonly used CAM therapy (18.9%) when everything else proved to be ineffective (Mwangi and Gitonga, 2014). In the United Kingdom, it is estimated that in 1996 alone, at least 72 million pounds was spent on alternative therapies (licensed herbal medicine, homeopathic remedies and essential oils for aromatherapy). Herbal remedies are very common in Europe. In Germany, herbal medications are dispensed by apothecaries (e.g., Apotheke). Prescription drugs are sold alongside essential oils, herbal extracts, or herbal teas. Herbal remedies are seen by some as a treatment to be preferred to pure medical compounds regulated as supplements, same case with the US (Goldman, 2001). In USA approximately 40% of the annual expenditure on medicine can be attributed to sales of herbal remedies directly to the public and other naturopathic treatments (Barnes, 2002). However, in India selling the traditional drugs or practicing the local traditional health system has no legal acceptance.

In case of Ayurveda people are now actively conducting clinical trials to establish the authenticity of Ayurvedic medicines. In fact, Ayurveda has been practiced in India since ages and has stood the test of time. The efficacy and safety of Ayurvedic drugs is a proved one through clinical experiences over not only hundreds but thousands of years. However, for global acceptance there is need to assess the efficacy of these drugs through scientific clinical research.

A kidney stone, also known as renal calculus, is a solid concretion or crystal aggregation formed in the kidneys from minerals in the urine. Kidney stones typically leave the body by passage in the urine stream, and

many stones are formed and passed without causing symptoms. If stones grow to sufficient size (usually at least 3 mm or 0.12 in) they can cause blockage of the ureter. Blockage of the ureter causes decreased kidney function and dilation of the kidney. This leads to pain in the flank or lower back and often radiating to the groin or genitals. This pain is often known as renal colic. It is commonly accompanied by urinary urgency, restlessness, hematuria, sweating, nausea, and vomiting. Other associated symptoms include: fever, blood in the urine, pus in the urine, and painful urination. Urinary stones are typically classified by their location in the kidney (nephrolithiasis), ureter (ureterolithiasis), bladder (cystolithiasis), or by their chemical composition (calcium-containing, struvite, uric acid or other compounds). Calcium (calcium oxalate) is one of the most common types of component in human kidney stones. Vegetarians tend to have higher levels of citrate excretion and low risk of stone formation (Johri et al., 2010). About 80% of those with kidney stones are men. For stones pain control is usually the first measure. More severe cases may require procedures, e.g. extracorporeal shock wave lithotripsy and percutaneous nephrolithotomy.

Methodology:

In case of Ayurveda people are now actively conducting clinical trials to establish the authenticity of Ayurvedic medicines. In fact, Ayurveda has been practiced in India since ages and has stood the test of time. The efficacy and safety of Ayurvedic drugs is a proved one, through clinical experiences over not only hundreds but thousands of years. However, for global acceptance there is need to assess the efficacy of these drugs through scientific clinical research.

For case studies selection of disease was based on two important criteria-

1) The disease should be non-infectious or is the result of changed life style (life style diseases).
2) It was strictly avoided to select the critical diseases like cancer or those which need surgery.

Consent form was prepared with the help of registered medical practitioner.

Only those patients were considered who were willing to give the consent without any condition or hesitation. Before taking consent the proper counseling of concerned person was done regarding the disease for which he/she was taking the treatment and need to keep record at particular time intervals.

Consent form was also prepared for medicinemen. The most important fact mentioned in the consent form was that his formulations will not be disclosed to any other person who can take the disadvantage of his knowledge and secondly he will not face any medicolegal situation.

Case studies were undertaken to examine and establish the credibility of ethnic health practices. Collaboration was made with registered medical practitioner Dr. S. G. Kadu (M. B. B. S., Ex Medical Officer, Regi. No. 1080) and local vaidus. To make it very clear I would like to state that these are not clinical trials but is simply scientific case follow-up with the consent of patient and vaidu.

In case studies the diagnosis made by medicineman was either confirmed by registered medical practitioner or the patient started traditional/herbal treatment after the ailment was diagnosed by the doctor. All are non-comparative studies (no comparison parallel to allopathic medicine). Original papers of case studies signed by registered medical practitioner and local herbal healer as well as consent forms signed by patients are retained with author.

Study Treatment:

Fully expanded leaf of *Bryophyllum calycinum* Salisb. and fruits of *Piper nigrum* L. was given to eat on empty stomach. After half an hour, 50 ml of decoction, prepared from roots of *Hemidesmus indicus* (L.) Schult. and fruits of *Tribulus terrestris* L., was given. Treatment was repeated twice/day till relief upto twelve days. Clinical follow-up was taken after 3 days, 6 days and 12 days. In all 15 studies were made to understand the efficacy of the treatment.

Result and Discussion:

It is mainly confirmed by acute stomach-pain over the kidney angle in abdomen, difficulty in passing urine and painful urination. In all 15 case studies have been recorded. The age of the test group varies from 20 Yrs. to 78 Yrs. Period of suffering varies from 1- 4 Yrs. In all cases 6-7 days of treatment resulted in 90% relief irrespective of the period of suffering and age. In one case even sonography reports were procured. In Ayurveda, *Bryophyllum pinnatum* (Lam.) Oken (Syn. *B. calycinum* Salisb.) known as 'Pashanbhed' is used to treat the kidney stone. In Warud tahsil also traditional healers use the same plant. This shows intimate relationship between ethnomedicine and the ancient life science i. e. Ayurveda in India (Sharma, 1982).

In traditional practices whole plant or its extract or polyherbal extract are used. It is the synergistic effect of phytoconstituents in a plant which exhibit their action. It is frequently observed that single medicinal

herb or complex herbal mixture show the expected bioactivity, but during fractionation with bioactively-guided isolation of natural products the activity gets weaker and finally can even be lost. An interesting aspect in this context is that one compound of an herbal mixture may activate some proteins of a signal transduction pathway of interest, while another constituent of the mixture may activate the other proteins of the same signaling cascade. Hence the reciprocal supplementation leads to full stimulation of a signaling route and thereby therapeutic effects (Efferth, 2011). Hence there is a need to adapt traditional treatments after more scientific validation.

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An Investigation of Plant Growth and Nutrient Content by the Effect of Metal Ion and Their Complexes in Cassia Tora (Tarota) Plant

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Abstract

*In the present study Cassia Torawere taken as experimental plant in order to study effect of heavy metals and their complexes of (1S- cis)- 4- (3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine on to improve the yield of economically important plant.*Cassia tora *Linn. (Family: Leguminosae) is well known plant widely distributed in India. Different parts of the plant (Leaves, seed, and root) are reputed for their medicinal value.The seeds were immersed in Mg (II), ions, ligand and its complexes to study the germination and growth pattern and certain physiological processes. Effect of ligand, metal ion and complex solution on growth, determination of % of nitrogen, proteins and chlorophyll in the leaves of plants were studied. The data harvested indicates increased germinations in all seed treatments. The changes in growth pattern of roots length and shoots length are observed in the experimental plants. However, chlorophyll content was found to be higher in plant species. The percentage of nitrogen and proteins were found affected in the leaves of Tarota plant treated with Sartraline, complex and metal Mg(II). Nitrogen and protein contents are found higher in the treated plants as compared to control.*

Key words –Sartraline, Mg (II), Plant, Chlorophyll, Nitrogen, Protein.

Introduction:

India is virtually a herbarium of the world. In India, we are using plants and herbs as the basic source of medicine because we are rich in them. The plant physiologists not only to supply basic information regarding how plants grow and develop but also to undertake research program to increase yield of plant products. Seed germination behavior is important for horticulture and agriculture.[1,2]

Metals are acting a beneficial role for plant growth, development, and productivity at an optimum concentration in the form of the essential micronutrient[3]. To grow and complete the life cycle plants use the essential micronutrients[4]. The plant takes these essential heavy metals like iron, zinc, copper, and manganese from the soil due to concentration gradients and selective uptake of these metals[5]. These ions enthusiastically affected the function of many enzymes and cellular metabolism. These metals also play a prominent role in the synthesis of protein, nucleic acids, photosynthetic pigment, and it also take part in the structural and functional integrity of cell membranes[6].Agricultural scientists realize that crop plants grow in production to the amounts of various nutrients present in soils. Today the application of various salts to soils is a basic future of agricultural practice. With the application of these and other fertilizer to soils, the large crop yields obtained in developing. In modern agricultural practice, various chemicals in solution or aqueous suspension are sprayed on the crop plants with in the object of accelerating and modifying the plant growth and their development.Manganese (Mn) is an essential plant mineral nutrient, playing a key role in several physiological processes, particularly photosynthesis.

Some of heavy metals (Fe, Cu and Zn) are essential for plants[7].Oxines and Gibberlines are the growth promoting harmones.[8-10] Very dilute solution of these growths promoting hormone solutions, if sprayed over the plant, chlorophyll synthesis is accelerated and consequently vegetative growth has been observed. Experimental results indicate that, if the hormonal solution sprayed over crop plants, the crop yield increases to a considerable extent.

Since *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine*has intense biological activities,antidepressant, selective competitive inhibitor. Sertralineinhibits the activity of the enzymes and since no work is reported on the biological application of binary complexes of Mg (II), with *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine* and comparing with pure ligand, metal and control solution (double distilled water) to study the effect of complex, metal, ligand over control solution on germination, survival seedlings height etc, on *Tarota* plant in order to make suggestion whether complex, metal and ligands can be used as a plant growth regulator.

Also, biological analysis of chlorophyll contents and percentage of nitrogen and proteins in the leaves of leafy vegetables are carried out at room temperature.

Material And Experimental Methods:

The solution of Mg (II)in the form of nitrate and *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine*of the concentration of 0.01 M was prepared in double distilled water. The applications of complex, metal, ligand solution is studied by dissolving it in proper solvent at 3.60, 7.00 and

10.5 pH and at constant ionic strength of 0.01 M potassium nitrate solution. Fertilized soil was collected from agricultural land. It was then ground and filtered. This soil was filled in two wooden trays and tray was moistened with water. Sowing of seeds was done in the soil after one hour.Passioura J.B.[11] has studied on soil structure and plant growth. Many soils contain continuous macrospores that provided niches for the roots to grow in. The presence of such macrospores increases the extent of the root system, Soil structure not only affect the ability of root to grow and to supply the leaves with water and nutrients it also induces them to send hormonal signals that slow the growth of shoot.

Experiments Performed:

In general practice various chemicals are used in agriculture as an ingredient of various pesticides, insecticides, fertilizers etc., to improve the crop yield. Amongst several economical important plants *Tarota* is selected as a plant system.

1. 100 healthy seeds of *Tarota* were taken 3.5 and 7.00 pH for about two hours. These seeds soaked were taken out of each solution and sowed in the wooden tray in a row, the wooden tray was kept under atmospheric pressure at room temperature.
2. Effect of ligand, metal ion, complex solution on growth of Tarota (*Cassia tora) species*plants was studied at different pH (3.5 and 7.00).
3. Effect of ligand, metal Mg (II), complex on percentage of Nitrogen, Proteins and Chlorophyll in the leave of *Cassia tora* plants were studied.
4. Chlorophyll content in fresh leaves were determined by spectrophotometric method given by Jahagirdar[12].

Parameters:

Plant growth is decided on the basis of parameter such as percentage of germination, survival, seedling height, shoot length; root length and thickness of young leaf having high values compare to control systems. Germination was noted after 3 days and survival was noted after 10 days. After noting the survival of plant, they were taken out of soil. The seedling height and thickness of leaves of survived *Tarota*plants were measured.

Table 1.1-Effect of Ligand, Metal ion and Complex on Germination, Survival, Seedling height etc. on *Cassia tora*Test System.

Test System	Effect of	pH	Parameters						
			%Germination after 2&1/2 days	% Survival after 10 days	Seedling height (cm)	Root length (cm)	Shoot length (cm)	Root / Shoot	**Width of young leaf (cm)**
***Tarota*Test System**	Water (Control)	3.5	60.00	60.00	23.072	8.621	14.450	0.590	**1.65**
		7.0	66.66	66.66	23.62	8.84	14.78	0.5981	**1.620**
	Ligand	3.5	73.33	73.33	22.984	8.718	14.603	0.5970	**1.761**
		7.0	80.00	86.66	25.24	9.14	16.08	0.5440	**1.841**
	Complex	3.5	60.00	60.00	23.614	8.712	14.702	0.5925	**1.421**
		7.0	73.33	80.00	24.49	9.07	15.41	0.5885	**1.490**
	Metal	3.5	80.00	73.33	23.881	8.804	15.077	0.584	**1.850**
		7.0	**30.00**	**93.33**	**27.71**	**8.22**	**14.44**	**0.5692**	**1.843**

Table 1.2- Estimation of Chlorophyll for ***Cassia tora***Plants System

Sr.No.	Treatment	Leaves of plant	Total Chlorophyll gm/Lit.x10^{-3}	Chlorophyll 'a' gm/lit. x 10^{-3}	Chlorophyll 'b' gm/lit. x 10^{-3}
1	Control	*Tarota*	5.125	3.714	**1.754**
2	Ligand		6.725	5.921	**2.028**
3	Complex		6.873	4.659	**2.316**
4	**Metal**		**7.413**	**6.354**	**2.292**

Table 1.3 - Estimate of Total Nitrogen and Proteins in Leaf Powder of***Cassia tora***

Sr. No	Plant	Treatment	% Element			% Protein
			Nitrogen	Carbon	Hydrogen	
1		Control	7.35	38.18	6.85	**38.657**

2	*Tarota*	Ligand	7.87	37.23	6.78	**39.213**
3		Complex	8.11	35.54	6.67	**39.443**
4		**Metal**	**8.32**	**33.76**	**6.39**	**39.574**

Results And Discussion:

Germination starts when the seed shows emergence phase of growth, which begins, with penetration of embryo from the seed coat and end with the development of root and shoot system. Elongation of shoot axis follows emergence of radical.

The rate and extent of elongation is subjected to the variety of controls, including nutrition, hormones and environmental factors. Though the root and shoot development start within a fraction of time but the further developments may vary according to the nutrients required for the development of root length and length shoot independently. Therefore, root length and shoot length differs. The observation table 1.1 clearly indicates that average root length in *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine*, complex, Mg (II), at all pH increases over control.

Chlorophyll control / chlorophyll pigment were found affected in *Tarota*plant by the treatments. Total chlorophyll was found to be higher in *Tarota*.

Percentage of nitrogen and proteins were found affected in leaves of *Tarota* by the treatment of *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine*, complex, Mg (II). It is observed that percentage of nitrogen and protein are higher than that of control.

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Extraction of Natural Dyes From *Nerium Oleander* L.Flowers For Cotton And Silk Colouration

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Abstract:
Alarming environmental issues posed by largescale use of synthetic dyes in textile industries made researchers to focus on the development of safer alternatives i.e. natural dyes. In present investigation, aqueous, ethanoland alcohol extracts of flowers of Nerium oleanderused for dyeing cotton and silk.Protocol adopted were – without mordanting and with two different chemical mordant i.e. Ferrous ammonium sulphate and Copper sulphate. Aqueous extract shows lighter color shade than the ethanolic and alcoholic extracts. All extracts with mordant ferrous ammonium sulphate shows darker color than Copper sulphate. In dyeing without mordant procedure, dark and lightest colors obtained were Grey beige and Thunder respectively. It was found that mordant ferrrous ammonium sulphate exhibit darker coloration on cotton than the Copper sulphate. Dark olive and uniform were the darkest shades obtained by dyeing with mordant ferrous ammonium sulphate. While silk exhibitthree lighter coloration i.e. Surfmist, Squirrel grey and Light pewter by dyeing with mordant Copper sulphate.
Keywords: *Natural dyes, Nerium oleander, Ferrous ammonium sulphate, Copper sulphate, mordants.*

Introduction:

Nature is full of wonderful colours, which enriched our life. These colors are utilize for dyeing purposes. Colour variability and promising shades can be obtained by using synthetic dyes, they posed devastating effects in the form of pollution, health hazards, toxicity and high saturation rate in environment. As hazards of synthetic dyes are no longer unknown, evaluation of natural resources available for their possible dye yielding potential is gaining more attention in recent years.

The word "Natural dyes" comprises all those colorants that can be obtained from plant, animal or mineral resources without any chemical processing. As the food, pharmaceutical, cosmetic as well as the textile coloration industry increased demand for these dyes during the last decade, use of natural dyes has gained more importance. Certain natural dyes are known to have mutagenic effects e.g., safflower yellow and elderberry color; while some like carmine, can cause serious respiratory consequences like asthma. But yet most of them are safe, mostly eco-friendly, biodegradable,less toxic, and less allergenic as compared to synthetic dyes. In the beginning, there were dyes derived only from natural sources which were used in the coloration of textiles, food, drugs, cosmetics and also for coloration of paper leather, shoe polish, wood, cane, candles in smaller quantities (Han and Yang, 2005; Hill, 1997; Ali *et al.,* 2006; Gulrajani, 2001).

Even though natural dyes have so many advantages over synthetic dyes, non-availability in their color shades and non-efficient applicationprocedure limiting their use as a most promising dye resources. *Nerium oleander* (Syn. *Neriumindicum*) is a large, spreading, evergreen shrub with whorled branches and leaves. Flowers are red, pink or rosy colored born in terminal cymes (Dhore,2002). Present investigation is an attempt to evaluate dye yielding potential of flowers of *Nerium oleander* (red variant) for cotton and silk coloration.

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Materials and Methods:

Flowers of *Nerium oleander* L. were collected from local area of Pawan Nagar, Amravati and were identifiedby using standard flora(Dhore, 2002). Fresh flower petals of *Nerium oleander* (Red variant) were used for dye extraction and dyeing process (Figure 1).Two different fabric materials -Tasar silk and cotton fabric were bought from Amravatimarket.2% Ferrous Ammonium sulphate and 5% Copper sulphate were used as chemical mordents.Three different solvents - water, ethanol and alcohol were used for dye extraction.50 gm of fresh flowers petals of *Nerium oleander* were crushed in mortar and pestle with 100 ml. of solvent. The solution was filtered through muslin cloth to obtain dye.

For dyeing without mordanting procedure,cotton and silk fabrics were immersed directly in a dye bath solution containing dye. After dyeing, the dyed material was dried at room temperature.For dyeing with mordanting procedure,Cotton and silk were first immersed in beaker containing either 2% Ferrous Ammonium Sulpahte or 5% Copper Sulphate for 3 hours and then they were further immersed in a dye bath solution containing dye. After dyeing, the dyed material was dried at room temperature.For washing and shade analysis, dyed fabrics were washed with tap water and finally dried in air at room temperature. Pantone shade color charts system was used for matching the naturalcolorants shade.

Results and Discussions

Different shades of colors obtained from Aqueous, alcoholic and ethanolic extract of *Nerium oleander* with and without use of chemical mordantshas been tabulated in Table I and Table II (Figure 2) with their Panton shade number.

About six different color shades obtained by direct treatment of cotton and silk fabrics in dye solution. Among those darkest shade exhibited by alcoholic extract on cotton (Grey beige, Panton paint shade no. 5773) while most lighter color exhibited by alcoholic extract on silk(Thunder, Panton paint shade no. 5645). All other extracts exhibited different intermediate colors on cotton and silk fibers.

Table I: Effect of aqueous, alcoholic and ethanolic extract of *Nerium oleander*on cotton and silk without mordant.

Sr. No.	Materials	Extract	Color shade (Panton paints color chart)	Color
1	Cotton	Aqueous	5845	Dark beige
2	Silk	Aqueous	5527	Edge comb grey
3	Cotton	Alcoholic	5773	Grey beige
4	Silk	Alcoholic	5645	Thunder
5	Cotton	Ethanolic	451	Himalaya
6	Silk	Ethanolic	452	Paper bark

About twelve different color shades were obtained from aqueous, alcoholic and ethanolic extracts of *Nerium oleander* with mordantsFerrous ammonium sulphate (FAS)and Copper sulphate were tabulated in Table II (Figure 3).

Ethanolic and alcoholic extract with mordant Ferrous ammonium sulphate found to exhibit Dark olive (Panton paint shade no.418) and Uniform (Panton paint shade no. 5615) respectively on cotton which are the darkest shades while most lighter shades exhibited by silk fiber dyed by ethanolic extract with Copper sulphate (Surfmist, Panton paint shade no. 4535), alcoholic extract with Copper sulphate (Squirrel grey, Panton paint shade no. 442) and aqueous extract with Copper sulphate (Light pewter, Panton paint shade no. 5517).

Table II: Effect of aqueous, alcoholic and ethanolic extract of *Nerium oleander* on cotton and silk with mordant.

Sr. No.	Materials	Mordant	Extract	Color shade (Panton Paints color chart)	Color
1	Cotton	FAS	Aqueous	448	Best bronze
2	Silk	FAS	Aqueous	416	Gulf
3	Cotton	Copper sulphate	Aqueous	5797	Dark ivory
4	Silk	Copper sulphate	Aqueous	5517	Light pewter
5	Cotton	FAS	Alcoholic	5615	Uniform
6	Silk	FAS	Alcoholic	443	Shale grey
7	Cotton	Copper sulphate	Alcoholic	5783	Moss
8	Silk	Copper sulphate	Alcoholic	442	Squirrel grey
9	Cotton	FAS	Ethanolic	418	Dark olive
10	Silk	FAS	Ethanolic	429	Harbor grey
11	Cotton	Copper sulphate	Ethanolic	15-1218	Flaxen
12	Silk	Copper sulphate	Ethanolic	4535	Surfmist

Bhuyan and Saikia (2005) evaluated dye yielding potential of different parts of five plant species *Rubiacordifolia, Morindaangustifolia, Tectonagrandis, Mimusopselengi* and *Terminalia arjuna*and concluded that dyes obtained from native plants might be alternative sources to synthetic dyes for dyeing of natural silk and cotton. Parthsarthi and Lokesh (2015) tested efficiency of dye extracted fromdried and semidried sample (without calyx) of*Spathodeacampanulata* and found that cotton fabricdyed with water extract was found to have bestresults and can be used for textile application.

The color variability from camel brown to dark chocolate brown was obtain by Vankar*et al.* (2009) when cotton, silk and wool yarn fabrics were dyed with *Garcinia mangostana*pericarp after premordantaing with metal salts of Al, Sn, Fe, Cr and Cu. Again Vankar*et al.* (2009) proposed that huge amounts of

Tagetuserecta(marigold) flowers offered in Indian temples generate very large waste. They suggested use of this floral waste as a source of natural dye for cotton, silk and wool coloration on industrial scale.

Figure 1 : Plant Material

Nerium oleander

Figure 2 : Notable color variation obtained by using dye extracted from *Nerium oleander*

P. S. No. – Panton Paint Shade Number

Singh *et al.* (2004) even reported antimicrobial properties of natural dyes obtained from five plants *Acacia catechu, Kerrialacca, Quercusinfectoria, Rubiacordifolia*and *Rumexmaritimus*against common pathogens *Escherichia coli, Bacillus subtilis, Klebsiellapneumoniae, Proteusvulgaris* and *Pseudomonas aeruginosa.*They found that*Quercusinfectoria*dye was most effective and showed maximum zone of inhibition.

Many workers worked on applications of plant based dyes for fabric and textile coloration. Ali *et al.* (2006) Eucalyptus bark, Sachan and Kapoor (2007) from turmeric rhizome (*Curcuma longa*), Nilani*et al.* (2008) from marigold (*Tageteserecta*), Kulkarni *et al.* (2011) from Pomegranate (*Punicagranatum*) Peel,Kamel*et al.*(2009) from *Crocus sativus*, Mongkholrattanasit*et al.*(2010) from Eucalyptus leaves, Shingane in *Bombaxceiba* (2015).

Conclusions

In aqueous extract of *Neriumoleander* there is lighter color shade than the ethanolic and alcoholic extracts on cotton and silk fiber. On cotton dark color obtained than silk fiber. Six color shades obtained when cotton and silk fabrics in dye solution out of which Grey beige was the darkest one while Thunderwas the lighter shade. There are twelve different color shades obtained in dyeing with mordant treatment. All extracts with mordantFerrous ammonium sulphate showed darker color than Copper sulphate. Dark olive and affix uniform to fabrics the dark shades obtained by dyeing with mordant Ferrous ammonium sulphate. While silk exhibit three lighter colorations i.e. Surfmist, Squirrel grey and Light pewter by dyeing with mordant Copper sulphate.

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Inventory of Scorpion Fauna from Akot Tehsil of Akola District, Maharashtra, India

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Abstract:

The present paper deals with the inventory of the scorpion fauna of Akot tehsil of Akola district, Maharashtra, India. Two species of scorpions were recorded from different microhabitats. Present information provides a baseline biological data for further demographic and ecological studies and stresses the need for impact assessment prior to undertaking developmental projects in region, since Arachnids exhibit restricted movements and are vulnerable to habitat modification.

Key words:*Akola, Akot, India, Inventory, Maharashtra, Scorpion.*

Introduction

Scorpions are predatory arachnids of the order Scorpiones. They have eight legs, and are easily recognized by a pair of grasping pincers and a narrow, segmented tail, often carried in a characteristic forward curve over the back and always ending with a stinger. The evolutionary history of scorpions goes back 435 million years. They mainly live in deserts but have adapted to a wide range of environmental conditions, and can be found on all continents except Antarctica. There are over 2,500 described species, with 22 extant (living) families recognized to date. Their taxonomy is being revised to account for 21st-century genomic studies (Ahmadi*et al.,* 2020; Anderson *et al.,* 2021).

Scorpions primarily prey on insects and other invertebrates, but some species hunt vertebrates. They use their pincers to restrain and kill prey, or to prevent their own predation. The venomous sting is used for offense and defense. During courtship, the male and female grasp each other's pincers and dance while he tries to move her onto his sperm packet. All known species give live birth and the female cares for the young as their exoskeletons harden, transporting them on her back. The exoskeleton contains fluorescent chemicals and glows under ultraviolet light (Feola. *et al.,* 2020).

The vast majority of species do not seriously threaten humans, and healthy adults usually do not need medical treatment after a sting. About 25 species have venom capable of killing a human, which happens frequently in the parts of the world where they live, primarily where access to medical treatment is unlikely.Scorpions appear in art, folklore, mythology, and commercial brands. Scorpion motifs are woven into kilim carpets for protection from their sting. Scorpius is the name of a constellation; the corresponding astrological sign is Scorpio. A classical myth about Scorpius tells how the giant scorpion and its enemy Orion became constellations on opposite sides of the sky (Howard. *et al.,* 2019).

In this concern, a present study is an approach to understand the diversity of Scorpion Fauna from Akot Tehsil of Akola District, Maharashtra, India

Materials and Methods

The Akot tehsil of Akola district is one of the most diversified regions in Maharashtra State of India, with respect to biodiversity. Its healthy climate, mountainous terrain, rugged configuration, and sudden fall in elevation are phenomenal. Akot is a city in the Vidarbha Region and a municipal council in Akola district in the Indian state of Maharashtra. It is located between 21.1°N 77.06°E. The climatic condition of this district is characterized by a hot summer, well-distributed rainfall during the south-west monsoon season, and generally dry weather during the rest of the year (Akola Gazetteer,2022). The survey was conducted to prepare an inventory of Scorpion Fauna from Akot Tehsil of Akola District, Maharashtra, India. The observed scorpion species were identified on the spot using published keys (Tikader and Bastawade 1983);

Results and Discussion

The study was conducted during 2021 in Akot tehsil of Akola district, Maharashtra, India. Study reveals the presence of two scorpion species. *Heterometrusphipsoni* (Pocock, 1893), the forest scorpions, is a species of scorpions belonging to the family Scorpionidae. *Hottentottapachyurus* (Fabricius, 1798), the Indian scorpion is a species of scorpion of the family Buthidae.Heterometrusphipsoni (Pocock, 1893) are lapidicolous scorpions found under stones. Hottentottapachyurus (Pocock, 1897) are non-burrowing species and mostly found only under tree bark.

Warburg (1997) studied biogeographic and demographic changes in the distribution and abundance of scorpions inhabiting the Mediterranean region in northern Israel. Warburg (2000) studied intra- and inter-specific cohabitation of scorpions in the field and the effect of density, food, and shelter on their interactions. Raz*et al.* (2009) have studied biodiversity, species abundance, inter-slope divergence and other aspects of scorpion fauna of Mt. Carmel, Israel. Pande*et al.*, (2012) studied the diversity of scorpion fauna of Saswad-Jejuri, Pune District, Maharashtra, India. Thus, scorpion diversity, distribution, abundance as well as other related aspects of scorpion ecology are well studied elsewhere. As the study area is earmarked for development projects such as plantation, beautification, dam construction, urbanization and industrialization that will lead to habitat loss through land use modification.

Detailed studies on scorpion fauna of India including various ecological aspects such as population estimates, diversity, distribution, abundance, biogeographic and demographic changes, microhabitat preferences, etc. are necessary to understand the potential threats to the scorpion fauna and to direct conservation efforts.

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The Effect of Feed Cycling And Ration Level on Compensatory Growth Response in Fresh Water Fish Ctarias Batrchus

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Abstrat:
To investigate the nature of compensatory growth in fish, a 6 week study was performed on fresh water fish claras batsaushus Fishes were starved for 0 (control-lA), 1 (IB), 2 (1C) and 3 (ID, IE & IF) weeks and then re-fed to satiation for 1,2 and 3 weeks. Weekly changes in weight gain, percentage weight gain and specific growth rate were monitored during re-feeding. Although «1 and I/ feeding cycle group (IB) with 5% ration level performed better than '3 and 3* and '2 and 2' feeding cycle groups since all the parameters viz. mean weight gain, percentage weight gain, SGR and FCR values showed an improving trend after re-feeding in this group but it is much less than control group. Final results suggested that growth parameters were significantly different (P<0.05) in case of control group as compared to experimental groups suggesting that starvation followed by subsequent re-feeding did not play a role in more growth of Cyprinus carpio.*
Keywords: *Compensatory growth, Starvation, Specific growth rate Food conversion ratio. Feed cycle.*

Introduction

catch-up growth refers to the unusually fast growth that follows a period of reduced growth resulting from restricted food availability. Compensatory growth is a phase of unusually rapid growth following a period of undcr-nutrition. Compensatory growth is usually accompanied by hyperphagia (an increase in appetite) and sometimes improved growth efficiency. This phenomenon has been reported in a range offish species covering different taxa (Dobson & Holmes, 1984; Russell & Wootton, 1992; Jobling *et al.*, 1994; Kirn & Lovell, 1995; Hayward *et al.*, 1997; Sacther & Jobling.1999; Qian *et at.* ,2000; Wang *et al.* ,2000 and AH *et al.* ,2003).

Present study was designed to investigate the effect of feed cycling/starvation on *C.carpio.* Particular emphasis was laid to understand whether compensatory growth is present or not since it is a way to ameliorate fish growth performance, as in some of the species, compensatory growth is so intense that fish exhibit a higher growth rate than those continuously fed. Moreover, this information can also be utilized in designing the feeding schedules of particular fish in culture operations.

Material And Methods

Fishes were divided into 6 groups having 6 fishes in each group. Feed cycling period and ration level were changed in all the treatments.

Group 1A - (Control group) Fed @ 5% body weight during the whole experimental period.

Group IB - Starved for one week and then re-fed for next week. This feed cycling (alternate starvation periods and feeding periods) continued throughout the period of experiment i.e. 6 weeks. Again the feed was given @ 5% of the body weight.

Group 1C - Initially starved for 2 weeks and then re-fed for next 2 weeks. The feed was provided @ 5% of the body weight.

Group ID- Fasted for first 3 weeks and then re-fed for next 3 weeks. The feed was provided® 3% of the body weight.

Group IE - Fasted for first 3 weeks and then re-fed for next 3 weeks. The feed was provided @ 5% of the body weight.

Croup IF - fasted for first 3 weeks and then re-fed for next 3 weeks. The feed was provided @7% of the body weigh! per day ration level, adjusted weekly.

In all the treatments, diet was given once a day. Groups were .sampled weekly. Three fishes were netted from each group and measured and then were returned to their appropriate groups. The experiment was conducted in duplicate and it continued for six weeks. The left over feed and excreta were removed once a week. The left over feed was collected in already weighed beakers and oven-dried at 105°C aad weighed. The data was statistically analysed to calculate ANOVA with the help of MS, Excel 2003 and SPSS (12.0 version Inc. Chicago, USA) and mean compared by using Duncan's Multiple Range Test (Duncan, 1955).

Results And Discussion

1. Weight gain : Analysis of Table. 1 reveals that at the end of sixth week:
1. The weight gain was observed to be best in group-IA with weight gain of about 0.33±0.02 gm which was signi ficantly different (P<0.05) from all other groups;

2. The weight gain was found to be less in group ID having -0.04±0.01 grn weight gain which was not found to be significantly different (p<0.05) from the value recorded for group 1C, having weight gain of-0.08±0.01 gm.
3.The value of the weight gain showed a decreasing trend from groups IA to ID and again a little increase in group IF, and IF.

Table. 1 Observed values for weight grain, % weight grain, specific growth rate ; and food conversion ratio for groups IA-IF.

Parameters	Weight gain		Percentage weight gain		Specific growth rate	
Weeks/Groups	Week 3	Week 6	Week 3	Week 6	Week 3	Week 6
IA	0.12i0.05"	0.33i0.02"	11.53±0.02'	31.73iO.03"	0.52^.01"	0.64iO.()l"
IB	0.10±0.02[a]	0.26±0.03[b]	10.OOiO.05"	26.00i2.00"	0.42i0.01[b]	0.54*0.01"
1C	-0.05iO.01"	-0.08±0.01[d]	-4.76i0.01[c]	-2.85i0.01[c]	-0.19iO.01"	-0.16iO.01"
ID	-0.24iO.01"	-0.04±0.01[d]	-35.41±0.01[r]	-4.16i0.04°	-1.14±0.01[f]	-0.38i0.01[c]
IB	-0.I8iO.OP	0.05i0.01[c]	-17.82±0.02[C]	4.95i0.05<	-0.81i0.01[c]	-0.07i0.01[d]
IF	-0,!6±0,01[C]	0.05±0.01'	-10.73i0.03[c]	3.35i0.05[d]	-0.52±0.0!°	-0.0710.01"

2. Percentage weight gain (% WG): Analysis of Table. 1 reveals that at the end of sixth week
   1. The percentage weight gain was observed to be best in group IA with percentage weight of about 3! .73 ; 0 03% which was significantly different (P<0.05) from all other groups;
   2. The percentage weight gain was found to be less in group ID having -4.16±0.04% which was not found to be significantly different (P<0.05) from the values recorded for group 1C, having % weight gain of-2.85±0.01 %.
   3. The values of the % weight gain showed a decreasing trend from groups IA to ID and again a little increase in group IF and IF.
3. Specific Growth Rate (SGR): Analysis of Table. 1 reveals that at the end of sixth week:
   1. The specific growth rate was observed to be best in sub-group IA with SGR of about 0.64±0.01% which was significantly different (P<0.05) from all other groups;
   2. The SGR was found to be less in group ID having -0.38i0.01% which was not found to be significantly different (PO.05) from the values recorded for group 1C, having SGR of QO. 16±0.01%.
   3. The value of the SGR showed a decreasing trend from group IA to ID and again a little increase in the group IE and IF.

The results suggested that the growth parameters were found to be significantly different (P<0.05) in case of group IA and was best among all treatments suggesting that starvation followed by subsequent re-feeding did not play a role in the more growth of the fishes. Our observations are in accordance with Schwarz et al. (1985) who have also observed that the controlled groups with constant and regular ration level showed better growth than other groups. The experiment performed showed that compensatory growth does not occur Almost every group undergoing starvation showed the largest weight loss during the first week of starvation as found by Dobson and Holmes (1984) due to gut emptying (Elliott,1972). The rate of weight loss declined in subsequent weeks upon re-feeding there was a moderate increase in the weight due to gut refilling in all the groups, same has been recorded by Quinton and Blake (1990) while studying the effect of feed cycling and ration level on compensatory growth response in rainbow trout, Oncorhynchus mykiss.

A perusal of the Table. 1 reveals that as the experiment progressed, a decline in specific growth rate (SGR) was observed in groups (IB-IF) as compared to control group IA with starvation producing a negative specific growth rate in all the groups. The present observation thus indicates that the length of starvation had a marked effect on SGR. Similar results have been put forth by Furhan et al. (2006) in Cirrhinus mrigala and Muhammcd et al. (2006) in Labeo rohita. Further, The results indicate that common carp was unable to maintain its SGR during re-feeding periods like that of control (lA).Contrary to this however, Van Dijk et al (2005) observed that juvenile roach, Rutilus rutilus was able to fully compensate SGR when transferred to rc-fccding after 21 days of starvation. Similar results have been recorded by AH (1999) for three-spined sticklebacks, Gastrosteus aculeatus.

Data reveals that occurrence of compensatory growth is species specific and depends upon the duration of fasting period in warm water fish species (Xie et al. ,2001). A comparative analysis of all the treatments reveals that' 1 and 1' feeding cycle group with 5% ration level (IB) performed better than rest of the experimental groups and weight gain, % weight gain, SGR and FCR values also showed an improving trend after re-feeding in restricted fish (Table. 1). Such an improving trend cannot be designated as compensatory

gain rather it appears more to be a case of the stunted/restricted fish performing at the level expected for smaller/restricted fish. Thus, it can be safely concluded that compensatory growth does not exist in Cyprinus carpio as data of our present study is also quite convincing for this conclusion.

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Some Wood-Rotting Fungi from Khultabad Tehsil, District Aurangabad (M.S.) India.

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Abstract

Wood rotting fungi are the parasite as well as saprophytic which grow on the living trees, dead trees, wood logs and decay the external and internal structural components which are cellulose, hemicellulose, and lignin. In the present investigation, thirty-seven specimens of macro-fungi were collected from different areas of Khultabad Tehsil, District Aurangabad (M.S.) India, from that twelve specimens were studied. Based on morphological and microscopic characteristics which belong to nine genera and twelve species. It was observed that Auricularia nigricans, Flavodon flavus, Phellinus badius, Pseudofavolus tenuis, Scytinostroma duriusculum, Trametes cingulata, and Truncospora tephropora were most abundantly found while Ganoderma mediosinense, Phellinus allardii, Phellinus gilvus, Pleurotus djamor, and Trametes ellipsospora are rarely observed macro-fungi.

Keywords: *Khultabad, Macro-fungi, Microscopic, Morphological, Saprophytic.*

Introduction

Wood rotting fungi have the ability to decompose wood causing rot, fruiting bodies of macro-fungi grow on living trees, dead trees, and wood logs which comprise 10% of total fungal diversity from which 16–41% have been described to date (Rossman 1994, Mueller et al, 2007). Wood decaying fungi are classified into three groups i.e. brown rot, white rot, and soft rot, wood decay by brown rot fungi is brown and crumbly which degrade via the enzymatic and non-enzymatic system. Cellulase enzymes are secreted by brown rot fungi for degradation, but no lignin-degrading enzyme is involved. White rot fungi associated with hardwood decay show different decaying patterns by secretion of cellulase and lignin-degrading enzyme. According to (Jasalavinch et al. 2000) white rot fungi can utilize all major components of the cell wall including carbohydrates and lignin. Soft rot fungi secrete cellulase enzyme from hyphae which break down cellulose and lower lignin content in wood and create the cavity in the wood cell wall. The injuries to branches, roots and the main trunk of trees allow wood-decaying agents to gain entry through wounds and make the serious loss of wood's mechanical strength. Wood decaying fungi are an important component of the forest ecosystem (Wang et al, 2011).

Studies on Indian wood-rotting fungi were initiated with Europeans' launch of studies in Indian fungi. The first Indian record of its kind could be traced back to the work of (Klotzsch 1832) in his paper on Indian Polyporaceae. (Ranadive et al., 2013) studied eight families, fourteen genera, and twenty species of Aphyllophorales from Pune district. (Chouse and Mali 2020) on the diversity of Aphyllophorales from Latur district, Maharashtra reported thirty-four genera and forty-seven species of wood-rotting fungi. (Gore and Mali 2021) reported seventeen genera and eighteen species of wood-decaying fungi from Paithan Tehsil, Aurangabad district (M.S.) India.

Materials And Methods

In the present investigation, the thirty-seven specimens of wood-rotting macro-fungi were collected 20 to 25 days after heavy rainfall during the year 2014 – 2019 after several intervals from various regions of Khultabad Tehsil, District Aurangabad (M.S.) India. The specimen of Basidiome were collected in brown paper bags, noting the hostname, locality, date of collection, color of the specimen, and type of attachment suggested by Gilbertson and Ryvarden (1986). The morphological and microscopic character was recorded, fresh material from the field and dried material in the laboratory. Macroscopic observations were carried out by using Cosmo Compound Light Microscope under a 10X objective. The freehand thin section cutting of fruiting bodies was done by chopping method with the help of sharp razor blades, stained and studied in 10% KOH, Lactophenol, Cotton Blue, and Melzer's reagent and microscopic observations were made under 40X and 100X Magnification (Olympus CX 41) in the laboratory.

Result And Discussion

Details of the wood rotting fungi collected during present investigation has been described with photo plate 1 as fallows.

***Auricularia nigricans* (Sw.) Birkebak, Looney& Sancher–Garcia.**

Basidiome 5–31 × 4–26 mm, annual, pileate, lossely attached with small tapered stalk, moist dependent, jelly like when fresh and brittle on drying. Upper surface velvety hairy. Margin acute, decurved. Lower fertile surface smooth. Context jelly like when fresh, waxy hard when dry. Basidia cylindrical, hyaline, 3-septate, 39 –

58 × 3.5 –5 µm with 1–3 lateral sterigmata, sterigmata 9–14 × 1.5–11 µm. Spores 13–15 × 4–5µm, cylindrical to allantois, slightly kidney shaped, thin walled, smooth. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′39″N 75˚14′10″E; alt 677m; on the wood logs of *Mangifera indica* L.; 08/09/2016; Vijay Gore (VUG/VPM–360).

***Flavodon flavus* (Klotzsch) Ryvarden**

Basidiome 5–73 × 4–59 mm annual, resupinate to pileate, widely effused reflex. Upper sterile surface concentric zonation, tomentose. Lower fertile surface poroid, lamellate, iripicoid to hynoid, pores 1–2 per mm. Tube up to 3 mm deep. Context up to 2 mm thick. Hyphal system dimitic. Generative hyphae hyaline, thin to slightly thick-walled, septate, branched, 1.4–3 µm wide. Skeletal hyphae thick-walled, branched, 2–6 µm wide. Cystidia occur as skeletal hyphal projection, thick-walled, encrusted at the tip, 11–32 × 6–11µm. Basidia 23 – 28 × 6 – 8 µm, clavate, hyaline, thin-walled, with 4-sterigmata. Spores 5.3–7 × 3–4.5 µm, ellipsoid, smooth, thin–walled, hyaline.

Specimens examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Gadhana; 20˚02′23″N 75˚15′33″E; alt 702m; on the living tree but on dried main trunk *Senna siamea* (Lam.) H.S.Irwin & Barneby; 22/09/2016; Vijay Gore (VUG/VPM–397).

***Ganoderma mediosinense* J.D. Zhao**

Basidiome 87–132 × 52–108 × 3–29 mm annual, pileate, laterally to centrally stipitate, leathery when fresh, corky to woody on drying. Upper sterile surface mostly sulcate, weakly zonate, glabrous. Margin distinct, acute to obtuse. Lower fertile surface poroid round, regular, pores 3–4 per mm. Context up to 19 mm wide, homogenous. Tubes up to 10 mm deep. Stipe 59–79 × 14–26 mm, cylindrical to inflated near pileus, homogenous. Hyphal system trimitic, generative hyphae 1.4–3 µm wide, clamped, septate, thin-walled, hyaline. Skeletal hyphae 2–5 µm wide, thick-walled. Binding hyphae 1.4–3 µm wide, thin, hyaline. Basidia clavate, 4-sterigmate, clamped at base. Spores 8–10 × 5–6 µm, ovoid to ellipsoid, exospore smooth and hyaline, endospore distinctly echinulate. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′19″N 75˚13′48″E; alt 718m; on the wood logs of *Senna siamea* (Lam.) H.S.Irwin & Barneby; 08/09/2016; Vijay Gore (VUG/VPM–358).

***Phellinus allardii* (Bres.) S. Ahmad**

Basidiome 72 × 106 × 2–18 mm, perennial, resupinate to pileate. heavy when fresh, corky hard on drying, broadly attached and elongated, frequently sub-resupinate. Upper sterile surface narrowly sulcate. Margin fertile, sharp, undulating, velvety. Lower fertile surface poroid, round, pores 5–8 per mm. Context very thin, sometimes almost absent. Tubes up to 3 mm deep. Hyphal system dimitic, generative hyphae 2–3 µm wide, simple septate, smooth, hyaline. Skeletal hyphae 3–3.5 µm wide, thick-walled, smooth, hyaline. Basidia 11–15 × 5–6 µm, clavate, 4-sterigmate, septate at base. Spores 4.5–6 × 3–4 µm, broadly ellipsoid to subglobose, thick-walled, smooth. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′20″N 75˚13′48″E; alt 719m; on the living tree but on dried main trunk *Senna siamea* (Lam.) H.S.Irwin & Barneby; 07/11/2019; Vijay Gore (VUG/VPM–771).

***Phellinus badius* (Cooke) G. Cunn.**

Basidiome 34–109 × 22–71 × 2–28 mm, perennial, sessile, semicircular, easily detachable from the host. Upper sterile surface velvety. Margin obtuse, sterile. Lower surface poroid, pores 4– 7 per mm, thick-walled. Context up to 22 mm thick, corky when fresh, hard on drying. Tube up to 4 mm deep. Hyphal system dimitic, generative hyphae hyaline, septate, branched, 3.5–4 µm wide. Skeletal hyphae thick-walled, 3.5–5 µm wide. hymenial setae absent. Basidia broadly clavate 10.5–14 × 5.5–7 µm, 4–sterigmate. Spores 6–7.5 × 5–6.5 µm, ellipsoid to sub-globose. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′19″N 75˚13′47″E; alt 722m; on the living tree on main trunk *Senna siamea* (Lam.) H.S.Irwin & Barneby; 07/11/2019; Vijay Gore (VUG/VPM–769).

***Phellinus gilvus* (Schwein.) Pat.**

Basidiome 22–54 × 18–37 × 4–11 mm, annual to perennial, imbricate, sessile to effuse reflexed, corky to brittle on drying. Upper sterile surface weakly zonate, finely velutinate, glabrous, strigose to radiate-striate. Margin acute, lobed. Lower surface poroid, round and regular, smooth, shiny, pores 6–9 per mm. Context homogenous, up to 7 mm thick. Tube up to 4 mm deep. Hyphal system dimitic, generative hyphae septate, branched, 2.4–4 µ m wide. Skeletal hyphae thick-walled 3.5–5 µm. Hymenial setae thick-walled, 25–35 × 6–10 µm. Basidia 5.8–11 × 4.4–6 µm, clavate, hyaline with 4-sterigmata. Spores sub-globose to ellipsoid, 4.5–6 × 2.4–3.5 µm, thin-walled, smooth. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Varegoan; 20˚05′01″N 75˚21′40″E; alt 655m; on the dried standing stump at main trunk *Azadirachta indica* A.Juss.; 21/08/2016; Vijay Gore (VUG/VPM–272).

***Pleurotus djamor* (Rumph. ex Fr.) Boedijn**

Basidiome 15– 39 × 12–31 mm, annual, spathulate to flabelliform, convex or depressed towards the base. Upper sterile surface finely tomentose towards the base, finely striate. Margin at first involute, often incised. Lamellae are deeply decurrent, sometimes with yellowish cream or pale red tints, narrow, moderately crowded. Stipe absent or reduced and then lateral or eccentric, 1–5 × 3–4 mm, cylindrical, solid. Context thin, 1–4 mm thick, soft, fleshy. Hyphal system dimitic generative hyphae 3–8 µm, with prominent clamp-connections, skeletal hyphae, 2.5–8 µm. Basidia 23–30 × 3–6 µm, narrowly clavate bearing 4-sterigmata. Cheilocystidia 22.5–30 × 6–7 µm, inflated clavate. Spores 7.5–9×4–5 µm, cylindric, hyaline, thin-walled, Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′20″N 75˚14′48″E; alt 679m; on the wood logs of *Mangifera indica* L.; 08/09/2016; Vijay Gore (VUG/VPM–753).

***Pseudofavolus tenuis* (Fr.) G. Cunn.**

Basidiome 25–53 × 19–38 mm, annual to perennial, dimidiate, flabelliform to semicircular, effused-reflexed to pileate, leathery when fresh, corky to tough on drying. Upper sterile surface smooth concentrically zonate, sulcate, glabrous, radially wrinkled. Lower fertile surface poroid 1–2 per mm wide, angular to hexagonal. Context up to 1 mm wide, homogenous; Tubes 1–2 mm long, homogenous. Hyphal system trimitic, generative hyphae hyaline, thin-walled, clamp, branched, 1.5–3 µm wide. Skeletal hyphae thick-walled, 3.5–6 µm wide. Binding hyphae hyaline, thick-walled, 3–5.5 µm wide. Spores 14–17.5 × 4–6 µm, cylindrical, hyaline, thick-walled. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Gadhana; 20˚02′23″N 75˚15′32″E; alt 702m; on the fallen dried twing of *Senna siamea* (Lam.) H.S.Irwin & Barneby; 22/09/2016; Vijay Gore (VUG/VPM–394).

***Scytinostroma duriusculum* (Berk. & Broome) Donk.**

Basidiome 19–104 × 17–72 mm, annual, membranous, resupinate to widely effused papery thin, and brittle on drying. Fertile surface smooth, when touched gives velvety sensation. Context finely layered, smooth, dense, subhyaline in section, faintly stratose, homogeneous. Hyphal system dimitic, generative hyphae thin-walled, clamp absent, branched, nondextrinoid, 1.5–2.4 µm wide. Skeletal hyphae branched, branches mostly lateral, 1.2–2 µm wide. Spores 5.5–7.5 × 4–7.5 µm in diameter, globose, amyloid, smooth. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Gadhana; 20˚02′20″N 75˚15′32″E; alt 711m; on the living tree at main trunk *Senna siamea* (Lam.) H.S.Irwin & Barneby; 22/09/2016; Vijay Gore (VUG/VPM–390).

***Trametes cingulata* Berk.**

Basidiome 20–39 × 12–16 × 3–6 mm, annual, dimidiate, semicircular, hard, corky, sessile. Upper sterile surface glabrous, weakly zonate, concentrically ridged to radially wrinkle. Margin thin, acute to obtuse, wavy. Lower fertile surface poroid, round to regular, 5–7 per mm. Context homogenous, up to 4 mm thick. Tubes up to 2 mm deep. Hyphal system trimitic, generative hyphae hyaline, thin-walled, septate with clamp, 2–3.5 µm wide, skeletal hyphae hyaline, thick-walled, unbranched, narrow lumen, 3–5.5 µm wide. Binding hyphae 1.5–3 µm wide, thick-walled, smooth, hyaline. Basdia clavate, thin-walled, 4- sterigmate, 16–22 × 4–6 µm. Basidiole clavate, thin-walled, 19–26 × 9–12 µm. Spores 3.5–5.5 × 3–3.5 ellipsoid, thin-walled, smooth, hyaline. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Khultabad; 20˚00′51″N 75˚12′08″E; alt 706m; on wood log *Acacia nilotica* (L.) Delile; 10/08/2014; Vijay Gore (VUG/VPM–12).

***Trametes ellipsospora* Ryvarden**

Basidiome 16–34 × 10–19 × 2–4 mm, annual, resupinate to effused reflex to pileate, sessile with a broad base, leathery when fresh, brittle on drying.. Upper sterile surface covered with stiff persistent strigose hairs, shiny, sulcate, weakly zonate. Margin thin, acute, wavy. Lower fertile surface poroid 4–6 per mm pores, pores surface flat or decurrent, angular, irregular, toothed. Context duplex, up to 2 mm thick. Tubes up to 2 mm deep. Hyphal system dimitic, generative hyphae hyaline, thin-walled, septate with clamp, 1.5–3 µm wide, skeletal hyphae hyaline, thick-walled, unbranched, narrow lumen, 2–5 µm wide. Binding hyphae 2–3.5 µm wide, thick-walled, smooth, hyaline. Basdia clavate, thin-walled, 11–14 × 4–6 µm. Basidiole clavate, thin-walled, 19–26 × 9–12 µm. Spores 3.5–5.5 × 2–3.5 µm, ellipsoid, thin-walled, smooth, hyaline. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′20″N 75˚13′47″E; alt 725m; on the living tree on dried branch *Senna siamea* (Lam.) H.S.Irwin & Barneby; 07/11/2019; Vijay Gore (VUG/VPM–772).

***Truncospora tephropora* (Mont.) Zmitr.**

Basidiome, 72 × 34 cm, up to 1.4 cm thick at the center, resupinate to widely effused, tough to hard when fresh, woody hard on drying, broadly elongated. Margin sterile, obtuse. Fertile surface poroid, 4–6 per mm pores, round, regular, cracked when mature. Context papery thin to almost absent, hard, homogenous. Tubes up to 14

mm wide, duplex or in the layer, each layer or strata up to 3 mm wide. Hyphal system trimitic, Generative hyphae 2.1–3 µm wide, clamped, thin-walled, smooth, hyaline. Skeletal hyphae 3.2–4 µm wide, thick-walled, smooth. Binding hyphae1.4–3 µm wide, thin to thick-walled, branched, smooth, hyaline. Basidia 13–16 × 4–5 µm, narrowly clavate, 4-sterigmata, clamped at the base. Spores 4.7–6 × 3.5–4.5 µm, broadly ellipsoid, truncate, collapsed partly, moderately thick-walled. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Yesgaon; 20˚04′56″N 75˚20′24″E; alt 660m; on the dried standing stump on main trunk *Eucalyptus oblique* L'Hér.; 21/08/2016; Vijay Gore (VUG/VPM–273).

Conclusion

Wood-rotting fungi were collected during July (2014) to November (2019) after the regular interval from different sites of Khultabad Tehsil, Aurangabad district (M.S.) India. Thirty-seven specimens of macrofungi were examined, and from that nine different types of genera and twelve species, were studied (Photo Plate 1) which belong to six families Auriculariaceae, Hymenochaetaceae, Irpicaceae, Peniophoraceae, Pleurotaceae, and Polyporaceae. Polyporaceae is dominating family consists of four genera. From the above discussion, it is concluded that *Auricularia nigricans*, *Flavodon flavus*, *Phellinus badius*, *Pseudofavolus tenuis*, *Scytinostroma duriusculum*, *Trametes cingulata*, and *Truncospora tephropora* were most abundantly found while *Ganoderma mediosinense*, *Phellinus allardii*, *Phellinus gilvus*, *Pleurotus djamor*, and *Trametes ellipsospora* are rarely observed macro-fungi, belongs to four hosts *Acacia nilotica*, *Azadirachta indica*, *Mangifera indica*, and *Senna siamea*.

Photo Plate-I

Auricularia nigricans (Sw.) Birkebak, Looney& Sancher–Garcia.

Flavodon flavus (Klotzsch) Ryvarden

Ganoderma mediosinense J.D. Zhao

Phellinus allardii (Bres.) S. Ahmad

Phellinus badius (Cooke) G. Cunn.

Phellinus gilvus (Schwein.) Pat.

Pleurotus djamor (Rumph. ex Fr.) Boedijn

Pseudofavolus tenuis (Fr.) G. Cunn.

Scytinostroma duriusculum (Berk. & Broome) Donk.

Trametes cingulata Berk.

Trametes ellipsospora Ryvarden

Truncospora tephropora (Mont.) Zmitr

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Ethnoveterinary Plants to Treat Bone Fractures of Animals in Buldana district, Maharashtra.

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Abstract:

The people of rural areas still depend to a large extent upon plants and household remedies for curing Veterinary ailments. The folk knowledge of Ethnoveterinary medicine and its significance has been identified by the traditional communities through a process of experience over thousands of years. This paper deals with commonly found in different categories of livestock (i.e. Cow., oxen, buffalo etc) and their treatment with10 medicinal plants 10 species belonging to 10genera and 9 families that occur in forests as well as close vicinity of the rural settlements. Out of the Total population, majority of the people was found dependent on traditional (herbal) system of treatments practiced by local herbal healers. In this study observed that old aged people have more knowledge and experience particularly in remote areas for curing Veterinary ailments. The traditional system of Treatment is one of the most important Prevailing systems in the area where modern Veterinary health care facilities are rare or in very poor conditions.

The purpose of the present Study was to unravel the mode of application of the medicine prepared from Plants and quantify the dependence of the local people on herbal and allopathic systems of veterinary health care.

Key words: *Ethnoveterinary plants, livestock.*

Introduction:

Ancient human beings were closely associated with animals ,especially the domesticated ones and with the plants those were found in and around their close vicinity as well as with other plants which were used for their daily necessities like food ,shelter, clothing and medicines .Ethnoveterinary medicine consists of local peoples knowledge dealing with folk beliefs ,skiills,methods, and practices pertaining to animal health care and production .This knowledge is based on close observation of animals and or the oral transmission of experience from one generation to the Next .The Buldana district has a predominately livestock based economy and social welfare .However ,economic dependence on livestock ,lack of effective veterinary infrastructure have forced the local farmers even today to apply their indigenous knowledge to look after and maintain their livestock population. This paper includes social practices and the ways in which livestock are incorporated into farming system. Over centuries people have developed their own system of keeping animals healthy and productive using age old remedies, surgical and manipulative techniques and religious practice. The use of ethnoveterinary medicine uses differ not only from region to region but also among and within communities. Ethnoveterinary medicinal practice and skills have developed through time mainly by tribal and error and sometimes through experimentation and innovation.This paper deals with commonly found in different categories of livestock (i.e. Cow., oxen, buffalo etc) and their treatment with10 medicinal plants 10 species belonging to 10genera and 9 families that occur in forests as well as close vicinity of the rural settlements.

Material and Method: -

During investigation, repeated field visits were made to the remote villages. After establishing good rapport with local herbal healers, elderly persons and a person athorough knowledge of veterinary practices. Some of the commonly occurring veterinarydiseases were listed. The morpho taxonomical description of each plant taxon was done and identified with the help of different floras.

Observation-

Local people of various regions used 10 different types of plants for Bone fracture in animals. The plants arranged alphabetically with family name and Mode of Administration.

Sr. no.	Name of Plant	Family	Mode of Administration
1.	*Bauhinia racemosa*	Fabaceae	Root powder with butter and boiled rice is given to animals for three days in bone fracture to join the bones.
2.	*Blepharis repens*	Acanthaceae	Powder of leaves mixed with pulses of Black gram given to bone facture in animals.
3.	*Buchanania latifolia*	Anacardiaceae	Gum resin is used in case of Bone fracture where plaster cannot be tied
4	*Capparis zeylanica* L.	Capparaceae	Leaves crushed with water mixed with 250ml edible oil and

			applied on bone of cattle on Bone of cattle in Bone fracture.
5.	*Cassia fistula*	Fabaceae	One Pinch seed powder is mixed with melted Jaggery and applied on thigh swelling in lamness.
6.	*Cissus quadrangularis*	Vitaceae	1.Stems are crushed, and the paste is applied on bone fracture in cattle. 2. Stems crushed and mixed with jawar floor and the bolus is fed to animals for healing the bone fracture.
7.	*Clematis triloba*	Ranunculaceae	The vegetable oil or butter is applied over the fractured part and then the decoction of leaves is applied for joining bone of Animals. This treatment used in case where plaster can not be tied.
8.	*Soyamida febrifuga*	Meliaceae	Warmed leaves are tied on the fractured bone.
9.	*Terminalia arjuna*	Combrataceae	Stem bark crushed in water and the paste applied over bone fracture.
10.	*Viscum articulatum*	Santalaceae	Stem branches are given orally or mixed with fodder.

Conclusion-

The ethnoveterinary medicinal plants species are collected by local people from the surrounding areas, forests and are being used as remedies for various animal ailments. Documentation of ethnoveterinary medicinal plant survey of vital importance in finding some miraculous medicines for curing various veterinary diseases .10 plants from 9 families used in bone fracture of animals. Taking into consideration all these facts and the importance of plats Uses it is very necessary to save plant and to undertake such studies before the knowledge is lost forever.

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Status and distribution of Barn owl *Tyto alba* from Melghat Tiger Reserve, Amravati, Maharashtra, India

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Abstract
Distribution and population status of Barn owl Tyto alba was assessed by survey methods. This study implies thatowl species distribution is not common and also the species is less observed in dense forests.
Keywords – MTR, Owls, Owlets, Population status, Birds of prey, Barn owl

Introduction
Owls are found in diverse habitats such as from deserts to forests, including human habitations. However, despite their wide presence they are confined and difficult to be seen (Kumar *et al*. 2017).Owls are of great economic, scientific and aesthetic values hence the species has been given much importance (Santhankrishnan, 2011).

All owls have a large, rounded head with eyes directed forward. The basic morphological features of the members of this group include a curved bill with a pointed tip similar to diurnal birds of prey, and talons having curved and sharp claws which are very powerful which may be considered as an adaptation for carnivory. These birds have mostly coloured plumage which is soft and fluffy. Ecologically Owls may be considered as nocturnal counterparts to diurnal birds of prey, without being related to them.

Barn owls are Normally nocturnal, sometimes hunting diurnally in dim weather; flies slowly low over fields. This species roosts and nests mainly in cavities in old buildings, ancient forts and ruins or caves. Breeds throughout year, Nest is a collection of straw, twigs, rags and rubbish padded into tree-hollow and holes. The same site is used year after year.

The Indian subcontinent is home to 32 species of owls, according to Grimmet et al. (1999) 30 of them recorded from India. Also recently updated checklist of India by Praveen *et al.* (2016) recorded presence of all 32 owl species.

Amravati district harbours dense forest cover. It includes the famous widely spread Melghat Tiger Reserve and many other forests adjoining the Amravati city. Diversity studies have been done many years ago (MTR official checklist) thus requiring re- assessment of current status of owl diversity with location data, hence an effort was made in the present work to study the diversity of owls and owlets in this region.

Materials and Methods -

The work was conducted in the Melghat Tiger Reserve of Amravati district, Melghat is the hotspot of biodiversity of the state. It is located in Central India, as a southern part of Satpuda hill range. The Melghat Tiger Reserve and adjoining forest lies at the Northern extreme of Amravati district of Maharashtra State on the Madhya Pradesh border. Melghat Tiger Reserve is a representative of the Biogeographic Zone '6 E Deccan peninsula' Central Highlands in the central India.

Fig – 1 – Map of Melghat Tiger Reserve.

Extensive Survey of Melghat Tigre reserve was done during the July 2013 to December 2017 to enlist number of owl and owlet species. Interviews with local indigenous people were conducted for collecting

information about sightings of the owls. Various other inputs from the local people were also taken into accord. Following survey techniques were used in the present study,

1) Surveys were done systematically in the study area by making use of existing forest roads, local trails, animal trails along rivers and streams and around water holes. Surveys were conducted either by foot or by motorized vehicle. Information provided by the local people was considered during each visit
2) Point survey (around villages and Rest Houses, ancient trees and riverine ecosystem) were done. At larger spatial scales, counts or detections at points have been used to document raptor presence (Kennedy and Stahlecker 1993), community diversity (Manosa and Pedrocchi 1997), and to estimate occupancy (McLeod and Andersen 1998).
3) Sighted owls were photographed and identified with the help of different field guides, some owls were identified with self recorded calls, using Sony ICD voice recorder and parabolic disc. The latitude and longitude data (GPS) of the sites of sightings of the owls were recorded by a GPS device.

Result and Discussion–

Species was not commonly recorded in Melghat Tiger Reserve. The species was reported from both East and west Melghat but not in dense forest. Total 21 individuals were reported, of which 10 were sighted. All of which were in association with human habitation such as Rest house premises, and agricultural farms. Surprisingly all nests were found in old or dry Banayan tree holes. It is observed that it is present in its nest in tree cavity for whole day and is not seen generally in day time. Pellets from the owl species were collected and studied.

According to Taylor (1992), Bam Owl selected isolated trees around farm sheds and villages and along hedgerows and woodland edges, rather than in the centres of woodland, which is in corroboration with the present study. Following map depicts an idea about distribution of Barn owls from MTR.

Fig. 2 – Map Showing Barn owl sighting locations recorded during Study.

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Phylogeny of Vertebrates from striated muscle proteins

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Abstract

Every living cell requires specific enzymes for the thousands of chemical reactions that maintain life. Like enzymes muscle proteins such as actin and myosin are specified by genes with unique DNA sequences. Both actin and myosin and the unique structures into which they are organized are conserved among all animals, no matter how diverse. This conservation implies that the encoding DNA sequences have changed little through evolutionary time. Just as similarities of structures indicate a common descent, variations and differences indicate divergence on the evolutionary tree. A complete understanding of DNA and inheritance, however, requires a greater appreciation of the importance of proteins. DNA dictates the production of specific proteins, but the proteins themselves directly determine an organism's traits. Therefore, a close study and comparison of particular proteins from different species may indicate how closely related the species are. Proteins have important in phylogeny and the classification and hence the present study designed to know evolutionary correlation between different vertebrate animals with respect to striated muscle proteins which are involved in movements in the selected animals.

Key words : skeletal muscle, muscle protein, amino acid sequences , molecular phylogeny

Introduction :

Recently DNA has been a primary focus of research, but the ultimate function of DNA is to specify what proteins are made. In fact, recent studies of the genome sequences of humans and other organisms have revealed that the number of proteins expressed by a species contributes more to its complexity than does the number of genes (Jasny and Kennedy, 2001, International Human Genome Consortium, 2001).

The genes for actin and myosin are members of gene families that encode proteins that enable movement while actin and myosin are highly conserved across all animal species, other muscle proteins show more variability . The variations in an organism's proteins are the results of random DNA mutations within the encoding genes, which have occurred over thousands to millions of years. Each mutation may results in some kind of change in a protein. These changes can lead to novel traits and generate diversity individual differences among members of a population. Occasionally, a genetic mutation will alter a protein's structure to confer a functional advantage, enhancing an organism's survival in a particular niche, environment, or predator-prey relationship. Thus, genetic diversity makes evolution possible, The Evolutionary biologists are interested in how individual species arose from earlier forms. A classic way of addressing this question is to compare the morphology of different living organisms to one another and to fossilized species. With the onset and advancement of molecular biology, it is now possible for evolutionary biologists to compare not only the physical form and structure of different organisms, but their DNA and proteins as well.

Therefore, a close study and comparison of particular proteins from different species may indicate how closely related the species are. Species that diverged from a common ancestor a long time ago are less similar biochemically than those that diverged more recently. The biochemical composition of organisms includes their protein molecules. Thus, the degree of relatedness of two species can be estimated from the amount of similarity between their protein make ups. Molecular phylogeny , is the use of the structure of molecules to gain information on an organism's evolutionary relationship. The origin of species over a century later, evolutionary biologists still use tree diagrams to depict evolution because the floral analogy effectively convey the concept that speciation occurs. Recent advances in molecular technique as well as more powerful phylogenetic algorithms and faster computers have made it possible to infer phylogenetic relationships using sequences data, (Zardoya, and Meyer,). Different branches of related organisms separated at evolutionary times. The further apart species are on the tree, the less related they are, Molluscs and arthropods diverged from one another before the emergence of chordate animals with backbones, very early in evolutionary time. These animals are only distantly related to fish, birds, reptiles, mammals and amphibian, which are more closely related to each other. Just as similarities of structures indicate a common descent, variations and differences indicates divergence on the evolutionary tree. Proteins have important in phylogeny and the classification and hence the present study designed to know evolutionary correlation between different vertebrate animals with respect to striated muscle proteins which are involved in movements in the selected animals.

Materials and Methods :

Analysis of Proteins by using Block Maker and Peptool online software

The analysis of molecular information of muscle proteins in the different Vertebrates. Their amino acid sequences were obtained in the FASTA format from the NCBI Home Page by using NCBI sequence viewer v 2.0 windows internet explorer cited by www google com and conducted a comprehensive search for muscle protein sequences such as Actin, Myosin, Troponin, Tropomyosin. From selected species and their fasta formats were aligned together by Block Maker by accessing the website WWW. Block Server. Finally build the Phylogenetic tree for each protein. A set of blocks can also be used to construct and display a neighbour joining tree for examination of possible subfamily relationships. Because blocks represents the most highly conserved regions of proteins, misaligned regions were avoided to get a high quality tree. Further studies was carried out by using pep tool a protein analysis software.

Observations and Results :

I) Phylogeny of Actin :

The results obtained are shown in Fig.1.1 All the 14 sequences selected for phylogeny resulted into one block, with a width 14. The tree (Fig.1.1) showed 3 clades . First clade comprises of 4 lineages, B.gargarizans, C.batrachus, R.tigrina and C.punctatus. Second clade comprises of 6 lineages , C.coturnix, G.gallus, H.japonica, M.musculus, N.naja, and R.norvegicus as these lineages split originated from a common ancestor. The third clade includes 4 species with a common ancestor which splits into 2 subclades. C.livia showed the separate lineage and other three L.rohita, O.cuniculus and C.versicolor mutuated at various time from one common ancestor. The most recent lineages are C.versicolor and L.rohita with more mutational changes. C.versicolor and O.cuniculus developed from a common ancestor.

Fig.1.1 Phylogeny of Actin

ii) Phylogeny of Myosin:

The results obtained are shown in Fig. 1.2 All the nine myosin sequences used for phylogeny studies resulted into one block, with a width 17.The phylogram of myosin (Fig.1.2) showed four clades, among the 4 clades first and fourth clades comprises 2 lineages, the *R. tigrina* and *H. chrysoscelis* which split from common ancestor. The second clade comprises of 2 lineages, *O.cuniculus* and *N.naja* as a sister taxa. The lineage *O.cuniculus* has undergone less changes in myosin development during evolution than lineage *N.naja* The third clade represents 5 species with a common ancestor which further evolved in 4 different directions (4 subclades). *G.gallus* showed the separate lineage and other four *C.coturnix*, *M.musculus*,

L.rohita and *R.norvegicus* mutuated at various time from one common ancestor, the most recent lineages are *R.norvegicus* and *C.coturnix* with more mutuational changes, *R.norvegicus* and *L.rohita* developed from a common ancestor. *C.coturnix, M.musculus, L.rohita* and *R.norvegicus* are the cousins with respect to development of myosin.

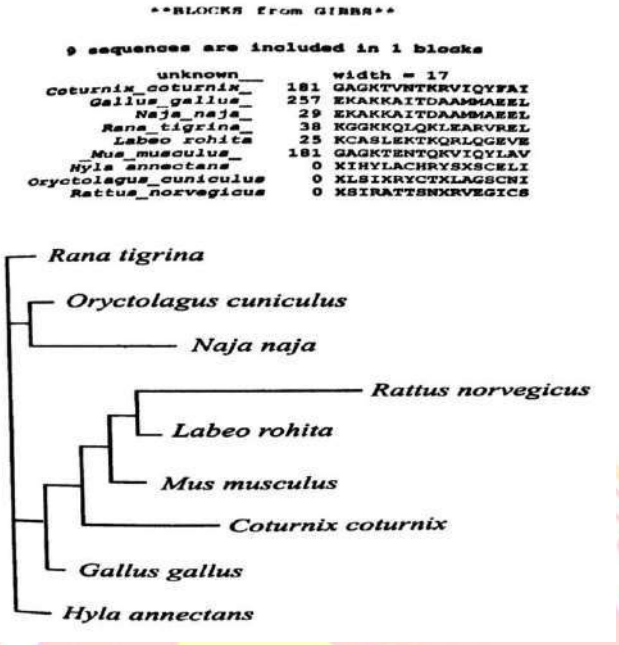

Fig.1.2 Phylogeny of Myosin

iii) Phylogeny of Troponin :

The results obtained are shown in (Fig.1.3). All the nine sequences selected for phylogeny of troponin resulted into one block with a width, 23. The phylogram (Fig.1.3) showed four clades. First, second and third clades comprises 3 separate lineages leading to *M.musculus, R.norvegicus, R.tigrina.* These lineages originate from a common ancestor.The fourth clade includes 6 species with a common ancestor which splits into 2 subclades. *C.coturnix* showed separate lineage and other five *L.rohita, G.gallus, B.marinus, N.naja* and *O.cuniculus* mutuated at various times from a common ancestor. *N.naja* and *B.marinus* are sister taxa developed from a common ancestor. The most recent lineage is *O.cuniculus. O.cuniculus* and *N.naja* are cousin lineages in the development of troponin.

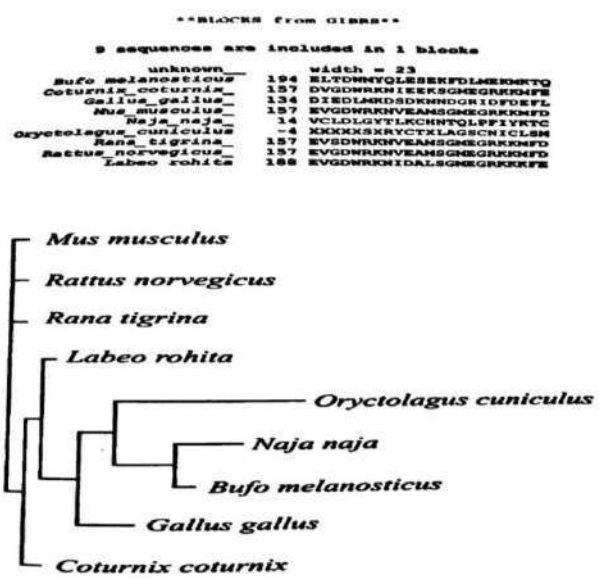

Fig.1.3 Phylogeny of Troponin

iv) Phylogeny of Tropomyosin :

The results obtained are shown in (Fig.1.4). All the ten sequences selected for phylogeny of tropomyosin resulted into one block with a width,32. The tree (Fig.1.4) showed four clades. First, second and third clades comprises 3 separate lineages leading to *M.musculus*, *R.norvegicus* and *G.gallus.* The fourth clade is separated into 4 lineages *B.viridis*, *H.chrysoscelis* , *R.tigrina* and a fourth complex lineage. The fourth clade includes two main lineages which split from a common ancestor. *C.coturnix* is quite separate lineage and the remaining three *O.cuniculus*, *L.rohita* and *N.naja* develop separately. *L.rohita* and *O.cuniculus* are the sister taxa developed from a common ancestor. The most recent lineages are *N.naja and O.cuniculus* with a more mutational changes and they are cousins with respect to tropomyosin development.

```
**BLOCKS from GIBBS**

10 sequences are included in 1 blocks

unknown__          width = 32
Bufo_melanosticus_    25 ESERGMKVIENRALKDEEKMELQEIQLKEAKH
Coturnix_coturnix_   166 EEKSGMEGRKKMFEAGESXXXXXXXXXXXXXX
Hyla_annectans_      120 ESERGMKVIENRALKDEEKMELQEIQLKEAKH
Mus_musculus_        122 ESERGMKVIESRAQKDEEKMEIQEIQLKEAKH
Oryctolagus_cuniculus -4 XXXXXSXRYCTXLAGSCNICLSMDAIKKKMQM
Rana_tigrina_        122 ESERGMKVIENRALKDEEKMELQEIQLKEAKH
Rattus_norvegicus_   122 ESERGMKVIESRAQKDEEKMEIQEIQLKEAKH
Labeo_rohita          50 DTQQCCSVINAKYARRLADSFLASCRIQKKQI
_Gallus_gallus_      122 ESERGMKVIENRAQKDEEKMEIQEIQLKEAKH
_Naja_naja_           50 HQRRPFSLRYIRGCAATCPETKPRDMVECCST
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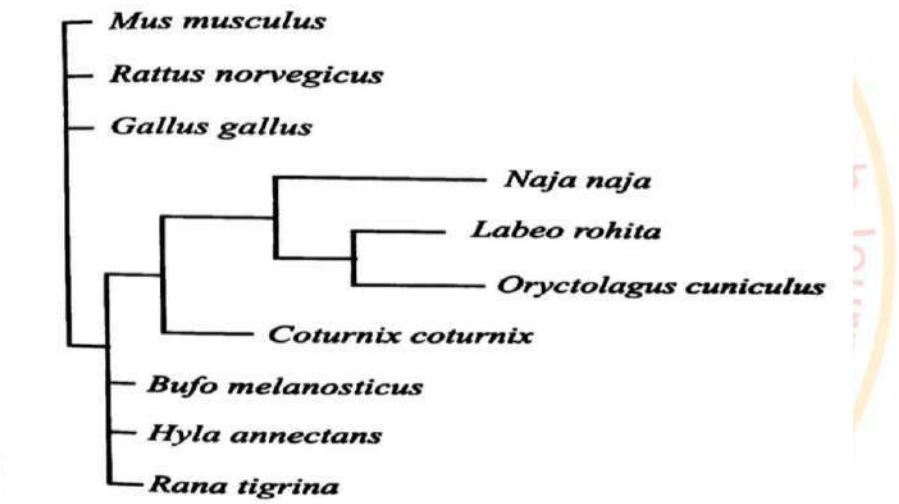

Fig.1.4 Phylogeny of Tropomyosin

Discussion and Conclusion:

The muscle protein phylogeny studies indicated divergent evolution with respect to Actin, Myosin, Tropomyosin and Troponin on different lines (Fig.1.1 to1.4) . Actin exhibited conserved amino acid sequences in C.coturnix, G.gallus, H.japonica, M.musculus, N.naja and R.norvegicus with a width of 14 amino acids . Thereafter actin exhibited divergent evolution with similar conserved amino sequences in Bufo, Clarias, Rana and Channa and diversified sequences in Columba, Labeo, Oryctolagus and Calotes. Actin in Columba livia striated muscles evolved simultaneously with Bufo. The phylogeny tree drawn for Actin amino acid sequences indicate the latest mutation in Labeo rohita which could be because of the genetic modification and or its introduction as an invasive species.

Similar observations are recorded by Volff (2005) who stated that the striated muscle development in all the culturable fish species are recent in the evolution. Myosin phylogeny was found to be more divergent than that of actin. Astonishingly, a conserved sequences of 17 amino acid width is found in Gallus gallus and Naja naja , though both of them evolved on separate lines.With respect to myosin evolution myosin in R.norvegicus, Labeo rohita and Coturnix coturnix, the mutations appear to be recent and this could be because all of them are culturable species. However, in R.tigrina and H.chrysoscelis myosin is evolved separately showing their divergent evolution and thus they are distantly related. Zardoya and Meyer (2001) studied the origin and phylogenetic relationships among living amphibians and supported the Batrachus hypothesis from both molecule and morphology based studies provides a robust phylogenetic framework that will be helpful to

comparative studies among the living amphibians and will permit better understanding of the considerably divergent digit developmental patterns found in frogs and tree frogs. Troponin in all the culturable species like Rattus norvegicus, Labeo rohita and Coturnix coturnix show primitive nature , however all the molecules in all these culturable species show divergent evolution from a common ancestor. Mus musculus, Rana tigrina and Rattus norvegicus exhibit a conserved block of 23 amino acids. Troponin from Labeo rohita also shows the similarity in this 23 amino acid block with 5 replacements as shown below.

Rattus norvegicus EVGDWRKNVEAMSGMEGRKKMFD
Labeo rohita EVGDWRKNIDALSGMEGRKKFE

The troponin evolution which is much more divergent proves the functional modifications. Performance is an intermediate step between morphology and biochemical evolution (Harris and Steudel, 2002). The bones to which the striated muscles are attached change the functional efficiency of the animal variability in the myosin ,tropomyosin and other muscle proteins are studied by Harris and Sterdel (2002) and concluded that the existence of most of the vertebrates are because of survival of fittest and the muscle proteins play a major role in it. Thus during evolution of striated muscle, biochemical changes took placed in Actin, Myosin, Troponin and Tropomyosin elimination some amino acids and by addition of some amino acids. Secondly, these alterations in amino acids sequences might have taken place as a change in the bones to which these muscles are attached with respect to increase the functional efficiency for survival. The present results also indicated that the amino acids proline, alnine, glutamic acid and glycine are lost gradually from actin and myosin during evolution. Protein analysis is quite cheaper, time saving and more reliable for phylogenetic relationship of animals.

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X-ray Diffraction Analysis of Mn-Ti doped Co-ferrite Nanoparticles

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Abstract

In the present investigation, Mn-Ti doped $CoFe_2O_4$ with the formula $CoFe_{2-2x}Mn_xTi_xO_4$ ($x = 0.05$) using well known standard sol-gel auto combustion synthesis method with a view to understand the influence of Mn-Ti doping on the structural properties. X-ray diffraction technique was used to investigate the crystal structure, nano-crystalline nature and for the determination of structural parameters. Absence of impurity peaks in the XRD pattern revealed the single-phase formation. Powder X-ray diffraction analysis of the XRD pattern proves that prepared nanoparticles belong to cubic spinel structure. The crystallite size estimated from Debye Scherrer formula was found to be 21 nm. The lattice constant obtained from XRD data found to increase as compared to pure cobalt ferrite.

Key words: *Sol-gel method, X-ray diffraction, lattice constant.*

1. Introduction

Magnetic materials are key aspects of today world. Nanotechnology and nana science are the two side of coins leads to develop magnetic materials. The magnetic materials in particular ferrite plays a key role in many technological applications on the basis of their very good electrical and magnetic properties. Iron oxide and metal oxide are the basic composition of ferrite materials.

Ferrite materials are metal oxides have high electrical resistivity, low eddy current losses and convincingly low costs coupled with their potential microwave applications such as circulators, isolators and phase shifters. Now a day nanosized ferrite materials have been widely used to prepare many electromagnetic devices such as inductors, converters, phase shifters and electromagnetic wave absorbers. The crystal structure of ferrite leads to different types namely spinel ferrites, cubic garnet and hexagonal ferrite. Spinel ferrite are the most common magnetic material represented by AB_2O_4 formula (where A= divalent metal ions and B = trivalent Fe^{3+} ions)[1]. These materials are widely studied because of their interesting electrical and magnetic properties. .

Various electrical and magnetic properties of ferrite such as DC electrical resistivity, activation energy, drift mobility, saturation magnetization, coercivity, permeability, Curie temperature are of current interest to many researchers. The combined electrical and magnetic properties along with low eddy current and dielectric loss associated with the ferrite have placed them at the top of the magnetic materials. Many researchers have carried out synthesis and investigations of electrical and magnetic properties of ferrite for different applications[2].The crystal structure of the ferrite is such that any cations of different valance and size can accommodate in the interstitial sites bringing wide variation in the properties of ferrite. The synthesis of ferrite is simple and can affect the properties of ferrite. Apart from method of synthesis chemical composition, choice of dopant cation distribution, etc also influences the properties of ferrite. Spinel ferrite, garnet and hexagonal ferrites are of great interest to many scientists and technologist. However, considering the processing, cost and applicability spinel ferrite are found to be more versatile and useful in many technological applications. Interest in the production of nonmetric metal oxides has enormously risen in the last years because of the novel and/or exalted properties they display. Among the many synthetic methods proposed, good results have been obtained by standard sol-gel auto combustion synthesis method.

Spinel ferrite possesses cubic spinel structure with FCC type and has two interstitial sites[3]. In the family of spinel ferrite, cobalt ferrite is one of the best and promising candidates for many applications. Cobalt ferrite possesses inverse spinel structure in which cobalt ions occupy octahedral [B]site and F^{3+} occupy both tetrahedral (A) and octahedral [B] site. The coercivity of the cobalt ferrite is much more than another spinel ferrite. The high saturation magnetization, high magneto crystalline anisotropy and high permeability are the features of cobalt ferrite[4]. In the literature there are many reports on the various properties of cobalt ferrite and substituted cobalt

ferrite. In last two to three decades cobalt ferrite in nanocrystalline form has attracted the attention of many researchers. The properties of nanoparticles are very much different than that of their bulk counterpart. Greater reactivity, larger surface area to volume ratio, greater stability, chemical homogeneity etc are the important characteristics of the spinel ferrite nanoparticles[5]. Researchers have investigated various electrical and magnetic properties of the cobalt ferrite nanoparticles for various applications such as drug delivery, magnetic hyperthermia, sensors, catalyst, water purification, photo degradation etc. There is ample scope to prepare the cobalt ferrite using different technique with improved properties which can lead to novel applications. Therefore, it is of great interest to prepare cobalt ferrite in nanosized form by wet chemical method. Doping of Zn, Al, Cd, Mg etc ions in Cobalt ferrite have been reported in literature, however, co-doping of magnetic Mn^{2+} ions and non-magnetic Ti^{4+} ions in cobalt ferrite is not reported in the literature. Therefore, attempt is made to synthesize Mn-Ti doped cobalt ferrite and study the X-ray diffraction analysis.

2. Experimental details

2.1. Chemicals

For the preparation of $CoFe_{2-2x}Mn_xTi_xO_4$ (x = 0.05) nanoparticles, the chemical such as Co $(NO_3)_2 \cdot 6H_2O$, Fe $(NO_3)_2 \cdot 9H_2O$, Ti $(OC_4H_9)_4$, Mn $(NO_3)_3 \bullet 4H_2O$, $C_6H_8O_7$, NH_3 samples having 99.99 % pure AR grade chemicals are used. The following (Fig.1) flow chart shows the stages involved in the complete process for preparation of spinel ferrite by sol-gel auto combustion method

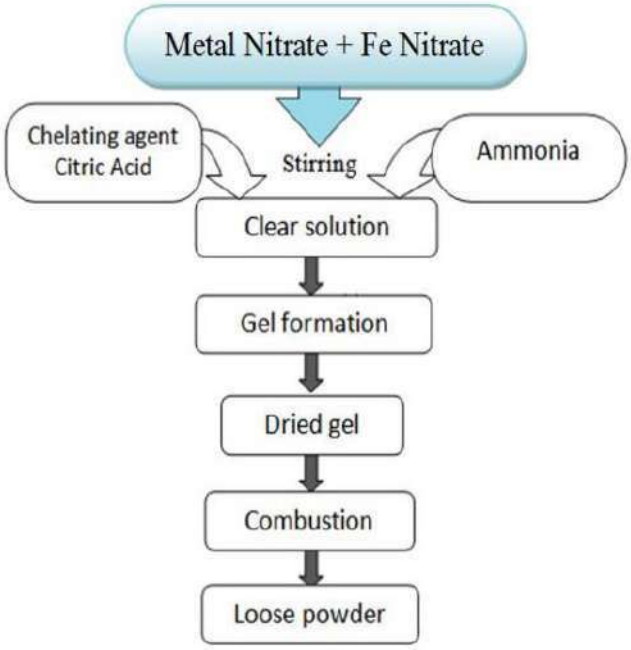

Fig. 1: Flow chart shows the stages involved in preparation of spinel ferrite by sol-gel auto combustion method

2.2. Characterization tools

To study the X-ray diffraction (XRD) analysis, $CoFe_{2-2x}Mn_xTi_xO_4$ (x=0.05) nanoparticles were carried out at room temperature by using standard characterization tools. The details of characterization tools along with their make and specification applied are given in Table 1.

Table 1: Details of the characterization techniques

Name of the Technique	Make and Model	Specifications
X-ray diffraction (XRD)	Rigaku X-ray diffractometer	Source: Cu-Kα radiation Range: 10^0 - 70^0
UV-Visible spectrophotometer (UV-Vis)	Agilent Technologies Carry 100 UV-Vis	Range: 100-1000nm

3. Results and discussion

3.1. X-ray diffraction analysis

Crystallographic structures were examined by powder X-ray diffraction (XRD) using Rigaku X-ray diffractometer. The prepared Mn-Ti doped cobalt ferrite ($CoFe_{2-2x}Mn_xTi_xO_4$, where x = 0.05) nanoparticles were characterized by X-ray diffraction technique. The X-ray diffractogram were recorded at room temperature is shown in **Fig. 2.**

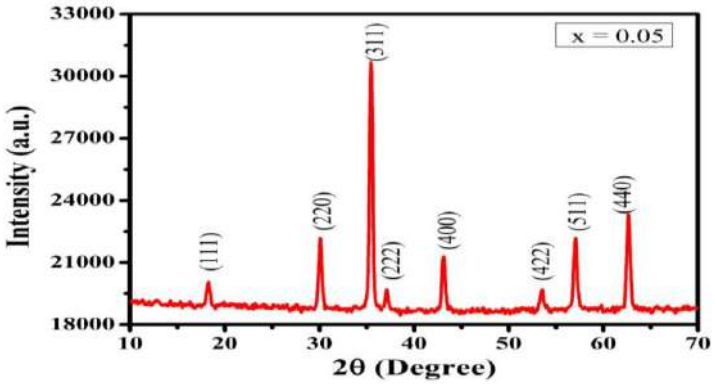

Fig.2: XRD pattern of $CoFe_{2-2x}Ti_xMn_xO_4$ (x= 0.05) nanoparticles

A close examination of XRD pattern shows that the presence of well-defined intense and sharp Bragg's peaks which are indexed using Bragg's law. The diffraction peaks are designated as (220), (311) (222), (400), (440), (511) oriented at various Bragg's angle[6]. All these diffraction peaks are the part of cubic structure with FCC type. No extra peaks other than the cubic phase was observed in the XRD pattern. Thus, it proves that the prepared nanoparticles possess single phase cubic spinel structure. The structural parameters like lattice constant (a), unit cell volume (V) and X-ray density (d_X) were determined using the XRD data and their values are put in Table 2. On comparison with the lattice constant of the pure cobalt ferrite (a = 8.382, [7]), it is noticed that that the lattice constant of the presents Mn-Ti doped cobalt ferrite has been increased. These results can be supported by the ionic radii of Mn-Ti is greater than that of Fe^{3+} ions. The replacement of Fe^{3+} ions by Mn-Ti composition x results in increase of lattice constant. The unit cell volume and X-ray density was also determined using the value of lattice constant. The X-ray density (d_x) of all the samples was calculated using the molecular weight and volume of the unit cell using the following relation.

$d_x = 8M / Na^3$

where, M is molecular weight and N is Avogadro's number.

Table 2 shows the values of unit cell volume and X-ray density, which show increased and decrease respectively in comparison with pure cobalt ferrite. These results can be attributed to the fact that both unit cell volume and X-ray density depends directly and inversely respectively to the lattice constant.

Table 2: Variation of lattice constant 'a' (Å), Crystallite size 't' (nm), X-ray density 'dx' (g/cm^3), lattice volume (Å^3)

Composition (x)	a (Å)	t (nm)	d_X(g/cm^3)	V (Å^3)
0.05	8.385	21	5.324	589.6

4. Conclusions

The successful incorporation of Mn-Ti dopants in cobalt ferrite has been achieved through sol-gel auto combustion synthesis technique. The X-ray diffraction pattern and its analysis revealed the formation of single-phase cubic spinel structure of prepared samples. Lattice constant and unit cell volume increased, whereas X-ray density is decreased as compared to lattice constant of pristine cobalt ferrite nanoparticles.

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Characterization and Thermal Stability measurement of Chemically Synthesized polyaniline-SnO_2 nanocomposites

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1. Introduction

In earlier days, use of conventional sources of energy is increased due to increase in necessity and also this result in increase in pollution for environment. [1] Hence there arises a need of some alternate and renewable source that exists last long and should not pollute the environment and soil as well. For this purpose some conducting polymers like polyaniline (PANI) has gained much interest as having some interesting applications such as sensors, microactuators, polymeric batteries, electronic devices and electrolytic capacitors. [2] The commercial exploitation of most of the applications based on polyaniline is closely linked to the lack of its processability and mechanical properties [3]

The properties of electronically conductive polymers depend strongly on their microstructure and morphology. [4] It is well known that polymer composites can be produced exhibiting enhanced properties that the constituent materials may not exhibit. Conducting polymer nanocomposites formed by immobilization of metal nanoparticles into the conjugated conducting polymer matrices [5]. Conducting polymers synthesized with doping any metal oxide such as SnO_2 given much increased conductivity and stability of the composite formed in nanosize.

In the present work, chemical oxidative polymerization method used to synthesize polyaniline doped with SnO_2 at a particular weight percent. The SEM images shows, polyaniline nanoparticles of different diameters were obtained, Thermal stability of the polymers plays important role to modify the polymer properties to be used for advanced applications. Also it indicates that, the morphology and particle size of product are depend on the temperature during synthesis Hence thermal stability of conducting PANI and its composites has great importance.[6,7] It is measured using TG-DTA analysis.

2. Methods and Materials:

2.1 Materials used:

The Aniline Hydrochloride (AR grade), Ammonium Persulphate (AR grade), Hydrochloric Acid, Acetone (AR grade) obtained from Loba Chem. Mumbai, (India). All the chemicals were used as received. Double distilled (DD) water was used for synthesis.

2.2 Synthesis of Polyaniline (PANI) nanoparticles:

In this process polyaniline nanocomposite was synthesized by chemical oxidative polymerization method [8]. 2.59 gm of aniline hydrochloride was dissolved in 50 ml distilled water in a volumetric flask. Similarly 5.71 g of ammonium persulfate (APS) was dissolved in 50 ml distilled water kept for 1 h. at room temperature (303 K), During additions, the mixture is stirred for 2 h. and allowed to polymerize for next 1 h. Then the resulting dark green precipitate of PANI was filtered. Then washed with three 100 ml portions of 0.2 M HCl and acetone. Obtained precipitate was kept in oven to dry for about 8 hrs. at 50-60 ^{0}C.

2.3 Synthesis of PANI- SnO_2 Nanocomposite:

In this process polymer composite was synthesized by in-situ chemical oxidative polymerization method [9] for 15 wt. % of SnO2. SnO2 nanoparticles were dispersed into the APS solution of 50 ml DD water and stirred for 1 h before added to aniline monomer. Aqueous solutions of 2.59 g of aniline hydrochloride prepared in 50 ml DD water. It is then added slowly in APS under vigorous stirring for 2 h. and allowed to polymerize for next 1 hr. The resulting dark green PANI-SnO2 precipitate was filtered and washed with three 100 ml portions of 0.2 M HCl, and acetone. Obtained precipitate was kept in oven to dry for about 8 h. at 50-60 0C. In this way PANI-SnO2 nanoparticles were formed.

3. Characterization Techniques:

3.1 Scanning Electron Microscopy (SEM):

In the present work Field Emission Gun-Scanning Electron Microscope with model number JSM-7600F was used. Magnification was about 25 times to 1,000,000 times. This technique gives the morphology of synthesized composite.

3.2 X-Ray Diffraction Technique (XRD):

XRD is a method for structural materials characterization and quality measurement. To determine particle size Debye-Scherrer method is used. Sixth generation MiniFlex 600 X-ray diffractometer (XRD) is used for the determination of crystallite size, strain and molecular structure of material.

4. Result and discussion:

4.1 Scanning Electron Microscopy:

The surface morphology of PANI and PANI-SnO_2 (15 wt %) nanocomposite was observed under scanning electron microscope (SEM) and obtained images are as shown in figure. The surface morphology of nanocomposite was completely different compared to without dopant. The surface morphology changes from rough to smooth. PANI - SnO_2 shows fine microsphroidal surface observed with poor matrix.

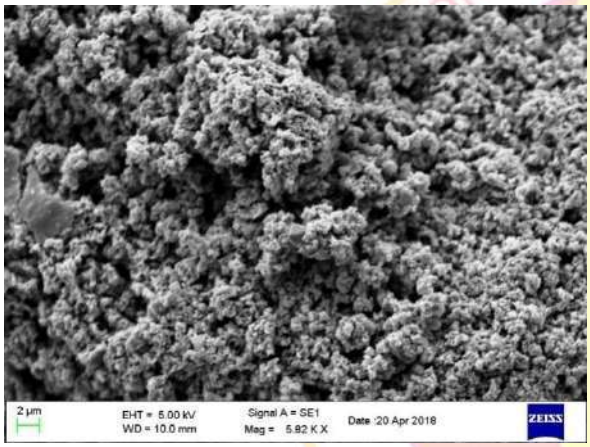
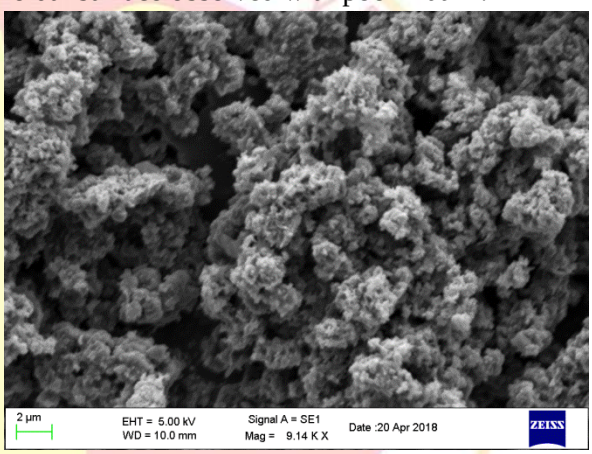


Fig. Pure PANI



PANI-SnO_2 nanocomposite

The average size of the particles is 15-268 nm. PANI is completely amorphous in nature whereas PANI-SnO_2 nanocomposite shows partly crystalline as well as amorphous phase. The micrograph shows porous microstructure in which SnO_2 nanoparticles are dispersed in fibrous PANI forming a nanocomposite. It is highly microporous and thus capable of increasing the liquid–solid interfacial area providing more locations for the insertion.

4.2 X-Ray Ddiffraction:

From the following figures it can be stated that the more crystalline regions in the zinc oxide sample are observed with major reflections between 20° and 30° (2θ values). Also less intense peaks at 17°, 20°, 25° (2θ values) indicate the high crystallinity of SnO_2 samples.

Absence of peak in the intensity versus 2θ curve represents complete amorphous state of sample. Indication of peak or peaks in the curve suggests formation of phase or phases in the composite during polymerization process.[10] The degree of crystallinity increased in PANI-SnO_2 nanocomposite than pure conventional PANI, clearly indicated the homogeneous distribution of nanoparticles in the polymer matrix.

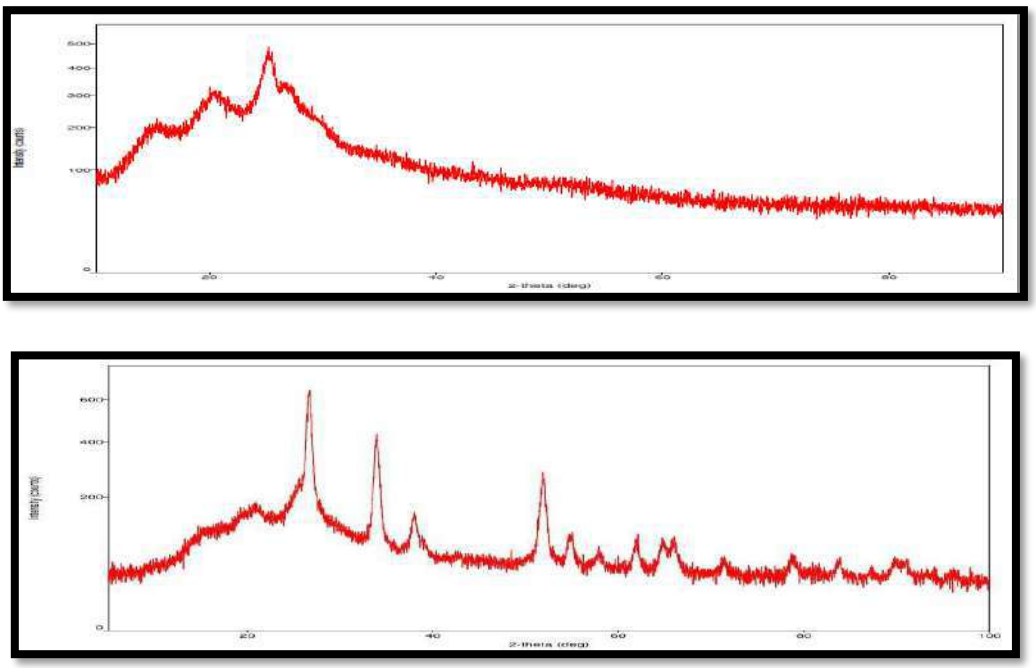


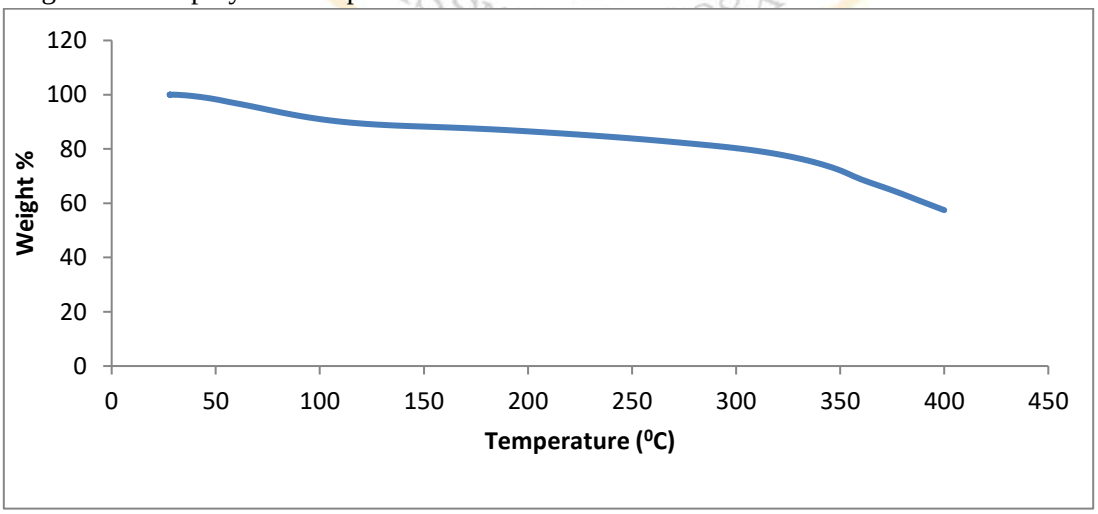
Fig. XRD pattern of Pure PANI and PANI-SnO_2 nanocomposite

The crystallite size can be determined using Debye Scherrer formula and found as 40 nm. The XRD-pattern of PANI-SnO_2 shows sharp diffraction peaks at 26°, 34°, 51° which confirms the presence of SnO_2 nanoparticles are highly crystalline and can be indexed as (110), (101) and (211) planes of SnO_2. Also these peaks were slightly shifted from their respective standard positions which may be due to metal oxide. [11] The XRD pattern of PANI shows the three broad peaks at 2θ= 15.13°, 20.34°, 25.20°.PANI showed two broad hallows at 2θ =20.34° and 25.20°. A nanocomposite show the greater crystallinity due to the addition of SnO_2.

4.3 Thermogravimetric Analysis and Differential Thermal Analysis:

Thermal properties of pure Polyaniline and PANI doped with Tin Oxide (SnO_2) nanocomposite were evaluated by TGA/DTA in the temperature range 0ºC to 700 ºC at a heating rate of 15 ºC/min as shows Figure.

TGA thermograph of PANI-SnO_2 nanocomposites shows two step degradation. In first step the initial weight loss was observed between 35 to 200^0 C and was attributed to the loss of moisture and low molecular weight compounds in polymer composite. It can be clearly seen that both samples exhibit minimal weight loss until the samples reached 200^0 C. In second step, a major weight loss was observed form 200 to 700^0 C and was due to the degradation of polymer composite.



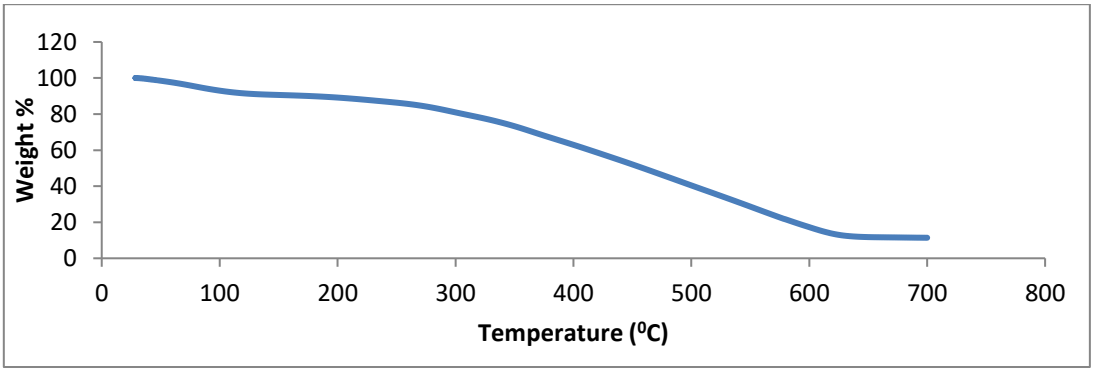


Fig. Thermogravimetric Analysis Curve of Pure PANI and PANI-SnO_2 nanocomposite

Figure shows that in two step degradation of PANI-SnO_2 nanocomposite, loss of ~ 93 % of its weight when it was heated to 670^0 C. It indicates that ~ 83 to 93 % of the sample consists of polymers and softeners. The residual about ~ 6 to 16 % was considered to account for metallic compounds, added as Tin Oxide and dopant.

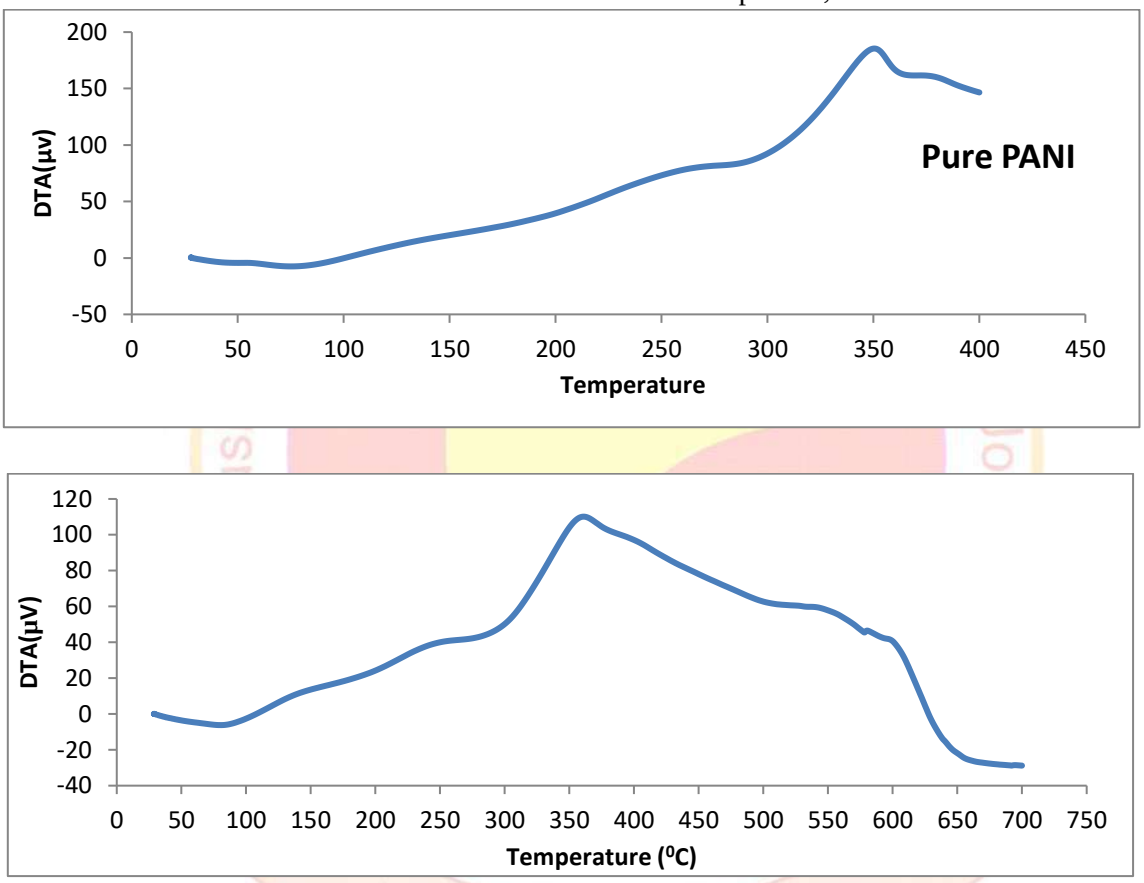


Fig. Differential Thermal Analysis Curve of Pure PANI and PANI-SnO_2 nanocomposite

Figure shows DTA curves of pure Polyaniline and PANI doped with SnO_2. In DTA curve, the endothermic peak appearing at ~ 75-100^0 C is probably due to the melting point of PANI that identified as melting of crystalline phase of polymer. Another endothermic peak appearing at 273 – 285^0C in the in situ synthesised hybrids is assigned to the decomposition and elimination of dopant. The sample PANI-SnO_2 nanocomposite shows the strong and broad exothermic peak in the range 350 to 400 ^{0}C accompanied by rapid weight loss can be ascribed to the decomposition of PANI-SnO_2 nanocomposite. This study indicated that the sample is thermally stable up to 343^0C.

PANI doped with Tin Oxide (SnO_2) shows the strong and narrow exothermic peak as compared with pure Polyaniline. It shows that with the addition of Tin Oxide the thermal stability of PANI-SnO_2 nanocomposite was increased. Thus it indicates that PANI-SnO_2 nanocomposite is more thermally stable than pure Polyaniline.

5. Conclusion

In this work, Pure polyaniline (PANI) and PANI-SnO_2 nanocomposites were successfully prepared by *insitu* polymerization method at room temperature. The particle size of PANI-SnO_2 was found to be 15 to 268 nm. SEM image shows the formation of nanoparticles of composite with agglomeration of the particles. XRD shows a size of about 40 nm for the nanoparticles of PANI-ZnO with 15% of weight. Also thermal stability of the nanocomposite is observed as more than the pure PANI. At about 400 and 500 deg. celcius the powder is degraded. It is more stable and less degradation of the nanocomposite is observed due to addition of metal oxide SnO_2. Such type of material could be used for various applications such as photovoltaic cell, rechargeable batteries, etc.

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Synthesis And Characterization of Zinc Oxide Nanoparticles from *Alishewanella Sp*. And Its Antimicrobial Activity Against Escherichia Coli

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Abstract

Metal nanoparticles have been intensively studied within the past decade. Nanosized materials have been an important subject in basic and applied sciences. Zinc oxide nanoparticles have received considerable attention due to their unique antibacterial, antifungal, and UV filtering properties, high catalytic and photochemical activity. The objective of this work is to synthesize Zinc oxide nanoparticles using green synthesisl method and characterize zinc oxide nanoparticles using scanning electron microscope and X-ray diffractometer. Further its antimicrobial activity against Escherichia coli is studied.
Key words: *Nanoparticles, Zinc oxide, Alishewanella sp., Escherichia coli.*

Introduction

New technologies often create new challenges to science in addition to their benefits, raise concerns about health and various environmental problems. Recent nanotechnology holds a promise and a broad aspect towards wide applications of nanoparticles in a multiple way of emerging fields of science and technology. Over last decades, nanotechnology has established as the great innovation of science and technology. Nanotechnology is a science and engineering branch of recent well established technology refering at the nanoscale, i.e. 1 to 100 nm Generally, metal oxide nanoparticles are inorganic. Various nanoparticles like Fe, Ni, Co, Mn, Zn, etc. are known as the enormously accepted magnetic materials for a wide range of applications like various electronic ignition systems, generators, vending machines, medical implants, wrist watches, inductor core, transformer circuits, magnetic sensors and recording equipment, telecommunications, magnetic fluids, microwave absorbers, etc. They are also applicable in other high-frequency applications. Green synthesis method is proved as beneficial over other methods which are implemented for the synthesis of nanoparticles. Green synthesis methods are eco-friendly approach and compatible for pharmaceutical and other biomedical applications, as the toxic chemicals are not used in these methods.

Besides, this method does not require high pressure, temperature. Synthesis of various nanoparticles by microorganisms is used more than the other techniques due to its ecofriendly nature. The use of environmentally beneficial materials like plant leaf extract, bacteria, fungi and enzymes for the synthesis of zinc nanoparticles proposes abundant benefits of eco-friendliness and compatibility for pharmaceutical and many other biomedical applications

These compounds act as chemo-therapeutic agents for the treatment or prevention of bacterial infections (Saunders Comprehensive Veterinary Dictionary 2007). An antibacterial agent is considered as bactericidal if it kills bacteria or as bacteriostatic if it inhibits their growth. Different methods have been adopted for the assessment and investigation of antibacterial activity in vitro. These methods include disk diffusion, broth dilution, agar dilution, and the microtiter plate-based method.

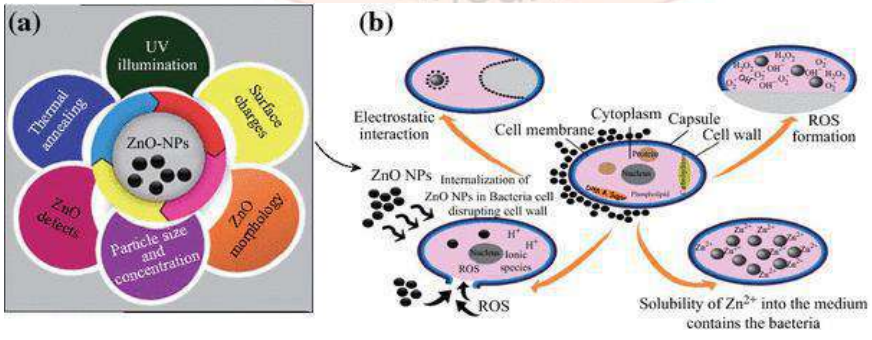


Fig:2 Correlation between the a influence of essential ZnO-NPs parameters on the antibacterial response and the different possible mechanisms of ZnO-NPs antibacterial activity.

Correlation between the influence of essential ZnO-NPs parameters on the antibacterial response and the **b** different possible mechanisms of ZnO-NPs antibacterial activity, including: ROS formation, Zn^{2+} release, internalization of ZnO-NPs into bacteria, and electrostatic interactions.

The antimicrobial property of nanoparticles is determined by their size, shape, morphology, composition and crystallinity. Researchers are going on to synthesize nanoparticles, designing of nanodevices and application of these in different fields like medical science, environment, energy, information, and communication, industries and also in food technology etc. Generally there are two parts of nanoparticles, the core material and a surface converter. The surface converter is responsible for alteration in the physicochemical properties of core materials. The core material consists of a variety of biological materials like phospholipids, lipids, lactic acid, chitosan, and dextran or may be formed of carbon, chemical polymers, silica or meta

Experimental:

Materials And Methods

- Culture of *Alishewanella species*
- Distilled water
- Zinc Sulphate
- Mueller Hinton Agar
- Nutrient agar
- Nutrient broth

Nutrient agar:

Composition

Ingredients	Gms/lit
Peptic digest of animal tissue	5.000
Sodium chloride	5.000
Beef extract	1.500
Yeast extract	1.500
Agar	15.000
Final Ph (at 25^0)	7.4 to 0.2

Nutrient broth:

Composition

Ingredients	Gms/lit
Peptic digest of animal tissue	5.000
Sodium chloride	5.000
Beef extract	1.500
Yeast extract	1.500
Agar	15.000
Final Ph (at 25^0)	7.4 to 0.2

Muller Hinton Agar

The major used of Mueller hinton agar is for antimicrobial susceptibility testing

Composition

Ingredients	Gms/lit
Beef extract	2.00 gm
Acid hydrolysate of casein	17.50 gm
Starch	1.50 gm
Agar	17.00 gm
Distilled water	1000 ml
Final pH (at 25^0)	7.3 to 0.1

Reagent

- Crystal violet
- Iodine
- Safranin (0.25%)
- Alcohol (95%)
- Hydrogen peroxide (3%)
- Oxidase reagent (1% tetramethylene paraphenylene diamine dihydrochloride).
- N HCl.

Following reagent was used for identification and characterization of isolated.

1. Crystal violet stain

Solution A:

Crystal violet - 2.0 g
Ethyl alcohol - 20ml

Solution B:

Ammonium oxalate - 0.8 gm
Distilled water - 80 ml
Mixture of solution A and B

2. Grams Iodine solution

Iodine - 1gm
Potassium Iodine - 2.0 gm
Distilled water - 100 ml

3. 95% alcohol

4. Safranin solution (1%)

Safranin - 1.0 gm
Distilled water - 100ml

Preparation of 2mM ZnO solution

100ml $ZnSO_4$ solution was prepared which has the molecular weight of 161.47g/mol. 2.86 gm of $ZnSO_4$ was dissolved in 100ml distilled water.

Method

Enrichment of culture

Enrichment culture is a medium having specific and known qualities that favour the growth of particular microorganism. Enrichment culture's support the growth of particular microorganisms while inhibiting the growth of others. These cultures are used to increase the small number of desired organism to detectable work in the present work. Enrichment of culture was done in nutrient broth containing zinc sulphate solution as a source for synthesis of ZnO nanoparticle.

Centrifugation

Centrifugation is used to separate the two miscible substances. The culture was centrifuged at 3000rpm for 20 minutes. After centrifugation cell pellets were seperated by removing supernant. Separated cell pellets were inoculated in 100ml of 2mM zinc sulphate solution.

Synthesis of ZnO NPs

For synthesis of ZnO nanoparticle flask containing 2mM solution of zinc sulphate with cell pellets was incubated on rotary shaker for 3 days at 100 rpm. Zinc oxide nanoparticle synthesis was seen by means of change in colour from white to pale yellow.

For confirmation of zinc oxide nanoparticle synthesis UV-visible spectophotometric studies was done, from which the graph was obtained showing spectra at 430nm.

Results And Discussion

Nutritional responses, optimization of pH and temperatures of *Alishwanella sp.*			
Colour	Creamy	Trehalose	-
Size	Large	Arabinose	+
Shape	Circular	Galactose	-
Texture	Moist	Rhamnose	-
Elevation	Flat	Salicin	-
Opacity	Opaque	Xylose	-
Margine	Serrete	Esculin	-
Gram staining	-	Malic acid	-
Shape	Rod	pH 6	-
Catalase	+	pH 7	+
Oxidase	+	pH 8	+
Indole	-	pH 9	++
Methyl red	-	pH 10	++
Voges Proskauer	-	pH 11	++
Citrate utilization	-	pH 12	+
Nitrate reduction	+	Temp 30ºC	+
Dextrose	+	Temp 40ºC	++
Lactose	-	Temp 60ºC	-
SR- Short Rod; (+) = Positive; (-) = Negative; + = Normal growth; ++ = Moderate growth; +++ = Luxuriant growth			

Biosynthesis of ZnO NP's

Fig 1. Biosynthesis of Zno NPs

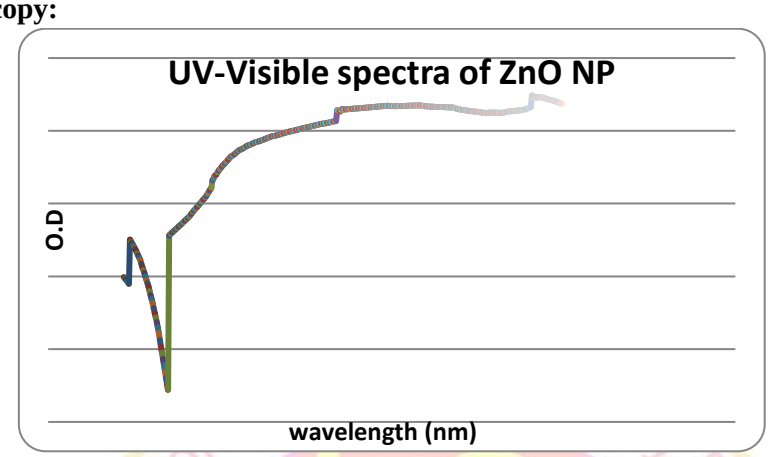
1. Control eppendrop without cell pellets
2. Experimental eppendrop with cell pellets showing colour change from white to pale yellow.

Culture was maintained by serial sub-culturing on nutrient agar slants. Two experimental flask was used for the zinc oxide nanoparticles synthesis of nanoparticle shown in the figure. Confirmation of synthesized nanoparticle in the medium was characterized by the change in color of the reaction mixture from white to pale yellow after 24h of incubation. First flask was used as a control containing 2mM $ZnSO_4$ without inoculation of cell pellet kept on rotary shaker, which did not show color change after 24 hours. The second flask containing 2mM $ZnSO_4$ with cell pellet kept on rotary shaker, pale yellow color formed after 24 hours which shows positive result. That means it confirmed that the zinc oxide nanoparticle was synthesized (Fig 1).

reaction mixture from white to pale yellow after 24h of incubation. First flask was used as a control containing 2mM ZnSO4 without inoculation of cell pellet kept on rotary shaker, which did not show color change after 24 hours. The second flask containing 2mM ZnSO4 with cell pellet kept on rotary shaker, pale yellow color formed after 24 hours which shows positive result. That means it confirmed that the zinc oxide nanoparticle was synthesized.

Characterization of zinc oxide nanoparticles:

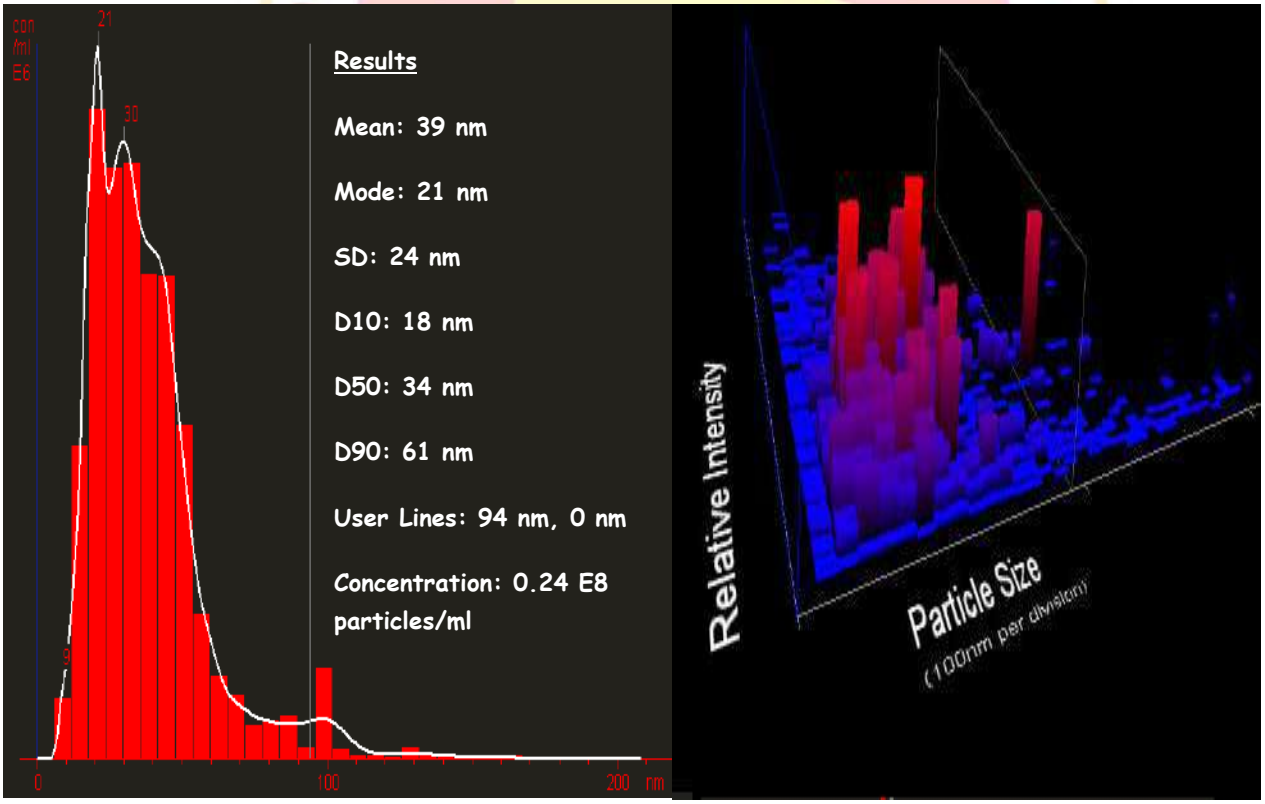
UV- Visible spectroscopy:



Graph1. UV-Visible spectra of ZnO NPs

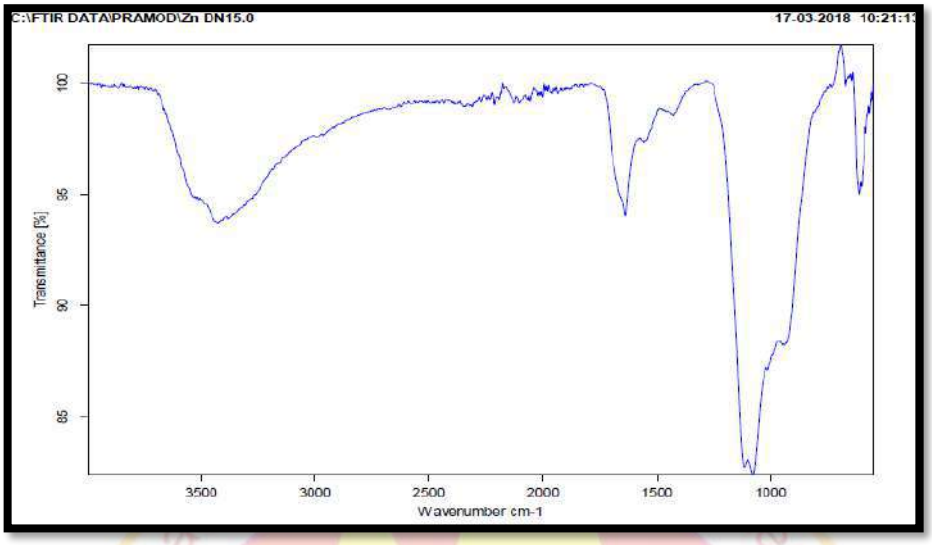
The synthesized zinc oxide nanoparticle solution was observed in UV–visible spectra, the change in color of this solution was recorded in Spectrophotometer in the range of 350–500nm. The absorption Maxima was seen at 440 nm, which confirms the synthesis of zinc oxide nanoparticles for studied bacterium. The absorption maxima was at 440 (Graph1).

Nanoparticles tracking and analysis (Nanosight LM 20)



Nanoparticle tracking analysis NTA (NanoSight-LM 20) histogram showing particle size distribution and the average size of zinc oxide nanoparticles (39 nm). The particle analyzer results revealed the presence of nanoparticle in the range of 21 to 39 nm. The mode displayed by the analyzer was 21 and the mean was 39nm.

Fourier transform Infra-red spectroscopy



Graph 2: FT-IR of zinc oxide nanoparticle

Graph 2.Shows the of FTIR spectrum of the ZnO nanoparticles synthesized by biological, which was acquired in the range of 500-4000cm-1. The band between the 500-550cm^{-1} corelated to metal oxide bond (ZnO). FTIR method measurements was carried out to identify the possible biomolecules responsible for capping and efficient stabilization of the metal nanoparticles synthesized by the microbes. It also confirms the reduction of metal ions by the used bacteria. The peaks in the range of 1100-1600cm^{-1} corresponds to the C=O bonds.

Antimicrobial activity of ZnO NPs:

A. Experimental **B. Control Positive**

Fig 2: Antimicribial action of ZnO NPs

Fig 2 A: Action of zinc oxide nanoparticle against *E.coli*.

Fig 2 B: Action of standard antibiotic tetracycline

Table 2: Antibacterial action of zinc oxide nanoparticle.

Test organism	Zone of inhibition (mm)
E.coli	**19**

Table 3: Antibacterial action of standard antibiotic

Antibiotic	Zone of inhibition (mm)
Tetracycline	22

The antibacterial activity of zinc oxide nanoparticle against pathogens was performed by well diffusion method. For testing the antibacterial activity of zinc oxide nanoparticle the well diffusion method was used, the pure bacterial culture was subculture on muller hinton agar respectively. Wells of 8 mm diameter made on muller hinton agar using cork borer. The strain was swabbed uniformly into the individual plates using spreader. After that Using a micropipette, sample of nanoparticles solution poured into the well and incubated plates for 24 hours. And the zone of inhibition was observed.

This work demonstrates that zinc oxide nanoparticle showed the property to synthesized by bacteria. The isolated strain of *Alishwanella sp.* was found to have the potential to form zinc nanoparticles at room temperature within 24 h. The synthesized zinc oxide nanoparticles was characterized by UV– Vis spectroscopy and confirmed by particle analyze, FT-IR spectroscopy and Zeta potential. Zinc oxide nanoparticle was again tested for its antimicrobial activity against pathogenic *E.coli*. These zinc oxide nanoparticles shows very good effectivity on some pathogens.

Conclusion

Alishwanella sp. was able to synthesized zinc oxide nanoparticle efficiently. The source used for synthesizing zinc oxide nanoparticle was zinc sulphate. The nanoparticle was characterized by visual observation, UV-VIS spectrophotometer, FT-IR spectroscopy and zeta potential. The size of zinc oxide nanoparticle ranged from 21 to 39 nm.

The UV-Vis spectroscopic study shows the Plasmon resonance property, confirmed the reduction of metal ion and formation of nanoparticle with plasma resonance peak at 440 nm. The change in color of ZnO solution was recorded in Spectrophotometer in the range of 350–500nm. The sharp bands of zinc colloids were observed at 426 nm proves the zinc metal reduces the bacterial cell extract more efficiently.

Nanoparticle tracking analysis NTA (NanoSight-LM 20) showed particle size distribution and the average size of zinc oxide nanoparticles (39 nm). FTIR confirms the reduction of metal ions by the used bacteria. The peaks in the range of 1100-1600cm^{-}1.The nanoparticles was found to be the potent inhibitors of pathogenic bacteria and have shown significant zone of inhibition against pathogenic *E. coli*.
particle size.

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Water vapour sensing mechanism of pristine SnO_2 nanoparticle based thick film sensor

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Abstract

The SnO_2 was synthesized by co-precipitation method. The gross structure and phase purity of the pure SnO_2 nano powder were examined by powder X-ray diffraction technique. It reveals that the sample crystallize in tetragonal structure. The surface morphology investigated through field emission scanning electron microscope(FE-SEM) results that pure SnO_2 possesses uniform grains and is almost homogeneously distributed, which indicates the high packing density of the materials and nano spheres like structures. Further, Water vapour or humidity sensing investigations of pristine SnO_2 nano powder were study. Our result indicates that pristine SnO_2 in form of thick film was most sensitive for humidity under same conditions. The hysteresis plot between increasing and decreasing the RH range of 30–90% Rh and vice versa. The samples resistance decreases from 10^{11} Ω to 10^{8} Ω. The similar change was also observed in sensitivity. The response and recovery time were also studies. The results were re- producible up to ± 79% after 2 months of observations.

Key words: *SnO_2 nanoparticle, Humidity sensor.*

1. Introduction

Humidity plays a significant role in every part of the Earth in biology factors and varrious industrial processes. To have a desirable surrounding atmosphere, it is essential to monitor, detect and control the ambient humidity under different conditions ranging from low temperature to high or in combinations with other gases by precise and provident sensors [1,2]. Due to the different operating conditions of moisture sensors in different areas of application ranging from indoor to open air uses, various types of humidity sensing instruments have been developed based on different work principles and diverse hygroscopic sensing materials [3-5]. The operating principle of metal oxide semiconductor sensors is based on the change in conductivity of the sensitive layer by the chemical adsorption of molecules. Typically, the metal oxides semiconductors (SnO_2, In_2O_3, WO_3, ZnO, etc.) are used to create sensitive layers [6-8]. Tin oxide is an n- type wide band gap semiconductor (Eg = 3.6 ~3.97eV) and its electrical properties critically depend on its stoichiometry with respect to oxygen, on the nature and amount of impurities or dopants present and on its size as well as shape of nanostructures [9-11]. Stannic oxide is formed in the structure of rutile, the spatial group being P4/mnm. The unit cell is tetragonal, it consists of six atoms – two stannum and four oxygen atoms – and is characterized by the lattice parameters a and c and intrinsic parameter u. The optimized cell parameters obtained in the calculation are as follows: a=b= 4.738Å, c= 3.188Å and u = 0.30756. In the bulk all Sn atoms are six-fold coordinated to threefold coordinate oxygen atoms. The SnO_2 is an anisotropic polar crystal, which crystallizes in tetragonal rutile structure [12-16]

In this work, SnO_2 nanoparticles is synthesized by using co-precipitation method. The humidity sensing properties of the synthesized material such as hysteresis cycle, sensitivity and response time of pure synthesized material were studied.

2. Experimental

2.1 Synthesis of SnO_2 nanoparticle

All the chemicals used in this study were of GR grade purchase from Sd-fine, India (purity 99.99%). In preparation of SnO_2, 2 g (0.1 M) of stannous chloride dehydrate ($SnCl_2.2H_2O$) is dissolved in 100 ml distilled water. After complete dissolution, about 4 ml ammonia solution is added to above prepared aqueous solution with magnetic stirring. The solution was stirred for 20 minutes to make homogeneous solution. White gel precipitate is immediately formed and it is allowed to settle for 12 hrs. Then it is filtered and washed with deionised water 2-3 times. The obtain precipitate were mixed with 0.27 g carbon black powder (charcoal activated). The obtained mixer is kept in vacuum oven at 70 ºC for 24 hours so that the mixer gets completely in to dried powder. Then this dry product was crushed into a find powder by grinder. Now obtained product of fine nano powder of SnO_2

was calcinated at 800°C up to 8 hours in the auto-controlled muffle furnace (*Gayatri Scientific, Mumbai, India*.) so that the impurities from product will be completely removed.

Preparation of thick films

The thick film was prepared by screen printing technique on a glass substrate. Initially, for the screen printing the thixotropic paste was formulated by mixing the sintered fine powder of pure nano SnO_2 powder a with a solution of ethyl cellulose (as 10% temporary binder) in a mixture of organic solvent such as butyl cellulose, butyl carbitol acetate and turpineol. The ratio of inorganic to organic part was kept as 75:25 in formulating the paste. The paste of pure SnO_2 and it was screen printed on a glass substrate in the form of thick films. The prepared films were dried at 80-110°C in oven for 1hrs then the dried films are kept for fired at 500°C for 25 min in muffle furnace (Kumar make Mumbai), so that all the organic materials (in the form of binders) and organic impurities can be evaporated form the sensor material. For the surface conductance measurement, the electrodes of silver paint were formed on adjacent sides of the films and again, the films were subjected to heating at 80°C for 15 min for drying the silver paint.

2.2 Characterization

X-ray diffraction (XRD)

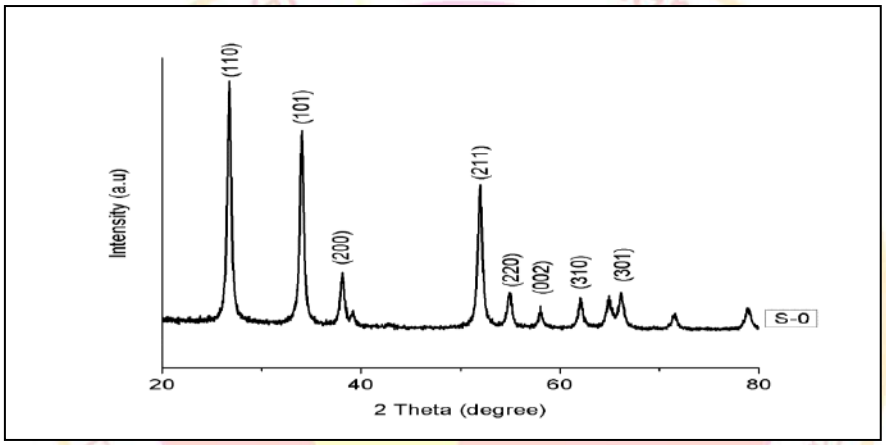

Figure 1 XRD pattern of pristine stannic oxide (SnO_2)

Figure 1. shows the XRD pattern of pristine stannic oxide (SnO_2) nanostructure synthesized by liquid phase via co-precipitation method calcinated at 400°C it is clearly observed that the highest intensity peak is obtained at (110) crystal planes and other peaks lying at (101), (200), (211), (220) and (002) of SnO_2. All the peaks match well with the standard tetragonal structure of SnO_2 with lattice constant a = 4.723 nm and c = 3.238 nm and its unit cell volume ($V=72.24A^{o3}$) with JCPDS card no. 71-0652. All the peaks are perfectly match with pure SnO_2 nanostructure, which indicates the high purity of obtained SnO_2 nanoparticles. The average crystalline size was found to be 23.19 nm calculated by using Debye-Scherer formula [17].

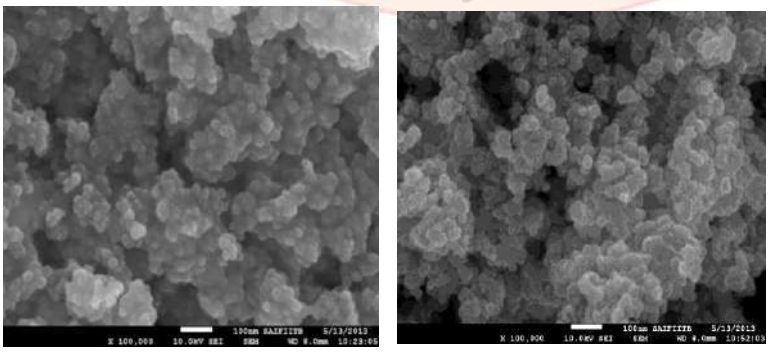

Figure 2. FE-SEM of pure SnO_2

Figure 2. shows the micrograph of sample pure SnO_2 thick films in this the particles are found to in the tetragonal shape within the particle size in the range of about 15 nm to 31.2 nm.

3. Result and Discussion

Hysteresis Plot

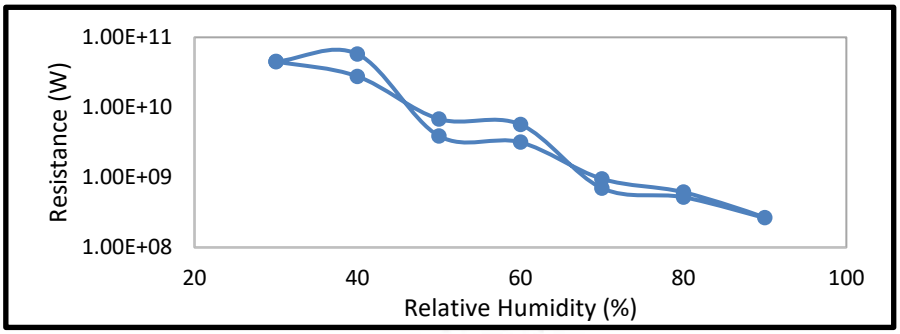

Figure 3. Hysteresis Plot

Hysteresis plot of pristine SnO_2 shows the variation between resistances of sample with respect to the relative humidity in increasing and decreasing order from 30 to 90 % RH as shown in the figure 3. A very small hysteresis present during forward and reverse cycle of relative humidity, where as a very significant average change observed in the value of resistance from 10^{11} Ω to 10^{8} Ω, these is a very remarkable change in the observed in the value of resistance in pristine SnO_2 material. In all the prepared sample the hysteresis is present which shows processes of regeneration is quite slower. Apart from these a sample shows comparable decrease in resistance with an increase in % RH which indicates that the conduction occurred at the grain surface by release of electron from the water molecule and possessed a high sensitivity factor due to large surface area and porosity in the form of thick films.

Sensitivity

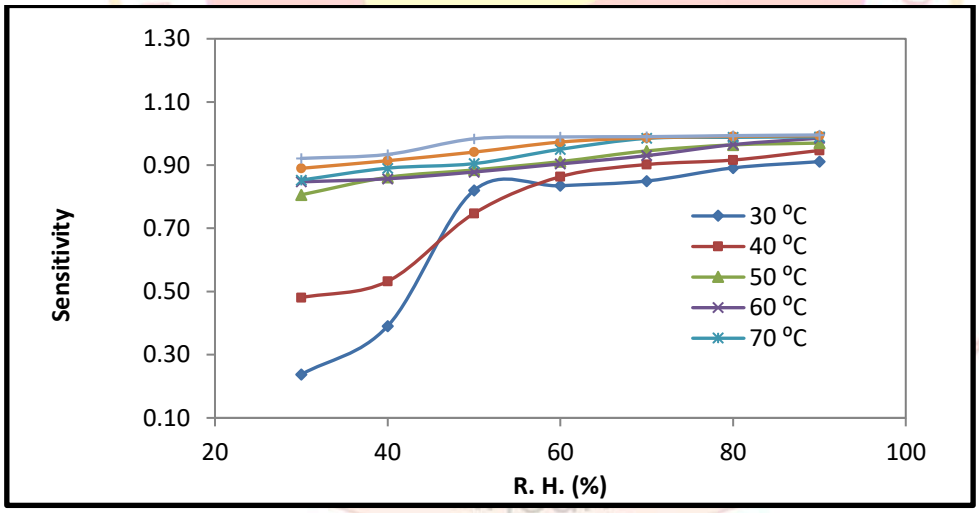

Figure 4. Sensitivity curve

The sensitivity is found to be increasing with the RH for the thick films and it is increasing up to some particular RH and then afterward it remains constant as shown in figure 4. For higher RH the sensitivity curve is found to be higher for the thick film of pristine SnO_2. It also state that the change in conductivity is more in SnO_2 nano materials the similar change is observed in sensitivity also. The Pure SnO_2 nanoparticle-based sensors exhibits significantly higher sensitivity it is due to the formation of heterogeneous interface between them and more adsorption site was created to absorbed more water vapuors. The fall in resistance is mainly due to the increased amount of conduction electron or charge carrier upon adsorption of water vapours by the surface layer of the thick films.

Response Time

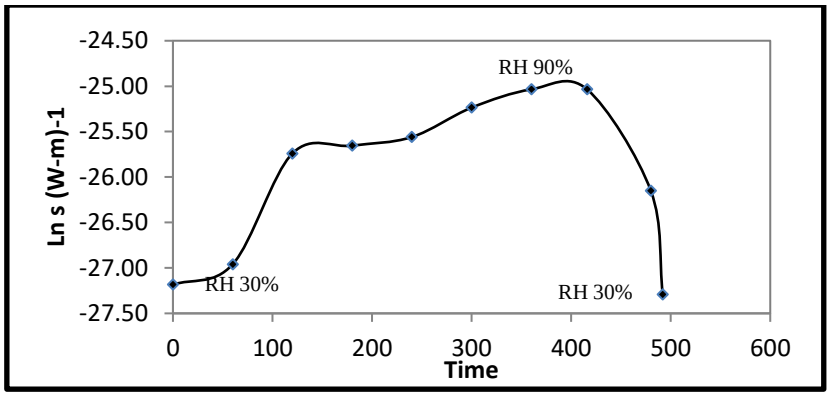

Figure 5. Response Curve

The responses curve pristine SnO_2 at constant temperature is as shown in figure 5. From the response curve, on time and recovery times are measured. Under the condition of constant temperature, the relative humidity is increases from 30 % RH to 90% RH in some appropriate time and then at the 90 % RH it is stopped, (ON response time) 360 sec which is after, it was allowed to fall up to 30 % RH (OFF recovery time) which is 127 sec. It is observed that response and recovery time is nearly fast in the pristine SnO_2.

4. Conclusion

SnO_2 nanoparticle was successfully synthesise co-precipitation method. Minimum crystallite size was found to be 23.19 nm for SnO_2 nanoparticle. The Surface morphology of pure SnO_2 shows that most particles are spherical in shape leaving more space as pores and hence it was most sensitive for humidity sensing. The Hysteresis plot shows very significant average change in the value of the resistance from 10^{11} Ω to 10^{8} Ω during forward and reversed cycles. Sensitivity is found to be increasing with the RH in pure SnO_2 thick film and it is increasing up to some particular RH and then afterward it remains constant. This shows that it has good scope for the development of moisture sensor in the range of relative humidity 30% to 90% RH. The response and recovery time of pristine SnO_2 based thick film sensors were satisfactory i.e. the sensors were found to be fast in operation. The recovery time found to 127 s at constant temperature respectively.

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Green And Facile Synthesis Of Silver Nanoparticles Using *Azadirachta Indica* (NEEM) Extract

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Abstract:
Nanoparticles are gaining interest in biomedical applications due to its importance such as anti-bacterial, anti-fungal and anti-cancer agents. Eco-friendly green methods using plant extracts are gaining popularity due to the abundance of raw materials and the production of non-toxic by-products threatening to the environment. For the synthesis of silver nanoparticles (SNPs) using the leaf extract of Azadirachta indica as a reducing agent from 1 mM silver nitrate ($AgNO_3$) has been investigated. The synthesis silver nanoparticles were characterized by UV/VIS spectroscopy, XRD, EDAX, IR and Scanning Electron Microscopy. Thus from this study it can be concluded that Azadirachta Indica can be effectively used for synthesizing silver oxide nanoparticles.
Keywords: *Silver oxide Nanoparticles, Green Synthesis, Azadirachta indica*

Introduction

Biological synthesis process provides a wide range of environmentally acceptable methodology, low cost production and minimum time required. At the same time the biologically synthesized silver nanoparticles has many applications includes catalysts in chemical reactions [1]. In this context, the concepts of green chemistry have gained immense popularity; these are mainly concerned with replacing chemical products and improving or developing processes and technologies to reduce or even eliminate substances that are harmful to health and the environment [2]. Generally, metal nanoparticles can be prepared and stabilized by chemical, physical, and biological methods; the chemical approach, such as chemical reduction, electrochemical techniques, photochemical reduction and pyrolysis and physical methods, such as Arcdischarge and physical vapor condensation are used. To synthesis stable metal nanoparticles with controlled size and shape, there has been search for inexpensive, safe, and reliable and "green" approach. The novel methods so called green/biosynthesis have been recently developed by a variety of plant extract such as Ocimum Sanctum, Petroselinum crispum, Murraya koenigii, Coriandrum Sativum for the synthesis of metal nanoparticles[3-5]. Among the various metal nanoparticles synthesized (such as silver, gold, iron, zinc and platinum), silver nanoparticles have gained more importance in the nanotechnology field. As, silver in the nano size is safe inorganic and non-toxic agents and encompasses a wide range of applications such as antibacterial and antifungal effects. It promotes reactions without hazardous solvents, reducing agents, and stabilizers [6]. Several green methods have been applied so far for the preparation of AgNPs including electrochemical reduction, microwave and sonochemical preparation, or synthesis from supercritical liquids [7].

Here we have developed a rapid, eco-friendly and convenient green method for the synthesis of silver nanoparticles from silver nitrate using leaf extracts of Azadirachta indica.

Material And Methods

Materials: Materials used in this research consist of Silver nitrate, *A. indica* (Neem) used in this work were collected from the garden of Shri. Shivaji science college Akot.

Preparation of Water Leaf Extract of A. indica (Neem): To 10 gram of powered leaf sample 100 ml of water as a solvent was added (10g/100ml). Plugged with cotton wool and then kept on a rotary shaker at 200 for 10 hours. After 10 hours the extract was filtered and the filtrate was concentrated using flash evaporator and stored in air tight containers at 4°C and used for further experiments.

Synthesis of Silver Nanoparticles (AgNPs) from water Leaf Extract of A. indica (Neem): Silver nanoparticles were prepared from water leaf extract of *A. indica (Neem)*. To 10 ml of the water leaf extract 90 ml of 1mM silver

nitrate solution was added. The extent of nanoparticles synthesis was monitored by measuring the absorbance at 400-600nm

Characterization of Silver nanoparticles

UV-Vis spectrophotometer:

Formation of silver nanoparticles is easily detected by spectroscopy because the colored nanoparticle solution shows a peak ~400 nm. The band in silver nanoparticles solution was found to be close to 400 nm. In this study, spectrophotometer was used to measure the optical density of solutions.

EDAX Spectroscopy:

The EDAX is a reliable tool to determine the elemental composition of the synthesized AgNPs from *A. indica (Neem)* extract. The EDX profile of the AgNPs from *A. indica (Neem)* extract showed the presence of typical peaks for silver. Additional peaks also observed which indicated the presence of nitrogen and oxygen, representing the existence of other elemental compounds in the AgNPs.

FTIR Spectroscopy:

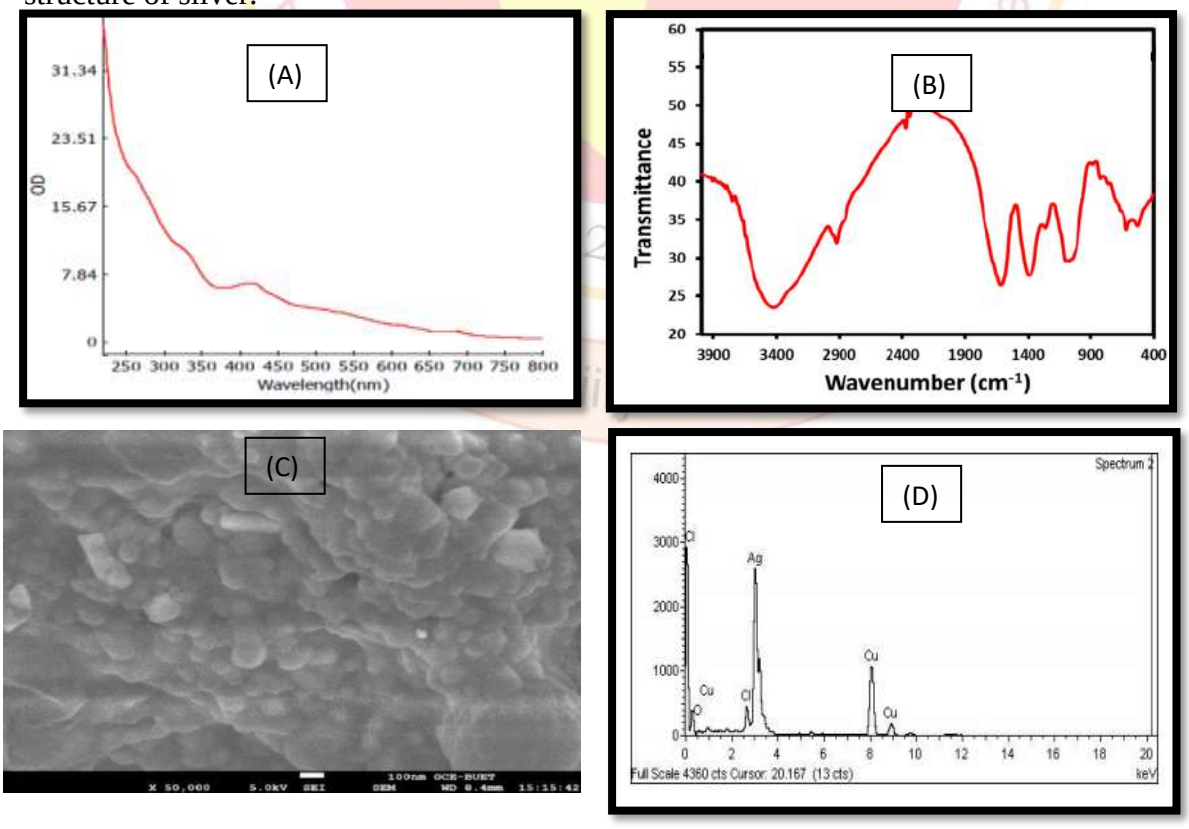
The FTIR spectra of *A. indica (Neem)* extract leaf extract showed the characteristic peaks of OH, alkene, aldehyde groups which may be involved in the reduction and stabilization of silver nanoparticles. The presence of OH, aldehyde and alkene in the extract acted as the capping and stabilizing agent for the synthesis of silver nanoparticles. The silver nanoparticles synthesized from *A. indica (Neem)* extract leaf extract showed the presence of phytoconstituents namely amides, alkenes, aliphatic amines, alkanes and alkyls, responsible for the reduction of silver nitrate.

Scanning electron microscopy:

SEM images showed that most of the silver nanoparticles are predominately spherical in shape having smooth surface and well dispersed with close compact arrangement shown in fig. (C).

X-Ray Diffraction:

The XRD pattern of synthesized AgNPs using *A. indica (Neem)* leaf extract was shown in Fig. (E). The XRD was done to determine the crystalline nature of AgNPs and the resulted peaks were found at 37.90°, 44.05°, 64.25° and 77.20° representing (111), (200), (220) and (311) face centered cubic structure of silver.



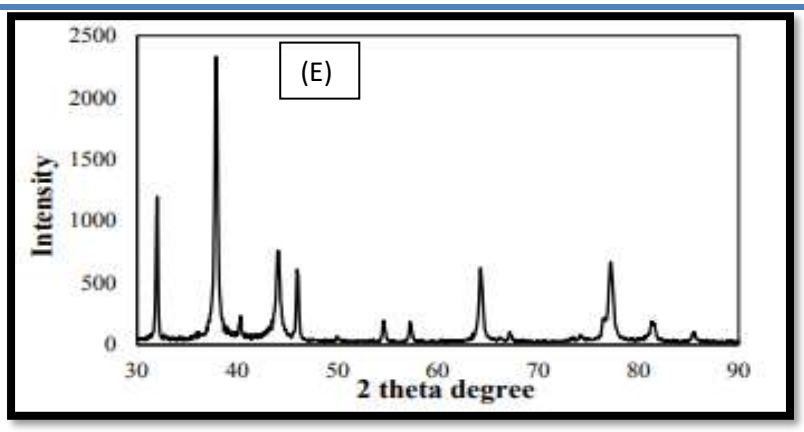


Fig. (A) UV-Vis spectrum (B) FTIR spectrum (C) SEM spectrum (D) EDAX spectrum (E) XRD spectrum of silver nanoparticles.

Conclusions

The green synthesis of AgNPs using *A. indica (Neem)* leaf extract was shown to be rapid, eco-friendly and produced nanoparticles are fairly uniform in size and shape. The functional groups present on their surface confirm the bioactive potential. The AgNPs showed a good stability profile. The ideally suited structure for AgNPs was successfully characterized. This work indicates that neem leaf extract had a good valuable potential in the future for production of silver nanoparticles

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Application of Nanotechnology in Food Packaging: A Review

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Abstract

Nanotechnology has validated its competence in almost all feasible fields. But still, Food Nano packaging is an incompletely explored discipline of observe both in Nano technology and food science. The motive of this paper is to expose the applications of nanotechnology in food packaging. Bio primarily based packaging is a one of the terrific techniques to reduce the environmental pollution. It replaces the non-degradable polymers with biodegradable materials which reduces waste and may be altered to increase the shelf life, and beautify food nice. Next is advanced packaging, which objectives in producing packaging cloth with excellent barrier homes, mechanical energy, flexibility and stability. Smart packaging is set use of Nano sensors and Nano devices inside the detection of freshness of food, contaminants in meals, screen changes and integrity of packaging fabric.

Keywords: Nanoparticels, Nano biosensors, Nanopacking

I. Introduction

Nanotechnology is the engineering of practical systems at less than a hundred nm scale degree. Nanotechnology applications are multiplied in the numerous sectors within the industrial world so as in food industry. Nanotechnology acts a distinguished function in food enterprise via supporting to enhance its range of sub sectors together with meals packaging. At present studies are being carried out to extend the shelf lifestyles and enhance meals first-rate even as decreasing packaging waste.

Thus, Nanotechnology applications in food packaging have brought about big amount of improvements which can be used inside the packaging industry commercially. This evaluate covers the position of novel nanotechnology primarily based meals packaging strategies in order to get higher enhancement in Food Quality and Safety.

Application of nanotechnology in improvement of bio based totally packaging which includes starch and polylactic acid, progressed packaging consisting of Nano laminates, Nano coatings and Nano clay, and clever/shrewd zone such as spoilage indicators, Nano-primarily based sensors and lively tags have been reviewed

II. Bio Based Packaging

The developing problem related to disposable of plastic in-turn has caused the development of bio degradable packaging. Bio based totally packaging are biodegradable packaging movie which can be able to controlling moisture switch and/or fuel trade with the intention to enhance protection and keep the dietary and sensory satisfactory. Bio polymers are used to produce these sorts of packaging movies. Bio polymers have poor mechanical, thermal and barrier houses [1].

Particularly, high brittleness, low warmth distortion temperature, excessive permeability of gasoline and vapored bad resistance to processing operations has confined their programs in meals enterprise [2,3]. Thus nanotechnology has been applied to improve the properties of these biopolymers. Nano-composites are advanced to conquer these boundaries of the biopolymers via nanotechnology. At nano scale degree, the size of the filler is immensely decreased, leading to the full-size increment in the floor area of the fillers. This is desired due to the fact bio Nano composites depend upon the high floor location of the Nano sized fillers which ends up in a massive boundary or interfacial place among the matrix or biopolymer and Nano filler. These kinds of alteration to biopolymers have advanced the homes of it as food packaging materials.

Biopolymers consist of plant-derived substances along with, starch, cellulose, other polysaccharides, and proteins; microbial products like polyhydroxylbutyrate and polymers synthesized chemically from naturally derived monomers including, polylacticacid. Most reviews centered on software biopolymer movies as fit for human consumption films

III.**Starch**

Starch and derivate are the most commonly used form of biopolymers that has been studied to supply bio-Nano composite materials for food packaging programs. Studies display that starch is absolutely degradable and will induce biodegradability of non-biodegrable substances while mixed Unfortunately, the starch has some limitations, including poorer mechanical residences and robust hydrophilic behavior (bad moisture barrier) [4, 5]. To conquer this problem, incorporating inorganic materials and artificial polymers has been proposed to improve water barrier belongings of starch. If starch is processed in an extruder via both mechanical and thermal power, it may be transformed to a thermoplastic fabric.

Here, plasticizers are used to reduce intra-molecular hydrogen bonds and to offer balance to product residences. But still thermoplastic starch (TPS) cannot meet some of these necessities along with green mechanical, oxygen and moisture protection. To overcome this problem, clay turned into used as follows. Clay has been used as a potential filler to improve the residences of TPS. Starch or clay Nano composite films have been obtained through dispersing montmorillonite (MMT) nanoparticles via polymer melt processing techniques [6].

IV.**Polylactic Acid (PLA)**

Polylactic acid (PLA) is the maximum common artificial biopolymer that has been studied until nowadays. PLA has received attention as a biocompatible, sustainable, biodegradable cloth with better mechanical properties. Therefore, PLA presents greater disposal alternatives and its production is much less environmentally burdensome than traditional petroleum-primarily based plastics [7, 8].The most essential barriers for the packages of PLA in meals packaging are its negative hardness, sluggish degradation, terrible gasoline barrier properties, and hydrophobicity [8]. Nanotechnology may be carried out to enhance this assets through the usage of Nano composites. Solvent casting of combinations of PLA and organophilic clay in chloroform led to substances with an improved crystallization tendency and extended Young's modulus.

The PLA layered silicate Nano composites, evolved by means of simple soften extrusion, exhibited considerable development of material residences in each solid and soften states as compared to the matrix without clay [2]. The oxygen barrier residences of Nano composite of amorphous PLA blended with chemically changed kaolinite had progressed by using 50%. The mixture of PLA and MMT layered silicate may additionally bring about a Nano composite with barrier homes appropriate for food packaging applications [4].

V. **Improved Packaging**

In the improved packaging improvement, nanomaterials are mixed into the polymer matrix to get better barrier properties and to enhance temperature and humidity resistance of the packaging [4]. Such new packaging materials have top notch barrier houses to save you the migration/diffusion of O2, CO2, water vapor, and taste compounds. This could have a high effect at the shelf existence of clean and processed meals. In many events, it has been stated that the barrier residences of this new packaging film can be improved through about 50% as compared to the properties of the neat polymer. This is due to the creation of a maze shape results in a tortuous route for gases and different molecules and by way of that decreasing their permeation fee [9]

VI. **Nano Coatings**

Coating in meals may be defined as skinny film of edible fabric placed among meals additives to provide a barrier to mass switch. Edible coatings are currently broadly used on a spread of ingredients, consisting of veggies, end result, chocolate, meats, cheese, bakery products, candies and French fries [6].Up to now range of researches has been done in order to improve the bodily homes of these suitable for eating movies by way of the combination of Nano-debris.

In order to decrease the migration of oxygen, clay MMT has been integrated into pectin. Anoticeableraise in stability of chitosan layered Nano composites become received [6]. The inclusion of inorganic Nano fillers which include, TiO2, ZnO and ZnS, and carbon nanotubes has more desirable the retention of taste, acids, sugars, shade and texture, elevated balance at some point of delivery and garage, stepped forward look and decreased spoilage [8].

VII. **Nano Laminates**

A Nano laminate is made of two or more layers of fabric with nanometer dimensions which can be bodily or chemically bonded to each different. Nano laminates provide some blessings over traditional technologies for the practise of fit to be eaten coatings and films and therefore have some of crucial applications in the food enterprise [10]. A range of various adsorbing substances could be used to increase the distinctive layers, which includes; natural poly electrolytes (proteins, polysaccharides), charged lipids (phospholipids, surfactants), and colloidal debris (micelles, vesicles, droplets) [11,12]. It could be useful to incorporate active functional agents such as antioxidants, antimicrobials, enzymes, anti-browning dealers, flavors, and colors into the movies. These purposeful agents might increase the shelf lifestyles and high-quality of coated ingredients [6]. These Nano laminates may be created completely from food-grade ingredients (proteins, polysaccharides, lipids) by way of the usage of easy processing operations which includes dipping and washing [11].

VIII. **Nano Clays**

Nano clays are bi-dimensional platelets with a completely minute thickness (1 nm) and several micrometer lengths. Those are high performance, enormously to be had and occasional price substances. Thus vast range of clinical researches has been carried out approximately nanoclays. Interaction among the Nano clays and polymers are considered as the number one principle for Nano primarily based packaging. According to the prevailing clinical researches; two varieties of Nano scale composites are created by means of the interactions among Nano clays and polymers, named as intercalated Nanocomposites and exfoliated Nano composites.Beer packaging gives particular examples on Nano clay packages in packaging zone.

In the past, plastic was no longer used as a packaging material in beer industry because of the oxidation and unwanted flavour improvement.

Nanotechnology has given a practical answer using Nano composites to conquer the hassle. This caused employment of plastic substances in beer bottling and this cloth offers 6 month shelf existence for beer. This era may be additionally carried out in packaging of gentle liquids (ETC institution 2004). In addition to liquids, positive meals gadgets such as processed meat, cheese, confectionary, and boil-in-bag ingredients can also be packaged according to this era. Other than the shelf life extension, there are numerous different blessings in Nano clays and Nano-crystals primarily based packaging. As an example, the weight of the Nano-based packaging is appreciably less and as a result it results in cut-off the transportation value. Significant boom in film electricity is also may be performed in these types of substances and this ends in make certain the protection of the meals stuff that is within the packaging. The maximum full-size limitation of this generation is that the Nano clays on polymers reduce the transparency of the packaging.

IX. **Nano-Based Sensors**

Environmental modifications leads to the deterioration of food product and also leads to boom the microbial hobby on meals stuffs and toxicant generation. Nano particles and Nano composites may be used to meals packages which can be act as reactive particles and pick out unwanted changes. These kinds of substances are considered as nanosensors.Nanosensors can discover precise chemical substances, pathogens and toxicants, with reaction to their level of incidence in food stuff.

Time temperature integrators, gasoline detectors for food spoilage and O2 sensors are the not unusual kinds of Nano sensors applied in food packaging. As an instance, Scientists at Kraft, Rutgers University and the University of Connecticut, have designed the “digital tongue” to come across pathogenic microorganisms and other substances in elements in step with trillion with the assist of embedded Nano sensors within the packaging substances using nanotechnology. The sensors can detect coloration modifications in the bundle when the food merchandise start to destroy

X.**Conclusion**

Researches screen that nanotechnology is a promising generation that facilitates in innovative tendencies inside the meals packaging. Application of nanotechnology in meals packaging shows sizeable enhancements in

the processing, shelflife, fitness and packaging functionalities, transportability, and decreased expenses. Nanotechnology can be applied in food packaging in many approaches. Most of this applications are nonetheless in the experimental or fundamental level and some are handiest restrained to excessive-cost merchandise.

Bio based packaging is one among such utility. Increased interest in environmental pollutants made bio based packaging an indeed generation. Bio based totally programs have changed the non-degradable polymers. The problems associated with these biopolymers are overall performance, processing and value. The Nano composite is evolved to triumph over those barriers of the biopolymers via nanotechnology. In starch to improve its first-class Nano composite is produced the use of MMT clay as Nano filler. The mixture of PLA and MMT layered silicate results in a Nano composite with better barrier houses appropriate for meals packaging.

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Particle Size Confinement of Hybrid Nanostructured Zinc Oxide / Polyaniline Matrix

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Abstract

Hybrid matrix of Zinc oxide/Polyaniline (ZnO/PANI) nanocomposite material was synthesized by typical oxidative polymerization which followed by Ultra-sonication treatment. Due to this post treatment of ultra-sonication radiation bombardment; particle size was reduce which causes confinement in particle size. This confinement of particle size reveled by XRD patterns, also it is found that at polymerization stage nanotube were formed. These reduce small sized hybrid nanostructured Zinc oxide/Polyaniline materialmay enhanceextensive properties like electrical and gas sensing properties.

Keywords: Hybrid ZnO/PANI, Ultra-sonication, X-ray diffraction, Particle Size, Confinement.

1. Introduction

The use of nano-sized materials, nano-composite materials and hybrid structurematrix nano-compositematerial are rapidly arousing interest in scientific community due its intensive properties like the surface-to-bulk ratio for the nano-sized materials is much greater than that for coarse materials [1]. In nano-sized materials, a large fraction of the atoms are present at the surface and hence the surface properties become paramount.

Since then, broad research has been carried out on nano-sized conducting polymers because of their excellent electrical, optical and sensing properties. These materials have broad application in areas ranging from anticorrosion coatings to chemical sensors and biosensors, light-emitting devices, and solar cells, as well as many others [2]. Among the variety of conducting polymers due to unique electrical properties, stability and easy fabrication process polyaniline is one of the most attractive materials. Because of these interesting properties, polyaniline has been a potential candidate in many applications [3, 4].

Semiconductor Metal oxide (SMOx) material like Zinc Oxide (ZnO), Titanium dioxide (TiO2), Magnesium Oxide (MgO) etc has many applications in electrical, thermal, optical and sensing devices. These materials are easily synthesized by using large variety of synthesis methods. These SMOx materials particle sized varies from bulk to nano- size; depending upon synthesis techniques and conditions during synthesis [5-7].

Now days, there are emergent interests to combine both organic and inorganic materials for applications in electro-optic [8-10]. Combination of nanosized metal oxides and conducting polymer has the potential to enhance the property of the hybrid complex matrix of metal oxide and conducting polymer. Such composites material enhances properties due to its optimized volume to surface ratio of nanosized metal oxides. The properties of nanocomposite materials depend not only on the properties of their constituents but also on their combined morphology and interfacial characteristics [9-12].

Among the various semiconductor oxides materials, Zinc Oxide (ZnO) has been chosen as the key sensing material. Zinc Oxide is among the extensively studied metal oxide outstanding because of their unique properties and important characteristics for example low cost, easy availability and wide range of applications

Polyaniline which can be synthesized either by chemical oxidization polymerization [13-15] or electro polymerization [16]. Conventional chemical polymerization is conducted by polymerizing aniline monomers in the presence of a free radical activator.In past two decades, a variety of methods have been used to synthesize polyaniline nanofibers, including electrospinning, interfacial polymerization, rapid- mixing,nanofibers seeding, templates and surfactants or oligomer-assisted polymerization [12].

In present work composite material of Zinc Oxide (ZnO) and Polyaniline (PANI) synthesized and structural properties were studied also on the basis of X-ray diffraction (XRD) patterns the property of particle size confinement was studied.

2. Experimental

I. Synthesis of Nanomaterial Metal Oxide: Zinc Oxide (ZnO)

All the chemicals used in this study were of GR grade purchase from Sd-Fine, India (purity 99%). The chemicals are used without any further purification. Synthesis method adopted from S.D. Charpe *etal*[17] liquid –phase method. Finally we get product of ZnO nanoparticles.

II. Synthesis of Conducting Polymer: Polyaniline

In present work, use International Union of Pure Applied Chemistry (IUPAC) method is used prepare polyaniline in which aniline hydrochloride (5.18gm) is dissolved in 100 ml distilled water to make up volume. Ammonium peroxydisulphate (11.42gm) is dissolved in 100 ml distilled H_2O in a volumetric flask. The solutions are kept for 1 hour at room temperature. The above solutions are mixed together in equally proportion with constant stirring [18].

The precipitated is collected by filtration and washed with 0.2 M HCl, to remove all residual monomers, oxidant and its decomposing products. Finally it is washed with acetone to removes low –molecular-weight organic intermediates and oligomers. It also prevents the aggregation of PANI precipitated during drying. The precipitated is dried at 60^0C for 12 hours. The resultant material is a polyemeraldine salt.

2.1.Synthesis of Nanocomposite (PANI/ZnO)

In the experimental work, there were syntheses of hybrid matrix of ZnO/PANI done. For this synthesis process *in –situ polymerization* method was adopted [17-20] to prepare nanocomposite of PANI/ZnO hybrid matrix. First we prepare 1 M HCl solution in distilled water. Here we used Zinc Oxide which prepared in steps I.

In preparation we add Zinc Oxide (ZnO) in 1M HCl solution to achieved 0.1 M gel solution of Zinc Oxide then this solution under treatment of sonication for 1 hour. Now prepared 100 ml 0.1 M Aniline hydrochloride Solution then add 10 ml sonicated ZnO solution. Again go for sonication for 10 minutes then add 100 ml Ammonium peroxydisulphate (APS) solution slowly with continues stirring, after 3 hours we achieved polymerization. This type polymerization is called as *in-situ Polymerization*[21-22].

After 3 hours filter, washed above solution with 1 M HCl solution and dried under vacuum for 12 hours. Hence, nanocomposite hybrid matrix structures of PANI/ ZnO were synthesized [21].The yield of synthesized ZnO/PANI nanostructure was found to be well proportion. To study particle size conferment effect, bombardment of Ultra-sonication radiation of specified voltage and for specific time intervals.Synthesized ZnO/ PANI nanostructure which were sonicated for 0 min(without sonication),10 min and 20 min time period named as 0 min ZnO (S_1), 10 min ZnO (S_2) and 20 min ZnO (S_3) respectively.

3. Results and discussion

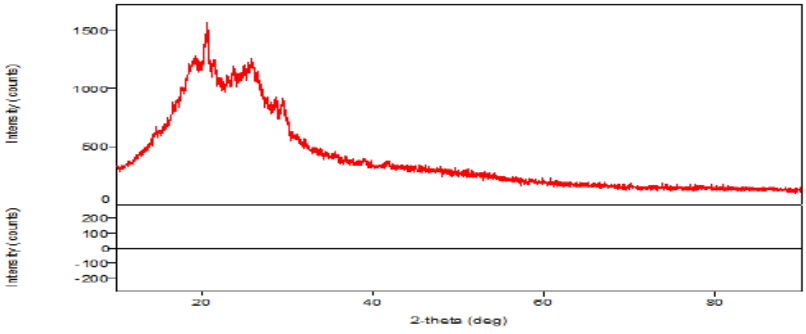
3.1. X-Ray Diffraction Studies

3.1.1 ZnO/PANI Composite

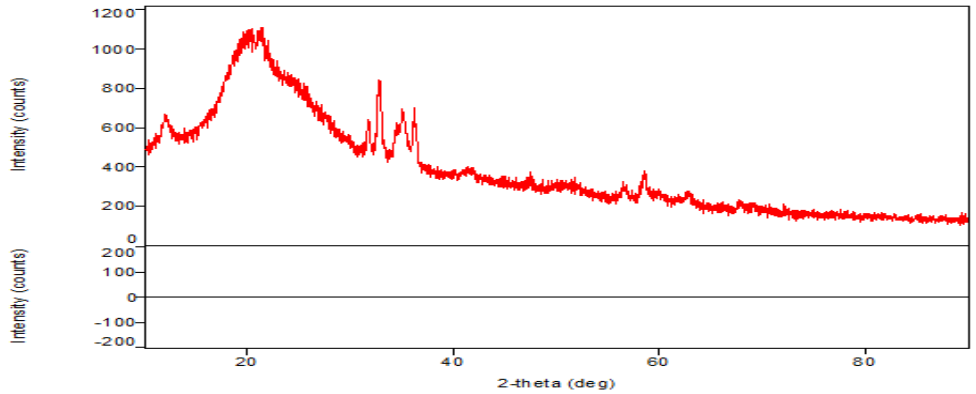
The main objective of the present investigation is synthesis of nanocomposite of ZnO/PANI. In present work three samples were studied and they are labelled 10% Zinc Oxide – Polyaniline (10%-ZP) [S_1], 15% Zinc Oxide – Polyaniline (15%-ZP) [S_2], 20% Zinc Oxide – Polyaniline (20%-ZP) [S_3].

The semi-crystalline structure of nanocomposite (ZnO/PANI) were characterized by powder X-ray diffraction (RigakuX-ray diffractometer) with Cu-α source and 2θ range of 10° - 90°.

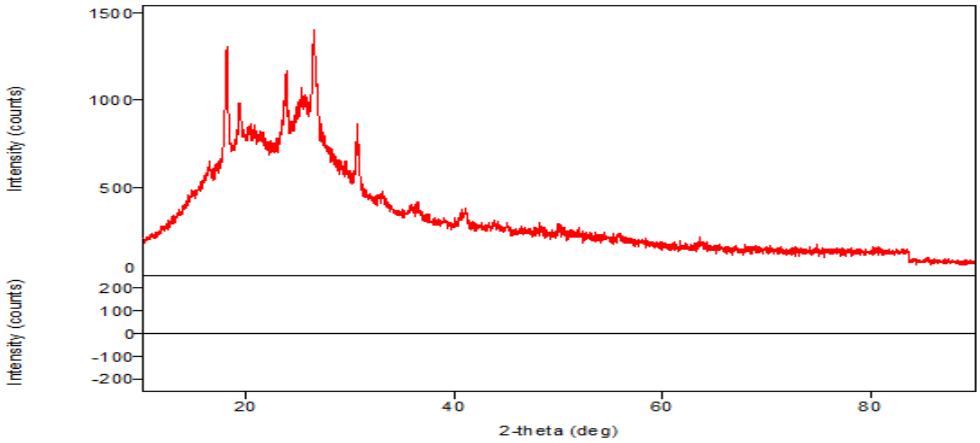
Figure 01 (a, b and c) shows X-ray diffraction patterns of synthesized nanocomposite samples of ZnO/PANI (S_1 to S_3).



(a)



(b)



(c)

Fig. 1: XRD Pattern (a) 10%-ZP, (b) 15%--ZP, (c) 20%-ZP

Left part of all figures 1(a) to 1(b) showscrystalline nature. The corresponding X-ray diffraction peak for (100), (002), (101), (102) (110), (103), (200), (112), (201), (004), (202) and (104) planes confirm the formation of hexagonal wurtzite structure of ZnO (DB card no.-2300013).Hence XRD pattern confirmed that synthesized ZnO are highly crystalline in nature [23].

The recorded XRD pattern figure 1 (a to c) confirmed that synthesized composite of ZnO/PANI Zinc Oxide/ Polyaniline are polycrystalline nature that is semi amorphous in nature [24, 25].One can see the presence of peaks corresponding to zinc oxide nanocrystallites. However, these peaks are slightly shifted, from their respective standard positions, may due presence of PANI matrix. This superficial property of the nanocomposites as has also been suggested by Tang *et al* [26] in the study of x-rays patterns of Polymethylmethacrylate (PMMA) and zinc oxide composites.

With increasing concentration of ZnO, a slight broadening in all the peaks corresponding to PANI is observed. The broadening is however more pronounced as the concentration of the zinc oxide increases in composites and as concentration of zinc oxides in polyaniline (PANI) increases crystallinity increases. The probable reason for this is influence induced on nanoparticles due to the surface effects arising from the surrounding PANI [27]. However, the presence of such polymer matrix seems to cause the decrease in the size of zinc oxide nanoparticles due to the formation of polymer-Zn complex on the surface of zinc oxide nanoparticles present within/on the surface of the nanocomposites. Various nanocomposites combinations showed similar peak patterns, therefore, it may be assumed that presence of polyaniline did not cause any change in crystal structure of zinc oxide or negligible change which may be ignored.

3.2. Effect of Ultra-Sonication on ZnO/PANI Matrix:

To compare the broadening of peaks obtained in case of different samples, XRD patterns are merged together. Further, the calculated average crystallite size of prepared samples is shown in Table 1.It was found that

average crystallite size decreases due to increase in sonication time interval [28-29]. The influence of thesonication time on the crystallite size was the main subject of interest here.

Furthermore, from XRD patterns can be seen that there little shift in diffraction peaks due to ultrasonic radiation treatment

Table1: Comparison of crystallite size among S_1, S_2 and S_3

Sr. No	Sample	2 Theta (degree)	FWHM Value (degree)	Crystallite Size (nm)
1	S_1	36.25	0.1022	85.46
2	S_2	36.41	0.1235	70.76
3	S_3	36.45	0.1485	58.85

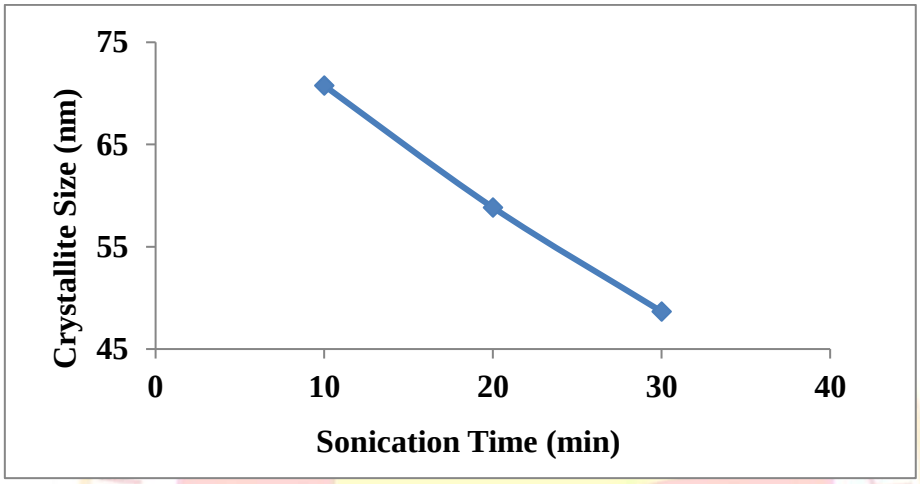
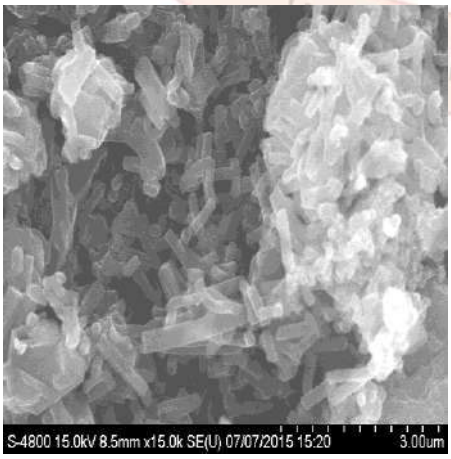


Fig. 2: Variation of crystallite size with sonication time.

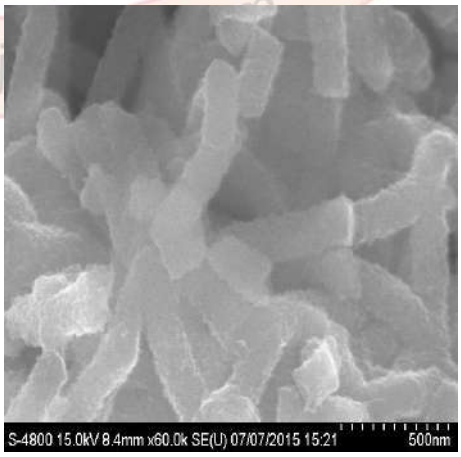
Figure 2 shows the variation of crystallite size of synthesized ZnO/PANI with its sonication time. It is seen that poly-crystallite size decreases with sonication time. So it observed that the mechanical influence produced by ultrasonic waves such as emulsification, stir, and others, could prevent the crystal growth and aggregation [30].

3.3. SEM of Nanocomposite PANI/ZnO

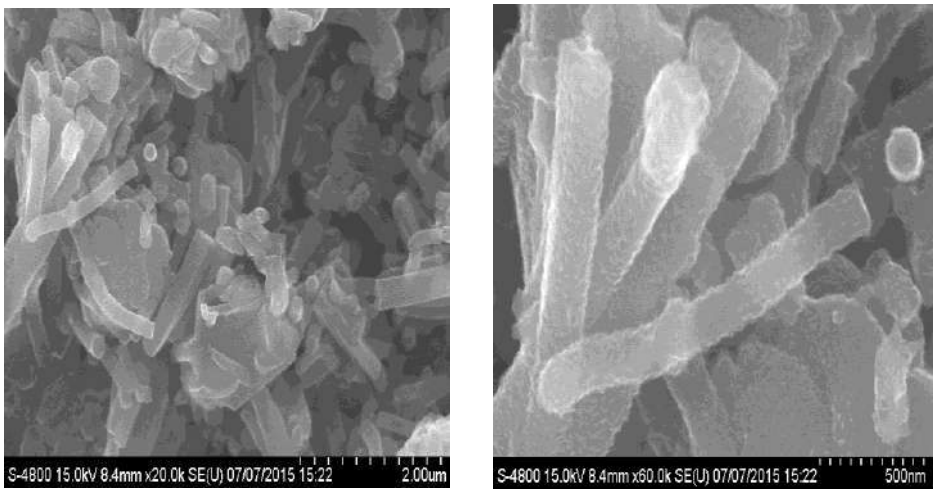
Figure 3(a, b, c & d) shows SEM micrograph of nanocomposite of zinc oxide and polyaniline at different resolution scale. From micrographs it is cleared that there were formation of nanotubes of nanocomposite material ZnO/PANI. It is observed that from SEMimage 3 (a and d) on head of polyaniline nanotube there is decomposition of nanosized Zinc Oxide. This is evidence for *in –situ polymerization* method of PANI and ZnO to synthesis nanocomposite of ZnO/PANI.



(a)



(b)



(c) **(d)**

Fig. 3 (a to d) SEM micrograph of ZnO/PANI at different resolution scale

4. Conclusions

The Pure Zinc Oxide, Pure Polyaniline and ZnO/PANI nanocomposites have been successfully synthesized. ZnO nanotubes were successfully covered with PANI by process of '*in situ'* chemical oxidative polymerization of aniline. Due to interfacial interactions between nanocomposite ZnO and PANI, there is formation of PANI and ZnO matrix. This type of hybrid material will use in many applications.

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Humidity Sensing Propertiesof PANI Doped Zinc Oxide Nanocomposites Thick Film Sensor

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Abstract

Over the last decades a variety of chemical sensors have been developed based upon semiconductors, which monitor different characteristic sensor properties such as conductivities for electronic conductivity sensors. In the present work Polyaniline is prepared by polymerizationof aniline under acidic condition. Zinc Oxide (ZnO) nanopartical prepaired by wet chemical method at room temperature using zinc nitrate and sodium hydroxide as starting material . ZnO nanoparticles were combined with conducting (PANI) polymer via polymerization in acidic aqueous solution to obtain a new type of inorganic – organic composites nanostructured . It is observed that PANI doped ZnO nanocomposites sensor shows a high response and sensitivity with good repeatability as compared to that of purePANI and ZnO nanoparticle.Theeffect of hysteresis is of the sensors, theeffects of pure and composite oxide on sensitivity of the sensors were studied. The crystallinity and the crystallite size were examined byX-Ray Diffraction technique.

Keywords: Polyaniline ,Zinc Oxide Nanocomposites,Humidity sensor.

1. Introduction

There is a growing demand for a sensing system that has high sensitivity, wide dynamic range, good stability, quick response, good reproducibility, simple structure and minimal cost. Metal oxide films sensitive to humidity have been reported earlier where sensing has been done using optical means. However, metal oxide humidity sensors depending upon measurements of electrical parameters require high temperature operation and consume significant amount of power.Humidity control and monitoring are of great interest to a wide area; these include moisture sensitive products, fresh and pack-age food, drug storage and environmental control for valuable Antiques or paintings etc. [1, 2]. Humidity sensors that are available in the market include dew point, infrared, catalytic and tin oxide-basedsensors, which may be expensive, or require high temperature operation and consume significant amount of power and high cost ofmaintenance [3].Much research has been focused on the development of humidity sensitive material [4–6]. Among these are the investigation of using conducting polymers such as polyaniline, polypyrrole, and polythiophene for humidity and gas sensing [7–9]. Advantages with polymers as sensing materials are light weight, flexible, low cost and simple fabrication process [10]. Pure polymer, polymer blends and polymer–inorganic composites have also been studied for the purposes, resulting in different degree of advancements in this area [11–16].

2. Synthesis of Material:

A) Synthesis of Polyaniline (PANI): In general is synthesized using two major polymerization approaches: electronic and chemical polymerization. In the present work polyaniline is synthesized by chemical polymerization method in which 0.2 M aniline hydrochloride is used as monomer unit. The synthesis is done by oxidative polymerization with 0.25 M ammonia peroxysulphate in aqueous medium. Bothsolutions kept 1 hour at room temperature then mixed in beaker, briefly stirred. And left at rest to polymerized , next day, the pani precipitate was collected on a filter , washed with three 100 ml portion of 0.2 M HCL and similarly with acetone . polyaniline hydrochloride powder was dried in air and then in vaccum at 60°c. Polyaniline prepared under these reactions and processing condition are further referred to as standard sample.

B) Synthesis of Zinc oxide (ZnO): It is prepared by the aqueous solution of zinc nitrate. And ispreparedbydissolving 0. 2M of zinc nitrate hexahydrate in 100 ml of distilled water .To this aqueous zinc nitrate solution 0.2 M sodium hydroxide is added and the reaction mixture was heated at 80°c along with stirring and the

process is carried out for four hour after which the white precipitate was obtained. The formed oxide wet precipitate is centrifuged Then the wet precipitate is washed with de-ionized water to remove impurity ions present in it and further heated in the oven at 150°c to dry the precipitate formed.

Characterization :The above synthesized PANI-ZnO composites are structurally and surface morphologically characterized by using different technique like X- ray diffraction (XRD),the x-ray diffraction patterns of the prepared samples are obtained by Siemens D 5000 X-ray diffractometer using CuKα radition (λ =1.717 A°). The diffractograms are recorded in terms of 2ᵬ in the range 40°-50° at ambient temperature with scanning rate of 2° per minute .The surface morphology of polyaniline and its composites are studied by using Leica's SEM (modal S 440) at 10kv.

Result And Disscusions:

XRD Pattern of ZnO

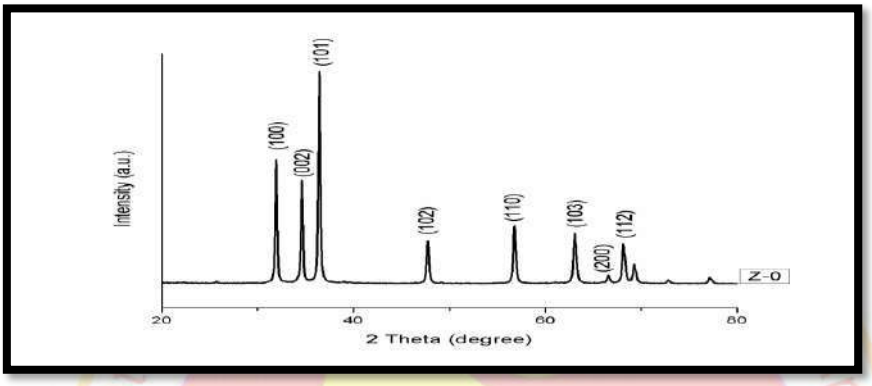

Fig. 1 XRD of Pure ZnO

XRD pattern of pristine zinc oxide (ZnO) nanostructure synthesized by liquid phase method via chemical wet reaction method were calcinated at 800ºC as shown in figure 1.The crystalline nature with 2θ peak lying at (100), (002), (101), (102), (110) and (103) planes. All the peaks match well the standard hexagonal wurtize structure of zinc oxide (ZnO) with lattice constants a = b = 0.3249 nm and c = 0.5206 nm [JCPDS card no. 36-1451]. All the peaks are perfectly match with pure ZnO structure, which indicates the high purity of the obtained ZnO nanoparticle. The average crystalline size was found to be 37.38 nm calculated by Deye-Scherrer formula.

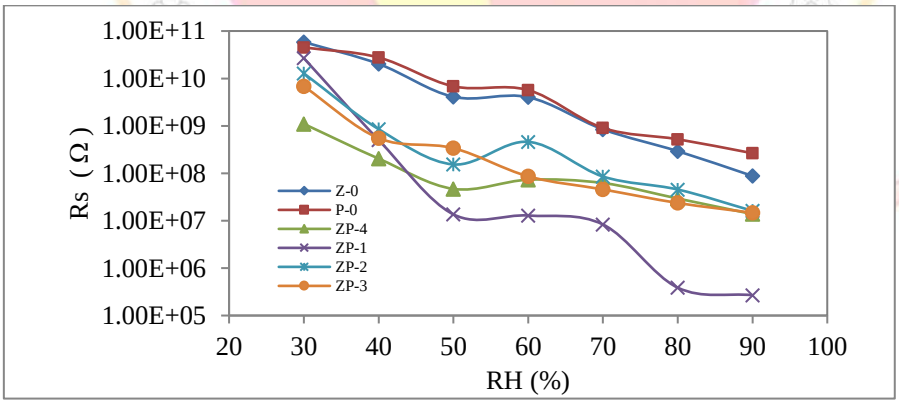

Figure: 2 Hysteresis plot

Hysteresis plot shows the variation between resistances of sample with respect to the relative humidity in increasing and decreasing order from 30 to 90 % RH as shown in the fig. 2. A very small hysteresis present during forward and reverse cycle of relative humidity, where as a very significant average change observed in the value of resistance of sample, in the sample ZP-1 (10ZnO – 90PANI) the change in value of resistance is from $10^{11}\Omega$ to $10^{5}\Omega$, these is a remarkable change in the value of resistance.

Sensitivity

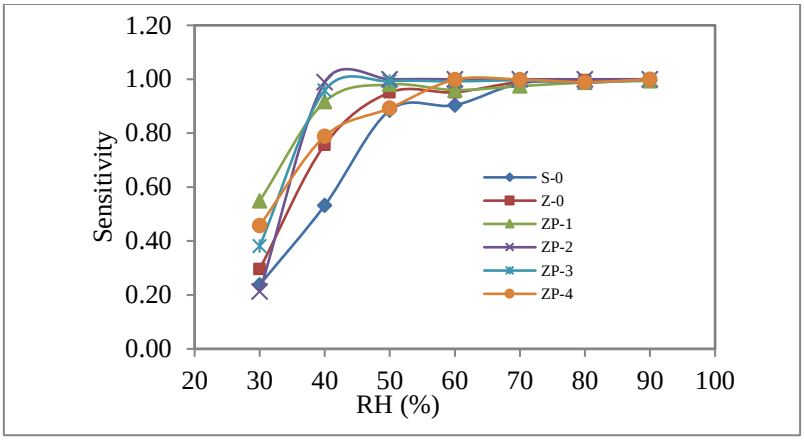

Figure: 3 Variation of sensitivity with Relative Humidity

In the above samples the sensitivity is found to be increasing with the RH for all the samples of thick films and it is increasing up to some particular RH and then afterward it remains constant as shown in fig. 3 For higher RH the sensitivity is found to be higher in case of all samples of thick films. The sensitivity of ZP-1 (10ZnO-90PANI) is more than ZP-2, ZP-3, and ZP-4 samples and also from the pristine samples P-0 and Z-0. The (ZnO-PANI) composite sensors exhibits significantly higher sensitivity than sensor constructed specially from ZnO nanoparticles and PANI itself due to the formation of heterogeneous interface between them and more adsorption site was created to absorbed more water vapours.

5. Conclusions:

Nanostructured ZnO was successfully prepared via chemical precipitation method and PANI with IUPACpolymerization technique. Minimum crystallite size was found to be for ZnO is 37.38 nm. The Hysteresis plot shows very significant average change in the value of the resistance from$10^{11}\Omega$ to $10^{5}\Omega$during forward and reversed cycles of sampleZP-1(10ZnO-90PANI). The sensitivity is found to be increasing with the RH for all the samples of thick films and it is increasing up to some particular RH and then afterward it remains constant.Amongst all the prepared samples ZP-1 is more sensitivity than other prepared composite samples.

References:

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Ba TiO_3 doped Polyaniline based Nanocomposites thick film senor for humidity sensing Application

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Abstract

Polyaniline (PANI) and $BaTiO_3$-Pani composites were synthesized by chemical polymerization method using ammonium per sulphate (APS) as an oxidizing agent. This is a single step polymerization process to synthesize the conducting polymer. Thick films of PANI and BaTiO3-Pani were fabricated by Screen – Printing followed by firing at 70º c for 30 min. BaTiO3-Pani thick films resulted in humidity sensor. An exceptional sensitivity was found to the relative sensor at 80º c and no cross sensitivity was observed to other hazardous and polluting gases ever at higher concentration. . The effect of microstructure and dopant concentrations on the gas response,Hysteresis , sensitivity, of the sensor in the presence of humidity were studied and discussed.

Keywords: *Polyaniline , Barium Titanate,BaTiO3-Pani composites , Humidity sensor.*

1. Introduction

The use of sensors by human being has been day by day increasing at an astounding rate in the last few years and modern society depends heavily on the use of the sensors for variety of purposes. Over the last decades a variety of chemical sensors have been developed based upon semiconductors, which monitor different characteristic sensor properties such as conductivities for electronic conductivity sensors, impedance for capacitance sensors, potentials for field effect sensors or temperatures for calorimetric sensors. For the determination of gas components, many of these devices make use of the same molecular detection principle. Depending on the operation temperature, their signals are caused by changes in the concentration of free electrons, dielectric constants, electrical fields and heats of adsorption or reaction. These changes result from physisorption, chemisorption, catalytic reactions, and surface or bulk defect reaction with particles from the gas phase.

There is a continuing need for accurate, reliable, inexpensive sensing systems for measuring relative humidity (RH), not only for human comfort but also for a broad spectrum of applications in chemical industry, process control, atmospheric sciences, agriculture etc. Humidity is one of the most common constituents present in the environment and its measurement is indispensable when it comes to monitoring of various environmental parameters. For instance, detecting organic pollutants in indoor atmosphere, organic vapour monitoring, maintenance of Green houses, performance of air/ smoke filters, hydrocarbon sensing are all affected by relative humidity conditions. Therefore, sensing and controlling relative humidity is of great importance [1].

In the recent years there has been significant progress in the field of polymer based humidity sensors. According to their sensing mechanisms these can be either resistive type or capacitive type. In addition to the traditional quaternary ammonium and sulfonate compounds, polymers containing phosphonium have also been studied for humidity sensing. Copolymers, mutually reactive copolymers and conjugated polymers have also been reported for humidity sensing. Conjugated polymers especially conducting polymers like polypyrrole, polyethylene, polypropylene etc. have shown humidity sensing properties [2]. Besides these metal-polymer nanocomposites for instance iron oxide-polypyrrole have also been reported for relative humidity sensing sensor. The present study deals with the humidity sensing application such as relative humidity, stability humidity, selectivity etc. of selected inorganic materials.

Humidity control and monitoring are of great interest to a wide area; these include moisture sensitive products, fresh and pack-age food, drug storage and environmental control for valuable Antiques or paintings etc. [3,4]. Humidity sensors that are avail-able in the market include dew point, infrared, catalytic and tin oxide sensors, which may be expensive, or require high temperature operation and consume significant amount of power

and high cost ofmaintenance [5].Much research has been focused on the development of humidity sensitive material [6–8]. Among these are the investigation of using conducting polymers such as polyaniline, polypyrrole, and polythiophene for humidity and gas sensing [9–11]. Advantages with polymers as sensing materials are light weight, flexible, low cost and simple fabrication process [12]. Pure polymer, polymer blends and polymer–inorganic composites have also been studied for the purposes, resulting in different degree of advancements in this area [13–19].

2. Synthesis of Material :

A) Synthesis of Polyaniline (PANI): In general is synthesized using two major polymerization approaches : electronic and chemical polymerization. In the present work polyaniline is synthesized by chemical polymerization method in which 0.2 M aniline hydrochloride is used as monomer unit . the synthesis is done by oxidative polymerization with 0.25 M ammonia peroxysulphate inaqeous medium . both solution kept 1 hour at room temperature then mixed in beaker ,briefly stirred. And left at rest to polymerize, next day, the pani precipitate was collected on a filter , washed with three 100 ml portion of 0.2 M HCL and similarly with acetone . polyaniline hydrochloride powder was dried in air and then in vaccum at 60°c. Polyaniline prepared under these reaction and processing condition are further referred to as standard sample[63].

B)Synthesis of Barium titanate ($BaTiO_3$): In preparation of barium titanate ($BaTiO_3$) 0.25 M $Ba(NO_3)_2$ solution and 0.25 M $TiO(NO_3)_2$ solution were dissolved in 2 N nitric acid solution in a beaker. About 0.6 M tartaric acid solution was then added to under constant magnetic string. The solution heated under continuous string to its boiling point until all the liquid evaporated. About 7 gm of ammonium nitrate was added towards the ends to avoid slurry formation. Brown fumes evolution takes places and fluffy mass were settled at the base of the beaker. The product is then dried in vacuum oven at 96^oC for 2 hrs. So that moisture will removed from the final product and we will get dry product. Then this dry product was crushed into fine powder and finally this fine nanopowder of $BaTiO_3$ was calcinated at temperature 800^oC for 5 hrs. in the auto controlled muffle furnace to remove the impurity form the product will be completely removed and get a final product of $BaTiO_3$ nanoparticle.

3. Experimental methodology for humidity: -

The humidity chamber/ stability chamber has stainless steel body purchased from Gayatri Scientific, Mumbai . The working size of humidity chamber is 50×43×430cm (H×D×W). The chamber having two open side door window namely inner side door and outside door, inner side is full length inner plexi glass door which is transparent and outer side door was metal door with magnetic gasket and lock . inside the chamber it has two trays, which are made of stainless steel. it has PID digital display temperature indicators which is outside at the top of the chamber , indicating the current temperature of the chamber .indicating the current temperature of chamber. The power sources of 230 V having frequency of 50Hz required. the temp[rapture range is ambient to 80 C. The chamber has temperature accuracy of ± 1.0 C .

The range of humidity varying from 40% RH to 80% RH having the accuracy of ± 3% RH. To operate the chamber a program feed for the varying RH as well as different temperature. Which will sets the controlled the humidity of set temperature for given time. To measure the humidity characteristics , the sensor element was placed inside the humidity chamber by operating the program at different RH and temperature the humidity was varied . The sensor element was placed inside the humidity was measured by standard hygrometer which is already placed inside chamber . The electrical resistance of the file was measured by using Keithley source meter (2400). The humidity and temperature of the chamber camn be controlled by using Bull's Eye control UK-100, it is a program controller for humidity and temperature verses time even controller .The UK-100 can be program by varing RH, temperature , time parameters. The total number of programs are 99out of this are set program for set temperature 40 C by varying RH 1 steps NO. Of program 8, event 0001, are tabulated

4.Characterization :

The above synthesized PANI-$BaTiO_3$ composites are structurally and surface morphologically characterized by using different technique like X- ray diffraction (XRD), and scanning electron microscopy (SEM).the x-ray diffraction patterns of the prepared samples are obtained by Siemens D 5000 X-ray diffractometer using CuKα radition (λ =1.717 A°). The diffractograms are recorded in terms of 2ꝏ in the range

40°-50° at ambient temperature with scanning rate of 2° per minute .The surface morphology of polyaniline and its composites are studied by using Leica's SEM (modal S 440) at 10kv.

X-Ray Diffaration

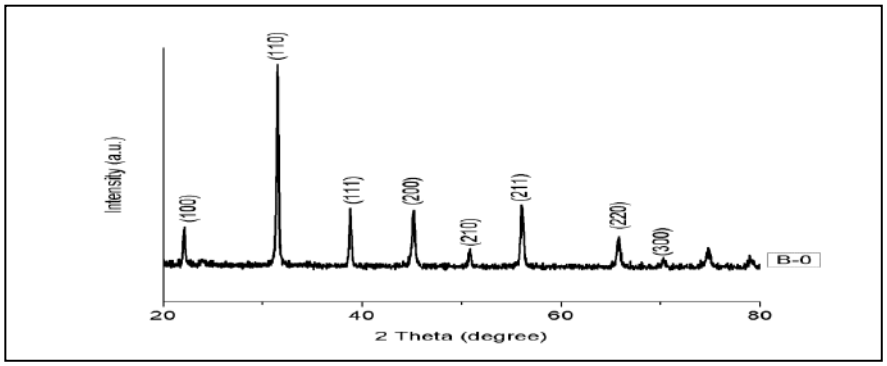

Figure: 1 XRD of ($BaTiO_3$) (B-0)

The XRD pattern of pristine Barium Titanate ($BaTiO_3$) nanostructure synthesized by liquid phase method via solid state method calcinated at 800ºC as shown in figure 1.The crystalline nature with 2θ peak lying at (100), (110), (111), (200), (210) and (220) planes. All the peaks match well the standard provskite type structure of Barium Titanate ($BaTiO_3$) with lattice constants a = 3.992 nm and c = 4.036 nm . All the peaks are perfectly match with pure $BaTiO_3$structure, which indicates the high purity of the obtained $BaTiO_3$nanoparticle. The average crystalline size was found to be 46.90 nm calculated by Deye-Scherrer formula.

Hysteresis plot :

Hysteresis plot shows the variation between resistances of sample with respect to the relative humidity in increasing and decreasing order from 30 to 90 % RH as shown in the figure. 2. A very small hysteresis present during forward and reverse cycle of relative humidity, where as a very significant average change observed in the value of resistance of sample, in the sample BP-1 (10$BaTiO_3$ – 90PANI) the change in value of resistance is from $10^{11}\Omega$ to $10^{3}\Omega$, these is a remarkable change in the value of resistance.

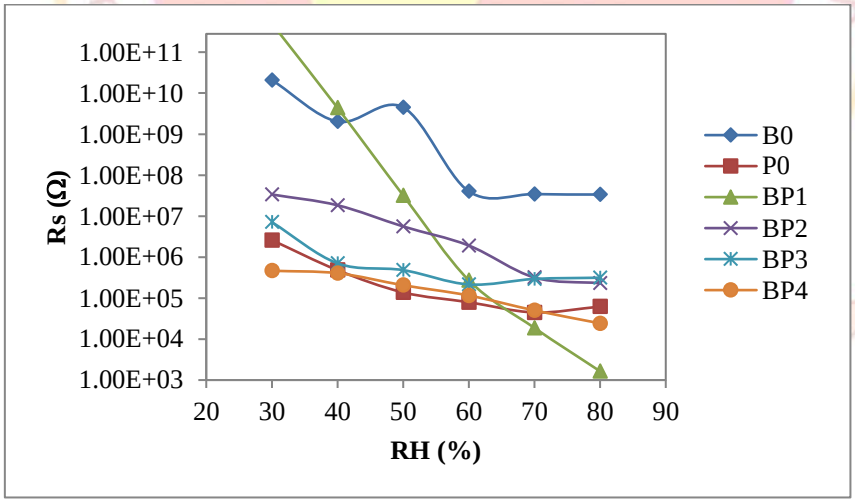

Figure: 2 Hysteresis plot

Sensitivity

In the above samples the sensitivity is found to be increasing with the RH for all the samples of thick films and it is increasing up to some particular RH and then afterward it remains constant as shown in figure 3. For higher RH the sensitivity is found to be higher in case of all samples of thick films. The sensitivity of BP-1 (10 $BaTiO_3$ -90PANI) is more than BP-2, BP-3, and BP-4 samples and also from the pristine samples P-0 and B-0. The ($BaTiO_3$-PANI) composite sensors exhibits significantly higher sensitivity than sensor constructed specially from Barium Titanate nanoparticles and PANI itself due to the formation of heterogeneous interface between them and more adsorption site was created to absorbed more water vapours.

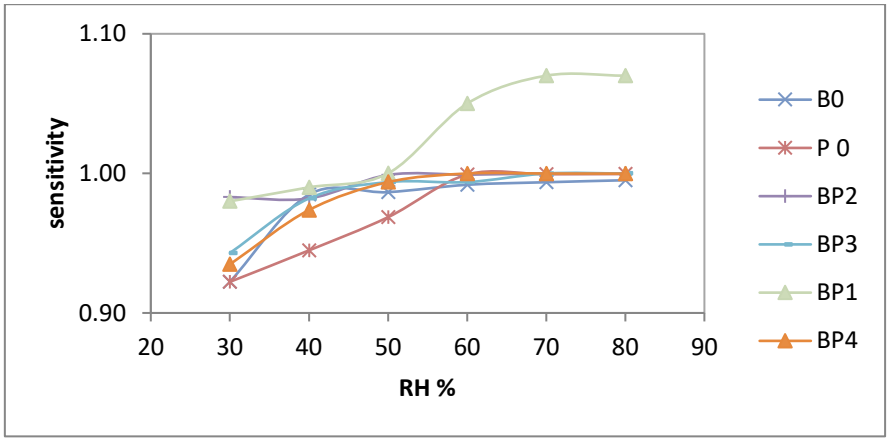

Figure: 3 Sensitivity curve

5. Conclusions

Nanostructured $BaTiO_3$ was successfully prepared via chemical precipitation method and PANI with IUPAC polymerization technique. Minimum crystallite size was found to be $BaTiO_3$ is 46..90 nm. The Hysteresis plot shows very significant average change in the value of the resistance from $10^{11}\Omega$ to $10^{3}\Omega$ during forward and reversed cycles of sample BP-1 (10 $BaTiO_3$-90PANI)). The sensitivity is found to be increasing with the RH for all the samples of thick films and it is increasing up to some particular RH and then afterward it remains constant. Amongst all the prepared samples BP-1 is more sensitivity than other prepared composite samples.

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Sol-gel Auto Combustion Synthesis and Characterizations of Cobalt Ferrite Nanoparticles

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Abstract
Cobalt ferrite ($CoFe_2O_4$) nanoparticles were successfully synthesized by sol-gel auto combustion method. Pure phase formation of cobalt ferrite with cubic spinel structure was observed in X-ray diffraction pattern. The average crystallite size, lattice parameter and other structural parameters were calculated from XRD data and they were in reported range. The magnetic parameters were measured by M-H hysteresis loop technique at room temperature and saturation magnetization, remenant magnetization and coercivity was estimated.
Keywords: *Cobalt ferrite, Sol-gel auto combustion,XRD, Magnetization.*

1. Introduction:
In order to meet today's technologies requirement, the development of new synthes is technique to develop new materials is essential which produces nanosized materials with superiormagnetic performance compared to that of bulk materials is desired. Different wet chemical methods areavailableforthesynthesis of spinel ferrite nanoparticles, suchas, chemical co-precipitation,sol–gel, hydrothermal, solvothermal, thermaldecomposition and microwavecombustion methods[1, 2]. These wet chemical methods are economic, easy, requires less time and low temperature, produces particles of nanometer dimensions and therefore now a days commonly used in the synthesis of magnetic nanoparticles of spinel ferrite.

Amongst these wet chemical methods, thesol–gel auto-combustion technique is one of the most convenient and effective method, involving a low reaction temperature(80°C–100 °C) and a rapid turn-around time for powder synthesis[3]. In the variety of spinel ferrite materials, cobalt ferrite is the unique spinel ferrite with inverse spinel structure, in which Co^{2+}ions occupy an octahedral [B] site. The high saturation magnetization,high permeability,high electrical resistivity,high Curie temperature, high magneto-crystalline anisotropy etc are the notable properties of nanocrystalline cobaltferrite[4].These properties are useful in many applications including magnetic recording media, magnetic sensors, magnetic memories, magnetic fluids, magnetic composites and catalysis, antennarods, permanentmagnets etc[5].

Thus, the present work reports on synthesis of nano-crystalline spinel structured cobalt ferrite sample by sol-gel auto combustion method using citric acid as a fuel. The results on structural, morphological and magnetic properties are reported in this work.

2. Experimental
The nano-crystalline cubic spinel structured cobalt ferrite ($CoFe_2O_4$) sample was prepared by sol-gel auto combustion method using citric acid as a fuel. AR grade chemicals such as cobalt nitrate ($Co(NO_3)_26H_2O$), ferric nitrate ($Fe(NO_3)_39H_2O$) and citric acid ($C_6H_8O_7$) were used for the synthesis. The metal nitrates to fuel ratio calculated using propellant chemistry was taken as 1:3. Ammonia solution was added to maintain the pH of the solution at 7. The as-synthesized powder is sintered at 550°C for 4 h and then used for further investigations. The detailed procedure is reported in the literature[6].

The prepared sample was characterized by X-ray diffraction (XRD) technique by Regaku model. The XRD patterns were recorded at room temperature in the 2θ range of 20° to 80° using Cu-Kα radiation (λ = 1.54056 Å). The magnetic properties of the cobalt ferrite sample were measured using pulse field hysteresis loop technique at room temperature.

3. Results and Discussions
3.1 Structural characterizations
The room temperature X-ray diffractions patterns of un-irradiatedand irradiated $CoFe_2O_4$ ferrite nano-particles are shown in Fig. 1. All the reflection peaks in the XRD pattern were indexed by using Bragg's law. The presence of planes (220), (311), (222), (400), (422), (511) and (440) in the XRD pattern reveals the cubic spinel structure of all the samples.It is also evident that all the reflection peaks are intense and sharp. No impurity peaks were observed thus the samples are single phase in nature[7].

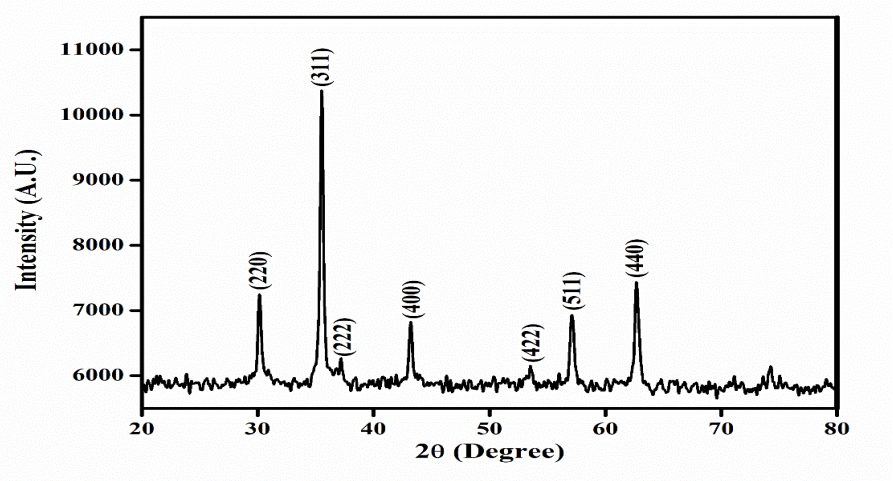

Fig.1. X-ray diffraction pattern of $CoFe_2O_4$

The Lattice constant (a) values of the cobalt ferrite samples was calculated using standard relation,

$$a = d\sqrt{(h^2+k^2+l^2)} \quad Å$$

where, (d) is interplanar spacing;(h k l) is Miller Indices.
The obtained values of the lattice constant (a) are tabulated in Table 1.
The unit cell volume (V) was calculated by using the following equation

$$V = a^3 \quad Å$$

where, V is the unit cell volume, a is the lattice constant.
The X-ray density (d_X) was calculated by using the relation and values are summarized in Table 1;

$$d_x = \frac{Z \times M}{V \times N_A} \text{ gm/cm}^3$$

where, Z is the number of molecules per formula unit (Z = 8 for spinel system),M is molecular mass of the sample,V= $a^3$is the unit cell volume,$N_A$is the Avogadro's number.

Table 1. Lattice parameter (a), Average particle size (t), Unit cell volume (V) and X-ray density (d_x) of $CoFe_2O_4$

a (Å)	**8.28**
t (nm)	26
V (Å^3)	588
d_x (gm/cm^3)	5.19

The crystallite size of cobalt ferrite powder was calculated using the Debye-Scherer's relation for small and uniform sized cubic crystals mentioned below;

$$t = \frac{0.9\lambda}{\beta \cos\theta}$$

where, λ is wavelength of the Cu-Kα radiation, β is the full width of the half maximum, θ is Bragg's angle. The obtained values of the particle size are presented in Table 1 and are having good agreement with the literature [8].

Magnetic characterizations

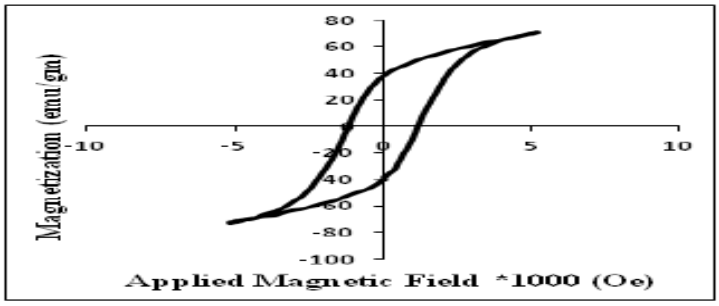

Fig. 2 The M-H plot of the $CoFe_2O_4$nanoparticles

The magnetic properties of present cobalt ferrite sample were recorded using pulsed field hysteresis loop technique at room temperature with the applied field ranging upto 1000 kOe is shown in Fig. 2.Saturation magnetization(M_s), remenance magnetization(M_r) and coercivity(H_c) values are reported in Table2. The magnetic hysteresis(M–H) loop confirms that the sample possessferro magnetic performance with soft magnetic nature[8, 9].

Table 2: Saturation magnetization (M_s), coercivity (H_c), remenance magnetization (M_r) of cobalt ferrite nanoparticle

M_s (emu/gm)	M_r (emu/gm)	M_r/M_s	H_c (Oe)
68.70	40.50	1.69	1096

4. Conclusion

The spinel structured cobalt ferrite nanoparticles were successfully synthesized by sol-gel auto combustion method usingcitric acid as a fuel. Pure phase formation of spinel type cobalt ferrite with no impurities was observed from X-ray diffraction pattern. The average crystallite size of the prepared sample was found to be 26 nm. The values of saturation magnetization (M_s) and coercivity (H_c) were found to be 68.70 emu/gm, and 1096 Oe respectively.

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Study of thermal properties of Polyaniline-Poly vinyl acetate blend

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Abstract

An attempt was made to study the thermal properties of Pani-PVAc blend. Pani-PVAc blends were prepared by chemical synthesis method. Thermo gravimetric analysis was carried out for various polymers to determine the wt. loss at different temperatures. The themal analysis of pure conducting polymer was recorded for comparison as original standard. TGA/DTA data shows that, interaction between the polymers, altered the rate of degradation and wt. loss decreases as the PVAc concentration increases in the blend i.e. thermal stability increases. The decrease in wt. loss was observed from 68.75% to 52%.

Keywords: Pani-PVAc blend, Chemical synthesis, TGA/DTA.

1. Introduction

In last few decades, there has been a great deal of increasing interest in the synthesis and characterization of conducting polymers because of their applications in organic batteries, sensors, microelectronic devices, electro catalysis and also their electrical, electrochemical and optical properties [1].

Earlier the blends of PVC and PPy were prepared by oxidative chemical polymerization of pyrrole with an oxidizing agent $FeCl_3$. Ionic conductivity study of such material was carried out and studied the effect of oxidizing agent on conductivity of the films [2]. Polyvinyl acetate (PVAc) is used extensively in coatings, adhesives [3] and films. The carbonyl group (C=O) in the structure of PVAc forms hydrogen bonding (like polyamide) with amine and hydroxyl groups and this may also enhance miscibility with polyaniline. Hence, PVAc has been chosen for blending with Pani.

There are many methods of blending polymers but only limited techniques can be applicable for conducting polymers. PVAc is soluble in high dielectric constant solvent such as methanol. However, Pani is not soluble in this solvent even after modification with suitable dopants. Hence, a new method has been adopted for blending these two components [4].

2. Experimental

Poly vinyl acetate obtained (M.W. 40000), 2 gram dissolved in 100 ml methanol was taken in a beaker. To that, 0.51 gram of monomer aniline (0.005M) and 5 ml of 1 N HCL solution were added. About 25 ml of 0.1 M initiator ammonium per sulphate was added slowly to the above reaction mixture under constant stirring. Similar reactions were carried out with aniline concentration of 0.01M, 0.02M and 0.05M and 10 ml of 1N HCL, 20 ml of 1N HCL, 50 ml of 1N HCL solution. The aniline to ammonium per sulphate molar ratio in all the above reactions was 1:1, so as to reproduce same conditions in all cases.

The polymerization of aniline was carried out simultaneously in each vessel. The reaction was carried out at ambient temperature for 10 Hr. The blend was precipitated in distilled water, filtered, washed with distilled water several times and dried in a vacuum till moisture was removed. The green mass of each composition of the blend was crushed in mortar and pestle to a fine powder.

Thermo gravimetric analysis was carried out for various samples to determine the weight loss at different temperatures. All the measurements were carried out using TG/DTA (Seiko II SSC 5100 Japan model). The samples used were in the form of powder and tested under nitrogen atmosphere at the rate 10^0/min from room temperature to 500^0 C.

3. Results

The interaction between the polymers can also be noted from the degradation curves through TGA studies. Given figure shows the wt. loss and thermal stability in the blend. Thermogram was scanned under the nitrogen atmosphere at the rate of 10^0/min (heating) and the temperature range were 25^0C to 500^0C. Thermal data is given in the table. The TGA curve of Pani and PVAc shows three steps wt. loss. The first wt. loss in both the prestine polymers at 150^0C to 300^0C was owing to the loss of absorbed moisture and solvent from room temperature to around 300^0C. The second stage occurring at 350^0C, decreased from 68.75^0C to 52^0C and the broad DTA peak of PVAc shows that the melting owing to the loss of acid dopant in Pani salt, as there is very less interaction between N atom and Cl atom and degradation of PVAc chain. The final degradation of the polymers occurs from 350^0Cto 500^0C. S. H. Goh, etal [5] has studied the TGA of the same blend film. It was observed that the nature of the degradation pattern matches very closely to our data.

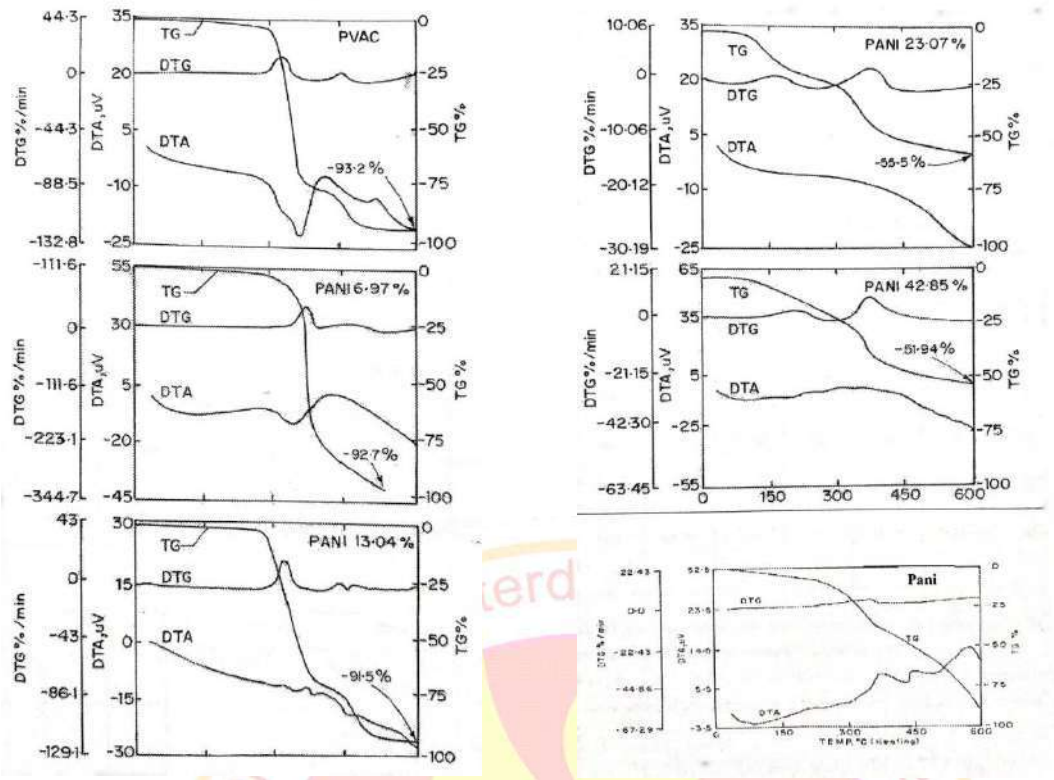

Figure: Thermogram of Pani-PVAc blends

It was noticed that as the percolation of Pani in the blend is increased, the wt. loss decreased from 68.75^{0}C to 52^{0}C and the broad DTA peak of PVAc shows that the melting temperature was reduced on modification. From the thermogram it was observed that the blend shows the improvement in thermal stability.

Table: Thermal data of Pani-PVAc blend

S.N.	Temp (^{0}C)	PVAc wt. loss in %	Pani (3%) wt. loss in %	Pani (7%) wt. loss in %	Pani (13%) wt. loss in %	Pani (68%) wt. loss in %	Pani wt. loss in %
1	100	1	1	1	3	2	3
2	200	4	2	6.25	14	13.50	6
3	300	10.50	36.50	29	26	30	18
4	400	37	44	48	43.75	43.50	40
5	500	68.75	63	72	56.25	52	60

As the PVAc concentration increases in the blend, and blend concentration follows the same trend of degradation pattern as observed in PVAc. The wt. loss found in the blend concentration is not observed in prestine polymers, suggesting the presence of interaction between the polymers, which alters the degradation pattern.

4. Conclusion

TGA/DTA data shows that, interaction between the polymers, altered the rate of degradation and wt. loss decreases as the PVAc concentration increases in the blend i.e. thermal stability increases. The decrease in wt. loss was observed from 68.75% to 52%.

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Recent Advancement of Electrochemical Biosensors Based On Conducting Polymers: A Mini Review

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Abstract :

Day by day humans life style become fast due to this fast life style people forgot to take care of their health. From the health care point of view the development of biosensors is necessary. The various conducting polymers showed prominent response in the field of biosensing due to their great electrochemical, physical, optical and thermal properties. The many researchers try to enhance the sensitivity by adding the dopant or taking their composition such as TiO2, SiO2 andMnO2 etc. These mini-reviews give the information about recent development in the field of electrochemical biosensors based conducting polymer. Also tell us about the process of biological sensing and their different electrochemical technique for detection.

Keywords : electrochemical biosensors, paper based biosensor, urea biosensor, glucose biosensor, cancer biosensor.

1.Introduction

The health care point of view biosensing is necessity in our everyday life. Now a day's world suffering from most silent health related issues one of them is diabetes can damaged the heart, blood vessels, eyes, kidneys and nerves, leading to disability and premature death [1]. Generally most of the patient insulin which is utilized by the cell to get glucose inside cell decreases so that cell cannot utilize glucose. Hence the sugar level in the blood increases. The patient health is depends on glucose concentration that related to the symptoms of diabetes mellitus [2]. The classification of various types of biosensors which are shown below.

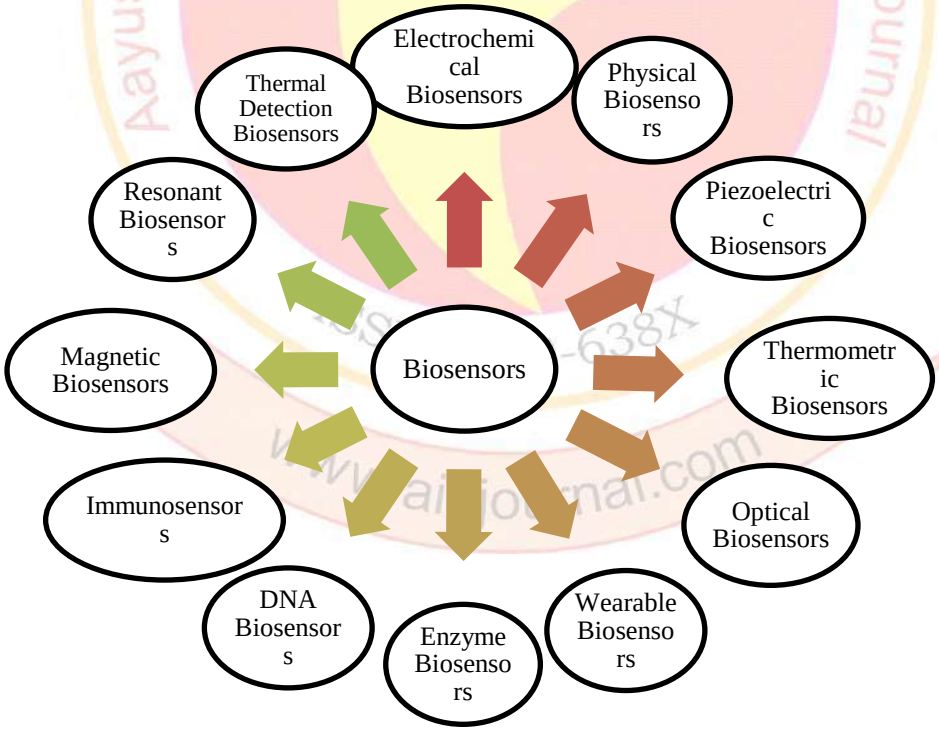

Figure1.https://www.elprocus.com/what-is-a-biosensor-types-of-biosensors-and-applications/

Paper based diagnostic technologies are affordable, robust, rapid, user friendly and scalable for manufacturing for the determination of blood glucose in real time is very important for diabetic patient [3]. Polymers are studied in the different field of polymer science that is polymer chemistry and polymer physics, biophysics and materials science and engineering. Conducting polymers are attracted more interest in the field

of gas sensor, biosensor, actuators, super capacitor and electronic devices due to their unique attribution, ease of production and often ductile nature and light weight [4]. A variety of conducting polymer such as polyaniline, polypyrrole, polythiophene and PEDOT (Poly-3,4ethylenedioxythiophene) has given more attention toward nanoscience and nanotechnology [5]. There are a lot of progress remain in the field of biosensor. Now a day's researcher focus on PEDOT polymer has been a significant and promising one of the conducting polymers family due to its high electrical conductivity, superior optical transparency, long term electrochemical stability, highly mechanical strength and very less study has been happened using graphene and titania nanoparticles [6]. The homogeneous entrapment on the paper, antistatic and electrochemical property has turned a new page for the paper based biosensing application [7-9]. Different type of oxides are radially used in the field biosensor such TiO_2, MnO_2, ZnO_2, iron oxide and phytic acid. Titania is identifying better dopant in the PEDOT-PSS polymer to enhance the conducting ability by several order of magnitude and biosensing and humidity response due to its porous morphology. Moreover reliable glucose detection methods with high sensitivity, excellent selectivity, good stability, fast response and portability have been the focus of scientist [10].

1. Electrochemical Biosensors

The biosensor is device of biological recognition element using transducer [11]. The basic principle of electrochemical biosensors that convey the biological signal such as enzymes, tissues, cells etc. that can detect with the help of transducer element then transducer signal may converted into an electric signal and amplified with the help of detector circuit; get physical parameters and measurements from computer software for the analysis [12].

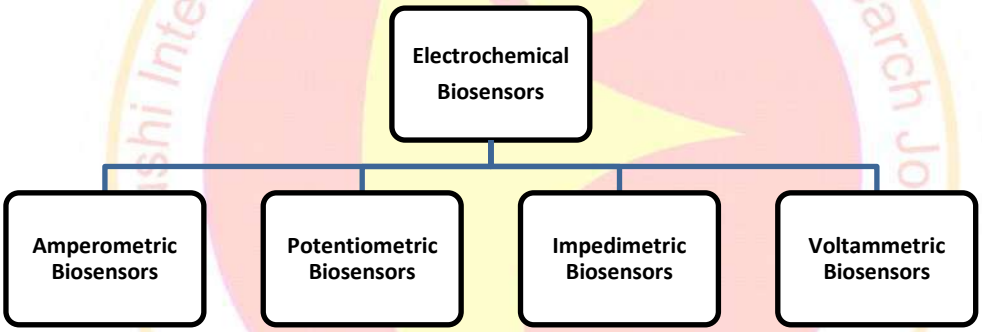

Figure 2. These show the different types electrochemical biosensors.

The commonly used paper substrate for the fabrication of electrochemical biosensors is whatman No.1 chromatography paper. This whatman paper having uniform structure, excellent wicking properties, smooth surface, high content of α- cellulose and free hydrophobic binders [13]. Researcher have special attention towards that certain enzymeless glucose sensors have numerous advantages of high sensitivity, simplicity in the development, high stability and no need to be immobilize enzyme [14].

2. Process of Biological Sensing:

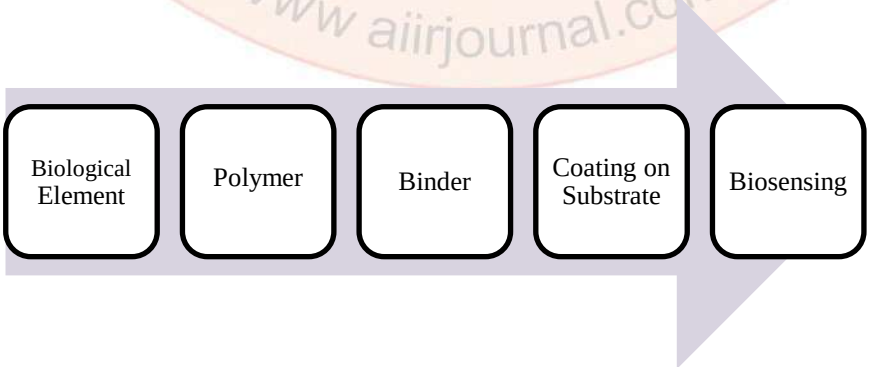

Figure 3. These show the procedure of biological detection.

Firstly take the biological element (e.g. glucose oxidase, antigen, H_2O_2, etc.) that use as sensing then this element attach to the surface of polymer with the help binder (e.g. n- butyl carbitol , ethyl cellulose, polyvinyl alcohol, etc.) after that it will be coated with the help of different method such as layer by layer [15], chemical bath deposition [16] , spin coat [17] and SILAR [18]. The biosensing response check by using electrochemical method. To increase the efficiency and capacity of the biosensor system certain dynamic and static measurement are necessary. Selectivity, sensitivity, linearity, response time, stability and reproducibility are the different characteristics of biosensors [19].

4. Biosensors:

According to the properties there are various types of biosensors and their recent development in most focus biosensor can be discussed as follows.

1] Urea Biosensor:

X. Hung and his team developed a disposable conducting paper based analytical device for measuring the salivary uric acid in human body based on electropolymerization of PEDOT and graphene composite on the ITO substrate. The electrochemical behavior of uric acid at different working electrode was determined by cyclic voltammetry in PBS with Ph 7.5. The linear range for uric acid detection is 2-1000 µM. The result indicated that the developed device is promising for non invasive monitoring of salivary uric acid [20]. The researcher Zhybak M. and his coworker developed creatinine and urea biosensors based on polyaniline-Nafion-Cu composite.Immobilisation of enzymes was shown the important step in the development of biological sensor. The electrochemical measurements done with the help of three electrode system and analytical performance were measured. It shows high selectivity for creatinine and urea biosensor. The sensitivity of urea and creatinine biosensor are found to be 112±3.36 mA $M^{-1}cm^{-2}$ and 85±3.4 mA M^{-1} cm^{-2}.The response time for analytes to be 15 sec and limit of detection foun to be 0.5 µM. The linear concentration range to respond the biosensor to be 1 to 125 µM [21]. Singh A.K. and his team studied urea biosensor and its application in milk sample. This sensor developed with the help of Fe_3O_4/MWCNT- polyaniline nanocomposite film. This composite polymer with enzyme characterized by scanning electron microscope, fourier transform infrared shows strong sharp band around 1031.09cm^{-1} and different electrochemical techniques were used for the analysis. The linear range of urea biosensor found to be 1.0-25.0 mM with detection limit 67 µM. The biosensor response gives great result up to 40 days with 90% activity and it can be responded up to 60 days with 70% activity [22]. The researcher Botewad S.N. and his coworker reported about fiber optic urea biosensor modified by polyaniline-cladding. The active cladding was obtained by depositing uniform layer of polyaniline. In UV-vis spectrum shows two peaks at ~ 227nm and 280 nm. The two broad diffraction peaks occur between 20 and 40°. The exposure time response for each concentration of urea solution was ~120 sec. It shown variation in absorbance at ~250 nm with different concentration urea sample. The stability of sensor tells us about that the sensor is stable about 28 days. It shows lower sensing limit up to 100 nm [23].

2] Cancer Biosensor :

S. Kumar and his team developed a flexible, lightweight and disposable paper based elctrode modified with nFe_2O_3:PEDOT:PSS for the detection of carcinoembryonic antigen (CEA), a cancer biomarker. The electrochemical response measured with the help of chronoamperometry method and concluded the sensitivity of 2.1µAng^{-1}mL.cm^{-2}which is nearly 4.8 times lower than electrochemical paper electrode. The electrical conductivity was found to be 2.4 ×10^{-2} Scm^{-1}. The proposed electrode was verified by ELISA for the CEA detection in serum sample of cancer patients [24]. S. Kumar and his team developed PEDOT-PSS and reduced grapheme oxide (RGO) composite based paper sensor studied for cancer biosensor. The incorporation of RGO into the conducting paper results in improved electrochemical performance and signal stability. The conductivity found to be 1.16×10^{-4} S$cm^{-1}$to~3.57×10^{-2} Scm^{-1}(nearly 300 times increases) on the treatment with ethylene glycol increase in electrical conductivity is due to the conformational rearrangement in the polymer [25]. Kivrak E. and his Coworker studied aptamer based electrochemical biosensing on human non small cell lung cancer. The sensing response done by using polyacrylonitrile and polypyrrole polymers with the help of nanofiber modified disposable pencil graphite electrodes. The surface morphology of composite nanofibers was confirmed

using scanning electron microscopy. Analytical performance of the aptasensor achieves high sensitivity and sample of optimization condition were tested. The aptasensor showed low detection limit of 1.2× 10^3cells/mL [26]. Soni A. and his team gives information about cancer biomarker detection. The sensing of cancer biomarker done with the help of polyaniline-MoS_2 hybrid nanostructures. The composite material detect the chronic myelogenous leukemia (CML) using electrochemical impedance spectroscopy method. The composite material has wide range of target DNA concentration (10^{-6}-10^{-17}M).The low limit of detection found to be 3×10^{-18} M. This biosensor was found the high stability of 6 weeks and retained 87.5% to the original signal [27].

3] **Glucose Biosensor:**

L. Yang and his co-worker studied an electrochemical two step synthesis route to produce CuNPs(copper nanoparticale) /PEDOT/PA(Phytic acid) nanocomposite through electrochemical oxidation of EDOT and PA substrate and reduction of CuNPs. This shows a wide analytical range (5-403µM), high sensitivity upto 79.27 $\mu A.\mu M^{-1}.cm^{-2}$, low detection limit of 0.278µM and response time of the glucose sensor 4 sec. The hospital provided glucose value 3.8mM, 5.5mM, 7.5mM and biosensor detected values 3.6mM, 5.3mM, 7.6mM matches approximately 98% for enzymeless glucose sensing [28]. J. Liu and his co-worker studied organic thin film transistor for glucose sensor with the help of spin coating technique using PEDOT conducting polymer film. This showed that a linear increase in the OTFT drain current was observed resulting from the increase in glucose concentration. This developed glucose sensor showed rapid response time within 20 sec and give high sensitivity of 1.65 µA per mM. The result was indicated that the OTFT based glucose sensor retain the enzyme bioactivity [29]. Z. Amirzadeh and his co-worker developed a non-enzymatic glucose sensor based on a pencil graphite electrode (PGE) using PEDOT-PSS/CuO/MWCNTs composite. A cheap electrode, as well as simple modification process, make the developed glucose sensor economic as the modifier film were simply prepared by drop coating of the modifier suspension on the surface of a pencil graphite electrode. At an applied potential of +0.70V gave an acceptable sensitivity of 663.2 µA $mM^{-1}cm^{-2}$ in wide linear range upto 10mM [30]. Popov et.al. has prepared, rGO in combination with PANI,Nafion and Gox for an amperometric biosensor. The developed glucose biosensor showed a wide linear range (0.5-50) mM, low limit of detection 0.089 mM, good selectivity, better reproducibility, and good stability. The PANI nanostructure and rGO dispersion is proved to be an excellent material for the glucose biosensor [31]. Yang J and his team developed non-enzymatic an amperometric glucose biosensor. The investigation done with the help of polypyrrol nanowires electrode loaded with nickel hydroxide nanoflakes by chemical bath deposition method on substrate. The surface morphology of the composite material characterized by scanning electron microscopy and verified by X-ray photoelectron spectroscopy. The electrochemical behavior showed excellent performance and result tell us about the current was increased from 0.4 V to 0.7 V in glucose solution. The sensing characterization was evaluated by its dynamic detection range, stability, selectivity and reproducibility.The performance of the glucose biosensor detected range of 0.001-4.863 mM with sensitivity 1049.2 $\mu A\cdot mM^{-1}\cdot cm^{-2}$ and low detection limit found to be 0.3 µM [32]. Sheng L. and his team developed enzyme-free glucose sensor with novel nanocomposite of Ni(OH)2 over reduced graphene oxide and PEDOT with the help of electrodeposition method and show that Ni(OH)2 nanoparticles uniformly deposited on PEDOT-RGO hybrid film for detecting glucose. This sensor gives ultrafast response time (< 1 S), low detection limit, a wide linear range up to 7.1mM and the sensitivity found to be 346 µA mM^{-1} cm^{-2} [33]. Paul G. and his coworker developed the conducting paper-based biosensor using PEDOT-PSS grafted reduced graphene oxide-titanium dioxide [rGO-TiO2] nanohybrid. The different dopant like ethylene glycol, methanol and glycerin were doped and their effect on the conductivity of sample was investigated. Electrochemical results show that modified conducting paper (CP) shows high sensitivity with a low limit of detection 0.01mM [34]. The information regarding the other biosensor can be given in the following table.

Table : The below table represent the development in biosensor based conducting polymer.

Sr. No.	Material	Biosensor Analyte	Limit of Detection	Stability	Response Time	Linear Range	References
1.	(P(3HT-co-3TAA))	Urea	5mM	-	6 min	1.3-3.5 mM	[35]
2.	polythiophene-AgBr (PT-AgBr)	glucose	310 nM/10.4 µA mM^{-1} cm^{-2}	14 days	<1 min	370 nM/756 µA mM^{-1} cm^{-2}	[36]
3.	PANI-MMT	glucose	0.1 µM	40 dayes	-	10 µM-1.94mM	[37]
4.	Polythiophene	small RNA	0.7 pM miR-221	-	1.2 h	1-100 pM	[38]
5.	functional Polythiophene	cancer cell (sialic acid)	10 cells mL^{-1}	-	10 min	$1x10^1$-$1x10^6$ cells mL^{-1}	[39]
6.	pdAg NSPs-PPy	Dopamine	0.0258 -0.0860µM	-	-	0.001-200 µM	[40]
7.	Pt-PPy-Uri-Grap	Uric acid	0.541nmol^{-1}	-	-	0.002 to 0.024 nmol^{-1}	41]
8.	Ppy-CS-TiO_2	non enzymatic Glucose	614µM	14 days	<3 sec	1-14 mM	[42]
9.	PPY-(MWCNT-COOH)	DNA	0.08 µmol L^{-1}	15 days	150 sec	0.2–100.0 µmol L^{-1}	[43]
10.	PPY-NrG	epirubicin	1.0nM	-	-	0.004-55.0 µM	[44]
11.	PPy-PtPd	H_2O_2	(sensitivity)	60 days	-	2.5-8000 µM 1360.83 µA.mM^{-1}.cm^{-2}	[45]
12.	PANI-AuNPs	DNA	0.01fM	10 week	5 Min	1000-0.001 pM	[46]
13.	GRA-PANI	glucose	2.769 µM	-	400 sec	10.0 µM-1.48 mM	[47]
14.	PANI-CQD	dopamine	0.1013 µM	-	50-300 sec	0.1-100 µM	[48]
15.	PANI-Ni-MOF	HCV	0.75 fM	-	15 min.	1f -100 nM	[49]
16.	TiO_2/ PANI / GCE	glucose	18 µM	30 days	10sec	0.02 mM to 6.0 mM	[50]
17.	HCS@PANI	AChE	0.16 ng mL^{-1}	15 days	-	1.0 ng mL^{-1} to 10 µg mL^{-1}	[51]
18.	rGO-PANI	Hg^{2+}	0.035 nM	-	-	0.1 nM to 100 nM	[52]
19.	SiO_2($LuPc_2$)PANI-(PVIA)-CNB	Glucose	0.1 mM	45 days	~2 sec	1-16 mM	[53]
20.	GCE/PEDOT:PSS-AuNPs	xanthine	3.0 × 10^{-8}	4 week	5 min	5.0 × 10^{-8} to 1.0 × 10^{-5} M	[54]

Conclusion:

The present review article, we have discussed the electrochemical paper based biosensors due to their unique properties such as low cost, light weight , easily portable and gives instant result. Also discuss the procedure of analyte the biosensing element these can be done with their various coating methods. The sensitivity , selectivity, stability , limit of detection , linear range and fast response time in biosensor can be understood on different conducting polymer such as Poly(3,4-ethylenedioxythiophene), Polypyrrol, Polyaniline and Polythiophene with their composition. A very few of the biosensors were achieved sensitivity, fast response time and made their stability. The researchers need to focus on this parameter and try to evolve another method to reach the efficiency of biosensor.

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AC conduction of Polythiophene composite thin films doped with Bromine

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Abstract
Thin solid films of PTh-PVAc doped withBromine (3.5, 5.5, 10.4, 14.9, 18.9 and 22.5 wt %) were synthesized by chemical oxidative polymerization method in order to study the ac conduction at various temperature ranges. The impedance spectra of PTh-PVAc doped with Bromine films (323-343K over frequencies from 0.1-200 KHz) found to consist of only one arc suggest various parameters such as relaxation time, bulk resistance, bulk capacitance, dielectric activation energy etc. Comparison of impedance spectra was done on the basis of various AC conduction parameters
Keywords: Poly(vinyl acetate) (PVAc), Polythiophene (PTh), Bromine, dc,ac

1.Introduction
The conjugating polymers thin films have been studied by many workers, because of special electrical properties, considerable thermal stability and oxidation resistance that are favorable in applications such as optoelectronic, biosensors, electro chromic displays and chemical sensors [1-3]. Roncali [4] surveyed the electrochemical synthesis and the electronic properties of substituted PThs in 1997. The overall review on chemical synthesis of PThs and applications as chemical sensors, organic memory devices, photo conductivity, etc., is given by many researchers [5,6]. Temperature-dependent conductivity, in the case of ion conducting solid electrolytes, is more completely explained by Vogel-Tamman-Fulcher (VTF) [7-9] rather than other models. Ryu et al. [10-11] predicted that PTh powder prepared by electrochemical method, shows better results than that prepared by the fast oxidation method. The present paper focuses on comparison in electrical properties of Polythiophene composite thin films doped with Bromine.

2 Experimental Procedures
2.1 Sample preparation
Thin solid films of PTh-PVAc doped withBromine (3.5, 5.5, 10.4, 14.9, 18.9 and 22.5 wt %) were synthesized by chemical oxidative polymerization method in order to study the ac conduction at various temperature ranges.

2.2 ac conductivity measurement
ac conductivity of the samples were recorded on LCR meter (Wayne Kerr, UK) having range of frequencies from 0.1-200 KHz at temperature in the range 323-343K with heating rate 1°C min^{-1}. A constant voltage is applied to the sample and corresponding impedance and phase angle was measured at constant temperature for all frequency range. ac conductivity of the pure PTh-PVAc sample and doped with different Bromine wt % was measured at various temperatures 323-343K by applying a wide range of frequencies from 0.1-200 KHz.

3 Results and discussion
3.1 ac conductivity of PTh-PVAc films doped with Bromine
Fig.3.1.1-3.1.3 shows Nyquist plots of the samples DD7, DD8 and DD9 and it is observed that the resistance of all the samples decreases with the rise of temperature. From the fig., it is observed that the sample shows similar trend of semicircle for temperature 323-343 K. Many researchers [12-15] reported a similar behavior in the Nyquist diagram. The impedance spectrum of PTh-PVAc films doped with Bromine is found to consist of only one arc.

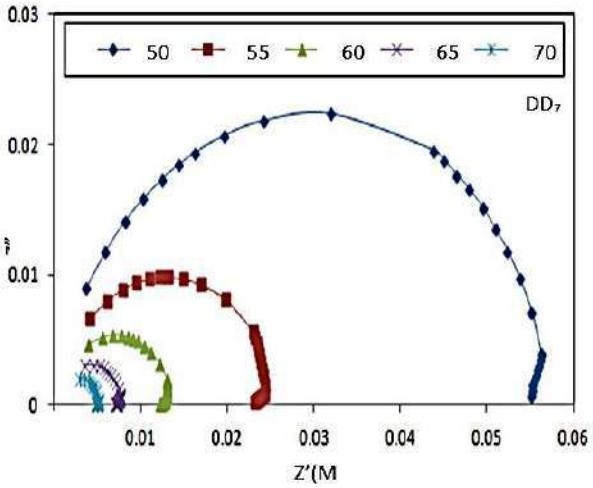

Fig.3.1.1

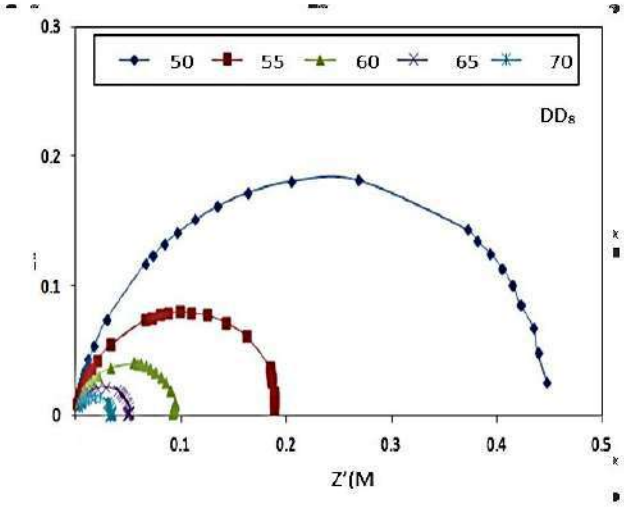

Fig.3.1.2

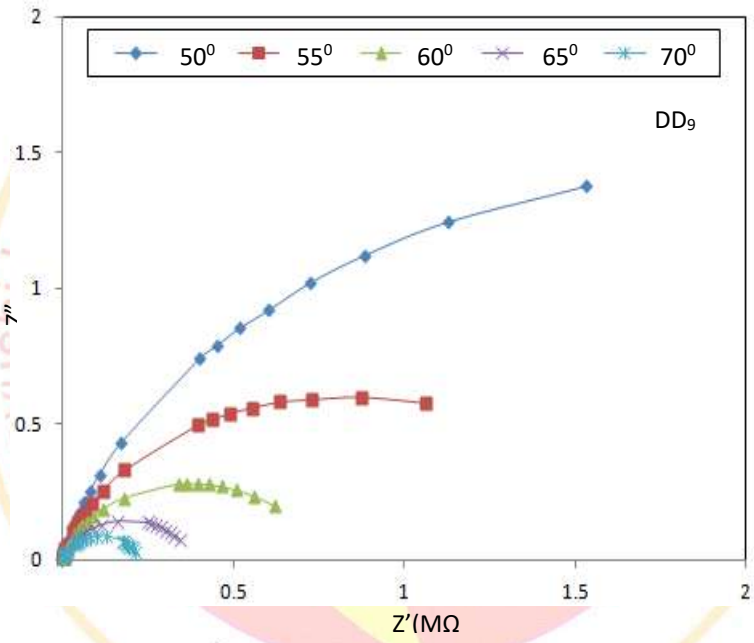

Fig.3.1.3

Also it may be argued that as the temperature increases for PTh-PVAc films doped with Bromine reduces the arc of semicircle indicating the increase in conductivity. The impedance spectra in figure 5.24 exhibited a single capacitive time constant at high frequencies and a finite length transport impedance with a permeable boundary at the low frequency end. The basic features of the spectra seem to be qualitatively similar to those obtained by Johnson et al. [14] for polythiophene films and Komura et al [23] for polypyrrole polystyrenesulfonate composite films. The arcs are found to be highly depressed for all films for different temperatures which indicate the distribution of relaxation times [15]. From the semicircle, the values of bulk resistance are calculated and noted in table 3.2.2. The variation of log f versus Z' at different temperature is as shown in fig 3.1.4-3.16.

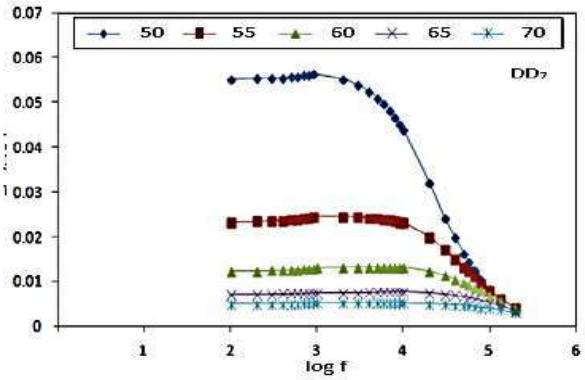

Fig.3.1.4

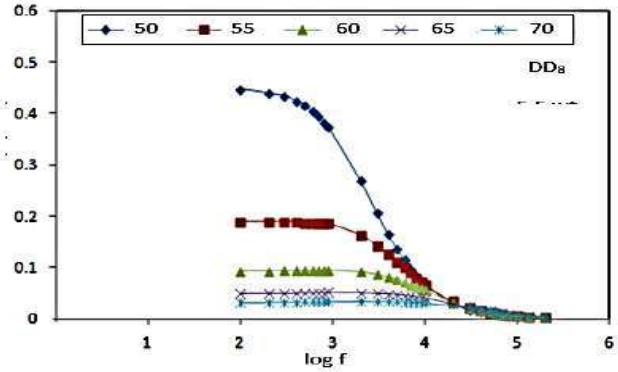

Fig.3.1.5

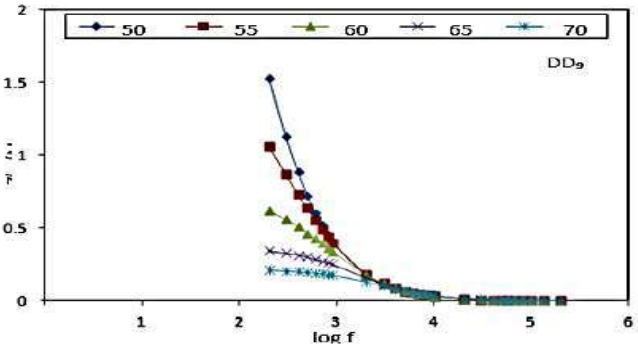

Fig.3.1.6

From the figure it is observed that the pure PTh-PVAc sample shows the wide variation of resistance with all frequencies. The resistance of the sample is found to be decreased with increase in frequency. Also as the concentration of the dopant Bromine is increasing, the sample constitutes much lesser resistance for increasing frequencies. The magnitude decreases on increasing temperature in the low frequency range which merges in the high-frequency region irrespective of temperature. This nature may be due to the release of space charge [16].

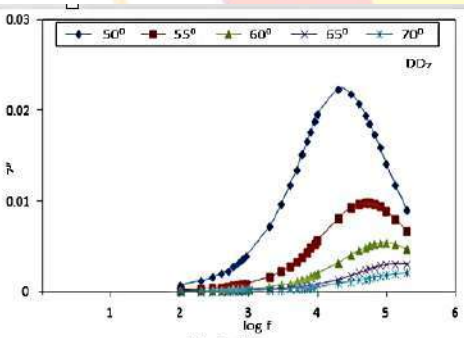

Fig.3.1.7

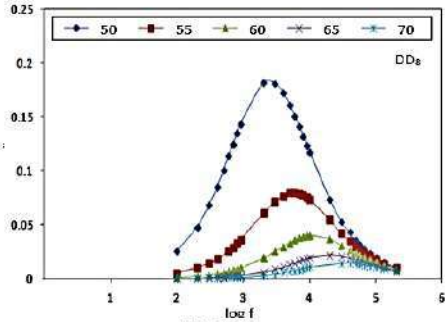

Fig.3.1.8

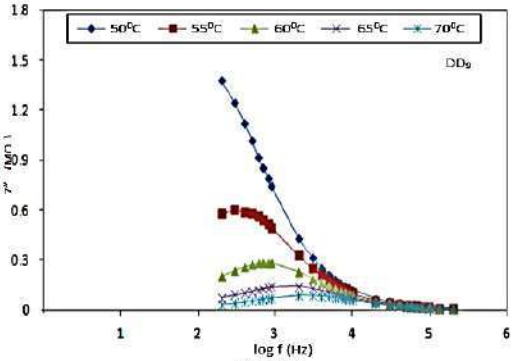

Fig.3.1.9

The reduction in barrier properties of the materials with rise in temperature may be a responsible factor for enhancement of a.c. conductivity of the materials at higher frequencies [17-18]. Further, in the low frequency region, there is a decrease in magnitude with rise in temperature showing negative temperature coefficient of resistance (NTCR) behavior [19]. This behavior is changed drastically in the high frequency region showing complete merger of plot above a certain fixed frequency. The variation of log f versus Z" is as shown in fig.3.1.7-3.1.9 which shows asymmetric peaks at different temperatures. Each peak is associated with a maximum frequency called as relaxation frequency. As the temperature increases the relaxation frequency is found to be shifting towards higher frequency [20-21]. The relaxation frequency (fr) follows the Arrhenius behavior as same in **equation no 3.2.1**. This equation is explored to find out the dielectric relaxation activation energy (ΔE) and relaxation time (τ).

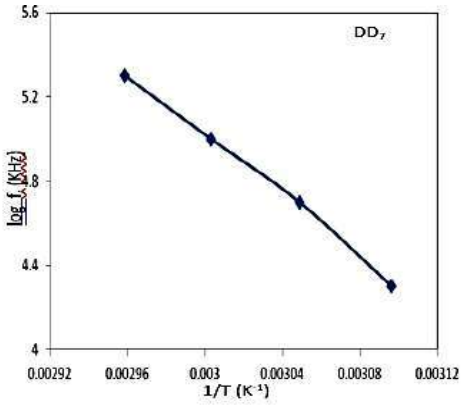

Fig 3.1.10

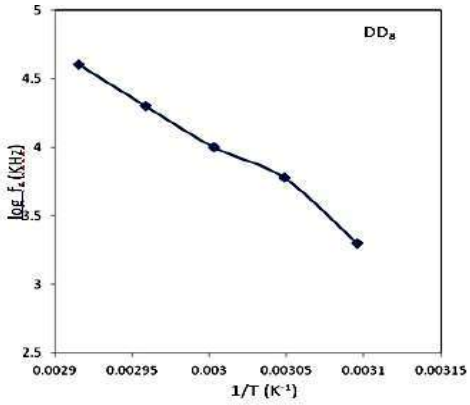

Fig 3.1.11

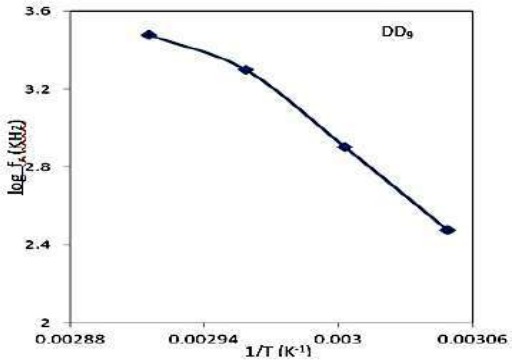

Fig. 3.1.12

The variation of 1/T versus log fr for samples DD7, DD8 and DD9 in fig.3.1.10-3.1.12. shows a straight line nature [20-22]. The values of peak frequencies (log f) are plotted against the 1/T as shown in fig 3.2.10-3.2.12. From this straight lines dielectric relaxation activation energy (ΔE) and relaxation time (τ) is calculated and tabulated in table 3.1.1.

Table 3.1.1: Dielectric relaxation activation energy and Relaxation time of PTh-PVAc with doped Bromine

Sr.No.	Bromine wt %	ΔE (eV)	τ (μs)
1	3.5	0.6224	2.51
2	5.5	0.5985	17.78
3	10.4	0.6619	199.52

From the table it is observed that, dielectric relaxation activation energy and relaxation time is maximum for the sample 10.4 wt % of Bromine and minimum for 3.5 wt % of Bromine.

Table 3.1.2: Bulk resistance and Bulk capacitance of PTh-PV Ac doped with Bromine at different temperature

Bromine wt %	323K		328K		333K		338K		343K	
	R_b(KΩ)	C_b(pF)	R_b(KΩ)	C_b(pF)	R_b(KΩ)	C_b(pF)	R_b(KΩ)	C_b(pF)	R_b(KΩ)	C_b(pF)
3.5	57	139.7	24.2	131.6	13	153.1	7.9	150.2	5.3	-
5.5	450	176.9	185	172.1	98	180.3	51.8	153.7	35	113.7
10.4	3800	-	1700	312.2	750	303.3	380	209.5	225	235.1

The values of bulk resistance (Rb) and bulk capacitance (Cb) at peak frequencies are noted in table 3.1.2.From the table it is observed that the bulk resistance of the sample is decreasing as the temperature increases but the bulk capacitance of the samples almost remain constant at all temperature. The bulk capacitance is found maximum for the sample with 10.4 wt % of dopant Bromine.

4. Conclusion

The impedance spectra of PTh-PVAc for the samples 5.5, 10.4, 14.9 and 22.5 wt % of Bromine dopant consist of only one arc which may be taken to mean that the conduction processes have identical time constants. The variation of real axis Z' with log f shows negative temperature coefficient of resistance (NTCR). The variation of imaginary axis Z" versus log f shows asymmetric peaks at different temperatures that lead to Debye type of relaxation. On the basis of impedance spectra various parameters such as relaxation time, bulk resistance, bulk capacitance, dielectric activation energy etc. are calculated. Dielectric relaxation activation energy and relaxation time is maximum for 5.5wt% of Bromine and minimum for 10.4 wt % of Bromine. The bulk capacitance is found to be maximum for the sample with 5.5 wt % Bromine. Dielectric relaxation activation energy and relaxation time is minimum for 5.5 wt % of Bromine. The bulk capacitance is found to be maximum for the sample with 10.4 wt % Bromine.

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Synthesis And Experimental Evaluation of New Chalcone Derivative.

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Abstract:

Chalcones which are also known as α,β-unsaturated ketones is an important class of organic compounds and reported to possess a wide spectrum of biological activities such as antibacterial, antifungal, anticancer, anti-inflammatory etc. This compound is the main precursor in the synthesis of a variety of heterocyclic compounds, therefore it is very important to develop the latest strategies in the synthesis of Chalcone. Chalcones are a valuable molecule of medicinal importance due to presence of reactive ketoethylenic group –CO–CH=CH–, belonging to the flavonoid family. These reactive α,βunsaturatedketo function in chalcones are responsible for their biological activity. Chalcone can be synthesized by several methods using aldehydes and ketones as starting material.

This paper is focused about different methods of synthesis and characterization done by NMR, MASS and IR spectroscopic techniques and physical properties with experimental data such as melting point, molecular weight,density,refractive index and viscosity of chalcones.

Keywords :Chalcone, Molecular weight,Density, Refractive index, Viscosity etc.

Introduction:

Chalcones are the aromatic ketones which belong to 1, 3-diaryl-2-propen-1-ones, which forms the central core for the synthesis of variety of important biologically active compounds.They are ubiquitous in natural products and belong to the family of flavonoids examples - licochalcone and morachalcone[1,2].

The compounds with the backbone of chalcone have been reported to exhibit a wide variety of pharmacological activity including antimalarial[3],antibacterial [4], antitubercular[5,6], antiviral[7], anticancer [8], anti-inflammatory [9], antifungal [10], antioxidant [11], antileishmanial[12], antidiabetics[13] etc.. Furthermore, chalcones are industrially used as light stabilizing agent[14], Sweetening agent[15], analytical reagent in amperometry[16] ,spectrometric reagent[17] and synthetic reagent for the synthesis of pharmacologically active heterocyclic compounds[18–20].Chalcones are also present in nature and can be obtained from plant species like Angelica, Glycyrrhiza, Humulus and Scutellaria, which are widely used as traditional folk remedies. Chalcones are important intermediates for the biosynthesis of flavonoids. The bright yellow-colored chalcones found in many plants and in some families contribute significantly in the pigmentation of corolla. Chalcones can be synthesized in the laboratory by Aldol condensation between a benzaldehyde and an acetophenone in the presence of base.

In this study we synthesized,characterize and physical interpretation of the new substituted chalcone. The structure of the compound was characterized by NMR,MASS and IR spectroscopic studies.

Refractive Index along with density, molecular mass andviscosity is very useful in the evaluation of variousthermodynamics properties of chemical materials. The number of atoms, groups, radicals and bonds present in thecompound can also be calculated by refractive indexmeasurement.

Scheme for Synthesis of Chalcone derivatives :

Substituted acetophenone [21] and substituted benzaldehyde[22] were mixed in a round bottom flask. Ethanol was annexed and then sodium hydroxide.The mixture was stirred at room temperature, then left to stand for 24 h. The mixture was poured into a beaker containing crushed ice to quench the reaction and then neutralized with HCl. The precipitates formed were filtered, washed with distilled water and dried. They were then recrystallized fromabsolute ethanol to obtain the desired products[23-29].

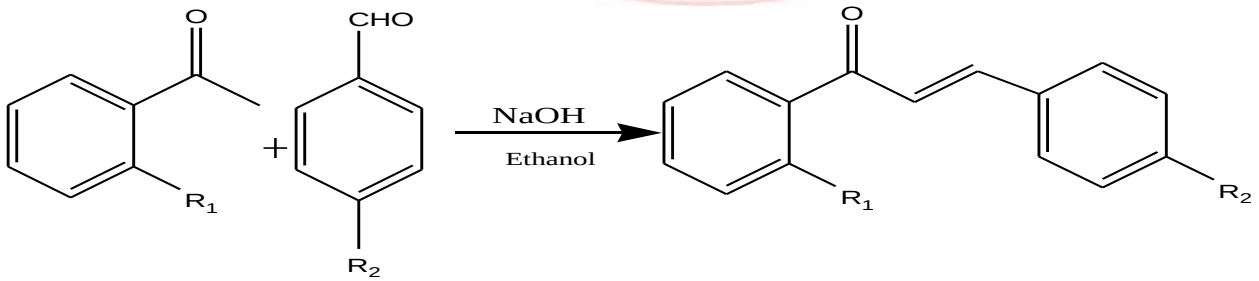


Table : 1 : Physical parameters of synthesized Chalcone.

Sr. No.	Compound	Substitution	Molecular Formula	Molecular Weight	Yield
1	Chalcone	OH and Cl	C15H11O2Cl1	258.5	75 %

Experimental

I.Synthesis :

Substituted chalconehave been synthesized andtheir general structures were confirmed by IR, 1H NMR and mass spectral data. Table 1,Table 2, Table 3,Table 4and Table 5 shows thevarious physicalparameters of synthesized Chalcone.

II.Physicochemical studies:

The synthesized chalconewas recrystallized from DMF. The solvents dimethylformamide(DMF) and dimethylsulfoxide (DMSO) were used for thephysicochemical studies.The selection of solvents indifferent physicochemical study is due to solubility andother practical problems.

III.Density and Refractive index:

Solutions of differentconcentrations were made in DMF and DMSO of the synthesized compound. The density and refractive index ofsolutions were measured at various temperatures and various concentrations. Abbe refractometer was used to determine the refractive index of all the solutions. Table shows the refractive index of synthesized chalcone at various temperatures and various concentrations.

Results and Discussions:

I.Refractive Index of synthesized Chalcone:

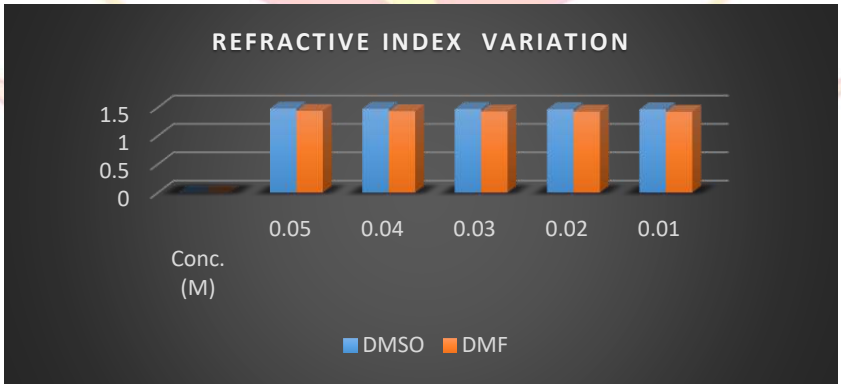
Values of refractive index are varies with various concentrations of solution at 313.15 K temperatures.The below table shows the dynamic values of refractive index.

Table :2 **Temperature: 313.15 K**

Conc. (M)	DMSO solvent	DMF solvent
	RI	**RI**
0.05	1.482	1.440
0.04	1.479	1.434
0.03	1.474	1.429
0.02	1.470	1.426
0.01	1.468	1.424

Space Graph:

Below space graph clarifies that the refractive index with solvent DMF is lesser than that of solvent DMSO.



II. Density and Viscosityof synthesized Chalcone:

The table below shows the dynamic experimental values of density (ρ), and viscosity (η), at different temperature and different concentrations.

Table :3 **Temperature: 303.15 K**

Conc.	DMSO Solvent	DMF Solvent

(M)	Density(ρ) ($g.cm^{-3}$)	Viscosity ($\eta.10^{-3}$)poise	Density(ρ) ($g.cm^{-3}$)	Viscosity ($\eta.10^{-3}$)poise
0.05	1.1209	12.349	0.9619	7.882
0.04	1.1199	12.297	0.9612	7.789
0.03	1.1192	12.274	0.9608	7.753
0.02	1.1187	12.135	0.9602	7.691
0.01	1.1170	12.058	0.9576	7.651

Table :4 **Temperature: 308.15 K**

Conc. (M)	DMSO Solvent		DMF Solvent	
	Density(ρ) ($g.cm^{-3}$)	Viscosity($\eta.10^{-3}$)poise	Density(ρ) ($g.cm^{-3}$)	Viscosity ($\eta.10^{-3}$)poise
0.05	1.1204	11.190	0.9642	7.281
0.04	1.1201	11.082	0.9644	7.202
0.03	1.1193	11.031	0.9633	7.139
0.02	1.1188	10.929	0.9629	7.088
0.01	1.1171	10.899	0.9617	7.002

Table :5 **Temperature: 313.15 K**

Conc. (M)	DMSO Solvent		DMF Solvent	
	Density(ρ) ($g.cm^{-3}$)	Viscosity($\eta.10^{-3}$)poise	Density(ρ) ($g.cm^{-3}$)	Viscosity ($\eta.10^{-3}$)poise
0.05	1.1198	10.397	0.9658	6.583
0.04	1.1193	10.331	0.9653	6.494
0.03	1.1180	10.294	0.9641	6.437
0.02	1.1175	10.184	0.9632	6.382
0.01	1.1172	10.131	0.9605	6.284

The above physical parameters show that, decrease in concentration of solution,the density and viscosity are decreased,while the same values were increased in increased temperatures.Table 1 shows the experimental values of refractiveindex of solutions of the newsynthesized compound in DMF and DMSO at 313.15 K.Table 2,Table 3 and Table 4 shows the dynamic valuesof densities and viscosities of compound in various concentration and various temperatures with solvent DMF and solvent DMSO.

Conclusions:

From above experimental values it is concluded that densities,viscosities and refractive index of solution are changes by changing temperatures and by changing the solvent due to solute-solvent interaction.

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A short theoretical view on fundamental aspect of material science

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Abstract:
Materials science still incorporates elements of physics, chemistry, and engineering. The interdisciplinary field of materials science, also commonly termed materials science and engineering, covers the design and discovery of new materials, particularly solids. The basis of materials science is studying the interplay between the structure of materials, the processing methods to make that material and the resulting material properties.
Key word: *chemistry, physics, engineering, phenomenological, ancient,*

Introduction:

Beginning in the 1940s, materials science began to be more widely recognized as a specific and distinct field of science and engineering, and major technical universities around the world created dedicated schools for its study. Materials scientists emphasize understanding, how the history of a material (*processing*) influences its structure, and thus the material's properties and performance. The understanding of processing-structure-properties relationships is called the materials paradigm. This paradigm is used to advance understanding in a variety of research areas, including nanotechnology, biomaterials, and metallurgy.

Methodology:

Materials science is also an important part of forensic engineering and failure analysis – investigating materials, products, structures or components, which fail or do not function as intended, causing personal injury or damage to property. Such investigations are key to understanding, for example, the causes of various aviation accidents and incidents.

1. **Fundamental**
   The main classes of materials are metals, semiconductors, ceramics and polymers.
   A material is defined as a substance (most often a solid, but other condensed phases can be included) that is intended to be used for certain applications. There are large numbers of materials around us they can be found in anything from buildings and cars to spacecraft. New and advanced materials that are being developed include nonmaterials, biomaterials, and energy materials. The complex combination of these produces the performance of a material in a specific application. Many features across many length scales impact material performance, from the constituent chemical elements its microstructure and macroscopic features from processing. Together with the laws of thermodynamics and kinetics materials scientists aim to understand and improve materials
2. **Structure**
   Structure is one of the most important components of the field of materials science. Materials science examines the structure of materials from the atomic scale, all the way up to the macro scale. Characterization is the way materials scientists examine the structure of a material. This involves methods such as diffraction with X-rays, electrons or neutrons, and various forms of spectroscopy and chemical analysis such as Raman spectroscopy, energy-dispersive spectroscopy, chromatography, thermal analysis, electron microscope analysis, etc. Structure is studied in the following levels
3. **Atomic structure**
   Atomic structure deals with the atoms of the materials, and how they are arranged to give rise to molecules, crystals, etc. The length scales involved are in angstroms (Å). The chemical bonding and atomic arrangement (crystallography) are fundamental to studying the properties and behavior of any material. Much of the electrical, magnetic and chemical properties of materials arise from this level of structure.
4. **Bonding**
   This involves the study and use of quantum chemistry or quantum physics. Solid-state physics, solid-state chemistry and physical chemistry are also involved in the study of bonding and structure. To obtain a full understanding of the material structure and how it relates to its properties, the materials scientist must study how the different atoms, ions and molecules are arranged and bonded to each other.
5. **Crystallography**
   Crystallography is a useful tool for materials scientists. Crystallography is the science that examines the arrangement of atoms in crystalline solids. In single crystals the effects of the crystalline arrangement

of atoms is often easy to see macroscopically because the natural shapes of crystals reflect the atomic structure. The understanding of crystal structures is an important prerequisite for understanding crystallographic defects. Further physical properties are often controlled by crystalline defects. Mostly materials do not occur as a single crystal but in polycrystalline form as an aggregate of small crystals or grains with different orientations.

6. **Nanostructure**
   Nanomaterials are subject of intense research in the materials science community due to the unique properties that they exhibit Materials which atoms and molecules form constituents in the nanoscale (i.e., they form nanostructure) are called nanomaterials. Nanostructure deals with objects and structures that are in the 1 - 100 nm range. In many materials, atoms or molecules together to form objects at the nanoscale. This causes many interesting electrical, magnetic, optical and mechanical properties in describing nanostructures it is necessary to differentiate between the numbers of dimensions on the nanoscale
7. **Microstructure**
   Microstructure is defined as the structure of a prepared surface or thin foil of material as revealed by a microscope above 25× magnification. It deals with objects from 100 nm to a few cm. The microstructure of a material (which can be broadly classified into metallic, polymeric, ceramic and composite) can strongly influence physical properties such as toughness, strength, hardness, ductility, corrosion resistance, high/low temperature behavior wear resistance and so on. Most of the traditional materials such as metals and ceramics are micro structured
8. **Macrostructure**
   Macrostructure is the appearance of a material in the scale millimeters to meters, it is the structure of the material as seen with the naked eye
9. **Thermodynamic**
   Thermodynamics is concerned with heat and temperature and their relation to energy and work. Thermodynamics describes the bulk behavior of the body not the microscopic behaviors of the very large numbers of its microscopic constituents such as molecules. It defines macroscopic variables such as internal energy, entropy, and pressure that partly describe a body of matter or radiation. These general constraints are expressed in the four laws of thermodynamics. It states that the behavior of those variables is subject to general constraints common to all materials. The behavior of these microscopic particles is described by and the laws of thermodynamics are derived from statistical mechanics the study of thermodynamics is fundamental to materials science.

Result and Discussion:

Materials science is a highly active area of research. Together with materials science departments, physics, chemistry, and many engineering departments are involved in materials research. Materials research covers a broad range of topics. Materials science is also an important part of forensic engineering and failure analysis – investigating materials, products, structures or components, which fail or do not function as intended, causing personal injury or damage to property.

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Fabrication of FeSe thin films deposited by successive ionic layer adsorption and reaction method.

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Abstract
Fabrication of Iron chalcogenide materials has been the subject of much interest in essential research because of their novel physical and chemical properties. In this paper, FeSe thin films were deposited on glass substrates by successive ionic layer adsorption and reaction deposition method and the number of cycle varies. These deposition techniques are a very simple and produce thin films at room temperature. The spaceman were investigated by X-ray diffraction techniques and SEM. The XRD pattern confirmed that Iron Selenide thin film. The SEM image exhibited that the obtained sample is homogonous in nature.
Key Words: *Thin Films, XRD, SILAR method, Morphological properties*

1. Introduction
Chalcogenide thin films are persistently under development to extend new potential materials appropriate for photo-voltic devices. The chalcogenides materials have magnetized scientists maybe due to their potential uses in a variety of optoelectronic devices[1,2]. The structural, morphological, magnetic, electrical, and optical properties of FeSe thin film materials are strongly dependent on production methods. Among these methods, it is known that parameters such as solution temperature, molarity, pH value, annealing temperature and time, drying atmosphere, substrate have an influence on the quality, thickness, and production cost of the film. When the literature is reviewed, It is seen that a wide variety of methods like Pulsed Laser Dep, chemical method and other method[3,4] The most important plan of this learning is to set up a successive ionic layer adsorption and reaction deposited FeSe thin films and studies its morphological and structural characteristics.

2 Experimental
2.1 Deposition of thin films
The thin films of iron selenide (FeSe) have been grown on glass substrates by successive ionic layer adsorption and reaction deposition technique. The chemicals used in this work were of analytical reagent grade (99% purity). Before the deposition the glass slides with dimensions 75 × 25 × 1 mm^3 ultrasonically were cleaned and rising with distilled water for each 6 min. The Na_2SeSO_3 solution was prepared by mixing 100 g anhydrous sodium sulfite in 500 ml of distilled water with 10 g selenium powder (99% purity, Merck) with constant stirring for 10 h at 80 ^{0}C. It was sealed and kept overnight, since on cooling, a little selenium separated out from the solution. It was then filtered to obtain a clear solution. The deposition of FeSe films was done at room temperature in a reactive solution prepared in a beaker. Glass substrates were immersed in the 60 ml of Fe $(NO_3)_3.9H_2O$ solution for 10 s. It was then immersed in the 30 ml of EDTA solution for 10 s and then to immersed in 60 ml of freshly prepared Na_2SeSO_3 solution for 10 s. This forms one SILAR deposition cycle. Deposition cycles were varied from 100 to 250 cycles in the steps of 25 cycles. All the prepared samples were annealed for 24 h for the complete transformation. The X-ray diffraction was used to study the structure of the film. X-ray diffraction patterns of the films were taken with a PANalytical X'Pert PRO MRD X-ray diffractometer with Cukα radiation in the 2θ range from 20^0 to 90^0. The morphological study of the film was carried out using scanning electron microscopy (SEM) with a Park Scientific Instruments and SEM/EDAX with JOEL's JSM -7600F.The scanning electron microscope gives topographical and elemental information at various magnifications.

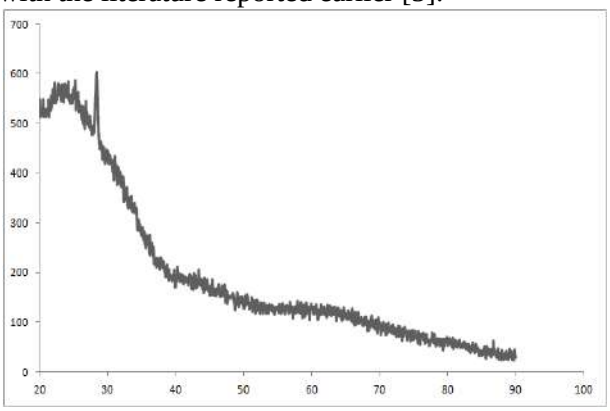
2.2 X-ray diffraction
X-ray diffraction technique is an appropriate system for studying the crystal formation of the deposited thin films. The inter-planar spacing's d was calculated using the relation,

$$D_{hkl} = (\lambda/2)\ \mathrm{Sin}\theta$$

Fig.1. shows the x-ray diffraction pattern of FeSe thin film deposited on glass substrate at room temperature. The differaction peakes of FeSe is found at 2θ values of 28.3912, corresponding to the lattice plane (100). The d value calculated using equation confirm well with available JCPDS standered for FeSe. The average crystallite size of the deposited material is determined by using Debye-Scherer's formula,

$$d = \frac{0.9\,\lambda}{\beta \cos\theta}$$

where β is Full Width at Half Maximum of the peak in radians, λ is the wavelength of CuKα radiation (λ=1.5418 A^0), θ is the Bragg diffraction angle at peak position in degrees. These results are in good agreement with the literature reported earlier [5].



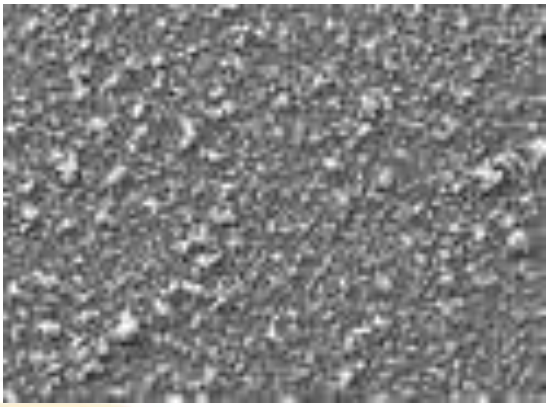


Fig.1. shows the x-ray diffraction pattern of FeSe thin film and Fig.2. shows, the SEM image of as deposited FeSe thin film on to glass substrate

2.3 Surface morphology

Fig.2. shows, the SEM image of as deposited FeSe thin film on to glass substrate. From SEM, we can examined that as-deposited FeSe film is homogeneous and covering the substrate. The surface investigation from two dimensional micrograph showed that the film surface is uneven which confirms its absorbent nature observed in SEM image.

3. Conclusions

The structural properties of FeSe thin films deposited by successive ionic layer adsorption and reaction deposition technique have been studies. These results are in good agreement with the literature reported earlier.

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Application of PANI-Mn Nano-composite for Removal of Dyes from Wastewater

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Abstract

The waste water generated from industries creates severe public health issue and environmental pollution concern, create a major challenge to existing conventional water treatment systems. The different biological and physiochemical treatment process have been studied, but they shows different removal ability on the basis of their experimental condition. Among them, adsorption methods is most efficient due to its high removal efficiency, cost-effective, easy to operated and recyclability of adsorbent. In this research Facile synthesis of Polyaniline-Mn Nano-composite was done by oxidative polymerization methods and used as an adsorbent for removal of methyl orange dyes from waste water. The effect of some important parameter such as Initial Concentration of dyes, pH of water, temperature and contact time on the removal and efficiency was investigated in adsorption system. The adsorption capacity of PANI-Mn Nano-composite was high 94%at pH of 3-4 and the adsorption of dyes increased with 92.60% to 96.42% increase in temperature from 35ºC to 50ºC.

Keyword: *Polymer, PANI-Mn, Polyaniline, Methyl Orange, Dyes.*

1. Introduction

The dye may be defined as a coloured substance which when applied to the fibres gives it a permanent color. The dyes contain Chromophore which are responsible for producing color to a dye because they are capable of absorbing light in near U.V region.[1]The dyes are classified mainly on the basis of structure and their application. Depending upon the type of chromophore present in their structure the dyes are Nitro and Nitroso dyes, Azo dyes, Triphenyl methane dyes, Phthalein dyes, Indigoid and Thioindigoid dyes, Anthraquinone dyes, Miscellaneous dyes.[2] The Methyl Orange dyes an azo dye containing one azo (-N=N-)group. It contain sulphuric acid (-SO_3H) group and hence it is acidic Azo dye. This –SO_3H group make the dye more soluble and It is also used as reactive point for fixing the dyes. This –SO_3H group act as auxochrome.[3] The IUPAC name is dimethyl amino azobenzene sulphonic acid. In our country the use of dye is high and wastewater from textile industries causes damages to water living organism. Consequently these are affecting to the ecological system of environment. It also affect to public health, hence its removal from waste water is big challenge.[4] It also affect to soil if it is not degradable because most of the dyes are stable to light and non-degradable.

The many researchers are attracted towards its removal with the help of Nano scale material. When polyaniline doped with any transition metal then it is called Nano-composite. Some researchers used the Nano-composite for different dyes for example, the polyaniline sawdust is used to removal of Acid Violate 49 dyes.[5] The removal of cationic dye using a new magnetic Nano-composite based on starch-g-poly (vinylalcohol) and functionalized with sulphate group.[6] Polyaniline Nano-composite for the adsorption of Acid dyes from aqueous solution. The polyaniline Nano-layer composite for removal of tartrazine dyes from aqueous solution.[7] The basic blue dye adsorption from water using Polyaniline/Magnrtite (Fe3O4) Composite.[8] The green synthesis of magnetic nano- composite by Cordia Africana(CA) leaves extract for the treatment of Methylene blue.[9] An Eco-Friendly NiO/Polydopamine Nano-Composite used for efficient removal of Dyes from wastewater.[10] polyacrylamide/Ni,ZnO, Nano-composite an efficient adsorbent capacity for toxic dyes.[11] The various adsorbents such as bio-adsorbents, carbon-based Nano-adsorbent,[12] Transition metal oxides-based adsorbent,[13] Polymer-based adsorbent[14] are used to treat waste water containing dyes. It can be observed that adsorbents such as polymer-based material and activated carbon are studied more for the removal of dyes. There has been increasing interest in finding the easy and efficient Nano-composite for removal of dyes from waste water.

In present research the facile synthesis of Polyaniline–Mn Nano-composite and its application in removal of methyl Orange dyes from waste water. The Factors which affects removal from waste water i.e Initial dyes concentration, pH, temperature describe here.

2. Materials and Methods

The chemicals used such as Ammonia, aniline, ammonium persulphate, manganese dichloride, ethanol, concentrated HCl, aldehyde, dethyl phosphite are of analytical grade, The Distilled water used for experimental work.

2.1 Synthesis of Polyaniline:

The 0.5 M aniline monomer (99%) and 0.5 M ammonium persulphate (APS) was prepared in 0.5M Cons. HCl solution, In a round bottom flask. These are mixed slowly with constant stirring on magnetic stirrer. This mixture was kept in ice bath maintaining the temp below 0-4ºC for 8-10 hours. The reaction mixture was

poured into 200 ml water to complete the precipitation, washed with distilled water and HCl solution to remove un-reacted monomers.[15] After some time polymerization take place and the dark suspension becomes green in color. The green colored residue like paste was obtained. The final product was washed 2-3 times with D.W. and ethanol. Finally the dark-green powder is dried at 80°C for 6-8 Hours in Oven[16] The final product was grinded to form a green powder is known as conducting PANI (ES).Fig-1.

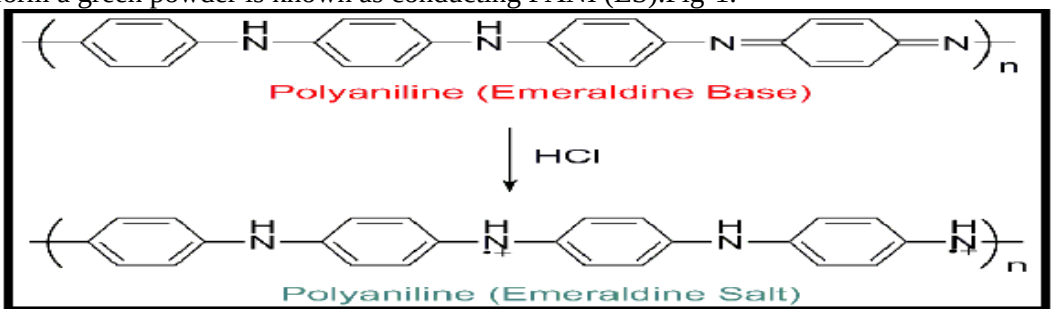

Fig-1 Structure of Polyaniline

2.2 Synthesis of PANI-Mn Nano-composite:

After formation of Polyaniline Emeraldine Salt (ES) the accurate amount of 0.2 M solution of Manganese chloride ($MnCl_2$) slowly and carefully dissolved in polyaniline. The Polyaniline Manganese chloride solution was kept in R. B. flask and kept for vigorous stirring with the help of hot plate with magnetic stirrer (700 RPM) is adjusted, about 3-5 hours. The dark green suspension is formation in the R. B. flask after that this R B flask was kept in Ice bath for 12 Hours. After filtration, The product were washed with 2 times with distilled water and 3 times with ethanol. The prepared Nano catalyst was kept in hot air oven for 7 hours at 70^0C.[17] In this method the Nano particle of Mn is uniformly distributed in Polyaniline. There is formation of Nano- catalyst having dark green color, The surface morphology was studied on Scanning Electron Microscopy. **(Fig-2)**

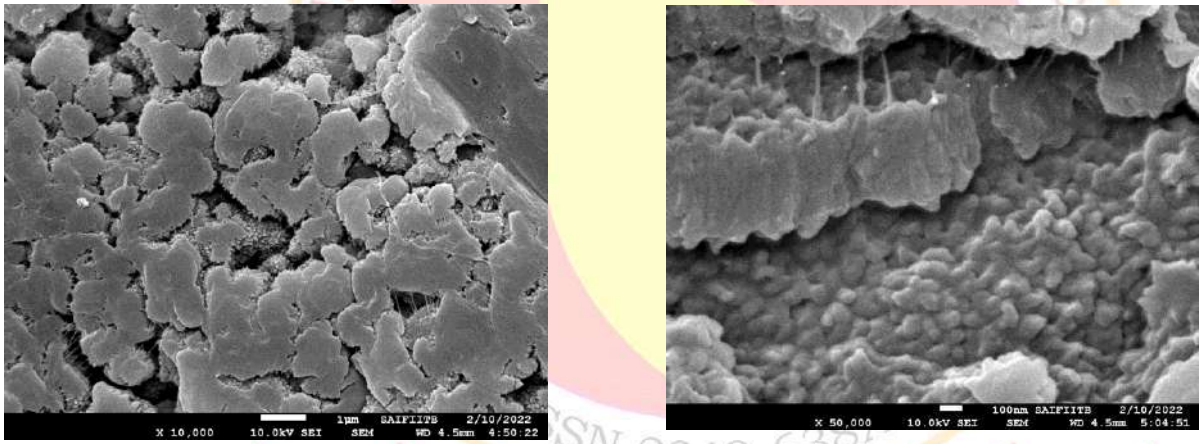

Fig-2 SEM images of PANI-Mn Nano-composite at 1nm and 100 nm

On the basis of scanning electron microscope structure the manganese molecule is uniformly distributed in the polyaniline. The size of particle is 1-100nm. The high surface area is available for electrostatic attraction to methyl orange dyes.

3. Adsorbate

The dyes used in this studies was methyl orange it is an acidic dyes. Having molecular formula $C_{14}H_{14}N_3NaO_3S$ and Molecular weight 327.34g mol^{-1} The molecular structure is given in Fig-2. The stock solution of 1000mg/L prepared by by dissolving appropriate amount of dyes in 1 litre of Distiled water. The solution were obtained by diluting the dye stock solution in accurate proportion to different initial concentration.

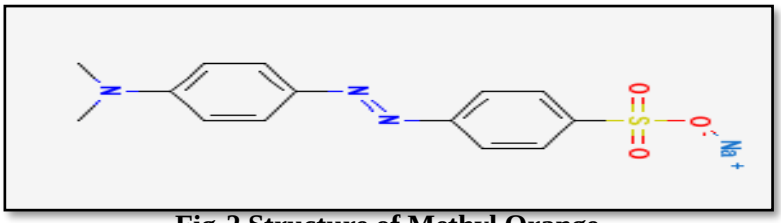

Fig-2 Structure of Methyl Orange

4. Batch mode adsorption experiments

The adsorption experiments were carried out by agitating 100 mg adsorbent with 200 mL of dye solutions of 25 to 100 mg/L concentration at 150 rpm on Hot Plate with magnetic stirrer. The mixture was withdrawn at specified intervals, centrifuged using electrical centrifuge at 4500rpm for 20 minutes and un adsorbed supernatant liquid was analyzed for the residual dye concentration using spectrophotometer. at 558 nm.

The effect of temperature on adsorbent was studied at four different temperature i.e. 25ºC, 30ºC, 35ºC, 40ºC. The effect of pH was studied by using dilute HCl and NaOH solutions. . All experiments were carried out repeated and the mean values are reported, where the maximum deviation was within 5%.

5. Desorption Studies

The main aim to study the Desorption to analyze the mechanism of adsorption and recovery of the adsorbate and adsorbent. The supernatant Liquid was separated after centrifugation and the adsorbent was separated and allowed to agitate with 100 mL of distilled water at different pH i.e. 3-12 above the equilibrium time of adsorption. The desorbed dye solution was estimated as given in the adsorption studies. [18-19]

6. Mechanism of adsorption

In process of adsorption firstly Nano-composite having high surface area. On this surface the surface diffusion process take place and molecules of dyes attracted towards surface area of Nano-composite. It should be noted that adsorption of methyl orange dye present in waste water on surface of adsorbent is mainly due to electrostatic attraction, pi-pi interaction, "van der waals" forces, hydrogen bonding, acid base reaction, and hydrophobic interaction.[20] Out of which adsorption of methyl orange dye on surface of adsorbent mainly due to electrostatic attraction and ion exchange phenomenon. In electrostatic attraction -SO3H groups having negative charge and adsorbent surface having positive charge they attract each other and easily removed. In ion exchange mechanism involves exchange of ion between dyes solution and solid phase adsorbent.

Fig-3

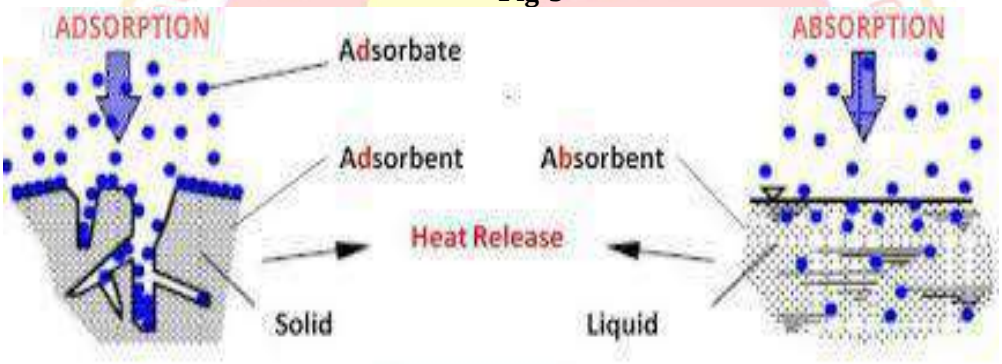

Fig-3 Mechanism of Adsorption

6.1 Effect of Initial dye concentration

The effect of time on the removal of Methyl orange dye is observed. The percentage of removal increases with time and attains equilibrium at 50 minutes for all concentrations studied (30 to 100 mg/L). After that no significant change was observed in the extent of adsorption. The amount of dye adsorption increases from 49.45 mg/g to 174.51 mg/g. while increasing the initial dye concentration from 30 to 100 mg/L. This is due to the fact that with increase in dyes concentration, it shows that dyes molecule near the adsorbent also increased.

6.2 Effect of pH

It is found that the percentage removal of Methyl Orange was higher when the pH is below 4. After pH 4, the adsorption rate decreased. In acidic conditions, the surface of the adsorbent is positively charged due to high concentration of H^+ ions, so electrostatic attraction between the adsorbent and the adsorbate is enhanced.[21] Lower adsorption of Methyl Orange under alkaline conditions is due to the presence of hydroxyl ions on the surface of adsorbents competing with the adsorbate for adsorption sites . Methyl Orange has anionic dipositively fixed charged sites which are balanced with the anions originating from monomer or oxidant solution during their synthesis. The small size dopant anions can be exchanged with other anionic species in treated, solutions which have stronger interactions with the polymer . It may be suggested that the rate of anionic dye removal is high due to the ion exchange mechanism between mobile cation and anionic dye molecules. It was observed that The removal of Methyl Orange dyes 94% at lower pH i.e 3-4.

6.3 Effect of temperature

It has been observed that the percentage removal of Methyl Orange by PANI-Mn Nano-composite increases from 92.60 % to 96.42% on increasing the temperature from 35°C to 50°C. This indicates that the adsorption of anionic dyes is endothermic in nature[19]. These adsorption data were further analyzed with adsorption isotherm models to find out the suitable model.

7.Equilibrium adsorption isotherm

The Langmuir adsorption isotherm has been used successfully for many adsorption processes of monolayer adsorption. Langmuir model[21] is represented by the following equation

Equation-1

$$C_e/q_e = 1/Q_o b_L + (1/Q_o) C_e$$

where, qe is the amount of dye adsorbed at equilibrium (mg/g), Q0 is the monolayer adsorption capacity (mg/g) and bL is Langmuir constant related to energy of adsorption, Ce is the equilibrium concentration (mg/L) It shows a linear plot of Ce / qe against Ce for the removal of AV49 by PAC. The Langmuir adsorption capacity varies from 187.77 mg/g to 212.18 mg/g for Mehyl orange onto PANi-Mn Nano-composite with increase in temperature from 35°C to 50°C. This indicates that the adsorption is favored at high operating temperature.

7.1 Kinetics of Adsorption

In this present research paper, the following two kinetic models were applied for the experimental data. Adsorption kinetics is necessary for the design of adsorption systems[22]

Pseudo first - order kinetic model assumes that the rate of change of solute uptake with time is directly proportional to difference in saturation concentration and the amount of solid uptake with time.[23-24] The rate constant of adsorption is expressed as a first – order rate expression given as: Eq-2.

Equation-2

$$\log (q_e - q_t) = \log q_e - K_1/2.303\, t$$

Where, k1 is the pseudo-first-order rate constant (min^{-1}). The plot of log (qe-qt) versus t should give a straight line with slope of –k1/2.303 and intercept log qe which allows calculation of adsorption rate constant k1 and equilibrium adsorption capacity qe . Calculated values of k1 and qe for the adsorption of Methyl orange dyes on PANI-Mn Nano-composite.

7.2 The pseudo second-order kinetic equation

$$t/q_t = 1/k_2 q^2_e + t/q_e$$

Equation-3

In Eq-3. Where, 2 k is the rate constant of pseudo second –order adsorption (g/mg min) and e q is the equilibrium adsorption capacity (mg/g). The pseudo second -order plot for the adsorption of Methyl Orange at various initial dye concentrations (Temperature 30°C). A plot of t/qt against t should give a linear relationship from which 2 k and qe can be determined from the intercept and slope of the plot.[25-26] The correlation coefficient values are greater and the data points give a linear straight line. It indicates that the adsorption of Methyl Orange by PANI-Mn follow the pseudo second order kinetic model.

7. Conclusions

In this present research paper The Polyaniline-Mn Nano-composite was easily synthesized by Oxidative polymerization. The removal of Methyl orange is pH dependent and the maximum removal is observed below pH 4, due to its mechanism. The adsorption of dyes increased with 92.60% to 96.42% increase in temperature from 35ºC to 50ºC. The kinetic study shows that adsorption of Methyl orange followed pseudo-second order kinetics model. It was observed that PANI-Mn Nano-composite having potential to remove Methyl Orange dyes from waste water.

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Graphene Based Space Qualified Battery Materials

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Abstract

Space craft's require different technologies that envisioned for power generation, storage and its management. Generally, in the CubeSats, solar cells are the power generator and secondary batteries serve as energy storage. The primary task of the battery is to deliver power when the production of power from solar panels is stop or not sufficient to cover the consumption. When a satellite passes through an eclipse and no light available for solar cells to produce power, that time batteries take charge of power supply. If the battery fails to provide power to satellite, it leads to interruption of the mission or loss of the satellite. Hence battery is very crucial component in satellites for smooth functioning. Therefore, by considering the need of battery system in space mission, present review paper reports some noteworthy contribution in this field. In this review, some recent advances in the graphene-containing materials used in lithium-ion batteries are summarized and future prospects are highlighted.

Key words: *Space Qualified, Rechargeable Battery, Non-Rechargeable Battery*

Introduction

Graphene is single layered atomic sheet of carbon atoms, which has outstanding mechanical, electrical and optical properties [1]. A continuous and conductive composites formed by graphene can effectively improve the electron and ion transportation of the electrode materials. Therefore, the use of graphene can greatly boost Li-ion battery's properties with considerable chemical stability, higher electrical conductivity and higher capacity [2]. Figure 1 shows the single sheet graphene.

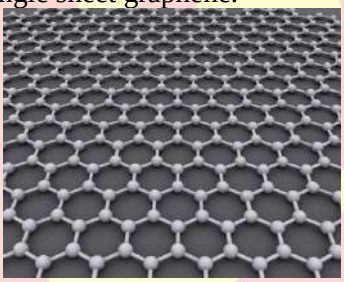

Figure 1. Single sheet of graphene.

CubeSats and small satellite are very useful solutions for space missions they enable a fast, cheap, and agile. To make them powered, crucial component of satellite system is the energy storage device, which is practically equal to a battery. In power system of space vehicle, group of several batteries used as secondary power source for a space mission.

The desired characteristics from Space Batteries are,

- Reliability and robustness
- Light weight and compact for reducing the launch costs
- Capability to perform under extreme temperatures
- Long calendar life
- Tolerance to high intensity radiations.

The small satellites have mainly two benefits, first is they are cost effective due to their size and shape. Second, their compactness fit to the structure and combability [3].

In light of above discussion, this brief review is planned to reports some recent developments in space qualified rechargeable and non-rechargeable battery materials. In subsequent section, some noteworthy reports in this field are discussed. Figure 2 depicts the batteries which are used in space missions.

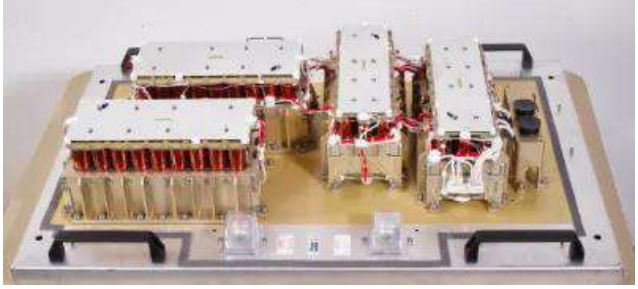

Figure 2. Batteries used in outer space.

Literature survey

In order to meet all above listed qualities, graphene-based materials are the key option. Due to two-dimensional structure of graphene, it has many outstanding characteristics such as high conductivity, mechanical strength, high charge carrier mobility and high surface area which make graphene a suitable electrode material for Li-ion battery.

However, graphene-based composites face many problems like low tap density, volumetric energy density and more capacitor-like behavior. But all these issues which are associated with graphene can resolve by incorporating proper metal oxide on graphene surface, which results in improving the electrochemical properties.

During literature survey, we came across with two significant contributions. First is reported by Mussa et al, which reports a microwave irradiation method for the preparation of reduced graphene oxide (RGO) based Co_3O_4 nanocomposites as anodes for lithium-ion (li-ion) batteries. The Co_3O_4/RGO nanocomposites displayed good electrochemical behavior as anodic materials for li-ion batteries when compared to pure Co_3O_4. The Co_3O_4/RGO nanocomposites with low RGO content resulted in stable electrochemical performance with 100% coulombic efficiency at a high current density of 500 mA/g for 50 cycles. The enhanced capacity of the Co_3O_4/RGO nanocomposites is due to the incorporation of RGO, which resulted in a four times larger surface area than that of Co_3O_4. This increased surface area could facilitate the absorption of more lithium ions, resulting in excellent electrochemical performance. Interestingly, the novelty of this work is that the designed li-ion batteries showed stable electrochemical performance even at a high temperature of 100 °C, which might be useful for rechargeable battery applications in a wide temperature range [4].

And second report made by Cheng et al, which reports carbon material called graphene-like-graphite (GLG) as anode material of lithium-ion batteries that delivers a high capacity of 608 mAh/g and provides superior rate capability. The morphology and crystal structure of GLG are quite similar to those of graphite, which is currently used as the anode material of lithium-ion batteries. Therefore, it is expected to be used in the same manner of conventional graphite materials to fabricate the cells. Based on the data obtained from various spectroscopic techniques, this work propose a structural GLG model in which nanopores and pairs of C-O-C units are introduced within the carbon layers stacked with three-dimensional regularity. Three types of highly ionic lithium ions are found in fully charged GLG and stored between its layers. The oxygen atoms introduced within the carbon layers seem to play an important role in accommodating a large amount of lithium ions in GLG. Moreover, the large increase in the interlayer spacing observed for fully charged GLG is ascribed to the migration of oxygen atoms within the carbon layer introduced in the state of C-O-C to the interlayer space maintaining one of the C-O bonds [5].

Due to cost effectiveness, easy availability and environmental friendliness, $LiMn_2O_4$ is used as cathode material since 1990s. But the disadvantages like its low electrical conductivity and low-rate capacitance make it less commercial for use in battery. Bak et al experimentally shows that graphene sheets are very efficient in improving the electrical conductivity and rate capacity. This study prepares the $LiMn_2O_4$-graphene composites using microwave assisted hydrothermal method which showed the reversible capacities of 117 mAh/g and 101 mAh/g at 50 C and 100 C [6]. Figure 3 shows the TEM image and Specific Capacitance response of $LiMn_2O_4$-graphene composites.

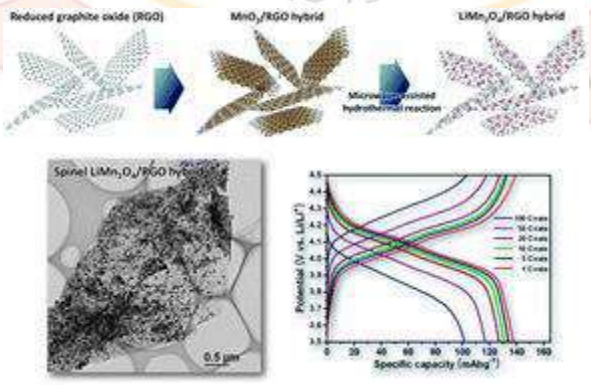

Figure 3. TEM image and Specific Capacitance response of $LiMn_2O_4$-graphene composites.

$LiNi_{1/3}Mn_{1/3}Co_{1/3}O_2$ is another potential cathode material for battery application due to its outstanding properties such as high energy density, good stability, enhanced safety and low cost. Jiang et al demonstrated that

$LiNi_{1/3}Mn_{1/3}Co_{1/3}O_2$-graphene composites are prepared as cathode materials for battery application which deliver a capacity of 115 mAh/g at 6C [7].

Relevance with ISRO's Activities

Presently, ISRO pressing on exploration and envisions to send humans/space craft to Mars, spacecraft into the atmosphere of Venus, onto the surface of outer planetary icy moons, and even boring through the ice covering liquid oceans on these moons. To complete these challenging missions, presently available space-rated Li-ion batteries are not satisfactory. Therefore, it is extremely necessary to extend the operational temperature range, increase the specific energy of the electrodes, to improve the radiation tolerance of Li-ion batteries.

In 2018, ISRO offers Technology Transfer of Lithium-ion cells intends to qualify and shortlist suitable industries in India/Start-ups based on eligibility criteria through an open evaluation process.

Conclusions

Current studies demonstrated that pristine graphene can't become straight substitute for current carbon-based commercial electrode materials in lithium-ion batteries. As it has low coulombic efficiency, high charge–discharge platform and poor cycle stability. However, when used as a matrix or in synergetic form in the composite electrode materials, graphene can play a very important role.

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Study of Infrared spectra of PVC –PS Polymer blend and Polyaniline doped polymer Blend

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Abstract :

InfraRed Spectra of PVC –PS Polymer blend and Polyaniline doped polymer Blend has been measured in the region 4000 to 650 cm^{-1} on spectrophotometer.The infrared absorption band frequencies , their intensities and tentative vibrational assignments are discussed.

Keywords *: PVC – PS Blend , InfraRed Spectra*

Introduction

Polymers having different properties and chemical structures are usually mixed togrther to obtain polymer blendswhich may acquire a set of valuable properties. A lot of attention has been devoted in recent years to the characterization of polymer blends as was studied by Ahn et al [1]and Straka et al [2] FTIR spectrum of 2-chloro-6-methyl benzonitrile in the region 2-4000 cm has been recorded in KBr pellet technique with a Braver IFS - Fourier transform spectrometer. FT-Raman spectrum in powder form has been recorded in the region 50-4000cm on a Bruker IFS 66 optical each with an FRA 106 Raman module attachment interfaced to a microcomputer. Geometry and vibrational wavenumbers were calculated using ab-initio calculations with HF method by Virendra Kumar et al [3].Sharma et al [4] characterised the super ionic AgI-$Ag_2O.V_2O_5$-TeO_2 glasses by X-ray FTIR and DSC studies. The FTIR spectra reveal that the network structure remains essentially the same with AgI concentrations.Pradeep kumar et al [5] measured near nomal incidence for infrared (FIR) reflectivity spectra of a single crystal of $TbMnO_3$ from 10K to 300 K in the spectral range of 50 cm^{-1} - 700 cm^{-1} Indulal and Raveendran [6] used The FTIR for study of the stretching and bending frequencies of molecular groups in the sample.The pressure of of naphthalene in PS thin film was confirmed by IR spectra of the sample taken on FTIR - 8400 spectrophotometer by Sangawar et al [7] IR spectra of undoped polyblend and 30% napthalene doped polyblend was studied by Dhokne et al The infrared spectra of undoped and naphthalene doped polyblend are observed in the range of 500 cm^{-1} to 4000 cm^{-1} FTIR spectra for gamma doses of 0, 10, 35 and 50 KGY was student by Tarafdar et al [8]. They showed the results of infrared absorption frequencies for doses 0, 10, 35 and 50 kGy. Thicknesses are nearly equal and salt concentration is 18% for all samples studied and so intensities of the peaks in the graphs can be directly compared. There are evident changes with gamma irradiation. The most prominent change is in the peak at 1150 cm^{-1} which has been attributed to C-C bond stretching and C-0-C asymmetric stretching The morphology of PVF_2, films grown from the selection has been studied by Mehendra and Chand [9]. The IR spectra in the frequency range $90-480 cm^{-1} were recorded at room temperature and compared with Murayama's spectra. Venkata Chalapathy et al [10] carried out the FTIR analysis of Neyvelilignite and fly ash samples. The extinction coefficient (K) values calculated for the bands at 3450, 2900, 2835, 1695, 1600 cm^{-1} etc. Saikia et al[11] have carried out FTIR and impedance spectroscopy studies of PVC-PMMA-NH_4 SCN-DBP based polymer blend electrolyte to see the formation of polymer-salt complex and to measure the bervity respectively. Deshpande and Tyagarajan [12] have recorded the polarised IR polyvinyl alcohol (PVA) film. Ishra [13] studied the IR spectra of pure and 1.0 wt% I_2 doped PVC/NBR blend. The results obtained by him showed that a new band of weak intensity appeared at 1670 cm^{-1} and the intensity of bands at 3510 cm^{-1} and 555 cm^{-1} decreased on doping with iodine. Agari et al [14] prepared 200 µm films of PVC/ PMMA gradient polymer blends containing a wide compositional gradient phase. They characterized the films with FTIR technique. The ideal blend was found to have significantly new or improved properties (eg a large half width of temperature of dissipation factor) which cannot be observed in any PVC,PMMA homogeneously (that is ordinarily) miscible blend or laminate system.

Experimental details

The polyvinyl chloride (PVO) and polysterene (PS) of standard grade product supplied by Polychem Industries, Mumbai were used for the study The conducting polymer (polyaniline)was prepared by chemical oxidation using ferric chloride by conventional procedure. Polyaniline was used as a dopant Sample Preparation For the preparation of PVC-PS polyblend, the two polymers PVC (1.25g) and PS (0.25g) were taken in the ratio 5:1 by weight. 1.25 g of PVC in 15 ml tetrahydrofuran (THF) and 0.5g of PS in 10 ml of THF dissolved seperately and subsequently mixed together. For the preparation of Polyaniline doped thin films the two polymers PVC (1.25g) and PS (0.25g) were taken in the ratio 5:1 by weight. 1.25 g of PVC in 15 ml tetrahydrofuran (THF) and 0.5g of PS in 10 ml of THF dissolved seperately and subsequently mixed together.

Polyaniline was taken in 25 wt % and was dissolved in 5 ml of THE to produce Polyaniline solution . After allowing them to dissolve completely. the three solutions were mixed together The solution was heated at 60° c for two hours to allow polymers to dissolve completely to yield a clear solution . A glass plate thoroughly cleaned with hot water and then with acetone was used as a substrate, To achieve perfect levelling and uniformity in the thickness of the film, a pool of mercury was used in a plastic tray in which the glass plate was freely suspended .The solution was poured on the glass plate and allowed to spread uniformly in all directions on the substrate. The whole assembly was placed in a dust free chamber maintained at a constant temperature (40°C). In this way, the film was prepared by isothermal evaporation technique [15.16]. The film was subjected to 12 hours heating at constant temperature of 50°C and for another 12 hours at room temperature to remove traces of solvent .Finally, the film was removed from the glass plate, it was cut into small pieces of suitable size which were washed with ethyl alcohol to remove the surface impurities Thickness measurement For measuring the thickness, micrometer screw guage [16] with least count 0.001cm (10 μ m) was used. But for greater accuracy and resolution, a compound microscope in conjunction with an acculometer which gives least count 1.3 μ m and 3.3 μ m, at the magnification of 1:10 and 1 100 respectively was used. A small section of the sample was taken mounted vertically to get a clear section of view of the thickness. The film used for the present study was of the thickness 70 μ m Electrode coating The electrode coating on the film of measured thickness was done by quick drying and highly conducting silver paste [16] supplied by Eltecks Corporation, Bangalore. A mask of a circular aperture of 25 cm diameter was used while coating to ensure uniformity in size of coated silver electrode

Study of Infrared Spectra

The infrared spectra of all the samples of series I and II are studied in the region 4000 to 650 cm^{1} on Perkin Elmer (Japan) spectrophotometer. The KBr technique was used. All the spectra were taken at the department of metallurgical and materials Engineering, Visvesvaraya National Institute of Technology, Nagpur - 440011 (India). Typical IR spectra of series I . (samples are J1, J2, J3, J4 and J5) and series II (samples are JPI, JP2. JP3, JP4 and JP5)are shown in fig 3.3.1 and 3.3.2 respectively

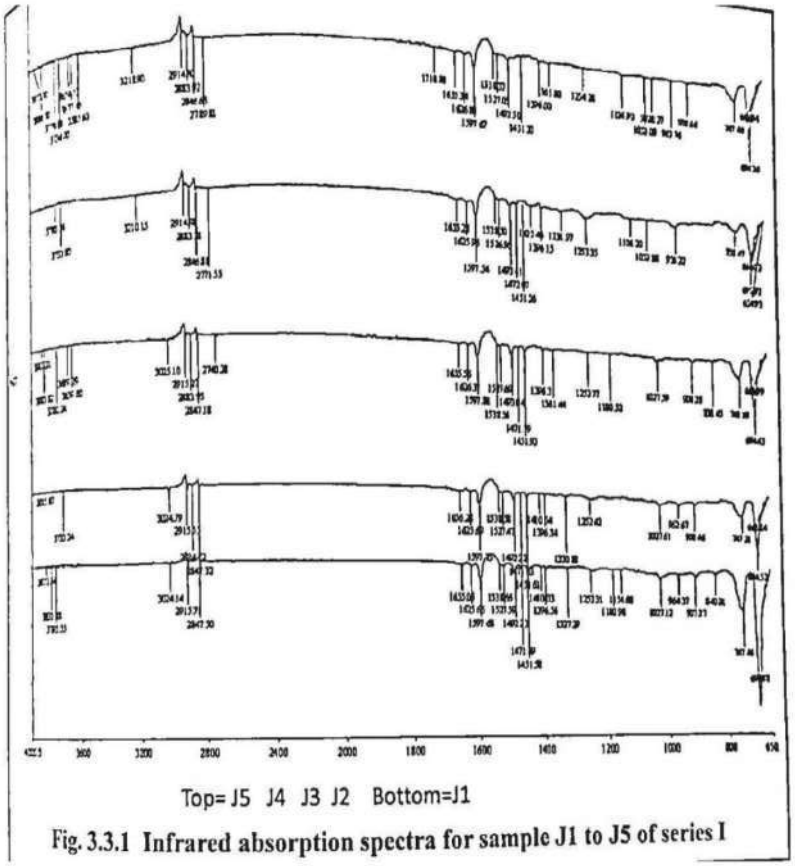

Fig. 3.3.1 Infrared absorption spectra for sample J1 to J5 of series I

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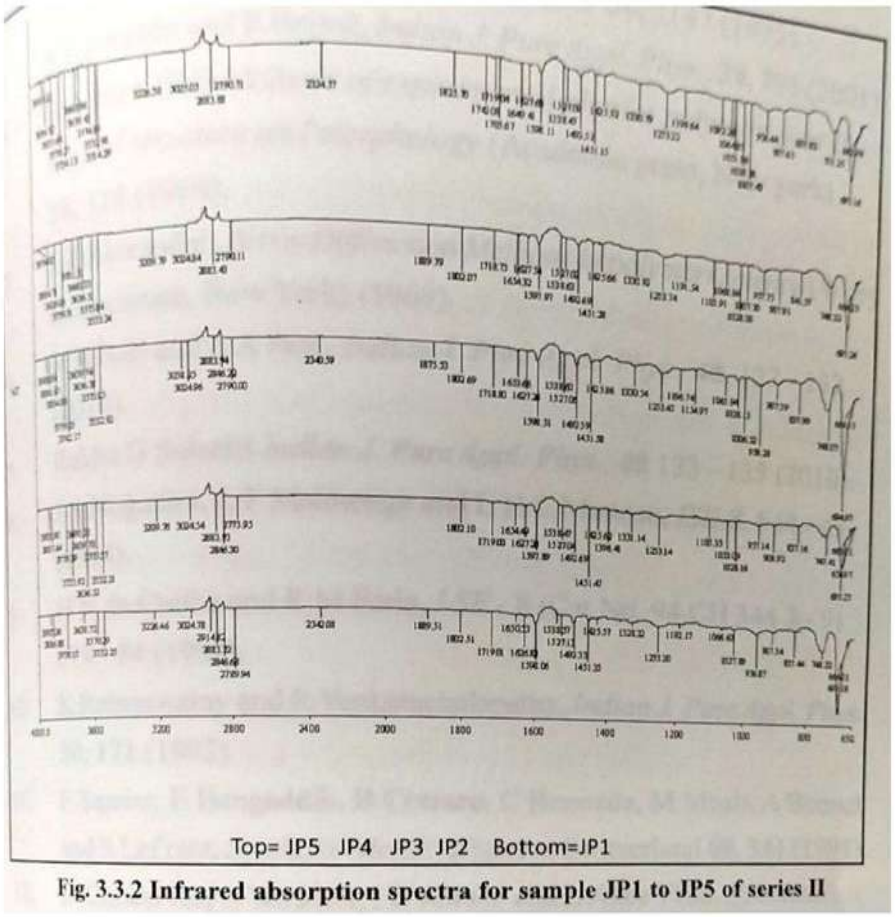

Fig. 3.3.2 **Infrared absorption spectra for sample JP1 to JP5 of series II**

Result and Discussion

A weak absorption band appeared for all the samples in the frequency 3024. 14 to 3025.13 cm^{-1} and attributed to C-H stretching due to aromatic ring (benzene ring) A strong absorption band appeared in all the samples range except JS (medium absorption band) in the frequency range 2914.76 to 2915.70 cm^{-1} which indicates the presence of C-H stretching of monosubstituted alkane. The medium absorption band appeared for all the samples in the frequency range 1625.57 to 1626.29 cm^{-1} which can be attributed to C-C stretching alkene nonconjugated.The strong absorption band appeared in all the samples in the frequency range 1597.57 to 1597.83 cm^{-1} which indicates the presence of C=C in aromatic (benzene ring).The strong absorption band appeared for all the samples in the frequency range 1492.22 to 1493.20 cm^{-1} which attributed to C-H bonding in methylene group.A medium absorption band appeared for all the samples except J5 (Weak absorption band) in the frequency range 907.29 to 908.81 which attributed to Ar - H bending.These strong absorption band observed at 747.23 to 750.42 cm^{-1} and 93.80 to 695.97 cm^{-1} in all the samples which is attributed to C-H out c ane bending and C-Cl stretching.

Similarly in the IR spectrum of PVC+PS +PANI (Samples JP1,JP2,JP3,JP4 and JP5), All the samples show a weak absorption band in the frequency range 3514.29 to 3533.24 cm^{-1} which indicates the presence of N-H amines.A weak absorption band for all samples in the frequency range 3024.79 to 3025.07 cm^{-1} which is attributed to C-H stretching due to aromatic ring.

There is medium absorption band for all samples in the frequency range 2883.32 to 2884.04 cm^{-1} and 1626.78 to 1627.52 cm^{-1} which is attributed to C-H stretching of monosubstituted alkane and C- C stretching alkene nonconjugated.The strong absorption band in the region 1597.93 to 1598.15 and 1492.31 to 1492.68 cm^{-1} for all samples are assigned as = C aromatic stretching and C-H bonding in methylene group. The presence of weak absorption band at around 1053.09 to 1068.86 cm^{-1} show the presence of C-N vibrations.There is medium absorption band for all samples in the frequency range 907.63 to 909.01 cm^{-1} which is due to Ar-H bending.The strong absorption band for all samples in the frequency 751-26 and 694.96 to 695.26 cm^{-1} which is due to C-H out of plane bending and C-Cl stretching.

Conclusions

The values of frequencies observed in the IR spectrum agree well standard IR spectrum frequencies. The orientation of NH, group in aniline makes ortho and para positions more susceptible towards electrophilic attack and as a result of this polymerization of aniline monomers into polyaniline molecule is occuring at these (ortho and para) positions. The polymer thus obtained still has possibility to expose its reactive sites towards suitable reactants under the influence of -NH-/- NH = groups . It was therefore thought that it is interesting to use polyaniline as PVC-PS blend to study the conductivity of the mixture (blend) The electron rich ortho and para positions of polyaniline aromatic nucleus also shows susceptibility towards the attack of electropositive sites of PVC-PS blend. The overall influence of -NH-/- NH= group on geometry of PVC-PS blend and the interaction of positive centres with ortho and para positions of aromatic nucleus enchances the conductive property to considerable extent, so also a protonic exchange between –NH-/-NH= groups of polyaniline helps to increase the conductance in PVC –PS blend

Acknowledgement

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Comparative Study of Blood Glucose Measurement Using Non- Invasive Method

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Abstract –

The past three decades has attracted tremendous attention in the diagnosis and monitoring of diabetes by non-invasive methods. The main objective of this paper is to compare measurement of blood glucose concentration using invasive and non-invasive method. Measurement of blood glucose levels was done using an existing invasive in the pathology laboratory and non-invasive tool that have been develop in this research. Non-invasive method based on NIR spectroscopy is used as it can be easy and safe to measure blood glucose concentration. In this study 50 patients glucose measurement test readings are recorded using both methods and has been compared. The result found is in the standard range.

Keywords: Diabetes mellitus, Invasive, Non-invasive, Optical Spectroscopy.

1. Introduction

In the 21st century diabetes is one of the fastest growing global health emergencies. It is estimated that 537 million people have diabetes in 2021[1]. Diabetes Mellitus is a condition in the human body wherein body does not produce enough insulin required to maintain normal circulating blood glucose. Insulin is a hormone that enables glucose to enter the body's cells to be used for energy [2]. Regular monitoring of blood glucose is very important as diabetes can lead to very serious and severe complications including heart failure, blindness, gangrene and amputation. Blood glucose measuring in day to day life is becoming a need of society. Regular monitoring of blood glucose is important to avoid complications of diabetes. In recent medical practice, glucose in blood is measured using an invasive technique which involves pricking of finger for blood sample. Non-invasive method is a pain free technology which helps patient's regular blood glucose monitoring [3,4,5].

There are two main types of diabetes, type 1 and type 2. The implications of your blood glucose results will depend on the type of blood glucose test used. For a fasting blood glucose test, a normal blood glucose level is between 70 and 100 mg/dL. For a random blood glucose test, a normal level is usually around or below 125 mg/dL. Mostly the exact level will depend on when you last ate [6].

II. Methods for glucose measurement

1) Invasive Method

Invasive method is used in recent medical practice to measure the concentration of glucose in blood. Invasive technique involves finger puncturing for the blood sample. This simple test involves giving a small sample of blood. In pathology laboratories, before drawing blood the healthcare provider cleans the area with an antiseptic to kill any germs and tie an elastic band around upper arm of patient, causing veins to swell with blood. Once a vein is found, they insert a sterile needle into it and then blood drawn into a tube attached to the needle. When drawing blood have been finished, the healthcare provider removes the needle and places a bandage over the puncture site and pressure will be applied to the puncture site for a few minutes to prevent bruising. The sample of blood is then passed through the standard chemical tests to measure glucose concentration.

In generic few ml of blood required where as recently patient can measure blood glucose at home using invasive glucometer, less than a drop of blood is taken out. The sample of blood will be placed on the strip and is inserted into the blood glucose meter. Inside a glucometer, a series of chemical reactions will take place and result is display on the screen.

Being a diabetic, it is necessary to check your blood glucose level regularly but regular use of an invasive method has many drawbacks such as,

1) For diabetics, measuring blood glucose level is an everyday thing so it is very difficult to incorporate pain into routine.
2) Both Laboratory and glucometer tests are costly. While using glucometer, one strip is used at a time and need to be replaced once finished.
3) Due to low immunity, diabetic people are more prone to infection. Invasive method has more risk of infection.
4) Non-compliance can be dangerous as it can increase the complications of diabetes. [7,8]

2) Non-Invasive Method

The advent of a pain free non-invasive technology would improve the patient's compliance for regular blood glucose monitoring. Subsequently the diabetic patient's life will improve considerably [9]. It prevents both chronic and acute complications, as this blood glucose measurement method is without drawing blood, puncturing the skin, causing pain or trauma. This technique is applied to overcome the pain, scare procedure, infections.

In non-invasive blood glucose monitoring the most commonly approaches are by using optical detection or optical scanning methods. i.e., Polarimetry, Raman Spectroscopy, Photo Acoustic Spectroscopy, Mid-Infrared (MIR), Spectroscopy using an Attenuated Total Reflection (ATR) Prism, and Near- Infrared (NIR) spectroscopy. The NIR spectroscopy is one of the most promising optical methods. NIR spectroscopy is very useful in Non- Invasive blood glucose monitoring [10].

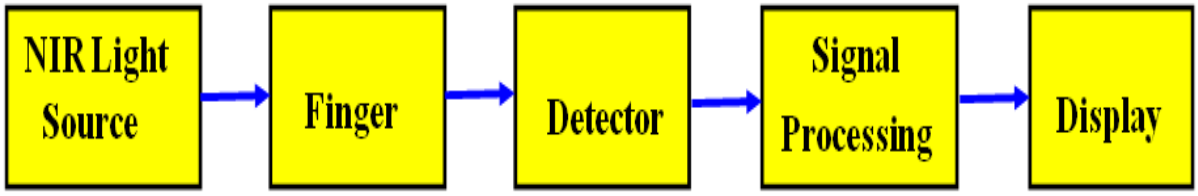

Figure-1

III. Comparative blood glucose measurement

Glucose concentration is measured non-invasively with the help of developed system and invasively with the help of pathology laboratories. Following figures are the result mapping chart of different age group, which shows the glucose concentration measured by the designed system and at the same time, for the same person glucose concentration measured in pathology laboratories. Good correlation is found between the blood glucose concentration value measured by the both methods.

To calculate error in measurement of invasive and non-invasive method the formula used is,

$$\% \text{ Error} = \frac{IV - NIV}{IV} \times 100$$

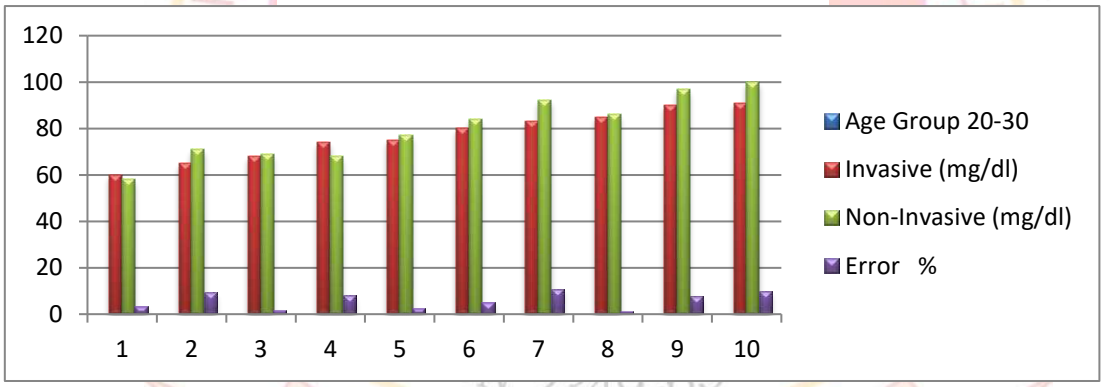

Figure-2: Blood glucose measurement of ten persons of age group 20-30

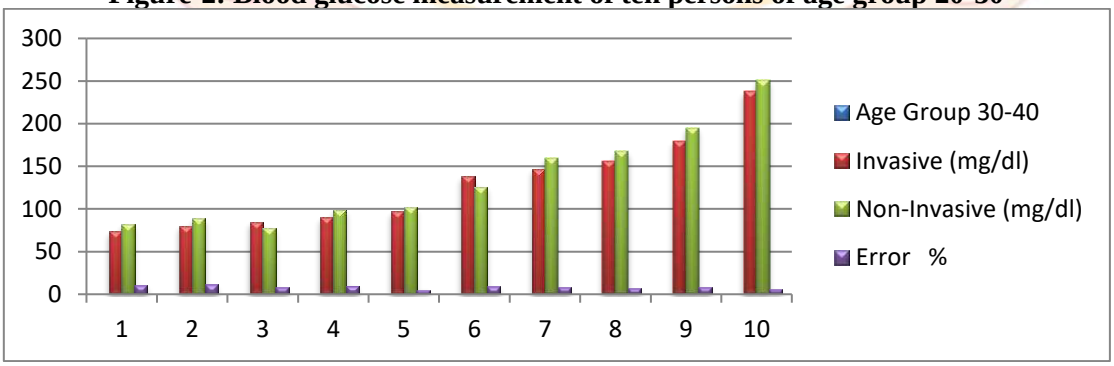

Figure-3: Blood glucose measurement of ten persons of age group 30-40

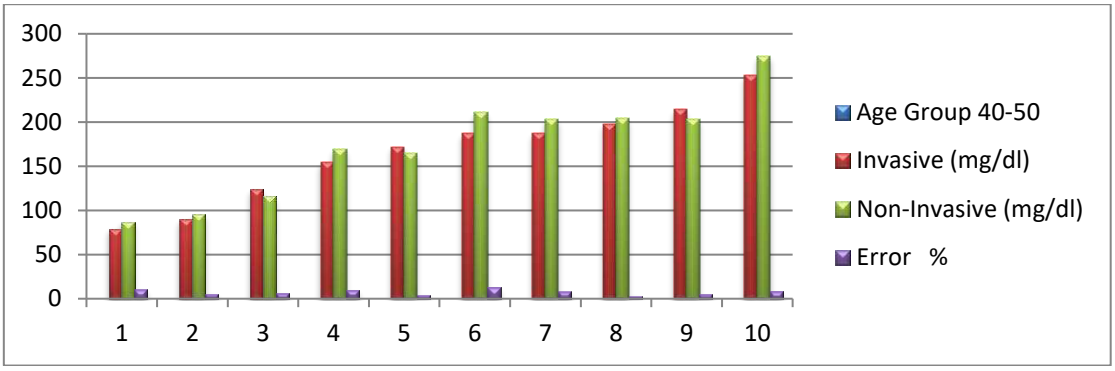

Figure-4: Blood glucose measurement of ten persons of age group 40-50

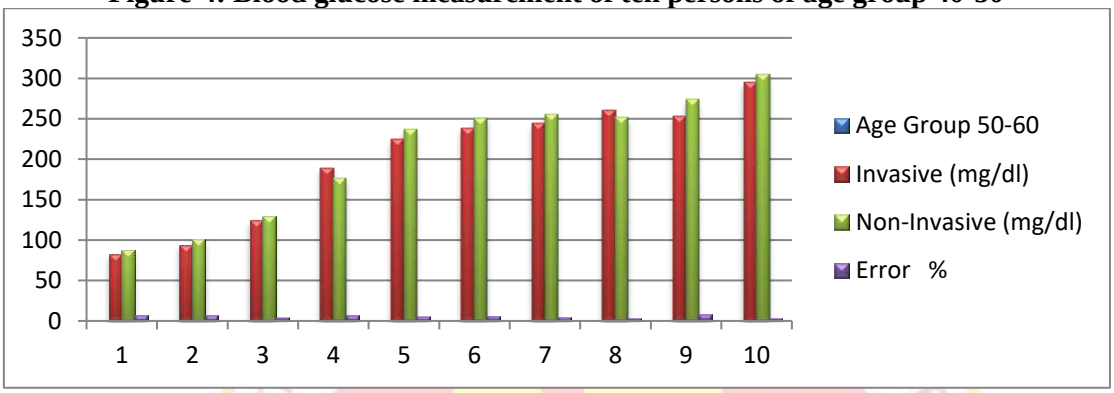

Figure-5: Blood glucose measurement of ten persons of age group 50-60

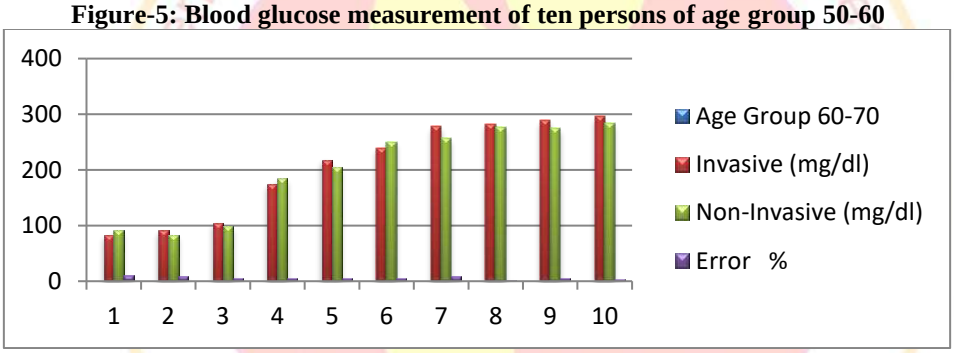

Figure-6: Blood glucose measurement of ten persons of age group 60-70

III. Result and Discussion

Regular monitoring of blood glucose level is important to avoid the long-term and short-term effects of diabetes. Data analysis was done by measuring the percentage error of invasive and non-invasive blood glucose measurement results. The result shows that the lowest percentage error measurement is 1.17% and the highest is 12.83%. In this research, lowest error was obtained in blood glucose measurement of 8th person from the age group of 20-30 and highest error was obtained in blood glucose measurement of 6th person from the age group of 40-50. The result obtained shows the feasibility of using NIR based non-invasive blood glucose measurement technique.

IV. Conclusion

Non-Invasive blood glucose monitoring system needs to improve for continuous monitoring in healthcare centres and homes hence, diabetic patient will monitor their blood glucose regularly. The performance of the system can be increased by developing suitable signal conditioning circuit to minimize error.

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Study Sem and Ftir Analysis of PEO: PVP: Naclbased Polymer Electrolyte

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Abstract

The sodium ion conducting polymer electrolyte complexes with PEO and PVP were prepared by solution caste technique with different compositions of PEO, PVP with NaClrespectively. Theoretical aspects of characterization technique such as Scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR) analysis were used to characterize these electrolyte.

SEM result shows the crystalline behavior of the polymer electrolyte. In FTIR spectra it is observed that, the intensity of the aliphatic C-H stretching vibrational band observed around 2900 cm^{-1} in pure PEO, PVP which is found to be decreased with increased in concentration of salt in the polymer. The width of the C-O stretching band observed around 1100 cm^{-1}in pure PEO,PVP which is also found to be decreased with increased in concentration of salt.

Keywords: Polymer electrolyte, PEO, PVP, NaCl.

Introduction

The polymer electrolyte (Solutions) serve as electronic insulators between the anode and cathode but it must be a good ionic conductor. Polyethylene oxide (PEO) is used as the polymer matrix because it is chemically inert, able to dissolve in number of inorganic salts and it provides moderate ionic conductivity. Polymer electrolytes based on PEO complexed with $NaClO_3$, $AgNO_3$ and $NaYF_4$ etc. have been reported [1]-[6]. Also the polymer electrolytes based on PVP complexed with $NaClO_3$ have been prepared [7]-[8]. The polymer electrolyte based on PEO, PVP complexed with $NaClO_3$ were prepared [9].Keeping this view in mind, authors prepared polymer electrolyte based on PEO, PVP complexed with NaCland study their SEM and FTIR analysis.

Preparation of polymer electrolyte

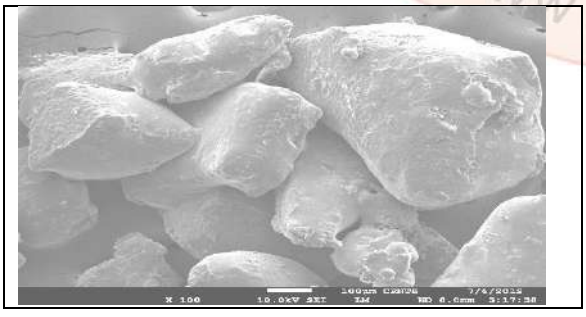
The polymers PEO and PVP were taken separately at different ratio with NaClwt% as (40:50:10) (35:50:15), (30:50:20), (25:50:25), (20:50:30) and (15:50:35). Each mixture dissolved in methanol for making polymer-salt mixture into solution. To obtain the perfect solution of this mixture, the solution was stirred well for 24 hours and powered into a polypropylene dishes. The solution was slowly evaporated at room temperature. Thus, thin film of polymer electrolyte was prepared by solution cast technique. Further these films were crushed into powder form. This powder is used for SEM and FTIR analysis.

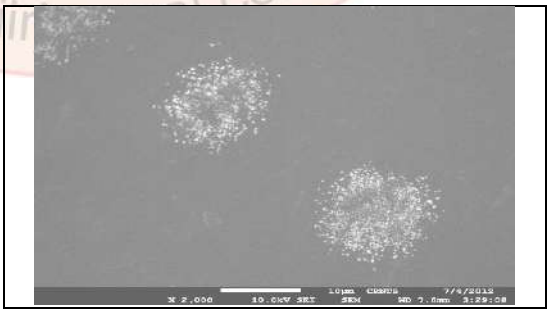
Result and discussion

4.1 Scanning electron microscopy (SEM)

The surface morphology of the composite films of 25wt% of NaCl was analyzed by SEM and the pictures are shown in Fig.1.The SEM pictures show crystalline behavior. The distorted crystals of NaCl are seen. Because of random size of crystals voids are created.

Energy dispersive X-ray analysis was performed for different wt% of NaCland pictures are shown in Fig.2 Energy dispersive spectroscopy (EDS) allows to identify particular elements and their relative proportions. From EDAX measurements the characteristics peaks corresponding to NaCl , PEO and PVP are identified which shows the existence of these in composite films.





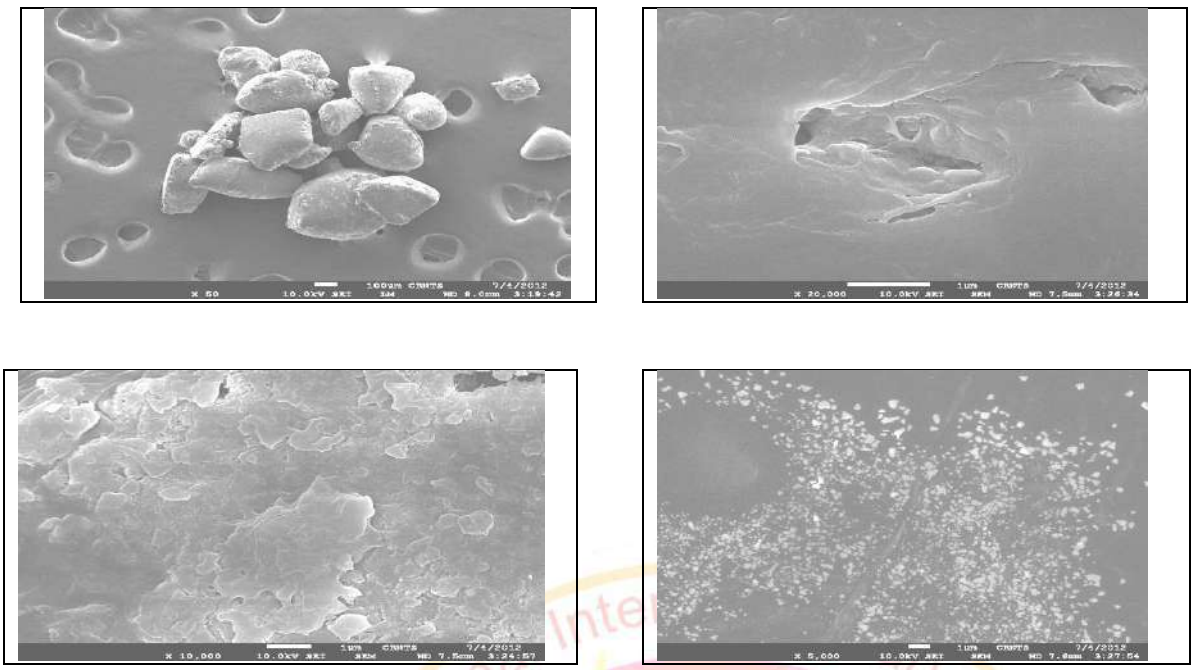


Fig.1 : SEM pictures of 25 wt% of NaCl at different magnification

Element	Weight%	Atomic%
C K	61.09	67.91
N K	9.48	9.03
O K	25.30	21.11
Na K	1.76	1.02
Si K	0.33	0.16
Cl K	2.05	0.77

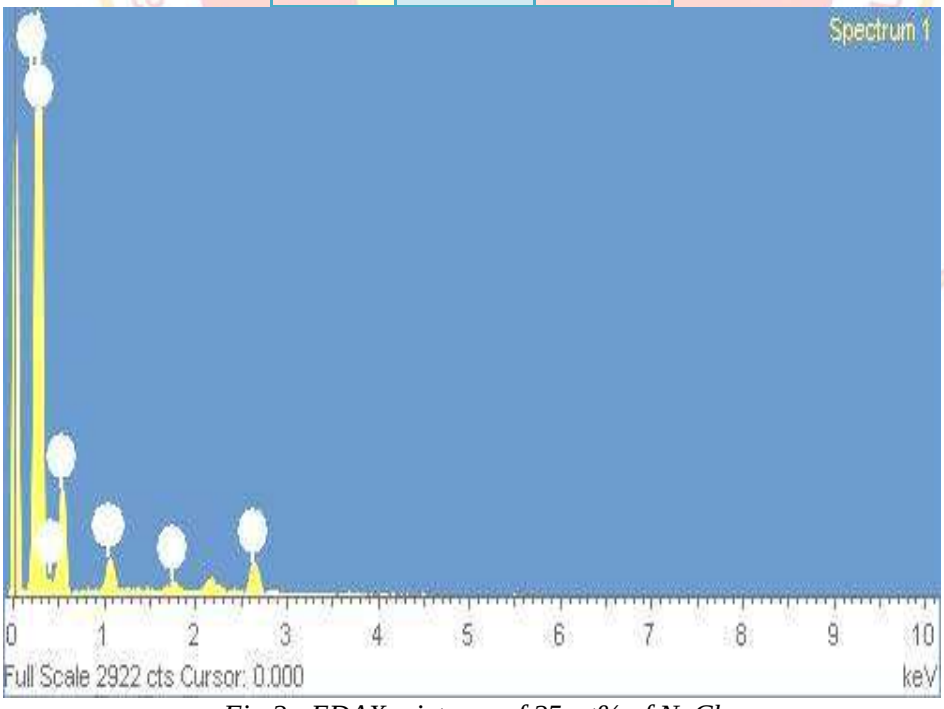


Fig.2 : EDAX pictures of 25 wt% of NaCl

4.3 Fourier transform infrared spectroscopy (FTIR) analysis

Sr. No	Composition Wt % NaCl	Peak Position cm^{-1}									
1	20	680	840	1100	1310	1500	1700	1880	2400	2900	3900
2	25	680	840	1100	1310	1500	1700	1880	2400	2900	3900
3	30	680	840	1100	1310	1500	1700	1880	2400	2900	3900

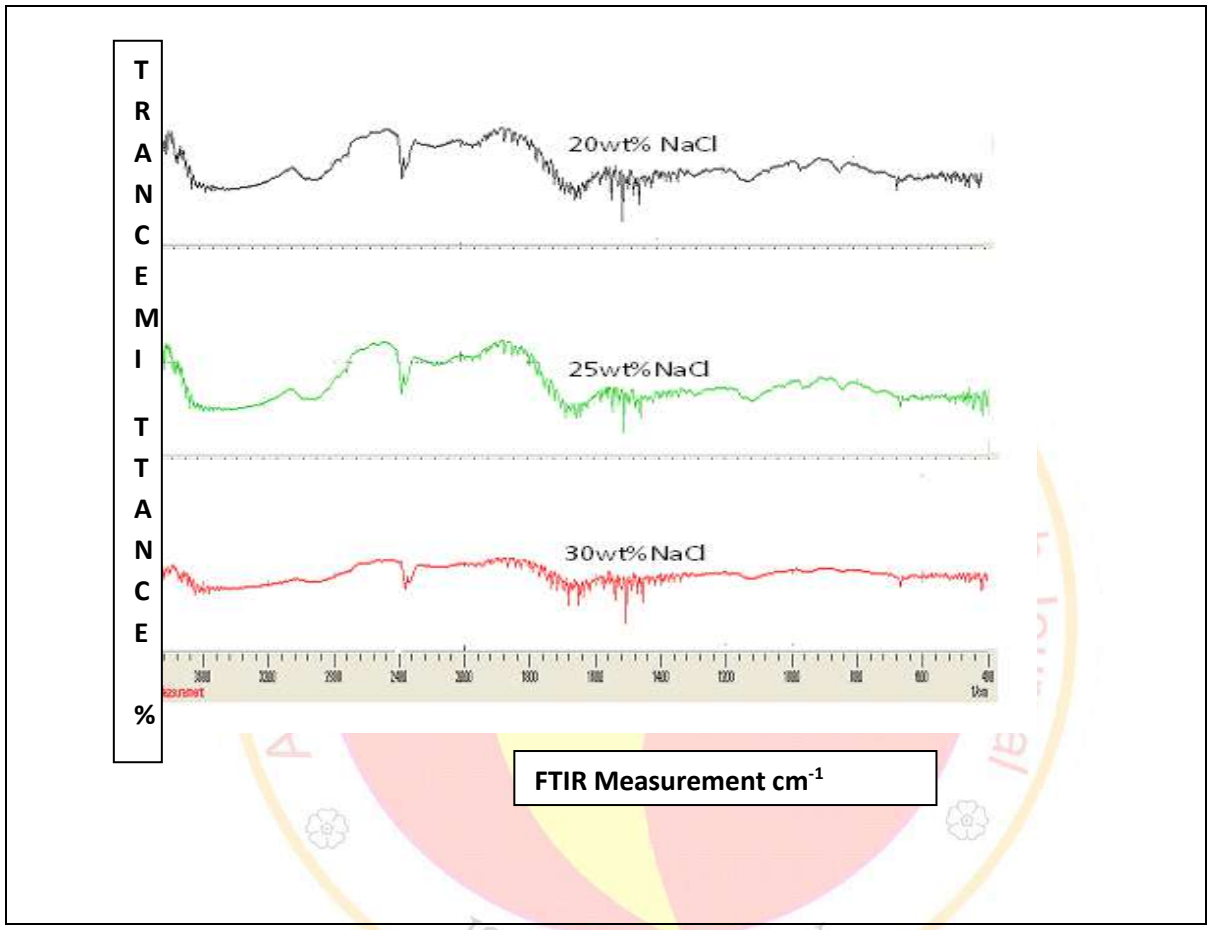


Fig.3 FTIR spectra of 20,25 and 30 wt% NaCl

The FTIR spectra of 20,25 and 30 wt% NaCl were recorded in the range 4000- 400 cm^{-1} and are shown in fig.3.

In the IR spectra of pure PEO and PVP strong broad absorption band is observed around 2900 cm^{-1} corresponds to the symmetric and asymmetric C-H stretching mode of CH_2 group. The width of the band decreased with increased in concentration of NaCl salt in the polymer. Also the band is observed around1100 cm^{-1}in IR spectra of pure PEO and PVP corresponds to the C-O stretching . The width of this band is decreased with increased in concentration of NaClsalt[10,11].Several new peaks are around 3900,2400,1880,1700,1500,1310,840 and 680 cm^{-1} have been observed in PEO:PVP complexed with NaClsalt. The appearance of the new peaks along with the changes in existing peaks (and/or their disappearance) in the IR spectra directly indicate thecomplexation of NaClsalt with PEO:PVP.

Conclusion

A sodium ion conducting polymer electrolyte based on PEO with PVP was prepared by solution cast technique. Polymers PEO and PVP were taken separately at three different ratios with NaClsalt. Each component was dissolved in methanol for making polymer salt mixture into solution. This solution was stirred well for 24 hrs. so that homogeneous solution was obtained and then polymer electrolyte was made.

PEO:PVP:NaCl polymer electrolyte was studied via structural , thermal characterization. Following conclusions were drawn.

In NaCl series distorted crystals of NaCl are seen. So, SEM result shows the crystalline behavior of the polymer electrolyte.

From FTIR spectra it is observed that, the intensity of the aliphatic C-H stretching vibrational band observed around 2900 cm^{-1} in pure PEO, PVP which is found to be decreased with increased in concentration of salt in the polymer. The width of the C-O stretching band observed around 1100 cm^{-1}inpure PEO,PVP which is also found to be decreased with increased in concentration of salt. The appearance of the new peaks along with the changes in existing peaks (and/or their disappearance) in the IR spectra directly indicate the complexation of salt with PEO:PVP.

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Development of Polyaniline -Metal oxide Nanocomposite: Brief Review

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Abstract:

Nanostructures and Nano composites of conducting polymers have developed as a new field dedicated to the manufacture of smart materials for use in forthcoming technologies. Preparation of Blends of inorganic nanoparticles in intrinsically conducting polymer matrix is believed to be an easy method to prepare and design Nano composites where delocalized -electrons can interact with inorganic nanoparticles, which have a unique combination of mechanical properties, the processability of conventional polymers and the electrical property of conducting polymers. The current review paper will emphasize PANI composites with thermosetting polymer matrices Many studies special attention is given on synthesis of Polyaniline Nano composite have been reported in the quest to develop new advanced materials with improved mechanical, electrical, optical and catalytic properties or to improve conduction mechanism in electronic devices. These materials have found their use in many electronic and nanoelctronic devices.

Keyword: (PANI)- Polyaniline Nano composites

Introduction:

In recent years, developments of inorganic–organic hybrid materials on nanometer scale have been receiving significant attention due to a wide range of potential applications and high absorption in the visible part of the spectrum and high mobility of the charge carriers. Polyaniline is the most attractive conductive polymer because of the presence of the reactive – NH– groups in polymer chain [1-2], and used in broad applications such as batteries, sensors , electronic devices , super capacitors and corrosion protection in organic coatings due to its physical and chemical properties, good electrical conductivity (p-type), high environmental stability, low cost, light weight, flexibility, facile fabrication and possibility of both chemical and electrochemical syntheses . Electrical conductivity of polyaniline is a very important parameter and it could be modified by the addition of inorganic fillers . Additionally, electrical conductivity of polyaniline depends on dopant ions . Metals and semiconducting nanostructure materials are used as stabilizers or capping agents of these conducting polymers. In recent decades, several reports have been published on the synthesis of the PANI nanocomposites with the inorganic nano-scale such as TiO2, CdS, Silica , Ag, CeO2 , Fe3O4 , Zn and MnO2 [3-5].

Polyaniline (PANI) is a promising conducting polymer due to its easy synthesis, environmental stability and high electrical conductivity on doping with protonic acids [5-6]. The highly ordered structures such as crystalline or self-assembled structures of ideal conducting polymer with conjugated structure is expected to have Metal - like electrical conductivity .To induce an ordered structure, other materials acting as filler for the composite are required [7-12]. The preparation of PANI composites with various materials has received great attention because of their unique properties and applications in various electrical and electronic devices.

Literature Review:

Among the various conducting polymers, Polyaniline (PANI) has been investigated as a potential material for gas sensing applications, due to its controllable electrical conductivity, environmental stability and interesting redox properties associated with the chain nitrogen's. It is the unique type of conducting polymer in which the charge delocalization can, in principle, offer multiple active sites on its backbone for the adsorption and desorption of gas analyte [8]. However, PANI is not as sensitive as metal oxides towards gas species, and its poor solubility in organic solvents limits its applications, but it is suitable as a matrix for preparation of conducting polymer nanocomposites [9-10]. Therefore, there has been increasing interest of the researchers for the preparation of nanocomposites based on PANI for gas sensing applications. Hybridization of metal oxide and conducting polymer could improve the properties of pure metal oxides or conducting polymers based gas sensor and the new synthesized material shows the synergistic effect of these two materials

PANI-ZnO with different weight percentage of zinc oxide were successfully synthesized and tested for hydrogen gas sensing. It was concluded that PANI-ZnO showed the best response compared to other composition[12].

A Mehata et al [13] synthesized polyaniline/ZnO nanocomposites for ammonia gas sensing application. The lower intensity polaron absorption bands for polyaniline/ZnO nanocomposites in the UV-Vis spectra indicate that the conducting state of the polymer has been improved. Observed results clearly indicate that polyaniline/ZnO nanocomposite is a good candidate for ammonia sensing with better sensitivity.

M. Sawarkar et.al. [14] studied PANI, ZnO and CdO nanoparticles along with PANI/ZnO, PANI /CdO nanocomposites had been successfully synthesized by a simple, cost effective technique. ZnO and CdO nanoparticles were synthesised by sol gel method. XRD studies clearly showed the crystalline and hexagonal quartzite nature of the ZnO nanoparticles and PANI/ZnO nanocomposites of 32 nm and 48 nm, respectively. A change in the lattice parameters of ZnO in the PANI/ZnO nanocomposites was observed which also indicated the interaction between ZnO particles and PANI matrix. The SEM study of PANI/ZnO nanocomposites revealed uniform distribution of ZnO nanoparticles in PANI matrix. FTIR spectra revealed that the absorption peaks of PANI/ZnO nanocomposite were found to shift towards lower wave number as compared to those observed in pure PANI. The shifting of absorption bands were attributed to the interaction of ZnO nanoparticles with the PANI molecular chains.

Meng, F et. Al. [15] Polyaniline (PANI) and MnO2/PANI composites are simply fabricated by one-step interfacial polymerization. The morphologies and components of MnO2/PANI composites are modulated by changing the pH of the solution. Formation procedure and capacitive property of the products are investigated by XRD, FTIR, TEM, and electrochemical techniques. We demonstrate that MnO2 as an intermedia material plays a key role in the formation of sample structures. The MnO2/PANI composites exhibit good cycling stability as well as a high capacitance close to 207 F g−1. Samples fabricated with the facile one-step method are also expected to be adopted in other field such as catalysis, lithium ion battery, and biosensor.

Conclusion

The current review paper will emphasize PANI composites with thermosetting polymer matrices Many studies special attention is given on synthesis of Polyaniline Nano composite have been reported in the quest to develop new advanced materials with improved mechanical, electrical, optical and catalytic properties or to improve conduction mechanism in electronic devices. These materials have found their use in many electronic and nanoelctronic devices.

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DC Conductivity and Thermal Analysis of Polyaniline Cadmium Sulphide nanocomposite

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Introduction

In recent years, with the rapid development of nanotechnology and composite materials, polyanline (PANI) nanocomposites have attracted considerable interest. PANI is one of the most promising conducting polymers due to its high conductivity, easy preparation, good environmental stability and large variety of applications [1]. Unlike other conjugated polymers, PANI has a simple and reversible acid/ base doping/dedoping chemistry, enabling control over properties such as solubility, electrical conductivity and optical activity [2]. Polymer nanocomposites show quite different properties from the constituent materials due to interfacial interactions between nanostructured semiconductors and polymers.

CPs join the electronic and optical properties of semiconductors and metals with the alluring mechanical properties and handling preferences of polymers. CPs have numerous profitable properties in chemical, electrical, physical and optical angles, contrasted with ordinary polymers. These properties cover high conductance, iridescence, electrochromism and high thermal soundness. This has set off the improvement of novel CPs, for example, polyaniline (PANI), polypyrrole (PPY), polythiophene, polyphenylene, etc. [3-5] and their application in batteries [6-9].

Polyaniline (PANI) has gotten much consideration in view of its electronic, thermoelectric and optical properties and additionally its great ecological solidness and simplicity of synthesis. Polyaniline is likewise one of a kind among natural conducting polymers in that its electrical properties are controlled by the two its oxidation state and level of protonation. Thus, polyaniline is generally utilized for different applications, for example, battery-powered batteries [10,11], chemical transtiors , supercapicitors , electrochromic shows , actuators, sensors and hostile to corrision covering .

Among conducting polymers, polyaniline (PANI) is presumably the most generally examined because of its few interesting properties [12,13]. It simplicity of arrangement, light weight, ease, better electronic, optical properties, exceptionally stable in air and dissolvable in different solvents, and great processibility [14-16]. Then again it very well may be utilized in numerous applications, for example, electromagnetic obstruction (EMI) protecting, electro-impetuses, battery-powered battery, light-producing diodes (LEDs), solar cell, chemical sensor, biosensor, erosion gadgets and microwave ingestion [17,18].

Experimental

Materials

The Aniline monomer (AR grade) and Ammonium Persulphate (AR grade). Cadmium Nitrate (AR grade), Ammonium Sulphide (AR Grade)

Synthesis of Polyaniline Cds Nanocomposite

In the Present work polymer composite film of Polyaniline (PANI)-CdS was prepared for different weight percent of Cadmium Sulphide (CdS).

Synthesis steps of PANI/CdS nanocomposite are similar to the synthesis method of PANI. Different amount of CdS were dispersed into the APS solution and stirred for 1 h prior to the addition of aniline. Aniline (0.4 mol) stirred with 0.4M H_2SO_4 in 100 ml of distilled water were added drop-wised using burette into the APS-CdS solution and stirred vigorously to form homogeneous dispersion. For convenience, PANI Composites were prepared with different weight percentages of CdS [19]. Same synthesis conditions were maintained for all composites as that of pure PANI.

Result and Discussion

1) TG/DTA

Thermogravimetric Analysis or thermal gravimetric analysis is a sort of testing performed on tests that decides changes in weight in connection to a temperature program in a controlled atmosphere.Such analysis relies on a high degree of precision in three measurements: weight, temperature, and temperature change. TGA is commonly employed in research to determine characteristics of materials, degradation temperatures, absorbed moisture content of materials, the level of inorganic and organic components in materials,

decomposition points of explosives and solvent residues. The TGA/DTA of PANI-CdS nanocomposite TGA/DSC temperature is maintained up to 973K. and heating rate of the sample was 10°C/min.

Thermal properties of pure Polyaniline polymer and PANI doped with Cadmium Sulphide (CdS) were evaluated by TGA/DTA in the temperature range 0 °C to 500 °C at a heating rate of 10 °C /min (Figure 1).

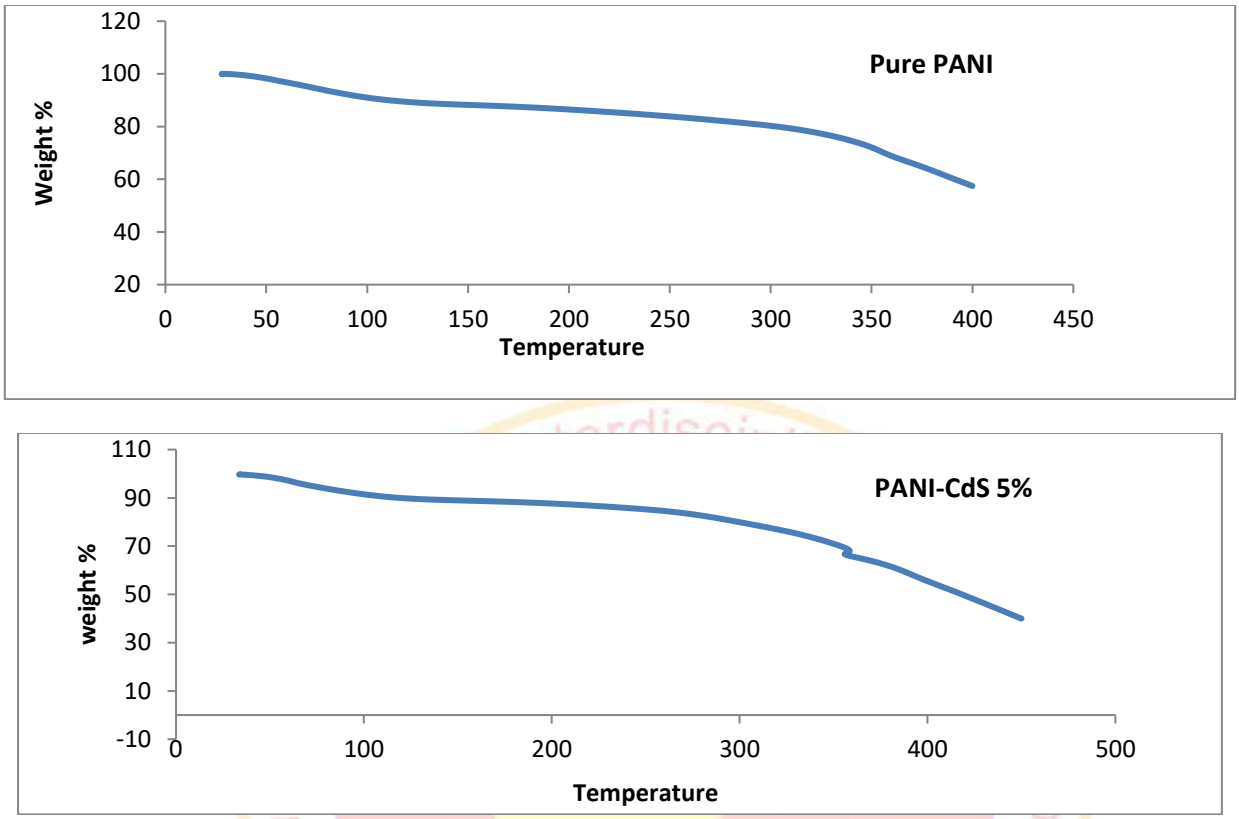
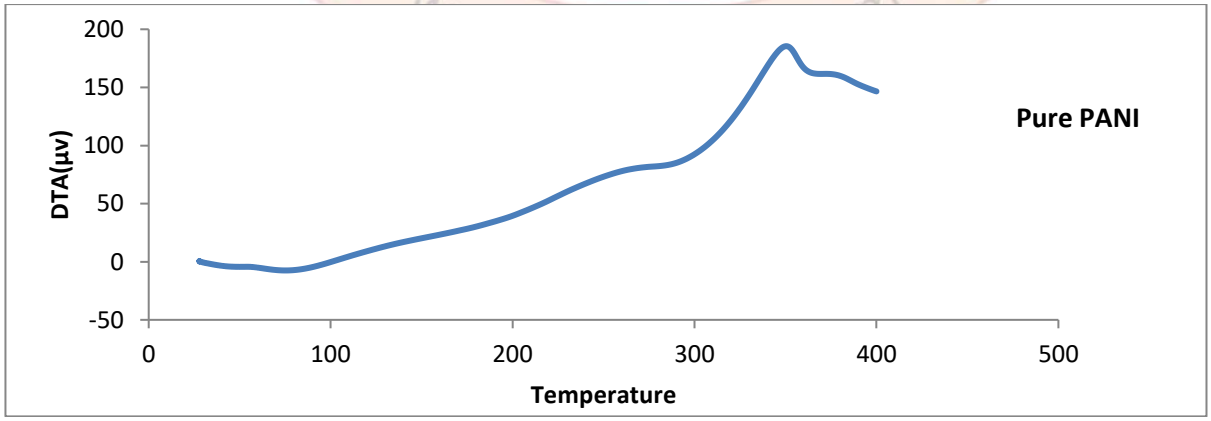


Fig. 1 TGA thermographs of pure PANI and PANI doped with 5 wt % of Cadmium Sulphide CdS

TGA thermograph of PANI-CdS nanocomposites shows two step degradation Figure 1 shows the two step degradation of PANI-CdS nanocomposite having 60-65% of its weight loss when it was heated to 500^{0}C. It indicates that 60-65 % of the sample consists of polymers and softeners. The residual about 35-40 % was considered to account for metallic compounds, added as sulphide and dopant. Residual was increases with increasing the wt. % of dopant. Addition of CdS weakens the structure of PANI as weight loss increases.

Figure 2 shows DTA curves of pure Polyaniline and PANI doped with CdS(10 %). In DTA curve, the endothermic peak appearing at ~ 70-80 ^{0}C is probably due to the melting point of PANI that identified as melting of crystalline phase of polymer. The sample PANI-CdS nanocomposite shows the strong and broad exothermic peak in the range 340 to 400 °C accompanied by rapid weight loss can be ascribed to the decomposition of PANI-CdS nanocomposite.



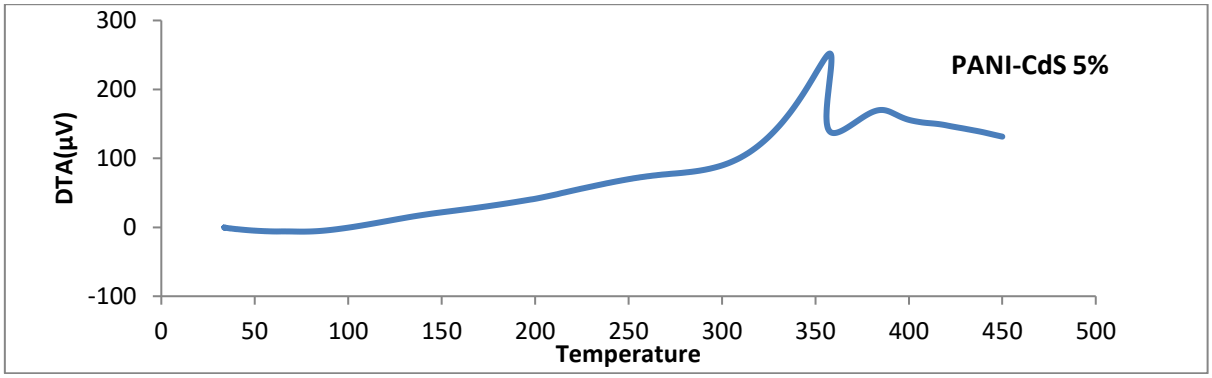


Fig. 2 DTA Curve of pure PANI and PANI doped with 5 % of Cadmium Sulphide CdS

ll) DC Conductivity

A suitable heating rate (2^0C/min.) was maintained with the help of dimmer stat. A digital temperature indicator connected to a thermocouple (resolution 1^0C) placed near the sample to measure the temperature of the sample. A constant voltage is applied to the sample and corresponding current (Pico-ammeter, Scientific Equipment Roorkee, resolution 1 pA) was measured at constant temperature, which gives resistance of the sample. Then the change in conductivity of the samples with temperature was estimated.

DC conductivity of the pure PANI polymer and doped with different wt. % of CdS was measured in the temperature range 308 to 328K by using Ohms law. The resistance of the samples was measured. It is observed that the value of resistance depends on temperature as well as on composition.

The variation of dc conductivity with different wt. % of CdS is shown in fig 3 As compared to pure Polyaniline the conductivity increases with CdS wt. % . Polyaniline doped with the 5 wt. % CdS shows the maximum value of dc conductivity.

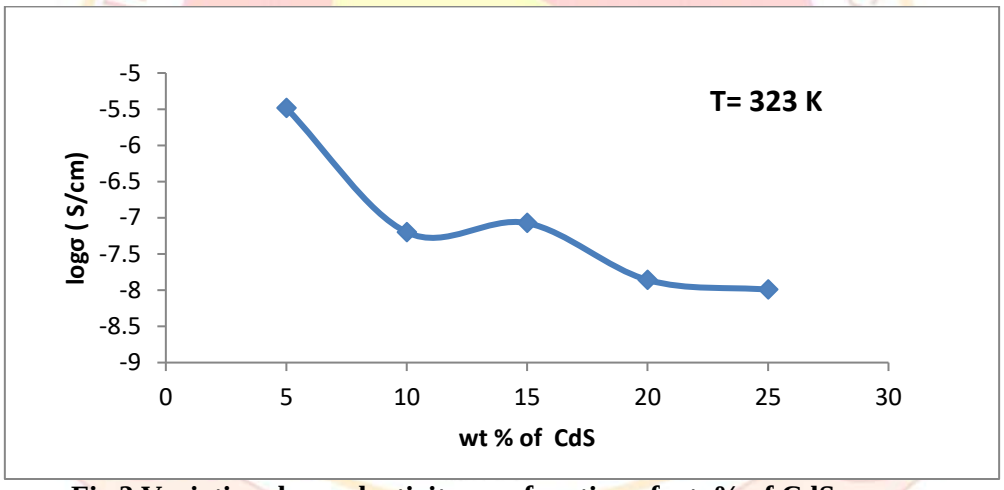


Fig 3 Variation dc conductivity as a function of wt. % of CdS

The variation of dc conductivity as a function of inverse temperature for Polyaniline polymer doped with the different wt. % CdS was estimated. The nature of plots is shown in Figure 4, over the temperature range 308 to 328 K. It can be observed that the dc conductivity for all the compositions of PANI doped with the different wt. % CdS increases with increasing temperature for the entire range.

It tends to be seen that the Arrhenius plots for every one of the examples show a comparative behavior. The dc conductivity esteems increments with the different wt. % CdS at various temperatures.

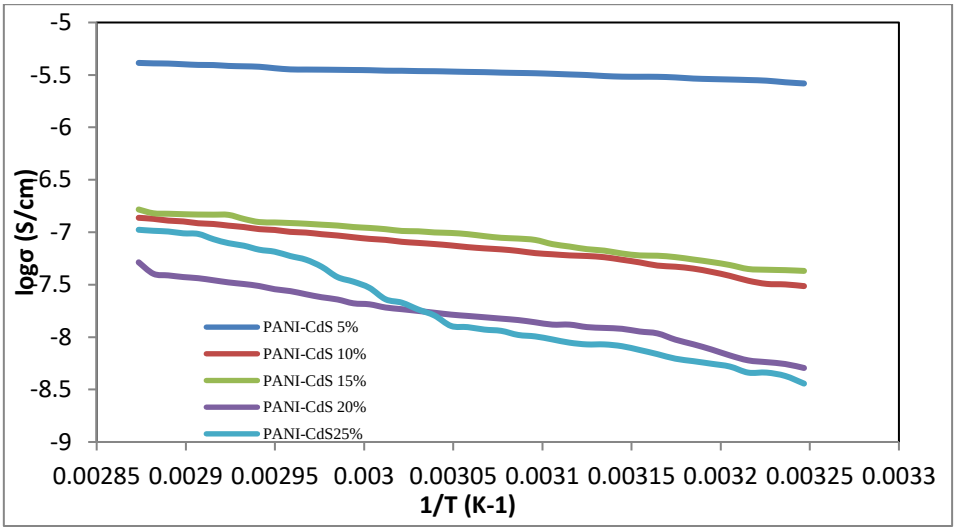


Fig 4 Arrhenius plots of the dc conductivity of PANI-CdS composite for different wt. % of CdS

As the temperature builds, versatility of the ions expands, which results the rise in conductivity . Uppermost curve belong to 5 wt % of CdS for which conductivity is maximum. The conductivity versus temperature curves of all synthesized samples shows the increase in conductivity. The rate of increase of conductivity is linear for the composite; which may be due to the segmental motion of the ions in the polymer [20].

The natures of the curves are consistent with Arrhenius type charge conduction in polymer composites and the conductivity relationship follows the equation,

$$\sigma = \sigma_0 \, ex \, (-E_a/kT) \qquad (1)$$

Where E_a is the activation energy, σ_0, is the pre-exponential factor and k is the Boltzmann's constant. The slope of each straight line gives the activation energy which lies between 0.039 and 0.36 eV. From the figure 5, DC parameters are calculated and noted in table 5.1.

Sr.No.	CdS wt %	Activation Energy E_a (eV)	Conductivity σ (S/cm)
1	5	0.039	3.2833×10^{-6}
2	10	0.146	6.3232×10^{-8}
3	15	0.135	8.4481×10^{-8}
4	20	0.201	1.3852×10^{-8}
5	25	0.364	1.0162×10^{-8}

Table 1 : DC parameter for the PANI-CdS Nanocomposite

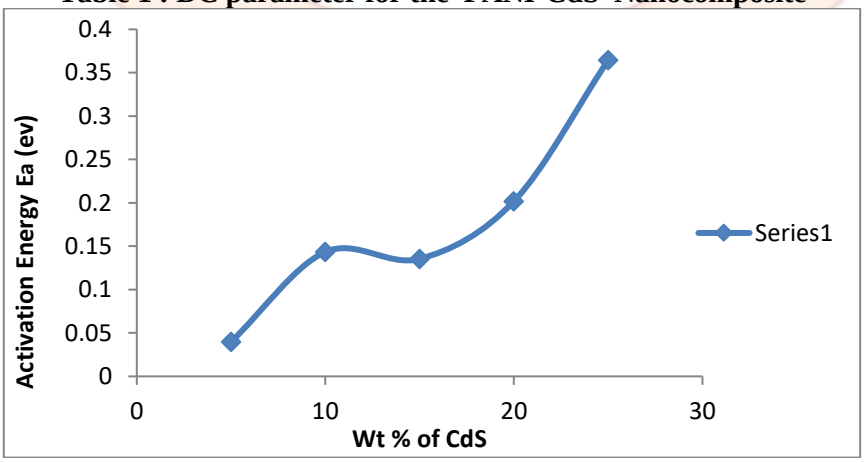


Fig. 5 Variation Activation Energy as a function of wt. % of CdS

Plot of activation energy with different wt. % of CdS is illustrated in figure 5.8, which shows that activation energy Ea is found to be maximum for the 25 wt % of CdS. The value of activation energy increases with wt. % CdS.

Conclusion

In this work PANI-CdS nanocomposites were successfully prepared by *insitu* polymerization method at room temperature. As compared to pure Polyaniline the conductivity increases with CdS wt. % . Polyaniline doped with the 5 wt. % CdS shows the maximum value of dc conductivity and 25 wt % CdS shows maximum activation energy. TGA shows the two step degradation of PANI-CdS nanocomposite having 60-65% of its weight loss when it was heated to 500^0C. In DTA curve, the endothermic peak appearing at ~ 70-80 ^{0}C is probably due to the melting point of PANI that identified as melting of crystalline phase of polymer.

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Density, Viscosity and Ultrasonic Velocity Studies of Aqueous Solution of D-(-) - Tartaric Acid at Different Temperature

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Abstract

At concentration range (0.01 to 0.1) mol/kg and temperature range T = (298.15 and 303.15) K, densities (ρ) , ultrasonic speeds (u) and viscosities (η) of aqueous solutions of D-(-) - Tartaric acid were measured. From these experimentally measured values the parameters such as Adiabatic Compressibility (β_a), Free Length (L_f), Free Volume (V_f), M_{eff}, Internal Pressure (P_i), Acoustic Impedance (Z), Gibbs free energy (ΔG), Molar Cohesive Energy (M_{CE}), Relaxation Time (τ), Molar Volume (V_m) and Rao Constant (R) have been evaluated. The results have been interpreted in terms of solute-solvent and solute-solute interactions in these systems. It has been observed that there exist strong solute-solvent interactions in these systems and these interactions increases with concentration of solute in aqueous medium.

Keywords: *Density, Ultrasonic speed, Viscosity, molecular interaction.*

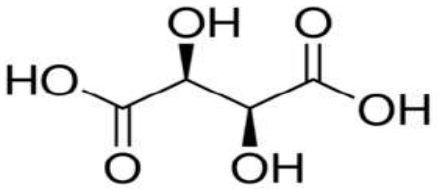
Introduction

Tartaric acid is a white, crystalline organic acid that occurs naturally in many fruits, most notably in grapes, but also in bananas, tamarinds, and citrus. Tartaric acid has three stereoisomeric forms dextrorotatory tartaric acid, levorotatory tartaric acid and racemic tartaric acid. Tartaric acid is an alpha-hydroxy carboxylic acid, and is diprotic organic acid [1]. All the forms of tartaric acid are readily soluble in water. It can form salts with bases, and some of the important salts of tartaric acid are cream of tartar (potassium hydrogen tartrate) and Rochelle salt (potassium sodium tartrate).Tartaric acid plays an important role in the preparation of many food additives. Tartaric acid is used in pharmaceutical products, skin care, beverages, agriculture products and textiles. The studies on Tartaric acid solute solvent interactions are most important for the field of biosynthesis, medicine, immunology and pharmacology. The study of physiochemical behaviour and molecular interaction in liquid mixtures is of considerable importance and number of techniques has been used to investigate the interaction between the components of binary liquid mixtures. In recent years, the measurement of ultrasonic velocity has been extensively applied in understanding the nature of molecular systems, physiochemical behavior and molecular interactions in liquid mixture.

In the present article, we report the densities, ρ, ultrasonic speeds u and viscosities η of solutions of Tartaric acid in water at different temperatures and atmospheric pressure have been computed using standard relations given by literature [2-4]. Various physicochemical parameters, viz., Adiabatic Compressibility (β_a), Free Length (L_f), Free Volume (Vf), M_{eff}, Internal Pressure (P_i), Acoustic Impedance (Z), Gibbs free energy (ΔG), Molar Cohesive Energy (M_{CE}),Relaxation Time (τ),Molar Volume (Vm) and Rao Constant (R) have been calculated using the experimental data.

Material and Methods

Tartaric acid (AR 99%) having molecular weight of 182.65 was obtained from Sigma Aldrich chemicals Ltd. The molecular structure of this compound is as follows



D-(-)-tartaric acid

The aqueous solutions of Tartaric acid of different concentrations were freshly prepared by using double distilled water. The required amount of solute was measured by using a digital weighing machine. The solutions were made on the basis of molality and stored in special airtight bottles to avoid contamination and evaporation. The densities measurements have been done by using specific gravity bottle (10ml). Ultrasonic velocities have been determined by using digital ultrasonic pulse echo velocity meter (VCT -70A). The viscosities of the solutions were measured by using Ostwald's type viscometer. The instrument has been calibrated with double distilled water at certain temperatures before taking measurements. The flow time has been measured with a digital stopwatch and average flow times were taken for each series of liquid solutions.

Mathematical Formulation

Apparent molal volume measurements (v_φ)

$$\emptyset_v = \frac{1000(\rho_0 - \rho)}{m\rho\rho_0} + \frac{M}{\rho} \quad (1)$$

Where, m= molality of the solute

ρ = density of solution

ρ_o= density of solvent

M= molar mass of the solute (tartaric acid)

Where f = frequency of the ultrasonic wave

Apparent molar compressibility (k_s, φ)

$$K_s, \varphi = \frac{1000(K_s\rho_0 - K_s^0\rho)}{m\rho\rho_0} + \frac{K_s M}{\rho} \quad (2)$$

Where, $k_s$and k_s^0= isentropic compressibility of the solution and solvent (water) respectively.

Isentropic Compressibility

$$K_s = \frac{1}{u^2}\rho \quad (3)$$

Acoustic Impedance (Z)

The specific acoustic impedance is given by

$$Z = U\,\rho_s \qquad \text{Kg } m^{-2}s^{-1} \quad (4)$$

ρ_s = Density of solution

U = ultrasonic velocity of solution

Relaxation Time (τ)

$$\tau = \frac{4}{3\beta\eta} \quad (5)$$

where η is the viscosity of solution

Classical absorption $(\alpha/f^2)_{cl}$

$$(\alpha/f^2)_{cl} = \frac{8\pi^2\eta}{3\rho U^3} \quad (6)$$

Where f = frequency of the ultrasonic wave

Free Length (L_f)

$$L_f = K\beta^{1/2} \quad (7)$$

K= temperature dependant constant

Result and Discussion

The experimental values of basic parameter of Ultrasonic velocity (u), Density) and Viscosity obtained are given in table 1 and by using these basic parameter the various acoustic parameter such as Acoustic Impedance (Z), Adiabatic compressibility (βa), Relaxation Time (T), Free Length (Lf), Free Volume (Vf),Meff (kg), Internal Pressure (Pi), MCE,Molar Volume (Vm), Rao Cont. Molar Sound Velo.etc are calculated in table2,3,4 and 5 the various acoustic parameter's calculated values are given.

Composition M(mol/kg)	298.15 K			303.15 K		
	Velocity U(m/s)	Density ρ (kg/m^3)	Viscosity η (N.s.m^3)	Velocity U(m/s)	Density ρ (kg/m^3)	Viscosity η (N.s.m^3)
0.01	1410.19	1035.1220	9.81E-04	1503.14	1020.2290	8.67E-04
0.02	1493.54	999.0480	9.58E-04	1503.75	1020.2290	8.62E-04
0.03	1494.14	1001.0520	9.60E-04	1503.76	1020.2290	8.43E-04
0.04	1494.14	1002.0540	9.45E-04	1504.35	1021.2520	8.48E-04
0.05	1494.73	1000.0500	9.37E-04	1504.96	1022.2760	8.24E-04
0.06	1495.33	1001.0520	9.76E-04	1504.96	1023.2990	8.38E-04
0.07	1495.33	1003.0560	9.83E-04	1505.56	1023.2990	8.73E-04
0.08	1495.93	1004.0580	9.63E-04	1505.56	1026.3690	8.55E-04
0.09	1496.53	1005.0600	9.42E-04	1506.17	1025.3460	8.17E-04
0.1	1497.53	1006.0620	9.48E-04	1506.17	1027.3920	8.53E-04

Experimental Values of density, viscosity and ultrasonic velocity of aqueous D- (-)-Tartaric Acid and other parameters

Table 1
Table 2.

	298.15 K			303.15 K		
Composition M	Adiabatic Compre. βa ($10^{-10}N^{-1}.m^2$)	Free LengthL$_f$ (10^{-11}m)	Free Volume V$_f$ ($10^{-8}m^3.mol^{-1}$)	Adiabatic Compre. βa	Free Length L$_f$ (10^{-11}m)	Free Volume V$_f$ ($10^{-8}m^3.mol^{-1}$)
0.01	4.858E-10	4.534E-11	1.5E-08	4.338E-10	4.324E-11	2E-08
0.02	4.487E-10	4.357E-11	1.7E-08	4.335E-10	4.322E-11	2.0E-08
0.03	4.475E-10	4.351E-11	1.7E-08	4.335E-10	4.322E-11	2.1E-08
0.04	4.470E-10	4.349E-11	1.7E-08	4.327E-10	4.318E-11	2.1E-08
0.05	4.476E-10	4.352E-11	1.8E-08	4.319E-10	4.314E-11	2.1E-08
0.06	4.468E-10	4.348E-11	1.6E-08	4.315E-10	4.312E-11	2.1E-08
0.07	4.459E-10	4.343E-11	1.6E-08	4.311E-10	4.310E-11	2E-08
0.08	4.451E-10	4.340E-11	1.7E-08	4.298E-10	4.304E-11	2E-08
0.09	4.443E-10	4.336E-11	1.8E-08	4.299E-10	4.304E-11	2.2E-08
0.1	4.432E-10	4.331E-11	1.7E-08	4.291E-10	4.300E-11	2.1E-08

	298.15 K			303.15 K		
Composition m	Meff (kg)	Internal Pressure Pi (10^9pas)	Acoustic Imped. Z (kg. m^{-2}.s^{-1})	Meff (kg)	Internal Pressure Pi (10^9pas)	Acoustic Imped. Z (kg. m^{-2}.s^{-1})
0.01	1.80E-02	3.004E+09	1.460E+06	1.80E-02	2.709E+09	1.534E+06
0.02	1.80E-02	2.817E+09	1.492E+06	1.80E-02	2.701E+09	1.534E+06
0.03	1.81E-02	2.805E+09	1.496E+06	1.81E-02	2.654E+09	1.534E+06
0.04	1.81E-02	2.785E+09	1.497E+06	1.81E-02	2.663E+09	1.536E+06
0.05	1.81E-02	2.769E+09	1.495E+06	1.81E-02	2.626E+09	1.538E+06
0.06	1.81E-02	2.827E+09	1.497E+06	1.81E-02	2.650E+09	1.540E+06
0.07	1.82E-02	2.823E+09	1.500E+06	1.82E-02	2.687E+09	1.541E+06
0.08	1.82E-02	2.796E+09	1.502E+06	1.82E-02	2.664E+09	1.545E+06
0.09	1.82E-02	2.766E+09	1.504E+06	1.82E-02	2.602E+09	1.544E+06
0.1	1.82E-02	2.776E+09	1.507E+06	1.82E-02	2.663E+09	1.547E+06

Table 3.
Table 4.

	298.15 K		303.15 K	
Composition m	Gibbs free energy ΔG (Jmol^{-1})	Molar Cohesive Energy MCE (kJ mol^{-1})	Gibbs free energy ΔG (Jmol^{-1})	Molar Cohesive Energy MCE (kJ mol^{-1})
0.01	4.616E-21	5.224E+04	3.748E-21	4.780E+04
0.02	4.238E-21	5.076E+04	3.724E-21	4.765E+04
0.03	4.235E-21	5.072E+04	3.642E-21	4.708E+04
0.04	4.174E-21	5.031E+04	3.657E-21	4.719E+04
0.05	4.147E-21	5.012E+04	3.545E-21	4.650E+04
0.06	4.290E-21	5.112E+04	3.603E-21	4.687E+04
0.07	4.309E-21	5.122E+04	3.750E-21	4.779E+04
0.08	4.227E-21	5.067E+04	3.663E-21	4.725E+04
0.09	4.139E-21	5.009E+04	3.497E-21	4.619E+04
0.1	4.154E-21	5.022E+04	3.648E-21	4.717E+04

Table 5.

	298.15 K			303.15 K		
Composition M	Relaxation Time T (10^{-13}sec)	Molar Volume Vm ($10^{-5}m^3.mol^{-1}$)	Rao Const. (Mol. Sound Velo.) R ($10^4m^5.N^{-2}$)	Relaxation Time T (10^{-13}sec)	Molar Volume Vm ($10^{-5}m^3.mol^{-1}$)	Rao Const. (Mol. Sound Velo.) R ($10^4m^5.N^{-2}$)
0.01	6.354E-13	1.739E-05	1.95E-04	5.015E-13	1.764E-05	2.02E-04
0.02	5.732E-13	1.802E-05	2.06E-04	4.982E-13	1.764E-05	2.02E-04
0.03	5.728E-13	1.808E-05	2.07E-04	4.872E-13	1.774E-05	2.03E-04
0.04	5.632E-13	1.806E-05	2.06E-04	4.892E-13	1.772E-05	2.03E-04
0.05	5.592E-13	1.810E-05	2.07E-04	4.745E-13	1.771E-05	2.03E-04
0.06	5.814E-13	1.808E-05	2.07E-04	4.821E-13	1.769E-05	2.03E-04
0.07	5.844E-13	1.814E-05	2.07E-04	5.018E-13	1.779E-05	2.04E-04
0.08	5.715E-13	1.813E-05	2.07E-04	4.900E-13	1.773E-05	2.03E-04
0.09	5.580E-13	1.811E-05	2.07E-04	4.683E-13	1.775E-05	2.03E-04
0.1	5.602E-13	1.809E-05	2.07E-04	4.880E-13	1.771E-05	2.03E-04

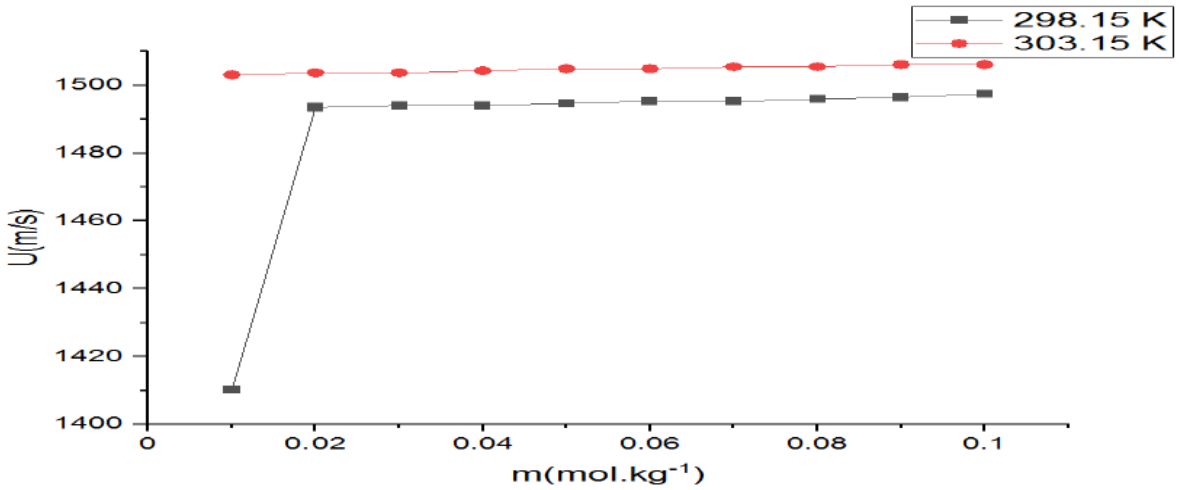


Fig.1 Variation of Ultrasonic Velocity with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

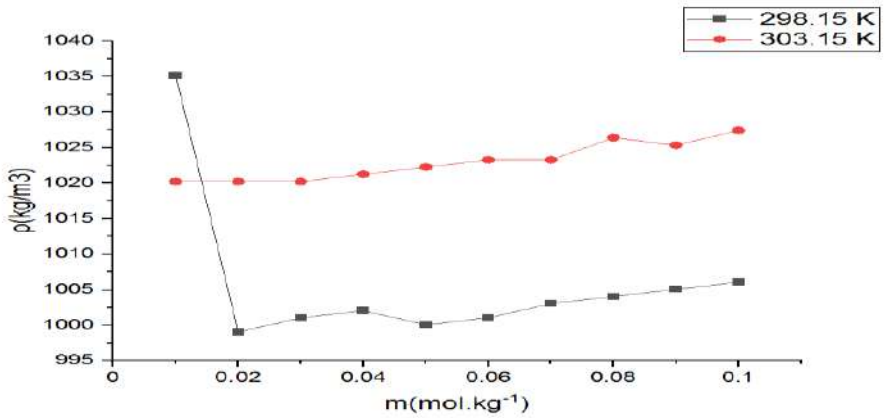


Fig.2 Variation of Ultrasonic Density with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

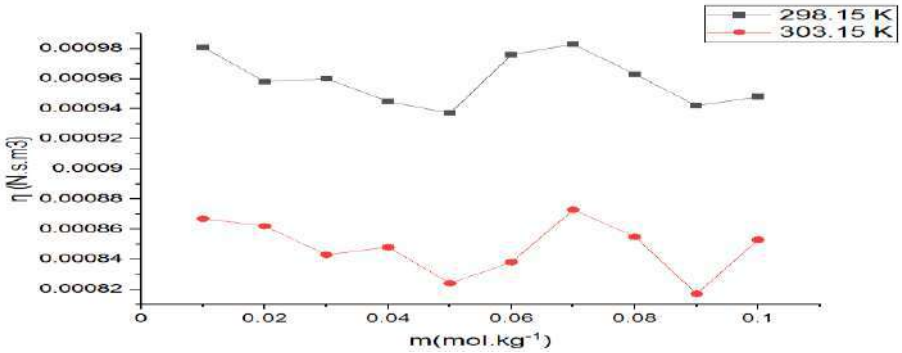


Fig.3 Variation of Ultrasonic Viscosity with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

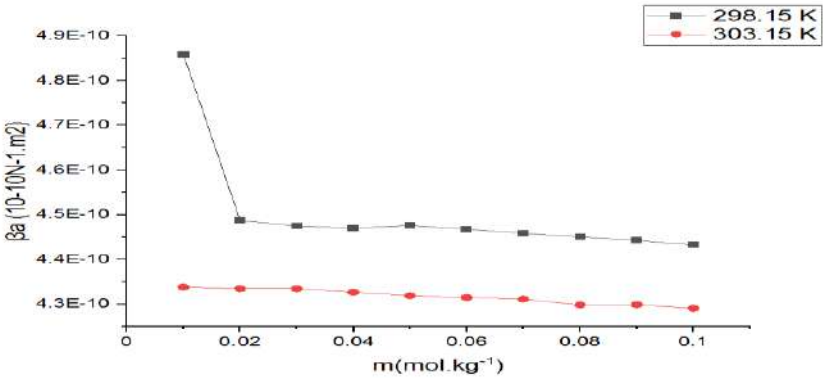


Fig.4 Variation of Adiabatic Compressibility with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

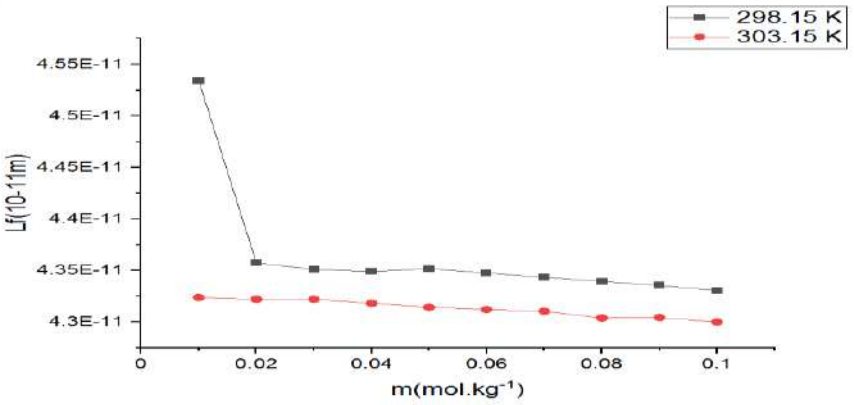


Fig.5 Variation of Free Length with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

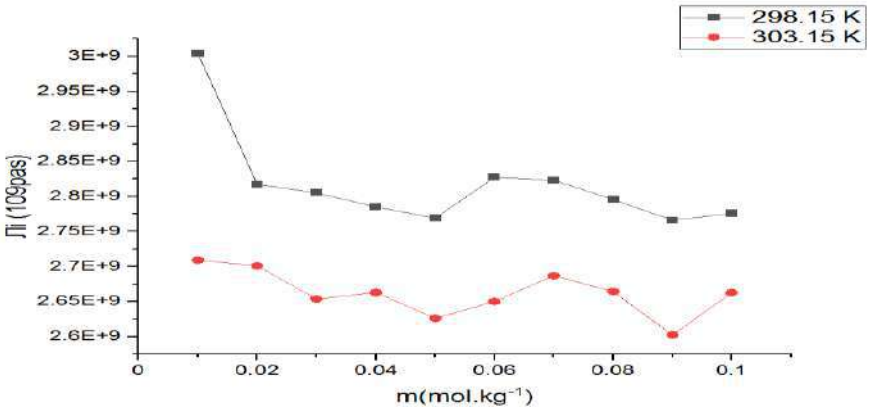


Fig.6 Variation of Internal Pressure with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

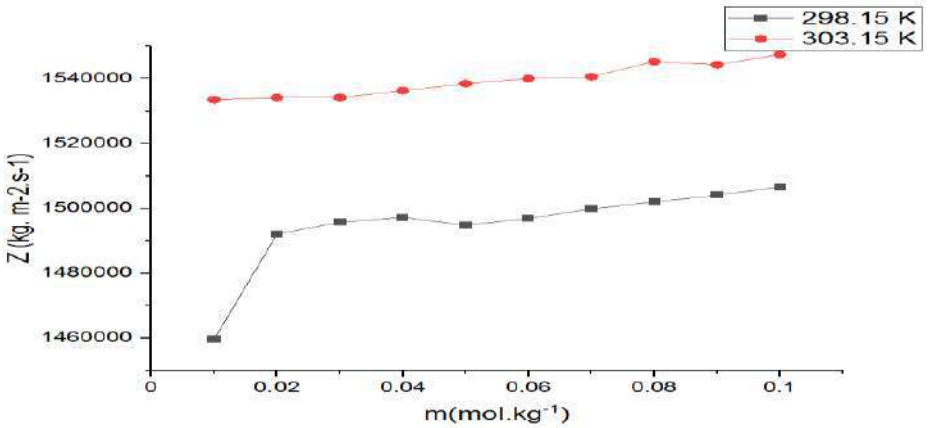


Fig.7 Variation of Acoustic Impedance with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

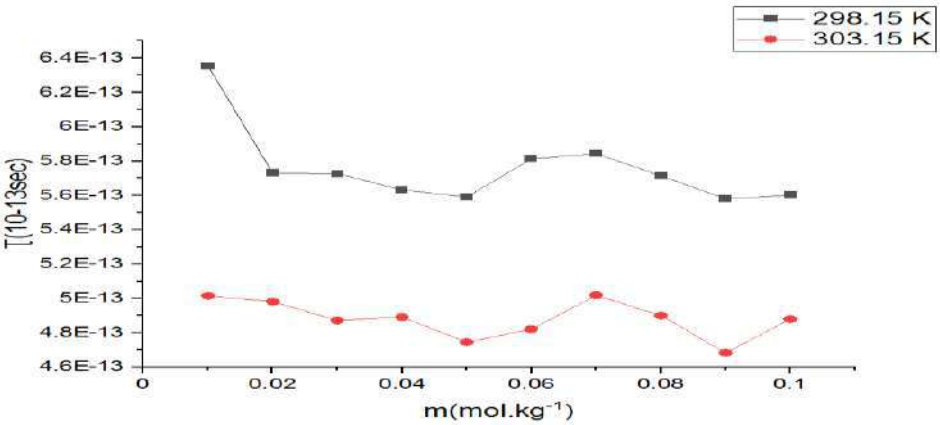


Fig.8 Variation of Relaxation Time with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

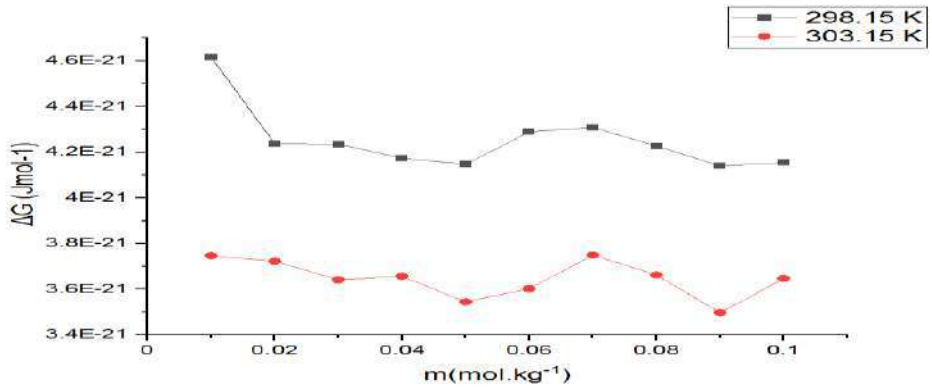


Fig.9 Variation of Gibbs free energy molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

In the present study, the experimental value of ultrasonic velocity, density and viscosity with different concentration of D-(-)-tartaric acid in distilled water at temperature 298.15K and 303.15K are tabulated table 1. While other parameters such as adiabatic compressibility ,free length, free volume, internal pressure , acoustic impedance , relaxation time, molar volume, Gibbs free energy , meff , rao constant and molar cohesive energy are tabulated table 2 to table 5 Fig.1. Shows that the ultrasonic velocity increases with increasing number of solute particle in solvent double distilled water and also with rise in temperature. The increase in ultrasonic velocity is an indication of enhanced solute solvent molecule interaction and structure making tendency of solute D-(-) - Tartaric acid in water.

Fig.2. shows that density of solution increases with increase in concentration due to increase in number of particle in solution. It is predict that there strong interaction in molecule of solution. The density of solution increases with rise in temperature.Fig.3. shows that Viscosity is inversely proportional to the adiabatic compressibility means that adiabatic compressibility decreases at that time viscosity is increases. Fig.4. It

represents the adiabatic compressibility decreases with increase in the concentration also with temperature. The decrease in the compressibility shows that there are enhanced molecular association in this system with increase in the solute content as the new entities become compact and less compressible [5].Fig.5. It is observed from this figure that the free length of aqueous D-(-) - Tartaric acid solution decrease with rise in concentration . This indicates that there exists a significant solute-solvent interaction which leads to a structure promoting behavior. The decreasing trends of free length with rise in concentration is due to decrease in spacing between the molecule of D-(-) - Tartaric acid solution. The free volume increases with increase in concentration as well as temperature. The increase in free volume may be attributed to lose packing of the molecule inside the shield. This may be brought about by weakness of molecular interaction. The free volume is inverse function of internal pressure.Fig.6. shows that the internal pressure decrease with increase in concentration which indicates the decrease in cohesive forces. The reduction in internal pressure may be due to loosening of cohesive force leading to breaking the structure of the solute. Decrease in internal pressure indicates that there is a weak interaction between the solute and solvent molecule [6]. Fig.7. It is observed that acoustic impedance increase with concentration and also with temperature. This may be due to the variation of pressure from one particle to another particle and the increase in acoustic impedance value with solute concentration can be attributed to the effective solute solvent interaction.Fig.8. shows that relaxation time decreases with increase in concentration also with temperature. The relaxation time is order of 10^{-12} sec is due to structural relaxation process in such a case it is suggested that molecule get rearranged due to co-operative process. It was reported that if the variation in Rao's constant is linear then it show that there is complex formation and so is found in the present investigation which means that there is no complex formation.Fig.9. Gibbs free energy first decreases and then increase with concentration of solution also with temperature. This result are in accordance with clathrate like structure of D-(-) - Tartaric acid.

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Synthesis and Characterization of Bis-Schiff Bases Derived from Vaniline

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Abstract

The Schiff Bases are the utmost extensively used organic compounds . Schiff bases are significant class of compounds in medicinal and pharmaceutical field as they have also been shown toexhibit wide range of biological activities, including antifungal, antibacterial,antiferative, anti inflammatory, antiviral, and antitumor properties.

The Bis-schiff bases are the product of the reaction between Bis-aldehydes and triazole amine. Some Bis-Schiff base derivatives of 1,2,4- triazole amine and their reduced derivatives have been also found to posses pharmacological activities[6-8].

Keyword *Synthesis of Bis-schiff base,anti inflammatory, antifungal, antibacterial, antitumor etc.*

Introduction

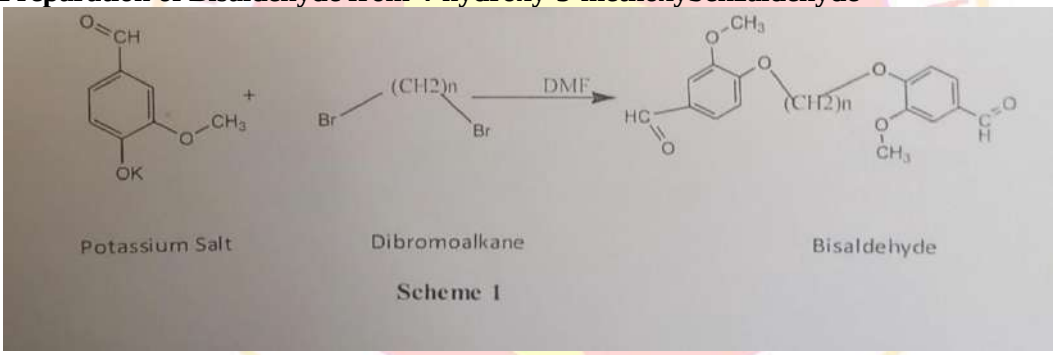
Schiff bases are the condensation products of primary amines and carbonyl compounds[1]. In present investigation,we report synthesis, characterization of Schiff Base derived from 1,2,4-triazole-4-amine and 4-hydroxy 3-methoxy benzaldehyde. Synthesis of various triazole derivatives have been reported[10-11].

In general Schiff base are most widely used compounds. They have been shown to exhibit a broad range of biological activities.

Litrature survey has revealed several advantages of Schiff bases derived from triazole. In vitro antibacterial , antifungal and cytotoxic activities of some Schiff bases and their complexes give the more research focus on this compounds[4-5].

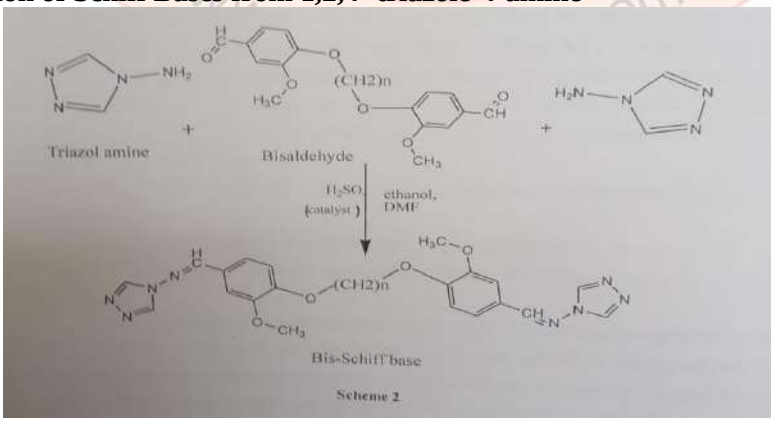
Methods for synthesis of Schiff base

Scheme I- Preparation of Bisaldehyde from 4-hydroxy-3-methoxybenzaldehyde



Take 1.5 g of 4-hydroxy-3-methoxybenzaldehyde dissolve in methanoic KOH. Stirr for 15 min. and remove solvent. Dissolve remaining in DMF and add Dibromoalkane. Reflux the reaction mixture for half an hour . Pour the content in crushed ice after ther completion of reaction . Collect solid Bis aldehyde from recrystalisation.

Scheme II – Preparation of Schiff Bases from 1,2,4- triazole-4-amine



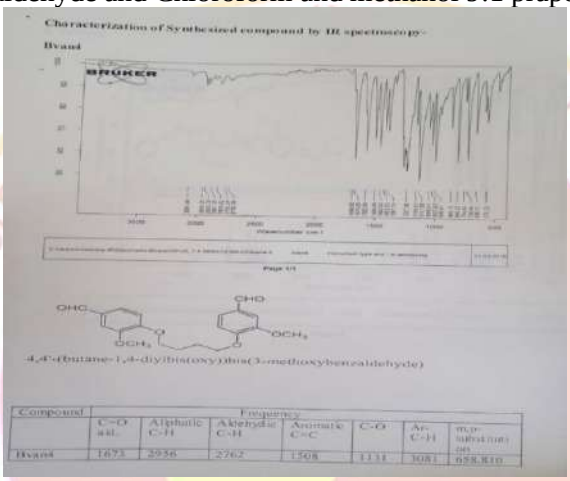
Take 0.86 g of Bisaldehyde and 0.42g of triazole in round bottom flask. Add ethanol and DMF in 9:1 praportion resp. Heat the solution till it will be completely soluble . Add 2-3 drops of H_2SO_4 to it. Reflux the solution till ppt appears.

Properties of the compound synthesized-

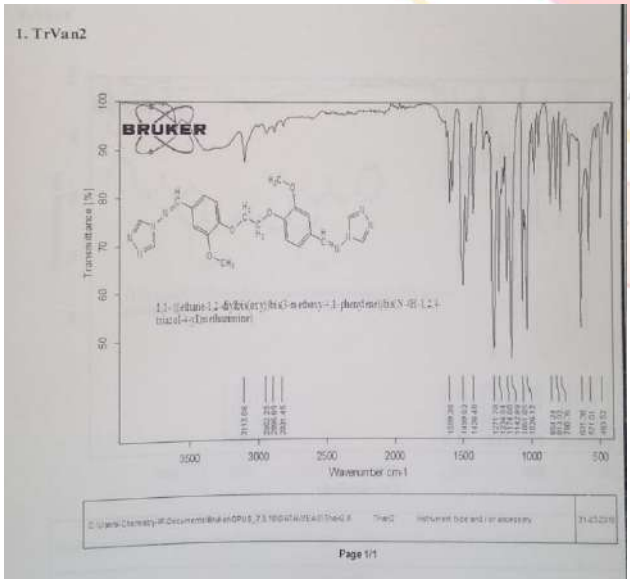
Compound	N	Molecular Formula	Molecular Weight	Melting Point
TrVan 2	$-(CH_2)_2-$	$C_{22}H_{22}N_8O_4$	430.198	228^0C
TrVan 3	$-(CH_2)_3-$	$C_{23}H_{24}N_8O_4$	444.208	244^0C
TrVan 4	$-(CH_2)_4-$	$C_{24}H_{26}N_8O_4$	458.218	240^0C
TrVan 5	$-(CH_2)_5-$	$C_{25}H_{28}N_8O_4$	472.228	216^0C

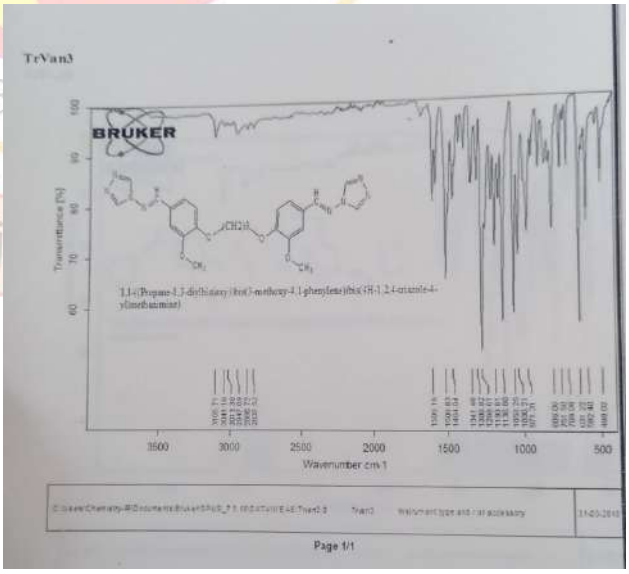
Result and Discussion-

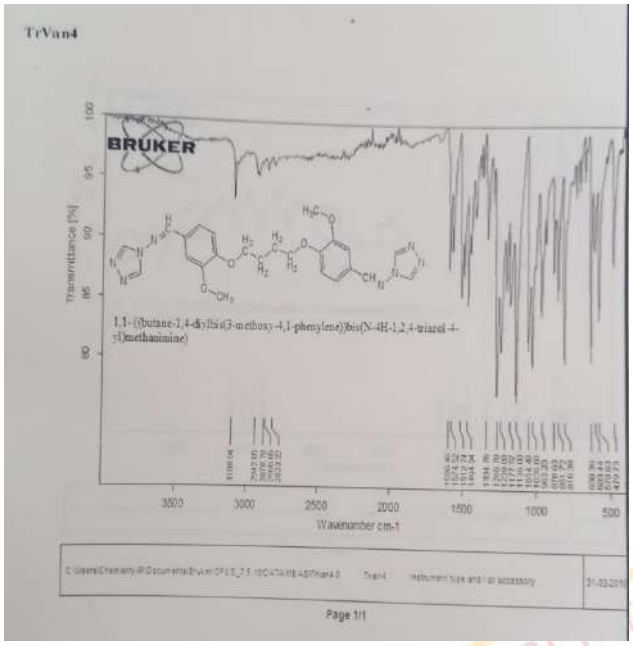
The synthesis of Schiff bases from triazolamine and bisaldehyde is very efficient required short reaction time , atom economical and with better yield. In present investigation the reaction of the various bisaldehyde with triazole were studied. The purity of the product obtained was checked by TLC using ethyl acetate and cyclohexane in 6:4 ratio for bisaldehyde and Chloroform and methanol 9:1 praportion for Schiff bases.

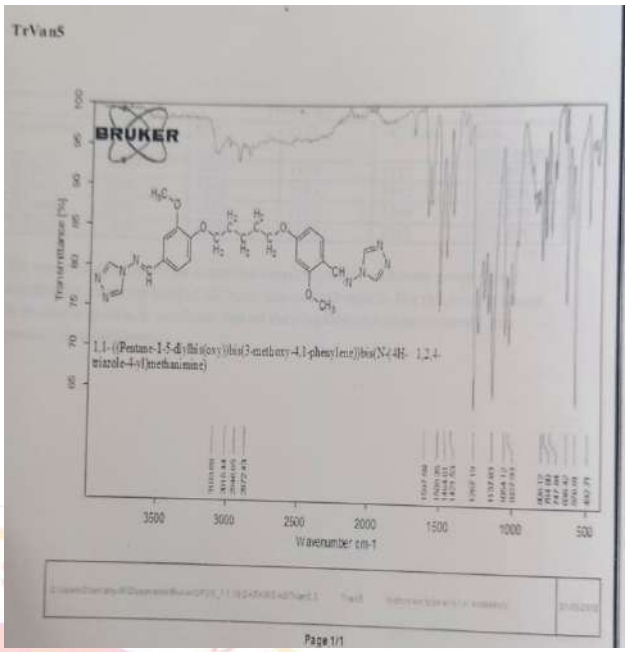


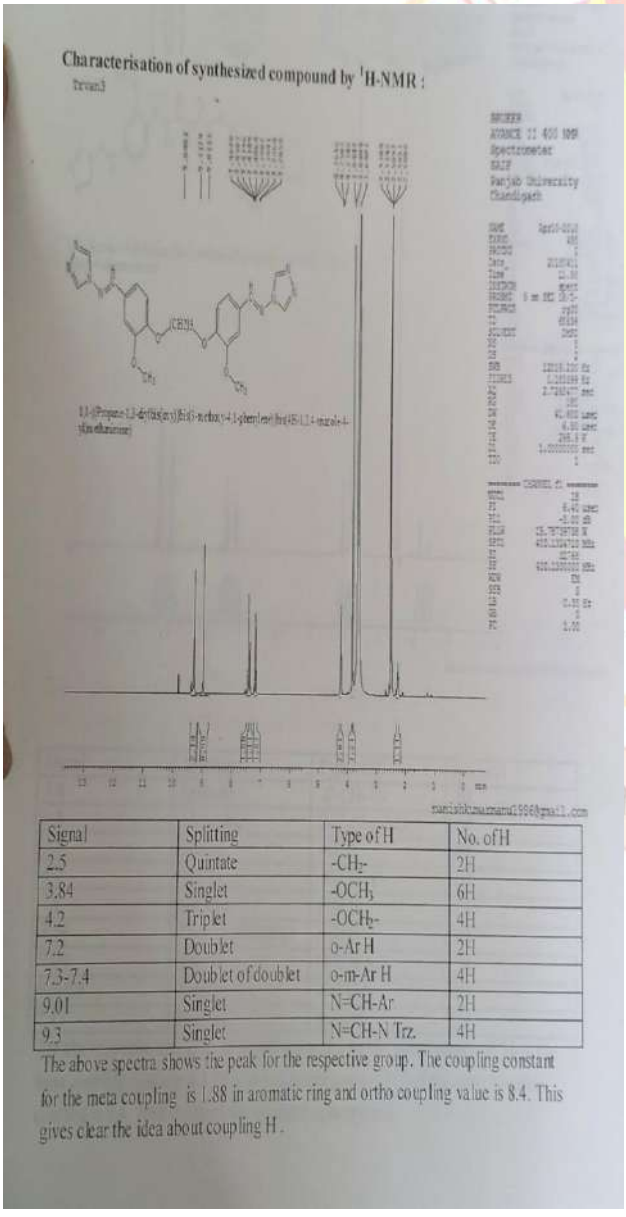
The conventional method take more time for the completion of reaction. But by using H_2SO_4 as the catalyst we can increase the rate of reaction . After addition of catalyst we get the product immediately within 5-10 min. This process is energy efficient and also autoeconomical. All the new compounds are tested with TLC , purified and crystalize with ethanol.





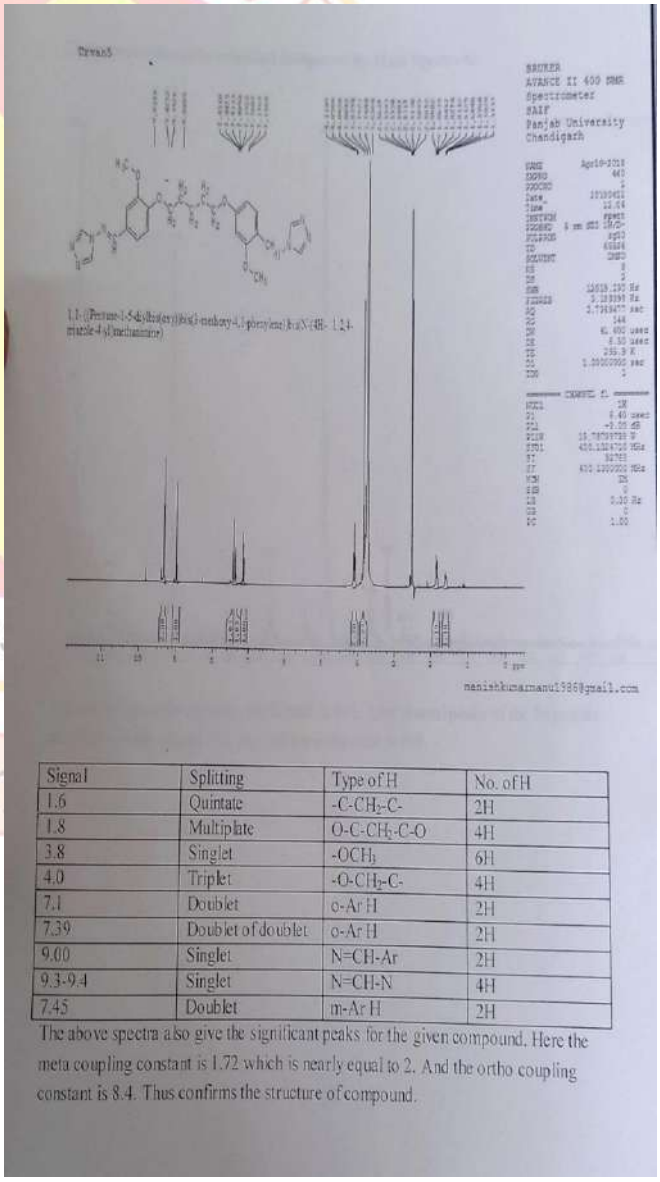






Signal	Splitting	Type of H	No. of H
2.5	Quintate	-CH_2-	2H
3.84	Singlet	-OCH_3	6H
4.2	Triplet	-OCH_2-	4H
7.2	Doublet	o-Ar H	2H
7.3-7.4	Doublet of doublet	o-m-Ar H	4H
9.01	Singlet	N=CH-Ar	2H
9.3	Singlet	N=CH-N Trz.	4H

The above spectra shows the peak for the respective group. The coupling constant for the meta coupling is 1.88 in aromatic ring and ortho coupling value is 8.4. This gives clear the idea about coupling H.



Signal	Splitting	Type of H	No. of H
1.6	Quintate	-C-CH_2-C-	2H
1.8	Multiplate	O-C-CH_2-C-O	4H
3.8	Singlet	-OCH_3	6H
4.0	Triplet	-O-CH_2-C-	4H
7.1	Doublet	o-Ar H	2H
7.39	Doublet of doublet	o-Ar H	2H
9.00	Singlet	N=CH-Ar	2H
9.3-9.4	Singlet	N=CH-N	4H
7.45	Doublet	m-Ar H	2H

The above spectra also give the significant peaks for the given compound. Here the meta coupling constant is 1.72 which is nearly equal to 2. And the ortho coupling constant is 8.4. Thus confirms the structure of compound.

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Thermokinetic Studies of Cr(III), Mn(III) and Fe(III) Complexes Derived From Thiazole Schiff Base.

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Abstract:
Thiazole Schiff base ligand was derived from the condensation of thiazole and 2-hydroxy-5-chloro-3-nitro acetophenone. The Schiff bases behaved as charge bidentade ligand. The ligand was characterized by elemental analysis and spectral methods. The coordinating ability of the ligand is investigated by preparing its metal complexes with Cr(III), Mn(III) and Fe(III),) have been prepared and characterized by elemental analysis, conductance measurements, molecular weight determinations, spectral and thermal studies. The synthesized products are coloured solids, soluble in DMF, DMSO and THF.
Keywords: *Schiff base, Magnetic susceptibility, Thermal*

Introduction :

Synthesis, characterization and antifungal activity of manganese (II) complex with Schiff Base derived from acetylacetone andl leucine[1] synthesis, characterisation and various methods of Schiff base derived from sulphanilic acid and salicylaldehyde and Comparative study of Schiff base using various synthesis methods and their theoretical prediction of activities[2] The newly synthesized Schiff bases, 2-acetylthiophene thiosemicarbazone and thiophene-2-aldehyde thiosemicarbazone and their metal complexes with Co(II), Cu(II), Zn(II) and Ni(II) complexes and Their Schiff bases metal complexes were tested for antibacterial activity[3] There is the combination of the azo group, the imidazole unit and the Schiff base fragment to studies the synthesis, characterization, and optical properties of four different Schiff bases ligands. They are reported the possible use of such systems in biological applications for their antifungal properties and antioxidant activities[4]. Synthesis and structural diversity transition metal coordination complexes with diverse Schiff base ligands and macrocyclic systems[5] The aim of present investigation is to synthesize various transition metal complexes of Schiff base derived from 2-hydroxy-5-chloro-3-nitro acetophenone and 2-amino-4-phenylthiazole

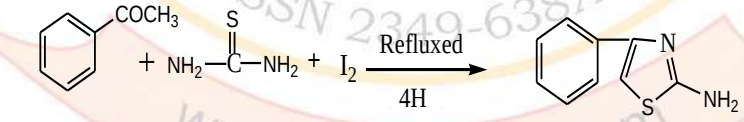
Experimental :

All the chemicals were of A.R. grade and used as received. 2-hydroxy-5-chloro-3-nitro acetophenone (HCNA) and 2-amino-4-phenylthiazole was prepared by known methods6-9. The solvents were purified by standard methods10.

Synthesis of 2-amino-4-phenylthiazole;

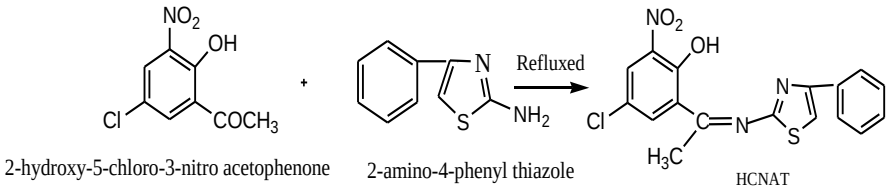
The synthesis of 2-amino-4-phenylthiazole prepared by known method7-9. The product was filtered and crystallized from 70% ethanol, after several minutes the golden coloured product of 2-amino-4-phenylthiazole was separated out.

Yield: 9g (75%); m.p.: 148-1500C



Acetophenone 2-amino-4-phenylthiazole

Synthesis of 2-hydroxy-5-chloro-3-nitroacetophenone 4-phenyl-2 imino thiazole [HCNAT]: A solution of 4-phenyl-2 imino thiazole (0.02M) in 25ml of ethanol was added to an ethanolic solution(25ml) of 2-hydroxy-5-chloro-3-nitro acetophenone (0.02M) and the reaction mixture was refluxed on a water bath for 4h. After cooling a pale yellow coloured crystalline solid was separated out. It was filtered and washed with ethanol, crystallized from DMF and dried under reduced pressure at ambient temperature. The purity of ligand was checked by elemental analysis and m.p. It was also characterized by IR and 1H NMR spectral studies. Yield:75%; m.p. 3050C



2-hydroxy-5-chloro-3-nitro acetophenone 2-amino-4-phenyl thiazole HCNAT

Table1. Analytical data of the Ligands.

Ligand	Molecular Formula	Formula Weight	Color and nature	Elemental Analysis			
				C% found (Cal.)	H% Found (Cal.)	Cl% Found (Cal.)	S% Found (Cal.)
HCNAT	**$C_{17}H_{12}N_3O_3SCl$**	**373.06**	**Yellow Crystalline**	**52.35 (52.20)**	**03.20 (03.34)**	**9.22 (9.38)**	**08.34 (08.46)**

Preparation of complexes:

All the metal complexes were prepared in a similar way by following method. To a hot solution of ligand HCNAT (0.02M) in 25ml of ethanol a suspension of respective metal salts was added drop wise with constant stirring. The reaction mixture was refluxed on a water bath for 3-5 h. The precipitated complexes were filtered, washed with ethanol followed by ether and dried over fused calcium chloride. Yield : 55-60%. The complexes are soluble in DMSO and DMF but insoluble in water and common organic solvents. The metal chloride content of complexes were analyzed by standard methods11,12 The 1H NMR spectra of ligand was recorded and obtained from RSIC Chandigarh. IR spectra of the compounds were recorded on Perkin Elmer 842 spectrophotometer in the region 400-4000cm-1, Carbon, Hydrogen and Nitrogen analysis were carried out at RSIC, Punjab University, Chandigarh. The molar conductance of the complexes at 10-3 M dilution in DMF were determined using equiptronic digital conductivity meter EQ-660 with a cell constant 1.00 cm-1 at room temperature. The magnetic moment measurement were made on a Gouy balance at room temperature using [HgCo(SCN)4] as the calibrant. The thermogravimetric analysis were performed on laboratory set up apparatus in air atmosphere at 100 C min-1 heating rate. The molecular weights of the complexes were determined by Rast method.

Table 2. Analytical data and molar conductance of the compounds.

Ligand	Formula weight g $mole^{-1}$	Colour	Elemental Analysis Found (Calcd.)				μ_{eff} B. M	Λ_M (Ω^{-1} cm^2 mol^{-1})
			M%	C%	H%	Cl%		
$[CrL_2(H_2O)Cl]$ H_2O	868.7	Green	5.42	44.98	2.56	11.18	3.6	17.6
			(5.96)	(45.29)	(2.98)	(11.19)		
$[MnL_2(OAc)]$ H_2O	895.1	Brown	5.46	46.35	3.23	7.41	4.8	17.4
			(5.80)	(46.59)	(3.42)	(7.53)		
$[FeL_2(H_2O)Cl]$ H_2O	872.6	Black	6.12	44.85	3.22	11.46	5.4	21.2
			(6.19)	(45.10)	(3.28)	(11.72)		

Result and Disscution:

The Schiff base HCNAT and its complexes have been characterized on the basis of ^{1}H NMR, IR spectral data, elemental analysis, molar conductance, magnetic succeptibility measurements and thermogravimetric analysis data .

All these values and analytical data is consistent with proposed molecular formula of ligand . All the compounds are coloured solid and stable in air. They are insoluble in water but soluble in coordinating solvents like DMF and DMSO. The molar conductance values in DMF(10^{-3} M) solution at room temperature (Table2) shows all the complexes are non electrolytes.

The ^{1}H NMR spectra of ligand shows signals at δ 12.14,(1H, s phenolic OH), δ 7.56, 7.54, 7.53 and 7.52 (4H, m, phenyl) δ 6.81,6.80, and 6.78 (3H, s, Phenyl), 6.68 (1H,s, thiophene), and 2.56 (3H, s, methyl) [11,13-15].

IR spectra of ligand and metal complexes shows ν(C=N) peaks at 1622 cm^{-1} and absence of C=O peak at around 1700 – 1750 cm^{-1} indicates the Schiff base formation[16-19].

Table 3. IR spectra of ligand and metal complexes

Compound	(O H) hydrogen bonded	(C=N) imine	(C O) phenolic	(M O)	(M N)	(C S)
HCNAT (LH)	3119	1622	1514	--	--	1126
$[CrL_2(H_2O)Cl]\ H_2O$	--	1595	1500	478	406	1118
$[MnL_2(OAc)]\ 2H_2O$	--	1567	1462	498	418	1095
$[FeL_2(H_2O)Cl]\ H_2O$	--	1605	1505	513	436	1085

Table 4. Thermal decomposition data of HCNAT and its complexes.

Compounds	**Half Decompo-sition** Tempera-ture **(°C)**	**Activation Energy (kJ $mole^{-1}$)**			**Frequency Factor** Z **(sec^{-1})**	**Entropy Change -ΔS (J mol^{-1} K^{-1})**	**Free Energy Change ΔF (kJ mol^{-1})**
		B*	H-M**	F-C***			
HCNAT (LH)	260.46	3.22	5.47	4.31	87.28	211.42	118.65
$[CrL_2(H_2O)Cl]\ H_2O$	550.32	9.78	12.92	12.92	259.78	208.14	183.62
$[MnL_2(OAc)]\ 2H_2O$	710.34	11.15	18.54	11.16	222.34	208.83	217.88
$[FeL_2(H_2O)Cl]\ H_2O$	429.25	3.78	9.48	8.40	169.78	208.34	156.57

Thermogravimetric studies : Thermogravimetric study indicates all the complexes are stable up to 60-700C. All the complexes shows half decomposition temperature(Table 4). The Thermal activation energy was calculated by Freeman-Carroll,20 Horowitz-metzger21 and Broido22 method.

Conclusions

In conclusion, we have synthesized new ligand 2-hydroxy-5-chloro-3-nitro acetophenone 4-phenyl-2 imino thiazole and their metal complexes. Ligand was found to bind the metal ion monobasic (ON) bidentate manner. Conclusion of thermal decomposition temperature and activation energy of synthesized Schiff base metal complexes

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Fabrication and Characterization of Ce modified $SmFeO_3$thick film

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Abstract
Thick films of $SmFeO_3$ were prepared onto a glass substrate by screen printing technique and fired at 500^0C for 30 min. As-prepared pure $SmFeO_3$ thick films were then dipped into 0.1 M aqueous solution of Cerium Chloride for 5 min. The films were then fired at 550 ^{0}C for 30 min to obtainCe modified $SmFeO_3$ thick films. Structural and morphological properties ofboth pure and surface modified $SmFeO_3$ thick films were characterized by Field Effect Scanning Electron Microscopy (FE-SEM) and Energy Dispersive X-Ray Analysis (EDAX) techniques. The effect of cerium doping on microstructure and surface morphology of pure $SmFeO_3$ thick film was discussed.
Keywords: $SmFeO_3$, Surface modification, Perovskite, Gas sensor.

Intruduction
Presently, environmental pollution due to hazardous gases emitting from auto and industrial exhaust has become a big challenge for human being. Therefore, detection and monitoring these gases is strongly required for better air quality. Different techniques have been employed for environmental monitoring. Among them metal oxide based gas sensors are of practical interest due to their small size. In 1962, Seiyama et al reported first semiconductor metal oxide gas sensor and since then different semiconducting metal oxides have been studied for ethanol, benzene, NO_2 and VOCs [1-3].But, their gas sensing characteristics such as sensitivity, selectivity, stability and operating temperature are still unsatisfactory.

Over a past few decade, perovskites of type ABO_3 (A: rare earth, B: transition metal) have attracted a great deal of attention for gas sensordue to their improved physical and chemical properties.Due to its doping flexibility, adsorption and desorption behavior can be controlled and sensor performance can be optimize. Properties of perovskite such as ionic and electronic conductivity, chemical stability and reactivity depends on the nature and amount of A and B cations. These properties can be tuned for particular application by partial substitutions at A-site, B-site and/or both A-site and B-site. Therefore perovskites have extensively studied for wide range of applications including solid oxide fuel cell[4], catalysis[5] and gas sensors[6-7].Among various perovskite oxides, $SmFeO_3$is reported to be a promising material for gas sensor due to its stability in thermal and chemical atmosphere. $SmFeO_3$is one of the rare earth orthoferritep-type semiconducting material[8]. It is extensively used in gas sensor for oxidizing gases like O_3,NO_2, ethanol. However, its use for reducing gases, like CO and $H_2$is limited because of its lower reduction stability and electrical conductivity[9-10] .Both reduction stability and electrical conductivity depends on nature of A and B cations. ABO_3 type perovskite structure of $SmFeO_3$ permits the modification in microstructure by partial substitution at A-site and/or the B-site. Literature survey showed that doping of A-site with bigger cation enhances reduction stability whereas doping at B-site affects electrical conductivity as well as thermal stability. Researchers have reported the advantages of introducing Ce at A-site and Co, Ni and Mg at B-site[11-12] . S.M. Bukhari et al have reported that the partial substitution of Sm by Ce within the solubility limit improves the electrical conductivity of perovskite as well as prevents it from decomposing under reducing conditions[13] . This creates the possibility of using Ce doped $SmFeO_3$ as a gas sensor for reducing gases.

For the synthesis of $SmFeO_3$ perovskite different methods like sol-gel method[14] and hydrothermal method [15] have been adopted. Sol-gel method in citric system has advantage of providing $SmFeO_3$ perovskite powder with high sensitivity and selectivity.
In our previous work, we reported the synthesis of pure $SmFeO_3$ perovskite powder by Sol-gel method. In the present work, surface modification in $SmFeO_3$ thick films prepared by screen printing method was achieved by dipping technique.

Methods And Material
2.1.Preparation of $SmFeO_3$ powder
Stoichiometric amounts of samarium nitrate$Sm(NO_3)_3.6H_2O$, iron nitrate $Fe(NO_3)_3.9H_2O$and citric acid monohydrate were mixed in the ratio 1:1:1. The mixture was grounded in Agate mortar for 30 minutes. Ethylene glycol was added to this mixture under constant stirring at 75^0C for 2 hours to obtaina sole which was then dried into a gel. The gel was dried in oven at 110^0C for 12 hours and allowed to cool naturally. Finally, sample was calcined at 800^0C for 4 hours.

2.2.Preparation of $SmFeO_3$ thick films

The thixotropic paste was formulated by mixing the fine powder of $SmFeO_3$ with the solution of ethyl cellulose in a mixture of organic solvent The ratio of inorganic to organic part was 75:25 .This paste was then screen-printed on glass substrate in desired pattern.The films were fired at 500^0C for 30 min. and termed as pure $SmFeO_3$thick film.

2.3.Preparation of Ce surface modified thick films

As-prepared pure $SmFeO_3$thick films were dipped into 0.1 M aqueous solution of cerium chloride for 5 min. After drying, these films were fired at 550 ^{0}C for 30 min and termed as Ce surface modified $SmFeO_3$thick film.

Results And Discussion

3.1. X-ray diffraction and surface morphology analysis of pure $SmFeO_3$ powder

X-ray diffraction pattern of synthesized pure $SmFeO_3$ powder was reported in our previous paper [16]. The crystallite size was estimated to be 50.08 nm.

3.2. Surface morphology of pure and modified $SmFeO_3$ thick films by FESEM analysis

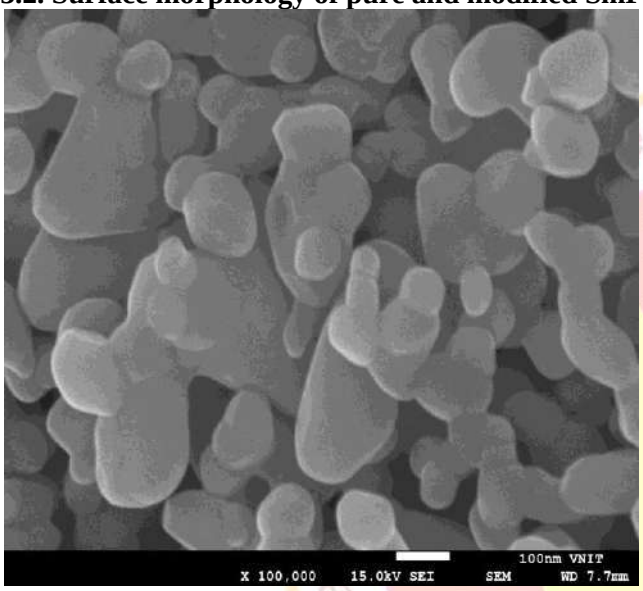

Fig. 1: FESEM of pure $SmFeO_3$ thick film.

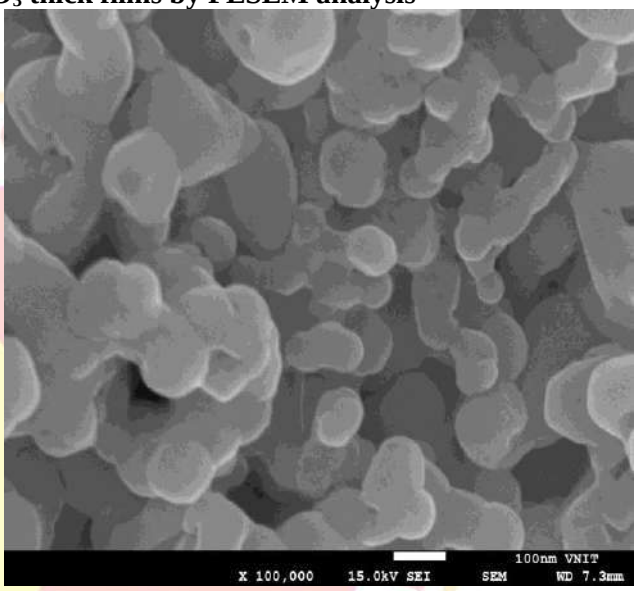

Fig. 2: FESEM of Ce doped $SmFeO_3$ thick film.

Fig. 1 represents the FESEM images of pure $SmFeO_3$ thick film fired at 500 ^{0}C for 30 min. The micrograph shows the presence of large number of grains with grain size ranging from 53 nm to 131 nm on the film. The films were highly porous with inner layer of perovskite type oxide adhere to the substrate.Due to the firing temperature, sintering proceeded and growth of the grains was observed. The composition of organic vehicle also influences the morphology of film. The presence of α-terpineol favored the sintering of grains.Fig. 2 depict FESEM image of Ce doped $SmFeO_3$ thick film for dipping time interval 5 min and fired at 550 ^{0}C for 30 min. The micrograph shows the distribution of smaller particles around the larger grains. The smaller particles may be attributed as Ce species. The modified thick film appears to have comparatively high porosity and large surface area for oxygen adsorption.

3.3.Elemental composition of pure and modified $SmFeO_3$ thick films by EDS analysis

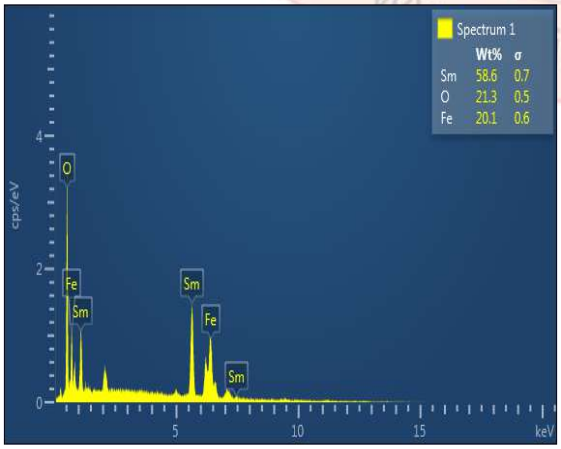

Fig 3: EDS of pure $SmFeO_3$ thick film.

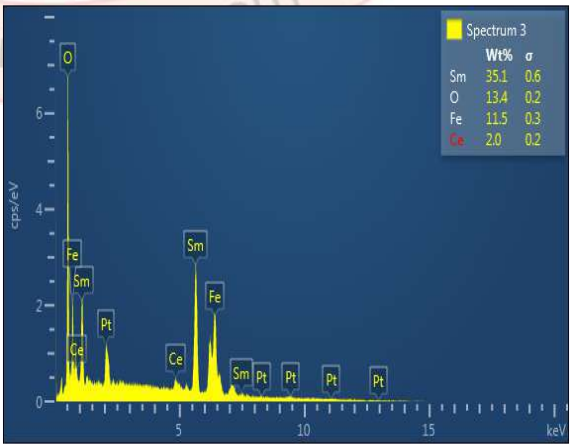

Fig 4: EDS of Ce doped $SmFeO_3$ thick film.

Elemental analysis of pure and Ce doped thick films was carried out by EDS technique. Table 1 represents the wt % of constituent elements of both pure and modified films.

Table 1**:** Quantitative elemental analysis**.**

	Pure $SmFeO_3$ thick film	**Ce modified $SmFeO_3$ thick film**
Sm (wt.%)	58.6	35.1
O (wt.%)	21.3	13.4
Fe (wt.%)	20.1	11.5
Ce (wt.%)	---	2.0
Total	100	100

It is observed from table 1 that weight percentage of oxygen decreases due to Ce doping. Further it was observed that both the samples are oxygen deficient but oxygen deficiency is more in Ce doped thick film than pure SmFeO3 thick film. Therefore,Ce doped SmFeO3 thick film may facilitate increased oxygen adsorption.

Conclusions

The results demonstrated that surface modification of SmFeO3thick films can be achieved by dipping technique.Moreover Surface modification promotes increased oxygen adsorption. FESEM analysis and EDX analysis respectively confirm the structural morphology and the elemental composition of both pure and modified thick films .

Acknowledgement : Authors would like to acknowledge VNIT, Nagpur for providing characterization facilities[16].

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X-ray diffraction, Uv-Vissible and Photoluminescence Study of Dysprosium Doped Lanthanum Calcium Borate La_2O_3-8CaO-$3B_2O_3$ Glasses

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Abstract.

In the present work, borate glasses doped with dysprosium in the system (x)Dy_2O_3-(1-x)La_2O_3-8CaO-$3B_2O_3$ with x = 0 (LaCOB), 0.01, 0.03, 0.05 and 0.07 (Dy:LaCOB) were prepared by melt-quench technique. The synthesized amorphous material confirmed by the X-ray techniques. The various optical transition states of dysprosium ions doped in glasses are analyzed by using ultraviolet-visible spectroscopy. The optical band gaps of the grown glasses have been evaluated form optical transparency data. The results show that there are decreases in the optical band gap as the concentration of dysprosium ions increases. The luminescence properties of LaCOB glasses doped with different concentrations of Dy^{3+} ions show emission bands at 470 nm ($^4F_{9/2}\rightarrow{}^6H_{15/2}$) and 575 nm ($^4F_{9/2}\rightarrow{}^6H_{13}$) under the excitation of 358 nm. The chromacity colour coordinates have also been calculated.

Introduction

The rare earth ions doped borate glasses and crystals find important application in the area of solid state laser, fiber laser, waveguide laser, laser amplifier in optical communication, optical data storage and amplifier in integrated optical components [1-4]. Different glassy materials like as borate, phosphate, fluoride, fluoroborate and tellurite have been usually investigated to understand the outcome of host glass on the lasing properties of rare earth ions [5, 6]. Borate glasses as a host material doped with different rare earth (RE) ions are being developed and their suitability as laser material has been tested by studying optical properties [7, 8]. The chemical composition of borate and oxide glass plays a vital purpose in the photoluminescent properties of RE ions, affecting the usefulness of the energy transition process. Oxide glasses are classical stable hosts for obtaining efficient luminescence in rare earth ions due to their high thermal stability, high transparency, and good rare earth ion solubility [6, 9-11].

Recently, the physical and optical properties of rare earth ion Dy^{3+} doped Li_2O–K_2O–B_2O_3 glasses were reported by Azizan et al [10]. Luminescence and spectroscopic properties of Dy^{3+} doped sodium fluoro-phosphate (FP) glasses useful for white light emission were reported by Babu et al [11]. Optical properties of lead borate glasses containing Dy^{3+} ions have been studies by Pisarska et al [12]. Glasses doped with trivalent dysprosium are being considered as promising laser materials due to their optical transitions. Dy^{3+} ions have two strong emission transitions with $^4F_{9/2}\rightarrow{}^6H_{15/2}$ transition corresponding to magnetic dipole at 470 nm in the blue wavelength region and $^4F_{9/2}\rightarrow{}^6H_{13/2}$ transition corresponding to electric dipole at 575 nm in the yellow wavelength. The currently transition is hypersensitive and is effectively dependent lying on the host glass composition. This transition is also significantly affected by the radial integral of 4f and 5d electrons. Thus, by providing suitable environment and varying Dy^{3+} ion concentration we can tailor the intensity ratio of yellow to blue transition so as to generate white light [3, 5, 8].

This report, present the synthesis of borate glasses doped with dysprosium in the system (x)Dy_2O_3-(1-x)La_2O_3-8CaO-$3B_2O_3$ with x =0 (LaCOB), 0.01(1%Dy:LaCOB), 0.03 (3%Dy:LaCOB), 0.05 (5%Dy:LaCOB) and 0.07 (7%Dy:LaCOB) prepared by melt-quench technique. Prepared glasses were subjected to optical and luminescence studies.

Experimental

The Lanthanum oxide (La_2O_3) was purchased from Central Drug House (CDH) Ltd, India. Calcium carbonate ($CaCO_3$) was purchased from Fisher Scientific, Dysprosium oxide (Dy_2O_3) was purchased from LOBA, India and boric acid (H_3BO_3) was purchased from sd Fine chemicals. All materials were of analytical reagent grade.

An alkali borate glasses (LaCOB), (1%Dy:LaCOB), (3%Dy:LaCOB), (5%Dy:LaCOB) and (7%Dy:LaCOB) were prepared by the melt-quenching method. The chemicals La_2O_3, $CaCO_3$, Dy_2O_3 and H_3BO_3 with 99.99% purity used as the starting raw materials. Dy_2O_3 in appropriate amount was mixed with La_2O_3, $CaCO_3$, and H_3BO_3. The raw materials were crushed in a mortar with the help of pestle to make the homogeneous mixtures. The mixtures were calcinated at 550^{o}C for 6 hours to remove moisture. The material was removed from the crucible and once again crushed and calcinated at 950 ^{o}C for 12 hours. This process was repeated two times. The obtained polycrystalline powders of LaCOB, 1%Dy:LaCOB, 3%Dy:LaCOB,

5%Dy:LaCOB and 7%Dy:LaCOB compound were melted in a platinum crucible in an electric furnace at 1000 ^{o}C and kept it for 120 minutes [6]. The obtained melt was poured on a stainless steel plate and immediately pressed with second one for immediate quenching to form amorphous phased solid. The formed glass samples were allowed to cool gradually to room temperature. The obtained glasses were cut into rectangular slabs of dimensions 4x2x1 mm^3 and polished to use for further characterizations.

Characterizations

Powder X-ray diffraction (XRD) patterns of powdered glass samples were recorded on a X-ray diffractometer (Rigaku, Miniflex-600, Japan) using Cu-Kα (λ=1.504 Å) radiation to check the amorphous state of the prepared glass sample at the scanning rate of 8 deg/min and 2θ varied from 10–90^{o}. Ultraviolet-visible (UV-Vis) transmission and optical band gap studies have been performed using Black-CSR-50 Stellar Net Spectrophotometer, USA. Photoluminescence study has been done using FL-7000 Hitachi Fluorescence spectrophotometer.

Results and discussion

1.1. **Powder XRD study**

XRD patterns were taken to confirm the glassy nature for all the glass samples. The typical XRD profile of the LaCOB, 1%Dy:LaCOB, 3%Dy:LaCOB, 5%Dy:LaCOB and 7%Dy:LaCOB are shown in figure 1. The pattern doesn't exhibit any sharp peak that reflects amorphous nature of the material.

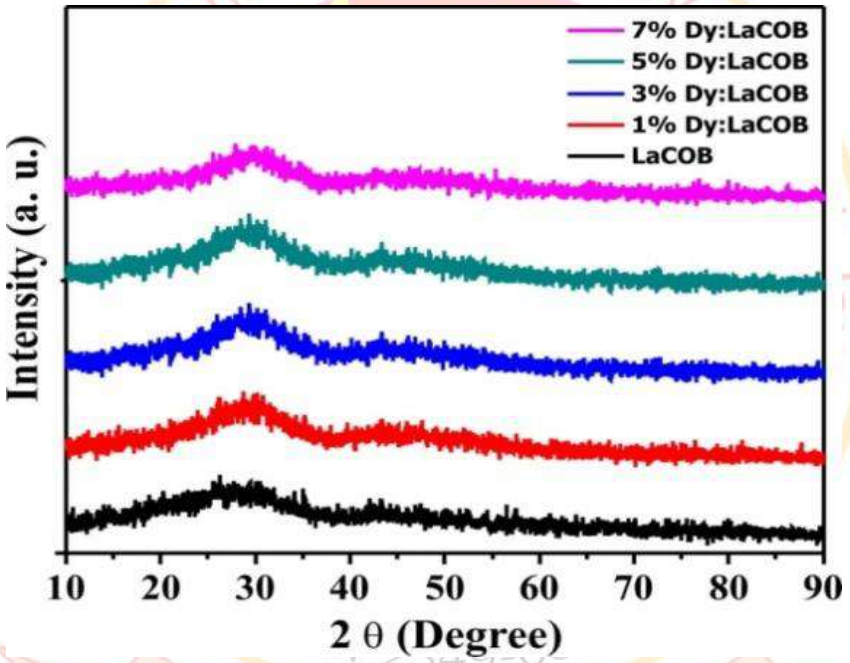

Figure 1. Powder XRD patterns of pure and Dy doped LaCOB glasses.

1.2. **UV-Vis spectroscopy**

Figure 2 a) shows the optical transmission spectra of prepared glasses recorded in the wavelength range 190-1083 nm. It can be observed that, the absorption peak for the grown glasses have lower cutoff wavelength in the range 204 - 220 nm. The glasses LaCOB, 1%Dy:LaCOB, 3%Dy:LaCOB, 5%Dy:LaCOB and 7%Dy:LaCOB show the optical transparencies around 75, 67, 53, 45 and 34% of in the UV and visible region, respectively. The optical transparencies of prepared LaCOB glasses doped with dysprosium are found to be decreased with increasing concentration of Dy^{3+}. The values of optical absorption coefficient (α) were determined using the relation (1) from the absorption data;

$$\alpha = (2.303/d)\log(1/T) \quad (1)$$

Where, T is the transmittance and d is the thickness of the glass [6]. The direct optical band gap of the glass can be determined by using relation (2);

$$(\alpha h\nu)^2 = A\,(Eg - h\nu) \quad (2)$$

Where, A is a constant.

Plotting a graph between $(\alpha h\nu)^2$ and photon energy ($h\nu$), as shown the figure 2 b), and drawing tangent to straight portion intercepting energy axis gives energy band gap and it was found to be 6.3, 6.2, 6.1, 5.7 and 5.3eV for LaCOB, 1%Dy:LaCOB, 3%Dy:LaCOB, 5%Dy:LaCOB and 7%Dy:LaCOB, respectively.

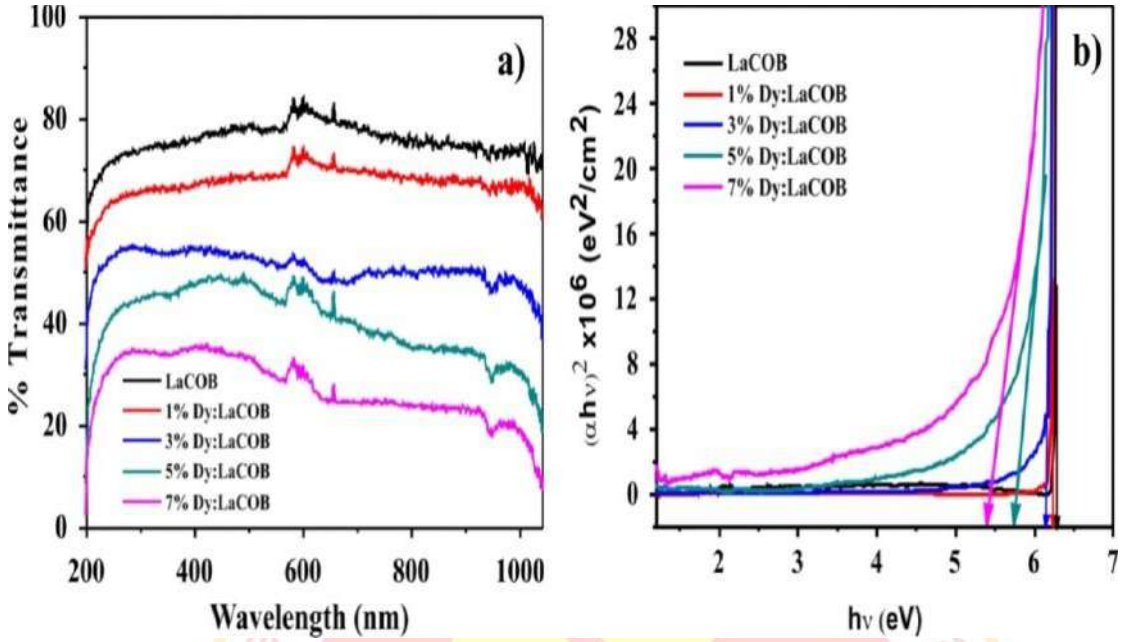

Figure 2.
a) UV-Vis transmission spectra and
b) a plot of variation of $(\alpha h\nu)^2$ versus hν pure and Dy doped LaCOB glasses.

1.3. Photoluminescence study and color quality of light Source (CIE)

The figure 3 (a) shows the photoluminescence spectra of Dy^{3+} doped LaCOB glasses. The glass shows emissions at 470 and 575 nm under the excitation at wavelength 358 nm. The peak centered at blue emission band (at 470 nm) is a typical emission of Dy^{3+} ions corresponding to transition $^4F_{9/2}\rightarrow{}^6H_{15/2}$ ground state, while the peak centered at yellow emission (at 575 nm) corresponds to the $^4F_{9/2}\rightarrow{}^6H_{13/2}$ optical transition of Dy^{3+} [2, 5, 13]. Similar results were reported for Dy^{3+} doped sodium aluminum phosphate and alkali lead tellurofluoro borate glasses [13-15]. The transition from $^4F_{9/2}\rightarrow{}^6H_{15/2}$ is a magnetic dipole transition which possess most intense blue emission band at wavelength 470 nm. The transition from $^4F_{9/2}\rightarrow{}^6H_{13/2}$ is electric dipole transition which possess moderate intense yellow emission band at 575 nm [1, 6, 7, 14]. The excitation spectrum Dy^{3+}:LaCOB shows narrows line in the UV range [15]. From figure 3 a), emission spectra also indicate that luminescence intensity increases with increase in concentration of Dy^{3+} dopant [10, 2]. The photoluminescence intensity for both blue and yellow emissions increased with the concentration of Dy^{3+} ions reaching a maximum at x = 0.05, and then it decreased for x = 0.07 because of concentration quenching.

The excitation spectra of Dy^{3+} doped LaCOB glasses recorded at emission wavelength of 470 nm are as shown in the figure 3 (b). The spectra consist of excitation band ($^6H_{15/2}\rightarrow{}^4P_{5/2}$) at 358 nm for various concentrations of Dy^{3+} ions [3, 6, 16]. The energy level scheme for all the observed absorption of Dy^{3+} doped LaCOB glass is shown in Fig. 3 (c).

The emission spectra (as shown in figure 3 (d)) of Dy doped LaCOB glasses consist of two important emissions in blue color at 470 nm and yellow color at 575 nm wavelengths. The appropriate color combinations of blue and yellow light results into a white light emission. CIE diagram is provided for an understanding of color relationships [2, 5, 7, 17]. This outcome it is predict that Dy doped LaCOB glasses can be intended for white light emitting devices under ultraviolet excitation.

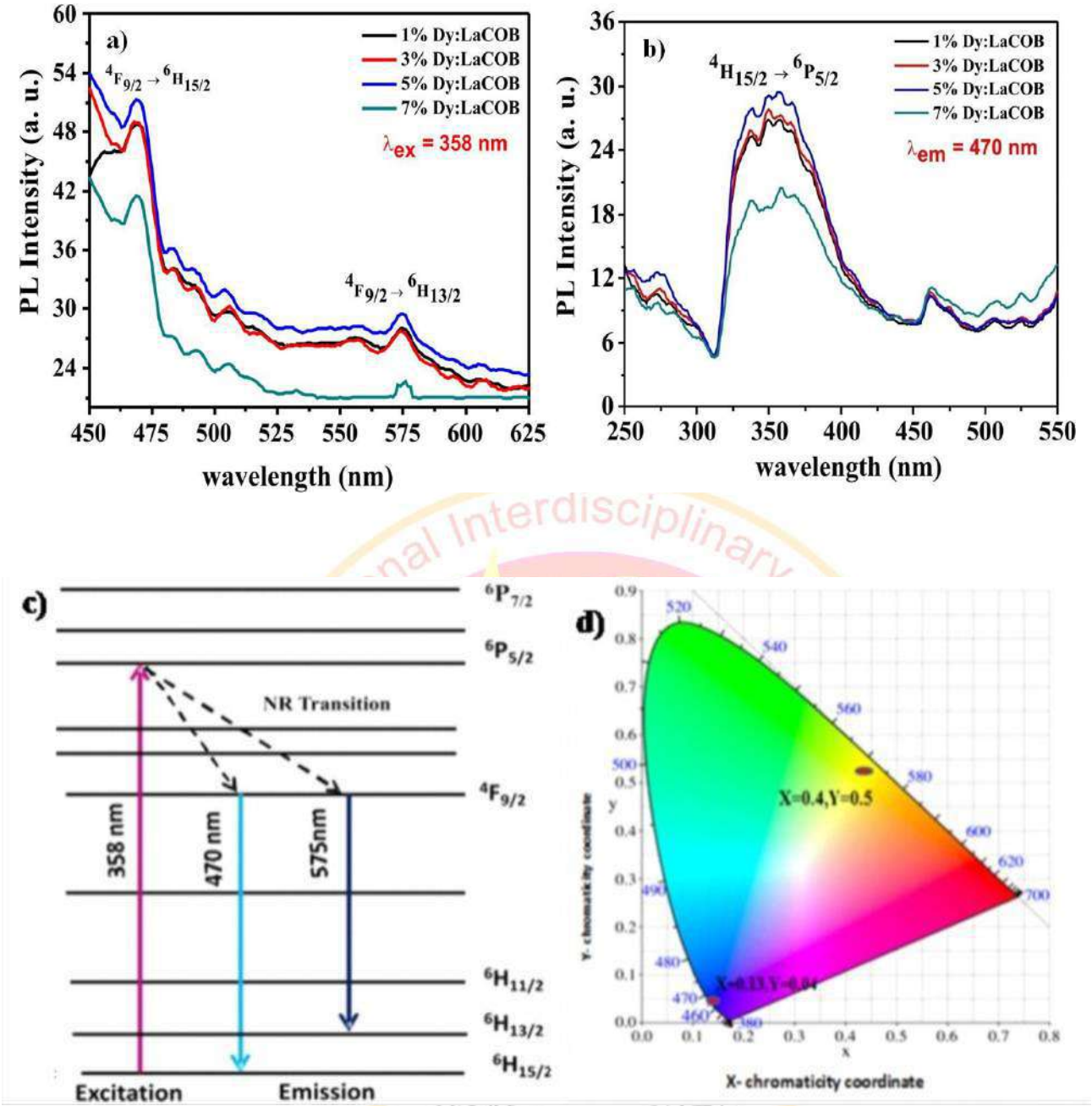

Figure 3.
a) Emission spectra, b) Excitation spectra,
c) Energy level diagram of Dy^{3+} ions showing transition and
d) The CIE diagram of Dy: LaCOB glasses.

Conclusion

The Pure and Dy doped LaCOB glasses are successfully synthesized by melt quenching method. The amorphous nature of the glasses was confirmed by XRD technique. Borate glasses pure and Dy doped LaCOB have been fabricated and characterized their properties through emission spectra and CIE 1931 color chromaticity studies. The photoluminescence of Dy^{3+} ions were studied and related to the host matrix nature. It is clear that there are two emission bands $^4F_{9/2} \rightarrow ^6H_{15/2}$ and $^4F_{9/2} \rightarrow ^6H_{13/2}$ over the excitation wavelength of 358 nm these bands correspond to the electron transitions from the discrete levels $^4F_{9/2} \rightarrow ^6H_{15/2}$ and $^4F_{9/2} \rightarrow ^6H_{13/2}$ transitions respectively for Dy^{3+} and which confirmed the presence of trivalent rare-earth ions in the glass matrix. The photoluminescence intensity for both blue and yellow emissions increased with the concentration of Dy^{3+} ions reaching a maximum at x = 0.05, and then it decreased for x = 0.07 because of concentration

quenching. It also provides guidelines for several applications in connection with industrial and technological needs. This outcome may potential to expand emission display and laser material applications.

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Optical Propertiesand IV characteristic of proton conductor solid polymer electrolyte

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Abstract:
In the present work proton conductor solid polymer electrolyte was prepared by solution cast technique. The dc conductivity was obtained from I-V characteristics by using Kitley 6487 picoammeter/voltage source meter instrument at various constant temperature. UV-Vis Double Beam Spectrophotometer in the wavelength range (190-700) nm were used to investigate the optical properties. It was found that the energy band gaps are decreased upon the increase of salts concentration. This is explained in terms of charge transfer complexes between the dopant and host matrix
Keywords: Polyvinyl alcohol, Ammonium Iodide, Optical properties

Introduction:

In recent year, there has been increase in focus on replacing traditional aqueous electrolyte by solid polymer electrolyte. Due to flexibility electrochemical stability, long life etc. Among solid polymer electrolyte proton conducting polymer electrolyte have receive considerable very much attention due to their large *applications.* Polyvinyl alcohol (PVA) is commercial availability, dopant dependent electrical and optical property, good film forming ability, mechanical strength, low cost etc. It has carbon chain backbone with hydro-oxyl group attach to the methane carbon. PVA is a nontoxin and water-soluble polymer having good charge storage capacity [1]. The electrical and optical properties of polymers can be modified by the addition of suitable dopants. [2-6]. This paper presents the results of investigations on the electrical and optical properties of NH_4I doped PVA films.

Experimental technique

In the present study, polyvinyl alcohol, ammonium iodide and deionized water were used to prepare solid polymer electrolyte. A solid polymer electrolyte system based on polyvinyl alcohol (PVA) with ammonium iodide (NH_4I) was prepared using solution cast technique. The film of pure and different composition of PVA -NH_4I has been prepared by solution cast technique. In this technique, appropriate amount of PVA and NH_4I have been dissolved individually in deionizedwater. These solutions have been mixed together in different molar ratio and stirred well by using magnetic stirred for 10-12 hr to obtained homogenous mixture. The obtained mixture is casted in petri dish. The whole assembly was placed in dust free chamber. The solvent was allowed to evaporate slowly at room temperature for 3-4 days. The films have been formed with uniformed thickness.

Result and Discussion:

I-V Characteristics

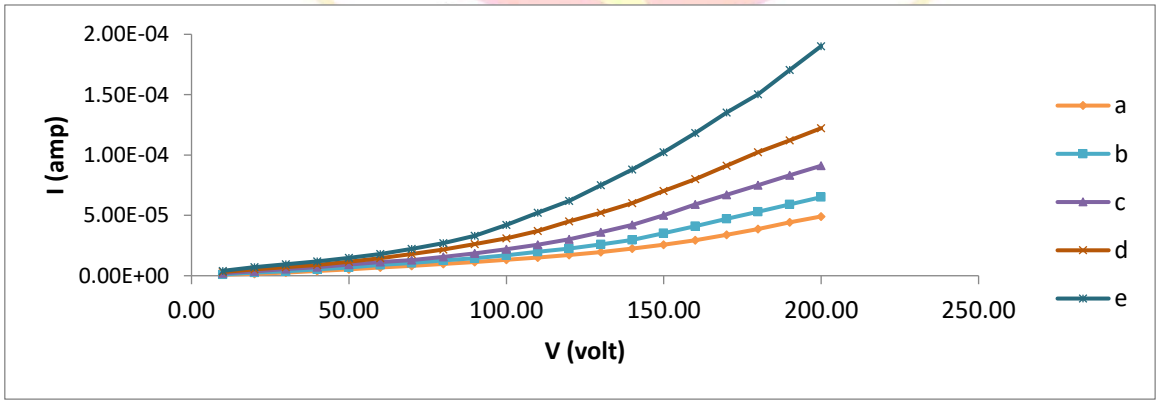

Fig 1: Variation of current (I) with voltage (V) for PVA with different (a) 5 mole %, (b) 10 mole %,(c) 15 mole %, (b) 20 mole %, (d) 25 mole % of NH_4I.

Current (I) with Voltage (V) characteristics of polyvinyl alcohol with ammonium iodide of different mole percent as shown in figure (1). The current increases linearly with applied voltage and followed ohmic conduction [7]. But in fig 1 when added the concentration of ammonium salts the current increases nonlinearly with applied voltage and absence of Ohmic conduction this mechanism is very different to intrinsic

semiconductor. There is no permanent dipole and random charge trap in sample. The localize motion of charge traped in the sample serves as effective electric dipole, when external electric field is applied. As a result, quasi particle was createdpolarons and bipolarons acts as charge, therefore the curve is nonlinear, when the strength of electric field is increases, the formation of charge are increases which contributing to increase in current with respect to voltage [8-9].

Optical properties:

Optical absorption spectra of PVA doped withammonium iodide in different molar percentages were carried out over a wavelength range 190-700 nmto determine the optical constants such as direct and indirect band gap. Most of the time, bandwidth divides semiconductors and insulations intotwo main parts, namely direct show energy bandwidth materials and indirect energy bandwidth materials. Valence and conduction bands both are exhibited a very less (zero) crystal momentum indirect bandgap. But in the indirect bandgap, the conduction band doesn't agree to crystal zero momentum and shift of the phonon energy. Shalliday and Davishad explained both the direct and indirect bandgap that occur near the basic edge of the band both direct and indirectand can be observed by plotting $(\alpha h\upsilon)^2$ and$(\alpha h\upsilon)^{1/2}$ as a function of energy hυ. [10]

The analysis of Thutpalli and Tomlin isbased on the following relations [11].

$(\alpha h\upsilon) = \beta_1(h\upsilon - E_{gd})^{1/2}$---------- (1)

$(\alpha h\upsilon) = \beta_2(h\upsilon - E_{gi})^{2}$---------- (2)

For direct and indirect electron transitions respectively, where hυis the photonenergy, $E_{gd}$is the direct band gap, E_{gi} is the indirect band gap, α is the absorption coefficient, and β_1, β_2 are constants. These expressions willbe helpful in the determination of the band structure of materials. To determine thenature and width of the band gaps $(\alpha h\upsilon)^2$ and $(\alpha h\upsilon)^{1/2}$ were plotted as a function ofincident photon energy.The direct band gap values are obtained from the plots of $(\alpha h\upsilon)^2$vs.hυshown in figure 2.

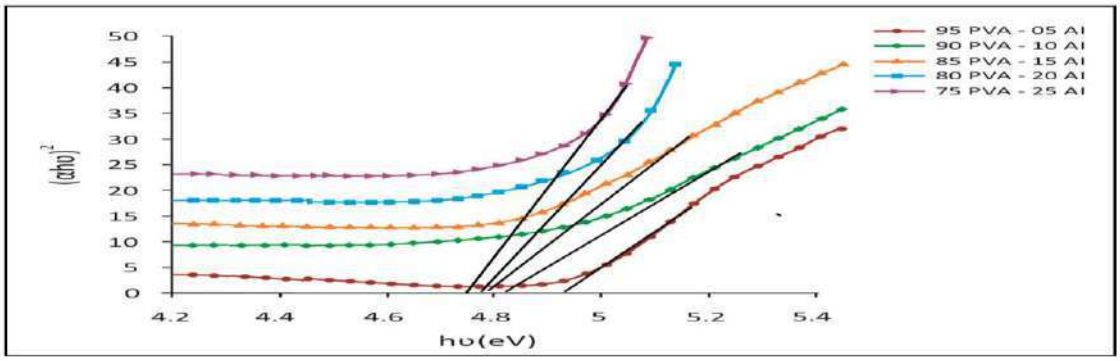

Fig:2 $(\alpha h\upsilon)^2$ as function of photon energy (hυ) for PVA with different ammonium iodide

The direct band gap value is determined byextrapolating the linear portion of the curve on to the energy axis. Theintercept on the x-axis gives the direct band gap energy value. It isshow that band gap decreases with increase in ammonium salt concentration. The direct band gap lies within 4.94ev to 4.74 ev.

For indirect transitions, which require photon assistance, the absorption coefficient has the following dependence on the photon energy

$\alpha h\upsilon = A(h\upsilon - E_g + E_p)^2 + B(h\upsilon - E_g + E_p)^2$

where Ep is the energy of the photon associated with the transition and A and B are constants depending on the band structure. The indirect band gaps were obtained from the plots of $(ahv)^{1/2}$ vs hν (photon energy) plots as shown in Fig 3.

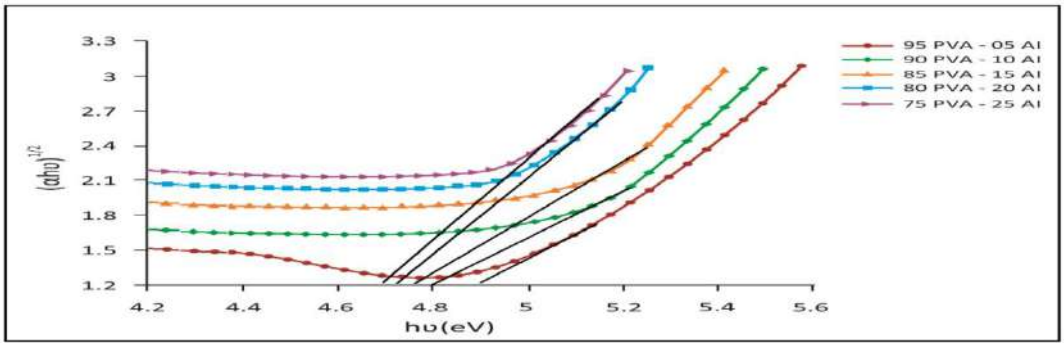

Fig: 3$(\alpha h\upsilon)^{1/2}$ as function of photon energy (hυ)for PVA with different ammonium salt

The indirect band gap value is determined by extrapolating the linear portion of the curve on to the energy axis. The intercept on the x-axis gives the indirect band gap energy value. The indirect band gap lies with 4.92 eV to 4.71 eV.It is observed that as the dopant concentration of polymer electrolyte is increased, thevalues of band gap energy have decreased gradually. This indicates theeffect of complexation on the value of band gap. Ammonium salt beingadded to the PVA polymer to enhance proton conduction. [12-15]

Conclusion:

Proton conductor solid polymer electrolyte of polyvinyl alcohol doped with different concentrationof ammonium iodidehas been successfully prepared by solution cast technique.In this investigation, I-V characteristics of prepared samples were studied. Optical absorption spectra of PVA doped with ammonium iodide in different molar percentages were carried out over a wavelength range 190-700 nmto determine the optical constants such as direct and indirect band gap. It was revealed that the energy band gaps are decreased with the increasing of salts concentrationdueto charge transfer complexes between the dopant and host matrix

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Study of Ac Electrical Conductivity and Dielectric Constant of 1:1 Pmma PVDF Polyblends At Various Temperatures and Frequencies

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Abstract

In the present work dielectric constant and ac conductivity of PMMA and PVDF (1:1) blend sample have been investigated at various constant temperatures ranging from (313K to 343K), in the frequency range of (1KHz to 500KHz).The results have been presented in the form of graphs. It has been found that the dielectric constant increases with increase of temperatures at constant frequencies, the dielectric constant decreases with decrease in temperatures at constant frequencies, the AC conductivity increases with frequencies at various constant temperatures. They attain almost saturation values as the frequency approaches its maximum value.

Index Terms: 'Solution cast method', percentage of amorphousness/crystallinity,1:1 (PMMA+PVDF), AC conductivity, dielectric constants etc.

Introduction

When two or more polymers are mixed together, polyblends or polymer alloys are obtained. This physical mixing or blending of two polymers produces alloys with quite different properties, which can be potentially useful. Two polymers are generally incompatible as they have very low combinatorial entropy of mixing for the components. This is insufficient to overcome the positive heat of mixing of polymers to make the Gibb's free energy of mixing negative. Only in the presence of specific interaction between two polymers (e.g. Hydrogen bonding, acid-base type interaction etc.), heat of mixing is negative that makes the free energy of mixing a negative quantity and then the mixing is spontaneous. Unlike the mixing of small molecules, the dictum like likens like does not hold good for mixing of macromolecules. However, both compatible and incompatible blends are industrially important materials. Two polymers may form the compatible blend, which exists as single phase. The incompatible blends on the other hand exist as two- phase system. Since most blends combine immiscible components and so the material that results contains tiny particles of one polymer in a matrix of the other. Controlled mixing and cooling of the blend makes it possible to form the .particles in the optimum concentration and range of sizes. Blending makes it possible to combine the good properties of several polymers. The most direct method to obtain a polyblend is to mix two component polymers in the molten state (melt mixing). In this case the extent of mixing depends on the rate of diffusion of the molecules. Since such a mixing requires high temperature, the polymer may decompose and undergo chemical changes.

Experimental Technique

Method of preparation of PMMA-PVDF (1:1) Undoped blends film:

Sample Preparation

Preparation of thin films using Pool of Mercury (As shown in fig 1).In the present work, Isothermal Evaporation Technique (Sangawar 1995,Belsare and Deogankar 1998) has been used, as it is best suited to the conditions in the laboratory. The two polymers PMMA-PVDF were taken in the ratio 1:1 were dissolved in the common solvent Dimethyl Formamide (DMF).The solution was kept for 1-2 days to allow polymers to dissolve completely to yield uniform solution. The solution mixture was stirrer with constant slow uniform speed for 1 hour at room temperature to get completely homogeneous solution. A glass plate (15 cm x 15 cm) thoroughly cleaned with water and later with acetone was used as a substrate. To achieve perfect levelling (and uniformity in thickness of the films), a pool of mercury was used (figure given below) in a plastic tray. The solution was poured on the glass plate and was allowed to spread uniformly in all directions on the substrate. The whole assembly was placed in a dust free chamber at room temperature. The solvent in the solution was thus allowed to evaporate completely and get air-dried. The film on the glass substrate was then removed and cut into small pieces of suitable sizes. In this way the films were prepared by isothermal evaporation technique. Further it was dried for 1 day to remove any traces of solvent.

Fig. 1 Pool of mercury

The solution was poured on the glass plate and was allowed to spread uniformly in all directions on the substrate. The whole assembly was placed in a dust free chamber at room temperature. The solvent in the solution was thus allowed to evaporate completely and get air-dried. The film on the glass substrate was then removed and cut into small pieces of suitable sizes. In this way the films were prepared by isothermal evaporation technique. Further it was dried for 3 days to remove any traces of solvent.

Thickness Measurement

The thickness of each sample film was measured at the four different places by using the Digital Micro meter (Mitutoyo Corporation, Japan) as shown in fig 2 . The average of four readings was taken as the sample thickness.

Fig 2. Digital Micrometer

Measurement of AC Electrical Conductivity and Dielectric Constant

The sample holder with temperature controlled electric oven supplied by **Pushpa Scientific, Hyderabad**, in conjunction with **4284 A Precision LCR meter (20 Hz - 1MHz) supplied by Agilent Technology, Singapore** has been used for the measurement of AC electrical conductivity and dielectric constant.

Fig.3 LCR meter and sample holder for the measurement of AC conductivity

The film sample was loaded into the sample holder in an oven. The entire experimental set up is as shown in fig 3.The AC frequencies were applied (in the range 1 KHz -1 MHz) across the sample by using the 4284 A precision LCR meter (20 Hz -1 MHz). The corresponding dielectric constants were measured by using LCR meter. From the dielectric data, the AC conductivity of the samples was calculated by using the relation [Rao, 2000],

$$\sigma_{ac} = \frac{f \cdot \varepsilon_r \cdot tan(\delta)}{1.8 \times 10^{10}}$$

Where,

f = Frequency applied in Hz

ε_r= Dielectric Constant at frequency f

$tan(\delta)$ = Dielectric loss tangent**.**

Results And Discussion

Several researchers [Shukla and Gupta 1987 , , Aziz and Aggour 1999, Khaled et al. 2003, Raghvendra et al. 2003, Muhammad Akram 2005] have studied the AC electrical conduction / Dielecrtic properties of various polymers composites . In the present work dielectric constant and ac conductivity of 1:1 PMMA-PVDF blend sample have been investigated at various constant temperatures ranging from (313K to 343K), In the frequency range of (1KHz to 500KHz).The results have been presented in the form of graphs (Fig no. 4, 5, 6, 7).

The graphs have been plotted for the variation of

1) *AC conductivity with frequencies at various constant temperature.*

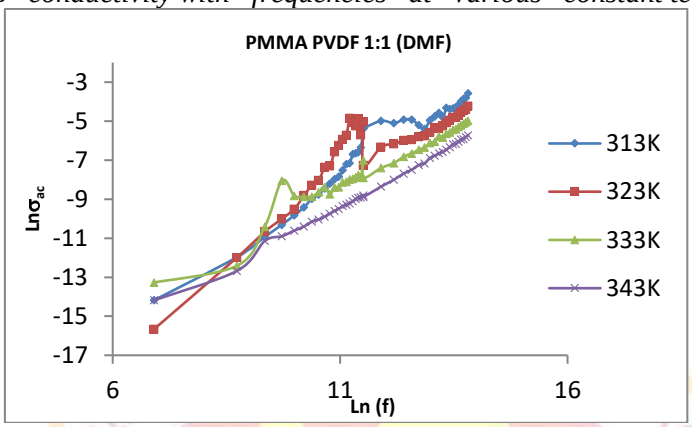

Fig. 4 $\log_e(\sigma_{ac})$s versus $\log_e(f)$

2) *Dielectric constant ε_r with frequency at various constant temperature.*

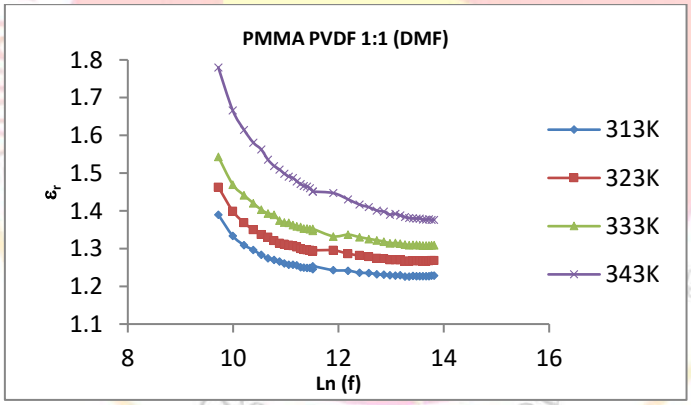

Fig. 5 ε_r *versus* $\log_e(f)$

3) *Dielectric constant with temperature at various constant frequencies.*

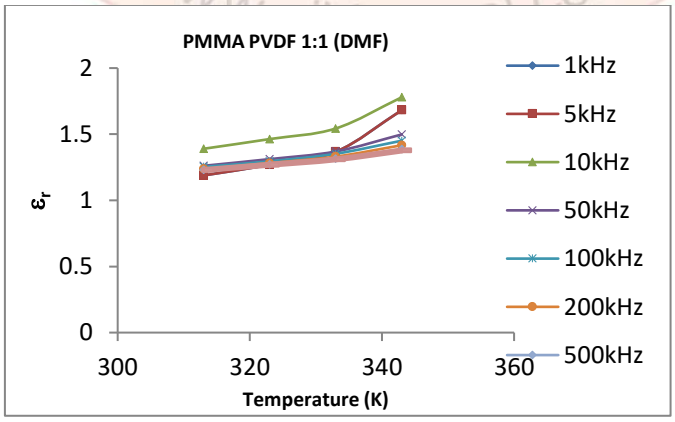

Fig. 6 ε_r versus temperature

4) *AC conductivity with temperature at various constant frequencies*.

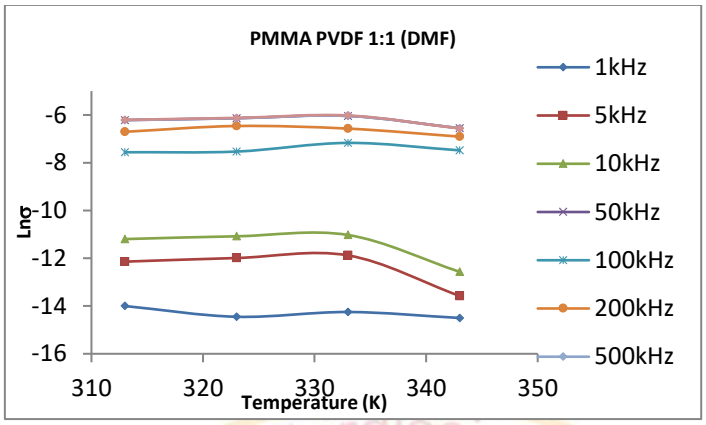

Fig. 7 $\log_e(\sigma_{ac})$s versus temperature

The following parameters have been consider for discussion
1) Dielectric constant(ε_r)
2) AC electrical conductivity(σ_{ac})

1) The Dielectric Constant (ε_r)
i) Increases with the increase of temperature
ii) Decreases with the increase of frequency

2) The AC conductivity (σ_{ac})
i) increases almost linearly with frequency above 1KH at the various constant temperatures and it attains almost constant saturation values as the frequency approaches its maximum value 1MH.
ii) At the constant frequency, seems to remain almost constant with the increases of temp in the range 313K to 363K.

Effect of temperature on dielectric constant:

It has been noticed that, there is an increase in the value of dielectric constant with the increase of temperature in case of 1:1 PMMA and PVDF polyblend samples.
Among two polymers used to form a blend system PVDF is non- polar while PMMA is weakly polar polymer. The introduction of polar polymer into the non-polar one is reported to reduce its resistance and hence increases the conductivity and also the dielectric constant.

Effect of frequency on dielectric constant:

The microscopic behaviour of the dielectric material under the influence of ac electric field can be understood from the polarization which constitutes a dielectric or which is introduced during its preparation. The polarization effect is dependent on the nature of dipoles and the frequency of the applied electric field.
As stated earlier, under the static electric field or the ac field of low frequency, the net polarization of the sample is contributed by electronic polarization, atomic polarization and orientational polarization. As the frequency is increased, orientational polarization becomes unable to follow field variation at higher frequencies. As a result dielectric constant decreases with the increase of frequency [Muhd. Akram et al.,(2005); Reda,(2006); Rao et al., (2000)].

Effect of frequency and temperature on ac conductivity:

The ac conductivity has been measured by increasing the frequency from 1KH to 1MHz at various constant temperatures 313K, 323K, 333K, and 343K for the blend system. It has been noticed that the ac conductivity increases with the increase in frequency. [Tripathi S. K. and Gupta A. (2012)]

Conclusions

1) The dielectric constant increases with increase of temperatures at constant frequencies
2)The dielectric constant decreases with decrease in temperatures at constant frequencies
3)The AC conductivity increases with frequencies at various constant temperatures
4)They attain almost saturation values as the frequency approaches its maximum value.
5) The dielectric constant does not significantly vary with temperature in the temperature range from (313K to 343K).

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Thermal Studies Of Thiazole Schiff Base Complexes Of Vo(Iv), Zr(Iv) And Uo_2(Vi)

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Abstract:

Newly synthesized product thiazole Schiff base was derived from the condensation of thiazole and 2-hydroxy-5-chloro-3-nitro acetophenone. The Schiff bases behaved as charge bidentade ligand. The ligand was characterized by elemental analysis and spectral methods. The coordinating ability of the ligand is investigated by preparing its metal complexes with VO(IV), Zr(IV) and UO_2(VI) have been prepared and characterized by elemental analysis, conductance measurements, molecular weight determinations, spectral and thermal studies. The synthesized products are coloured solids, soluble in DMF, DMSO and THF.

Keywords: *Schiff base, Magnetic susceptibility, Thermal*

Introduction :

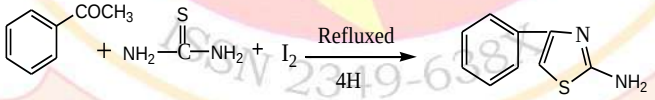
The newly synthesized Schiff bases, 2-acetylthiophene thiosemicarbazone and thiophene-2-aldehyde thiosemicarbazone and their metal complexes with Co(II), Cu(II), Zn(II) and Ni(II) complexes and Their Schiff bases metal complexes were tested for antibacterial activity[1] The Schiff bases play a significant role in the area of coordination chemistry. Synthesis, characterization and antifungal activity of manganese (II) complex with Schiff Base derived from acetylacetone andl leucine[2] and Spectral and thermal characterization of metal complexes containing schiff Base ligands.[3] Compounds containing an azomethine group (CH=N), known as Schiff bases, were formed by the condensation of a primary amine with a carbonyl compound. Schiff bases of aliphatic aldehydes were relatively unstable and were readily polymerizable. Schiff bases and their complexes are shows good progress in thermal analysis[4]. The thermogravimetric technique has been great significance research method on thermal stabilsation and thermal decomposition. Thermogravimetric could provide theory for material heating treatment and application.[5,] The aim of present investigation is to synthesize various transition metal complexes of Schiff base derived from 2-hydroxy-5-chloro-3-nitro acetophenone and 2-amino-4-phenylthiazole

Experimental ;

All the chemicals were of A.R. grade and used as received. 2-hydroxy-5-chloro-3-nitro acetophenone (HCNA) and 2-amino-4-phenylthiazole was prepared by known methods[6-9]. The solvents were purified by standard methods[10].

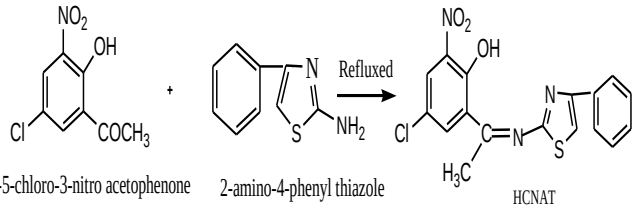
Synthesis of 2-amino-4-phenylthiazole;

The synthesis of 2-amino-4-phenylthiazole prepared by known method[7-9]. The product was filtered and crystallized from 70% ethanol, after several minutes the golden coloured product of 2-amino-4-phenylthiazole was separated out. Yield: 9g (75%); m.p.: 148-150^{0}C



Acetophenone 2-amino-4-phenylthiazole

Synthesis of 2-hydroxy-5-chloro-3-nitroacetophenone 4-phenyl-2 imino thiazole [HCNAT]: A solution of 4-phenyl-2 imino thiazole (0.02M) in 25ml of ethanol was added to an ethanolic solution(25ml) of 2-hydroxy-5-chloro-3-nitro acetophenone (0.02M) and the reaction mixture was refluxed on a water bath for 4h. After cooling a pale yellow coloured crystalline solid was separated out. It was filtered and washed with ethanol, crystallized from DMF and dried under reduced pressure at ambient temperature. The purity of ligand was checked by elemental analysis and m.p. It was also characterized by IR and ^{1}H NMR spectral studies. Yield:75%; m.p. 305^{0}C



2-hydroxy-5-chloro-3-nitro acetophenone 2-amino-4-phenyl thiazole HCNAT

Table1. Analytical data of the Ligands.

Ligand	Molecular Formula	Formula Weight	Color and nature	Elemental Analysis			
				C% found (Cal.)	H% Found (Cal.)	Cl% Found (Cal.)	S% Found (Cal.)
HCNAT	**$C_{17}H_{12}N_3O_3SCl$**	**373.06**	**Yellow Crystalline**	**52.35 (52.20)**	**03.20 (03.34)**	**9.22 (9.38)**	**08.34 (08.46)**

Preparation of complexes: All the metal complexes were prepared in a similar way by following method. To a hot solution of ligand HCNAT (0.02M) in 25ml of ethanol a suspension of respective metal salts was added drop wise with constant stirring. The reaction mixture was refluxed on a water bath for 3-5 h. The precipitated complexes were filtered, washed with ethanol followed by ether and dried over fused calcium chloride. Yield : 55-60%

The complexes are soluble in DMSO and DMF but insoluble in water and common organic solvents. The metal chloride content of complexes were analyzed by standard methods11,12 The 1H NMR spectra of ligand was recorded and obtained from RSIC Chandigarh. IR spectra of the compounds were recorded on Perkin Elmer 842 spectrophotometer in the region 400-4000cm-1, Carbon, Hydrogen and Nitrogen analysis were carried out at RSIC, Punjab University, Chandigarh. The molar conductance of the complexes at 10-3 M dilution in DMF were determined using equiptronic digital conductivity meter EQ-660 with a cell constant 1.00 cm-1 at room temperature. The magnetic moment measurement were made on a Gouy balance at room temperature using [HgCo(SCN)4] as the calibrant. The thermogravimetric analysis were performed on laboratory set up apparatus in air atmosphere at 100 C min-1 heating rate. The molecular weights of the complexes were determined by Rast method

Table 2. Analytical data and molar conductance of the compounds.

Ligand	Formula weight g $mole^{-1}$	Colour	Elemental Analysis Found (Calcd.)				μ_{eff} B.M	Λ_M (Ω^{-1} cm^2 mol^{-1})
			M%	C%	H%	Cl%		
$[VOL_2]$	812.2	Green	5.65	48.23	2.35	8.42	1.5	12.1
			(6.09)	(48.29)	(2.86)	(8.69)		
$[ZrL_2(OH)_2]\ 2H_2O$	906.4	Yellow	9.42	43.23	3.26	7.46	Dia	16.8
			(9.61)	(43.68)	(3.39)	(7.64)		
$[UO_2L_2]$	1015.3	Orange	22.34	38.58	2.12	6.52	Dia	14.7
			(22.62)	(38.63)	(2,22)	(6.86)		

Result and Disscution :

The Schiff base HCNAT and its complexes have been characterized on the basis of ^{1}H NMR, IR spectral data, elemental analysis, molar conductance, magnetic succeptibility measurements and thermogravimetric analysis data .

All these values and analytical data is consistent with proposed molecular formula of ligand . All the compounds are coloured solid and stable in air. They are insoluble in water but soluble in coordinating solvents like DMF and DMSO. The molar conductance values in DMF(10-3 M) solution at room temperature (Table2) shows all the complexes are non electrolytes.

The 1H NMR spectra of ligand shows signals at δ 12.14,(1H, s phenolic OH), δ 7.56, 7.54, 7.53 and 7.52 (4H, m, phenyl) δ 6.81,6.80, and 6.78 (3H, s, Phenyl), 6.68 (1H,s, thiophene), and 2.56 (3H, s, methyl) 11,13-15.

IR spectra of ligand and metal complexes shows (C=N) peaks at 1622 cm-1 and absence of C=O peak at around 1700 – 1750 cm-1 indicates the Schiff base formation16-19.

3. IR spectra of ligand and metal complexes

Compound	(O H) hydrogen bonded	(C=N) imine	(C O) phenolic	(M O)	(M N)	(C S)
HCNAT (LH)	3119	1622	1514	--	--	1126
$[VOL_2]$	--	1595	1508	515	438	1092
$[ZrL_2(OH)_2]\ 2H_2O$	--	1605	1499	448	418	1102
$[UO_2L_2]$	--	1590	1448	542	485	1074

Thermogravimetric studies: Thermogravimetric study indicates all the complexes are stable up to 60-700C. All the complexes shows half decomposition temperature(Table 4). The Thermal activation energy was calculated by Freeman-Carroll,20 Horowitz-metzger21 and Broido22 method.

Table 4. Thermal decomposition data of HCNAT and its complexes.

Compounds	**Half Decompo-sition** Tempera-ture **(°C)**	**Activation Energy (kJ mole^{-1})**			**Frequency Factor** Z **(sec^{-1})**	**Entropy Change -ΔS (J mol^{-1} K^{-1})**	**Free Energy Change ΔF (kJ mol^{-1})**
		B*	H-M**	F-C***			
HCNAT (LH)	260.46	3.22	5.47	4.31	87.28	211.42	118.65
$[VOL_2]$	400.35	5.22	8.62	6.36	138.82	211.82	148.78
$[ZrL_2(OH)_2]\ 2H_2O$	711.30	7.43	18.56	11.18	222.62	208.72	217.68
$UO_2L_2]$	800.00	19.88	22.16	17.69	353.24	207.74	239.69

Conclusions :

There is synthesized new ligand 2-hydroxy-5-chloro-3-nitro acetophenone 4-phenyl-2 imino thiazole and their metal complexes. Ligand was found to bind the metal ion monobasic (ON) bidentate manner. Conclusion of thermal decomposition temperature and activation energy of synthesized Schiff base metal complexes

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Investigation on Ionic Conductivity of PVA-PEG with NH_4Br Polymer Electrolyte

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Abstract:
A solid polymer film based on polyvinyl alcohol (PVA) and polyethylene glycol (PEG) complexed with ammonium bromide (NH_4Br) was prepared using solution cast technique. The ionic conductivity of the films was measured in the temperature range 323K–363 K. Dielectric constant and temperature dependant values of PVA –PEG poly blend film with NH_4Br where measured in the frequency range 20Hz-1MHz. The decrease in dielectric constant was observed with increase in frequency and also observed increase in temperature.
Keywords: PVA-PEG, NH_4Br, Ionic conductivity.

Introduction

In recent year, electrical conduction in polymer have been studied to understand the nature of charge transport. Polymer is a good insulating material with low ionic conductivity. PEG are synthetic water soluble polymers. They have a wide range of applications, including use in pharmaceutical experiments, food additives and plasticizers [1-2]. Polyvinyl alcohol (PVA) are commercial availability, dopant dependent electrical and optical property, good film forming ability, mechanical strength, low cost etc. It has carbon chain backbone with hydro-oxyl group attach to the methane carbon. PVA is a nontoxin and water soluble polymer having good charge storage capacity [3]. To increase the ionic conductivity depend on the addition of some dopant (ammonium salts) in polymer. Ammonium salts have been a very good proton doner to the polymer matrix system and to increase the conductivity [4-6]. Over the course of a year, a number of approaches were tested to increase the ionic conductivity of these polymeric electrolytes in the addition to developing new electrolytes **[7-9].** This system has been studied on account of the fact that both polyethylene glycol (PEG) and polyvinyl alcohol (PVA) are separately reported to form highly amorphous complexes and gels with salts and acids [10–13].

Eperimental technique

In the present study, polyvinyl alcohol, polyethylene glycol, ammonium bromide and deionized water were used to prepare solid polymer electrolyte. A solid polymer electrolyte system based on polyvinyl alcohol (PVA) and polyethylene glycol (PEG) complexed with ammonium bromide (NH_4Br) was prepared using solution cast technique. The film of pure and different composition of PVA-PEG-NH_4Br has been prepared by solution cast technique. In this technique, appropriate amount of PVA-PEG and NH_4Br have been dissolved individually in double distilled water .These solution have been mixed together in different molar ratio and stirred well by using magnetic stirred for 10-12 hr to obtained homogenous mixture. The obtained mixture is casted in petri dish. The whole assembly was placed in dust free chamber. The solvent was allowed to evaporate slowly at room temperature for 3-4 days. The films have been formed with uniformed thickness.

Result and discussion

Ionic conductivity

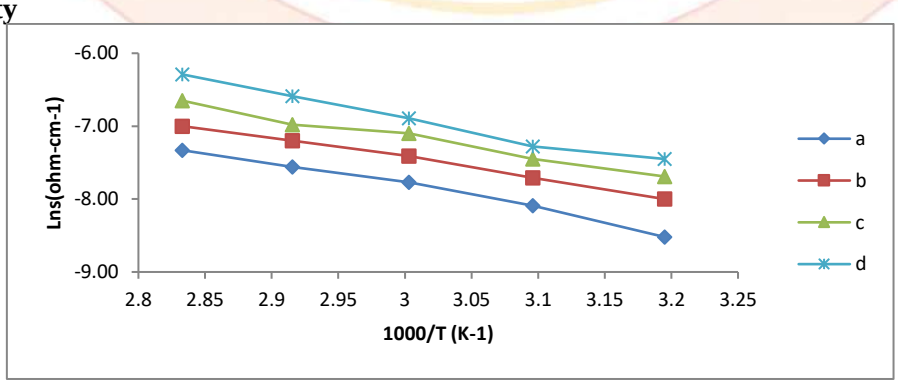

Fig 1:Variation of conductivity ln (σ) with temperature (Arrhenius plots) for (a) PVA-PEG with different (b) 5 mole %, (c) 15 mole %, (d) 25 mole % of NH_4Br.

The temperature dependence conductivity, lnσ verses 1000/T as shown in fig 1. The conductivity of solid polymer electrolyte PVA-PEG-NH_4Br is mostly depend on temperature. The temperature increases conductivity also increases in accordance with Arrhenius equation is given by -

$\sigma_T = \sigma_0 \exp(-Ea\backslash kT)$

Where σ_0 is the pre exponential factor, E_a is the activation energy and k is the Boltzmann constant [11-12]. The ionic conductivity is enhanced with increase of temperature and added with mole percent of ammonium bromide which suggest that the free volume around the polymer chain system increases causes the mobility of ions and polymer segments [13]. The segmental motion either allows the ions to hop from one side to another side. Hence ionic motion in polymer electrolyte is due to hopping of ions from one side to another site and the dynamic segmental motion of polymer , and accordingly the conductivity of polymer electrolyte becomes high. The ionic conductivity studies shows that the conductivity has been greatly affected by the addition of salt and the maximum conductivity has been observed for 25 mole % of salt doped in poly blend electrolyte.

Dielectric constant:

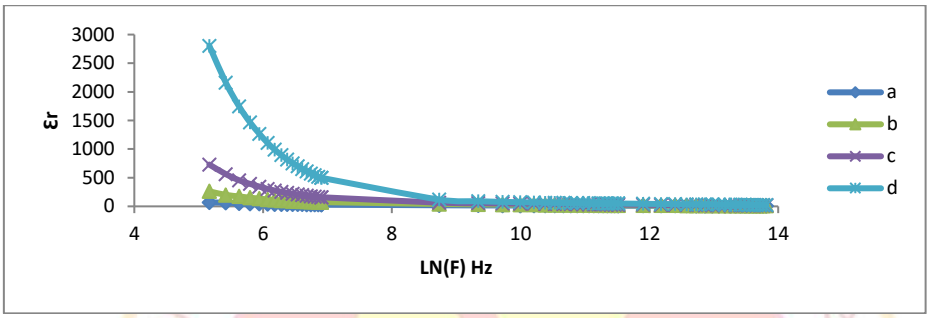

Fig 2: Variation of Dielectric constant with frequency (a) PVA-PEG (b) 5 mole %, (c) 15 mole %, (d) 25 mole % of NH_4Br.

The frequency dependent dielectric constant of PVA-PEG-NH_4Br mole % as shown in (figure 2) . It is observed that dielectric constant is high at low frequency. Due to contribution of charge accumulation at electrode-electrolyte interface. But in high frequency dielectric constant decreases and nearly constant value with increases in frequency. This is due to the dipole not being able to follow apposite of electric field variation at higher frequency [14-15].

Conclusion

A solid polymer electrolyte system based on polyvinyl alcohol (PVA) and polyethylene glycol (PEG) complexed with ammonium bromide (NH_4Br) was prepared using solution cast technique. The frequency dependant dielectric constant decreases with increase in frequency. It is reveal that electrical conductivity of PVA-PEG doped with NH_4Br increases with increasing salt concentration as well as temperature, which is attributed to the formation of charge transfer complexes.

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Magnetite Iron Oxide/Activated Charcoal (Fe_3O_4-AC) Composite for Arsenic Removal

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Abstract:

The article focuses on the development of magnetic Fe_3O_4 over the activated charcoal for the removal of arsenic (III) from synthetic aqueous solution. Chemical activation of activated charcoal was done using HNO_3 at 200°C to enhance the adsorption capacity of activated charcoal. Again, to enhance its adsorption capacity it was loaded with magnetic Fe_3O_4 which was synthesized by hydrothermal process. Batch study was conducted in which effect of pH, effect of contact time, effect of adsorbent dose on the arsenic adsorption were studied. The results shows that the activated charcoal loaded with magnetic Fe_3O_4 could remove arsenic very effectively at pH 8 at maximum adsorbent dose 1.2 g/L with the contact time 45 min at room temperature. Furthermore, the adsorption data were studied with Langmuir and Freundlich adsorption isotherm to analyze the equilibrium of the experiment. Langmuir model best fitted with the experimental results with the maximum adsorption capacity 7.28 mg/g. this finding indicated that the activated charcoal loaded with magnetic Fe_3O_4 could be used for the removal of trivalent arsenic from aqueous solution.

Keywords: Arsenic (III), Fe_3O_4, Activated charcoal, Langmuir model, Freundlich model

Introduction:

The whole countries in the world facing a problem of waste water contamination and its purification [1]. The government agencies around the world searching out the solution of wastewater contamination and its treatment by making various policies and in that Indian government specially focus on the swachchabharatabhiyan through that the treatment water of ganga river is the mainline task now a days. For the treatment of wastewater and also for the removal of toxic metal ions, organic and inorganic pollutants there are many methods available like reverse osmosis, physico-chemical treatment, advance oxidation treatment, coagulation-flocculation process, ion exchange, membrane filtration etc [2]. But treatment of wastewater is not an easy task because many facts have to be considered if we are looking for the treatment of wastewater. In to that first one is the process should be feasible, it should be carryout at any suitable workplace, it should be cost effective and as the green parameter consist it should not generate waste [3]. Looking in to that view the current work was carries out in which the removal of toxic metal i.e., arsenic from the synthetic aqueous solution onto the Magnetite Iron Oxide/Activated Charcoal (Fe_3O_4-AC). The activated charcoal is well known for the purification of wastewater because of its high porosity, easy availability, cost effective and Regenerability [4-6]. Furthermore, is surface is available for the modification by using surface active agents, nanomaterial, polymers etc. which will enhance its BET surface area and ultimately the adsorption capacity increases. Arsenic contamination is the major concern the various parts of the India [7]. As per the WHO guideline the maximum permissible limit for the arsenic in groundwater is 10 µg/L but in India highest concentration of arsenic was found to be in the range 0.003 - 3700µg/L. Usually inorganic arsenic is more toxic than the organic arsenic. In natural water arsenic persist in two oxidation state: arsenite (+3) and arsenate (+5). Long-term exposure to arsenic from drinking-water can cause diverse types of cancers, including skin, lungs, urinary bladder, kidney liver, and prostate cancers [8-9]. In developing countries two methods are widely used for the arsenic removal from wastewater one is precipitation and another is adsorption. A large amount of chemicals is required in precipitation method which finally creates sludge in the form of arsenic sulfide, calcium arsenate or ferric arsenate. On the other hand, adsorption method is easy to handle, cost effective and efficient and can be applied for the treatment of wastewater containing trace amount of pollutants [10]. Hence, the objective of this study was to find out the adsorption capacity of Magnetite Iron Oxide/Activated Charcoal (Fe_3O_4-AC) composite for the removal of As (III) from aqueous solutions

Material and Method

Synthesis of Adsorbent (Fe_3O_4-AC Composite)

Magnetic Fe_3O_4 was prepared by dissolving 0.8 g of $FeCl_3.6H_2O$ in 40 ml deionised water to it 2 ml ammonia solution were added under constant magnetic stirring at room temperature stir this mixture for about 30 min. Chemical activation of activated charcoal was done using HNO_3 at 200°C to enhance the adsorption capacity of activated charcoal.In beaker 0.1 g of activated charcoal were dissolve in 20 ml distilled water and 8 ml ethanol. Both this mixture was then transferred to Teflon crucible. For the hydrothermal treatment at 120°C, Teflon crucible was inserted in to stainless steel autoclave for 3 h. After the hydrothermal reaction, the autoclave was cooled down to room temperature. After that, the product was filtered, washed with deionised water and ethanol several times. The sample was dried in an oven at 60°C for 10 h Then, the obtained product designated as Fe_3O_4-AC composite and kept in cold condition for further studies.

Batch Adsorption Experiment

In the batch study various parameter like effect of pH, adsorbent dose, contact time were studied for the removal of Arsenic on Fe_3O_4-AC composite. A known concentration of Arsenic (III) solution was taken in a stoppered bottle to which definite amount of Fe_3O_4-AC composite were added and shaken at 500 rpm on rotary shaker for 1 h. After equilibrium the reacting solution was then filter and concentration of As(III) before and after was determine by molybdenum blue method at 840 nm using spectrophotometer.

Result And Discussion

Effect of pH: To study the effect of pH on As(III) removal in pH range 1-12 on Fe_3O_4-AC composite using 1.2 g of adsorbent, 5 mg/L initial As concentration and contact time 60 min are kept constant. 0.1 N HCl and 0.1 N NaOH was used to adjust the desired pH.

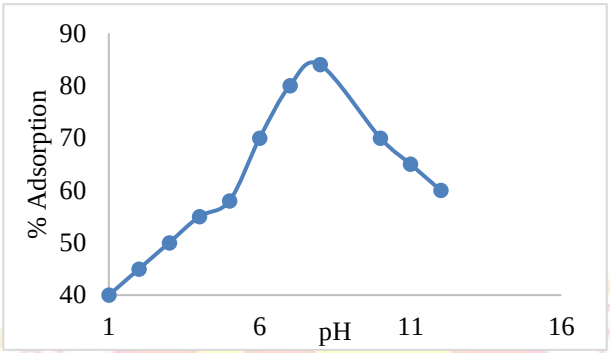


Fig. 1: Effect of pH

Effect of dose: To study the effect of adsorbent dose on As(III) removal on Fe_3O_4-AC composite by varying the dose of adsorbent from 0.1 g to 1.2 gm. pH 8, 5 mg/L initial As concentration and contact time 60 min are kept constant

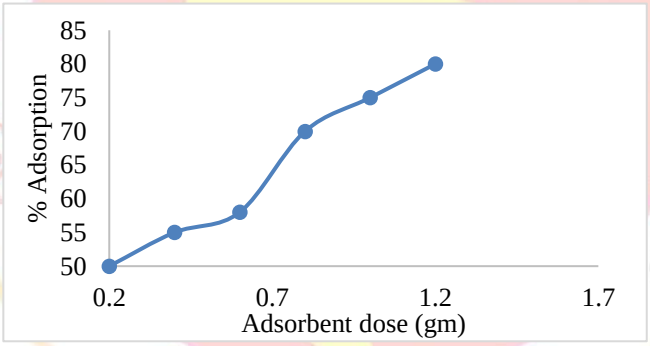


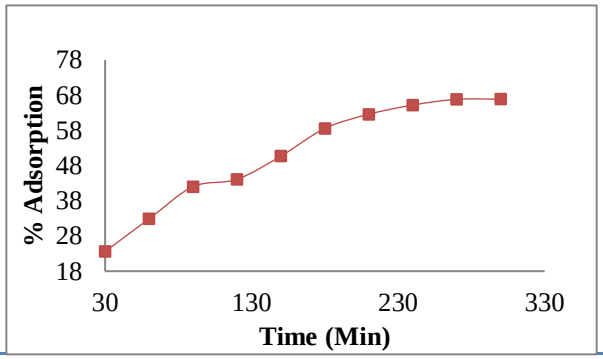
Fig. 2. Effect of adsorbent dose

Effect of contact time: The effect of contact time on the percentage of As(III) removal by Fe_3O_4-AC composite adsorbent was studied at different contact time from 5 to 120 min. Other parameters were kept constant,such as the adsorbent dose 0.5 g/L, initial As(III) concentration 5 mg/L, and pH 8. All the experimentswere carried out at room temperature. The percentage removal of As (III) adsorbed was calculated byusing the following equation.

$$\%\ \mathrm{As(III)Removal} = \frac{(\mathrm{Co} - \mathrm{Ce}) \times 100}{\mathrm{Co}}$$

Where Co = Initial concentration of Arsenic (mg/L) and Ce= final concentration of Arsenic (mg/L).

Fig.3. Effect of contact time



Adsorption Isotherm

To study the interaction between As(III) and magnetite Fe_3O_4-AC composite the equilibrium data was scrutinized and studied by using Langmuir and Freundlich adsorption model.TheresultsinAs(III)removal experimental datatobothFreundlichandLangmuirequation

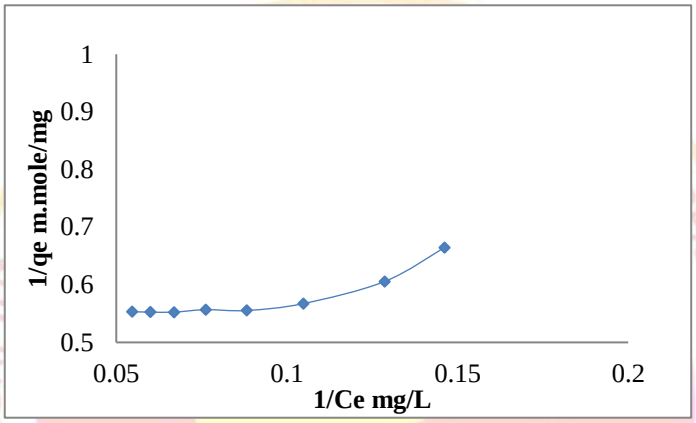
Isotherm Modelling

***Langmuir Adsorption Isotherm*: -**The Langmuir isothermmodel can be given as:

$$\frac{1}{q_e} = \frac{1}{Q^0 b} \times \frac{1}{Ce} + \frac{1}{Q^0}$$

The Langmuir constant Q^o is a measure of adsorption capacity and b is the measure of energy of adsorption. In order to observe whether the adsorption is favourable or not, a dimensionless parameter 'R_L' obtained from Langmuir Isotherm. The values of Q^o and b were evaluated from the intercept and slope of linear plots of $1/q_e$ vs. $1/C_e$ respectively.

***Freundlich Adsorption isotherm*: -** It is most commonly used adsorption isotherm model which describes adsorption on heterogeneous surfaces with interactions among adsorbed molecules. It helps to investigate the nature of adsorption and the adsorption capacity of an adsorbent. The linear form of Freundlich isotherm model is



$$\log q_e = B.\log C_e + \log K_f$$

Fig.4: Langmuir Adsorption Isotherm

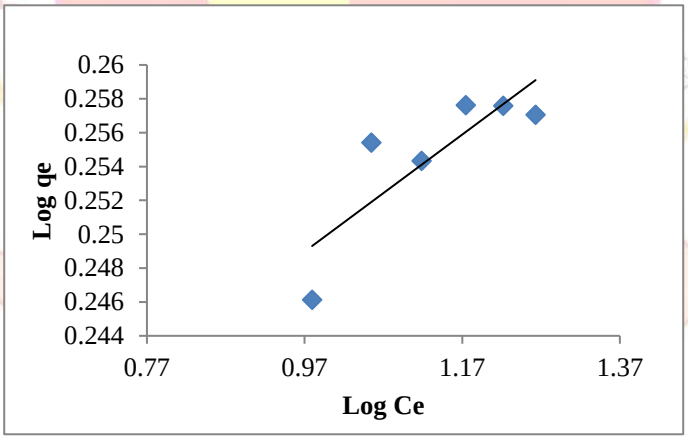


Fig. 5: Freundlich Adsorption Isotherm

Conclusion

Fe_3O_4-AC composite shows good adsorption efficiency for the removal of As (III). The removal efficiency was found to be rapid at initial stage and then slow down because it is depending upon the concentration of metal ions and active sites on the adsorbent for the binding of metal ions. The adsorption isotherm data was best revealed by the Langmuir adsorption isotherm. The maximum removal efficiency was found to be at pH 8. Batch study indicates that as the adsorption dose, contact time increases adsorption capacity increases.

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Conflict of interest: Nil

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A Efficient Synthesis of Nanoparticleof Some Benzothiazoles Derivative of Glucose

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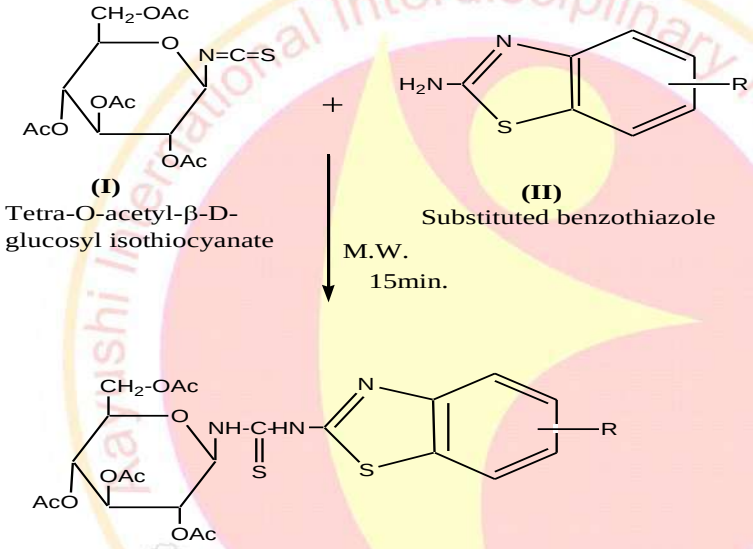
Abstract :-

Benzothiazoles have played an important role in the field of biochemistry and medicinal chemistry due to their highly pharmaceutical and biological activity. The development of synthetic processes is undoubtedly one of the most significant problems facing researchers.Nanotechnology also involves the synthesis of nanoparticles. These compounds arouse interest as potential biologically active substances and versatile intermediates for preparing various derivatives. To achieve the principle of green chemistry process, it leads to in search of green synthesis of nanoparticles.Here we havesynthesized 1-Tetra-O-acetyl- β -D-glucosyl-3-(2)- benzothiazolyl thiocarbamides by reaction of Tetra-O-Acetyl-B-D-glucosyl isothiocyanate with various substituted benzothiazole. The identities of newly synthesis compounds have been established based on usual chemical transformation and U.V, IR, NMR, Mass and Partical Size analysis Analytical studies.

Keywords: *TAG Isothiocyanate , substituted benzothiazoleand 1-Tetra-O-acetyl- β -D-glucosyl-3-(2)- benzothiazolyl thiocarbamidesnanoparticles.*

Graphical Abstract :-



Introduction :-

Benzothiazole is a representative class of sulfur-containing heterocycles and involves a benzene ring fused to a thiazole ring. The benzothiazole ring system was originally found in various marine and terrestrial natural compounds, which is widely used as vulcanization accelerators, antioxidants, plant growth regulators, anti-inflammatory agents, enzyme inhibitors, imaging reagents, fluorescence materials, and electroluminescent devices due to its highly pharmaceutical and biological activity [1,2,3,4]. Especially, benzothiazole plays an important role in the field of medicinal chemistry and renders an extensive range of biological activities including anti-cancer [5,6], anti-bacterial [7,8], anti-tuberculosis [9,10], anti-diabetic [11], anthelmintic [12], anti-tumor [13,14,15], anti-viral [16,17], anti-oxidant [18], anti-inflammatory [19,20], anti-glutamate and anti-parkinsonism [21], anticonvulsant [22], muscle relaxant activities [23], neuroprotective [24], inhibitors of several enzymes and so on [25]. Hence, the synthesis of benzothiazoles is of considerable interest due to their potent and significant biological activities and great pharmaceutical value.

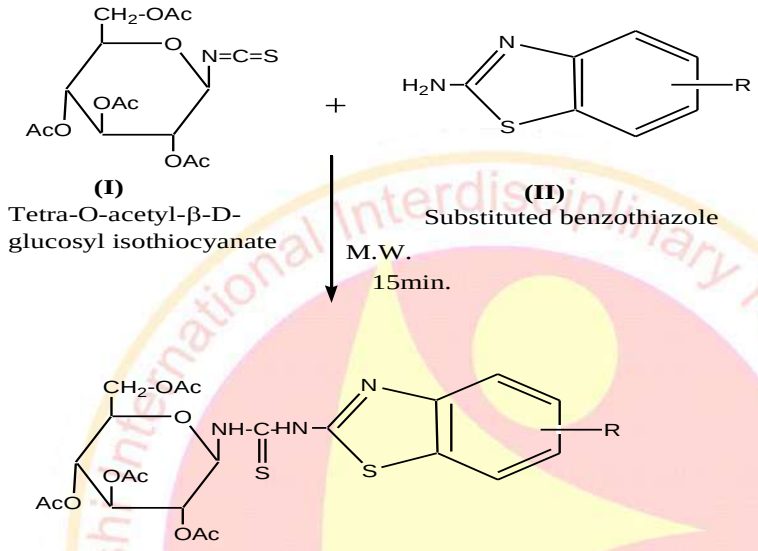
Nanotechnology, as defined by size, is naturally very broad, including the field of science as diverse as surface science, organic chemistry, molecular biology, semiconductor physics, energy storage, microfabrication, molecular engineering, etc. The associated research and applications are equally diverse, ranging from extensions of conventional device physics to completely new approaches based upon molecular self-assembly, from developing new materials with dimensions on the nanoscale to direct control of matter on the atomic scale. Nanotechnology may create many new materials and devices with various applications, such as in Nanomedicines, Nanoelectronics, and biomaterial energy production and consumer products.

Results And Discussion:

Nanoparticles:

A nanoparticle isa sub-classification of the ultrafine particle with lengths in two or three dimensions greater than 0.001 micrometer (1 nanometer) and smaller than about 0.1 micrometer (100 nanometers) and which may or may not exhibit a size-related intensive property. This term is a subject of controversy regarding the size range and the presence of a size-related property. Current usage emphasizes size and not properties in the definition. The length scale may be a hydrodynamic diameter or a geometric length appropriate to the intended use of the nanoparticle. The chemistry of thiourea of carbohydrates is extensively elaborated and well documented. These compounds arouse interest as potential biologically active substances and versatile intermediates for preparing various derivatives

Reaction Scheme:-



(I) Tetra-O-acetyl-β-D-glucosyl isothiocyanate

(II) Substituted benzothiazole

(III)

1-tetra-O-acetyl-β-D-glucosyl -3-substituted benzothiazolyl thiocarbamides

Here Tetra-O-Acetyl-β-D-Glucosyl-3-substitute benzothiazolyl thiocarbamide was synthesized by both methods; conventional and Microwave method.Tetra-O-acetyl-β-D-glucosyl isothioyanate was react with Substitute benzothiazole in benzene medium after that reaction mixture was titurate several times with petroleum ether . The product is confirmed based onthe melting point and other studies.

Experimental

Melting points were recorded on electro thermal melting point apparatus are uncorrected. Specificrotations were measured on Equip-Tronic digital polarimeter model no. EQ 800 at 30^0C in $CHCl_3$. IRspectra were recorded on a Perkin Elmer spectrometer. ^{1}H NMR were obtained on a Bruker DRX-300(300 MHz FT NMR) NMR spectrometer in $CDCl_3$ solution with TMS as an internal reference. The massspectra were recorded on a DART mass spectrometer were recorded. Partical Size was analysis by Malvern particalsizeanalysizer.

I) Preparation of Tetra-O-acetyl-β-D-glucopyranosyl isothiocyanate :

This has been prepared by the interaction of tetra-O-acetyl-α-D-glucopyranosyl bromide and lead thiocyanate, the former was prepared according to the procedure described earlier. Details of typical experimental are as follows :

a) Microwave assisted preparation of glucose penta acetate :-

Peracetylation of glucose to give the acetyl derivative with small excess of acetic anhydride under the catalyst of either Potassium or Sodium acetate (anhydrous) was found practically quantitative in less than 15 min with microwave heating.

Herein, we reported first time peracetylation of glucose in molecular proportion of acetic anhydride (30 ml) using catalyst sodium acetate 0.8 gm. Under Microwave heating the reaction was complete less than 10 min. Product was isolated by pour in ice cold water with constant stirring and cooling.

The glucose penta acetate is separated out; purification of product was done under water, ethanol system. Melting point of Glucose penta acetate was found to be 110°C.

b) **Synthesis of Tetra-O-acetyl-α-D-glucopyranosyl bromide** :

The finely powdered glucose pentaacetate (21.0g) was added gradually to the brominating reagent. After the addition the flask was kept for 2 hr. at room temperature. The reaction mixture was mixed with chloroform (50 ml) then the mixture was shaken vigorously for about 15 min. The resultant mixture was pour in ice cold water.

The chloroform layer was then separated. It was washed several time with aqueous sodium bicarbonate to removed excess of acetic acid followed by the aqueous sodium meta-bisulphate to remove the excess of bromine and finely 2-3 times with water. To the chloroform layer addition of petroleum ether afforded a solid (15 g). This solid was expected tetra-O-acetyl-ά-D-glucopyranosyl brominde, it was crystallized from ethanol, m.p. 88-90°C.

d) **Preparation of lead thiocyanate :**

Lead thiocyanate was prepared by mixing aqueous solution of lead nitrate and ammonium thiocyanate. The white granular lead cyanate was filtered washed with distilled water and dried at 50°C.

Preparation of Tetra-O-acetyl-β-D-glucopyranosyl isothiocyanate :

To a suspension of tetra-O-acetyl-α-D-glucopyranosyl bromide (21 g) in sodium dried xylene (80 ml) was added lead cyanate (15g). The reaction mixture was refluxed gently for 3 hr. with frequent shaking. This solution was then cooled and liberated lead bromide was removed by filtration. The xylene filtrate was then treated with petroleum ether (60-80°) with stirring, a pale yellow solid obtained (12 g). This solid was expected tetra-O-acetyl-β-D-glucopyranosyl isocyanate. It was purified by dissolving it in a minimum quantity of chloroform and reprecipitating with petroleum ether. m.p 115-120°C

Table No-2-: Study of synthesis of 1-tetra-*O*-acetyl-β-D-Glucosyl isothiocyanate under microwave irradiation[11]

Sr. No.	Amount of G-Bromide	Amount of Xylene	Time	Power in watt	Temp. °C	% Yield
1	10.0 gm	80 ml	35 min	P-70	120-130	**90%**
2	20.0 gm	120 ml	40 min	P-80	130-140	**80%**
3	**30.0 gm**	**150 ml**	**40 min**	**P-80**	**135-145**	**65%**

- Lead thiocyanate was taken in equimolar proportion of G-Bromide.
- G-Bromide :- 1-tetra-*O*-acetyl- -D-Glucosyl-Bromide

Experiment No. 1:- Tetra-O-acetyl-β-D-glucosyl-(3)-2-substituted benzothiazolylthiocarbamides

A benzene solution of tetra-O-acetyl- β -D-glucosyl isothiocyanate (0.005 M, 1.9 g, in 20 ml) was mixed with the suspension of 2-amino benzothiazole (0.005 M, 0.75 g in 10 ml) and mixture was under microwave irradiation After, benzene was distilled off and sticky mass obtained as a residue was triturated several time with petroleum ether to afford white solid. It was crystallized from ethanol water, m.p. 135-142°C. [Found: C, 52.00; H, 4.85; N, 8.14; S, 6.23, $C_{22}H_{25}O_{10}N_3S$. requires; C, 52.07, H, 4.93; N, 8.28; S, 6.31%].

The product was found soluble in ethanol, acetone, chloroform and benzene while insoluble in water and petroleum ether. It charred when heated with conc. sulphuric acid. It was non-desulphurisable when boiled with alkaline plumbite solution. It was found to be optically active and its specific rotation $[\alpha]_D^{29}$ = +74.46° (c, 0.94 in chloroform). The purity was checked by TLC and recorded Rf value 0.86 (CCl_4 : EtOAc, 3:2.1).

Analytical And Spectral Data Of Compounds:

Synthesis of 1-Tetra-O-acetyl-β -D-glucosyl-3-(2)- amino benzothiazolyl thiocarbamides (IIIa).

(IIIa) IR (KBr) : ν 3374 (N-H), 2969 (Ar-H) 1743 (C=O), 1588 (C=N), 1382 (C-N), 1239 (C-O) and 753 cm-1 (C-S); 1H NMR (CDCl3) : δ 7.57-7.20 (m, 5H Ar-H), 6.3-6.2 (s 1H N-H), 5.1-5.5 (m, 7H Glucopyranosyl ring), 2.1-1.9 (m, 12 H, 4COCH3); Mass : m/z 508 (M+), 331, 169, 109, Anal. Calcd. for C22H25N3O8S2; C, 48.97; H, 4.63; N, 8.24; S, 6.31; found C, 48.84; H, 4.59; N, 8.45; S 6.51%

Synthesis of 1-tetra-O-acetyl-β -D-glucosyl-3(2)-4-chloro benzothiazolyl thiocarbamide (IIIb).

(IIIb) IR (KBr) : ν 3340 (N-H), 2966 (Ar-H), 1745 (C=O), 1615 (C=N), 1378 (CN), 1231 (C-O) and 753 cm-1 (C-S) ; 1H NMR (CDCl3) : δ 7.7-7.6 (m, 1H, N-H), 7.4 - 7.1 (m, 4H, Ar-H), 5.1-4.7 (m, 7H, glucopyranosyl ring), 2.2-1.9 (m, 12H, 4 COCH3); Mass : m/z 544 (M+), 331, 169, 109; Anal. Calcd., C22H24N3O8S2-Cl, C, 46.07; H, 4.18; N, 7.72; S, 5.88 Found C, 46.13; H, 4.23; N, 7.21; S, 5.98%

Synthesis of 1-Tetra-O-acetyl-β -D-glucosyl-3-(2)-4-methyl benzothiazolyl thiocarbamide (IIIe) :

(IIIe) IR (KBr) : ν 3468 (N-H), 2997 (Ar-H), 1743 (C=O), 1610 (C=N), 1383 (C-N), 1238 (C-O) and 845 cm-1 (Glucopyranosyl ring); 1H NMR (CDCl3) : δ 7.4-7.0 (m, 4H, ArH), 5.15 (s, 1H , N-H), 2.3 (m, 3H, Ar-CH3)

5.4-5.5 (m, 7H, Glucopyranosyl ring), 2.2-1.8 (m, 12H, 4COCH3) Mass: m/z (Not predictable) 331, 109; Anal. Calcd. for C23H27N3O8S2; C, 49.90; H, 4.33; N, 8.04; S, 6.13; Found C, 4997; H, 4.26; N8.22; S , 6.21%.

Preparation of Nanoparticles of 1-tetra-O-acetyl-β-D-glucosyl-3-(2)-methyl benzothiazolyl thiocarbamide:

Take about 1 gm of 1-tetra-O-acetyl-β-D-glucosyl-3-*(2)*-methyl benzothiazolyl thiocarbamide and dissolve it completely in the 20ml of solvent in a 250 ml beaker and add poly vinyl alchole as a stibilizer 1.5ml . Now put this beaker in a sonicator. The highly penetrating acoustic waves are passed through the mixture, which creates high-pressure bubbles in the beaker due to which breakdown of the bulk material took place and desired sized nanoparticles are formed. Then stirred mixture about 6hr. in magnetic stirrer at room tempeture. The size determination of nanoparticlesis done by the partical size analysizer studies

Characterization of Nanoparticles:

1. Characterization using UV-Spectrophotometer: Single Beam UV-Spectrophotometer with software BI/CI/SP/SB-S-03 of Bio Era make. The UV-Visible Spectroscopy reveals the formation of Nanoparticles Characterization of Nanoparticles was done using a visible Spectrophotometer by using a model by showing different absorption those from bulk material.

2. Size determination ofGlucose Penta Acetate, Nanoparticles by X-ray Diffraction studies(Particle Size Analysis): From the X-ray diffraction, it comes to know that size of nano Glucose Penta Acetate is 97.57 nm.

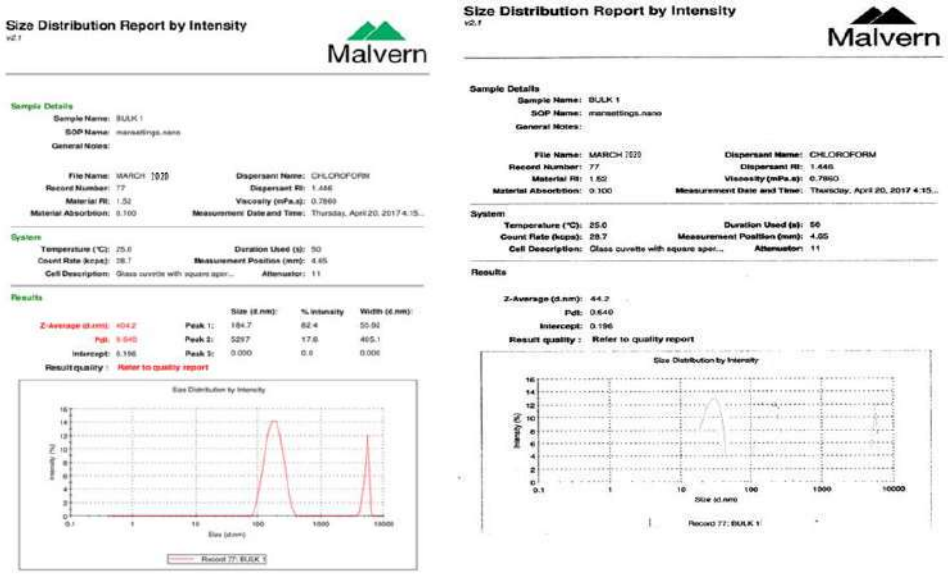


Table No. 2:- Tetra-O-acetyl-β-D-glucosyl-(3)-2-substituted benzothiazolylthiocarbamides

Sr.No.	-Nano of synthesis of Tetra-O-acetyl-β-D-glucosyl-(3)-2-substituted benzothiazolyl thio carbamides	M.P. °C	Particle Size
1	1-Tetra-O-acetyl- β -D-glucosyl-3-(2)- amino benzothiazolyl thiocarbamides	135-142	122.2nm
2	Synthesis of 1-tetra-O-acetyl- β -D-glucosyl-3(2)-4-chloro benzothiazolyl thio carbamide	112-120	153nm
3.	Synthesis of 1-Tetra-O-acetyl- β -D-glucosyl-3-(2)-4-methyl benzothiazolyl thio carbamide	152-155	97.57nm

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A three component synthesis of fused 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido [1,6-*a*]pyrimidine-3,9-dicarbonitriles with evaluation of their antioxidant activity

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Synthesis of novel fused 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives (4a-7d) have been accomplished via three-component reaction of 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3), ethyl-2-cyano-3,3-bis(methylthio)acrylate and nucleophiles such as substituted anilines/phenols/ hetryl amines/compounds containing active methylene group by using anhydrous K_2CO_3 as catalyst and DMF as solvent. Compound (3) was prepared by reaction between, simple condensation product of acetamidine hydrochloride (1) and bis(methylthio)methylene malononitrile (2) with same reaction condition which is used for title compounds. The chemical structures of newly constructed derivatives were corroborated by IR, ^{1}H-NMR, ^{13}C-NMR and Mass spectral analysis. Furthermore, these synthesized fused heterocycles were examined for their plausible antioxidant activity.
Keywords: Antioxidant, Bis(methylthio)methylene malononitrile, DMF and Potassium carbonate.

Introduction

Heterocyclic chemistry play a vital role in modern society and posses varied application in different fields due to which unabated research has been going on to synthesize new organic compounds including derivatization of naturally occurring scaffolds such as alkaloids, nucleic acids, vitamins, proteins and hormones etc. Synthetic heterocyclic compounds which contain N, S and O have enormous potential in the field of agrochemicals and medicinal chemistry.

Pyrimido[4,5-*d*]pyrimidines and pyrido[2,3-*a*]pyrimidines undoubtedly belong to the most ubiquitous heterocycles in nature. They are an important class of annulated uracils of biological importance [1], because of their connection with purine pteridine system [2]. Several patent have been reported for the synthesis of these fused heterocycles, derivatives of these are useful as antiallergic [3],vasodilators [4], bronchodilators [5], antihypertensive [6] agents. Fused pyrimido[4,5-*d*]pyrimidine ring system represent attractive target owing to divers pharmacological applications of these molecule that includes potent inhibitory properties regarding the tyrosine kinase domain of epidermal growth factor receptor [7], dihydrofolate reductase [8], 5-phosphoribosyl-1-pyrophosphate synthetase [9], antimicrobial [10], antitumor [11], antifungal [12], antiviral [13], antioxidant [14], hepatoprotective [15] activities.

Multicomponent reactions (MCRs) have been proved as simple and convenient way to produce diverse chemical libraries of 'drug like' molecules for biological screening, since the combination of three or more small molecular weight building blocks in a single operation leads to high combinatorial efficacy. In last decades many synthetic methods have been reported for the synthesis of pyrimido[4,5-*d*]pyrimidines and its derivatives [16-21]. Recently our research group have reported synthesis and antimicrobial activity of fused pyrido pyrimido pyrimido derivatives [22]. Hence in present investigation by considering the application of multicomponent reactions, it was thought to construct a novel multifunctionalized ring system such as 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives with evaluation of their antioxidant activity.

Material And Methods

All compounds were purchased from SD-Fine, Spectrochem and Avra chemical companies and used without any additional purification. Melting points of synthesized compounds were determined by Electrothermal IA 9000 SERIES digital melting point apparatus and were uncorrected. Purity of all the products were routinely checked by thin layer chromatography (TLC) on pre-coated sheets of silica gel-C plates of 0.25 mm thickness. FT-IR spectra were recorded in Nujol or as KBr pallets on infrared spectrophotometer. Brukner advance spectrophotometer 400 MHz was used to record ^{1}H-NMR and ^{13}C-NMR spectra using tetramethylsilane (TMS) as internal standard, Mass spectra were recorded on FT-VC-7070 H Mass spectrometer using the EI technique at 70 eV.

General procedure:

Synthesis of 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3)

A mixture acetamidine hydrochloride (1) (0.01mol) and bis(methylthio)methylene malononitrile (2) (0.01mol) in 10 ml of DMF and anhydrous potassium carbonate (10mg) was refluxed for 6 hours. The progress of the reaction was monitored by thin layer chromatography (TLC). After completion of reaction, the reaction

mixture was cooled to room temperature and poured into ice cold water. The separated solid product was filtered, washed with water and recrystalized from DMF-ethanol mixture to give pure compound (3).

Synthesis of 8-substituted derivative of 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives (4a-7d).

A mixture of compound (3) (0.001mol) and ethyl-2-cyano-3,3-bis(methylthio)acrylate refluxed independently with substituted anilines/ phenols/ hetryl amines/ compound containing active methylene groups (0.001mol) in 10 ml of DMF and anhydrous potassium carbonate(10mg) for 5-6 hours. The reaction progress was checked by TLC. The reaction mixture was cooled to room temperature and poured into ice cold water. The separated solid product was filtered, washed with water and recrystalized from DMF-ethanol (2:8) mixture to give pure compounds (4a-4d, 5a-5d, 6a-6d & 7a-7d).

Table 1. Physicochemical data.

Com.No.	MolecularFormula	Mol. Wt.	Colour	Yield %	M.P °C
3	$C_7H_8N_4S$	180	Gray	72.17	135-36
4a	$C_{18}H_{14}N_6OS$	362	Brown	68.31	184-85
4b	$C_{18}H_{14}N_6O_2S$	378	Brown	77.47	178-79
4c	$C_{17}H_{11}N_6OSCl$	382	Brown	56.82	136-38
4d	$C_{17}H_{11}N_7O_3S$	393	Yellow	62.24	181-82
5a	$C_{18}H_{13}N_5O_2S$	363	Brown	70.11	147-48
5b	$C_{17}H_{10}N_5O_2SCl$	383	Yellow	82.33	192-93
5c	$C_{17}H_{10}N_5O_2SBr$	426	Brown	61.65	206-07
5d	$C_{17}H_{10}N_6O_4S$	394	Yellow	63.94	173-74
6a	$C_{15}H_{14}N_6OS$	326	Brown	69.42	155-57
6b	$C_{16}H_{16}N_6OS$	340	Yellow	75.81	134-35
6c	$C_{15}H_{15}N_7OS$	341	Brown	72.56	139-40
6d	$C_{15}H_{14}N_6O_2S$	342	Brown	68.05	174-76
7a	$C_{14}H_7N_7OS$	321	Brown	65.89	197-98
7b	$C_{16}H_{12}N_6O_3S$	368	Brown	62.17	211-12
7c	$C_{16}H_{13}N_5O_3S$	355	Brown	54.46	160-61
7d	$C_{17}H_{15}N_5O_4S$	385	Brown	66.94	143-44

Spectral Analysis:

4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3).

IR (KBr/cm^{-1}) 2206 (CN), 3359 (NH_2): ^{1}H-NMR (400 MHz,DMSO-d_6): δ 2.38 (s, 3H, CH_3), 2.53 (s, 3H, SCH_3), 7.5 (s, 2H, NH_2): ^{13}C-NMR (DMSO-d_6): δ 11.84 (SCH_3), 25.98(CH_3), 81.79 (C-CN), 114.54 (CN), 162.59 (C=N), 168.04 (C=N), 172.10 (C-SCH_3) EI-MS(m/z: RA%): 180 (M^+).

8-(4-chlorophenylamino)-6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile (4c).

IR (KBr/cm^{-1}) 1631 (N-C=O), 2210 (CN), 3356 (NH): ^{1}HNMR (400 MHz,DMSO-d_6): δ 2.51 (s, 3H, CH_3), 2.80 (s, 3H, SCH_3), 6.82 (s, 1H, NH), 7.12-7.39 (m, 4H, Ar-H): EI-MS(m/z: RA%): 382 (M^+).

8-(4-chlorophenoxy)-6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile (5b).

IR (KBr/cm^{-1}) 1650 (N-C=O), 2221 (CN): ^{1}HNMR (400 MHz,DMSO-d_6): δ 2.50 (s, 3H, CH_3), 2.73 (s, 3H, SCH_3), 6.97-7.66 (m, 4H, Ar-H): EI-MS(m/z: RA%): 383 (M^+).

6-methyl-2-(methylthio)-8-morpholino-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile (6d)

IR (KBr/cm^{-1}) 1673 (N-C=O), 2204 (CN): ^{1}HNMR (400 MHz,DMSO-d_6): δ 2.37 (s, 3H, CH_3), 2.64 (s, 3H, SCH_3), 3.42 (S, 4H, NCH_2), 4.26-4.28 (S, 4H, OCH_2): EI-MS(m/z: RA%) : 342 (M^+).

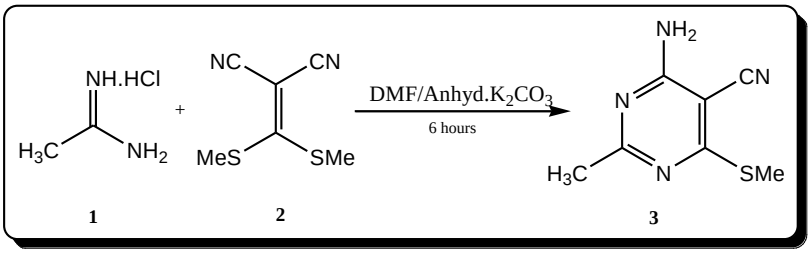
8-(dicyanomethyl)-6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile (7a)

IR (KBr/cm^{-1}) 1640 (N-C=O), 2203 (CN): ^{1}HNMR (400 MHz,DMSO-d_6): δ 2.37 (s, 3H, CH_3), 2.53 (s, 3H, SCH_3), 3.73 (S, 1H, CH): EI-MS(m/z: RA%): 321(M^+).

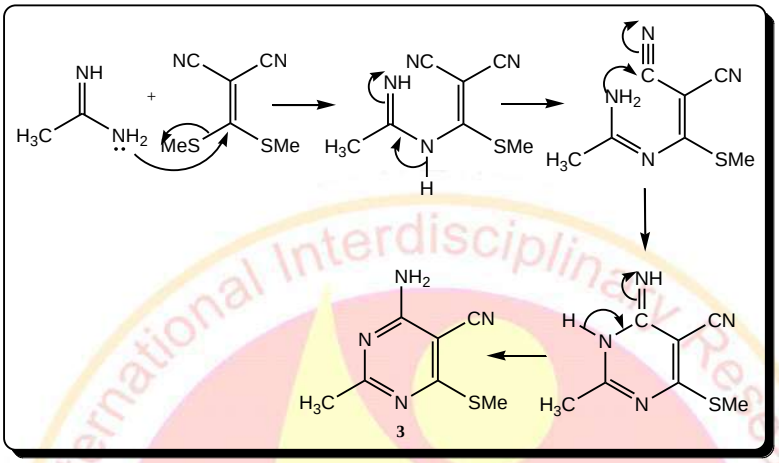
Result And Discussion

In present communication the most promising multicomponent method have been developed for synthesis of novel heterocyclic compound such as 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile its 8-substituted derivatives. Our synthetic plan commences from readily available acetamidine hydrochloride, which offers large number of annulated heterocycles. The requisite

starting material i.e. 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3) was prepared from condensation of acetamidine hydrochloride and bis(methyltio)methylene malononitrile **Scheme-1**.



Scheme-1. Formation of 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile

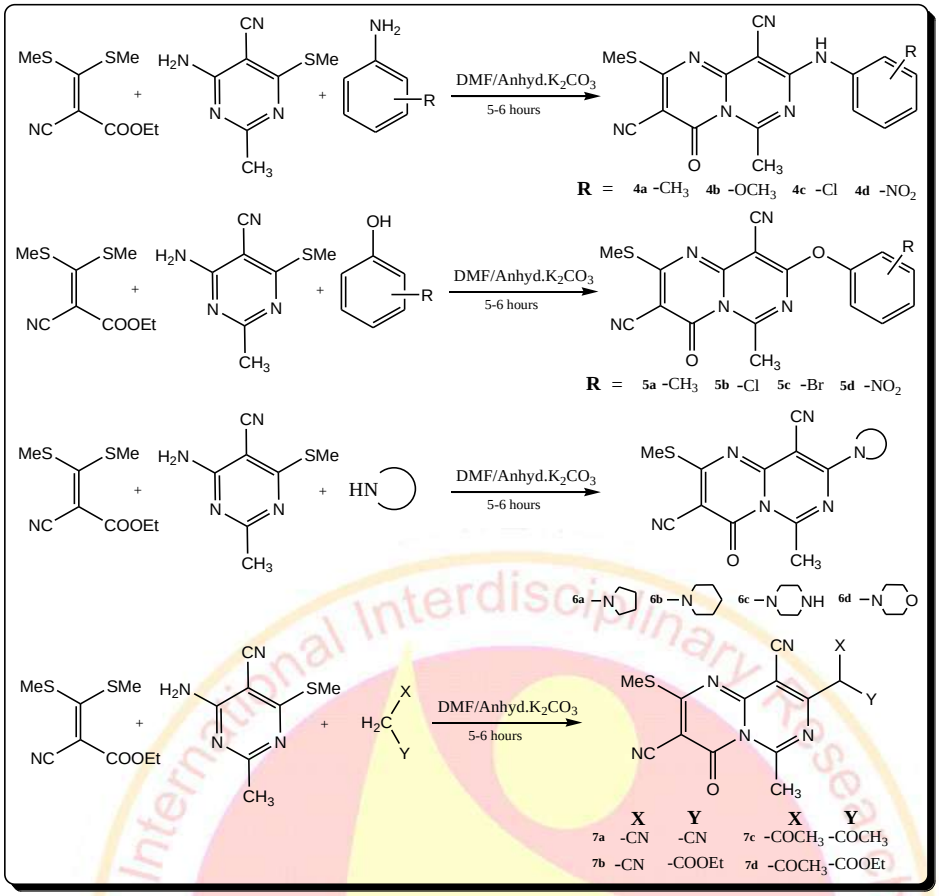


Scheme-1. Plausible mechanism for the formation of compound (3)

The presence of tautomerisable 1,3 nucleophilic positions of 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3) made itself more facile for attack on ethyl-2-cyano-3,3-bis(methylthio)acrylate, simultaneously compound (3) undergo nucleophilic substitution reaction due to presence of good leaving thiomethyl group resulting in the building of fused pyrimido[1,6-*a*]pyrimidine ring system via elimination of simple thiomethyl and ethoxy groups. **Scheme-2.**

The structure of newly synthesized compounds were assigned on the basis of IR, ^{1}H-NMR, ^{13}C-NMR and Mass spectral data. In IR spectrum of compounds absorption bands appear in the region 1675-1630 and 2221-2203 cm^{-1}for N-C=O, -CN respectively. ^{1}H-NMR spectra of compounds shows singlet peaks in the region of 2.30-2.52 and 2.53-2.80 ppm due to -CH_3, -SCH_3 protons respectively . ^{13}C-NMR spectrum of parent compound (3) shows peaks at 11.84, 25.98, 114.54 and 172.10 for –S<u>C</u>H$_3$, -<u>C</u>H$_3$, -<u>C</u>N and -<u>C</u>-SCH$_3$ carbons respectively. MASS spectra shows molecular ion peak which is corresponds to the molecular weight of respective compounds. Spectral studies of all compounds shows that compounds were stable and do not exhibit any tautomerism.

The overall DPPH radical scavenging activity of examined 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives (4a-7d) were in a range of 09.08-37.89 % as compared to the standard ascorbic acid (90.15%). The highest DPPH radical scavenging activity was exhibited by **6a** whereas **5c** demonstrate lowest activity. From the result of present work, it can be concluded that 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives are essential to boost the antioxidant activity.



Scheme-2. Formation of 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives (4a-7d)

Antioxidant activity:

DPPH radical scavenging assay :

The DPPH radical scavenging assay has been used for preliminary screening of the sample for antioxidant activity. The proton radical scavenging action is known as an important mechanism of antioxidants. The odd electron in DPPH radical gives a strong absorption maximum at 517 nm and is purple in colour. The colour turns from purple to yellow when the odd electron of DPPH radical becomes paired with hydrogen from free radicals scavenging antioxidants to form reduced DPPH:H. 1ml (1 mM) of test sample was added in to equal quantity of 0.1 mM solution of DPPH in ethanol. After 10 minutes of incubation at room temperature, the DPPH reduction was measured by reading the absorbance at 517 nm. Ascorbic acid was taken as standard reference. The result of DPPH reduction is summarized in table-2.

Table 2. Antioxidant activity of selected compounds.

Sr. No.	Compounds	Antioxidant activity
		DPPH radical scavenging activity (%)
1	4a	12.82±0.62
2	4b	31.78±0.47
3	5b	15.26±0.03
4	5c	09.08±0.88
5	5d	14.25±0.52
6	6a	37.89±0.93
7	6c	26.84±0.08
8	6d	12.59±0.76
9	7a	23.60±0.18
10	7d	36.32±0.55
6	Ascorbic acid	90.15±0.53

Conclusion

In summary with the aim of have a good contribution to design new heterocyclic compounds, we have developed new proficient multicomponent methodology for the synthesis of novel fused heterocles such as 6-

methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitriles with excellent product yield. The major advantage of this protocol is higher purity of derivatives, operational simplicity and short reaction time.

Acknowledgement

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Development of biobased acids cross linking of tamarind seed polysaccharide films and their coating

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Abstract

In the present study, Tamarind seed polysaccharide (TSP) was obtained by water-based extraction. For characterization of the extracted tamarind seed polysaccharide phytochemical screening was done and micromeritic properties were determined. It was also found that extracted tamarind seed polysaccharide had good flow properties and pH was 6.4, this showed that it can be used in dosage form without any irritation.

Further these tamarind seed polysaccharides modified by reacting with biobased acids such as citric acid and lactic acid and cast a film which can be further used as in packing. It has been used for coatings on various fruits and their effect has been studied and weight loss test.

Introduction

Edible polymers are the polymeric materials which can be easily consumed by human as well as animals without any harm on the health. Edible polymers have appeared as a substitute to synthetic plastic for food applications and have received significant attention in recent years because of their advantages over synthetic polymers. The main advantage of edible polymers over traditional synthetics is that they can be consumed along with the products. Edible polymer coatings can provide replacement and/or fortification of natural layers to prevent moisture losses, while selectively allowing controlled exchange of important gases, such as oxygen, carbon dioxide, and ethylene, which are involved in respiration processes.

Materials and Methods

All laboratory grade chemicals/reagents were acquired either from SD Fine Chemicals and Spectrochem, India and used as such with no further purification. The tamarind was obtained from Local market, Akola, Maharashtra and used as received.

Extraction procedure

Tamarind seeds were purchased from the seeds shop situated in the old Delhi, India. Seeds were boiled and mucilage was taken out to extract xyloglucan. Mucilage was dried, powdered and further passed from sieve # 20 and stored in air tight container until used.

Extraction of tamarind polysaccharide includes two steps:

Step 1: Extraction of tamarind polysaccharide

Xyloglucan extracted by tamarind seeds were done as follows:

Crude tamarind seeds were washed neat and clean then kept for 3 hrs boiling. After completion of boiling, boiled seeds were kept for cooling for 24 hrs so that mucilage is being expelled out from the seeds. Completing 24 hrs of expulsion of mucilage from seeds, heat them for few minutes then set for cooling. Pour seeds with mucilage in the muslin cloth and press till all the mucilage is squeezed from the seeds. Temperature of extraction media was maintained at 70C and duration of extraction was adjusted about 6 hrs [1].

Step 2: Isolation of tamarind seed polysaccharide

In hot water boiled tamarind seeds were kept for 24 hrs so that the mucilage can come out from the seeds. After 24 hrs, boiled the seeds containing xyloglucan for 1 hr. Water extracted juice were squeezed with muslin cloth bag and the concentrated juice was cooled to 4C. Tamarind seed polysaccharide xyloglucan was precipitated by alcohol- juice treatment 2:1(v/v) followed by continuous stirring for 15 min and mixture was further allowed to stand for 2 hrs for better tamarind seed polysaccharide precipitation. This allows filtering of polysaccharide substances because tamarind seed polysaccharide remains float on the surface of alcohol-water mixture. Floating tamarind polysaccharide coagulate was filtered through muslin cloth, washed with alcohol (95%) and squeezed. Squeezed tamarind seed polysaccharide was further dried to constant weight at 35-45°C in hot air oven. Hard tamarind seed polysaccharide cake was ground and sieved through sieve # 20, stored in desiccators for further use [1].

Physicochemical characterization of Xyloglucan consisted in Tamarind Seed Polysaccharide Identification tests for carbohydrates

Extracted mucilage was mixed with Molish's reagent followed by addition of sulfuric acid [4, 5].

Determination of Purity of Xyloglucan in Tamarind Seed Polysaccharide

For determination of purity of extracted xyloglucan test for alkaloids, proteins, gum. Fats tannins and amino acids were performed [1, 2].

Solubility behavior

One part of dry tamarind seed polysaccharide powder was shaken with different solvents and their solubility was determined. Solubility of tamarind seed polysaccharide was determined in basic solvents i.e Acetone, Chloroform, Hexane, Butanol and Water. It has been observed that polysaccharide is soluble in every solvent [1,2,].

pH of Xyloglucan in Tamarind Seed Polysaccharide:

Firstly, extracted Xyloglucan was weighed and then dissolved in water separately to get a 1% w/v solution. The pH of solution was determined using pH meter [1, 2].

FT-IR Study

The FTIR spectral analysis of tamarind seed polysaccharide and cross-linked biopolymers was carried out by KBR pellet technique using FTIR spectrophotometer and the FTIR spectral analysis was scanned between 500 to 4000 cm-1.

Cross-linking of Xyloglucan with Citric acid/ Lactic acid

The preparation of thin film proposed by Reddy et al. was performed with slight modification. The extracted polysaccharide was diluted with distilled water at 25 °C for 10-15 min. Citric acid/ Lactic acid (30% w/w polysaccharide) as a cross linking agent and glycerol (10 % v/w) as a plasticizer were added into the polysaccharide solution for preparing the film. The whole solution was stirred vigorously using a mechanical stirrer (speed 500 rpm) at 85-90 °C for 2-3 hrs. The viscous reaction mixture thus obtained was used for preparation of thin film and coating on fruits and vegetables. Film forming solution was poured immediately on a hot plate and cast film was cured at room temperature for 48-50 hrs [3].

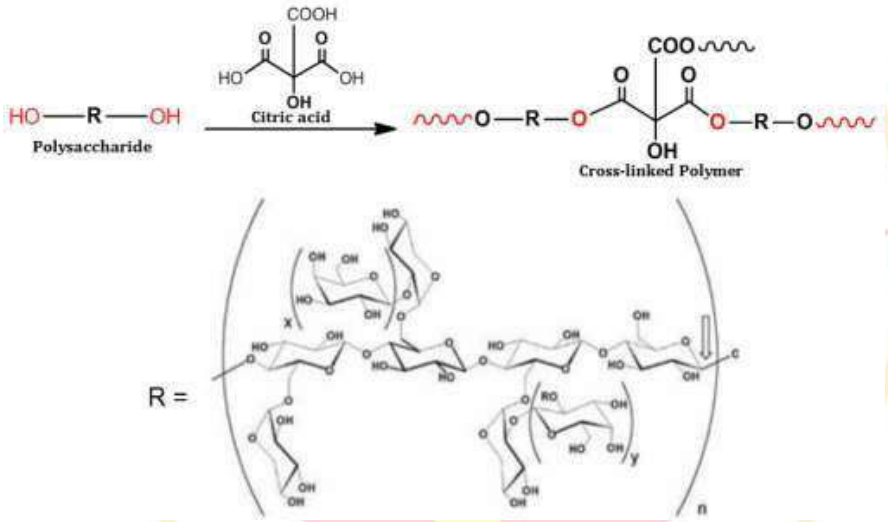


Figure 3.1: Synthesis scheme of cross-linked polymers (TSP-CA/TSP-LA)

Result and Discussion

Determination of purity of isolated tamarind seed polysaccharide

It has been observed that isolated tamarind seed polysaccharide was pinkish brown in color. It consist no odor and taste along with irregular shape as well as hard and rough in sensation and texture. The pH of 1% solution of TSP was found 6.4, which indicated that it should be non-irritating for mucus membrane. Solubility study showed that it was sparingly soluble in cold water, freely soluble and form viscous colloidal solution in warm water [1].

The isolated sample of TSP was subjected to identification. The violet color ring appeared at junction of mixture in test tube that confirms the presence of carbohydrates in sample powder. Confirmation test was also carried out for tamarind seed polysaccharide which gave positive test for mucilage, gums whereas negative for tannins, alkaloids and proteins. Other phyto-constituents were absent in the isolated powder [2]. This can be considered as proof for purity of the isolated tamarind seed polysaccharide as depicted in Table 3.1.

Polysaccharide is use for making edible plastic by using glycerol and CA as a plasticizer and crosslinker. This work investigated and developed the physical and chemical properties of polysaccharide based edible plastics and attempted to determine if they could be alternative to petrochemical plastics in the near future.

Multi-carboxyl structure of CA could induce interaction between CA and polysaccharide which will improve the barrier properties, moisture absorption, solubility of films etc. Modifiers have been used to

plasticized polysaccharide such as glycerol. Plasticizers have hydroxyl groups allowing compatibility with starch granules and they plasticized polysaccharide by breaking the internal hydrogen bonding between the glucose rings in starch. An effective plasticizer needs to be polar, hydrophilic and small enough to fit between the starch chains. Additionally, the boiling point of the plasticizer should be higher than manufacturing conditions so that it does not evaporate.

Table 3.1: Determination of purity of isolated tamarind seed polysaccharide

Test	Present/Absent
Carbohydrates	+
Hexose Sugar	+
Monosaccharides	-
Proteins	-
Fats and oils	-
Alkaloides	-
Amino acids	-
Mucilage	-
Gums	-

+ Present and - Absent

Percentage Yield of Tamarind Seed Polysaccharide

The % yield of the polysaccharide was found to be 70.0% for tamarind. During the processing of tamarind xyloglucan isolation washing is required many times which may result in loss of dissolved polysaccharides. However extraction processes tamarind is easy and hence gives better yield.

Solubility of Tamarind Seed Polysaccharide in various solvents

The solubility was checked in common solvents depending on their polarity such as water, phosphate buffers pH6.8, 0.1N HCl, acetone, ethanol, methanol etc. The polysaccharide was found to be soluble inorganic solvents and is also soluble in the aqueous solvents and swells to make a viscous solution. Hence the polysaccharides are hydrophilic in nature.

Rheological Behaviour of Tamarind Seed Polysaccharide

The viscosities of the different concentration (0.5%, 0.75% and 1%, w/v) of TSP solutions were determined by Brookfield viscometer at different shear. All the solutions showed sufficient viscosity at different shear rate and shows pseudoplastic flow. This was observed that viscosity decreases correspondingly with increasing shear. TSP shows consistent change behavior upon application of pressure

Fourier transforms infrared spectroscopy (FT-IR)

The FT-IR spectroscopy is simple but influential technique to study the curing of cross-linking. The FT-IR spectrum of tamarind seed polysaccharide (TSP), cross linked biopolymers TSP-CA and TSP-LA with citric acid and lactic acid respectively are shown in Figure 3.1.

In the FT-IR spectrum of TSP (Figure 3.1a), the vibration band at 3303.06 cm-1 is represented for the OH stretching. Two highly pronounced bands observed at vibrations 2924.09 cm-1 and 2862.36 cm-1 are result of -CH2 asymmetric and symmetric stretching vibrations respectively. A band observed at vibration 1375.25 cm-1 and corresponds to - CH2 bending vibration. The vibration at 1238.30 cm-1 and 1150 cm-1 is corresponds to - OH plane bending and glycosidic C-O-C stretching respectively. While the other vibration bands such as 945.12 cm-1, 898.83 cm-1 is corresponding to -CH bending.

The FT-IR spectrum of TSP cross linked with citric acid film (TSP-CA) is shown in Figure 3.1b. In FT-IR spectrum, the broad band at 3277.06 cm-1 is assigned for -OH stretching. The main peak of interest occurs at 1712.79 cm-1 and is associated with carboxyl and ester carbonyl bands [3]. The presence of the carbonyl peak confirms the crosslinking reaction between citric acid and polysaccharide. Two highly pronounced bands observed at vibrations 2983.88 cm-1 and 2889.37 cm-1 are result of -CH2 asymmetric and symmetric stretching vibrations respectively. A band observed at vibration 1352.10 cm-1 and corresponds to -CH2 bending vibration.

The vibration at 1276.88 cm-1 and 1143.79 cm-1 is corresponds to -OH plane bending and glycosidic C-O- C stretching respectively. While the other vibration bands such as 945.12 cm-1, 898.83 cm-1 is corresponding to -CH bending.

The FT-IR spectrum of TSP cross linked with lactic acid film (TSP-LA) is shown in Figure 3.1c. In FT-IR spectrum, the broad band at 3296.35 cm-1 is assigned for -OH stretching. The main peak of interest occurs at 1728.22 cm-1 and is associated with carboxyl and ester) carbonyl bands [3]. The presence of the carbonyl band confirms the crosslinking reaction between lactic acid and polysaccharide. A band observed at vibration 1375.25 cm-1 and corresponds to -CH2 bending vibration. The vibration at 1230.58 cm-1 and 1141.86 cm-1 is corresponds to -OH plane bending and glycosidic C-O- C stretching respectively. All other vibrational bands are in their respective region as similar to the TSP and TSP-CA spectrum.

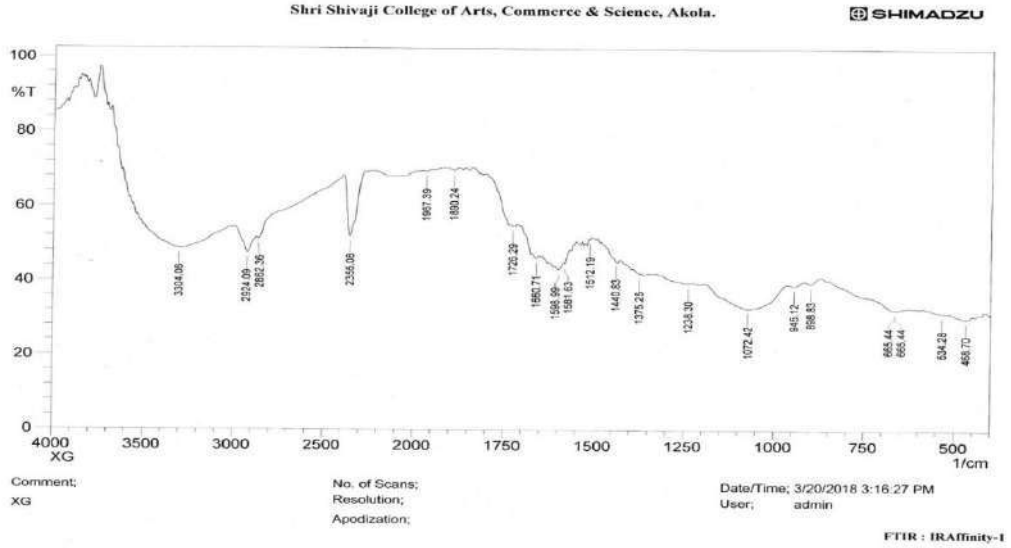


Figure 3.1: a) FTIR Spectrum of Tamarind seed Polysaccharide (Xyloglucon)

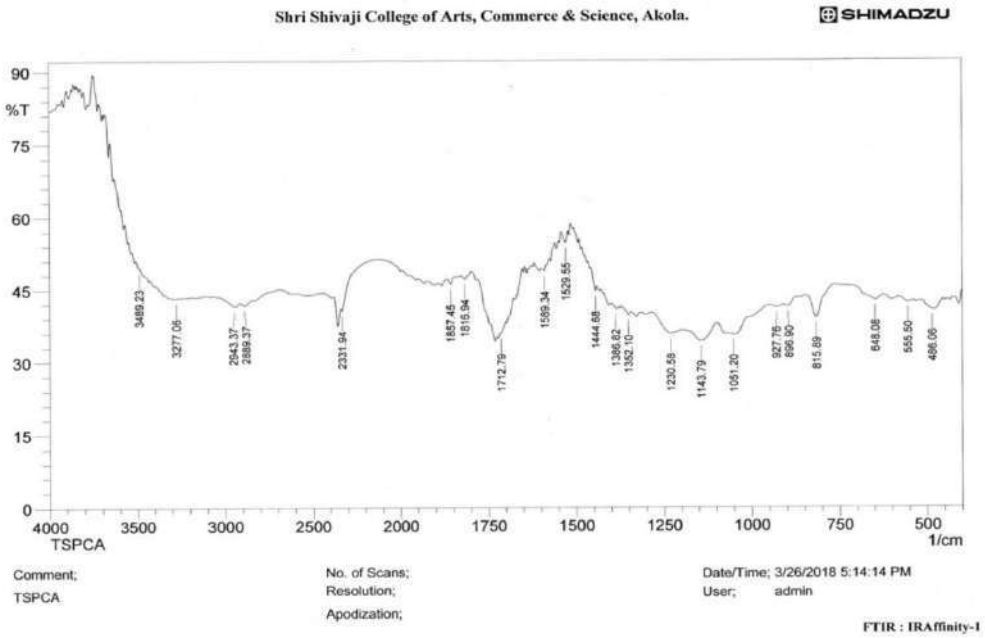


Figure 3.1: b) FTIR spectrum of Tamarind Seed Polysaccharide with Citric acid (TSP-CA)

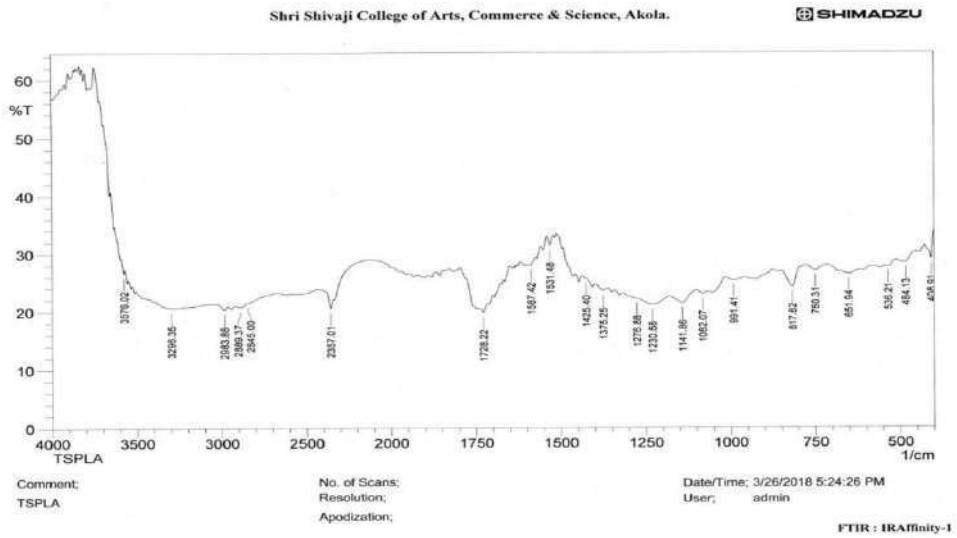


Figure 3.1: c) FTIR spectrum of Tamarind Seed Polysaccharide with Lactic acid (TSP-LA)

Chemical resistivity of cross-linked biopolymers TSP-CA and TSP-LA

The resistances to chemical factor test of TSP-CA and TSP-SA were studied using thin film in range of different protic as well as aprotic solvents such as NaOH, H2SO4, xylene, castor oil, dimethyl sulphoxide etc., The pieces of thin films were placed in different solvent for 5 days in a closed jar and the result were monitored at an interval of 24 h, by observing the change in their weights. The data has been tabulated in Table 3.2.

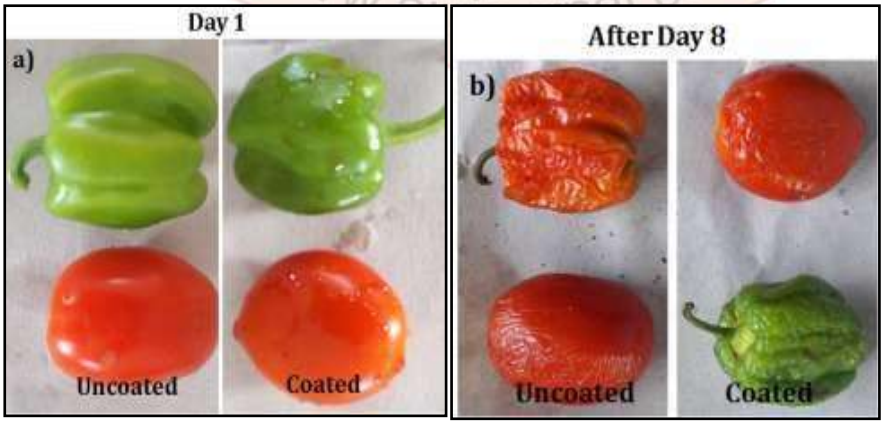
It was found that thin film is solubilized in both H2SO4 and NaOH solution as well as in DMSO and xylene solvent. However, it is resistance in all other solvents such as ethyl methyl ketone, acetone and chloroform etc.

Table 3.2: Determination of Chemical resistivity against different solvents

Solvents	TSP-CA	TSP-LA
Acetone	-	-
Ethyl methyl ketone	-	-
1 M NaOH	+	+
1 M H2SO4	+	+
Xylene	+	+
Castor oil	#	#
Chloroform	-	-
DMSO	+	+
Distilled water	#	#

Note: '+' is Soluble, '-' is Insoluble and '#' is Swelling.

Weight loss study of TSP-CA coating on fruits



The coating of TSP-citric acid crossed linked polymer on fruits and vegetables is shown in Figure 3.2. Coating is carried out to check the shelf life of fruits and vegetable by weight loss method. The weight loss and self life of data of coated fruits and vegetable are as shown in Figure 3.3. The data of weight loss study showed that weight loss is lower and shelf life is higher in case of coated capsicum and tomato compared to the uncoated. A result indicates that shelf life of fruits and vegetables increases by coating.

Figure 3.2: a) Uncoated and coated with TSP-CA cross-linked polymer and b) Uncoated and coated with TSP-CA cross-linked polymers after 6 days.

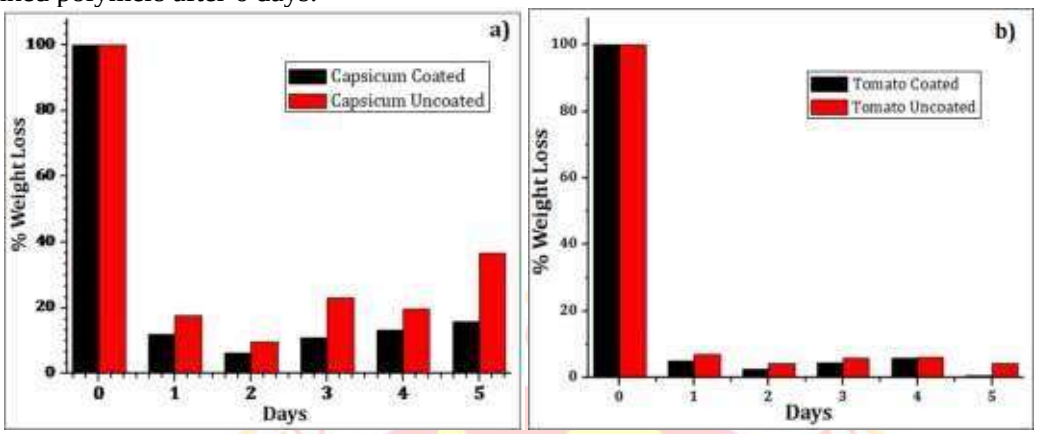


Figure 3.3: a) Comparative % weight moisture loss of Capsicum coated and uncoated and b) Comparative % weight moisture loss of Tomato coated and uncoated against 5 days.

Summary and Conclusion

The increasing interest in biodegradable and edible materials is being developed to solve the disposal of petroleum based conventional synthetic plastic materials. Petroleum based plastics requires lot of time for their degradation and most of them end up overwhelming the environment. In terms of end-use applications, packaging remains one of the major uses of plastics in the world.

Food packaging has become a centre of focus for waste reduction efforts, because in food packaging, a variety of petroleum-derived plastic materials are used at large scale due to their availability in large quantities at low cost and favorable functional characteristics. The use of edible films and coatings is constantly increasing in the food industry. Coatings can help to meet the many challenges involved in the storage and marketing of foods that are nutritious, safe and of high quality, stable and economic. The polysaccharide was isolated and characterized in terms of various physicochemical parameters of powder. From these characterized parameters it was observed that they possess substantial viscosity and very good mucoadhesive property. The mucoadhesive character of TSP may be due to resemblance with mucin structure. The other properties like pH, solubility etc. also found to be satisfactory. The observations showed that TSP exhibited good compatibility, cohesiveness and would be able to produce better flow properties in its granular form. It may be concluded that these polysaccharides can be chosen for the development of cross-linked edible polymeric materials. The tamarind seed polysaccharide was successfully utilized for modification by reacting with biobased acids such as citric acid and lactic acid. The developed cross- linked films are being resistant to most organic solvents whereas susceptible to acid alkali solution respectively. The weight loss study i.e., the coating on fruits and vegetable concluded that there is increase the shelf life of coated fruits compared to uncoated. The cast film can be further used as food packaging materials for future applications.

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Trace Elements Analysis in Ground Water Used for Drinking Purposes

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Abstract:

In this paper, assessment of trace metals in ground water used for drinking purposes in Nagpur city, Maharashtra, was carried out. Samples were collected from 10 Water Bodies supplying drinking water to the inhabitants in the region. All samples were analyzed for 10 trace and macro elements (Al, Pb, Cr, Ni, Cu, As, Cd, Zn, Fe, and Co) and using Inductively Coupled Plasma (ICP) spectrophotometer equipped with an ultrasonic nebulizer. Results recommended that an adequate and suitable treatment must be applied to the water bodies having elevated concentrations of the metals and supplying drinking water to the consumers.

Metal contamination issues are becoming increasingly common, with many documented cases of metal toxicity. Metals are a natural part of our ecosystem occurring in soil, rock, air, water and organisms. A few metals, including Cu, Mn, Zn, Co and Fe are however essential for metabolism in humans & plants in trace amounts. It is only when metals are present in bio- available forms at excessive levels that they have the potential to become toxic. Chronic poisoning occurs due to heavy metal content in the drinking water. Estimation should be made to differentiate between the possible cause and source of such poisoning case.

Keywords: Metal contamination, Drinking water Toxicity, Trace metals in ground water bodies

Introduction:

Providing quality drinking water to all citizens who are deprived of access to water will serve as the breaking point of poverty alleviation in most developing cities. Water supply systems and drinking water inaccessibility in developing countries is a global concern that calls for immediate action. About 884 mil-lion people in the world still do not get their drinking water from approved sources, and almost all of these people are in developing regions [1].

Water related diseases can often be attributed to exposure to elevated heavy metal concentrations of both organic and inorganic contaminants. Many of these compounds exist naturally, but their concentration has increased as a result of anthropogenic activities [2].

Living organisms require trace amounts of some metals including cobalt, copper, iron, manganese, molybdenum, vanadium, strontium and zinc. Excessive levels of these essential metals are detrimental to the organisms [3]. Non- essential metals like cadmium, chromium, mercury, lead, arsenic and antimony are of more concern to surface water system because these metals produce undesirable effects on human and animal life. Once these metals enter in a system, they remain for relatively longer periods [4]. Once absorbed, inorganic metals are capable of reacting with a variety of binding sites in the human body and have strong attraction to biological tissues. Natural water contains toxic metals in traces. All metals exist in surface water in colloidal, particulate and dissolved forms, although dissolved concentrations are generally low [5].

The magnitude of danger of environmental pollution by heavy metals was probably for first time realized with the Minimata disaster in Japan, where thousands of peoples suffered with mercury poisoning after consuming the fish caught in Minimata Bay. The bay got contaminated with mercury released from vinyl chloride plant between 1953 and 1960[6]. Similarly, it was also reported in Japan in 1955 that cadmium caused itai-itai Byo' disease in human beings, mainly in women over forty [7].

Heavy metals are important environmental pollutants and their toxicity is a problem of increasing significance for ecological, evolutionary, and environmental reasons. Heavy metals have played great roles in genesis of present-day civilization. In ancient times, the wealth of Emperors and Kings was attributed to the possession of metals like iron, gold, silver copper etc. in different forms. Still today, the dependence of heavy metals has not decreased as these are very commonly used in agriculture, medicine, engineering etc.

This was due to high level of cadmium in local foodstuffs attributable to irrigation water from soil heaps of an abandoned mine. Minimata raised its ugly head once again, not in Japan this time, but in fishing communities of Amazon rain forest. Heavy metal pollution has been worked out in recent days. Thus, in view of this widely used practice; it was of interest to undertake further investigation on these lines. The purpose of study is to promoting and coordinating activities in the field of environmental chemistry as well as health related water organizations.

Materials And Methods:

Collection of Samples: Assessment of trace metals in water supplied for drinking purposes in Nagpur city, Maharashtra, was carried out. Samples were collected from 10 Water Bodies supplying drinking water to the inhabitants in the region. Water samples were collected in one- liter plastic bottles, which were previously thoroughly washed with tap water and rinsed with distilled water. These were immediately acidified to pH 2 with HNO3 in order to keep metals in solution and prevent them from adhering to the walls of the bottles. All samples were transported to the laboratory in iceboxes and refrigerated at 4°C until analyzed. Sampling protocol was designed in such a way that samples collected in one sampling schedule were analyzed in the shortest possible time.

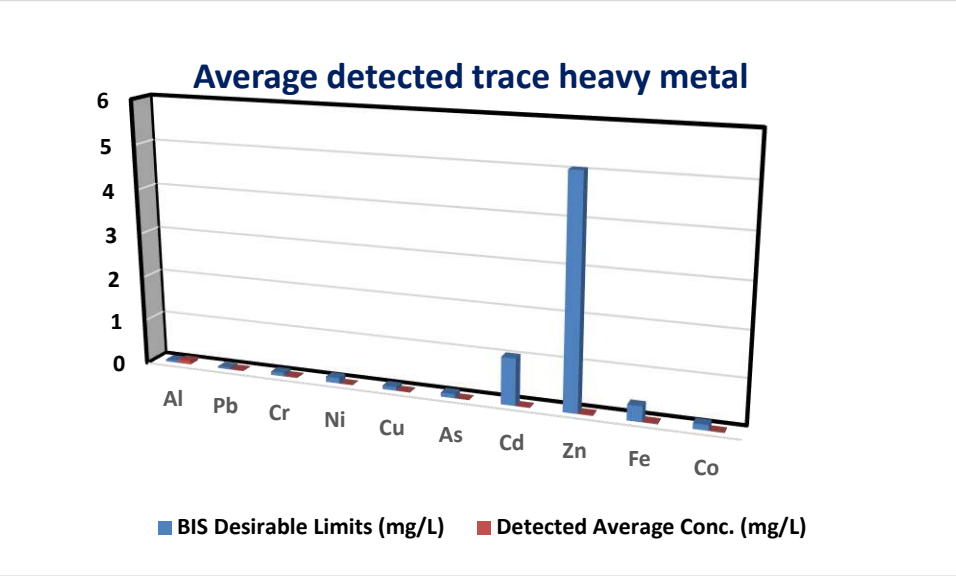
Sample Analysis: All samples were analyzed for 10 trace and macro elements using Inductively Coupled Plasma (ICP) spectrophotometer equipped with an ultrasonic nebulizer. Samples were analyzed for trace metals (Al, Pb, Cr, Ni, Cu, As, Cd, Zn, Fe, and Co) using a Perkin Elmer model 1000 Inductively Coupled Plasma. (ICP) spectrophotometer equipped with an ultrasonic nebulizer model Cetec-U 5000 AT. The use of the ultrasonic nebulizer instead of a pneumatic nebulizer provided a 5-to-50-fold improvement in detection limits and a 10-fold enhancement resulting in better reproducibility on trace metal level determinations. Analysis was carried out in duplicate and average values are reported. The ICP was calibrated with relevant Perkin Elmer Pe-Pure spectroscopy grade standards.

Results And Discussion:

The average detected trace heavy metal concentrations in the drinking water samples obtained from different parts of the Nagpur region has been presented in Table 1 and Fig-1.

Sr. No.	Trace Elements	BIS Desirable Limits (mg/L)	Detected Average Conc. (mg/L)
1.	**Al**	0.05	**0.008**
2.	**Pb**	0.04	**0.017**
3.	**Cr**	0.08	**0.018**
4.	**Ni**	0.12	**ND**
5.	**Cu**	0.08	**0.008**
6.	**As**	0.09	**ND**
7.	**Cd**	1.04	**0.001**
8.	**Zn**	5.06	**0.018**
9.	**Fe**	0.34	**0.014**
10	**Co**	0.12	**0.001**

Table 1



Aluminium (Al) - Soluble, colloidal, and insoluble aluminium may be present in treated water in residual form of coagulation with aluminium-containing material. BIS desirable limit is 0.05 mg/L Average Aluminum concentration in the analyzed drinking water samples was found to be 0.08mg/L.

Lead (Pb) - Tap water that are inherently not corrosive or not suitably treated may contain lead resulting from an attack on lead service pipes, lead interior plumbing, brass fixtures and fittings on solder pipe joints chiefly from galena (PbS). The BIS desirable limit is 0.04 mg/L Average Lead concentration in the analyzed drinking water samples was found to be 0.017mg/L.

Chromium (Cr) - Chromium may exist in water supplies in both the hexavalent and the trivalent state although the trivalent form rarely occurs in potable water. BIS desirable limit is 0.8 mg/L. Average Chromium concentration in the analyzed drinking water samples was found to be 0.018mg/L.

Nickel (Ni) - The average abundance of Ni in the earth's crust is 1.2 ppm; in soils it is 2.5 ppm; in streams it is 1 µg/L, and in groundwater it is <0.1 mg/L. BIS desirable limit is 0.12 mg/L. Arsenic was not detected in the analyzed drinking water samples. Nickel is a well-known human carcinogen and it affects the activity of α-tocopherol, the most common antioxidant in human body.

Copper (Cu) - Corrosion of copper-containing alloys in pipe fitting may introduce measurable amounts of copper into the water in a pipe system. BIS limit for copper is 0.08 mg/L. Average copper concentration in the analyzed drinking water samples was found to be 0.008mg/L.

Arsenic (As) - For the protection of aquatic life, the average concentration of As3+ in water should not exceed 72µg/L. And maximum should not exceed 140 µg/ L. BIS desirable limit is 0.09 mg/L. Arsenic was not detected in the analyzed drinking water samples.

Cadmium (Cd) - A cadmium concentration of 200µg/L is toxic to certain fishes. Cadmium may enter water as a result of industrial discharges or the deterioration of galvanized pipe. BIS desirable limit is 1.04 mg/L. Average cadmium concentration in the analyzed drinking water samples was found to be 0.001mg/L.

Zinc (Zn) - Zinc most commonly enters the domestic water supply from deterioration of galvanized iron and dezincification of brass. Zinc in water also may result from industrial waste
pollution. BIS desirable limit is 5.06 mg/L. Average Zinc concentration in the analyzed drinking water samples was found to be 0.018mg/L.

Iron (Fe) - Elevated iron levels in water can cause stains in plumbing, laundry and cooking utensils and can impart objectionable taste and colour to foods. The BIS standard desirable limit is 0.34 mg/L. Average Iron concentration in the analyzed drinking water samples was found to be 0.014mg/L.

Cobalt (Co)- The samples analyzed showed Co concentration in raw and treated water to be 0.06 and 0.02 ppm. BIS desirable limit is 0.09 mg/L, average Cobalt concentration in the analyzed drinking water samples was found to be 0.001mg/L. Cobalt is an integral part of vitamin B and essential for the production of

red blood cells. Its deficiency is thought to cause megaloblastic anemia called pernicious anemia. Salts of cobalt such as acetate, chloride, and sulphates are highly toxic to human beings.

Overview: In brief, Al exceeded the maximum desirable limits in the drinking water of Nagpur region. The detected average concentrations of Al, Pb, Cr, Ni, Cu, As, Cd, Zn, Fe, and Co did not exceed the maximum desirable limits in any of the drinking water samples in the Nagpur region.

Conclusions And Recommendations:

- Water samples were collected from 10 drinking water sources covering Nagpur.
- The minimum and maximum trace metals concentrations in different areas for Al, Pb, Cr, Ni, Cu, As, Cd, Zn, Fe, and Co ranged between ND-008, ND-0.017, ND- 0.018, ND, ND- 0.008, ND, ND-0.001, ND- 0.018, ND- 0.014 and ND-0.001 mg/L respectively.
- It is recommended to adopt some kind of inexpensive treatment to reduce the levels of trace metal Al in areas supplying water directly to consumers without any type of treatment.
- Further study in this area is required to access the quantity of trace heavy metals in various water bodies supplying drinking water, groundwater bodies as well as other natural water bodies.

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Study And Phytochemical Analysis Of Fenugreek (*Trigonella Foenumgraecum*)

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Abstract-

Fenugreek (*Trigonella foenumgraecum*) is an annual plant belongs to the family Leguminosae. It belongs to the class Magnoliopsida and order Fabales. It is the famous spices in human food. Fenugreek is a legume and it has been used as a spice throughout the world to enhance the sensory quality of foods. It is known for its medicinal qualities such as antidiabetic, anticarcinogenic, hypocholesterolemic, antioxidant, and immunological activities. Beside its medicinal value, it is also used as a part of various food product developments as food stabilizer, adhesive, and emulsifying agent. More importantly it is used for the development of healthy and nutritious extruded and bakery product. The present paper reviews about Phytochemical analysis of Fenugreek.

Keywords- Fenugreek, Seeds & Leaves, Phytochemical screening.

Introduction

Plants possess medicinal and drug activities. Current study on plants primarily focuses on its medicinal uses[1]. Plant can be extracted and used for chronic and infectious diseases[2].

The active drugs which play role are secondary metabolites. The antimicrobial activities of plant extract which produces different components including aldehyde and phenolic compounds[3]. Fenugreek, one of the earliest spices known to man belongs to the bean family trigonella foenumgraecum. It blooms white flowers in the summer and has very aromatic seeds. The herb can grow to be about two feet tall. Small and oblong shaped yellowish brown seeds of the fenugreek plant have a warm and slightly bitter taste. It is rich in vitamins and minerals and is high in protein. It has a long history as both a culinary and medicinal herb in the ancient world. Fenugreek leaves, which are high in iron, are used as a leaf vegetable in curries. The seeds and green leaves of fenugreek are used in food as well as in medicinal application that is the old practice of human history. It has been used to increase the flavoring and color, and also modifies the texture of food materials. Fenugreek (*Trigonella foenum-graecum*) being rich in phytochemicals has traditionally been used as a food, forage and medicinal plant[4]. Seeds of fenugreek spice have medicinal properties such as hypocholesterolemic, lactation aid, antibacterial, gastric stimulant, for anorexia, antidiabetic agent, galactogogue, hepatoprotective effect and anticancer. Fenugreek is a widely used herbal medicine for diabetes[5,6,7].

Phytochemistry

Fenugreek is well known for its fiber, gum, other chemical constituents and volatile contents.

These days it is used as food stabilizer, adhesive and emulsifying agent due to its high fiber, protein and gum content. The protein of fenugreek is found to be more soluble at alkaline pH Fenugreek is having beneficial influence on digestion and also has the ability to modify the food.

Leaves- The leaves contain seven saponins, known as graecunins. These compounds are glycosides of diosgenin. Leaves contain protein, fat, minerals, fiber, and carbohydrates which has therapeutic effects.[8] The mineral and vitamins present in leaves include calcium, zinc iron,phosphorous, riboflavin, carotene, thiamine, niacin and vitamin C.

Seed- Fenugreek is known for its pleasantly bitter, slightly sweet seeds. The seeds are available in any form whether whole or ground form is used to flavor many foods mostly curry powders, teas and spice blend.

List of chemical constituents is shown in table 1. The chemical composition of fenugreek showed that endosperm had the highest saponin and protein content. As against this, husk contains higher total polyphenols[9]. Seeds also contain the saponin (fenugrin B)[9]. Fenugreek seeds have been found to contain several coumarin compounds as well as a number of alkaloids (e.g., trigonelline, gentianine, carpaine). The major bioactive compounds in fenugreek seeds are believed to be polyphenol compounds, such as rhaponticin and isovitexin.

Methodology

Phytochemical test are performed. Extract is prepared then test for carbohydrate, protein amino acids, alkaloids, tannins, flavonoids, saponin, polyphenols are performed.

Materials and Methods

The fresh leaves of Fenugreek were collected. Collected fresh leaves were washed and used for the study of microscopic characteristics. The dried leaves and seeds of the plant were powdered and stored in an airtight container for further use.

Extraction and Isolation-

Near about 500gm leaves of Fenugreek dried and pulverized to powder using pestle and mortar in the laboratory. The plant material was macerated with hexane/methanol at room temperature and the extract store in refrigerator until the need of further study.

Phytochemical screening–

The chemical tests were performed for testing different chemical groups present in n-hexane and methanolic extract of leaves & Seeds of test plants Fenugreek.

Table 1: Qualitative Analysis of Phytochemicals

Sr.No	Test	Observation
1	**Test of Alkaloids**	
	1.0ml of plant extract was taken and then adds 1.0 ml of saturated solution of picric acid was added.	Yellow colour appears
2	**Test of Steroid**	
	About 0.5 g of the extract with few drops of acetic acid anhydride boil and cool .Then conc. H2SO4 was added from the side of the test tube.	Brown ring is formed at the junction two layers and upper layer turns green
3	**Test of Saponins**	
	0.5g of extract was added in 5ml of distilled water in a test tube. The solution was shaken vigorously. The frothing was mixed with 3 drops of olive oil and shaken vigorously.	Stable persistent froth appears. Formation of an emulsion
4	**Test for Flavonoids**	
	5 ml of dil. Ammonia solution were added to a portion of the crude extract followed by addition of conc. H2SO4.	Yellow coloration occurs.
5	**Test of Tannins**	
	About 0.5 g of the extract was boiled in 10 ml of water in a test tube and then filtered. A few drops of 0.1 fecl3 was added	Brownish green or blue- black coloration.
6	**Test for Polyphenol**	
	2 ml of extract was taken and add 2 ml of Folin's reagent.	Appearance of violet or Brown colour.
7	**Test for Amino Acid**	
	2 ml of extract was taken and boiled with 0.5 mL of a 0.1% solution of ninhydrin	Appearance of blue colour.
8	**Test of glycosides**	
	1 ml glacial acetic acid few drop of ferric chloride solution and conc. Sulphuric acid added	Appearance of reddish brown colour at the junction of liquid presence of deoxy sugar.

Conclusion

The preliminary phytochemical screening of Trigonella foenum gracum gives good results in the presence of flavonoids, alkaloids, phenolic compounds, tannins, saponins, carbohydrates and proteins. These phytochemical showed that Trigonella foenum gracum (fenugreek) seeds have good medicinal and therapeutic compounds. By observing the recent research studies it can also be used to reduce the level of glucose levels and can be used as one of the best anti-diabetic component.

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Overview of Recent Advances in Solar Cell Technologies

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Abstract

Earth will be facing the problem of energy crisis in near future. Use of renewable energy sources is the only way to tackle it efficiently. Solar energy is the important aspect of it. This paper reviews the different types of solar cells. Further, with different types of materials' utilization, study is done that how the performance of solar cells is enhanced. This paper consists of comparison between efficiencies of different types of solar cells with different materials. The future technologies in the solar cell technologies are studied briefly. The performance attained by the new technologies is also studied.

Keywords: Solar Cell, Solar Photovoltaics

Introduction

The sunlight which we get from the Sun is directly available to us as a renewable source of energy and it is non-vanishing also in nature. The energy derived from sunlight is also free from the pollutants of environment and noise. It can be easily used to compensate the energy which we draw from other sources like non-renewable sources of energy viz. fossil fuels, petroleum products and deposits found under the earth. To fabricate solar cells with high efficiency it has been put under large number of improvement stages from a long time. Earlier solar cells were developed by fabricating them on a single crystal of Si wafer. Those were regarded as the first generation solar cells. After that due to the development of thin films, organic materials as substitute to silicon, and dye sensitized solar cells the efficiency of conventional solar cells has been increased. The development and progress in the field of solar cell fabrication is generally hindered due to cost and efficiency factors.

The sun provides us daily with a tremendous and huge amount of energy which is in the form of heat and also the radiations known as solar energy. The energy received from the sun is available free of cost and is limitless in nature. It also has numerous advantages as solar energy can be easily harvested and used over other available conventional sources of power generator. The solar energy can be used by harvesting the sunlight in the form of solar energy by using the photovoltaic device called solar cell. The sun is basically a huge mass of gases made up of helium and hydrogen atoms. The hydrogen nuclei combine by emission of huge amount of energy by process called nuclear fusion. During the process of fusion, four of the H atoms unite and release energy to form one He atom. This energy which is released from the fusion reaction is pollutant- free, free from gases or any by product from the reaction.

The solar energy is utilized in two ways 1) photothermal and 2) photovoltaic. In first case the heat from solar radiation is either directly used for applications such as drying, water heating, space heating etc. or is converted into electricity. In photovoltaic conversion, the devices called as solar cells directly convert the solar radiation falling on them into electricity. Increasing the efficiency of solar cells and limiting the production cost is the key factors on which most of the research in this area are based upon.

Different Solar Cell Technologies And Other Efficiencies

Solar cells represent the building block and main component of PV systems. A solar cell is defined as an electrical device that directly converts the energy of photons into direct current (DC) electricity through a chemical/physical phenomenon called the photovoltaic effect. Photons with energy exceeding the cell material band-gap are absorbed causing excitation of charge-carriers and thus electric current and voltage. The conversion efficiency (η) is calculated as the percentage of the incident light power on the cell surface that is converted into electrical energy under standard conditions.

Solar cell technologies can be broadly divided as 1) solar cells based on Silicon 2) thin film solar cells 3) multijunction solar cells and 4) next generation solar cells.

Theoretical maximum solar cell efficiency value for homojunction cells can be about 29% (Sukhatme, S. P. &Nayak, J. K., 2018) assuming incident global radiation to be AM1.5 under a clear sky (1000W/m2) and with band gap energy in the range 1.1eV to 1.7eV. Many semiconductors like Si, GaAs, CdTe have band gap in this range. However, even with sustained research and development the highest reported values (2) from laboratories for solar cells and PV modules can barely reach the maximum theoretical values.

The efficiency values (Green, M.A. et al, 2016; Sukhatme, S.P. &Nayak, J. K., 2018) attained in laboratory with some first generation and second generation solar cells are listed in Table I for comparison purpose.

A. Crystalline Silicon Solar Cells

Single-junction c-Si is currently the dominant cell technology in the global PV market. The wafer-based conventional cells are classified according to their crystalline structure into four main types: Mono-crystalline, Poly-crystalline (i.e. multi-crystalline), Heterojunction with Intrinsic Thin layer (HIT), and Microcrystalline. Both single crystal and multicrystalline, are widely popular because silicon is abundant and non-toxic. With increasing production of solar PV cells and with need to reduce their cost, multicrystalline Silicon is used for commercial modules, though its efficiency is lower.

Due to high cost of making crystalline silicon, thin film cells based on a hydrogenated alloy of amorphous silicon (denoted by a-Si:H) have been commercialized.

Table I. Efficiency values attained in laboratory with some first generation and second generation solar cells. Measurements under global AM1.5 spectrum (1000 W/m2) and at cell temperature 250 C (Green, M.A. et al , 2016; Sukhatme, S. P. &Nayak,J. K., 2018)

Type of Solar Cell	Area (cm2)	Efficiency (%)
Silicon (single crystal)	143.7	**25.6**
Silicon (multicrystalline)	242.74	**21.3**
Silicon (amorphous)	1.001	**10.2**
Gallium arsenide GaAs (multicrystalline)	4.011	**18.4**
Thin Film:		
Cadmium telluride CdTe	1.0623	**21.0**
Copper indium gallium diselenide CIGS	0.9927	**21.0**
Gallium arsenide GaAs	**0.9927**	**28.8**

B. Thin Film Solar cells

To avoid the high economic and environmental cost of c-Si cells (in terms of material and energy) , a second generation of technology has been introduced since 1970s. Thin-film PV cells are manufactured by depositing thin layers of photovoltaic materials (thickness < 2 μm) to form a heterojunction barrier. Due to the direct and wide bandgap of most thin-film semiconductor materials (1.5-1.8 eV), 2G cells have better temperature coefficients as well as a good performance in indirect light. Furthermore, the main advantage of thin-film cells stems from their very small thickness. Accordingly, they can be deposited on flexible substrate materials, they can be connected into modules during the manufacturing process of the cells through laser cutting, and they can be vertically stacked to form the 3G tandem (multi-junction) cells.

Technology has helped to reduce the cost as compared to Silicon wafer based technology due to less material requirement. Other advantages of thin film modules are, they can be made in large sizes and can be mounted on curved surfaces with use of suitable substrates. However, the efficiencies of thin film solar cells are lower as compared to wafer based cells.

C. Multijunction Solar Cells

Based on amorphous silicon as well as compound semiconductors from group III and V elements of periodic table have shown greatly improved efficiencies. However, their manufacturing is expensive. An efficiency of 40.7% has been reported (King, R. R. et al., 2007) for a three-junction GaInP⁄ GaInAs⁄ Ge cell under the standard spectrum for terrestrial concentrator solar cells at 240 suns (24.0W/cm2, AM1.5D, low aerosol optical depth, 25°C). Multijunction cells based on III-V compounds are primarily used with solar concentrators, mainly providing power in space applications.

Gallium arsenide (GaAs) is a compound semiconductor which has replaced silicon in many applications due to high efficiency. GaAs solar cells have been made in various forms: thin film, single crystal, multicrystalline and multijunction. The thin film GaAs single junction solar cells have shown efficiency of 28.8% in laboratory and multicrystallineGaAs solar cells have shown 18.4 %. Thin film GaAs solar cell modules have shown 24.1% efficiency in laboratory (Green, M.A. et al, 2016). Multijunction solar cells with GaAs have shown efficiency of 31.6 % (Green, M.A. et al, 2016). Other advantages of GaAs are: its bandgap 1.42eV is close to ideal value for PV applications, its high performance in high temperature environment and better resistance to radiation. All these characteristics make it suitable for use in space applications and solar concentrators (Sukhatme, S. P. &Nayak,J. K. ,2018).

D. Emerging technologies

1) Pervoskites Solar Cell

Perovskites are a group of compounds having crystal structure similar to a mineral called perovskite which is composed of calcium titanate (CaTiO3). Perovskite solar cells are based on organometallic halides.

They have been recently reported with efficiency 25.5 % in single-junction architectures and 29.1% in silicon-based tandem cells (https://www.nrel.gov/pv/cell-efficiency.html). Perovskite solar cells are the fastest-advancing solar technology with the potential of achieving even higher efficiencies at low production costs. However, the commercialization of this technology faces certain issues, like stability against moisture and oxygen, heating under applied voltage (Yuan, Y., et al, 2016), photo-unstability , mechanical fragility (Rolston, N., et al, 2016) and environmental concerns due to toxicity of lead halides used in perovskite solar cells.

2) Organic Solar Cell

Organic solar cell or plastic solar cell is thin film cells which use organic semiconductors. The advantages of this type of cell are: they are inexpensive, flexible, light weight and involve solution based processing. But these cells suffer from low efficiency. Various architectures and different materials have been tried with organic solar cells. Recently efficiency for organic photovoltaics of 17.3% was reached via tandem structure (Chen, Y., et al, 2018).

3) Dye Sensitised Solar Cells (DSSC)

Dye sensitised solar cells (DSSC) or Gratzel cells are photoelectrochemical cells. The cell consists of photoanode, sensitizer, electrolyte and counter electrode. The sensitizer can be an organic dye, inorganic dye or metal-organic dye. The DSSC has attracted the attention mainly because it is simple to make using conventional roll-printing techniques and most of the materials used are low-cost. Conversion efficiencies of over 11% and 15% have been obtained with single junction and tandem cells, respectively, in the laboratory (Nazeeruddin Md. K., et al, 2011).

4) Kesterite Solar Cells

Kesterite solar cells are based on two synthetic compounds copper zinc tin sulphide (Cu_2ZnSnS_4) (CZTS) and copper zinc tin selenide ($Cu_2ZnSnSe_4$) (CZTSe). The optical and electronic properties of CZTS and CZTSe are similar to CdTe and CIGS. However, the advantage with CZTS and CZTSe is they do not contain toxic or rare earth elements like cadmium and indium respectively. Efficiency of 7.6% has been reported with CZTS cell and 9.8% CZTSe cell (Green, M.A., et al, 2016). Some loss mechanisms limiting the performance of these cells are dominant interface recombination, high series resistance and low minority carrier lifetime .

5) Quantum Dots

Quantum dots are a special class of semiconductors, which are nanocrystals, composed of periodic groups of II-VI, III-V or IV- VI materials. Quantum dot solar cells (QD) are structures with tunable bandgap to match the spectral distribution of solar spectrum, which reduces cost/ watt ratio of solar electricity. QDs offer the advantages like: they can be moulded into a variety of different types, in two-dimensional (sheets) or three-dimensional arrays; they can be processed to create junctions on inexpensive substrates such as plastics, glass or metal sheets; they can easily be combined with organic polymers and dyes. Recently scientists at the University of Queensland achieved 16.6% efficiency by synthesizing a quantum dot solar cell from a halide perovskite. U.S. National Renewable Energy Laboratory (NREL) set the previous record for quantum dot cell efficiency in 2017 at 13.4%, working with a similar lead halide perovskite (Sanehira, E. M. et al, 2017).

Future Trends

Continuous research and development in the field of solar photovoltaics is providing innovative materials to harvest maximum solar energy. Not only the materials but design of the products also plays important role in commercial application of the technology. Many interesting applications have been realised and some are expected in near future like : floating solar farms, where photovoltaic panels floating on reservoirs, dams and other water bodies save on large land area occupied by solar panels (Choi, Y. K., et al, 2016) ; building integrated photovoltaics (BIPV) blend into building architecture in the form of roofs, canopies; photovoltaic glasses act as energy generating device as well as allow natural light inside houses and offices; anti-solar panels working exactly opposite to conventional solar panels i.e. by using heat radiated from earth's surface so that energy can be generated around the clock (Deppe, T. &Munday, J. N., 2020) and perhaps the most promising would be solar paint with quantum dot solar cells and perovskite solar cells.

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Per formic acid: Effective reagent for preparation of Carene diol from Δ^3-Carene

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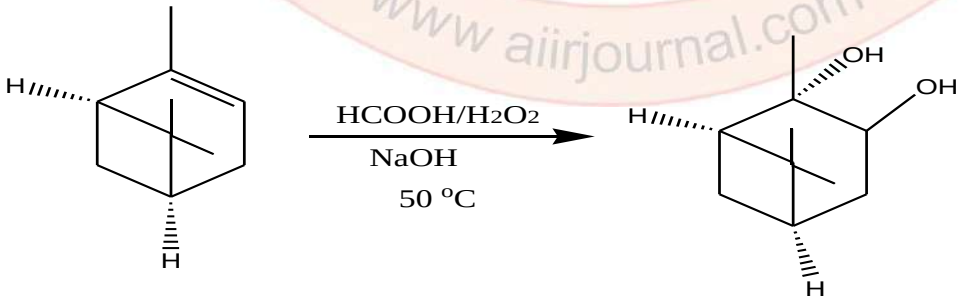
Abstract:
In the natural product, terpenoids are important because of its valuableimportance in various sectors. The terpenoids occur only in the volatile oils and they are normally colourless liquids or solids with pleasant smell and insoluble in water. They are soluble in organic solvents,alcoholand fixed oils. These terpenoids are very sensitive to prepare its various different derivatives. Terpenes are one of that terpenoids which can gives oxygenated derivatives like alcohols, ketones, aldehydes etc. Monoterpene is one of the terpenoids having molecular formula $C_{10}H_{16}$ used to prepare various derivatives. (+)3-Carene is one of the monoterpene which on oxidation by using oxidising agent performic acid which gives epoxide as intermediate product, (epoxidation of carene). Which on hydrolysis, it gives carene diol as final product.
Keyword: *terpenoids, volatile oils, Δ^3-Carene, α- pinene, carene diol.*

Introduction:

In the natural product, terpenoids are valuable natural product because of its importance in various sectors. The terpenoids occur only in the volatile oils they are normally colourless liquids [1] or solids with pleasant smell and are insoluble in water. They are soluble in, organic solvents,alcohols and fixed oils. Terpenoids normally contains one or more double bonds and forms additive compounds with halogens[2-3], nitrosyl chloride[4], and nitrosyl bromide. They are readily volatilise in stem and most of them are optically active [5].Then get oxidized by oxidizing agent. Terpene [No. of isoprene units two, M.F. $C_{10}H_{16}$] by virtue of their pleasant flavour the compounds of terpene [6] used in several industries specially perfumery, cosmetics, soaps, foods, pharmaceuticals [7], beverages and many others. Apart from flavour in food and pharmaceutical industries they are also used as mosquito repellents [8], insecticides, pesticides and deodorant [9] Antibacterial and Antifungal Properties [10]. Therapeutically they owe their action due to several compounds and find applications as antiseptic [11], stimulant, and diuretic, analgesic [12] and for several other purposes.

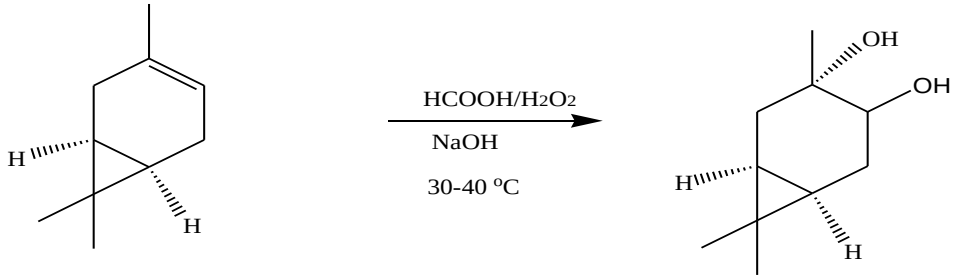
Terpenoids are classified on the basis of no. of isoprene units (C_5H_8).In that monoterpenes or terpene contains two units of isoprene ($C_{10}H_{16}$). Terpene or carene is present in (+) and (-) form. (-) form is isolated from root oil of kaempferia galangal [13-14] and from cedrus deodar oil and (+) form is wide spread plant product found specially in abies, citrus and janipenus oil with pleasant odour B.P.$_{200}$ =123-124°C and $\{\alpha\}_D^{30}$ =5.72, The (+) form of Δ^3-Careneis obtained from geranyl diphosphate[15]. Already recorded reaction of peracid such as Performicacidonterpene such as α-pinene epoxidation [16]takes place andepoxideofα- pinene is obtained. Which on hydrolysis, This epoxide is converted into 2α, 3β-pinenediol [17].The present work was done as same procedure given above on Δ^3-Carenewhich gives final product is 3α, 4β-carenediol.

Scheme I



α- pinene 2α, 3β- pinenediol

Scheme II



Δ^3-Carene3α, 4β-carenediol

General Experimental Procedure:

In the 150 ml three necked round bottom flask,equipped with a mechanical stirrer and dropping funnel was placed formic acid (90% 26 ml) and freshly distilled Δ^3-Carene (10gm)was added with stirring through a dropping funnel H_2O_2(30% 15ml) was then added drop wise maintaining the temperature of the reaction mixture between 30-40°C (2hrs) stirring was continued at that temperature for 6 hrs. And reaction was allowed to stand overnight. The solution of sodium hydroxide (8 gm in 20 mlH_2O) was added slowly to the mixture under stemming keeping the temperature around 25°C(1hrs) the reaction mixture was transpired to 150 ml separating funnel and the layer s were allowed to separate the upper oily layer approximately 13 gm was transferred back to the reaction flask and further amount of solution of sodium hydroxide (2 gm in 40 mlH_2O)was added slowly under vigorous stemming maintaining the temperature at 25°C to 30°Cafter stemming of one half hours and cooling to 5°Cto 10°C the solid diol separate out. It was filtered the residue washed with cold water and dried yield was 7 gm (64%) melting point 68°C. The crude diol was crystallized from pet ether + 5% ethyl acetate to give about 4 gm of diol (45%). Themelting point was87°Cto 88 °C

2.1*Spectral data of obtained compound:*
3,4-Hydroxy-3,7,7-Trimethyl-1- Bicyclo-(4,1,0)-Heptane.
IR(KBr):3448,2900,1460, 1375, 1058, 945 & 815 cm^{-1}

Result and Discussion:

Already recorded reaction of peracid such as Performic acid with terpene such as α- pinene epoxidation of reactant was takes place and epoxide of α- pinene is obtained as intermediate. Which on hydrolysis, This epoxide is converted into 2α, 3β-pinenediol of yield 40% .Whensuchreaction is carried out on Δ^3-Carene by using same reagenti.e.performic acid which is obtained from formic acid (90%, 26 ml) and with constant stirring through a dropping funnel H_2O_2 (30% 15 ml) was then added drop wise maintaining the temperature of the reaction mixture between 30-40°C (2 hrs) stirring was continued at that temperature for 6 hrs. And reaction was allowed to stand overnight. Then solution of sodium hydroxide (8 gm in 20 ml H_2O) was added slowly to the mixture. This mixture then cooling to 5°C to 10°C the solid diol separate out dried yield was 7 gm (64%) melting point 68°C. crude diol was crystallized from pet ether + 5% ethyl acetate to give about 4 gm of diol (45%). the melting point was 87°C to 88 °C

Table- 1

Sr. No.	Terpene			Yield (%)
1	α- pinene			40
2	Δ^3-Carene			45

In the present study preparation of carene diol from Δ^3-Careneby using simple & same procedure, Per formic acid in presence of base as same reagent and maintaining temperature between 30 to 50°C. Which is used for preparation of diol of α- pinene. The yield of product is also nearly equal in range i.e. between 40 to 45 %.

Conclusion:

We have been able to introduce an efficient procedure for preparation of terpene diol by using easily preferable, more efficient catalyst which gives good yield, easy to work up, purification of compounds by simple method are the key advantages of this method.

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Synthesis And Physicochemical Studies of Chalcone

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Abstract:
Chalcone compound is synthesized and its characterization was done byspectroscopic techniques such as IR, NMR and mass spectrometry.Some physicochemical properties such as melting point, density, viscosity, refractive index, etc. have been studied for newly synthesized chalcone in different solvents, different concentration and different temperature.
Keywords- Chalcones, Density, Viscosity, Refractive Index, Concentration, Temperature etc.

Introduction:

Chalcones are one of the most important compounds.The framework 1,3-diphenylprop-2-en-1-one is well known by the generic term ‘‘chalcone,’’ a name coined by Kostanecki and Tambor[1]. It is also known as benzalacetophenone and benzylidene acetophenone. The chalcones has most important properties like anticancer [2], antimalarial[3], antimicrobial[4] and antiinflammatory[5]etc. 2-Hydroxy chalcones are a group of naturally occurring compounds and are used as the intermediates for the synthesis of various other flavanoids[6,7]. The unsaturated carbonyl system in chalcones makes them biologically active[8].Indeed,chalcones constitute an important group of natural compoundsthat are especially abundant in fruits (e.g., citruses,apples), vegetables (e.g., tomatoes, shallots, bean sprouts,potatoes) and various plants and spices (e.g., licorice),many of which have been used for centuries in traditionalherbal medicine.[9]

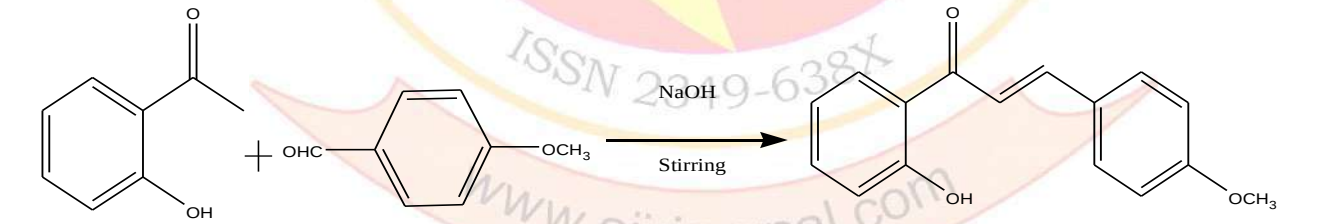
The physicochemical properties has lot of applications. The refractive Index ,density, molecular mass and viscosity are very useful in the evaluation of variousthermodynamics properties of chemical materials. The solubility is a main key factor in pharmaceutical industries.The crystallization process is also helpful in purifications and increases in crystal size.[10-12]

Thus, the present work was undertaken to synthesized new chalcone derivative and study of its physicochemical properties such as density, viscosity, refractive index etc. in different solvents, different concentrations and different temperatures.

Experimental

1. Synthesis

The chalcone was obtained by Claisen-Schmidt Condensation process.It contain equimolar quantity of aromatic ketones that is acetophenone derivatives and aromatic aldehyde as benzaldehyde derivatives will combine together in presence of base like NaOH to produce chalcone derivatives[13-20]. The structure of synthesized chalcone was confirmed by IR, 1H NMR and mass spectral data.



1-(2-hydroxyphenyl)ethanone 4-methoxybenzaldehyde (*E*)-1-(2-hydroxyphenyl)-3-(4-methoxyphenyl)prop-2-en-1-one

Table 1 shows the physical parameters of synthesized chalcone

Sr. No.	Compound	Substitution	Molecular Formula	Molecular Weight	Yield
1	Chalcone	OH & OCH_3	$C_{16}H_{14}O_3$	254	76%

2. Physicochemical studies:

The chlacone is recrystallized with DMF. All physicochemical properties were studied in dimethyl formamide (DMF) and dimethyl sulfoxide (DMSO) solvents.The different concentration of synthesized clacone prepared in DMF and DMSO. The selection of solvents for physicochemical properties on the basis of solubility.

2.1 Density and Viscosity:

The different concentrations of synthesized chalcone were made in DMSO and DMF solvents.The density of different concentration solutions were measured by using pycnometer while viscosity were measured by Ostwald viscometer at differenttemperatures**.**

2.2 Refractive Index:

The different concentrations of synthesized chalcone were made in DMSO and DMF solvents. The Abbe's refractometer was used for the measurement of refractive index of solutions of synthesized chalcone.

Results and discussion

1) Density and Viscosity of synthesized chalcone:-

The experimental values of density (ρ), and viscosity (η), at different temperature and different concentration are mention in fallowing tables

Table-2 Temperature:303.15 K

Conc.	DMSO Solvent		DMF Solvent	
(M).	Density (ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise	Density (ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise
0.05	1.202	13.2924	0.9710	8.3102
0.04	1.1190	13.2507	0.9698	8.2964
0.03	1.1188	13.1962	0.9690	8.2845
0.02	1.1178	13.1626	0.9681	8.2202
0.01	1.1168	13.1104	0.9678	8.1626

Table-2 Temperature: 308.15 K

Conc.	DMSO Solvent		DMF Solvent	
(M).	Density (ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise	Density(ρ) (g.cm^{-3})	Viscosity (η.10^{-3}) poise
0.05	1.206	11.3022	0.9626	7.9422
0.04	1.1194	11.2824	0.9610	6.9125
0.03	1.1186	11.2268	0.9572	6.8947
0.02	1.1174	11.1917	0.9555	6.878
0.01	1.1160	11.1364	0.9518	6.8262

Table-3 Temperature: 313.15 K

Conc. (M).	DMSO Solvent		DMF Solvent	
	Density (ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise	Density(ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise
0.05	1.1190	10.4612	0.9662	7.1522
0.04	1.1184	10.2643	0.9654	6.5844
0.03	1.1180	10.1107	0.9646	6.5005
0.02	1.1152	9.8215	0.9638	6.3863
0.01	1.1138	9.6276	0.9602	6.2084

The density of newly synthesize chalcone is higher in DMSO solvent than DMF solvent. The density decreases by decreasing concentration of solution because density is depend on the amount of substance present in solvent.The density in the two solvents is different.The different values in different solvents suggest that interactions of solute and solvent particles play an important role. In solutions, molecular interactions exist which differ in different solvents. Further, these interactions differ due to different concentration of solute insolution. Due to these interactions, there may be somechanges in mass and volume, which affects density

The viscosity of solution is depends on the interaction between solute and solvent particles, temperature, concentration etc. The viscosity in DMSO solution is higher than DMF due to strong solute solvent interaction in DMSO solvent. Viscosity in each solvent decreases as concentration decreases.

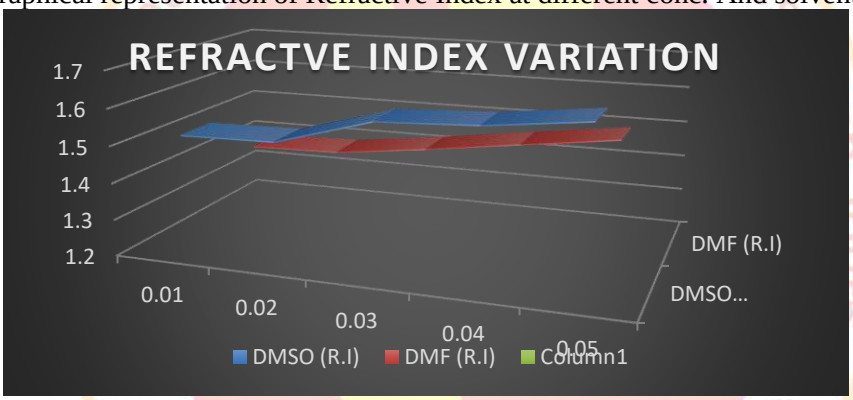
2) Refractive Index of synthesized chalcone:-

The experimental values of refractive index atdifferent concentrations and different solvents are mention in fallowing tables

Table-4

	DMSO	DMF
(M)	R.I.	R.I.
0.01	1.5126	1.3894
0.02	1.5168	1.3946
0.03	1.5914	1.4262
0.04	1.6021	1.4623
0.05	1.6322	1.4975

Graphical representation of Refractive Index at different conc. And solvents



It is observed that refractive index ofcompounds are different in each solvent as well as different concentrations . This again proves that in different solvents, inter molecular interactions are different which affects these parameter. In some solvents, aggregation or hydrogen bonding takes place whereas inothers, breakage of bonds takes place. As refractive index depends not only upon atomic refraction but also on single, double or triple bonds, these parameters are affected by the type of interactions taking place in solution.

Conclusion

It is concluded that physicochemical properties of a compound depends on concentration, temperature, solvents etc. The physicochemical properties play important role to explain the interaction between solute and solvent.

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A Biomonitoring of Plankton And Physico Chemical Properties of Kapileshwar Dam, Ashti, Dist-Wardha

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Abstract

The present study deal with biomonitoring of plankton and physico-chemical parameters of Kapileshwar dam. To cover the whole dam area the study area was divided into five sampling stations, comprehensively during the June 2017 to July 2018. The physico-chemical parameters were observed Temperature, Transparency, pH, Turbidity, Total Dissolved Solid, Total alkalinity, DO, Total hardness, Nitrate, Sulphate and Phosphate during the study. Water temperature exhibited feeble positive correlation with zooplankton. Transparency played an important role in flourishing population of phytoplankton as it established a positive correlation at 1% level of significance (r =0.729).The dissolved oxygen in water of the dam ranged from 5.00mg/l to 9.10mg/l at station I and II characterized as good level of water body. Nutrients like nitrates and phosphate present in the water body were found in the permissible limits as prescribed by WHO, BIS for drinking water quality which confirm that the water is unpolluted and safe for drinking purposes. At present the Kapileshwar dam is of mesotrophic nature.

***Key words**: Physico-chemical parameters, Kapileshwar dam, Plankton and Mesotrophic.*

Introduction

It is necessary that the quality of water should be checked periodically because due to use of contaminated water biotic fauna may suffer from a variety of water born diseases Sunkund and Patil (2004). In recent times limnological studies are often related to fisheries, biodiversity conservation, pollution assessment and rejuvenation of degraded inland freshwater ecosystems (Arlinghaus et al., 2008). Zooplankton diversity is one of the most important ecological parameters in water quality assessment. In many areas,the ecological impacts from human activities will far exceed the impacts from climate change, Scholze et al., (2006) have worked on a climate-change risk analysis for world ecosystems, Islam (2007) in a pond of Rajshahi University, has investigated the effects of abiotic parameters on the variations of zooplankton population. Zooplankton is good indicator of the changes in water quality because they are strongly affected by environmental conditions and respond. Nelson et.al.,(2009)carried out a detailed study on the combined effects of urbanization and climate change on stream ecosystems: from impacts to management options. Similarly, Durance and Ormerod (2009) have investigated existing trends in water quality and the consequent discharge confound long – term warming effects on river macroinvertebrates. The study of plankton and physico-chemical property of water was carried out by various people like

Mishra and Saksena (1991), Kuashik and Saksena (1995). Patel et al., (2013), Vasanthkumar and Vijay Kumar (2011), Garg et al., (2010). The water of Kapileshwar dam is utilized for drinking, irrigation and for fisheries activity. The present study was aimed to evaluate water quality and occurrence of zooplankton and phytoplankton with reference to physico-chemical parameters in a Kapileshwar dam.

Material And Methods

The Kapileshwar dam is a man made reservoir constructed on a river. It is at 780-17'-00" E longitude and 200-12'-00"N .The length of dam is 589 mtrs. and 7.31 meters high with a catchment area of 6.68 square km situated near Ashti Tahsil of Wardha District.Gross storage capacity of the reservoir is about 1.720 Mm3.The study area was divided into 5 sampling sites .Water samples were collected regularly on monthly basis in between 8 a.m. to 10 a.m. Water pH,DO,and TDS observed at sampling site using water analysis kit(Systronic make) while other abiotic components were analyzed at laboratory condition using the method prescribed by APHA(1989).

Result And Discussion

It is fact that maintenance of healthy aquatic ecosystem is dependent on the physico-chemical properties of water. Station wise mean values of physico-chemical parameters are summarized in Table 1.

Water Temperature(WT)

Temperature is one of the most important ecological factors, which controls the physiological behavior and distribution of organisms. In present study, lowest value of water temperature found in January190C and

highest in Jun 31.100C with the mean values 26.110C.that shows the optimum ranged for growth of aquatic fauna and flora. This result agrees with the reported by Swaranlatha and Rai (1998) in Banjara Lake. Salve(2006)also reported similar trends in Wan Prakalp reservoir, Nagpur.

pH

pH regulated most of biological processes and bio-chemical reactions. pH value ranged from minimum 6.05 to maximum 7.48 at station-I. The pH of water tends towards alkaline nature.Minimum pH was found in the month of April(summer) and reached to the maximum in the month of December (winter).This is in agreement with the findings of Manjare et al.,(2010) who studied the Vadgaon tank of Kolhapur.Mean and range pH value of all the five stations observed was 6.98 ± 0.10.

Transparency

Fresh water body in the present investigation showed no typical trend.Average mean value of water transparency evaluated is 47.68 cm. The lower values of transparency during rainy season may be attributed due to the rains which might have brought silt and mud from the catchment area making the water turbid. This is in the conformation with the observation made by Zafar (1966); Kaur et al., (2008). Mwara, (2006) also observed low transparency during rainy season in manmade reservoirs in Kenya.It was found higher in the summer season which might be due to suspended particles accumulated during summer months or may be attributed to human activity like washing and bathing.Jaybhaye (2009) also reported similar trends in Parola dam of Hingoli district.

Total dissolved solids (TDS)

TDS is measure of all the dissolved substances, both organic and inorganic in water. Higher TDS attributes to high dissolved and suspended particles in to the water.At station-I the total dissolved solid was found higher 400mg/l with the mean value considering all five station was 315.71 mg/l. It is in the range of permissible limit. Similar results were also reported by Chaturbhuj et. al.,(2004) in the Jamwa Ramgarh Lake, Jaipur.

Turbidity

The water was less turbid as observed during study period. Monsoon months particularly showed turbid water which is attributed to the surface runoff in the rainy season from the catchment area; recently Manjare et.al.,(2010) have reported higher turbidity in summer season. Average mean turbidity values of the entire sampling site calculated to 39.95 NTU.

Total alkalinity

Total alkalinity of water is the quality of water and kinds of components present in water such as bicarbonate, carbonate and hydroxide. Total alkalinity was in the ranged from 106mg/l to 330mg/l at sampling station –II and sampling station-V (Table-1) respectively. The maximum value recorded in the month of January(winter) and minimum in the month of August(monsoon).The alkaline water was found productive.Spence (1967) classified the lake into three categories based on alkalinity. On the basis of this classification, Kapileshwar dam considered as a nutrient rich dam.

Dissolved oxygen(DO)

Dissolved oxygen is an important limnological parameter indicating level of water quality , organic production and reflects the physical , biological processes prevailing in the dam water. It ranged was 5.00mg/l to 9.10 mg/l. The level of DO was found less during the month of may(summer). This is because of the low solubility of gases at high temperature Hynes,(1978); similarly during summer water volume also decreased and became more concentrated with the pollutants, Decreased DO in summer correlates with the higher solubility of oxygen at lower temperature. This is in agreement with the recent findings of Garg et al.,(2010) who found that dissolved oxygen was less during summer season. Average DO in the present study also exceeded the limit of 5mg/l as per European Environmental Commission Chapman (1997) and mean value observed in the present investigation was 7.91 mg/l. Therefore, it can be concluded that water is safe for human consumption.

Total hardness

The hardness of water is mainly governed by the content of calcium and magnesium which largely combine with bicarbonates & carbonates (temporary hardness) and with sulphate, chlorides and other anions of minerals (permanent hardness).In the present study,mean value of total hardness of five different stations was observed as 127.17 mg/l . The minimum and maximum evaluated was 86 mg/l and 226 mg/l respectively. It was found in permissible limit.

Nitrates

Nitrate is basic nutrient, which is determined the productivity of lake. In the fresh water nitrate content is meager. In the present study the average values of nitrate of all the sampling stations were observed to be 0.48 mg/l. there was no seasonal trend in the concentration of nitrates and minimum concentration was found

0.19mg/l at station-I while maximum 0.87 mg/l at station-IV.Nitrates were estimated more in winter season. This is in agreement with the findings of Islam(2007).

Sulphate

Most of the sulphate ions are probably derived from the solution of calcium & magnesium ions. Sulphate is naturally occurring ion found in all types of water and wide ranges in nature. Occurrence of sulphate in water is due to influx of runoff and leaching process. The average mean of water sulphate content was found to be 12.46 mg/l which is in permissible limit. Bhagat (2008) have also observed minimum sulphate content in Ambadi dam, near Akot Dt.Akola.

Phosphate

The lower and higher values fluctuated from 0.02 mg/l to0.60 mg/l at station- V and station-II respectively. Average mean of all the five stations calculated 0.25 mg/l. Winter months contribute higher concentration as compared to monsoon and summer seasons. Higher values may be due to accumulation of surface agricultural runoff and washing activities that contributed to the inorganic phosphate contents.

Conclusion

The pollution indicators phytoplankton and zooplankton were less in number at all the stations similarly As no industrialization has taken place in the surrounding areas, menace of effluent discharge and subsequent pollution is not evident in the dam. Abiotic components are found in the safe limit which confirms that the water is safe for drinking and also for healthy fish culture. The present status of water body is mesotrophic and unpolluted hence, the water can be utilized for irrigation, drinking and fishery activities.

Table 1 : Physico chemical quality of Kapileshwar dam during June 2017 to July 2018

Parameters	Sampling stations				
	I	**II**	**III**	**IV**	**V**
Water temperature(^{0}c)	25.82	25.36	25.66	26.11	25.76
Transparency(cm)	43.95	70.64	61.29	27.11	25.76
Total Dissolved Solid (mg/l)	251.43	264.29	260.00	315.71	282.86
pH	6.95	6.93	6.82	6.98	7.05
Turbidity(NTU)	41.57	32.40	38.17	44.40	43.20
Total alkalinity(mg/l)	153.00	163.57	158.14	185.14	208.29
DO (mg/l)	7.41	6.47	6.20	7.91	7.12
Total Hardness(mg/l)	128.57	128.57	126.29	117.43	135.00
Nitrate (mg/l)	0.43	0.45	0.49	0.49	0.52
Sulphate (mg/l)	9.68	9.27	13.69	19.89	9.75
Phosphate (mg/l)	0.31	0.29	0.16	0.32	0.18

Table - 2 : Numerical abundance of zooplanktons (org/l) at different stations June2017-July2018

S.No.	**Zooplankton**	**Stations**					Total	**%**
		I	II	III	IV	V		
1	Protozoa	8542	5670	9205	7437	8468	**39322**	15.09
2	Rotifera	14801	13917	14654	15316	14138	**72826**	27.95
3	Cladocera	9646	9204	10383	7878	6185	**43296**	16.61
4	Copepoda	8026	9205	6480	9205	7511	**40427**	15.51
5	Ostracoda	8247	8395	6185	5913	5913	**34653**	13.30
6	Worms & Larvae	5766	6775	4345	7585	5596	**30067**	11.54

Table- 3: Variation in the abundance of Planktons at different during June2017-July2018

Sr..no.	**Zoo planktons**	**Stations**				
		I	II	III	IV	V
1	Acantholeberis	+	+	+	+	-
2	Bosmina	++	+	+	+	-

3	Ceriodaphnia	+	-	-	-	+
4	Chydorrus	+	+	+++	+	+
5	Daphnia	+++	++	+	++	-
6	Diaphanosoma	-	-	+	-	+
7	Disparalona	+	+	++	++	+
8	Graptoleberis	+	-	+	+	+
9	Holopedium	+++	++	+++	+	+
10	Leydigia	+	+	-	+	+
11	Moinodaphnia	-	+	-	-	+
12	Polyphemus	++	+++	+++	+	+
13	Sida crystallina	++	+++	+	+++	++
14	Simocephalus	+	++	++	++	+
	(+)Denotes 500 org/l , (-) Denotes Absent, ( ) Pollution indicator species					

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Green Chemistry and Environment: A need of Current Era

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Abstract:

It is broadly accepted that there is an emergent need for more environmentally acceptable processes in the chemical industry. This tendency gives rise to Green Chemistry. It dictate a exemplar shift from traditional concepts of process efficiency, that focus largely on chemical yield, to one that assigns financially viable value to eliminating waste at source and avoiding the use of toxic and/or hazardous substances. The paper describes the need of Green chemistry and its effect on the environment.

Introduction:

Green chemistry is the design of chemical products and processes that reduce or eliminate the use or generation of hazardous substances. Green chemistry applies across the life cycle of a chemical product, including its design, manufacture, use, and ultimate disposal. Green chemistry (Anastas PT, *et. al*, 2000) is also known as sustainable chemistry. Over the past decade, green chemistry has convincingly demonstrated how fundamental scientific methodologies can be devised and applied to protect human health and the environment in an economically beneficial manner. Significant progress has been made in key research areas, such as atom economy, alternative synthetic route for feedstock's and starting materials, biocatalysis, green solvent, biosorption, designing safer chemicals, energy and waste management.

Role of Green Chemistry in the current Scenario:

Green chemistry addresses the environmental impact of both chemical products and the processes by which they are produced. Green chemistry eliminates waste at source, i.e. it is primary pollution prevention (Anonyms, 2009) rather than waste remediation. There is no doubt that, in the twentieth century, organic synthesis has achieved a high level of sophistication with almost no molecule beyond its capabilities, with regard to chemo-, regio- and stereo selectivity, for example. However, little attention was focused on atom selectivity and catalysis was only sporadically applied. Hence, what we now see is a paradigm change: under the mounting pressure of environmental legislation, organic synthesis and catalysis. It is probably true to say that nowhere is there a greater need for green catalytic alternatives (McKenzie LC, *et.al, 2005*) in fine chemicals manufacture than in oxidation reactions. In contrast to reductions, oxidations are still largely carried out with stoichiometric inorganic (or organic) oxidants such as chromium (VI) reagents, permanganate, and manganese dioxide and periodate. There is clearly a definite need for catalytic alternatives employing clean primary oxidants such as oxygen or hydrogen peroxide. The key to waste minimization is precision in organic synthesis, where every atom counts.

Basic Principals of Green Chemistry:

1. **Prevention:** It is better to prevent the production of waste than to treat or clean up waste after it has been generated.
2. **Atom Economy:** Synthetic methods should be designed to maximize the incorporation of all materials employed in the process into the final product i.e. Reduce waste at the molecular level.
3. **Less Hazardous chemical synthesis:** Wherever possible, synthetic methods should be designed to use and create substance that possesses little or no toxicity to human health and environment.
4. **Designing Safer Chemicals:** Chemical products should be designed to perform their desired function while minimizing their toxicity and environmental destiny throughout the design of the process.
5. **Solvents and auxiliaries:** Safest available solvents must be selected for any given step and organic solvents must be avoided whenever possible.
6. **Design for energy efficiency:** Choose the least energy demanding chemical method. Ambient temperature and pressure are ideal.
7. **Use of renewable feed stocks:** Use chemicals which are made from renewable (i.e. Plant based) resources rather than chemicals obtained from depleting resources.
8. **Reduce derivatives**: Minimize the route of temporary derivation such as blocking group, protecting groups.
9. **Catalysis:** Use catalytic reagents rather than stoichiometric reagents in reactions.
10. **Design for degradation:** Design chemicals that degrade and break down into innocuous substances which do not persist in environment at the end of their function.

11. **Real time pollution prevention:** Monitor chemical reaction in real time, in process and control before the formation of hazardous substance.
12. **Safer chemistry for accident protection:** Choose and develop chemical techniques and substances that are safer and minimize the potential for chemical accidents, explosions and fires.

From the above Principles (Anastas PT, Warner JC., 1998), It is clear that the challenge for the future chemical industry is based on safer products and processes designed by utilizing new ideas in fundamental research. It has been said that the revolution of one day becomes the new orthodoxy of the next Green Chemistry is applied and must involve the successful implementation of more environmentally friendly chemical processes and product design.

Result and Discussion:

In country like India (Kidwai M. 2001), there is a great need of improvement in industries from the environmental point of view. Most of the industries are mainly confined to cost effectiveness rather than being eco effective. Some collaborative work has been done by the academic institutes and some industries to bring the eco friendly lab technologies to the industrial plants (J.H. Clark, D.J. Macquarrie, 2002). The best examples are the applications of enzymes in various industries ranging from drugs to leather. The textile industry (R. A. Sheldon, 1992) is one of the highly revenue generating industries in India, and they are now switching over to microbial Decolorization and degradation. Government can do a lot of good for the cause of green chemistry by increasing public awareness and by bringing and enforcing strict environmental legislations. One of the recent examples of government initiative is the conversion of diesel vehicles to compressed natural gas (CNG) and use of Electric vehicles (EV) in order to reduce pollution in the Country.

Conclusion:

Green Chemistry is new philosophical approach that through application and extension of the principles of green chemistry can contribute to sustainable development. Great efforts are still undertaken to design an ideal process that start from non-polluting materials. Though many exciting green chemical processes are being developed but there is far greater number of challenges lies ahead. A lot of efforts are being undertaken to design nonpolluting starting materials and to get safer products without side products. Development of better machines and fuels which produce lesser amount of polluting exhaust gases such as CO, CO2, SO2, nitrogen oxides etc. leading to air pollution and ultimately ocean acidification, has been proposed. Use of good fuel and modified green processes will also reduce the addition of heavy toxic metals and other toxic substances to the environment. Solvent free chemical processes or replacement of organic solvents by water reduces the addition of volatile organic compounds (VOC) in the environment. Use of microwave for chemical processes has reduced reaction time as well as amount of heat energy. Reduce, reuse and recycling, the principles of green chemistry will result in decrease of marine debris also in addition to pollution in surrounding environment. The greatest challenge is too incorporate the green chemistry in industrial, laboratory and day to day processes in order to control environmental pollution and hence ocean pollution at source. Many successful efforts have been made but still a lot has to be done. This can be achieved by training and educating new generation of chemists. Green chemistry has to be introduced in the syllabus of the students at all levels, so that each individual is made aware to choose greener ways in his or her life. Most importantly we need the relevant scientific engineering so, we can say that this approach in chemistry is helpful in protecting human health and environment and it represents a significant departure from the traditional methods previously used.

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GC-MS Analysis of *Colebrookeaoppositifolia* stem in acetone extract

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Abstract

The Lamiaceae (Labiatae) is one of the most important angiospermic aromatic families with wide application in term of traditional knowledge. The family is represented by 236 genera and 7,200 species with 256 endemic species, the members of family found in temperate regions worldwide. Colebrookea is an important genus in the Lamiaceae, first described in 1806. It includes only one known species Colebrookeaoppositifolia Smith. The plants are commonly known as Indian Squirrel Tail (English). The indepth phytochemical examination of stem extracts revealed the presence of phytoconstituents in stemsnamely Resorcinol,Octanenitrile, Acetone extract

Key words :*Colebrookeaoppositifolia, GC-MS analysis,*

Introduction

The *Lamiaceae (Labiatae)* is one of the most important angiospermic aromatic families varying greatly in terms of ethno-medicine (Sarac*et al.*, 2007). The family is represented by 236 genera and 7,200 species with 256 endemic species, the members of family found in temperate regions worldwide (Cantino 1992).The members of this family are well known as aromatic species, as they contain large quantities of the essential oils (Kremer*et al.*, 2012). *Colebrookeaoppositifolia* is a monotypic genus of *Lamiaceae,* first described in 1806. The plant is evergreen, densely woolly shrubs or small tree, 1.2 to 3.6 m distributed mostly in subtropical regions of the world such as India, Pakistan, Nepal, Myanmar, Thailand, South west, China and in India widely in Northern and Southern slopes of the Himalayan range of Sikkim at elevation ranging between 3000-5000 ft. It also grows wild on hills and plains throughout India mainly occupying subtropical Madhya Pradesh and Deccan Peninsula (Rana*et al.*, 2009).It has been extensively used in the traditional system of Indian medicine for the treatment of various ailments such as headache, fever, dysentery, peptic ulcer, dermatitis, wounds, haemostatic, antifungal, as anti-fertility agent and the roots of the plant has been most widely used for the treatment of epilepsy (Kritikar*et al.*, 2007).

Collection of plant material

Collection of plant material was carried out from Chikhaldaraforest locality in the month ofSeptember. Frequent visits were made throughout the season to know the phenological events and collect the plant parts. Collected plant parts separated and washed with tap water followed by distilled water. Stem of plant grinded and converted to the fine powder and this stem powder used for the soxhlet extraction.

Preparation of Extract

5 gmair dried powder was extracted with four solventsnamely Petroleum ether, Acetone, Benzene and Water respectively. The extract so obtained was concentrated at room temperature and carried out preliminary phytochemical analysis. It revealed that, acetone solvent shows more positive results as compared to other solvents. Due to this reason acetone solvent was chosen for GC-MS analysis.

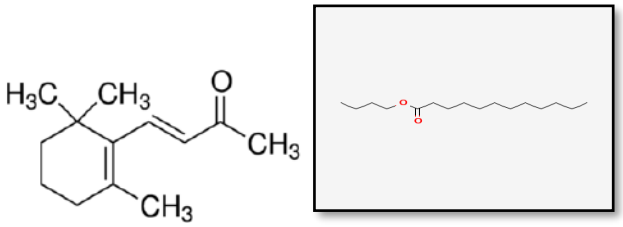
Gas Chromatography-Mass Spectroscopy (GC-MS) analysis.

The GC-MS analysis of stemin acetone extract was carried out using gas chromatography-high resolution mass spectrophotometer. 2 µl of sample was employed for GC -MS analysis. Analysis was carried out using AlegentHp 7880 with Colum 25m. Helium gas was used as carrier gas at constant flow rate.

Observation table

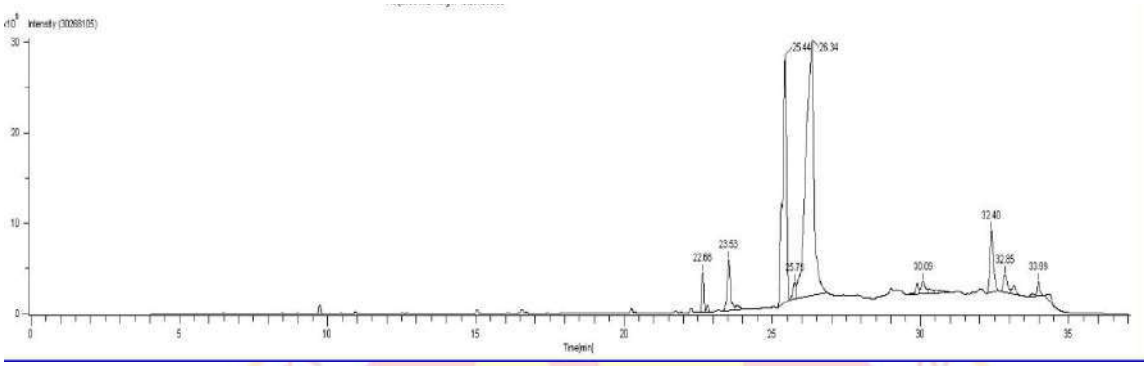
Sr. No.	R. T.	Compound	Percentage (%)	Mass	MF
1.	9.73	Resorcinol	0.48	110.10	$C_6H_6O_2$
2.	15.03	B-Ionone	9.66	192.15	$C_{13}H_{20}O$
3.	20.25	Octanenitrile	7.24	125.13	$C_8H_{15}N$
4.	23.53	n-Butyllaurate	2.41	256.24	$C_{16}H_{32}O_2$

Identified compounds in sample of*Colebrookeaoppositifolia*stemin acetoneextract

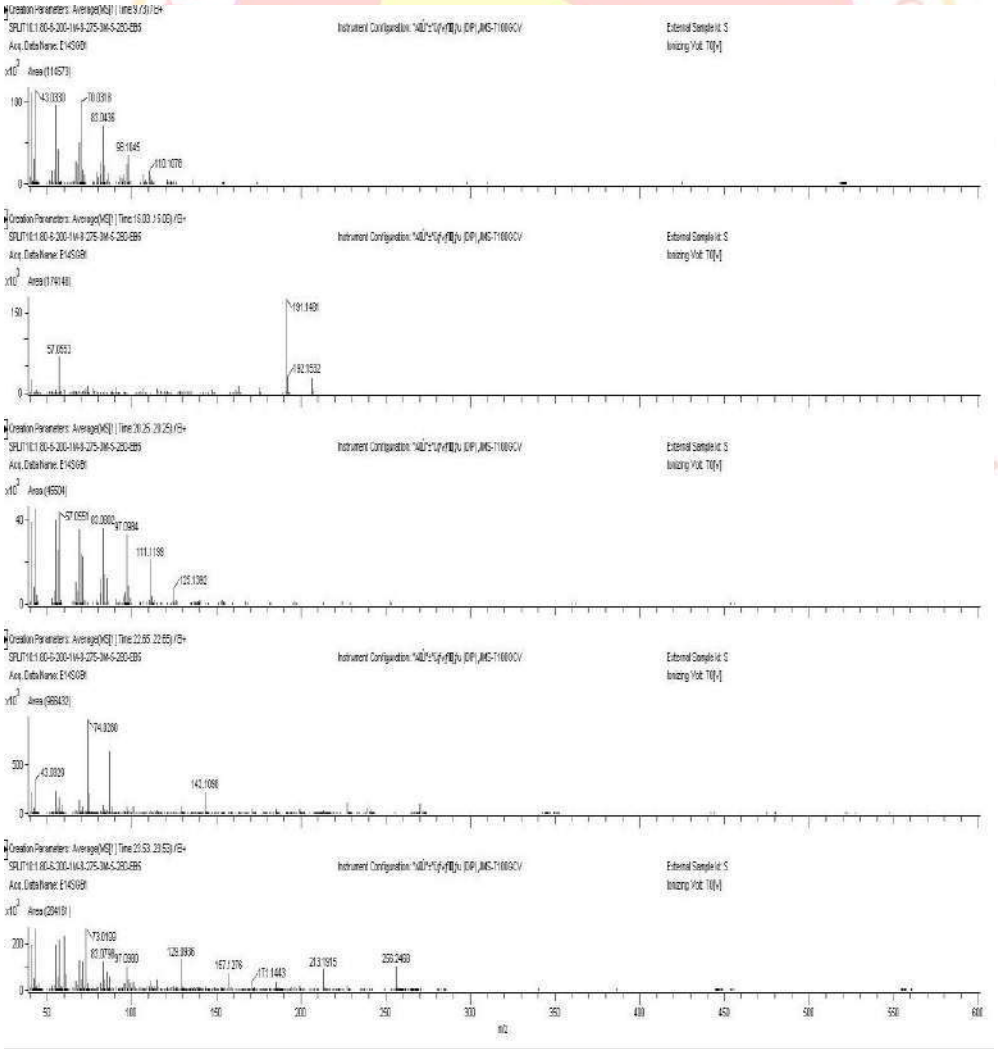


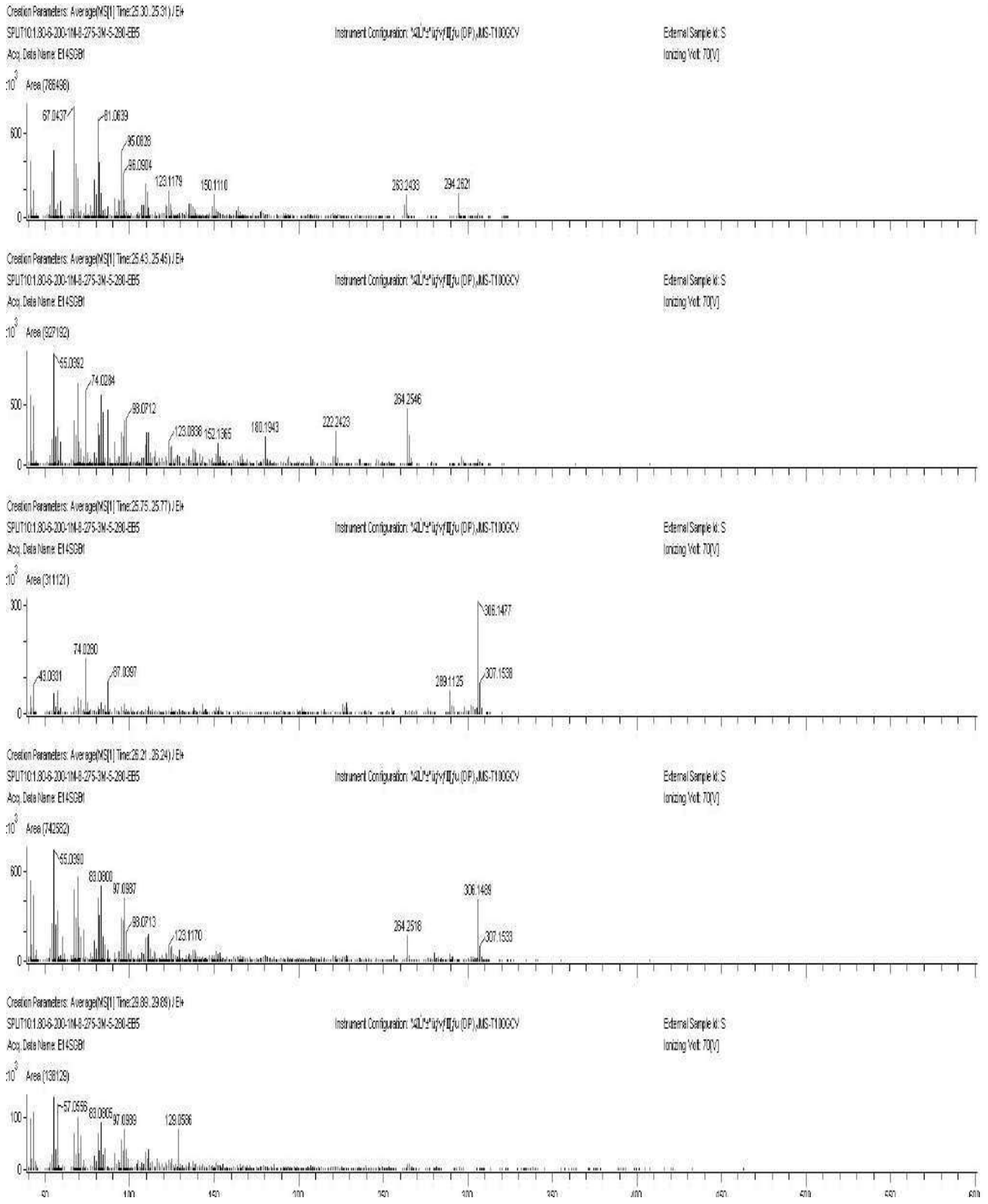
Resorcinoln-Butyl laurate

Fragmentation patterns of identified compounds



Chromatogram of *Colebrookeaoppositifolia* stem in acetone extract




Creation Parameters: Average(MS[1] Time:25.30..25.31) ,El+
SPLIT10:1.80-6-200-1M-8-275-3M-5-280-EB5
Instrument Configuration: %ÃÙ"ÿ°ÿ¡ÿ'ÿ¶ÿ[]ÿ¡ÿu (DP),MS-T100GCV
External Sample Id: S
Acq. Data Name: El+SGBf
Ionizing Volt: 70[V]
Area (766498)
67.0437
81.0639
95.0826
96.0904
123.1179
150.1110
263.2433
294.2821
Creation Parameters: Average(MS[1] Time:25.43..25.45) ,El+
Area (927192)
55.0392
74.0284
88.0712
123.0838
152.1365
180.1943
222.2423
264.2546
Creation Parameters: Average(MS[1] Time:25.75..25.77) ,El+
Area (311121)
74.0280
43.0331
87.0397
289.1125
305.1427
307.1538
Creation Parameters: Average(MS[1] Time:26.21..26.24) ,El+
Area (742552)
55.0390
83.0600
97.0397
88.0713
123.1170
264.2518
306.1498
307.1533
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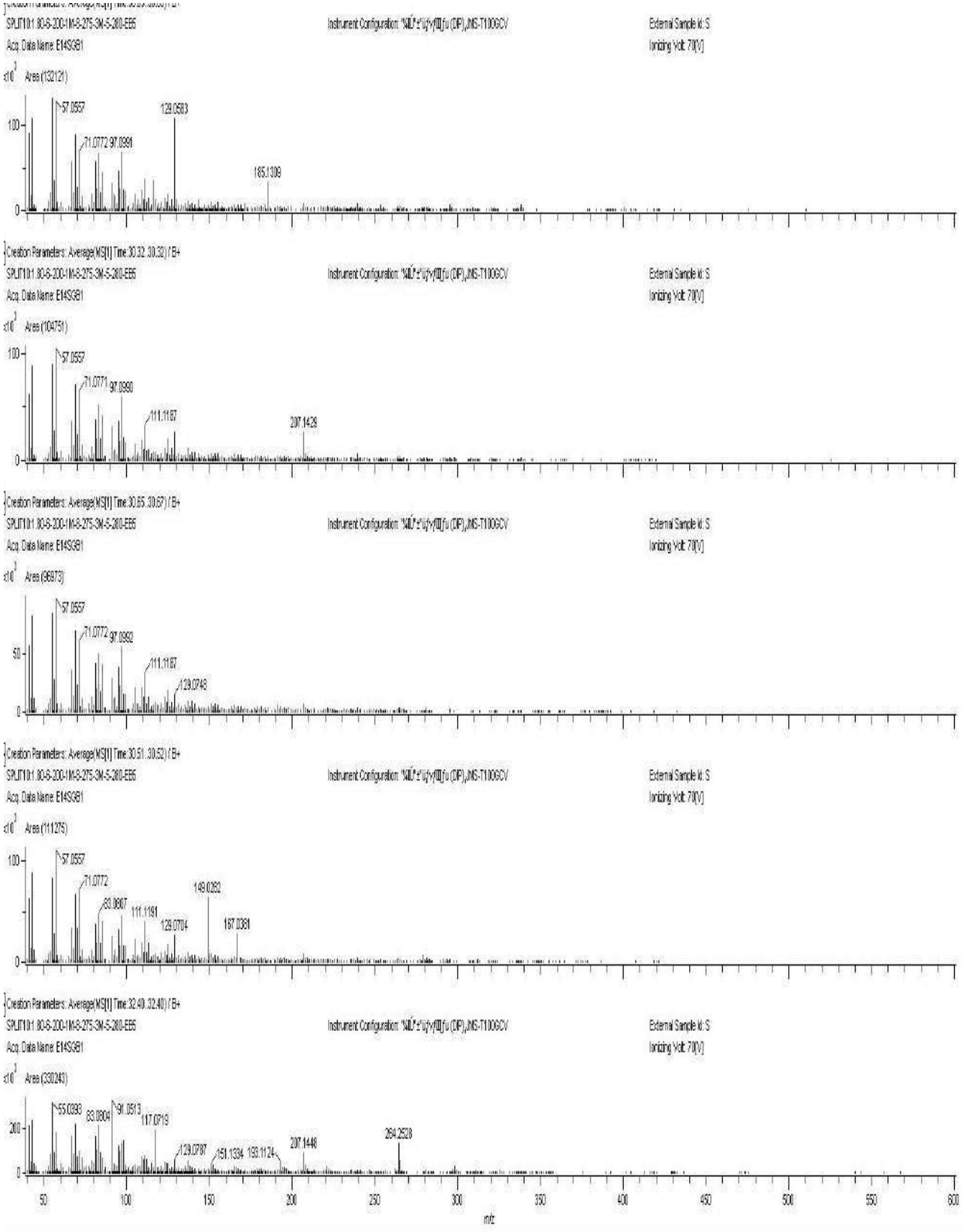
97.0399
128.0536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Acq. Data Name: E14S681
External Sample Id: S
Ionizing Volt: 70[V]
Area (132121)
57.0557
129.0583
71.0772
97.0991
185.1309
Creation Parameters: Average(MS[1] Time:30.32..30.32) / B+
Area (104751)
57.0557
71.0771
97.0990
111.1167
207.1429
Creation Parameters: Average(MS[1] Time:30.65..30.67) / B+
Area (96973)
57.0557
71.0772
97.0992
111.1187
129.0748
Creation Parameters: Average(MS[1] Time:30.51..30.52) / B+
Area (111275)
57.0557
71.0772
83.0607
111.1191
129.0704
149.0282
167.0381
Creation Parameters: Average(MS[1] Time:32.40..32.40) / B+
Area (330243)
55.0393
83.0804
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129.0787
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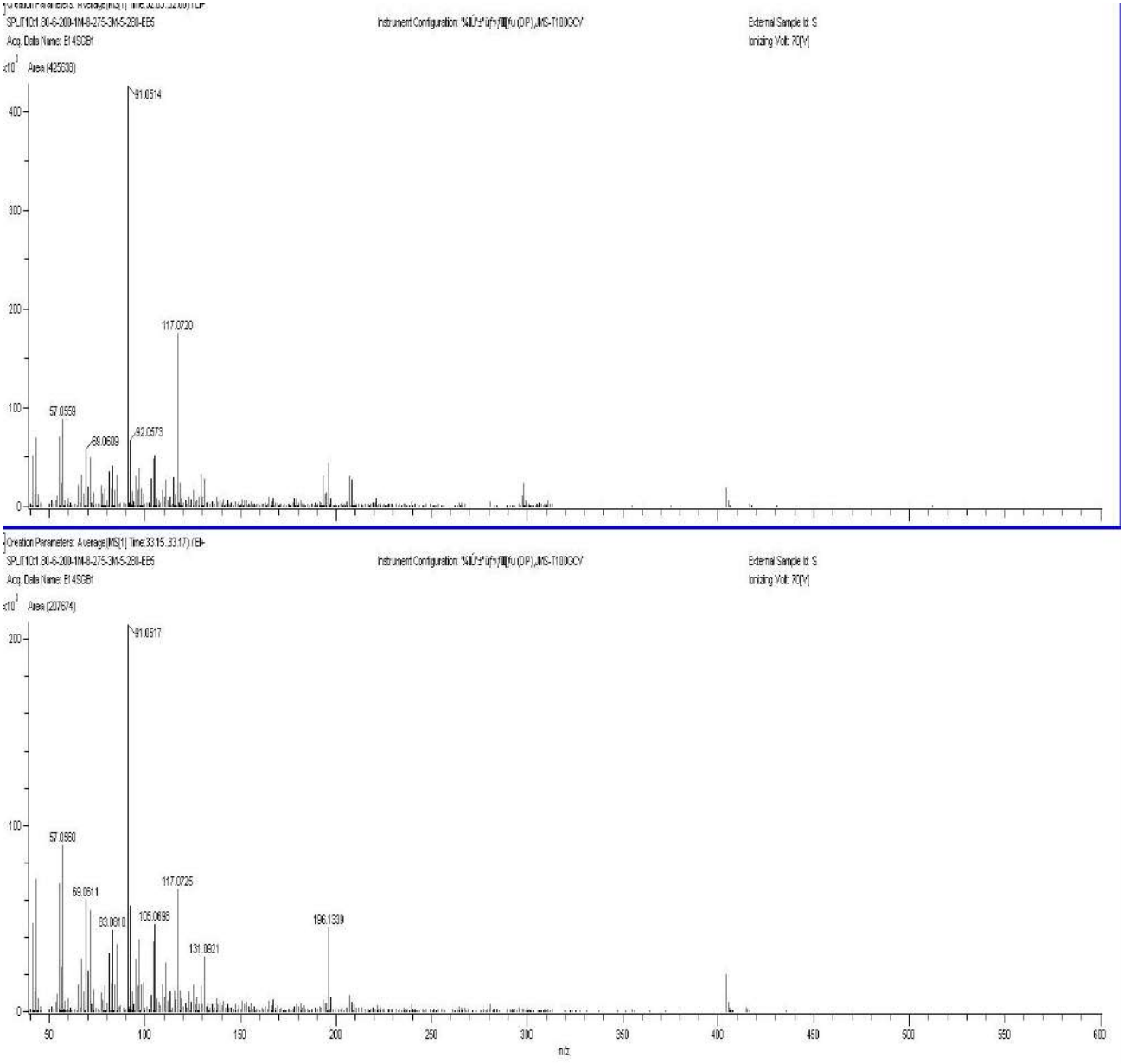
m/z



Mass-Spectra *Colebrookeaoppositifolia*stem in acetone extract

Result and Discussion

GC-MS analysis of stem of *Colebrookeaoppositifolia* in acetone extract revealedvarious compounds. These compoundswere confirmed on the basis of base peak and mass peak and compared with NIST mass spectrum. The percentage of various compounds was calculated by the use of gas chromatogram and mass spectra. Stem contain Resorcinol (0.48%), B-Ionone (9.66%), Butyl laurate (2.41%) and Octanenitrile (20.25%).

Resorcinol does not appear to occur naturally in the Free State. It is used for topical acne treatments at 2% or less concentration (Lander *et al.*, 1945). In most of the hospitals resorcinol paste applied directly to the skin for chronic acne.**B-Ionone** (9.66%) is aroma compounds found in a variety of essential oils, including rose oil. B-Ionone is a significant contributor to the aroma of roses, it is an important fragrance chemical used in perfume. The combination of α-ionone and β-ionone is characteristic of the scent of violets and used with other components in perfumery and flavouring to recreate their scent (Baldermann*et al.*, 2010).Butyl butyratealso called butyl butanoate,is an organic compound that is an ester formed by the condensation of butyric acid and n-butanol. It is a clear, colorless liquid that is insoluble in water, but miscible with ethanol and diethyl ether. Like other volatile esters, butyl butyrate has a pleasant aroma. It is used in the flavour industry to create sweet fruity flavours that are similar to that of pineapple. It occurs naturally in many kinds of fruit including apple, banana, berries, pear, plum and strawberry (CINF 2018)

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Assessment of Physico-chemical Properties of Farmland Soil From Different Village of Umarkhed, Dist. Yavatmal (Maharashtra) India

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Abstracts

Soil is a main source of nutrients needed to plants for growth.Soil provides structural stability for plants and retains and relinquishes water and the nutrients necessary for plant growth.Soil analysis provides information which is important for maximizing nutrient use efficiency and agricultural productivity. Soil properties that are sensitive to change in the management can be used as indicator. In the present study it was preferred to analyse the nutrients contain in soil sample of UmarkhedTahsil. The five samples were collected from different sites of the study area of UmarkhedTahsilin December 2021. The analysis of soil was carried out for the study of various parameters like Nitrogen, Potassium, Phosphorous, Magnesium, Calcium, Moisture, pH, EC, &Organic Carbon.

The study revealed that all the five samples of selected area of UmarkhedTahsilare medium to high in mineral content. The pH of the soilsamples were on slightly alkaline side, ranged from 7.80 to 8.21 but within the limit of 6.5-8.5 which is optimum for crops. OC contentall the samples were of medium rating ranged from 0.32% to 0.47%. Available nitrogen ranged from 559 kg/ha to 710kg/ha; available phosphorous ranged from 18.96 kg/ha to 36.12 kg/ha. Potassium ranged from 340 kg/ha to 589 kg/ha and twosamples were rich in potassium.

***Key words**: UmarkhedTahsil, Soil quality, Micronutrients, Physico-chemical parameters.*

Introduction

Soilis main and fundamental component of agricultural activityso that it is important and necessary to understand the basicneeds of soil.Soil productivity encompasses soil fertility plus the inherent and management-related factors affecting plant growth and development.The productivity of soil is mainly depending upon physico-chemical properties and nutrient content in it. Soil provide medium for many of the ecological processes that improve water and air quality and that promote plant growth. The physic chemical properties ofsoil play an important role in activities of microorganism in soil.Soil filters water, decomposes waste, stores heat and exchanges gases and hence has great bearing on environmental balance.The quality and health of soil is important for both agricultural sustainability and environmental quality which connected to the plant, animal and human health.

Soil analysis is well recognized as a sound scientific tool to assess the status of available micronutrients in soils and their relationship with various physico-chemical properties Considerable research work has been done regarding the study of Nutrients and Physico-Chemical assessment of various types of soil in Maharashtra as well as in India have been attempted by several investigators[3,4,5]. Khadake P.A. reportedsoil analysis and its environmental impact on Nanded city of Maharashtra State [6].

The status of micronutrients in soils district Bhimber and their relationship with various physico-chemical properties were investigated by WajahatNazif,et.al[7].It is a real time to carry out the physico chemical analysis of soil because as with the increasing use of chemical fertilizer to the soil, it is difficult to control the adverse effect of the chemical fertilizer to the soil, land, animal and the human being.[1,2]Soil fertility and productivity are the key pillars for food production and soil quality is of equal significance in the background of soil degradation caused by many factors.Soil is a naturally occurring porous medium that supports thegrowth of plant and roots by retaining air, heat, water andnutrients and provides mechanical support to the plant.[12] Factors that affect the availability of soil nutrients include leaching. Soil erosion, soil pH, denitrification , volatilization, nitrogen immobilization and crop nutrient uptake. Crop growth is influenced by aerial and soil environment.

Suitable environment is necessary for better germination, growth and yield of crops. The soil is a complex organization being made up of some six constituents' namely inorganic matter, organic matter, soil organisms, soil moisture, soil solution and soil air. Roughly, the soil contains 50-60%mineral matter, 25-35% water, 15-25% air and little percentage of organic matter.[11]The higher nutrient availability is favorable when soil has higher water holding capacity, proper aeration and less soil strength or mechanical resistance. The six elements nitrogen, phosphorous, potassium, magnesium, calcium and sulphurwhich are required in large quantities are labeled as macronutrients. Most of the soils supply enough calcium, magnesium and sulphurhence thesoil scientists called these elements as secondary nutrient elements. The other three elements nitrogen, phosphorous and potassium are called as primary nutrients and are not usually available in large amounts which is enough for best growth and therefore are added through fertilization.It is well known fact that the periodical analysis of soil provides the up-to date information about the nature and the composition of the

soil.Considerable research work has been done in Maharashtra as well as in India, regarding the study of Nutrients and Physico-Chemical assessment of various types of soil,A.A.Patil[8], R.P.Ganorkar[9],R.P.Ganorkar.[10]Therefore, the present work was undertaken for the study of impact of physic chemical properties of soil on soil quality and its productivity.

Material And Methods

Study Area

Soil sample iscollected from five different village ofUmarkhedTahsil in Yavatmal District of Maharashtra State, India; which is shown in Fig.-1. It belongs to Vidarbha RegionAmravatiDivision. Moderate rain fall in this region and well known for cotton,soya bean, Tur, SugerCaneand other rabi crops. The sources of water for this area is Penganga river, well water and tube wellwater.

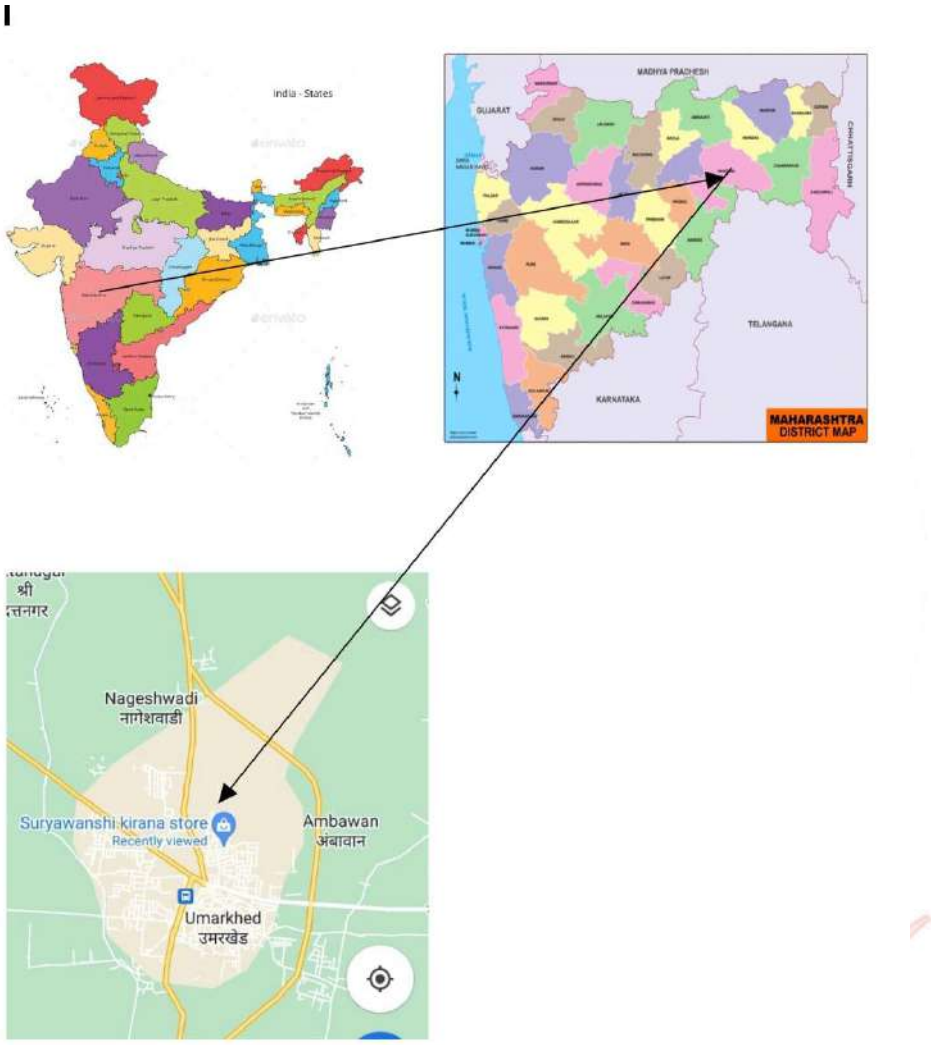


Figure1:-Location map of Study area UmarkhedTahasil District Yavatmal.

Sample Collection

Five samples were collected from the study area (farmer's field) in the month of December2021. Soil samples were collected randomly at 5 to 15 cm depths with five plots, in well sterilized polythene pouches. Soil sample were collected from following Village fields-

Sample-1 collected from VidulVillage.
Sample-2 collected from PophaliVillage.
Sample-3 collected from DahagaonVillage.
Sample-4 collected from Marlegaon.Village.
Sample-5 collected from Chili Village.

Physicochemical Analysis Of Soil Samples

The soil sample were Collected and dried for about 24hrs.Grinded more finely.Methods use for estimation of various parameters is as fallows, like Determination of pH by Digital pH Meter, EC by Conductometer, OC, Ca, N,P,by Titration Method, Determination of Mg was done by EDTA Titration Method.Determination of Potassium (K) by FlamePhotometry.

Result And Discussion

Color of Soil

The soil sample S1, S2, S3 and S4 were Black and S5 Faint Black in color.

pH

The range of pH is found in between 7.80 – 8.21. The sampleS1,S3 and S5 are slightly alkaline sample as compare toS2 and S4 soil sample which is in medium alkaline nature.

Organic Carbon

Organic carbon were recorded in the range of 0.32-0.47 %.The soil sample S2,S4, has high percentage of organic carbon. Sample S1,S5 have moderateandsample S3 has less organic carbon.

Nitrogen

Nitrogen content in the soil ranged from 710-559 kg/hector. The sample S3 & S5 has highnitrogen content as compared to other sample.

Phosphorous

The amount of Phosphorous content in the soil sample ranged between 18.96- 36.12 kg/hector. The soil sample S1 hasmore and soil sample S2 has very low phosphorous content.

Potassium

Potassium content in the soil sample ranged between 340 – 589kg/hector. The soil sampleS1havemore potassium content as compared to other samples.

Magnesium

The Magnesium content in the soil sample ranged from 8.75 – 11.45 %. It is seen in sequenceS1<S5<S3<S4<S2.

Electric Conductance

The Electric Conductance values varies from 0.090 – 0.242ms. It is seen that soil sample S2 have more value ofElectric Conductance as compared to other sample.

Calcium

The Calcium content in soil sample ranges from 49.10 – 60.90 %.It is seen in sequence S5<S3<S1<S2<S4.

Sodium

The Calcium content in soil sample ranges from 7.65 – 8.21 %.It is seen in sequence S5<S4<S2<S3<S1.

W.H.C.

The water holding capacity was observed in the sequence S5<S4<S2<S3<S1.

Calcium Carbonate

The Calcium Carbonate content in soil samples ranges from 6.02-8.35 %.It is seen that soil sample S1have more amount of Calcium Carbonate as compared to other soil samples.It is seen in sequence S2<S4<S5<S3<S1.

Density

The density of soil samples ranges from 1.45-1.63 %.It is seen that soil sample S2 &S4 have more density as compared to other soil samples.It is seen in sequence S4<S1<S3<S4<S2.

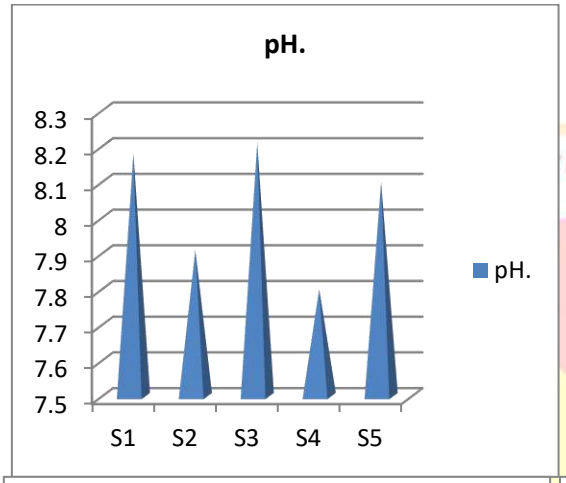
Conclusion

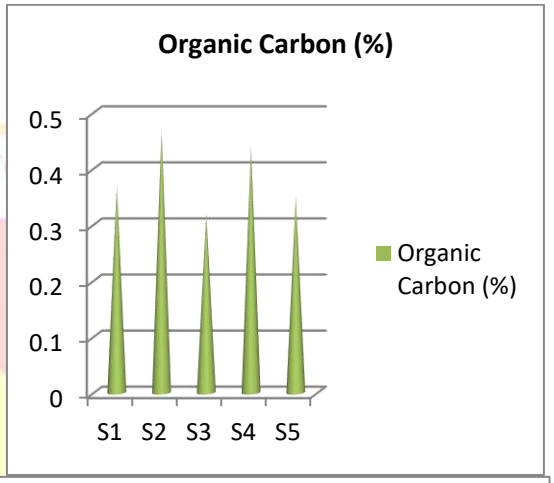
The physico chemical analysis of soil provides necessary information to set the target of nutrient application. The soil samples are slightly alkaline and the pH is in S4<S2<S5<S1<S3 order hence the Suggestion to use of compost manure.All the soil sample is low to modaret in organic carbone. In the soil sample S1 and S2 the Potassium is high as compare to other sample.

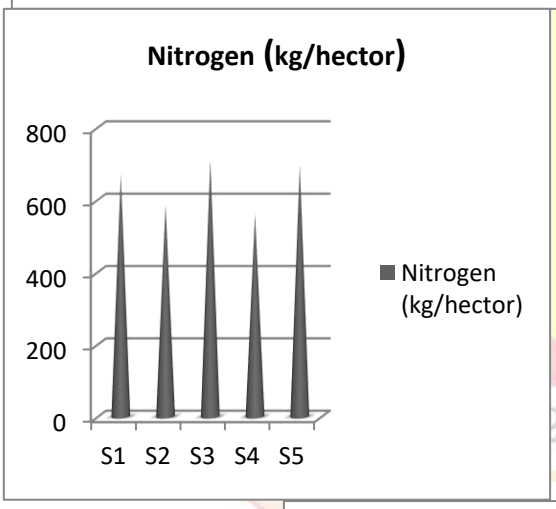
Table 1 :Physico chemicals parameters of soil samples

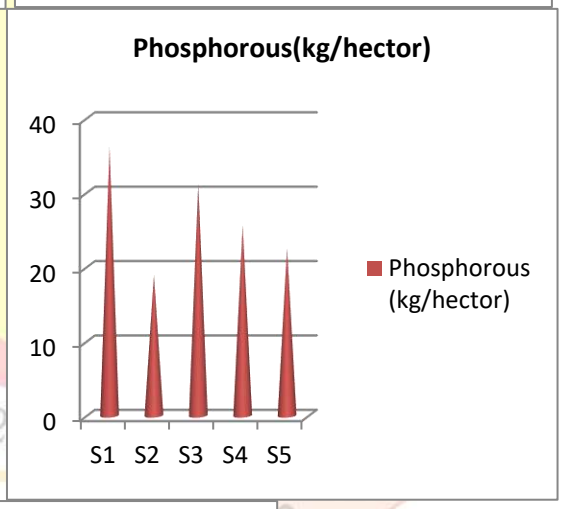
S. No.	Parameters	S1	S2	S3	S4	S5
1	Color	Black	Black	Black	Black	**Faint Black**
2	pH.	8.18	7.91	8.21	7.80	**8.1**

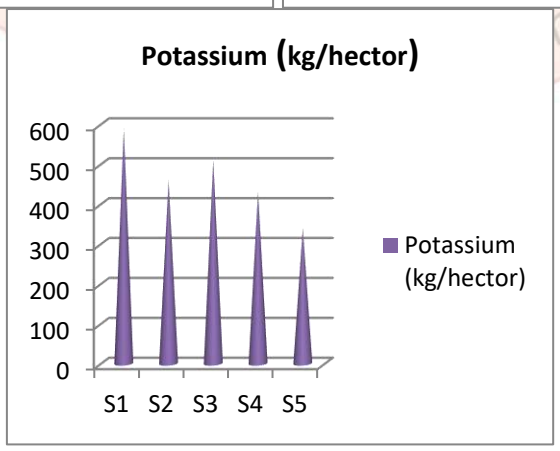
3	Electro Conductance(ms)	0.096	0.132	0.090	0.242	**0.112**
4	Organic Carbon (%)	0.37	0.47	0.32	0.44	**0.35**
5	Nitrogen (kg/hector)	670	585	710	559	**695**
6	Phosphorous(kg/hector)	36.12	18.96	31.20	25.60	**22.54**
7	Potassium (kg/hector)	589	460	510	430	**340**
8	Magnesium (%)	8.75	11.45	9.15	10.30	**9.10**
9	Calcium (%)	54.91	59.08	52.90	60.90	**49.06**
10	Sodium(%)	8.21	7.91	8.15	7.83	**7.65**
11	CaCo3(%)	8.35	6.02	8.26	6.35	**6.90**
12	M.W.H.C.	52.90	45.5	49.0	43.6	**42.50**
13	**Density**	**1.51**	**1.63**	**1.55**	**1.61**	**1.45**











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An Assessment of Water Sample for its Physico-Chemical Parameters of Umarkhed Tahsil, District Yavatmal (MH)

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Abstracts

Study of physico chemical parameter of water is very important to get exact idea about the quality of water and we can compare results of different physico-chemical parameter values with standard values and show present status of water.The Physico-Chemical parameter like pH, EC, TDS, Alkalinity, Mg&Ca have been analyzed.

The range of pH of water sample was found that 7.5-8.6.The range of EC was 354-642.TDS of tap water was law as compare to hand pump &Borewell water. Alkalinity varies between 135-565.Concentretion of Mg was found slight high in borewell water and Concentration of Ca was found in an average range.

***Key words**:Physico-chemical parameters, Tap water, Hand Pump, Borewell Umarkhed Tahashil.*

Introduction

Water is one of the most important and abundant compounds of the ecosystem.Groundwater is an important source of drinking water supply throughout the world[1-2] Urbanization and the unregulated growth of the population have altered the surface and sub-surface terrains of the many areas. Changes in local topography and drainage system directly affect both quality and quantity of the ground water. Groundwater quality depends on the quality of recharged water, atmospheric precipitation, inland surface water and sub-surface geochemical processes.[3]

As per WHO, any change in the physical, chemical and biological properties of water that has a harmful effect on living things is termed as water pollution. Rapid growth of population, urbanization and industrialization exerts pressure on water resources and unregulated or illegal discharge of effluents results in water pollution.The quality of water is characterized by a range of physical, chemical and biological parameters, which arise from a variety of natural and human influences.[4-7]

The quality of ground water depends on various chemical constituents and their concentration, So Study of physico-chemical parameter of water is very important to get exact idea about the quality of water and we can compare results of different physico-chemical parameter values with standard values and show present status of water.

Material And Methods

Study Area

The Six Water sample were collected in January month. The S1 and S2 sample were collected from tap water, S3 and S4 sample from hand pump and S5,S6 fromBorewell in UmarkhedTahsil in Yavatmal District of Maharashtra State, India; which is shown in Fig.-1. It belongs to Vidarbha RegionAmravati Division, The sources of drinking water for this area is Municipal tube water system,Bore well water, well water,and dam water.

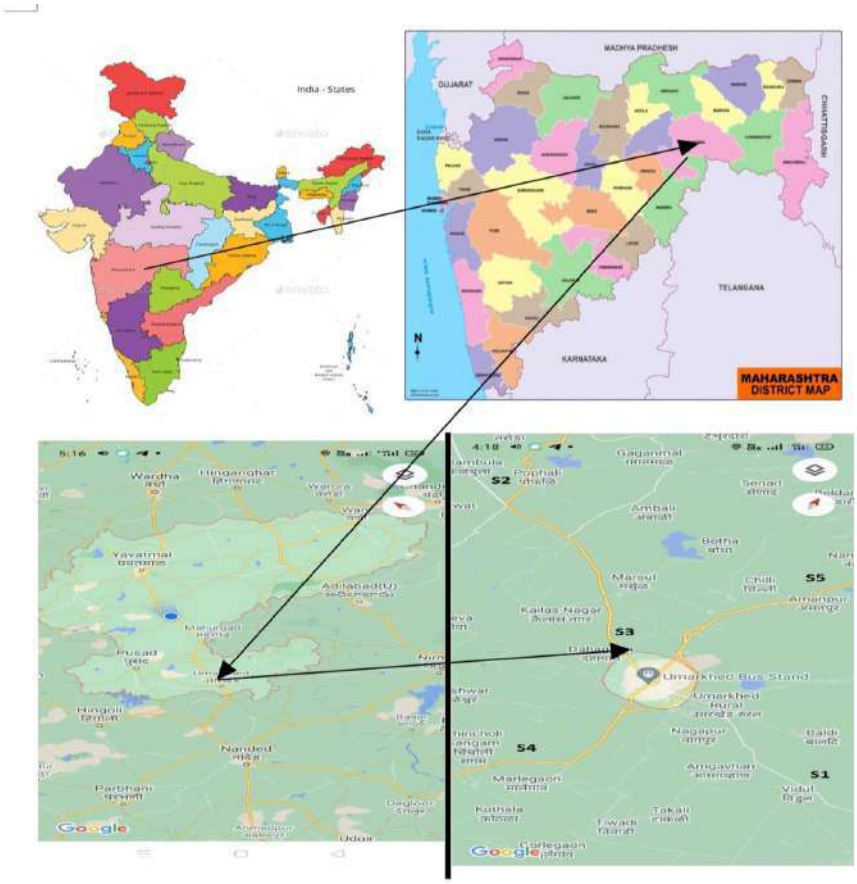


Figure1:-Map of Study area Umarkhed Tehsil

Sample Collection

Six samples were collected randomly from the study areaUmarkhedTahsil in Yavatmal District of Maharashtra State, India in the month of January 2022. Water sample ware collected in sterilized plastic bottle. Water sample were collected from following Source-

Sample-1 collected from Tap Water.
Sample-2 collected from Tap Water.
Sample-3 collected from Hand Pump.
Sample-4 collected from Hand Pump
Sample-5 collected from Bore well
Sample-6 collected from Bore well

Physicochemical Analysis of Water Samples

The Water sample ware collected in sterilized plastic bottle.Methods use for estimation of various parameters is as fallows, like Determination of, pH by Digital pH Meter, EC by Conductometer, TDS by TDS meter,Alkalinity , Mg and Ca, by Titration Method.

Result And Discussion

pH

The rangee of pH is found in between 7.5 – 8.140. The sample S4,S6 are slightly alkaline sample as compare toS1,S2,S3,S5 soil sample which is in medium alkaline nature.

Electric Conductance

Electric Conductivity were recorded in the range of 345 – 642 The watersample S5,S6 show high EC as compare to other sample.

TDS

TDS were recorded in the range of 220-660 The TDS was found that in water sample S1,S2 low as compare to other and it is seen in the sequence S2<S1<S5<S3<S4<S5.

Alkalinity

Alkalinity ware recorded in the range of 135-565. The water sample S1 and S2Showlow alkalinity it is seen in the sequence S2<S1<S6<S5<S3<S4

Magnesium

Magnesium content in the Water sample rangedbetween 10 – 35. The Water sampleS1has low and S4 hasmore concentration of Mg as compared to other samples.

Calcium

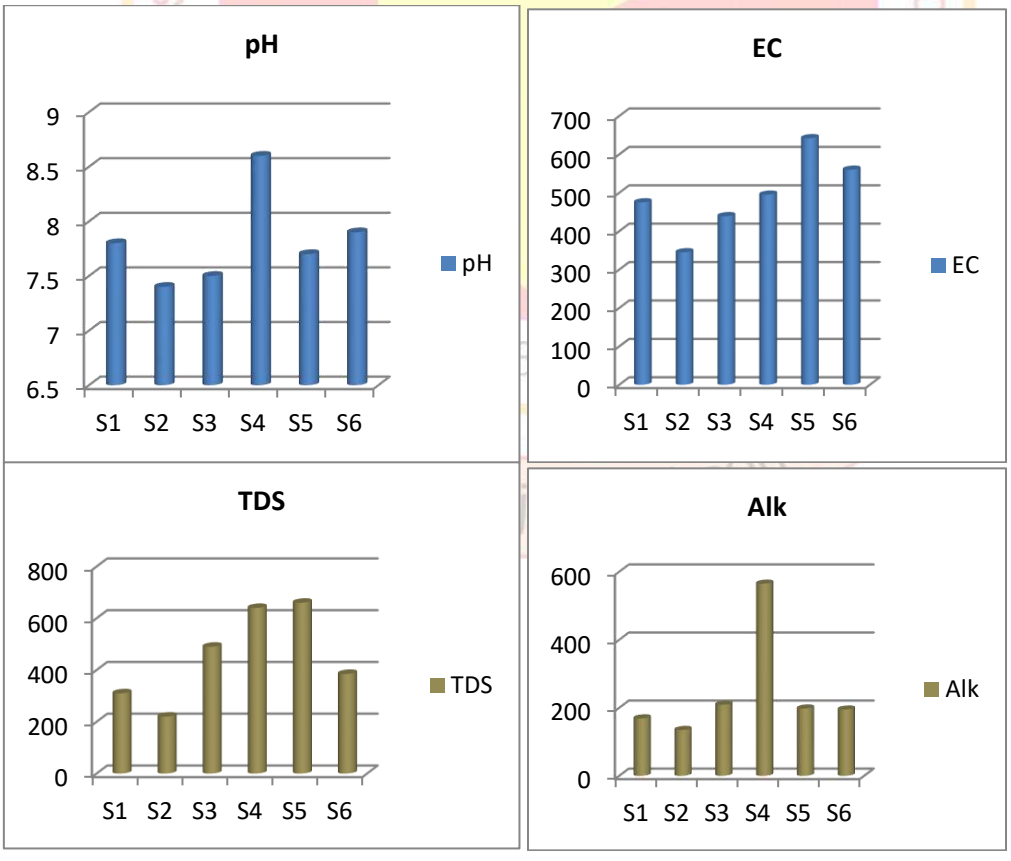
Calcium content in the Water sample ranged between 35 – 64. The Water sample S3 has low and S4 has more concentration of Ca as compared to other samples.

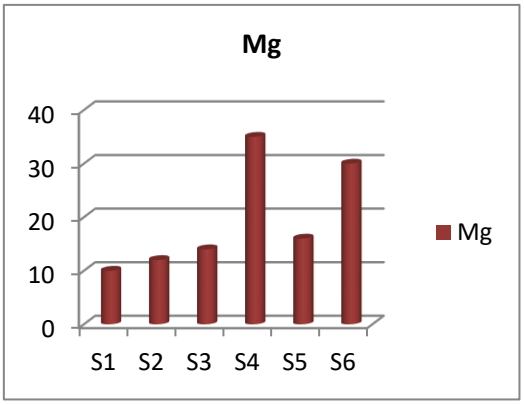
Conclusion

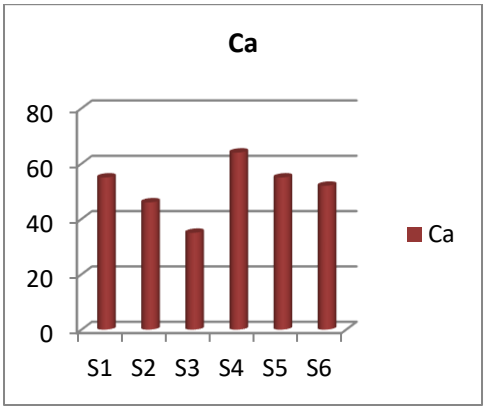
The physico chemical analysis of Water provides necessary information about quality of drinking water which gave idea to set the target of water treatment. The water samples are slightly alkalineand the pH is in S2<S3<S5<S1<S6<S4 order hence do not require special treatment to control pH.TDS of water is the most important properties to measure the quality of water and affected by other parameter like Hardness, EC, Alkalinity of water sample.

Table 1 :Physico chemical parameters of Water samples

Sample	S1	S2	S3	S4	S5	S6
pH	7.8	7.4	7.5	8.6	7.7	**7.9**
EC	475	345	439	495	642	**560**
TDS	310	220	490	640	660	**385**
Alk	169	135	209	565	198	**195**
Mg	10	12	14	35	16	**30**
Ca	**55**	**46**	**35**	**64**	**55**	**52**







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Induced frequency of chlorophyll chimeras in M_1 generation of kidney bean

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Abstract

Healthy and dwell dried seeds of kidney bean (Phaseolus vulgaris L.) were treated with various doses of chemical mutagens EMS and SA. The treated seeds were sown to raise the M_1 generation following randomized block design. The M_1 generation was screened for various chlorophyll chimeras. The plants carrying chlorophyll chimeras were counted and frequency of chlorophyll chimeras was determined.

Key Words: *Kidney bean, EMS, SA, chlorophyll chimeras*

Introduction

Kidney bean botanically described as *Phaseolus vulgaris* L. It is also called as haricot bean, common bean and navy bean (Singh, 1999; Pandey 2003). It comprises a good source of protein and also contains large quantities of complex carbohydrates, fibers and isoflavonoids (Anderson *et al.*, 1999). Mutagenesis is simple, relatively cheap to perform, applicable to all plant species and equally usable on small and large scale and therefore used to induce genetic variability in a great number of crops (Swaminathan 1995; Siddiqui and Khan, 1999). The objective of present studies was to study the effect of Ethyl methanesulphonate and Sodium azide on induction of chlorophyll chimeras in M_1 generation of kidney bean.

Materials And Methods

Healthy and uniform seeds of kidney bean variety HPR-35 were surface sterilized with 0.1% mercuric chloride solution for about one minute and washed thoroughly with distilled water. The seeds were presoaked in distilled water for 6 hours. Then seeds were later immersed in the mutagenic solution for 5 hours and treatment was given with intermittent shaking. All the treatments were given at room temperature of 25±2 °C. Seeds soaked in distilled water for 13 hours served as control. The different concentrations used for chemical mutagenic treatment were 0.05%, 0.10% and 0.15% for Ethyl methanesulphonate and 0.01%, 0.015% and 0.02% in case of Sodium azide. Immediately after the completion of treatment, the seeds were washed thoroughly under running tap water to remove excess of mutagens. Later on treated seeds were post soaked in distilled water for 2 hours. The post soaked seeds were dried in folds of filter paper. 360 seeds were used for each treatment, 60 seeds from each treatment were kept on moist blotting paper in petriplates to record germination percentage. Remaining 300 seeds of each treatment were sown in the field following randomized block design (RBD) with three replications each. M_1 generation was thoroughly screened for induced chlorophyll chimeras. Plants carrying chlorophyll chimeras were counted. Frequency of chlorophyll chimeras was determined.

Results And Discussion

Different types of chlorophyll chimeras were observed in mutagenic population. The chlorophyll chimeras could be detected in all the treatments. The different types of chlorophyll chimeras observed were *xantha* (yellow), *chlorina* (yellow green) and *viridis* (dull green). Among all concentrations the highest frequency of the various types of concentration the highest chlorophyll chimeras was observed in 0.15% concentration. And very least number of chlorophyll chimeras could be recorded in 0.10% concentration.

In present investigation three types of chlorophyll chimeras were noted sin M_1 generation of kidney bean after mutagenic treatments. Frequency of such chlorophyll chimeras was more at higher concentration. Motto *et al.*, (1975) also reported chlorophyll chimeras in kidney bean after EMS treatments. According to Gaul (1958) differential response of the embryonic cells to mutagen causes chimerism.

Table-1: Effect of mutagens on frequency of plants carrying chlorophyll chimeras in M_1 generation of kidney bean variety HPR 35.

Sr. No.	Treatment	Frequency of plants carrying chlorophyll chimeras (%)	± SE
1	**Control**	**-----**	**-----**
2	**0.05%**	8.00	3.0
3	**0.10%**	05.00	2.8
4	**0.15%**	16.00	0.3

Conclusion

Both the mutagens EMS and SA were effective in inducing chlorophyll chimeras in kidney bean at all concentration treatments with varied frequencies.

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Comparative Study On Total Dissolved Solids (Tds) Of Groundwater Of Arni Town, District-Yavatmal (Ms) India For Period Of 2 Year During Covid-19 Pandemic

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Abstract-

Water is life. Groundwater is considered as purest and majorly available source of water. It is used to fulfill 50% urban and 80% ruler water demand in India besides irrigation. Total Dissolved Solids, also known as TDS, are inorganic compounds that are found in water such as salts, heavy metals and some traces of organic compounds that are dissolve in water. Total dissolved solids (TDS) are a measure of the combined total of organic and inorganic substances contained in a liquid. This includes anything present in water other than the pure H_2O molecules. These solids are primarily minerals, salts, and organic matter that can be a general indicator of water quality. Arni is a town (Taluka) with (Administrative Division) & Tahsil in Yavatmal district of Maharashtra State in India. As groundwater is prominently used to fulfill domestic demands hence quality of groundwater must be checked time to time in order to supply safe drinking water. In this paper, one attempt has been made to study of variation in total dissolved solids of water of Arni Town, District-Yavatmal (MS) India over a period of 2 year during covid-19 pandemic.

Keyword- *total dissolved solids, groundwater, variation in total dissolved solids of water of Arni Town, District-Yavatmal (MS) India, period of 2 year during covid-19 pandemic.*

Introduction-

Water is colourless, odourless and transparent substance. Water is the important, precious and indispensable natural resources of the earth, covering approximately three-forth of the earth surface. Water is life. Water is an essential element of human being. Approximately 60-65% of human body is composed of water (1). Groundwater has excellent natural quality, usually free from pathogens, color and turbidity and can be consume directly without treatment. It does not require large storage, treatment and distribution system, can be frequently developed incrementally at point near water demand. Generally, groundwater is mostly chemically and microbiologically non-polluted so it is safe for drinking and cooking in addition to agriculture or industrial use. Groundwater is used to irrigate around two fifth of India's total agricultural land. Groundwater is considered as purest and majorly available source of water. It is used to fulfill 50% urban and 80% ruler water demand in India besides irrigation (2).

Total Dissolved Solids, also known as TDS are inorganic compounds that are found in water such as salts, heavy metals and some traces of organic compounds that are dissolve in water. Excluding the organic matters that are sometimes naturally present in water and the environment, some of these compounds or substances can be essential in life. But, it can be harmful when taken more than the desired amount needed by the body. The total dissolved solids present in water are one of the leading causes of turbidity and sediments in drinking water. When left unfiltered, total dissolved solids can be the cause of various diseases.

Arni is a town (Taluka) with (Administrative Division) & Tahsil in Yavatmal district of Maharashtra State in India. It is situated on the banks of the Arunavati River. It Connected with National Highway-361. Nearest Railway Station is a Dhamangaon which is located 90 km approximately & Nearest Airport is a Dr. Babasaheb Ambedkar International Airport, Nagpur is around 187 km from Arni. Location of Arni in Maharashtra, India Coordinates: 20°07′40″N 77°55′39″E. In Arni town, main source of drinking water is groundwater. As groundwater is prominently used to fulfill domestic demands hence quality of groundwater must be checked time to time in order to supply safe drinking water (3).

In this paper, one attempt has been made to study of variation in total dissolved solids of water of Arni Town, District-Yavatmal (MS) India over a period of 2 year during covid-19 pandemic.

Methodology – Water samples were collected from different location of Arni town during investigation period of June 2020 to May 2021. Sample is collected in polyethylene bottle. Within 10 minute total hardness is measured. For measurement of hardness of the sample, used Tds meter whose details are as follows:

Brand	: HM
Model Number	: AP-1
Type	: Digital
Range	: 0-5000 ppm
Temperature Range	: -5+50 degree C degree C
Accuracy	: +-2%
Battery Life	: 1000
Power Features	

Power Requirement : 3v

Dimensions
Width : 3 cm
Height : 15 cm
Weight : 0.1 kg
Manufacturer : HM DIGITAL PVT LTD SOUTH KOREA
Importer : HM DIGITAL INDIA PVT LTD DELHI

Source-www.Flipkart.com

For the study purpose, we had selected six different groundwater sources of Arni. Water samples are collected every month and Tds is measured with the help of digital Tds meter. Following table shows details of the water sample source:

Sr. No.	Sample	Area of sample	Groundwater source	Depth
1.	Sample 1	Madhav Nagar	Borewell	125 ft
2.	Sample 2	Old Tahsil Area	Borewell	100 ft
3.	Sample 3	Datta Nagar	Borewell	125 ft
4.	Sample 4	Mathura Nagar	Borewell	110 ft
5.	Sample 5	Sambhaji Nagar	Borewell	150 ft
6.	Sample 6	Swami Samarth Nagar	Borewell	200 ft

Following table shows Tds of different samples under study-

Sr. No.	Month	Sample 1 TDS (in ppm)	Sample 2 TDS(in ppm)	Sample 3 TDS (in ppm)	Sample 4 TDS (in ppm)	Sample 5 TDS (in ppm)	Sample 6 TDS (in ppm)
1	March 2019	565	833	681	503	484	363
	June 2020	545	803	621	453	444	343
2	April 2019	568	890	658	536	580	380
	July 2020	535	800	566	485	526	406
3	May 2019	555	790	690	594	520	394
	August 2020	511	721	620	522	499	394
4	June 2019	634	750	620	520	603	406
	September 2020	604	720	598	499	600	410
5	July 2019	675	843	540	497	637	396
	October 2020	500	705	510	506	605	346
6	August 2019	605	867	530	457	702	384
	November 2020	611	854	524	455	600	400
7	September 2019	535	830	526	502	664	419
	December 2020	505	730	476	456	624	401
8	October 2019	528	750	495	535	634	399
	January 2021	508	700	455	505	604	319
9	November 2019	528	651	510	504	558	409
	February 2021	508	601	500	458	498	380
10	December 2019	480	608	504	507	512	320
	March 2021	508	600	413	503	495	312
11	January 2020	402	605	470	498	375	377
	April 2021	431	522	355	500	446	301
12	February 2020	407	600	431	436	325	309
	May 2021	400	565	421	411	380	396

According to World Health Organization (WHO) and Bureau of Indian Standard some parameter are as follows:

Sr. No.	Water quality parameter	Bureau of Indian Standard (IS-10500:1994)	WHO International Standard (1983)
1.	pH	6.5-8.5	7.0-8.5
2.	Total Dissolved solids (ppm)	500-2000	500
3.	Total hardness (ppm)	300-600	100

TDS- The mineral constituents dissolved in water constitute total dissolved solids. The concentration of dissolved solids in natural water is usually <500 ppm while water with more than 500 ppm is undesirable for drinking and industrial use. It is reported that TDS value of 500 ppm is desirable limit and 2000 ppm is the maximum permissible limit and that water containing more than 500 ppm of TDS causes gastrointestinal irrigation (4). High value of TDS influences taste, hardness and corrosive property of water (5, 6). Drinking water should contain sufficient minerals to keep you healthy and should not contain excess minerals that become overloaded in the body. In this article, we will provide details about the acceptable minimum and maximum TDS (Total dissolved solids) Limits for drinking water.

Variation in hardness and minimum, maximum hardness of sample over a period of 2 year during covid-19 pandemic are summarized in the following table:

Sr. No.	Sample	Maximum TDS		Minimum TDS		TDS Range (in ppm)	Variation in TDS (Max.-Min)		Average TDS variation Range in ppm	
		Before Covid-19	In Covid-19	Before Covid-19	In Covid-19		Before Covid-19	In Covid-19		
1.	Sample 1	675	611	402	400	400-675	63	2	9-78	2-78
2.	Sample 2	890	854	600	522	522-890	36	78		
3.	Sample 3	690	621	431	355	355-690	69	77		
4.	Sample 4	594	522	436	411	411-594	72	25		
5.	Sample 5	702	624	325	380	325-702	78	55		
6.	Sample 6	419	410	309	301	301-419	9	8		

Conclusion-

From the variation of hardness table over a period of 2 year during covid-19 pandemic it is observed that the minimum TDS of groundwater Arni city is 301 ppm and maximum is 890 ppm. In period of covid-19 pandemic Tds is found to be decreases by 100-200 ppm. Average TDS variation Range of groundwater arni is found to be same. These samples Tds range have acceptable value according to Bureau of Indian Standard (IS-10500:1994) which has range 500-2000 ppm. Sample which has value below 500 ppm which has acceptable value according to WHO International Standard (1983). TDS range of groundwater in Arni city is found to be acceptable and fair over a period of 2 year during covid-19 pandemic.

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Assesment of Plastic pollution awareness and impact of Plastic Pollution on Environment among peoples

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Abstract-

Plastic pollution has become one of the biggest environmental issues. Understanding the knowledge and attitudes of peoples about plastic pollution and its impact on Environment is very important to battle against plastic pollution. This study set out to investigate knowledge and attitudes towards plastic pollution awareness. This was a mixed study approach, where both qualitative and quantitative data were derived. Data were collected using a questionnaire asking about participants' plastic pollution knowledge, behaviors, and opinions about plastic usage. Data collected from group discussion and interviews gives idea about peoples knowledge about environmental impact of Plastic pollution and plastic waste management. The majority of participants understood how harmful plastic pollution is to the environment. Our results revealed that participants' knowledge and awareness were at high levels about plastic pollution. The most common current actions toward reduction in plastic pollution reuse, reduce, recycle, educate and replacement of plastic with sustainable alternatives

Keywords- Plastic pollution, awareness, plastic waste management, reuse, recycling of Plastic.

Introduction

Plastic waste arises from our homes and offices to dustbins, landfills and bodies of water, causing contamination. Plastic pollution is the accumulation of plastic objects and particles in the Earth's environment that adversely affects humans, wildlife and their habitat Plastics come in a variety of shapes and sizes, and they are commonly used in our everyday lives. Today, it's difficult to find a substance that isn't made of plastic. Plastics are inexpensive, simple to manufacture, and extremely durable and very adaptable for different uses. Due to these qualities of plasic manufacturers choose to use plastic over other materials.

There are three major forms of plastic that contribute to plastic pollution: micro-, macro-, and mega-plastics. Plastic pollution has also greatly negatively affected our environment. "The pollution is significant and widespread, with plastic debris found on even the most remote areas. Plastic pollution on land poses a threat to the plants and animals – including humans who are based on the land. Plastic pollution has several negative effects on our climate, but the three most important are air pollution, water pollution, ocean pollution, land pollution and food pollution.

For the sake of health and the environment, it is important to properly dispose of such plastic waste and to reduce its widespread use.

Need of present study

Plastic pollution is a major global issue aries from last few decades. Plastic pollution really requires a global and comprehensive solution . There is need to rethink about production, usage and plastic waste management system. Increasing awareness about plastic pollution is important in todays situation. Many peoples are not much aware about the Plastic pollution and Plastic pollution management. So present study is the attempt to find out awareness of peoples towards Plastic pollution and Plastic waste management and impacts of plastic pollution on environment..

Objectives of research

To find the knowledge of peoples about Plastic Pollution.
To find the knowledge of peoples about impact of Plastic Pollution on environment.
To find the peoples attitude towards Plastic waste management.

Material and method:-

The purpose of present paper was to study Plastic Pollution and Plastic waste management awareness among peoples. For this random sample of 100 peoples of different sex, different age group and different educational qualification were selected. The area which is selected to study Plastic Pollution awareness is mainly restricted to Pandharkawada dist Yavatmal Maharashtra. This was a mix study approch. Collection of data was done through self developed questioner, group discussion and interviews of different age group peoples. Both qualitative and quantitative data was colected. Self developed questioner is mainly consist of questions about knowledge of peoples about use of plastic, Plastic Pollution, impact of Plastic Pollution on environment and peoples attitude towards Plastic waste management. Raw data is collected and after processing

data final conclusions are drawn. Questioner consist of questions having answers in rating scale and yes/no type questions.

Results and discussion-

Demographic Details of Respondents.

The demographic details regarding age, gender, highest level of education were collected from the respondents and they are as given below

Table 1

Age Group	No. of respondres	Percentage
18-28	67	67 %
29-38	14	14 %
39-48	13	13 %
49-58	06	06 %
Male	56	56 %
Female	44	44 %
Education of the respondents		
Below Graduation	11	11 %
Graduation or pursuing graduation	73	73 %
Post Graduation and above	16	16 %

In present study 94 % of study participants responded plastics causes the pollution to environment. 0 % responders respond that plastic will not cause pollution and 6 % responded that they don't know about plastic causing pollution to environment.

Table 2

According to responders the main source of plastic pollution are

Food Wrappers & Containers	**26 %**
Bottle & Container Caps	22 %
Plastic Bags	20 %
Plastic cups and Plates	11 %
Takeout Containers	09 %
Straws and Stirrers	05 %
Toys	04 %
other	03 %

Table 3

Number of participant aware about different types of pollution caused by Plastic waste are as follows

Air Pollution	**92 %**
Water Pollution	84 %
Soil Pollution	73 %
Marine Water Pollution	39 %
E Pollution	32 %

85 % participants responded burning of plastic will cause lung problem and 15 % were not aware about that. Among the study participants 73 % participants replied plastic can cause cancer, and 27 % were not aware about that. 64 % participants answered plastic using in food package will cause health problem and 10 % are not agreed with packing of food in plastic causing any health hazards. 26 % were not aware about packing of food in plastic causing any health hazards.

Number of participant responded to following options to control Plastic Pollution

Table 4

Recycle when possible	**43 %**
Use alternative packaging	07 %
Avoid single-use plastics	21 %
Find reusable options	11 %
Carry own cloth bag to market	18 %

From group discussion and interviews of responders following information is collected

Responders are aware about following impacts of Plastic Pollution such as Plastic Pollution disturbs the natural ecosystem, it disturbs the food chain, it affects the water supply. Plastic Pollution can be harmful to human health, It is harmful to animals and Clearing areas of plastic waste is difficult and expensive. From study it is observed that many responders have no clear idea about plastic waste management and recycling of plastic.

Findings –

From the study following major findings are obtained about Plastic Pouution

- Many responders were well known about plastic pollution and its impact on Environment.
- Awareness about Plastic waste management yet not properly developed among the responders.
- They are unknown about proper Plastic waste management and recycling of Plastic waste.
- As compared to air , water and soil pollution caused by Plastic, many responders are unknown about the impact of Plastic pollution on marine pollution and E pollution.
- Responders are familiar to adverse health effect of pastic on human health.
- Many Responders are well known about Reduce and Reuse of Plastic abut the are not much aware about recycling of pastic.

Conclusion -

Present paper highlights the plastic pollution and its impact on Environment among 100 peoples of different sex, different age group. It focus on Present condition of plastic pollution awareness, From the findings which are obtained about plastic pollution and its impact on Environment it is observed that Many responders were well known about plastic pollution and its impact on Environment. Many Responders are well known about Reduce and Reuse of Plastic abut the are not much aware about recycling of pastic. Peoples are unknown to many environmental consequences of plastic pollution. So there is a need of proper education to make aware peoples about plastic pollution and its impact on Environment. Reduce , Reuse, Recycle and Educate are the best ways to control the plastic polltion.

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Study of Water Quality Parameters of Pimpalkhuti Dam in TalukaRalegaon, District-Yavatmal

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Abstract:

Water resources are essential and equally important for natural eco system and human development. All eco system on earth depends on the water. Fresh water is finite, critical, renewable, vulnerable the resource on the earth plays as important role in living environment without its life is impossible. Thepresent study is focus on the determination of Physico- chemical parameter such as hardness, chlorides, alkalinity, DO, BOD, COD, temperature, pH, TDS, phosphate, and sulphate of water sample. Where analyzed for periods of twelve months from 1st February 2021 to 31st January 2022. All parameter where within the permissible limits. The result indicates that the corresponding dam is non-polluted and can be used for irrigation, fishculture, and domestic purpose.

***Keywords**: Physico- chemical parameters, permissible limits, living environment.*

Introduction:

Water is most indispensable requirements for all living organism. Unsafe drinking water is one of the main concerns in developing countries. In order to deal with this problem, physico- chemical parameters were determined in order to identify the contamination problems and suggest appropriate solution. The good quality of water is essential for living organism. The quality of water can be assessed by studying its physical and chemical characteristic. Because of vast population[1] highly used fertilizers[2], pesticides, insecticides, and negligence of human being [3], the quality of water is being deteriorated day by day. Regarding the quality of drinking water, microbiological contamination is primary concern of developing countries[4]. In addition, inorganic contaminants[5], concerning both health and aesthetic aspect can be present in the water. Fluoride and arsenic are a great health problem worldwide [6,7].The natural aquatic resources are causing heavy and varied pollution in aquatic environment leading to water quality and depletion of aquatic Biota. It is there for necessary that the quality of drinking water should be checked at regular time interval because due to use of contaminated drinking water. In present study includes the analysis of water quality in terms of physico- chemical parameters of Pimpalkhutidam talukaralegaon district,Yavatmal (Maharashtra). The dam water is basically used for Domestic, Agriculture purpose, Fisheries activity and Various Animal water drinking purpose. In Yavatmal region still now several researchers have done study on physicochemical parameters of various water resources [8, 9, 10].

Materials and Methods:

Surface water sample were collected from pimpalkhutidam. Water sample from all site were collected in sterile glass bottles in the morning Hours between 9 to 11 am, regularly for every month, brought to the laboratory, processed within 1-3 hrs for the estimation of various physico- chemical parameters like water temperature, pH, and Total Dissolved Solids were recorded at the time of sample collection by using Thermometer, pocket Digital pH meter and pocket Digital TDS meter. Transparency was measured with the help of Secchi Disc. While other parameters such as DO, Free CO_2, Hardness, Chlorides, Alkanity, Phosphate and Nitrate were estimated in the laboratory.

Result and Discussion: The monthly variation in physico-chemical parameters are represented in following table

Months	Temperature ^{0}C	TDS	pH	Turbidity NTU	Total Hardness mg/l
January	24	722	7.8	9.40	81.0
February	24.5	701	8.1	11.90	90.5
March	27	648	8.3	11.93	160
April	27	645	8.3	11.92	160
May	27.5	652	8.4	11.02	157
June	25	958	8.0	10.5	150
July	25.5	965	7.3	1.35	73

August	25	961	7.2	2.3	84
September	25.5	940	7.1	2.2	100
October	24.5	810	7.2	0.5	67
November	23.5	760	7.5	1.45	106
December	23.5	743	7.6	1.90	83

Table No. 2

Months	DO	Free Co_2 mg/l	Chloride	Alkalinity	Transparency Cm
January	8.90	0.0	42.32	118.25	14.3
February	9.10	0.0	33.08	122.50	6.9
March	12.32	0.0	42.06	182.50	6.8
April	15.5	0.0	55.08	160.25	6.6
May	15.4	3.5	55.59	205	6.7
June	12.08	7.6	41.18	169.0	9.4
July	10.02	8.4	43.32	153.25	60.1
August	9.08	7.3	48.59	191.0	61.4
September	9.15	21.0	37.12	192.0	57.2
October	7.96	15.7	41.09	173.25	92.0
November	6.55	25.3	43.57	150.50	92.4
December	6.40	25.3	47.61	141.25	66.25

Water Temperature:

Water temperature can exert great control over aquatic communities. Temperature of water may not be as important in pure water, but in polluted water, temperature can have profound effects on dissolved oxygen (DO) and biological oxygen demand (BOD). The fluctuation in dam water temperature usually depends on the season and sampling time. In this present study of the water temperature ranges from 23.5 ^{0}C to 27.5^{0}C. The maximum (27.5 ^{0}C) temperature was recorded in the month of May (summer) and minimum (23.5 ^{0}C) in the month of December (winter). It shows that higher temperature in summer and relatively lowers in winter. Similar study has done at Kapileshwar Dam AshtiDist- Wardha [11], observed that water temperature was high during summer season due to low water level, and clear atmosphere.

Total Dissolved Solid (TDS): The TDS in water consist of inorganic salts of calcium, magnesium, sodium etc. Small amount of organic matter and dissolved material present in the water. In this study TDS fluctuate from 645 ppm to 965 ppm. The maximum value of TDS was found to be 965 ppm in the month of July. It is due to heavy rainfall in rainy season and the minimum value of TDS 645 ppm was recorded in the month of April. Similar result reported by IoryueIjah Silas et al [12]

pH: The pH is an indicator of the existence of biological life. The pH of dam water was found to alkaline character throughout the study period. Were most of the water samples collected in different months of the year, tested in the present study were found to be in permissible range of pH value recommended by several health and pollution control organization eg. WHO, (the permissible value of pH is 6.5 to 8.5). The maximum pH value (8.4) was recorded in the month of May (summer season) and minimum pH value (7.1) was recorded in the month of September. pH of water directly affect the biochemical and chemical reaction as well as pH of water is increased by reducing the percentage of $Co_2$and biocarbonate which is happened due to photosynthetic activities. Apart from above some other factors such as air and temperature bring about changes the pH of water. K. Bheemappa et al [13] reported that the maximum value of pH was found in pre- monsoon season.

Turbidity: Turbidity may be due to the organic or inorganic constituents. The turbidity of water fluctuates from 0.5 NTU to 11.93 NTU during the year. The maximum values (11.93 NTU) was recorded in month of March

(summer) it is mainly due to the decrease in the water level and suspended particulate matter and minimum value of turbidity (0.5 NTU) was founded in the month of October.

Total Hardness: The amount of dissolved salts of calcium and magnesium in the water is generally known as hardness of water. Hardness of water is an important consideration to determining the suitability of water for industrial and domestic uses. The value of the hardness fluctuates from 67 mg/l to 160 mg/l. the maximum value (160 mg/l) was recorded in the month of March to April (summer) and minimum value (67 mg/l) in the month of October. Similar result were reported by H. V. Vyas and V. A. Sawant [14]

Dissolve oxygen (DO): Thedissolved oxygen content is essential for aquatic life. Its deficiency directly affects the ecosystem of dam or river low dissolved oxygen (less than 2 mg/l) would indicate poor water quality. The value of DO is generally average from 6.40 mg/l to 15.5 mg/l.

The maximum values of DO (15.5 mg/l) was recorded in month of April (summer) and minimum values of DO (6.40 mg/l) was recorded in month of December (winter).

Free CO_2: The value of free CO_2 ranges from 0.0 mg/l to 25.3 mg/l. The maximum value (25.3 mg/l) was found in the month of November to December (winter) and minimum value (0.0 mg/l) was found in the month of January to April.

Chloride: The value of chloride ranges from 33.08 mg/l to 55.59 mg/l. The maximum value (55.59 mg/l) was found to be in the month of May (summer) and the minimum value (33.08 mg/l) in the month of February.

Alkalinity: Due to increase in the percentage of bicarbonates in the month of March to May (summer) alkalinity was found to be maximum. Total alkalinity ranges from 118.25 mg/l to 205 mg/l. The highest value of alkalinity (205 mg/l) was recorded in the month of May (summer) and lowest value of alkalinity (118.25 mg/l) in the month of January (winter).

Transparency: Transparency of water fluctuates from 6.6 cm to 92.4 cm. The maximum water transparency 92.4 cm was recorded in the month of November (winter) and minimum 6.6 cm in the month of April (summer).Similar result were reported by Rachel M. Pilla et al [15]

Conclusion:

The thermal decomposition of the complexes is not simple and involves different stage decomposition. It is assumed that dehydration of the complexes containing water occurs within an active reaction interface. The compensation effect of thermal decomposition of the complexes indicating the change of sample mass on the estimated values of activation energy. The structural changes of all complexes have marked effect on the sensitivity and sensitivity varies with organisms.

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Study of Some Chemical Parameters of Water From Shahanoor Dam.

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Abstract-
Water is the most important or vital factor for the existence of all living organisms. Reservoirs are also the main sources of drinking water supply. Man has used water bodies as most convenient and cheapest refuse disposal system for domestic and industrial waste which leads to pollution. So its necessary to know chemical parameter of the water. In the present investigation chemical parameters of water from shahanoor dam was studied to assess the quality of water for, irrigation, fishing, industrial processing and so on. In the present study an attempt has been made to detect the Ph, Alkalinity and Acidity , Conductivity, Dissolved Oxygen, Carbon-di-oxide, Hardness, Calcium, Phosphate, Nitrate, Fluoride etc. water samples were collected per season from Shahanoor dam. Samples were analysed regularly for 3 years in the laboratory from Jan. 2011 to Dec. 2013. The observations were recorded. The pH turbidity were recorded at the site. All the chemical parameters of the dam are within permissible limit of World Health Organization (WHO) standards. This means chemical status of the dam is suitable for biodiversity of life. It showed that there are some, physical, chemical and biological processes which self-purify the dam.
Keywords- Shahanoor dam, Chemical Parameters, Oxygen, Carbon-di-oxide, Hardness, Calcium, Phosphate, Nitrate, Fluoride.

Introduction-

Human activities have the great impact on the environment, ecosystems, and economical sensitive areas. Medudhula. T. *et. al*. (2012). Environmental monitoring studies provided the information about any damage to the ecosystem. Harney, N. V., et. al. (2013). It assesses how affected ecosystems changes over time and thus determine the best means of prevention. Hulyal, S.B. (2011),

Environmental monitoring describes methods and processes to monitor the quality of the environment. It provides information about changes in structure and function of ecosystems which can be used in environmental protection or management, as well as in many circumstances in which human activities carry a risk of harmful effects on the natural environment. Ahangar I. A. *et. al*. (2012). From ancient time, civilizations depend on fresh water bodies like lakes, reservoirs, rivers and wetlands. Fresh water is essential not only to sustain human life but also to support the activities that form the basis for thriving economies. At the same time water resources are essential to human societies and the activities of these societies can pollute and degrade water resources. Barot C. , et. al. (2014). Water has unique property of dissolving large amount of substances in it. (Choudhari, 1995) This property of water brings about changes in its physical as well as chemical properties and ultimately the pollution. (Kaushik and Saksena 1999) It has long been recognized that regular monitoring of the physical, chemical and biological parameters characterizing water quality in river, lakes and reservoirs used for water supply is essential for protecting public health and assuring the long term reliability of these substances. (Banerjee, K., *et. al*. (2006).

Freshwater becomes a critical natural resource due to number of reasons . India receives about 1400-1800 mm of rainfall annually. It is estimated that the 85% of water is used for agriculture ,10% for industries and 5% for domestic use. Analysis conducted in 1982 revealed that about 70% of all available water in our country is polluted. (Chandrashekhar and Kodarkar, 1996) Dams are the major part of freshwater resources. A dam is manmade reservoir have been constructed for irrigational needs ,drinking purposes ,industrial and domestic use etc. Gopalkrishna, M.H. (2011).

Shahanoor dam selected in the present study is situated at a site nearly 10 km towards North-West from Achalpur Tahsil and 85 km from Amravati. It is build up on the Shahanoor river. It is an earthen dam with 6.9 km length and is situated in the midst of Satpuda hills.

Aquatic pollution thus brought about by human activities causing alteration in the chemical properties of water. APHA (1998). Water get polluted due to the discharge of chemical water pollutants such as mercury from mining activity, certain nitrogen compounds used in agriculture and chlorinated organic compounds arising from sewage water treatment plants. (Richardson *et al.* 2007) There for evaluation of physico-chemical parameters of water is essential to assess the quality of water for, irrigation, fishing, industrial processing and so on. (Rajgopal *et al.*,2010)

Chemical Paramaters -

Ph, Alkalinity and Acidity -

Alkalinity, acidity and buffering capacity are the important characteristics of water. pH is defined as the intensity of acidic or basic characters of a solution. pH of water affects its suitability for biota and also influence chemical reactions. Bade, B. B., *et. al.* (2009)**.** The largest variety of freshwater aquatic organisms prefer a pH range between 6.5 to 8.0.

- **Conductivity :**

Conductivity is a measure of a solution such as water of lake, dam or stream to pass an electric current. This is an indicator of dissolved electrocytes ions in the water.

- **Dissolved Oxygen :**

The presence of dissolved oxygen is essential to maintain the higher forms of biological life and to keep the proper balance of various populations thus making the water body healthy.

- **Carbon-di-oxide :**

Free carbon-di-oxide in the waters accumulates duo to microbial activity and respiration. This impart the acidity to the water because of the formation of carbonic acid. In an aquatic ecosystem sources of CO2 are commonly respiration and decomposition.

- **Hardness :**

Hardness is the property of water which prevents the lather formation with soap and increases the boiling point of waters. The major cautions imparting hardness are calcium and magnesium. Ecologically temporary hardness plays a key role in buffering capacity and this has a great effect on biotic diversity and biomass in an ecosystem

- **Calcium :**

Calcium is one of the most abundant elements found in the natural water. It is an important ion in imparting the hardness to the waters. At high pH much of its quantity get precipited as caco3.

- **Phosphate :**

The phosphates is generally considered as the critical nutrient for the growth of algae in water. The enrichment of this nutrient leads to the process of eutrophication. The most important sources of phosphates are discharge of detergents and agricultural run-off.

- **Nitrate :**

Like phosphorus nitrate is also one of the critical nutrient for the growth of algae and helps accelerating the eutrophication. Domestic sewage, natural run-off and agricultural wastes are the important sources of it. The determination of nitrate in drinking water is of prime importance because of the disease methamoglobonebia caused by its excessive presence.

- **Fluoride :**

Fluoride originates from weathering of fluoride containing minerals and enters surface waters from run-off and ground waters. Significant sources of fluoride are found in coke, glass and ceramics, electronics, pesticides, and fertilizer manucturing, steel and aluminium processing and electroplating industries.

Material And Methods

Description of the study area :

- **Shahanoor Dam :**

Shahanoor dam selected for the present study is situated near Anjangaon Surji, Amravati district, state of Maharashtra, India. This dam was constructed as a part of irrigation projects by the Government of Maharashtra in the year 1990. It is an earthfill dam built using soil and stones with a capacity of 45 MCUM on the Shahanoor river.

The dam is located in the hill ranges of Satpuda. Human activities like washing of clothes and vehicles, bathing are rare as the dam is far away from the adjoining villages. Water from the dam is used for irrigation and hydroelectricity. The net irrigation area is 7455 hectors. Water from the dam is supplied for drinking for 156 villages and 2 towns in Anjangaon Surji, Daryapur, and Bhatkuli Talukas of Amravati district.

Morphometry of the catchment area :

Shahanoor dam is located at latitude 21.15’21” and longitude 77.19’30”. The total catchment area of the dam site is 53.74 sq. miles (139.187Km^2). All the catchment area is through hill ranges of Satpuda and lies in Maharashtra state only. The length of the dam is 795 meters and height of the dam is 56.45 meters. An ogee type waste weir of 57 meter length having 4 radial gates on the left

bank saddle. The live storage capacity of the reservoir is 46.04 Km^3 and gross storage capacity is 47.85 km^3.

The drainage area receives rainfall 781.81 mm mainly from the southeast monsoon from June to October. The monsoon precipitation generally commences in the 2nd week of June and continues throughout the year. The soil in the area varies from grayish black to deep black.

chemical Analysis :

Water samples were collected once per season in well labeled, polythene sampling bottles which were tightly stoppered and brought to the laboratory for analysis.

pH - The determination of pH is important due to its effect on chemical and biological properties of liquids. On field pH was recorded with the help of standard pH paper strips. The paper was dipped in a sample water and colour developed was compared with standard colour code given. In the laboratory pH was recorded with the help of pH meter.

- **Free Carbon dioxide : (Titration Method)**

Free CO_2 was determined by titrating the sample using a strong alkali to pH 8.3. At this pH all the free CO_2 is converted into bicarbonates.

- **Total Hardness : (EDTA Method)**

Hardness is generally caused by the calcium and magnesium ions present in water. Hard water is unsuitable for cooking, washing and bathing.

- **Calcium : (EDTA method)**

Calcium is the major cation present in natural waters, its main source being leaching rocks in the catchment. Its concentration restricts water use while it is an important component in the exoskeleton of Arthropod and shells in Molluscs.

- **Chlorides : (Argenometric Method)**

Natural water normally has a low chloride content.

- **Total Phosphates : (Photometric method)**

The presence of phosphates in water is due to detergents, fertilizers.

- **Nitrates : (Phenoldisulphonic acid method)**

Nitrate is normally the most common form of combined inorganic nitrogen in aquatic system.

- **Fluoride : (SPADANS Method)**

Fluorides have dual significance in water supplies. High concentration causes dental fluoris and lower concentration (< 0.8 mg/l) causes dental caries. A fluoride concentration of approximately 0.1 mg/l is recommended. They are frequently found in certain industrial processes resulting in fluoride rich waste waters. It was calculated by SPADANS method.

- **Dissolved Oxygen : (Winkler's Method)**

Oxygen dissolved in water is very important parameter in water analysis as it is an indicator of the physical, chemical and biological activity. Generally high DO is found in the ecosystem which is free from pollution, while its values are negligible in case of polluted water due to the presence of NH_3, H_2S, Nitrites etc.

- **Bicarbonates (HCO_3) :**

Bicarbonates imparts the alkalinity to the natural waters. In natural waters CO_2 is responsible for alkalinity.

- **Magnesium : (EDTA Method)**

Magnesium is dominant cation in natural water which added in the ecosystem by the leaching of rocks in the catchment. Potable water got an unpleasant taste due to the high concentration of Mg.

RESULT

In the present study, seasonal variation of the physico-chemical paramaters of Shahanoor dam for the period of Jan. 2017 to Dec 2019 were studied. Water samples were analysed for 3 years at regular interval and the obtained data is presented in tables.

pH :

pH plays important role in the life of aquatic animals. During the present study pH ranges obtained were between 7.12 to 7.52 in 2017. In the year 2018 pH was highest 7.26 during monsoon and minimum during winter. In 2019, it was maximum 7.65 in monsoon and minimum 7.09 in winter. Seasonal variation in pH shows that it was maximum during monsoon followed by summer and winter for the successive two years 2018 and 2019. (Table 2-3)

Dissolved Oxygen :

Dissolved oxygen is the most important parameter of the aquatic ecosystem which can directly affect the survival and distribution of aquatic organisms.

In the present study, dissolved oxygen (mg/l) in water from dam varies from 6.81 to 9.07 mg/l. The maximum value 9.07 was recorded during winter and minimum value 7.8 recorded during summer in the year 2017. In the winter season of the year 2018 and 2019 it was maximum (8.72,9.07) respectively. But was minimum in the summer of 2018 and monsoon of 2019. (Table 2-3)

Free carbon-oxide :

In an aquatic ecosystems free CO_2 is essential for the photosynthetic activities. Free CO_2 of the water from Shahanoor dam varies from 0 to 0.51. The free CO_2 was absent during summer and monsoon season in the 2017. In winter of 2017, it was recorded 0.51mg/l. (Table 1) Again it was totally absent during summer in 2018 and during monsoon and winter in 2019. Its values were 0.51 during winter in 2017, 0.12 and 0.19 mg/l during during monsoon and winter in 2018 and 0.13 during summer of the year 2019. (Table 2-3)

Total Hardness :

Hardness of water is mainly imported by alkaline earth metallic cations mainly calcium and magnesium present in it.

Total hardness of Shahanoor dam was determined seasonally during the present study. The range of total hardness was found between 68 to 152 mg/l. Total hardness was found to be more (150, 152) during winter, followed by summer (132, 150) and minimum during the monsoon(88,188) respectively in the year 2017 and 2018 . While in 2019 total hardness was more than 148 mg/l in summer followed by monsoon and minimum during winter.

Total Alkalinity :

Total alkalinity of Shahanoor dam was found to vary in different seasons. The minimum and maximum values were noted as 24 mg/l and 150 mg/l respectively. In the year 2017 it showed highest 44 mg alkalinity in summer and lowest 32 mg/l in monsoon. Similar seasonal variation was found in the year 2018 and 2019 i. e. highest alkalinity during summer (52, 64mg/l) and lowest during monsoon (24,36) respectively (Table 2-3)

Bicarbonates :

The carbon-di-oxide that is dissolved by naturally circulating water appears a21s carbonates and bicarbonate ions. Seasonal variation was recorded in bicarbonate of the dam water throughout the study period. Bicarbonate values were maximum 40 mg/l during monsoon and minimum 26 mg/l during summer, for the year 2017. (Table 1) In 2018, 2019 higher carbonate occurred in monsoon 51, 65 and 29, 35 mg/l during winter season and moderate in summer. (Table 2-3)

Chlorides :

Chloride concentration from the studied dam ranged between 10 to 18 mg/l. The maximum chloride values were found to be 13, 14, and 18 mg/l found in monsoon season of the year 2017, 2018, and 2019 respectively. While the minimum value in the winter season of the year 2011 and 2013 was found to be 10 mg/l. The seasonal trend throughout the study was maximum in monsoon season. (Table 1-2-3)

Calcium :

Calcium is an important ion which impart hardness to the water. Calcium ion concentration in the water of the Shahanoor dam varied from 9mg/l to 30mg/l during the study period 2017 to 2018. Calcium values recorded were more in the monsoon season, followed by summer and winter seasons. (Table 1-2-3)

Magnesium :

Magnesium is an important cation which gives hardness to the water. High value of magnesium 15mg/l was found in summer season, while low value i.e. 9 mg/l was found in winter season in the year 2017. Similar pattern of seasonal variation was found in 2018 and 2019 i.e. maximum Mg in summer and minimum in winter season. Data of the study is presented in tables (Table 1-2-3)

Nitrates :

Nitrate content of the water from the Shahanoor dam was studied for the period 2017 to 2019. The nitrate content ws found to be maximum 5.17 mg/l during monsoon season and minimum 2.14 mg/l. in summer season. The nitrate value 2.68 mg/l and 7 mg/l were during winter season respectively. (Table 1-2) During the year 2017 and 2018, the nitrate values were found to increase from that of 2019, as recorded as 11.4 mg/l and 15.16 mg/l during summer season.

Phosphates :

Phosphates of Shahanoor dam was calculated seasonally during the present investigation period. Phosphate values were recorded as 0.03 mg/l during summer, 0.05 mg/l during monsoon season and 0.06 mg/l during winter season in the year 2017. In the year 2018, 0.06 mg/l during summer, 0.01 mg/l during monsoon season and 0.03 in winter season. (Table 1-2-3)

Fluoride :

The Fluoride values of Shahanoor dam were recorded as 0.20 mg/l and 0.11 mg/l in the monsoon and winter season of 2017 respectively. It was absent during the summer. 0.16mg/l,0.20mg/l and 0.07mg/l fluoride was found respectively during summer, monsoon and winter season in 2018. In the year 2019, 0.163mg/l, 0.112mg/l and 0.07mg/l fluoride were found during summer, monsoon and winter season respectively. All the data is presented in the table (Table 1-2-3)

Table 1
Seasonal Variation And Mean ± Se Of Chemical Parameters Of Shahanoor Dam.
JAN 2017 – DEC 2017

Sr. No.	Parameters	anges	Seasons		
			Summer	Monsoon	Winter
1.	pH	7.4 - 8.1	7.14 ± 0.15	7.16 ± 0.27	**7.52 ± 0.19**
2.	Dissolved Oxygen (mg/l)	5.30 - 9.00	6.81 ± 1.7	7.40 ± 1.11	**8.90 ± 0.5**
3.	Carbon dioxide (mg/l)	0 – 0.60	-	-	**0.51 ± 0.7**
4.	Total Hardness (mg/l)	120 - 155	132 ± 10.62	88 ± 5.12	**150 ± 9.36**
5.	Total Alkalinity (mg/l)	30 – 45	44.66 ± 4.1	32.19 ± 1.16	**36.71 ± 5.6**
6.	Total dissolved Solids (mg/l)	155 - 195	162 ± 9	180 ± 8.1	**168 ± 6.1**
7.	Bicarbonate (mg/l)	2.02 - 45.6	26 ± 5.8	40.08 ± 1.42	**32.21 ± 4.3**
8.	Chlorides (mg/l)	9.5 - 16.2	11.03 ± 1.02	13.16 ± 2.03	**10.47 ± 1.07**
9.	Calcium (mg/l)	11.6 - 35.09	18.09 ± 4.69	25.13 ± 3.1	**14.1 ± 5.49**
10.	Magnesium (mg/l)	7.06 - 18.65	15.01 ± 3.30	1.5 ± 1.69	**9 ± 5**
11.	Nitrates (mg/l)	1.67 - 13.5	11.14 ± 0.42	9.5 ± 0.16	**2.68 ± 0.54**
12.	Phosphates (mg/l)	0.01 - 0.08	0.03 ± 0.01	0.05 ± 0.03	**0.06 ± 0.01**
13.	**Fluoride (mg/l)**	**0.08 - 0.25**	**---**	**0.20 ± 0.01**	**0.01 ± 0.02**

Table 2
Seasonal Variation And Mean ± Se Of Chemical Parameters Of Shahanoor Dam.
JAN 2018 - DEC 2018

Sr. No.	Parameters	Ranges	Seasons		
			Summer	Monsoon	Winter
	pH	7.1 - 7.9	7.25 0.31	7.26 ± 0.26	**7.6 ± 0.39**
	Dissolved Oxygen (mg/l)	4.6 - 11.2	7.54 ± 2.09	8.09 ± 1.01	**$8.^{1/2}$ ± 2.2**
	Carbon dioxide (mg/l)	0.09 - 0.25	-	0.12 ± 0.01	**0.19 ± 0.05**
	Total Hardness (mg/l)	95 - 146	150 ± 5.8	118.05 ± 72	**152 ± 8.7**
	Total Alkalinity (mg/l)	20.55	52 ± 5.7	24 ± 2.4	**39 ± 4.17**
	Total Dissolved Solids (mg/l)	250 - 420	240 ± 10.1	404 ± 14.6	**243 ± 6.9**
	Bicarbonate (mg/l)	33.6 - 52.8	39.2 ± 2	51.8 ± 0.23	**29.9 ± 3.07**
	Chlorides (mg/l)	9.6 - 175	11 ± 1.6	14 ± 3	**12 ± 1.27**
	Calcium (mg/l)	18.8 - 36.5	19 ± 3.8	30 ± 6.5	**17 ± 1.18**
	Magnesium (mg/l)	4.6 - 18.90	13 ± 4.4	9 ± 2.9	**8.5 ± 3.5**
	Nitrates (mg/l)	4.9 - 17.01	15.16 ± 1.4	8.20 ± 0.89	**7 ± 2.1**
	Phosphates (mg/l)	0.01 - 0.09	0.06 ± 0.02	0.01 ± 0.02	**0.03 ± 0.01**
	Fluoride (mg/l)	**0.03 - 0.30**	**0.16 ± 0.03**	**0.20 ± 0.04**	--

TABLE 3
Seasonal Variation And Mean ± Se Of Physico-Chemical Parameters Of Shahanoor Dam.
JAN 2019 - DEC 2019

Sr. No.	Parameters	Ranges	Seasons		
			Summer	Monsoon	Winter
1.	pH	6.86 - 7.95	7.20 ± 0.35	7.65 ± 0.13	**7.09 ± 0.67**
2.	Dissolved Oxygen (mg/l)	6.8 - 13.6	8.8 ± 2.3	9.2 ± 0.34	**9.07 ± 3.93**
3.	Carbon dioxide (mg/l)	0.00 - 0.15	0.13 ± 0.01	-	-
4.	Total Hardness (mg/l)	67.13 - 53.2	148 ± 4.2	114 ± 8.65	**6.8 ± 0.13**
5.	Total Alkalinity (mg/l)	122 - 157	64 ± 10.59	36 ± 11.04	**56 ± 3**
6.	Total dissolved Solids (mg/l)	154.8 - 465.7	163 ± 8.8	163 ± 4.07	**216 ± 6.6**
7.	Bicarbonate (mg/l)	34.19 - 77.71	49 ± 3.05	65 ± 4.77	**35 ± 0.18**
8.	Chlorides (mg/l)	27.7 - 20.6	12 ± 0.094	18 ± 1.9	**10 ± 2.6**
9.	Calcium (mg/l)	7.4 - 26.5	20 ± 21	23 ± 3.4	**9 ± 2.4**
10.	Magnesium (mg/l)	8.00 - 24.09	19 ± 4.46	17 ± 1.89	**9 ± 1.01**
11.	Nitrates (mg/l)	0.26 - 5.92	2.14 ± 1.87	5.17 - 0.22	**3.03 ± 2.9**
12.	Phosphates (mg/l)	0.06 - 0.20	0.5 ± 0.5	0.09 ± 0.002	**0.12 ± 0.20**
13.	**Fluoride (mg/l)**	**0.04 - 164.9**	**0.163 ± 0.09**	**0.112 ± 0.06**	**0.07 ± 0.03**

Summary And Conclusion

In the present study chemical parameters was investigated.

pH ranged between 7.6 to 7.65. pH was maximum during monsoon and minimum during winter for 2012 and 2013. For 2011 pH was highest during monsoon and lowest during summer season.

Dissolved oxygen (mg/l) was found more (9.07) in the winter season throughout the 3 years, but it was minimum during summer season of 2011 and 2012 and monsoon of the year 2013.

Free CO2 of Shahanoor dam varied from 00 to 0.51 mg/l. The free CO2 was absent from the Shahanoor water during summer season of 2011 and 2012. Again it was absent during monsoon of the year 2011 and 2013. In the winter of the year 2011 and 2012 CO2 was recorded 0.51 mg/l and 0.19 mg/l respectively and 0.12 mg/l during monsoon of 2012.

Total hardness was found to be more (150, 152) during winter and minimum during the monsoon (88, 118) respectively for the year 2011 and 2012.

Total alkalinity varied between 24 mg/l during monsoon of 2012 and 64 mg/l during summer of 2013. Seasonal trend for alkalinity of Shahanoor dam was maximum during summer and minimum during monsoon throughout the study years.

Total dissolved solid of the dam ranged from 162 mg/l to 404 mg/l, and showed maximum values during monsoon seasons for the three year study.

Bicarbonate values of studied water body was maximum (40) during summer and minimum (26) during monsoon of the study years.

Maximum chloride values were recorded during monsoon season throughout the study years.

Maximum calcium content of the Shahanoor dam were recorded in the monsoon seasons for the three study years and minimum in the winter season.

Magnesium values of the dam were recorded higher in summer and lower in winter season for the year 2012 and 2013.

Nitrates values for the year 2011 and 2012 was found to be more during summer season and less during winter season.

Phosphate content of the Shahanoor dam varied between 0.03 mg/l and 0.06 mg/l maximum phosphate values recorded during winter season.

Fluoride values of Shahanoor dam was found to very between 0.07 and 0.163mg/l.

Conclusion :

From the present investigation of the dam following conclusions were drawn.

All the chemical parameters of the dam are within permissible limit of World Health Organization (WHO) standards.

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Aurone : Synthesis of Active Compound And Experimental Study In Physical Aspects.

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Abstract:

Aurones, constitute a subclass of naturally occurring compounds which are structurally isomeric to flavones, biogenetically related to chalcones, and are responsible for imparting beautiful yellow colors to some of the flower petals[1-4].Recent investigations have shown that these compounds have potent and promising biological activities, in some cases even more potent than chalcones and flavones[5-7] .

This paper aims to study physical properties with experimental data such as density, refractive index and viscosity of Aurone.

Keywords:Aurone,Density.Viscocity,Refractive index etc.

Introduction:

Actually,to date, the chemical structures of more than 100 different aurones have been identified, characterized by distinctive hydroxylated, methoxylated, and glycosylated substitution patterns. Moreover, their effective potential to predict viable therapeutic uses has begun to be unveiled[8-11] .Therefore, they represent a worth deepening class of natural compounds intended to provide bioactive compounds in the near future.

The first examples of aurones were characterized in 1940 in Asteraceae[12],the family of sunflowers, which synthesize the most common 4-deoxy-derivatives of the family including sulfuretin , maritimetin , leptosidin and their corresponding glycosides. The species *variabilis* and *sulphureus* mainly express sulfuretin and its glycosylated counterparts in leaves and petals. In the *bidens* species, maritimetin has been isolated while, in the genus Coreopsis, compounds such as sulfuretin, maritimetin, but also leptosidin may be found.

The chalcone are accessed through synthesis by the Claisen-Schmidt reaction of 2-hydroxyacetophenone and benzaldehyde or their derivatives in the presence of aqueous NaOH, KOH or Ba(OH)2[12-16].This chalcone further cyclized in various solvent to get desired substituted aurone . Aurone provides intense yellow pigmentation to some fruits and flowers [17].Aurones are found in flowers of Scrophulariaceae and Compositae family. However, they are also found in leaves, barks, seeds and woods of various plants. Aurone derivatives show various range of pharmacological activities such as antiviral, antifungal, antioxidant, anticarcinogen, antidiabetes[18,19].

Experimental

I.Synthesis :

Substituted Aurone have been synthesized by cyclization of substituted chalcone in presence of various solvents and their general structures were confirmed by IR, 1H NMR and mass spectral data. Table 1,Table 2, and Table 3 shows the various physical parameters of synthesized Aurone.

II.Physicochemical studies:

The synthesized Aurone was recrystallized from DMF. The solvent A.DMF and B.DMSO were used for the physicochemical studies.

III.Density and Refractive index:

Abbe refractometer was used to determine the refractive index of all the solutions. Table 1 shows the refractive index of synthesized Aurone at various temperatures and various concentrations.

Results and Discussions:

I. Refractive Index of synthesized Aurone:

Table 1 : shows the dynamic values of refractive index.

Concentrations	R.I. in solvent A	R.I. in Solvent B
0.05	1.492	1.553
0.04	1.485	1.541
0.03	1.469	1.534
0.02	1.458	1.531
0.01	1.453	1.529

II. Density and Viscosityof synthesized Chalcone:

The table below shows the dynamic experimental values of density (ρ), and viscosity (η), at different temperature and different concentrations.

Table:2 (Temperature: 303.15 K)

Conc.	Solvent A Density(ρ) ($g.cm^{-3}$)	Solvent A Viscosity Centipoise	Solvent B Density(ρ) ($g.cm^{-3}$)	Solvent B Viscosity Centipoise
0.05	1.1410	1.2754	0.9779	0.8510
0.04	1.1406	1.2601	0.9772	0.8478
0.03	1.1403	1.2522	0.9768	0.8398
0.02	1.1401	1.2497	0.9766	0.8257
0.01	1.1398	1.2453	0.9764	0.8201

Table:3 (Temperature: 313.15 K)

Conc.	Solvent A Density(ρ) ($g.cm^{-3}$)	Solvent A Viscosity Centipoise	Solvent B Density(ρ) ($g.cm^{-3}$)	Solvent B Viscosity Centipoise
0.05	1.1352	1.2455	0.9557	0.8212
0.04	1.1349	1.2398	0.9553	0.8191
0.03	1.1345	1.2342	0.9550	0.8129
0.02	1.1341	1.2292	0.9541	0.8087
0.01	1.1340	1.2231	0.9538	0.8002

Conclusions:

From above experimental values it is concluded that densities,viscosities and refractive index of solution are changes by changing temperatures and by changing the solvent due to solute-solvent interaction.

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Studies on Assessment of Physico-chemical Parameters of Drinking Water in Schools of Akola District

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Abstract:

Water is essential in every stage of life for any living organism. The quality of water is of vital concern for mankind since it is directly linked with human welfare. The water resources now days as consequences of population explosion coupled with industrialization, urbanization and green revolution. Water related diseases have remained a major concern in much of the developing world. The World Health Organization (WHO) estimated in the 2000 assessment that there are four billion cases of diarrhea each year in addition to millions of other cases of illness associated with the lack, of access to clean water. Therefore, this study is focused on analysis of physico-chemical parameters of water is essential for all living organisms.

Keywords: Water, Hardness, pH, COD, BOD, Chloride, Conductance, Acidity, Alkanality etc.

Introduction

Water:

Water is the most abundant compound on Earth's surface, covering about 70 percent of the planet. In nature, water exists in liquid, solid, and gaseous states. It is in dynamic equilibrium between the liquid and gas states at standard temperature and pressure. At room temperature, it is a tasteless and odorless liquid, nearly colorless with a hint of blue. Many substances dissolve in water and it is commonly referred to as the universal solvent. Because of this, water in nature and in use is rarely pure and some of its properties may vary slightly from those of the pure substance [1]. However, there are also many compounds that are essentially, if not completely, insoluble in water. Water is the only common substance found naturally in all three common states of matter and it is essential for all life on Earth. Water usually makes up 55% to 78% of the human body [2].

Clean, fresh drinking water is essential to human and other lifeforms. Access to safe drinking water has improved steadily and substantially over the last decades in almost every part of the world. However, some observers have estimated that by 2025 more than half of the world population will be facing water-based vulnerability. A recent report (November 2009) suggests that by 2030, in some developing regions of the world, water demand will exceed supply by 50%[3,4].

Forms of water:

Like many substances, water can take numerous forms that are broadly categorized by phase. The liquid phase is the most common among water's phases (within the Earth's atmosphere and surface) and is the form that is generally denoted by the word "water." The solid phase of water is known as ice and commonly takes the structure of hard, amalgamated crystals, such as ice cubes, or loosely accumulated granular crystals, like snow[5]. The gaseous phase of water is known as water vapour (or steam), and is characterized by water assuming the configuration of a transparent cloud. (Note that visible steam and clouds are, in fact, water in the liquid form as minute droplets suspended in the air.) The fourth state of water, that of a supercritical fluid, is much less common than the other three and only rarely occurs in nature, in extremely uninhabitable conditions. When water achieves a specific critical temperature and a specific critical pressure (647°K and 22.064°MPa), liquid and gas phase merge to one homogeneous fluid phase, with properties of both gas and liquid.

Contamination of Water :

Water is a chemical substance with the chemical formula H_2O. Its molecule contains one oxygen and two hydrogen atoms connected by covalent bonds. Water is often co-exists on Earth with its solid state ice, and gaseous state, water vapour or steam. According to researchers, water covers 70.9% of the earth's surface, and is vital for all known forms of life. On Earth, it is found mostly in oceans and other large water bodies, with 1.6% of water below ground in aquifers and 0.001% in the air as vapour, clouds (formed of solid and liquid water particles suspended in air), and precipitation. Research also claims that oceans hold 97% of surface water, glaciers and polar ice caps 2.4%, and other land surface water such as rivers, lakes and ponds 0.6%. A very small amount of the Earth's water is contained within biological bodies and manufactured products. Water on earth moves continually through a cycle of evaporation or transpiration (evapotranspiration), precipitation, and runoff, usually reaching the sea. Over land, evaporation and transpiration contribute to the precipitation over land.

Drinking water is never pure. Water naturally contains minerals and microorganisms from the rocks, soil, and air with which it comes in contact. Human activities can add many more substances to water. But drinking water does not need to be pure to be safe. In fact, some dissolved minerals in water can be beneficial to health. For example, the National Research Council (National Academy of Sciences) states that drinking water containing dissolved calcium and magnesium generally contributes a small amount toward calcium and magnesium human dietary needs. Fluoride, either naturally occurring or added to the water supply, can help protect against tooth decay. Whether or not drinking water is safe will depend on which substances are present and in what amounts.

Water Is Essential to Life:

Water is second to oxygen as being essential for life. People can survive days, weeks, or even longer without food, but only about four days without water. The average adult consumes and excretes two or more quarts of water each day. Some of this water is supplied through foods but most is consumed through beverages. It is generally recommended that adults consume 6 to 8 cups (48 to 64 ounces) of liquids daily. Some beverages, such as coffee, tea, soda with caffeine, and alcohol are diuretic and increase urine excretion. These beverages, if consumed in large quantities, can upset the body water balance [6].

Water is essential in every stage of life for any living organism. The quality of wateris of vital concern for mankind since it is directly linked with human welfare. The waterresources now days as consequences of population explosion coupled with industrialization, urbanization and green revolution. Water related diseases have remained a major concern in much of the developing world. The World Health Organization (WHO) estimated in the 2000 assessment that there are four billion cases of diarrhea each year in addition to millions of other cases of illness associated with the lack, of access to clean water. Therefore, analysis of physico-chemical parameters of water is essential for all living organisms [7].

Sources of water Supply:

Water resources are of critical importance to both natural ecosystem and human development. It is essential for agriculture, industry and human existence. The healthy aquatic ecosystem is depended on the physico-chemical and biological characteristics. The quality of water in any ecosystem provides significant information about the available resources for supporting life in that ecosystem. Good quality of water resources depends on a large number of physicochemical parameters and biological characteristics [8].

To asses that monitoring of these parameters is essential to identify magnitude and source of any pollution load

Sources of fresh water

a) Surface water

Surface water is water in a river, lake or fresh water wetland. Surface water is naturally replenished by precipitation and naturally lost through discharge to the oceans, evaporation, evapo-transpiration.

Human activities can have a large and sometimes devastating impact on these factors. Humans often increase storage capacity by constructing reservoirs and decrease it by draining wetlands. Humans often increase runoff quantities and velocities by paving areas and channelizing stream flow[9,10].

Nevertheless, over the long term the average rate of precipitation within a watershed is the upper bound for average consumption of natural surface water from that watershed.

Natural surface water can be augmented by importing surface water from another watershed through a canal or pipeline. It can also be artificially augmented from any of the other sources listed here; however in practice the quantities are negligible. Humans can also cause surface water to be "lost" (i.e. become unusable) through pollution [11,12].

b) Under river flow

Throughout the course of a river, the total volume of water transported downstream will often be a combination of the visible free water flow together with a substantial contribution flowing through sub-surface rocks and gravels that underlie the river and its floodplain called the hyporheic zone [13].

c) Ground water

Sub-surface water, or groundwater, is fresh water located in the pore space of soil and rocks. It is also water that is flowing within aquifers below the water table. Sometimes it is useful to make a distinction between sub-surface water that is closely associated with surface water and deep sub-surface water in an aquifer (sometimes called "fossil water").

The natural input to sub-surface water is seepage from surface water. The natural outputs from sub-surface water are springs and seepage to the oceans[14].

d) Desalination

Desalination is an artificial process by which saline water (generally sea water) is converted to fresh water. The most common desalination processes are distillation and reverse osmosis. Desalination is currently expensive compared to most alternative sources of water, and only a very small fraction of total human use is satisfied by desalination.

e) Frozen water

The Himalayas, which are often called "The Roof of the World", contain some of the most extensive and rough high altitude areas on Earth as well as the greatest area of glaciers and permafrost outside of the poles. Ten of Asia's largest rivers flow from there and more than a billion people's livelihoods depend on them [15].

Material And Methods: In proper Akola district, numbers of different schools are there such as primary schools, high schools, Junior colleges, convents etc. The drinking water samples were collected from different schools. The various physico-chemical parameters of these samples were assessed.

Ten such samples were collected from following schools

Table 1 : Names of schools from which water samples were collected.

Sr. No.	Names of Schools from which samples collected	Area
1	Shri. Shivaji Vidyalaya, Akola	Deshmukh Peth, Akola
2.	Jubilee English Convent, Akola	Ramdas Peth, Akola
3	Savitribai Phule Kanya School, Akola	Santoshi Manta Mandir, Akola
4	New English School, Akola	Ramdas Peth, Akola
5	B. R. High School, Akola	New Bus Stand, Akola
6	Jagruti Vidyalaya, Akola	Ranpise Nagar, Akola
7	Aadarsh Vidyalaya, Akola	Aadarsh Colony, Akola
8	D. R. Patil Vidyalaya, Akola	Sahakar Nagar, Akola
9	Jyoti Vidyalaya, Akola	Azad Colony, Akola
10	Swami Vivekanand Vidyalaya, Akola	Gurukul Nagar, Akola

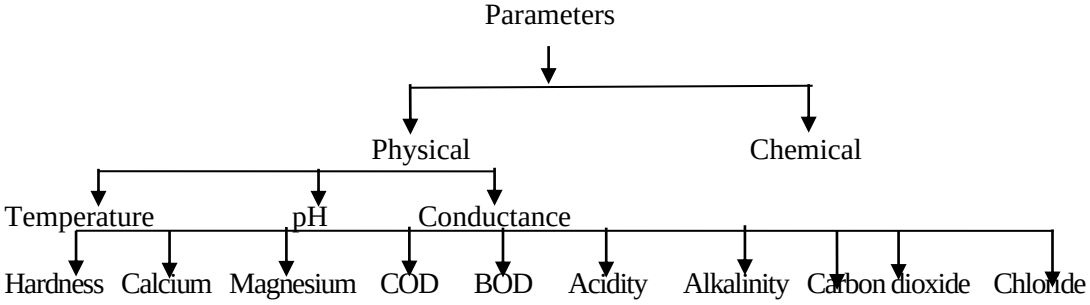
The water samples were collected from handpump, cement tank, plastic tank (PVC), Rajans from ten different schools. Drinking water samples collected in 250 ml sterilized glass bottle.

The standards (Maximum permissible limits) of physico-chemical parameters for drinking water as recommended by World Health Organization (WHO) are given in following table.

Sr. No.	Physico-chemical parameters	Limits
1	Colour	--
2	Odour	--
3	Taste	--
4	Temperature	10 – 15.6°C
5	Conductance	300 – 600 mg/lit.
6	Hardness	300 mg/lit.
7	Chloride	Not to exceed 600 mg/lit
8	Calcium	75 – 100 mg/lit.
9	Magnesium	50 – 150 mg/lit.
10	Alkalinity	200 mg/lit.
11	Acidity	--
12	Free CO_2	--
13	COD	Not to exceed 250 mg/lit.
14	BOD	Not more than 8 mg/lit.
15.	pH	6.5 – 8.5

Analysis of Water

Following are the parameters which are to be analyzed for the water samples.



Physical Analysis

1) Temperature

In wastewater various chemical reactions occur. The rate of chemical reactions increases with increasing temperature provided the higher temperature does not affect the reactant or catalyst. The temperature was recorded with the help of thermometer.

2) pH

pH of different sample was measured by pH meter. This measurement provides a very quick and easy obtain appraisal of the acid base equilibrium in an ecological system. It indicates the acidic and basic character of samples.

As per the standards set by Indian Council of Medical Research (ICMR, 1975), Drinking Water Protection Act (USA, 1973) p^H should be within 6-8.0 units. The standards set by other agencies are 6.5 – 8.5 units.

Importance of pH measurement

It may be evident from the forgoing discussion that pH of unpolluted natural waters occur within a narrow range of values and major deviations from that range caused by natural or anthropogenic sources, may have very strong impact of the aquatic ecosystems[16]. Physical, chemical and biological processes associated with water supply and sanitary engineering are also strongly pH dependent. Besides practically every analytical procedure associated with aquatic ecology and water pollution studies requires determination of pH.

pH Measurement

Connect the calomel and glass electrodes to the pH meter. Clean the electrodes with distilled water and dry it. Dip the electrodes in the 4.00 pH buffer solution. Adjust the temperature knob. Push the p^H button of function switch panel. Adjust the display to 4.00 p^H with calibration knob. Now pH meter is thus calibrated.

Wash the electrode, dry it and put in the solution whose pH is to be determined. Take the reading of pH.

3) Conductance

Electrical conductance is the ability of a substance to conduct the electric current. In water, it is the property caused by the presence of various ionic species.

The term specific conductance is also used in place of electrical conductivity, but it is an absolute term. The unit of conductivity measurement is Siemens. The older unit mhos/cm is now rarely used.

Importance of Conductivity Measurement

1. Conductivity is used to estimate total dissolved solids in water/wastewater.
2. It is useful in the rapid assessment of the salinity of water.
3. It is useful to assess the degree of mineralization of distilled and deionised water.
4. It is useful in checking the performance of water deionized and other ion-exchange resins.
5. It is useful to determine the amount of ionic reagent needed in certain precipitation and neutralization reactions and to determine end points in titrimetry.

4) COD

The amount of chemical oxidation required converting organic matter in water and wastewater to carbon dioxide in water and waste water is called as Chemical Oxygen Demand (COD). This test involves measuring the amount of oxidizing agent such as permanganate i.e. consumed when the organic matter in a water sample is oxidized completely to carbon dioxide. Organic matter in a sample also can be reacted directly with oxygen at a high temperature produce carbon dioxide. Too much organic matter addition to the lentic and lotic systems increases the levels of COD and changes the composition of oxygen requiring organisms. Variation in the organic matter in turn. Changes COD levels show diversity in the autotrophic and heterophic populations and decreases the productivity status. The energy budgets of the aquatic bodies also directly related to the levels of chemical oxidation in prescribed periods.

Procedure

50 ml of wastewater sample was taken and a mixture of added 10 ml of $KMnO_4$ and 10 ml H_2SO_4, H_2O was added into in to it then it was incubated for 4 hours, a few crystals of KI was added which turned the entire solution to yellow colour. After addition of few drops of starch indicator to above prepared solution until it turns colorless. Simultaneously distilled water bland was prepared and analyzed COD[12] (mg/L) using the formula.

$$COD(mg/L) = \frac{8\,xCx\,(B-A)}{Sx\,1000}$$

Where,

C = Concentration of titrant (N/80)

A = Volume of titrant used for blank (ml)

B = Volume of titrant used for sample (ml)
S = Volume of water sample taken (ml)

5) Biochemical Oxygen Demand (BOD)

Biochemical Oxygen Demand (BOD) is the measure of the degraded organic material present in a water sample, and can be defined as the amount of oxygen required by the microorganisms in stabilizing the biologically degradable organic matter under aerobic condition. Hence, BOD approximates the amount of oxidizable organic matter present in the solution and the BOD value can be used as a measure of waste strength. It is highly important to know the amount of organic matter present in the waste treatment system and that the quantity of oxygen required for its stabilization.

It can be determined by BOD bottles after five days.

BOD = (Do – Ds) x Dilution factor mg/lit.

6) Alkalinity

Reagents

A. Hydrochloric acid, 0.1 N
B. Methyl orange indicator, 0.05%
C. Phenolphthalein indicator
D. Sodium carbonate 0.1 N.

Procedure

1. Take 100 ml of sample in a conical flask and add 2 drops of phenolphthalein indicator.
2. If the solution remains colourless, PA = 0, and total alkalinity is determined as described in step 4.
3. If the colour changes to pink after addition of phenolphthalein titrate it with 0.1 N HCl until the colour disappears at end point. This is phenolphthalein alkalinity (PA).
4. Now add 2-3 drops of methyl orange to the same sample and continue the titration further, until the yellow colour changes to pink at end point. This a total alkalinity (TA).

Calculation

$$PA\ as\ CaCO_3, mg/L = \frac{(A \times Normality) of HCl \times 1000 \times 50}{ml\ of sample}$$

$$TA\ as\ CaCO_3, mg/L = \frac{(B \times Normality) of HCl \times 1000 \times 50}{ml\ of sample}$$

Where,

A = ml of HCl used with only phenolphthalein
B = ml of total HCl used with phenolphthalein and methyl orange
PA = phenolphthalein alkalinity
TA = Total alkalinity

7) Acidity

Reagents

A. Sodium hydroxide, 0.05 N
B. Methyl orange indicator
C. Phenolphthalein indicator

Procedure

1. Take 100 ml of colourless sample in a conical flask and add 2-3 drops of methyl orange indicator.
2. If the solution turns yellow, the methyl orange acidity is absent. In case the content turn pink, titrate it with 0.05 NaOH. At the end point colour changes from pink to yellow.
3. Now add few drops of phenolphthalein indicator to the same sample and titrate further with NaOH until the content turn to pink.

Calculation

$$Methyl\ orange\ acidity\ mg/L\ as\ CaCO_3 = \frac{A \times N of NaOH \times 1000 \times 50}{ml\ of sample}$$

$$Phenolphthalein\ acidity\ mg/L\ as\ CaCO_3 = \frac{B \times N of NaOH \times 1000 \times 50}{ml\ of sample}$$

Where,

A = Volume of NaOH used with methyl orange in titrating the sample to pH 3.7
B = Volume of NaOH used with phenolphthalein in titrating the sample to pH 3.7 to pH 8.3

8) Carbon Dioxide

Reagents

A. Sodium hydroxide, 0.05 N
B. Phenolphthalein indicator

Procedure

1. Take 100 ml of sample in a conical flask and add few drops of phenolphthalein indicator.
2. If the solution turns pink, free CO_2 is absent. If the sample remains colourless, titrate it against 0.05 N NaOH. At the end point pink colour appears.

Calculation

$$Free\ CO_2\ mg/L\ = \frac{(ml \times N)\ of\ NaOH \times 1000 \times 44}{ml\ of sample}$$

9) Chloride

Reagents

A. Silver nitrate, 0.02 N
B. Potassium chromate, 5%

Procedure

1. Take 50 ml of sample in a conical flask and add 2 ml of K_2CrO_4 solution..
2. Titrate the contents against 0.02 N $AgNO_3$ until a persistent red tinge appears.

Calculation

$$Chloride\ mg/L\ = \frac{(ml \times N)\ AgNO_3 \times 1000 \times 35.5}{ml\ of sample}$$

9) Hardness

Reagents

A. EDTA solution, 0.01 N
B. Buffer solution
C. Ferrochrome Black T (Solo chrome Black T) indicator
D. Sodium sulphide solution.

Procedure

1. Take 50 ml of sample in a conical flask. If sample is having higher calcium takes a smaller volume and dilute to 50 ml.
2. Add 1 ml of buffer solution.
3. If the sample is having higher amounts of heavy metals add 1 ml of Na_2S solution.
4. Add 100-200 mg of Eriochrome Black T indicator, the solution turns wine red.
5. Titrate the contents against EDTA solutions; at the end point colour changes from wine red to blue.

Calculation

$$Hardness\ as\ mg/L\ CaCO_3\ = \frac{ml\ EDTA\ used \times 35.5}{ml\ of sample}$$

10) Calcium

Reagents

A. EDTA solution, 0.01 M
B. Sodium hydroxide, 1 N
C. Murexide indicator.

Procedure

1. Take 50 ml of sample in a conical flask. If sample is having higher alkalinity, use smaller volumes diluted to 50 ml.
2. Add 2.0 ml of NaOH solution in the sample.
3. Add 100-200 mg of murexide indicator a pink colour develops.
4. Titrate against EDTA solutions until the pink colour changes to purple. For better judgement of end point, compare the purple colour with the distilled water blank end point.

Calculation

$$Calcium, mg/L\ = \frac{x \times 400}{ml\ of sample}$$

Where,

x = Volume of EDTA used.

11) Magnesium

Reagents

A. EDTA solution, 0.01 M
B. Buffer solution
C. Eriochrome Black T indicator

Procedure

1. Find out the volume of EDTA used in calcium determination.

Calculation

$$Mg^{++}, mg/L = \frac{y - x \times 400.8}{Volume\ of\ sample\ x\ 1.645}$$

Where,
y = EDTA used in hardness determination.
x = EDTA used in calcium determination for the same volume of the sample

OBSERVATIONS AND RESULTS

Observations

Water analysis Report

Table 1 : Quality Index of Drinking water of different schools in Akola district

Sr. No.	Samples ID	pH	Temp.	Colour	Odour	Taste
1	1	6.92	23°C	Clear	Odourless	Tasteless
2	2	6.77	24°C	Clear	Odourless	Tasteless
3	3	6.86	25°C	Clear	Odourless	Tasteless
4	4	7.00	23°C	Clear	Odourless	Tasteless
5	5	7.22	24°C	Clear	Odourless	Tasteless
6	6	7.33	25°C	Clear	Odourless	Tasteless
7	7	7.21	23°C	Clear	Odourless	Tasteless
8	8	7.23	24°C	Clear	Odourless	Tasteless
9	9	7.21	24°C	Clear	Odourless	Tasteless
10	10	7.37	23°C	Clear	Odourless	Tasteless

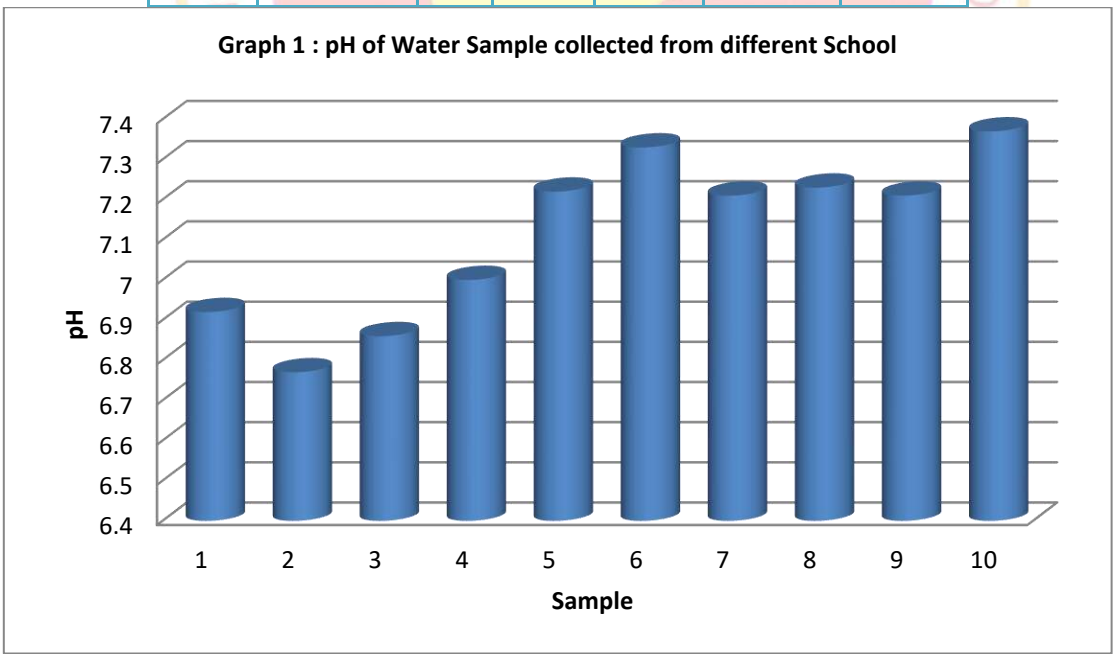


Table 2 : Conductance of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Conductance mg/l
1	1	415
2	2	310
3	3	310
4	4	425
5	5	305

6	6	417
7	7	610
8	8	306
9	9	504
10	10	425
11.	Standard by WHO	300-600

Graph 2 :- Conductance of Drinking water of different schools in Akola district

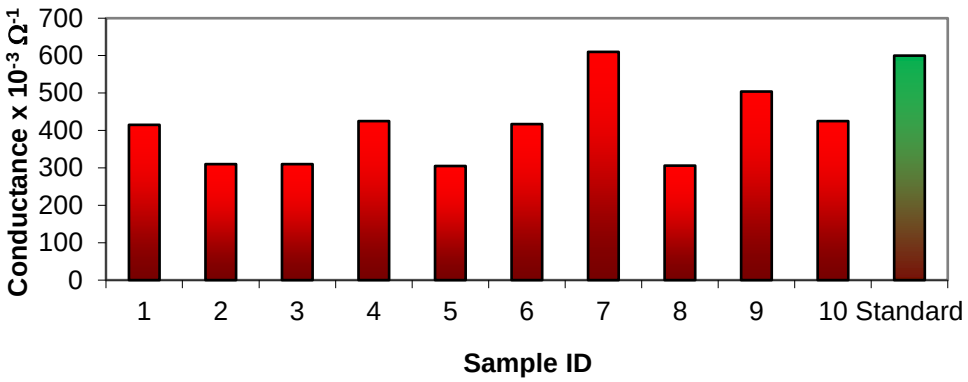


Table 3 : Hardness of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Hardness ppm
1	1	304
2	2	380
3	3	684
4	4	516.8
5	5	684
6	6	668.8
7	7	760
8	8	212.8
9	9	349.6
10	10	212.8
11	Standard by WHO	300

Graph 3 :- Hardness of Drinking water of different schools in Akola district

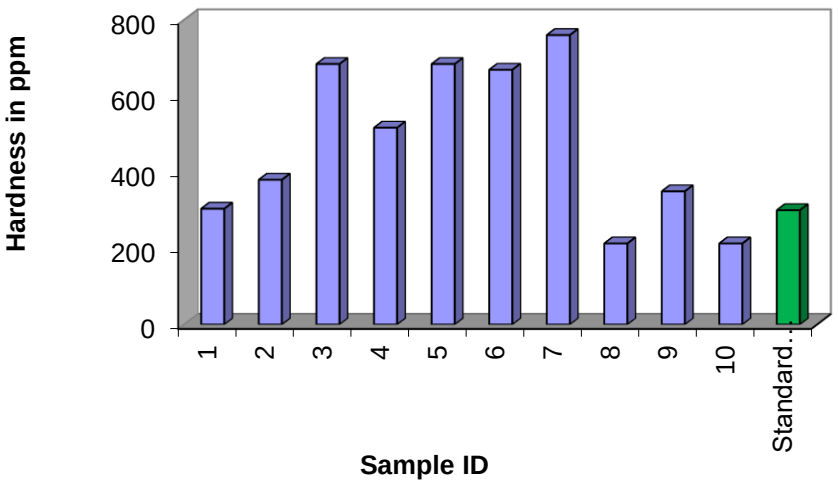


Table 4 : Calcium of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Calcium ppm
1	1	45.6
2	2	136.8
3	3	121.6
4	4	106.4
5	5	152
6	6	152
7	7	167.2
8	8	60.8
9	9	30.4
10	10	15.2
11	Standard by WHO	75 – 100

Graph 4 : Calcium of Drinking water of different schools in Akola district

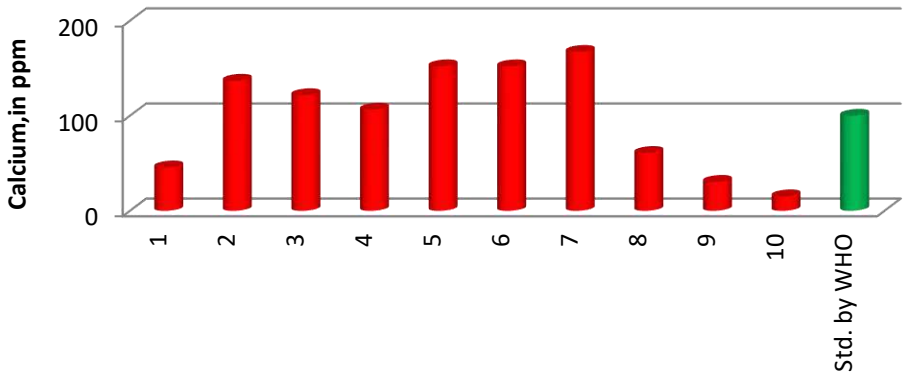


Table 5 :Magnesium of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Magnesium ppm
1	1	258.4
2	2	243.2
3	3	562.4
4	4	410.4
5	5	532
6	6	516.8
7	7	592.8
8	8	152
9	9	319.2
10	10	197.6
11	Standard by WHO	50 – 150

Graph 5 :- Magnesium of Drinking water of different schools in Akola district

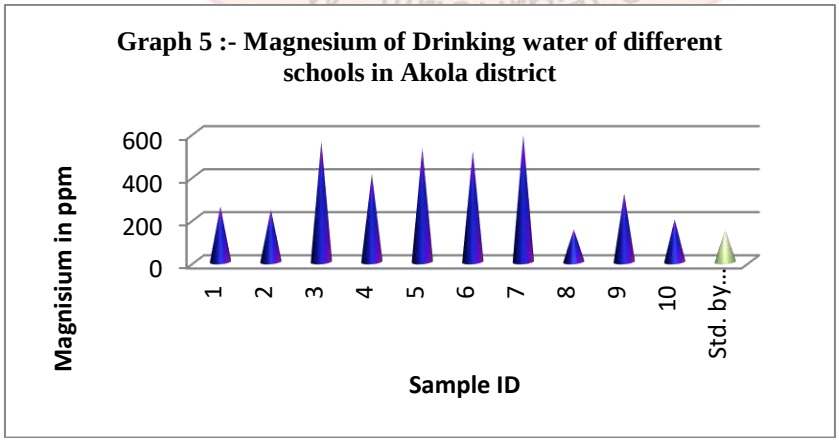


Table 6 : Chloride of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Chloride mg/l
1	1	183.18
2	2	140.438
3	3	134.332
4	4	702.19
5	5	106.855
6	6	100.749
7	7	131.279
8	8	146.544
9	9	732.72
10	10	427.42
11	Standard by WHO	Not to exceed 600

Graph 6 : Chloride of Drinking water of different schools in Akola district

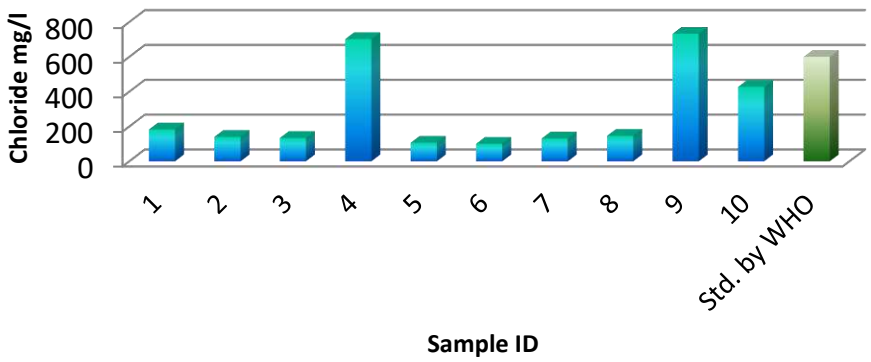


Table 7 : Alkalinity of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Alkalinity mg/l
1	1	300
2	2	400
3	3	350
4	4	350
5	5	500
6	6	650
7	7	1000
8	8	400
9	9	250
10	10	200
11	Standard by WHO	200

Graph 7 : Alkalinity of Drinking water of different schools in Akola district

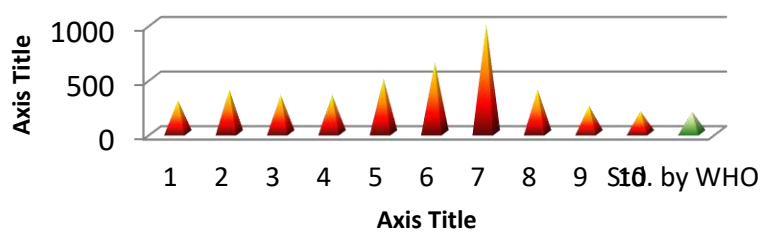


Table 8 : Acidity of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Acidity mg/l
1	1	50
2	2	125
3	3	175
4	4	125
5	5	150
6	6	225
7	7	250
8	8	100
9	9	75
10	10	50

Graph 8 : Acidity of Drinking water of different schools in Akola district

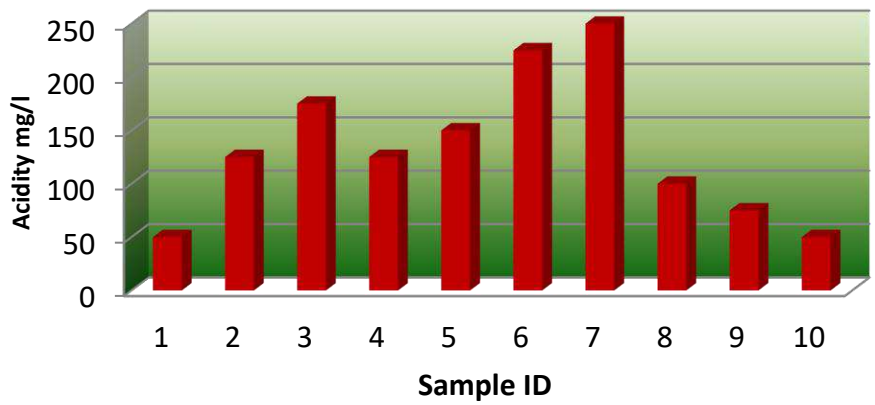


Table 9: Free CO_2 of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Free CO_2 mg/l
1	1	110
2	2	44
3	3	22
4	4	44
5	5	44
6	6	44
7	7	66
8	8	22
9	9	22
10	10	44

Graph 9 : Free CO_2 of Drinking water of different schools in Akola district

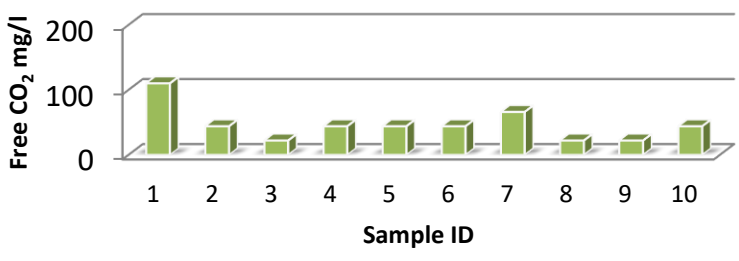
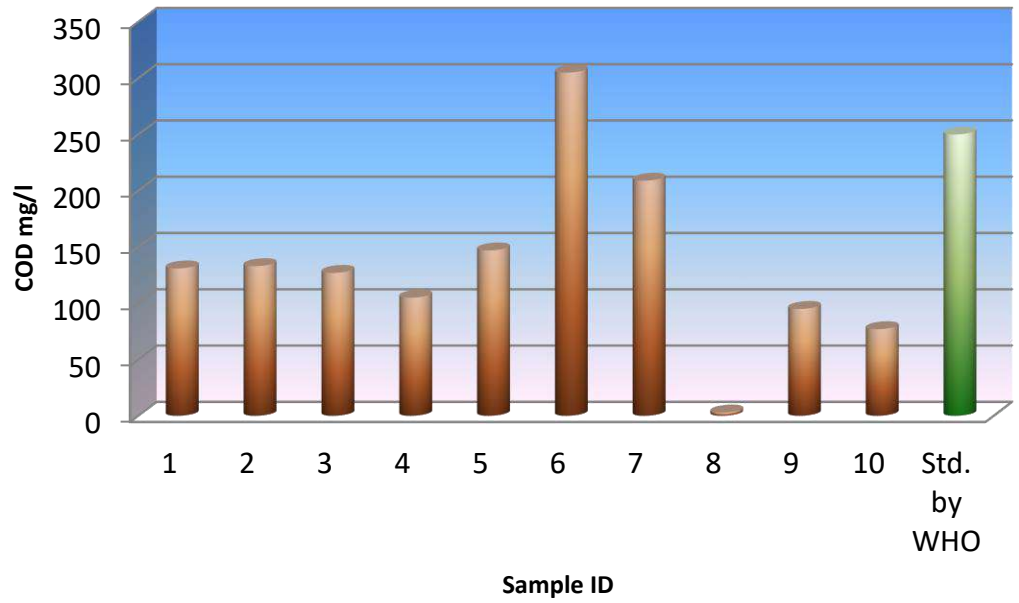


Table 9: COD of Drinking water of different schools in Akola district

Sr. No.	Samples ID	COD mg/l
1	1	131
2	2	133
3	3	127
4	4	105
5	5	147
6	6	305
7	7	209
8	8	3
9	9	95
10	10	77
11	Standard by WHO	Not to exceed 250

Graph 9 : COD of Drinking water of different schools in Akola district



CONCLUSION AND SUGGESTION

Conclusion

1) The study shows that better class and reasonably better quality water should provided at school and maintain its hygienic condition properly.
2) Storage of drinking water in Rajan and Drum was highly contaminated due to its direct contacts of hands and fingers.
3) The study also indicates that daily washing of storage means least coliform count. So we have low contamination in water.
4) The study shows that poor hygienic condition, improper method of storage, improper handling of drinking water makes drinking water more contaminated.
5) Hazen (1998) studied on drinking water and diarrhea diseases due to *E. coli* and reported that, prevention of fecal, contamination prevents water born outbreaks.

Suggestions

1) It is important to maintain the hygienic conditions of children's health.
2) Personal hygiene conditions
   a) Students should wash hands properly before drinking the water.
   b) Regular washing of water tanks/storages in schools.
   c) Water tanks/Rajan should be placed at the hygienic conditions.

d) Good quality purifier should be used in school.
e) Children should be guided serve drinking water properly from water storage (rajan, etc)
f) Children should aware about hygienic conditions related to drinking water.

3) Prevention from water born diseases
a) Regular checkout the pipeline leakage of water supply.
b) Water chlorination is the best and ultimate method of purification. Because chlorine reduces the germ and bacterial growth from water. Ferrous ions, magnesium ions and hydrogen sulphide from water oxidized by chlorine and it reduces the taste and odor from water.
c) Keep surrounding clean and animals away from the sources of water.

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Synthesis And Antimicrobial Activity Of 3, 5, 7 Trisubstituted -1, 2, 4-Triazolo-[3, 4-*B*] Benzothiazoles

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Abstract

4-Methoxy acetanilide on treatment with bromine in acetic acid, followed by hydrolysis with dil. HCl/NaOH solution, yielded 2-bromo-4-Methoxy aniline (1) which on treatment with sodium thiocyanate in acetic acid afforded 2-amino-4-bromo-6-Methoxy benzothiazole (2). Compound (2) in ethylene glycol was heated at 150 ^{0}C with 80% hydrazine hydrate to get 4-bromo-6-Methoxy-2-hydrazino benzothiazole (3). This hydrazino compound (3) on heating with 2-hydroxy-3-methoxy-benzaldehyde/4-methoxy benzaldehyde/4-hydroy-3-methoxy benzaldehyde/ 2-hydroxybenzaldehyde /4-hydroy benzaldehyde /4-dimethyl aminobenzaldehyde to obtain corresponding hydrazones (4a-4f). [4-bromo 2(substituted phenyl)-6-methoxy benzothiazolyl hydrazone]. These hydrazones (4a-4f) in unhydrous benzene independently were refluxed on water bath for three hours with Attenburrow's MnO_2[14] to obtain corresponding 3-substituted phenyl- 5-bromo-7-methoxy-1 ,2, 3-triazolo benzothiazoles (5a-5f). All these newly synthesized compounds were screened for antimicrobial activity against E.Coli (Gram –ve), B. subtilis (Gram +ve), E. Carotovara and xanthomonas citri using Ampicillin, Streptomycin and penicillin as a standard for comparison.

***Key Words** : Hydrazone, triazolobenzothiazole, biological screening*

Introduction:

1,2,4-triazole and their derivatives are important class of organic compounds with diverse agriculture, industrial and biological activities[1-3], including antimicrobial[4-5] anti-convulsant[6-7] and antiinflamatory[8]. Similarly benzothiazoles are known to posses different activities such as anticancer[9],anthelmintic activity[10], antitubercular activity[11].

A survey of literature reveals such fused substituted tricyclic triazoles are prepared by different methods[12 13] but little work is carried out on bromo methoxy derivative of such fused tricyclic triazoles. Hence it was thought worthwhile to synthesize 5-bromo-7-methoxy as a substituent on benzene moiety in the 1,2,4-triazolo-[3,4-*b*]-benzothiazole system by following series of reactions and study the chemistry and biological activity of these compounds.

As the first step, 2-bromo 4-methoxy aniline (1) was prepared by treating 4-methoxy acetanilide with bromine in acetic acid, followed by hydrolysis with dil. HCl / NaOH solution.To the solution of sodium thiocynate in glacial acetic acid, 2-bromo-4- methoxyyl aniline (2) was added .The mixture was stirred well and bromine in glacial acetic acid was added drop by drop action maintaining the temp. below 5 ^{0}C. The obtained residue filtered, dissolved in hot water and neutralized by 20% alkali. The obtained product 2-amino-4-bromo-6-methoxy benzothiazole (2) was recrystlised by using ethanol.

On the basis of elemental analysis and spectral data the obtained product (2) has assigned the structure 2-amino-4-bromo-6-methoxy benzothiazole. The I.R. spectrum showed absorption bands at 3440 cm^{-1} and 3340 cm^{-1} due to asymmetric and symmetric stretching of -NH_2 group respectively. The PMR spectrum exhibited singlet at δ 3.4 due to -OCH_3, broad peak of δ 6.0 due to -NH_2 protons and two singlets in the region δ 7.0 - 7.5 due to two Ar-H protons. The mass spectrum reveals molecular ion peaks at 260 (M+2, 98%) and 258 (M^+, 100%). It also confirmed the presence of one bromine atom.

2-Amino-4-bromo-6-methoxy benzothiazole (2) in ethylene glycol as solvent was heated with 80% hydrazine hydratehydrochloride for three hours by using oil bath and maintaing temp. at 150°C to 160°C to get 4-bromo-6-methoxy-2-hydrazino benzothiazole (3). The I.R. spectrum of compound (3) showed absorption bands at 3320 cm^{-1} and 3203 cm^{-1} due to -NH_2 asymmetric and symmetric stretching respectively. The mass spectrum exhibits molecular ion peaks of equal intensity at 275 (M+2) and 273(M^+) which also confirming the formation of product with one bromine atom.

Compound (3) in ethanol was heated with 2-hydroxy-3-methoxy-benzaldehyde/4-methoxy benzaldehyde/4-hydroy-3-methoxy benzaldehyde /2-hydroxybenzaldehyde/4-hydroxybenzaldehyde /4-dimethyl aminobenzaldehyde sperately on water to obtain corresponding hydrazones (4a-4f). The I.R. spectra of hydrazones showed stretching absorption bands in the region 3450-3100 cm^{-1} due to –N-H stretching. The presence of broad singlet in their PMR spectra in the region δ 2.5 to δ 4.5 confirmed the presence of -NH proton. The mass spectrum of the compound (4a) shows molecular peak at 377 (M^+.) which corresponds to molecular weight of the compound.

These hydrazones (4a- 4f) in benzene were refluxed on water bath for three hours with Attenburrow's MnO_2[1] independently to obtain 3-(2'-hydroxy-3'-methoxy phenyl/4'-methoxy phenyl / 4'-hydroxy-3'-methoxy phenyl /2'-hydroxy phenyl/ 4'-hydroxy phenyl /4'-dimethyl amino phenyl-5-bromo-7-methoxy-1,2,4-triaz-

olo[3,4-*b*]-benzo- thiazoles respectively (5a-5f). The I. R. spectra of these triazolo benzothiazoles observed the absence of strong bands in the region 3450cm^{-1} - 3100 cm^{-1} due to -NH stretching , however the absence of broad singlet in PMR spectra of these triazolo benzothiazole in the region δ 2.5 - δ 4.5 confirms the formation of cyclised products.

The mass spectrum of compound (5f) exhibits molecular peak at 403 which corresponds to its molecular weight. It confirms the formation of 5-bromo-3-(4'- dimethyl amino phenyl)-7-methoxy 1,2,4-triazolo-[3,4-*b*]-benzothiazole products

Experimental:

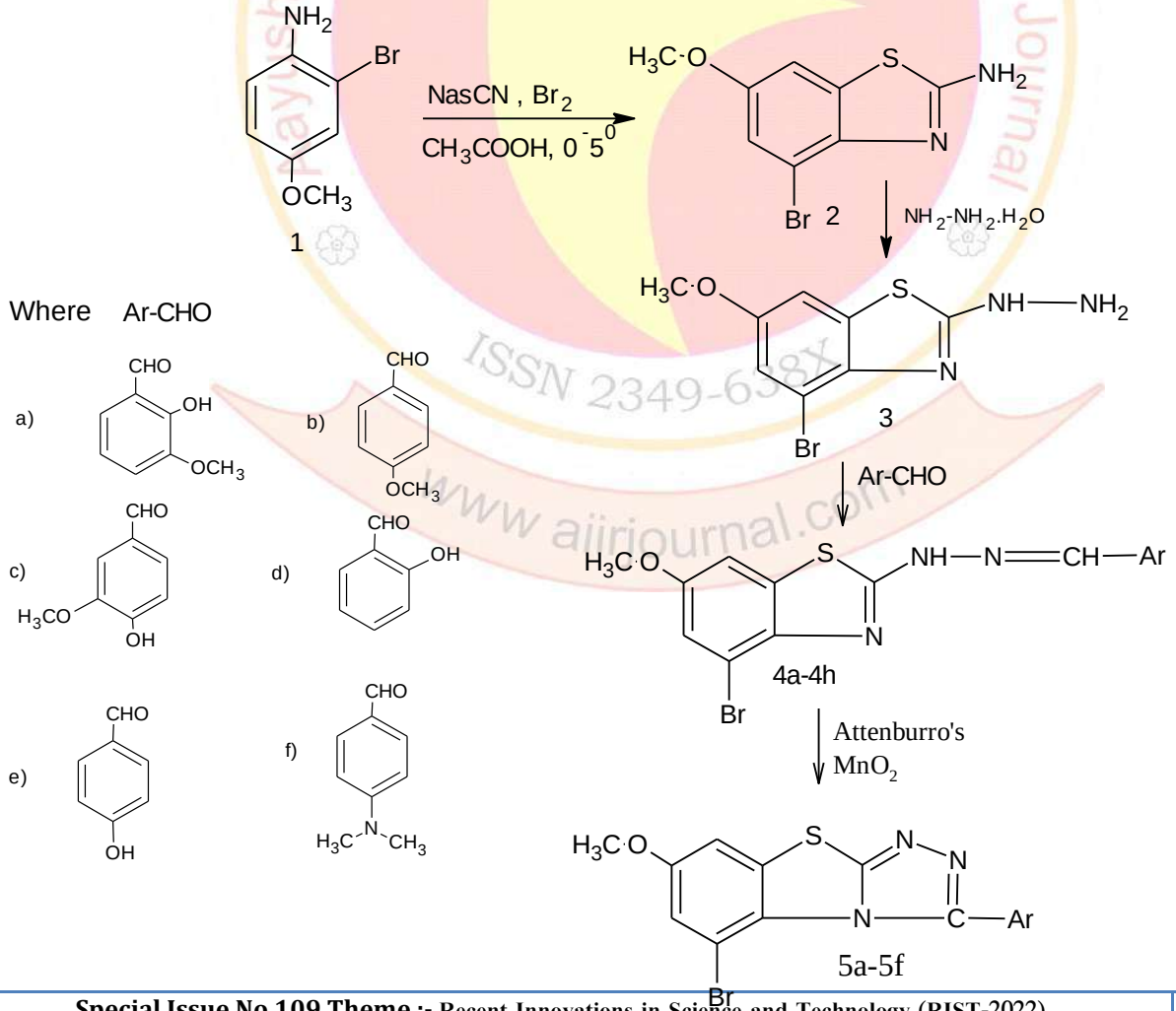
Melting points were determined in open capillaries and are uncorrected. Infrared spectra were recorded in Nujol / potassium bromide pellets on Bomen MB 104FT infrared spectrophotometer. ^{1}HNMR spectra were obtained on a Gemini 200 Mz specrtometer with TMS as an internal standard and mass spectra on FT VG-7070H mass spectrometer using the GI technique at 70 ev. Elemental analysis was carried out on a Heraeus CHN-O Rapid analyser. Purity of the compound was checked by TLC.

Synthesis of 2-Amino-4-bromo-6-methoxy benzothiazole (2)

2-Bromo-4-methoxy aniline (10.8 gm, 0.1 M) and sodium thiocynate (8 gm, 0.1 M) were dissolved in glacial acetic acid (75 ml). The solution was cooled in freezing mixture. Bromine (16 gm, 5 ml, 0.1 M) in glacial acetic acid (20 ml) was added with stirring and maintaining temperature below 25°C. The mixture was allowed to stand for overnight at room temp. The resulting hydrobromide was dissolved in hot water and neutralized with 20 % NaOH to obtain base. The amine thus obtained was filtered, washed with water and recrystallized in aq. alcohol to get the product 6.5 gm.

(60 %), M.P 160 °C., IR (KBr): 3440 cm^{-1} (Asymmetric stretching of -NH_2), 3340 cm^{-1}(N-H Symmetrical stretching of -NH_2), 3052cm^{-1} (Ar-H stretching), 1630 cm^{-1} (-C=N stretching), 1325 cm^{-1} (Ar–C-O stretching), ^{1}HNMR ($CDCl_3$) : δ 3.4 (singlet, 3H, CH_3) due to -OCH_3, δ 6.0 (broad, 2H, NH_2), δ 7.0-7.5 (two singlet, 2H, Ar-H), m/z 230 (M+2, 98 %), 228 (M^+,100%),

Scheme-1



4-Bromo-2-hydrazino -6-methoxy-benzothiazole (3)

Hydrazine hydrate (80%, 9 ml) was taken in a round bottom flsk, cooled the solution to 5°C and added conc. HCl (6 ml) in dropwise fashion with constant stirring. The flask was kept at room temperature for half an hour. 2-amino-4-bromo-6-methoxy benzothiazole (6 gm) and ethylene glycol (24 ml) was added in portions. The contents of the flask were heated at 150 °C to 160 °C on an oil bath for three hours and then cooled. The obtained product, 4-bromo-6-methoxy-2-hydrazino benzothiazole was filtered, washed with cold water and crystallized from ethyl alcohol to give 3.6 gm (62%), M. P. 172°C, IR (KBr) : 3320 cm^{-1} (asymmetric N-H stretching of $–NH_2$), 3203 cm^{-1} (symmetric N-H stretching of $–NH_2$) m/z: 275 (M+2), 273 (M^+)

General procedure for Synthesis of hydrazone of 2-hydrazino-4-bromo -6-methoxy benzothiazole and substituted aromatic aldehyde (4a-af)

2-hydrazino-4bromo-6-methoxy benzothiazole (0.01 M) and aromatic substituted aldehyde is suspended in ethanol seperatly.the mixture of these suspended solution was refluxed on water bath for three hours. The reaction mixture was cooled and obtained solid filtered by using vaccume pump. The obtained product washed with ethyl alcohol and recrystallised from hot benzene.

4a. 2.5 gm , M. P. : 150 °C, IR(KBr) : 3185 cm-1 (-OH Stretch), 3160 (N-H) stretch), 1584 (C= N Stretch), 1290, (C-N Stretch),

4b. : Yield : 2.4 gm, M. P. : 130 °C. IR (KBr) : 3200 cm^{-1} (-OCH_3 Stretch), 3167 cm^{-1} (N-HStretch), NMR shows 3.4 Singlet due to OCH_3 group.

4c. : Yield : 2.6 gm , M. P. : 115 °C. IR (KBr):3180 cm-1 (-OH Stretch), 3174 cm-1 (N-H Stretch).

4d. : Yield : 2.5 gm, M. P. : 140 °C. I.R. (KBr) : 3389 (N-H stretching) 3053 (= C-H stretch in aromatic ring), 1541 (C=N stretch), 1290 (C-N stretch),

4e. Yield : 2.5 gm , M. P. 182 °C, IR (KBr):3423 cm-1 (O-H) stretching), 3209 cm-1 (N-Hstretching),.

4f. Yield : 2 gm , M. P. : 138 °C, IR (KBr) :, 3200 cm-1 (N-H stretching),

General procedure for synthesis of 3-Substituted-5-bromo-7-methoxy 1,2,4 triazolo [3,4-b]-benzothiazole. (5a-5f)

4-Bromo-2-substituted -6-methoxy benzothiazolyl hydrazone (0.002 M) was taken in dry benzene (50 ml). To this was added Attenbarrow's active manganese dioxide[1] (2.0 gm, 0.016 M) and the mixture was refluxed on water bath for three hours. Contents were poured on hot condition in petridish, benzene solvent was removed by evaporation. Obtained solid product was recrystallized from hot ethanol,

All compound (5a-5f) shows absence of N-H streatching in IR specrum, which confirms the formation of cyclised product. Compound 5a shows absorption signal at 3200 cm^{-1} due to O-H streatching while it is absent in compound 5b and 5f because absence of O-H substituent on aromatic ring.

Table : 1

Sr. No.	Compound	Molecular formula	Molecular formula Weight	Yied In gm	M. P In ^{0} C.
1	5a	$C_{16}H_{12}BrN_3O_3S$	406	1.2	183
2	5b	$C_{16}H_{11}BrN_3O_2S$	390	1.3	170
3	5c	$C_{16}H_{12}BrN_3O_3S$	406	1.5	102
4	5d	$C_{15}H_9BrN_3O_2S$	376	1.0	182
5	5e	$C_{15}H_9BrN_3O_2S$	376	1.2	118
6	5f	$C_{17}H_{14}BrN_4OS$	403	1.4	103

Antimicrobial screening: Result and discussion:

Table-2: Evaluation of antimicrobial activity of 3-substituted 5-bromo 7-methoxy 1,2,4 triazolo [3,4,-b] benzothiazole.

Sr. No.	Comp.	Antimicrobial activity (zone of inhibition)			
		E.coli	***Erwinia cartovora***	***Bacillus subtilis***	***Xanthomo-nas. citri***
1	5a	+++	+++	++	++
2	5b	++	+++	+++	++
3	5c	++	++	+++	+
4	5d	+	-	-	+
5	5e	+	+	+	+
6	**5f**	+++	+++	++	++

The compounds (5a-5f) were tested for their antimicrobial activity by cup plate agar diffusion method against *E.coli* (Gram –ve) *B.subtilis* (Gram +ve), *E. carotovara* and *Xanthomonas citri* using ampicillin, streptomycin. and penicillin as a standard for comparison. The antibacterial screening data of the compounds is presented in table No.1. Dimethyl sulphoxide was used as a control (solvent). Compound 5a and 5f is active against *E. coli* and *E. carotovara* species while 5c compound is more active against *Bacillus subtilis* species. compound 5b active against *Bacillus subtilis* and *E. carotovara* species. Compound 5d and 5e are inactive against all four species tested.

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Role Of Physicochemical Properties in Drugs

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Abstract

A complete knowledge of the relevant therapeutic and physicochemical properties of the drug is required to determine the proper formulation and delivery method of a drug. In pharmacology, a drug is a chemical substance typically of known structure, which when administered to a living organism produce a biological effects. Pharmaceutical drugs also called a Medicine. Medicine which is a chemical substance used to treat, cure, prevent or diagnose a disease to promote well. The drugs were obtained through extraction from Medicinal Plants. Pharmaceutical formulation is the multistep process where the active drug is mixed with all other components by considering the factors of particle size, polymorphism, pH, and solubility and becomes the final beneficial medicinal product, the effect of a drug in the human body is mediated by specific interactions of the drug molecule with biological macromolecules. The present paper is based on the literature survey on the Physiochemical properties of drugs studied by various scientists. Physical properties of drugs are responsible for its action. The drug react extra cellular according to simple chemical reactions like neutralization, chelating, oxidation, etc.

Keywords*: solubility, Pharmaceutical, properties, drugs etc*

Introduction:

Physical properties, solvation properties related to interactions with different media, properties or molecular attributes that define intrinsic chemical reactivity. A drug is a chemical substance that interacts with proteins in the body to affect a physiological function. This is the general idea behind all medicine. Once these substances are absorbed into the systemic circulation they bind with certain proteins changes the functioning of the cell slightly.

Physical and chemical properties of substances are very important in identifying and studying chemical compounds. Physical properties are different from chemical properties of a substance. The main difference between physical and chemical properties is that physical properties can be observed without changing the chemical composition of a substance whereas chemical properties can be observed by changing the chemical composition of a substance [1]. The physical characteristics impact the passage of a drug molecule from the administered dose to the site of action, profoundly influencing its pharmacokinetics and pharmacology [1]. Chemical properties are properties that can be measured by changing the chemical composition of a substance. The chemical composition of a substance is like the identity of that substance

Why to study Physicochemical Properties of Drugs?

A complete knowledge of the relevant therapeutic and physicochemical properties of the drug is required to determine the proper formulation and delivery method of a drug. Avdeef A. etal [2]discuss that in addition to providing a basic understanding of the importance of solubility and stability to drug delivery, methods to enhance solubility and physical and chemical stability are described. They also focus on the processes required for the proper drug formulation. Since most drugs are administered in the solid state, the formulation process for tablets is described in detail. They also discuss on some basic drug delivery methods, with an emphasis on the physicochemical properties that impact those methods [2]. For Example: The various Physicochemical properties of the drug that affect drug dissolution and its rate are solubility, particle size, polymorphism, salt form, pseudo polymorphism, complexation, wettability, etc. Pharmaceutical formulation is the multistep process where the active drug is mixed with all other components by considering the factors of particle size, polymorphism, pH, and solubility and becomes the final beneficial medicinal product. Pharmaceutical drugs are usually categorized into drug classes. A group of drugs will share a similar chemical structure, or have the same mechanism of action, the same related mode of action or target the same illness or related illnesses [3]. The Anatomical Therapeutic Chemical Classification System (ATC), the most widely used drug classification system, assigns drugs a unique ATC code, which is an alphanumeric code that assigns it to specific drug classes within the ATC system [4].

Principle of drug action:

Goldstein A. etal [5] focus on the appearance of a text which is almost completely devoted to the theory of drug action, and in fact covers no particular drug in a systematic fashion, emphasizes the remarkable growth of pharmacology as a science. At a molecular level and in an orderly manner it dissects and demonstrates the logic by which man has attained the ability to control living processes of all types by the use of chemicals

How do Physicochemical Properties affect Drugs Absorption?

Avdeef A. etal [2] studied on solubility and permeability are considered as the major physicochemical factor that affect the rate and extent of oral drug absorption, moreover

other physicochemical properties always show their effects to drug absorption via affecting solubility and permeability [6].

Factors affecting on drugs solubility:

a) Drug solubility & dissolution rate b) Particle size & effective surface area c) Polymorphism & amorphism d) Pseudopolymorphism (hydrates/solvates) e) Salt form of the drug f) Lipophilicity of the drug (pH- Partition-hypothesis) g) pKa of drug & gastrointestinal pH h) Drug stability

Kerns EH. etal [7] focused on all drugs can be administered via number of routes Bolus is the administration of the medication, drug and other compound that is given to raise its concentration in blood to an effective level. Inhaled as an aerosol, vape, inhaler or dry powder. Injection as a solution, suspension or emulsion. Orally as a liquid or a solid, that is absorbed through the intestines. Sublingually, diffusing into the bloodthrough tissues under the tongue. Rectally as a suppository, that is absorbed by the rectum or colon [8].

Physicochemical properties of drugs

The ability of a chemical compound to elicit a pharmacological/ therapeutic effect is related to the influence of various physical and chemical properties of the chemical substances on the bio molecules that is interacted with. Physical properties of drugs are responsible for its action. Chemical properties of drug react extra cellularly according to simple chemical reactions like neutralization, chelation, oxidation, etc.

Types of physicochemical properties of drugs

A. Solubility
B. Partition co-efficient
C. Hydrogen bond
D. Chelation / Complexation
E. Ionization of drugs
F. Surface activity
G. Protein Binding

Solubility:

C. D. Rangel-Yagui. Etal[8] studied on the solubility of the substance at a given temperature. Solubility depends on the nature of solute and solvent as well as temperature, pH of pressure. The solubility of drug may be expressed in terms of its affinity or repulsion for either an aqueous or organic solvent [9]. Kerns EH. and C. D. Rangel-Yagui [8] focused on Solubility is based on the highest-dose strength of an immediate release product. A drug is considered highly soluble when the highest dose strength is soluble in 250 mL or less of aqueous media over the pH range of 1 to 7.5. Solubility improvement techniques can be categorized in to physical modification, chemical modifications of the drug substance, and other techniques. Physical Modifications includes Particle size reduction like micronization and nanosuspension, modification of the crystal habit like polymorphs, amorphous form and cocrystallization, drug dispersion in carriers like eutectic mixtures, solid dispersions, solid solutions and cryogenic techniques. Chemical Modifications includes Change of pH, use of buffer, complexation, and salt formation.

Partition co-efficient

Leo A. etal [10] explained on the chemical and pharmaceutical sciences, both phases usually are solvents. Most commonly, one of the solvents is water, while the second is hydrophobic, such as 1-octanol. Hence the partition coefficient measures how hydrophilic or hydrophobic a chemical substance. Partition coefficients are useful in estimating the distribution of drugs within the body. Hydrophobic drugs with high octanol-water partition coefficients are mainly distributed to hydrophobic areas such as lipid bi layers of cells. Hydrophilic drugs are found primarily in aqueous regions such as blood serum. Edwards MP, etal [11] studied on drug's distribution coefficient and how easily the drug can reach its intended target in the body, how strong an effect it will have once it reaches its target, and how long it will remain in the body in an active form. Log P is an octanol -water Partition co-efficient and measure the degree of hydrophobicity playing vital role in drug absorbtion.

Hydrogen Bond:

Edwards MP, etal [11] studied on the hydrogen bond which is a special dipole – dipole interaction between the hydrogen atom in a polar bond such as N-H, O-H or F-H and electronegative atom O, N, F atom. Dipoles result from unequal sharing of electrons between atoms within a covalent bond. These are weak are capable of forming hydrogen bonding is also soluble in water [1]. A number of motifs, several of which are clearly underutilized in drug discovery are analyzed in more detail by comparing small molecules and protein ligand X-ray structure. The effects on physiochemical properties, sets of closely related structures with and without the ability to form intra molecular hydrogen bonds were designed, synthesized and characterized with respect to membrane permeability, water solubility and lipophilicity [9].

Chelation / Complexation:

Drug complexation can lead abeneficial properties such as enhanced aqueous solubility and stability. In some instances, complexation also can lead to poor solubility or decreases absorption of drug in the body. For some drugs, complexation with certain hydrophilic compounds can enhance excretion.

Ionization of drugs:

Allen R. I., etal studied on the drugs are either weak acids or bases and can exist in either ionized or unionized state. Ionization = Protonation and deprotonation resulting in charge molecules. The ionization of the drug depend its pKa and pH. As the majority of drugs are weak acid and base of the dissociation constant in each case helps in understanding the ionic form a molecule will take across a range of pH values. The pKa of a drug influences lipophilicity, solubility, protein binding and permeability which in turn directly affect pharmacokinetic (PK) characteristics such as absorption, distribution, metabolism and excretion. The association between pKa and PK has also resulted in the requirement for pKa values to be measured for regulatory compliance. Allen R. I., etal [12] focused on the rate of drug adsorption is directly proportional to the concentration of the drug at absorbable form but not the concentration of the drug at the adsorption site. Ionization form imparts good water solubility to the drug which is required of binding of drug and receptor interaction. Unionized form helps the drug to cross the cell membrane **[12]**.

Surface Activity:

Surfactant is defined as a material that can reduce the surface tension of water at very low concentration. Surface active agents affect the drug adsorption which depends on:

- The chemical nature of surfactant
- Its concentration
- Its affect on biological membrane and the micelle formation.

In lower concentration of surfactant enhanced the rate of adsorption because amphiphiles reduces the surface tension and better adsorption. In higher concentration of surfactant reduced the rate of adsorption

Protein Binding:

Haupt V. J, etal [13] explained on the reversible binding of protein with non specific and non functional site on the body protein without showing any biological effect is called as protein binding. Protein + Drug⇌Protein – drug complex. Depending on the whether the drug is a weak or strong acid, base or neutral, it can be bind to single blood proteins to multiple proteins. The most significant protein involved in the binding of drug is albumin, which comprises more than half of blood proteins. The degree of protein binding can greatly affect the pharmacokinetics of drugs acid drugs such as non steroidal anti-inflammatory drugs (NSAIDs) tend to bind predominantly to albumin. Albumin is the most abundant plasma protein and it is critical to maintaining the colloidal entotic pressure in the vascular system. As a negative acute phase protein, albumin concentration decreases during inflammation. Other proteins, including corticosteroid binding globulin are important for binding of some specific drugs but are less important in overall drug protein binding. There is equilibrium between free and bound drug, just like the relationship of ionized and non ionized drug molecule. Protein binding is most clinically significant for antimicrobial therapy. Changes in protein binding caused by drug interactions are assumed to instantaneously change free drug concentrations and have been frequently cited as a cause of adverse drug reaction.

Conclusion:

From literature survey it is concluded that study of physiochemical properties are to be studied before the drugs are provided in market. The physicochemical properties of compounds that determine their interaction with transport proteins and the enzymes involved in drug clearance. Lipophilicity is an important physicochemical property resulting in interaction and, in particular, inhibition of both transport proteins and enzymes. Solubility is one of the important parameters to achieve desired concentration of drug in systematic circulation for achieving required pharmacological response. Partition Coefficient is useful in estimating the distribution of drugs within the body. The partition coefficient measures how hydrophilic or hydrophobic a chemical substance is one of the solvent is water while the second is hydrophobic, such as 1- octanol. Hydrogen bonding plays a crucial role in determining the specificity of ligand binding. Hydrogen bonding holds complementary strands of DNA together, and they are responsible for determining the three dimensional structure of folded proteins including enzymes and antibodies Chelation therapy is the preferred medical treatment for reducing the toxic effects of metals. Complexation is an extensively used technique in the pharmaceutical field to improve solubility of several pharmaceutical ingredients and subsequently the

bioavailability of poorly water soluble drugs. Ionized drugs are not absorbed as efficiently as unionized drugs. A drug that is a weak acid will be adsorbed primarily in acidic environment, whereas, a drug that is a weak base will be absorbed in the alkaline environment of small intestines. The action of surface activity in drug as a liquid membrane hypothesis of drug action for surface active drugs. Protein binding can influence the drugs biological half life. The bound portion may act as a reservoir or depot from which the drug is slowly released as the unbound form. The pKa of a drug influences lipophilicity, solubility, protein binding and permeability which in turn directly affects pharmacokinetic characteristics such as absorption, distribution, metabolism and excretion (ADNE)[1-5]. The modern drug discovery involves the identification of screening hits, medicinal chemistry and optimization of those hits to increase the affinity, selectivity, efficacy and oral bioavailability. The effect of a drug in the human body is mediated by specific interactions of the drug molecule with biological macromolecules, led scientists to the conclusion that individual chemicals are required for the biological activity of the drug.

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Green Chemistry,Nanotechnology,Environmental Chemistry and Synthetic Organic Chemistry.

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Abstract:-

Nano material are important in many diverse areas,from basic research to various application in Electronics,biochemical sensors catalysis energy.Bridge between homogeneous & Heterogeneous catalysis.Close to Homogeneous catalyst.Microwave assisted Nano catalysis in aqueous medium,in last fews years, Microwave assisted chemistry has blossomed in to a matured and useful Technique for a variety of applications. In India, agriculture plays an important role for development in food production. In our country, agriculture are depends on the monsoons which is not sufficient source of water. So the irrigation is used in agriculture field. In Irrigation system, depending upon the soil type, water is provided to plant. In this paper, automatic irrigation system based on GSM module is studied. The developed system is a machine based system, which automates the irrigation of land by combining various software and hardware approaches together to find exact field information and to provide instant across the field. This involves some sensors, LCD display, buzzer, artificial lights and GSM.Here we are using sensors to monitor the field condition. Those are Temperature, humidity, soil moisture, and fire and light sensors. All these devices are connected to the microcontroller.GSM is used for communication purpose only

Key words:- *Nanoparticles synthesis, icrobial synthesis, Phytonanotechnology, UV–visible spectroscopy.*

Introduction:-

Green chemistry is also known as environmentally benign chemistry or sustainable chemistry ,Paul Anastas and John Warner, who defined green chemistry as the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances.Chemical developments also bring new environmental problems and harmful unexpected side effects, which result in the need for 'greener' chemical products. Green chemistry looks at pollution prevention on the molecular scale and is an extremely important area of Chemistry due to the importance of Chemistry in our world today and the implications it can show on our environment. The Green Chemistry program supports the invention of more environmentally friendly chemical processes which reduce or even eliminate the generation of hazardous substances. Anastas and Warner formulated the twelve principles of green chemistry in 1998. These serve as guidelines for chemists seeking to lower the ecological footprint of the chemicals they produce and the processes by which such chemicals are made.The invention, design and application of chemical products and processes to reduce or to eliminate the use and generation of hazardous substances.

Green Chemistry Is About

- Waste Minimisation at Source
- Use of Catalysts in place of Reagents
- Using Non-Toxic Reagents
- Use of Renewable Resources
- Improved Atom Efficiency
- Use of Solvent Free or Recyclable Environmentally Benign Solvent systems

Principles Of Green Chemistry

1. **Prevention of Waste or by-products**
   It is better to prevent waste than to treat or clean up waste after it is formed
2. **Atom Economy**:-
   Atom economy (atom efficiency) describes the conversion efficiency of a chemical process in terms of all atoms involved (desired products produced).

$$Atom\ Economy = \frac{Mol.\ weight\ of\ Desired\ product}{Mol.\ weight\ of\ all\ reactants} \times 100$$

3. Minimization of hazardous products

Wherever practicable, synthetic methods should be designed to use and generate substances that possess little or no toxicity to people or the environment.

4. Designing Safer Chemicals

Chemical products should be designed to effect their desired function while minimising their toxicity

5. Safer Solvents & Auxiliaries

"The use of auxiliary substances (e.g. solvents, separation agents, etc.) should be made unnecessary wherever possible, and innocuous when used"

6. Design for Energy Efficiency

Energy requirements of chemical processes should be recognized for their environmental and economic impacts and should be minimized. If possible, synthetic methods should be conducted at ambient temperature and pressure. Developing the alternatives for energy generation (photovoltaic, hydrogen, fuel cells, bio based fuels, etc.) as well as continue the path toward energy efficiency with catalysis and product design at the forefront.

7. Use of Renewable Feedstock

"A raw material or feedstock should be renewable rather than depleting whenever technically and economically practicable."

8. Reduce Derivatives

Unnecessary derivatization (use of blocking groups, protection/de-protection, and temporary modification of physical/chemical processes) should be minimized or avoided if possible, because such steps require additional reagents and can generate waste. More derivatives involve ,Additional Reagents ,Generate more waste products More Time ,Higher Cost of Products .Hence, it requires to reduce derivatives.

9. Catalysis

Catalytic reagents (as selective as possible) are superior to stoichiometric reagents. e.g. Toluene can be exclusively converted into p-xylene (avoiding o-xylene & m-xylene) by shape selective zeolite catalyst.

10. Designing of degradable products

Chemical products should be designed so that at the end of their function they break down into innocuous degradation products and do not persist in the environment.

11. New Analytical Methods

"Analytical methodologies need to be further developed to allow for real-time, in-process monitoring and control prior to the formation of hazardous substances."

12. Safer Chemicals For Accident Prevention

"Analytical Substances and the form of a substance used in a chemical process should be chosen to minimise the potential for chemical accidents, including releases, explosions, and fires."

Microwave assisted Reaction: An approach to green Chemistry

Microwave assisted organic synthesis is defined as the preparation of desired organic compound from available starting material via some procedure involving microwave irradiation. As it is less hazardous it is a potential tool of green chemistry. Microwave Synthesis opens up new opportunities to the synthetic chemist in the form of new reaction that are not possible by conventional heating. It is an enabling technology for accelerating drug discovery and development processes.

Nanoparticles

Nanoparticles are particles which lie in dimensions between 1-100 nm. Nano derived from the Greek word Nanos which means dwarf or extremely small It can be used as a prefix for any unit to mean a billionth of that unit. For example, nanoseconds (billionth of a second), nanometer (billionth of a meter), nanoliter (billionth of a liter). They consist of micro molecular materials in which the active ingredients (drug or biologically active material) is dissolved, entrapped, encapsulated, adsorbed or attached

Methods For Synthesis Of Nano Particles

Physical method; time and energy consuming, synthesis at high temperature, and pressure.

Chemical method; simple, inexpensive, and low temperature, use of toxic reducing and stabilizing agents make it harmful.

Green method; Easy, efficient and eco-friendly. eliminates the use of toxic chemicals, consume less energy and produce safer products and by products.

Major Limitation Of Microbial Synthesis

Microbial synthesis is of course readily scalable, environmentally benign and compatible with the use of the product for medical applications, but production of microorganisms is often more expensive than the production of plant extracts.

Techniques For Synthesis Of Nano Particles

The methods for making nanoparticles can generally involve either a “top down” approach or a “bottom up” approach

Phytonanotechnology

Phytonanotechnology is actually the synthesis of Nano particles using fresh plants or plant extracts. Plant derived nanoparticles produced by readily available plant materials. The nontoxic nature of plants are suitable for fulfilling the high demand for nanoparticles with applications in the biomedical and environmental areas.Recently, successfully synthesized gold and silver nanoparticles using the leaf and root extract from the medicinal herbal plant Panax ginseng. Additionally, various plant parts, including leaves, fruits, stems, roots, and their extracts, have been used for the synthesis of metal nanoparticles. It has been proposed that proteins, amino acids, organic acid, vitamins, as well as secondary metabolites, such as flavonoids, alkaloids, polyphenols, terpenoids, heterocyclic compounds, and polysaccharides, have significant roles in metal salt reduction and, furthermore, act as capping and stabilizing agents for synthesized nanoparticles.

Phytochemical Screening

It refers to the extraction, screening and identification of the medicinally active substances found in plants. Some of the bioactive substances that can be derived from plants are flavonoids, alkaloids, carotenoids, tannin, antioxidants and phenolic compounds. Color changes or precipitation formation is the indication of presence of these phytochemicals.

Preparation Of Plant Extract For Phytochemical Screening

Take Fresh plant. An ethanol extract of sample can be prepared by milling 50 gram of the desired part of plant in an electric blinder. Then mixed paste of plant with 200 ml ethanol in conical flask by shaking it with hand and placed for three days or by mixing it with magnetic stirrer. Now filter the Ethanoic extract of plant. Placed the filtrate on rotary evaporator at 60 degree centigrade to remove ethanol. The extract will be concentrated by placing it on water bath at 75 degree centigrade. Now the sample is prepared for the phytochemical screening.

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Future aspects of 5G Technology in India- A Review

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Abstract

5G is the fifth-generation digital cellular network which will completely revolutionize digital cellular technology. We have seen from the past several years that how digital cellular network technology changed from 1G to 4G. This technology was widely accepted and spread in our country in a short span of time. As due to increasing dependency on technology we need much more high-speed internet with high data download capacity and low latency. In the future we will see how machine to machine communication, unman machine with artificial intelligence will change our way of life. Already we are using 4G cellular networks which are not enough with growing demand due to vast changing technology. In India very soon department of telecommunication will roll out auction of spectrum for 5G digital cellular network which is likely to be start in the beginning of 2022. Many private players like Reliance Jio, Bharti Artel and Vodafone Idea is ready to provide 5G network. Although department of telecommunication is all ready to go for 5G. But many users still unaware about 5G technologies. It is because due to increasing technology over the years we have seen lot of changes in nature and its effect ultimately on the human body. Hence, there is a palpable sense of fear among users related to its effect on health. This current paper provides comprehensive study of 5G technology, its implementation and myths related to health.

Keywords: 5G, 4G, Frequency, Millimeter wave, Radiation.

Introduction

5G is the fifth-generation digital cellular technology which is having capability of providing high speed internet connectivity, high downloading data with low latency. Although 4G is widely used in our country but it needs to update due to vast increasing and developing technology. It is believed that around 2025 there will be more than 5.7 billion mobile users around the world and 5 billion internet users [1]. We have seen from the last several years how there is an increasing dependence on technology. Today for anything we need internet through cell phones from calling taxi to order meal as well as using GPS for searching location. In the last decade there has been a tremendous increase of internet users. According to recent data there are 4.72 billion people around the world use the internet in April 2021, that's more than 60 percent of the world's total population. Internet users are currently growing at an annual rate of 7.6 percent. The average global internet user spends almost 7 hours online each day [2].

In India the number of smartphone users was estimated to reach over 760 million in 2021 [3]. This figure is growing day by day due to the majority of mobile users are going towards digital. Mostly youngsters are using digital payment option from paying bills for electricity to ordering meals and also for shopping. During covid-19 pandemic lockdown 2020-21 internet usage increased by 60%. From students to employees everyone was using the internet for working at home and to spend some time. This will not stop here we will see in future how our dependency will enhance on internet. Everything will be control by internet through Artificial intelligence such as driver less cars, house appliances, security cameras, smartwatches and machine to machine communication, like a high-speed vehicle on road or highway will communicate with another car on highway and provide safer journey. It will not only save our time but also avoid accidents. Another most significant aspect is its use within the medical field now a days we've seen how this pandemic realized the importance of doctors. Many countries don't have proper medical facility with specialized doctors. This pandemic emphasized the requirement of more specialized doctors. Available statistics show that, as of 2020 over 55% of WHO Member States report back to have but 20 medical doctors per 10000 populations (almost 40 countries within the WHO African region). Medical experts are distributed unevenly across the world. Countries with very cheap relative need have the best numbers of physicians, while those with the greatest burden of disease must manage with a far smaller health workforce. The African Region suffers quite 22% of the world burden of disease but has access to only 3% of medical examiners and less than 1% of the world's financial resources [4].

Even in our country position is additionally not good many remote areas don't have specialized doctors. Most of the specialized doctors are working in cities, only a few doctors are working in rural areas but most of them are not specialized. In such cases patients have to visit a nearby city hospital. The doctor to population ratio in India is 1:1456 against the WHO recommendation of 1:1000 [5]. To solve this problem either we've got to extend no of qualified doctors which isn't possible in less time like current situation of pandemic or we have to

use technology like 5G. Within which 5G digital network allow telemedicine service through which doctors can treat patients at remote area and do surgery from anywhere any time without delaying in time [6]. 5G technology isn't only useful for consumers but also very essential for our growing economy. Due to pandemic 2020-2021 government of India suffered huge loss of revenue. India's growth fell to 3.1 percent within the fourth quarter of the financial year 2020, as per the Ministry of Statistics [7]. The 140 million people lost employment during this lockdown, and others got salaries cut. During the primary phase of lockdown, the Indian economy was expected to lose $4.5 billion on a daily basis [8]. But 5G technologies may well be a game changer it can create lot of revenue to government of India and large no of jobs especially in private sector. Department of Telecommunications (DoT) is expected to auction spectrum for 5G in next year 2022, it delayed because of pandemic. Many companies like Jio, Bharti Airtel, Vodafone, BSNL and MTNL is geared up to go for 5G networks. It is estimated that 5G will deliver $150 billion in additional GDP for India [1].

On the other hand, there are some misconceptions related to 5G technology among the general public. The misperception is related to health, some believe that 5G cellular technology will create lot of radiation due to which it will cause to health. As radiofrequency EMFs at sufficiently high-power levels can adversely affect health. The International Commission on Non-Ionizing Radiation Protection (ICNIRP) published Guidelines in 1998 for human exposure to time-varying EMFs up to 300 GHz, including the radiofrequency EMF spectrum. This commission is regulating 5G network frequency to make sure safety to individual and environment. During this pandemic also some were believed that the second wave of coronavirus has been caused by testing of 5G technology. The ministry of communication issued an announcement they said that there's no relationship between coronavirus and testing of 5G network. They urged public not to believe on such fake news [9]. The study of 5G digital cellular network technology in this paper is to analyse its future aspects on Indian consumers.

Comprehensive information about 5 G technologies

Wireless communication and transmission of data is possible by the use of Radio frequency (RF) waves. It is the electromagnetic wave frequencies that lie in the range extending from around 3 kHz to 300 GHz in the electromagnetic spectrum. We are using this radio frequency from navigation of ship to satellite communication. Some frequency is reversed only for government agencies such as space and research or defence forces in countries. In wireless communication our journey starts from the analog world and now we come to the digital world. The first generation mobile communication start from 1G it had provided bandwidth 2.4 Kbps with frequency 30 KHz, 2G had provided bandwidth 64 Kbps with frequency 1.8 GHz, 3G had provided bandwidth 100 kbps-2 Mbps speed with frequency 2 GHz and 4G currently provided 100 Mbps-1 Gbps speed with frequency 8 GHz and is based on LTE (Long term evolution) Technology [10]. LTE developed by 3Gpp (Third generation partnership project). It was used to speed up the device like cell phone, tablet, Wi-Fi etc. We can observe that how bandwidth and frequency had increased from 1G to 4G with increasing technology and its uses. Following table-1 shows the development in technology [11].

Generation	Year of development	Technology	Frequency	Bandwidth
1G	1982	AMPS, NMT, TACS	30KHz	2Kbps
2G	1992	GSM	1.8 GHz	14.4-64 Kbps
3G	2001	CDMA	1.6-2 GHz	2Mbps
4G	2012	LTE, WiMAX	2 - 8 GHz	2Mbps to 1Gbps

Table-1 (Development of network from 1G to 4G)

5G is the fifth-generation digital cellular technology which will use higher Radio frequency of electromagnetic spectrum for high speed internet, high data downloading with low latency. 5G is technology designed to meet the requirements of IMT-2020 set by the International Telecommunication Union (ITU-R).

IMT-2020 (5G) is meant to supply way more enhanced capabilities than those provided by IMT Advanced (4G). Compare to 4G network its speed will 10 times higher. 5G will provide data speed 1 GB/sec and peak data speed will be 2-20 GB/sec. 5G will provide 1 milli second low latency which is far lesser than 4G having 100 milli second. 5G network uses higher frequency range from electromagnetic spectrum called as millimeter wave (mm Wave). Millimeter waves have a shorter range than microwaves, this millimeter wave is completely new for transmission of signal or data. But due to the use of higher frequency of millimeter wave it

affects the range of network. Hence, 5G network service area is divided into small geographical areas called cells. Small cells are low powered cellular radio access nodes in which it has a range of 10 meters to a few kilometers. These small cells are connected to macro cells or large tower to receive and emit signal See. 5G technology used Multiple bitstreams technique to transmitted data simultaneously. A technique called as beamforming, in which the base station computer will continuously calculate the best route for radio waves to reach each wireless device and will organize multiple antennas to work together as phased arrays to create beams of millimeter waves to reach the device.[13] [14].

To increase its capacity 5G used Massive MIMO (multiple input and multiple output) technique in which large number of antennas employed in transmitter and receiver. Each antenna is individually-controlled and will embed radio transceiver components. All 5G devices in a cell are connected to the internet and telephone network by radio waves through a local antenna in a cell. For wide 5G network service, it operates on three frequency bands-Low, Medium and High. Spectrum requirement for 5G network lies around three key frequencies ranges: Sub-1 GHz, 1-6 GHz and above 6 GHz. The selection of spectrum among these ranges will depend upon the capacity and coverage requirement of the region [17]. Low-band 5G uses the identical frequency range to 4G cell phones, 600–850 MHz, giving download speeds a little higher than 4G: 30–250 megabits per second (Mbit/s).[12] Low-band cell towers have a range and coverage area just like 4G towers. Mid-band 5G uses microwaves frequency from 2.5–3.7 GHz, allowing speeds of 100–900 Mbit/s, with each cell tower providing service up to many kilometers in radius. High-band 5G uses frequencies of 25–39 GHz, near the underside of the millimeter wave band. Since millimeter waves (mm Wave or mm W) have a more limited range, it requires many small cells.[15] Hence, millimeter signal waves could be impeded or blocked by materials in walls or windows [16]. Hence, 5G network service is planning to deploy cells only in dense urban environments and areas where crowds of people congregate like sports stadiums and convention centres. By deploying small cells, operators are able to support significantly higher capacity in dense areas, as well as improve coverage in areas where building blockage otherwise reduces the signal strength. Since 5G capabilities rely on hyper dense network, small cells are going to be required to be deployed at every 200-250 meters on many varieties of infrastructure like electric utility poles, street light poles, bus stands, roof tops, traditional cell towers, etc. [17]. The industry standards group 3GPP chose the 5G NR (New Radio) standard along with LTE as their proposal for submission to the IMT-2020 standard [18][19]. 5G NR include lower frequencies (FR1), below 6 GHz, and higher frequencies (FR2), above 24 GHz.

World position at 5G Technology

South Korea was the first country to adopted 5G network at her own country on a large scale. Swedish telecoms giant Ericsson predicted that 5G internet will cover up to 65% of the world's population by the end of 2025.[20] Also, it plans to invest 1 billion reals ($238.30 million) in Brazil to add a new assembly line dedicated to fifth-generation technology (5G) for its Latin American operations.[21].

India's preparation in the direction of 5G

A 5G High Level Forum (5G HLF) was founded by the Union Government of India in September 2017 to articulate the vision for 5G in India and to recommend policy initiatives & action plans. In August 2018 (5G HLF) released a report ''Making India 5G ready'' suggesting measures within the area of Spectrum Policy, Regulatory Policy, Education and Awareness Promotion Program, Application & Use Case Labs, Development of Application Layer Standards, Major Trials and Technology Demonstration and Participation in International Standards. The Government has launched a program titled 'Building an End-to-End 5G Test Bed' to advance innovation and research in 5G. The program envisages close collaboration between universities and small technology companies. The goal of the program is to make proof-of-concept 5G prototypes that are broadly compliant with the 3GPP standards [17]. On the standards front, the Low Mobility Large Cell (LMLC) use case accepted in the International Mobile Telecommunications-2020 (IMT-2020) requirements. Low Mobility Large Cell (LMLC) is a standard use to provide better coverage of internet in rural areas and other places of country. The base station in rural areas will cover up to 6 km range. According to 5G High Level Forum due to 5G roll out there will be an economic advantage of USD 1 trillion on India by 2035.

The National Digital Communication Policy-2018 (NDCP-2018), released on 26th September 2018 with the target of fulfil the information and communication needs of citizens and enterprises through the establishment of a ubiquitous, resilient, secure, accessible and affordable Digital Communications Infrastructure and Services; within the process, support India's transition to a digitally empowered economy and society. The three mission of NDCP are as following: -

1. Connect India- To push Broadband for All as a tool for socio-economic development, while ensuring service quality and environmental sustainability.
2. Propel India- To harness the facility of emerging digital technologies, including 5G, AI, IoT, Cloud and Big Data to enable provision of future ready products and services; and to catalyse the fourth industrial revolution (Industry 4.0) by promoting Investments, Innovation and IPR.
3. Secure India- To secure the interests of citizens and safeguard the digital sovereignty of India with paying attention on ensuring individual autonomy and selection, data ownership, privacy and security; while recognizing data as an important economic resource.

To support the digital economy and achieving objectives of National Digital Communication Policy there is a need of implementing 5G technology as early as possible. Department of Telecommunication (DoT) most probably in the beginning of 2022 will allow companies to conduct 5G trials and DoT wish to implement 5G technology in urban as well as rural areas. Dot will provide spectrum to companies like Reliance Jio, Bharti Airtel, Vodaphone idea and MTNL for a period of six months to conduct trials of 5G network across the country. Many cities like Delhi, Mumbai, Kolkata, Bangalore, Hyderabad and some part of Gujarat are companies first choice for conducting 5G trials. DoT also allowed Nokia, Samsung, Ericsson and C-DOT [22]. Companies got permission for the frequency 700 MHz, 3.3-3.6 GHz and 24.25-28.5 GHz to conduct trials. The base price for purchasing bandwidth per hertz is 492 crores (Source-media).

Effect of Radiation from 5G tower on Health

In India, there has always been a public concern on possible adverse health effects from the Electro-Magnetic Field (EMF) Radiation from mobile towers. Due to this people oppose the erection of telecom towers on rooftops of houses and in densely populated areas. For clearing the misunderstanding of public on mobile towers emissions, DoT in May 2017, launched Tarang Sanchar. It is a web portal for Information sharing on Mobile Towers and EMF Emission Compliances [12].

The ICNIRP issued some guidelines on Limiting Exposure to Electromagnetic Field are for the protection of humans exposed to radiofrequency electromagnetic fields (RF) within the range 100 kHz to 300 GHz. The rules cover many applications like 5G technologies, Wi-Fi, Bluetooth, mobile phones, and base stations. The rules periodically revised and updated as advances are made in the relevant scientific knowledge [23]. There is no any current evidence to confirm the existence of any health consequences from exposure to low level electromagnetic field [4]

EMF Radiation Norms in India

Department of Telecommunications have prescribed stricter precautionary norms for exposure limit for the Radio Frequency Field (Base Station Emissions) which is 1/10th of the present limits prescribed by ICNIRP and recommended by WHO [24]. The present limits/levels for antennae (Base Station) EMF emissions for general public exposure are detail below

Frequency Range	E-Field Strength (Volt/Meter (V/m))	H-Field Strength (Amp/Meter (A/m))	Power Density (Watt/Sq.Meter (W/Sq.m))
400MHz to 2000MHz	0.434f ½	0.0011f ½	f/2000
2 GHz to 300GHz	19.29	0.05	1

In addition to norms for mobile towers, government of India also released precautionary guidelines for mobile users [25].

1. Keep distance-hold the cell phones faraway from body to the extent possible.

2. Use a headset (wired or Bluetooth) to keep the handset off from your head.
3. Do not press the phone handset against your head. Radio frequency (RF) energy is inversely proportional to the square of the distance from the source.
4. Limit the length of mobile calls.
5. Use text as compared to voice wherever possible.
6. If the radio signal is weak, a mobile phone will increase its transmission power. Find a strong signal and avoid movement, use your phone where reception is good.
7. Let the call connect before putting the handset on your ear or start speaking and listening-A mobile phone first make the communication at higher power and then reduces power to an adequate level. More power is radiated during call connecting time.
8. If you have an option, use a landline (wired) phone. Not a mobile phone.
9. People having active medical implant should preferably keep the cell phone a minimum of 15 cm faraway from the implant.
10. While purchasing a mobile handset check the SAR value of the mobile phone.

Conclusion

As telecom sector is growing tremendously from last several years. Today, India is amongst top three of largest and one of the fastest growing telecom markets in the world. Also, India is very large country and installation of such 5G base stations or network will only be in certain small areas, not everywhere in country at least for some years. Hence, there is a need of large investment in telecom sector to achieve goal of digital India such smart cities, complete digital transaction etc. Adopting 5G technology will also benefit to our economy. According to various reports increase in 10% penetration of mobile broadband leads to more than 1% increase in GDP of country. Public safety is one of the important issues in our country and govt of India must convince to public and make sure that there are no any adverse health effects.

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An overview of study of basics of Artificial Intelligence (AI)

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Abstract

According to McKinsey, AI has the potential to create 600 billion dollars of value in retail bring 50 per cent more incremental value in banking compared with other analytics techniques. In transport and logistics, the potential revenue jump is 89% more. AI automates redundant jobs allowing a worker to focus on the high level, value-added tasks.

Introduction to AI

The new technology Artificial intelligence that can augment human intelligence, amplify human capabilities, and provide actionable insights that drive better outcomes for employees, customers, partners, and communities.[1]

Nowadays, AI is used in almost all industries, giving a technological edge to all companies integrating AI at scale. If an AI uses for its value purpose, it can automate mundane and repetitive tasks, allowing the sales representative to focus on relationship building, lead nurturing, etc. If a company XYZ provides a conversation intelligence service.[2] Each time a Sales Representative makes a phone call, the machine records, transcribes and analyzes the chat. The VP can use AI analytics and recommendation to formulate a winning strategy.
In a nutshell, AI provides cutting-edge technology to deal with complex data that a human being cannot handle. When AI is implemented at scale, it leads to cost reduction and revenue increase.

History of Artificial Intelligence

Artificial Intelligence is a buzzword today, although this term is not new. In 1956, avant-garde experts from different backgrounds decided to organize a summer research project on AI. Four bright minds led the project; John McCarthy (Dartmouth College), Marvin Minsky (Harvard University), Nathaniel Rochester (IBM), and Claude Shannon (Bell Telephone Laboratories).[3]
Here, is tabulated history of Artificial Intelligence:

Innovation	Year
Karel Čapek plays named "Rossum's Universal Robots, the first use of the word "robot" in English.	1923
Foundations for neural networks laid.	1943
Isaac Asimov, a Columbia University alumni, use the term Robotics.	1945
John McCarthy first used the term Artificial Intelligence. Demonstration of the first running AI program at Carnegie Mellon University.	1956
Danny Bobrow's dissertation at MIT showed how computers could understand natural language.	1964
Scientists at Stanford Research Institute Developed Shakey. A robot equipped with locomotion and problem-solving.	1969
The world's first computer-controlled autonomous vehicle, Stanford Cart, was built.	1979
Significant demonstrations in machine learning	1990
The Deep Blue Chess Program beat the then world chess champion, Garry Kasparov.	1997
Interactive robot pets have become commercially available. MIT displays Kismet, a robot with a face that expresses emotions.	2000
AI came into the Business world in the year 2006. Companies like Facebook, Netflix, Twitter started using AI.	2006
Google has launched an Android app feature called "Google now", which provides the user with a prediction.	2012
The "Project Debater" from IBM debated complex topics with two master debaters and performed exceptionally well.	2018

Subsystems of Artificial Intelligence

Here, are some important Subsystems of Artificial Intelligence:

Machine Learning: Machine learning is the art of studying algorithms that learn from examples and experiences. Machine learning is based on the idea that some patterns in the data were identified and used for future predictions. The difference from hardcoding rules is that the machine learns to find such rules.

Deep Learning: Deep learning is a sub-field of machine learning. Deep learning does not mean the machine learns more in-depth knowledge; it uses different layers to learn from the data. The depth of the model is represented by the number of layers in the model. For instance, the Google LeNet model for image recognition counts 22 layers.[4]

Natural Language Processing: A neural network is a group of connected I/O units where each connection has a weight associated with its computer programs. It helps you to build predictive models from large databases. This model builds upon the human nervous system. You can use this model to conduct image understanding, human learning, computer speech, etc.[5]

Expert Systems: An expert system is an interactive and reliable computer-based decision-making system that uses facts and heuristics to solve complex decision-making problems. It is also considered at the highest level of human intelligence. The main goal of an expert system is to solve the most complex issues in a specific domain.

Fuzzy Logic: Fuzzy Logic is defined as a many-valued logic form that may have truth values of variables in any real number between 0 and 1. It is the handle concept of partial truth. In real life, we may encounter a situation where we can't decide whether the statement is true or false.[6]

Types of Artificial Intelligence

There are three main types of artificial intelligence: rule-based, decision tree, and neural networks.

- Narrow AI is a type of AI that helps you perform a dedicated task with intelligence.
- General AI is a type of AI intelligence that can perform any intellectual task efficiently like a human.
- Rule-based AI is based on a set of pre-determined rules that are applied to an input data set. The system then produces a corresponding output.
- Decision tree AI is similar to rule-based AI in that it uses sets of pre-determined rules to make decisions. However, the decision tree also allows for branching and looping to consider different options.
- Super AI is a type of AI that allows computers to understand human language and respond in a natural way.
- Robot intelligence is a type of AI that allows robots to have complex cognitive abilities, including reasoning, planning, and learning.

How AI is different from Machine Learning?

The terms machine learning and artificial intelligence are often used interchangeably, but they don't mean the same thing. Most of our Smartphone, daily device or even the internet uses Artificial Intelligence. Very often, AI and machine learning are used interchangeably by big companies that want to announce their latest innovation. However, Machine learning and AI are different in some ways.[7]

AI- artificial intelligence- is the science of training machines to perform human tasks. The term was invented in the 1950s when scientists began exploring how computers could solve problems on their own.

Artificial Intelligence is a computer that is given human-like properties. Take our brain; it works effortlessly and seamlessly to calculate the world around us. Artificial Intelligence is the concept that a computer can do the same. It can be said that AI is a large science that mimics human aptitudes.

Machine learning is a distinct subset of AI that trains a machine to learn. Machine learning models look for patterns in data and try to conclude. In a nutshell, the machine does not need to be explicitly programmed by people. The programmers give some examples, and the computer is going to learn what to do from those samples.[8]

Machine Learning (ML)

When we talk about machine learning, we're referring to a specific technique that allows a computer to "learn" from examples without having been explicitly programmed with step-by-step instructions. Currently, machine learning algorithms are geared toward answering a single type of question well. For that reason, machine

learning algorithms are at the forefront of efforts to diagnose diseases, predict stock market trends, and recommend music.

Artificial Intelligence (AI)

Artificial intelligence is an umbrella term that refers to efforts to teach computers to perform complex tasks and behave in ways that give the appearance of human agency. Often they do this work by taking cues from the environment they're embedded in. AI includes everything from robots who play chess to chatbots that can respond to customer support questions to self-driving cars that can intelligently navigate real-world traffic.

AI can be composed of algorithms. An **algorithm** is a process or set of rules that a computer can execute. AI algorithms can learn from **data**. They can recognize patterns from the data provided to generate rules or guidelines to follow. Examples of data include historical inputs and outputs (for example, input: all email; output: which emails are spam) or mappings of A to B (for example, a word in English mapped to its equivalent in Spanish). When you have trained an algorithm with training data, you have a **model**. The data used to train a model is called a **training dataset**. The data used to test how well a model is performing is call **test dataset**. Both training datasets and test datasets consist of data with input and expected output.[9] You should evaluate a model with a different but equivalent set of data, the test dataset, to test if it is actually doing what you intended.

Bias Challenges in AI

So far, we've discussed the broad ethical implications of developing technology. Now, let's turn our attention to AI. AI poses unique challenges when it comes to bias and making fair decisions.

Opacity

We don't always know why a model is making a specific prediction. Frank Pasquale, author of *The Black Box Society*, describes this lack of transparency as the black box phenomenon. While companies that create AI can explain the processes behind their systems, it's harder for them to tell what's happening in real time and in what order, including where bias can be present in the model.[10]

Speed, Scale, and Access to Large Datasets

AI systems are trained to optimize for particular outcomes. AI picks up bias in the training data and uses it to model for future predictions. Because it's difficult if not impossible to know why a model makes the prediction that it does, it's hard to pinpoint how the model is biased. When models make predictions based on biased data, there can be major, damaging consequences.

Machine learning techniques have improved since 1979. But it's even more important now, as techniques become more opaque, that these tools are created inclusively and transparently. Otherwise, entrenched biases can unintentionally restrict access to educational and economic opportunities for certain people. AI is not magic; it learns based on the data you give it. If your dataset is biased, your models will amplify that bias.

Developers, designers, researchers, product managers, writers—everyone involved in the creation of AI systems—should make sure not to perpetuate harmful societal biases. (As we see in the next module, not every bias is necessarily harmful.) Teams need to work together from the beginning to build ethics into their AI products, and conduct research to understand the social context of their product. This can involve interviewing not only potential users of the system, but people whose lives are impacted by the decisions the system makes. We discuss what that looks like later in this module.

Why is AI booming now?

Now in this Artificial Intelligence testing tutorial, let's learn why AI is booming now. Let's understand by the below diagram.

A neural network has been out since the nineties with the seminal paper of Yann LeCun. However, it started to become famous around the year 2012. Explained by three critical factors for its popularity are:

1. Hardware
2. Data
3. Algorithm

Machine learning is an experimental field, meaning it needs data to test new ideas or approaches. With the boom of the internet, data became more easily accessible. Besides, giant companies like NVIDIA and AMD have developed high-performance graphics chips for the gaming market.

Hardware

In the last twenty years, the CPU's power has exploded, allowing the user to train a small deep-learning model on any laptop. However, you need a more powerful machine to process a deep-learning model for computer vision or deep learning. Thanks to the investment of NVIDIA and AMD, new generations of GPU (graphical processing unit) are available. These chips allow parallel computations, and the machine can separate the computations over several GPUs to speed up the calculations.[1-3]

For instance, with an NVIDIA TITAN X, it takes two days to train a model called ImageNet against weeks for a traditional CPU. Besides, big companies use clusters of GPU to train deep learning models with the NVIDIA Tesla K80 because it helps to reduce the data center cost and provide better performances.[4]

Data

Deep learning is the structure of the model, and the data is the fluid to make it alive. Data powers artificial intelligence. Without data, nothing can be done. The latest Technologies have pushed the boundaries of data storage, and it is easier than ever to store a high amount of data in a data center.

Internet revolution makes data collection and distribution available to feed machine learning algorithms. If you are familiar with Flicker, Instagram or any other app with images, you can guess their AI potential. There are millions of pictures with tags available on these websites. Those pictures can train a neural network model to recognize an object on the picture without the need to collect and label the data manually.

Artificial intelligence combined with data is the new gold. Data is a unique competitive advantage that no firm should neglect, and AI provides the best answers from your data. When all the firms can have the same technologies, the one with data will have a competitive advantage. To give an idea, the world creates about 2.2 exabytes, or 2.2 billion gigabytes, every day.[7]

A company needs exceptionally diverse data sources to find the patterns and learn in a substantial volume.

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An IoT Enabled Colorimetric Technique Based Soil Fertility Detection System

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Abstract:

Agriculture is a wide economic sector and plays a vital role within the overall economic development of the nation. Technological advancements in the sector of agriculture can ascertain to enhance the ability and quality of assured farming activities. Bad quality crop production is often because of either unnecessary use of fertilizer or insufficient addition of fertilizer. The intend of our developed system is to detect the N(nitrogen), P(phosphorus) and K(potassium) contents of soil and based on the result, farmers will used the necessary fertilizers as per need. For this we proposed IoT enabled colorimetric techniques based soil fertility detection system. Based on a color sensor (TCS 3200) as a soil fertility detection sensor, microcontroller (Arduino Nano V3) and Esp8266 Wi-Fi module for transferring data to cloud.

Keywords: Color Sensor, Soil Fertility, NPK nutrients, ESP8266, Internet of things, Arduino.

I. Introduction:

Agriculture is the only source for crop production. Soil is a valuable resource in agriculture. The physical and chemical conditions of soil play a most important role in the crop production cycle. In addition to this farmers can also add organic or inorganic nutrients to the soil in a precise proportion. Thus soil fertility detection plays a major role for better crop growth as well as yield [1]. Continuous cropping without enough measurement of soil nutrients may lead decrease in soil fertility and yield. Soil nutrient identification is greatly required for proper plant growth and effective fertilization [2], [3]. Farmer's follows traditional techniques still today which commonly make used of approximations i.e. unbalance feeding of fertilizer without knowing the actual necessity of nutrient to a specific crop, results in low productivity [4]. In order to improve the farm meadow, the fertility of soil is an important factor in increasing the crop production. The soil fertility is, amount of nutrients content available in the soil. There are 17 nutrients available in the soil classified into two classes namely macronutrients and micronutrients. Nitrogen (N), Phosphorous (P), Potassium (K) are some of the main macronutrients, which usually required in large quantity in the soil and zinc, copper, iron, boron are some examples of micronutrients which required in comparatively small amounts. The quantity of macronutrients defines the soil fertility [5]. Depending upon the deficiency of a particular nutrient for a particular crop in a given region the amount of fertilizer is determined. Thus the quantity of fertilizer to be used depends upon the soil fertility, crop to be grown and type of soil [6].

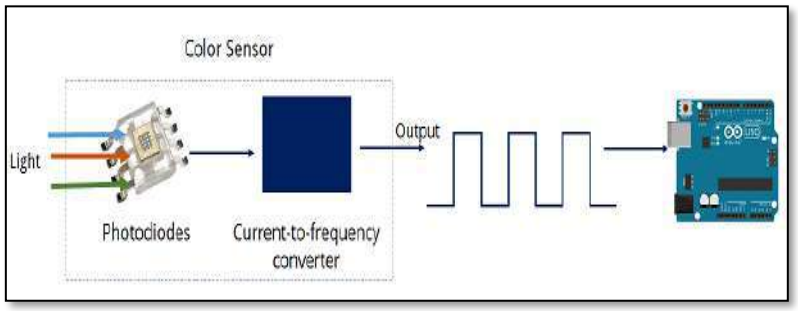
The general soil testing is take place in laboratories which are maximum available at district level also it take a considerable time to generates the results. Hence this process is time consuming and costly too [7]. Moreover the overall soil fertility changes with change in weather conditions. Thus a system required which will detect the soil nutrients in real time.

This system is based on colorimetric technique. In this, color sensor is used as a soil nutrient sensor, an aqueous solution of soil under test has been added different reagents which will eventually change its color depending on the concentration of the present micro nutrients values. Light emitted from a color detecting sensor will fall on the solution and the reflected light is received by color detecting sensor will convert the (R, G, B) values to electrical signals. Further using the threshold values which were earlier saved in the database of the microcontroller helps to detect the levels of micronutrients present in the soil sample.

II. Methodology

As we discuss the above said issue to resolve we design, Colorimetric Technique Based Soil Fertility Detection System. In this system, the color sensor works by illuminating white light on soil aqueous solution sample and measure the intensity of reflected light with the help of 8x8 photo-diode chip available in TCS3200

sensor. The microcontroller helps to uphold the intensity of light which is falling on soil sample, also helps to store the resultant values to cloud with the help of ESP8266 Wi-Fi module.



System Block Diagram

To detect the presence of nutrients in the soil by using colorimetric technique. First we make the aqueous solutions with the help of different chemicals regents. Then using color sensor we detects the nutrients present in the soil.

A. **SYSTEM REQUIREMENT**

Arduino Nano V3:

Arduino NANO V3 is the open source tiniest Embedded Development board launched by Arduino based on Atmega328 SMD Package Microcontroller. Also, is a Surface stand Breadboard Friendly board integrated with Mini USB Port.

Specifications:-

- Operating Voltage: 5 V
- Digital I/O Pins: 14, Analog Input Pins: 08
- DC Current per I/O Pin: 40 mA
- Flash Memory: 32 KB

Color Sensor TCS3200:

The TCS3200, Color Sensor programmable color light-to-frequency converters that comes with silicon photodiodes and a current-to-frequency converter on a single CMOS IC. The output is a square wave and frequency directly proportional to light intensity. [8]

The colors of the visible light spectrum

Color	Wavelength interval	Frequency interval
Red	~ 700–635 nm	~ 430–480 THz
Orange	~ 635–590 nm	~ 480–510 THz
Yellow	~ 590–560 nm	~ 510–540 THz
Green	~ 560–520 nm	~ 540–580 THz
Cyan	~ 520–490 nm	~ 580–610 THz
Blue	~ 490–450 nm	~ 610–670 THz
Violet or Purple	~ 450–400 nm	~ 670–750 THz

Table 1. Pin values for activation of Photodiode filters. [8]

S2	S3	PHOTODIODE TYPE
L	L	Red
L	H	Blue
H	L	Clear (No Filter)
H	H	Green

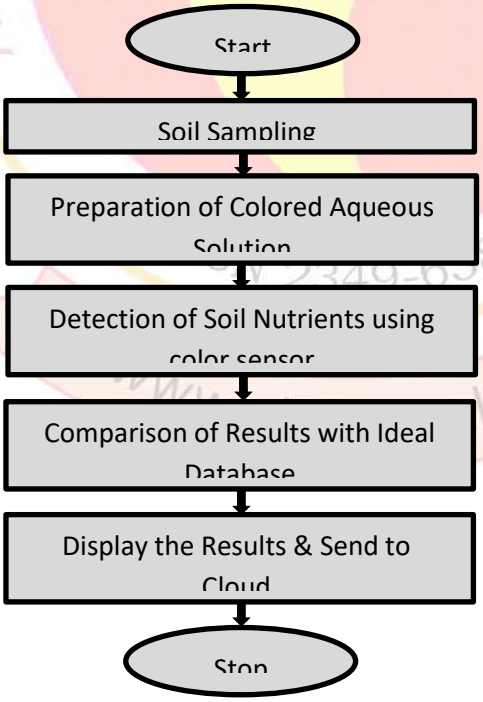
ESP8266 Wi-Fi Module:

The ESP8266 is a low-cost Wi-Fi module, have built-in TCP/IP networking software, and microcontroller capability. Each ESP8266 module comes pre-programmed with an AT command can be change its baud rate by calibrating it with the help of AT commands.

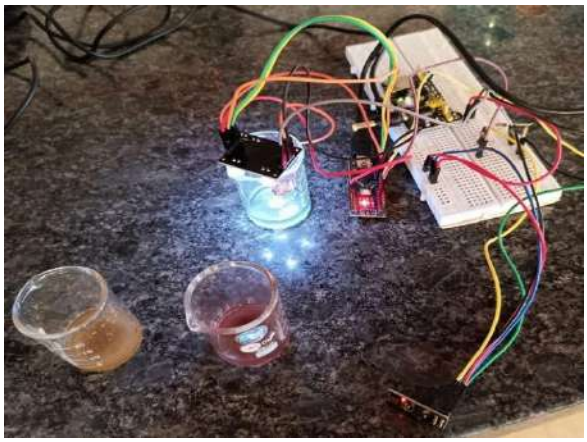
B.**Making Of Aqueous Solutions**

The aqueous solution is made with the help of soil testing kit with standard procedure.

C. WORKING FLOW CHART:



D.CIRCUIT DESIGN

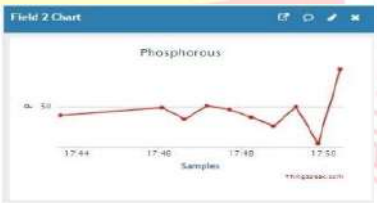


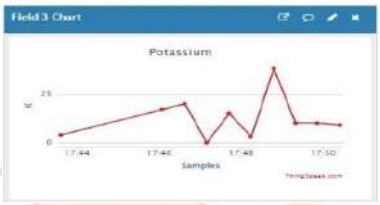
III.Results & Discussion

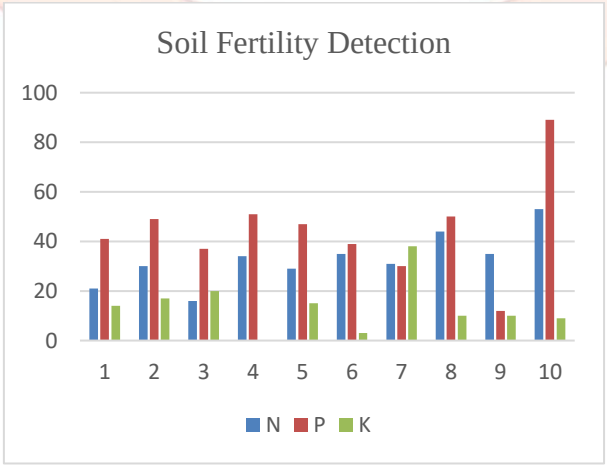
Table 2. Threshold color intensity values. [6]

Nutri.	Low	Medium	High
N	$x < 15$	$15 < x \leq 20$	$20 < x \leq 25$
P	$16 < x \leq 20$	$20 < x \leq 35$	$35 < x \leq 50$
K	$20 < x \leq 25$	$25 < x \leq 40$	$50 < x \leq 60$

By taking all adaptive measures we have used 2cm fixed distance between sensor & solution and we get sample results as below.







The above bar graph shows the different samples we have tested from different areas & found NPK values are changes from one area to another area.

Also the threshold color intensity values for N, P, K contents in the soil are described in Table 2. Which provides the scope of color intensity values in form of low, medium and high for N, P, K.

IV.Conclusions

This research concludes that, we have successfully developed a real time IoT enabled soil fertility detection system. This research will definitely reduce the farmer's time as well as money for soil fertility testing. Also help them to decide amount of fertilizers to be added in the soil according to the real time availability of the nutrients like N, P and K in the soil.

V.Future Scope

By extending this research can be possible to predict suitable crops according the nutrients are available in the soil. Also an atmospheric parameters effect can be observed on soil fertility. Therefore, the farmers can take necessity action towards their crop yield.

VI.Acknowledgement

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A Comparative Analysis on Energy Conservation in Wireless Sensor Networks Using NLP, Naive Bayes, and SVM Classifications

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Abstract:

A fundamental goal in the design of wireless sensor networks (WSNs) is to optimize their lifetime. Designers can use intelligent energy management models to help them reach this goal. These models strive to minimize the number of sensors used to report atmospheric measurements and, as a result, achieve improved energy economy while retaining the appropriate level of measurement precision. We compare three intelligent models based on Naive Bayes, Multilayer Perceptrons (MLP), and Support Vector Machine (SVM) classifiers in this research. For the identical WSNs Lifetime Extension Factor, simulation results prove that Linear-SVM selects sensors that yield higher energy efficiency than MLP and Naive Bayes.

A wireless sensor network (WSN) is a network of sensor nodes that are linked together. These sensors are low-cost, tiny devices with limited functionality. In a typical setting, every node in a sensor network must continuously monitor and gather information such as temperature, sound, and humidity, as well as physical conditions like pressure, vibration, motion, and light. Sensors may collaborate based on the circumstances to meet the sensor network's purpose of performing specific jobs. Furthermore, the information gathered is extremely significant. Because of the vast number of sensors placed, they are interconnected depending upon the nature of the analyzed measures. This paper analyses three smart models based on Naive Bayes, Multilayer Perceptrons (MLP), and Support Vector Machine (SVM)

1. Introduction

Well-known algorithms in the area of machine learning, neural networks, and artificial intelligence include Naive Bayes, Multilayer Perceptron (MLP), and Support Vector Machine (SVM). For starts, MLP can successfully conduct the classification operation [7, 8]. MLP neural network training, on the other hand, is difficult due to its structure's intricacy [7]. In the realm of data mining, SVM is also viewed as a very powerful algorithm.

It's been used successfully in a number of scientific applications [9]networks, for example. artificial intelligence, etc. MLP can, for starters, do the following tasks. A successful classifying operation [7, 8]. On the other hand MLP neural network training, on the other hand, is difficult due to the the structure's complexity [7]. In the area of data mining, SVM is also viewed as a very powerful algorithm.It's been used in a variety of scientific applications [9]networks, for example. artificial intelligence, etc. For beginnings, MLP can meet all the requirements of the classification operation [7, 8]. MLP neural network training, on the other hand, is difficult due to its structure's complexity [7]. In the realm of data mining, SVM is also regarded as a very powerful algorithm. It's been used successfully in a variety of research application.

For beginnings, MLP can meet all the requirements of the classification operation [7, 8]. MLP neural network training, on the other hand, is difficult due to its structure's complexity [7]. In the realm of data mining, SVM is also regarded as a very powerful algorithm. It's been used successfully in a variety of research applications [9].

Despite the significance of machine learning algorithms for WSN applications [5], there has been little consideration paid to offering comparative studies between different algorithms, particularly when it comes to WSN energy management. Additionally, there have been little contributions to identifying an effective intelligent energy management paradigm for these networks. Except for the one we disclosed in our prior study [11], there is no previous work that supports the usage of a certain intelligent algorithm compared to others for WSNs [10]. We present an intelligent and efficient energy management model for WSNs leveraging MLP rather than Naive Bayes in that paper. MLP and Naive Bayes were compared in order to see how well they performed in terms of performance.

In comparison to Naive Bayes, MLP demonstrates a considerable improvement in selection accuracy when given the same Lifetime Extension Factor. Due to its complexity and the updating process in the sequence of weights, MLP takes longer to train the network. As a result, sensor nodes may use a little more energy during the deployment phase.

Considering the significance of machine learning techniques for WSN applications [5], comparison investigations between these methods have received little attention. Especially as it pertains to WSN energy management. .Furthermore, there have been little contributions to specify a model for intelligent energy management that is appropriate for these interconnections There hasn't been anything like this before, as far as we know.

work that serves to reinforce the application of a particular clever algorithm except for the one we have, comparable to others for WSNs [10]. A paradigm for effective and efficient energy management Instead of Naive Bayes, WSNs use MLP. A comparison is possible to correlate MLP and Naive Bayes, a study was conducted.MLP achieves a higher Lifetime Extension Factor when given the same Lifetime Extension

Bayesian naivety. MLP, on the other hand, takes longer to train.Due to its complexity and the updating procedure in the network a set of weights As a result, sensor nodes may use energy.

First, relying on intelligent machine learning models and algorithms, we have provided a detailed state-of-the-art associated energy management in WSNs. Second, we used three real labeled evaluation metrics to conduct a thorough comparison of three clever neural network classifiers. Third, using a confusion matrix, the effectiveness of these three intelligent classifiers is evaluated. Finally, an intelligent paradigm for enhancing the energy in WSNs has been proposed. We used statistical ranking and selection strategies to address this model not only at the classification level, but also at the processing level. These two strategies, as well as the use of Linear-SVM as an intelligent classifier, are crucial in the development of the model.

The largest Contributions of this work is arranged as follows. Preliminaries are presented in Section 2: which examines the latest advances in the field of intelligent models for energy management in WSNs. The context of the classification methods employed in this study, particularly Naive Bayes, MLP, and SVM, is presented in Section 3.

2. Related Work

In order to achieve energy efficiency of WSNs, several sophisticated models have been developed. Thiemjarus et al. [17] suggested a sensor selection algorithm that can aid in discovering the network's optimum number of sensor nodes. The number of sensors can be reduced without degrading the decision-making process, and the network's lifetime can be enhanced. For sensor selection, the Bayesian strategy was chosen, as this filtering method aids in the detection of the best sensors in the network. A classifier was also employed, which was the Self-Organising Map (SOM). The authors of [18] developed a selection technique for optimizing WSN energy use. Sensors were ranked from most to least important in their scheme, considering the importance of their utilization in WSNs. Thereafter, the Naive Bayes classification approach was utilized to classify the data. This method was put to the test on three well-known real-world sensor datasets. The analysis indicated that as more sensors are employed, more energy is spent, and the sensor network's lifetime is shortened. The lifetime of the sensor network can be prolonged if the sensors are ranked, as the selection algorithm is used first, pursued mostly by intelligent classifier. This is due to the fact that the number of sensors used is limited. Similarly, [19] suggested a method to reduce energy use while extending the sensor network's lifetime. This would be focused on a feature/sensor selection that reduces the number of utilised sensors to the minimum level. It does, however, use a different selection technique by using K-Nearest Neighbor (KNN) method.

The segmentation problem is considered as a classification problem in [20], with clusters being constructed using Least Squares.SVM (LS-SVM) using a hybrid kernel (a blend of SVM and LS-SVM)Kernels with polynomial and Radial Basis Function (RBF) functions. Results demonstrated that combining LS-SVM with hybrid clustering was effective.

When compared to LS-SVM with a single input, kernel produced better results.Kernel was visible in the situation of a multiclass system. In the clustering problem, there is a classification challenge.

CDLSVM, a clustering-based distributed Linear-SVM methodology that varies from previous parallel SVM algorithms in its ability to obtain a global optimal classifier, was developed. The results suggest that the proposed method is effective for large-scale WSNs since it minimizes data interchange and energy usage.

Forero et al. [22] addressed distributed classification by creating techniques for training SVM in a distributed architectural environment where communication between nodes via a centralised processing unit is banned. The distributed forms of operation demonstrated how energy might be preserved.

The DFP-SVM (Distributed Fix Partition SVM) and the WDFP-SVM (Weighted Distributed Fix Part SVM) are two energy-efficient distributed learning techniques for WSN.SVM [23, 24] has been proposed. The aim was to develop an expert in the field.

SVM in a distributed and efficient manner. As a result, it is better. On the test data, classification results were reached with Compared to the standard SVM, it uses the least amount of energy. Several classification techniques based on SVM have recently been proposed. For example, Rajasegarar et al. [25] proposed a Centered Hyperellipsoidal Support Vector Machine (CE-SVM) and a distributed Quarter-Sphere Support Vector Machine to address the problem of anomaly identification in WSNs (QS-SVM). Using four datasets that correlated to wireless sensor datasets, a comparison study using CESVM and QS-SVM was performed. For the evaluation, four datasets were used: GDI, Ionosphere, Banana, and Synth.

In addition, three distinct kernel functions were considered: RBF, polynomial, and linear. When compared to QSSVM, the results showed that CESVM used to have a higher detection accuracy. Zhang et al. [26] introduced two online outlier identification and distribution strategies for WSNs, the key contribution of which is to build livestream intelligent classifying techniques in order to find outliers in the typical behaviour of sensor data in real time. The hyperellipsoid one-class SVM is used in the proposed intelligent approaches. EOOD (ellipsoidal SVM-based online outlier detection) and EOOD (ellipsoidal SVM-based adaptive outlier detection) are the two approaches (EAOD). In order to detect abnormalities in a WSN, both EOOD and EAOD evaluate the correlation between sensor data features. The simulation results suggest that EAOD has a higher detection accuracy than other methods.

Dutta and Terhorst [27] proposed a multisensor fusion and integration strategy based on artificial intelligence. To solve the challenge, the researchers focused on the categorization level of the embedded sensor fusion system.

Most frequent sensor flaws and problems Intelligent people in particular.For aggregate soil moisture estimation, classification approaches are used.To get optimal outcomes, cosmic ray sensors were introduced.Estimations that are fault-tolerant Four classifiers were used in this study.Adaptive Neuro-Fuzzy Inference System was examined. (ANFIS), Probabilistic Neural Network (PNN), Radial Basis Network (RBN), Radial Basis Network (RBN), Radial Basis Network (RBN), Radial Basis The RBF network and the Multilayer Perceptron constitute two types of networks (MLP) network

Experiments were conducted on three datasets, and the results demonstrated that ANFIS exceeds all other classifiers in terms of correct classification percentages. To detect intervals of food intake, Sazonov and Fontana [14] designed a sensor system, as well as signal processing and pattern recognition approaches. The analysis and classification of jaw movements was used in this investigation.

The researchers have chosen the most relevant aspects, which represented sensor signals, using the forward selection method.

The SVM was also employed as the chewing detecting classification technique. Furthermore, the linear kernel activation function was applied (Linear-SVM). The experts were able to attain a high mean accuracy of 80.98 percent for that application by implementing an intelligent classifier.

Furthermore, the linear kernel is the easiest of all the kernel functions for SVM, according to Karatzoglou et al. [28]. Linear-SVM also outperforms other machine learning classifiers, according to Ham et al. [29]. This classifier is now receiving greater attention because to its superior classification accuracy when compared to other machine learning classifiers. As a result, this efficient classifier has been used in a number of applications. A moving human motion detection system was proposed by Yun and Song [30].

Pyroelectric Infrared (PIR) sensors and intelligence classification techniques were used to build the system. The data for this investigation was acquired by recording PIR sensor signals while a person was walking. The dataset's size and memory cost were lowered by extracting and choosing identifiable features from it. In addition, Bayes Net, C4.5, decision table, KNN algorithm, Naive Bayes, MLP, and SVM were employed as intelligent classification methods.

The Linear-SVM was considered for SVM because its kernel needed less computing time than other kernels. Experiments on decreased feature sets indicated that Linear-SVM is the most efficient classifier for this application.

3. Preliminaries

This section gives a quick overview of the classification methods employed in this investigation, as well as the datasets used in the experiment.

3.1 Algorithms for Classification. Below is a brief description of the categorization algorithms employed in this study..

3.1.1 Naive Bayes Classifier. Naive Bayes is a well-known type of classifier that is based on the application of Bayes' theorem with strong independence assumptions. It is considered to be a simple probabilistic classifier that computes conditional class probabilities and then predicts the most probable class [31]. In other words, it will assign a class for an object based on the values of the descriptive attribute probability model.

3.1.2 Multilayer Perception is a type of perceptron that has multiple layers (MLP). MLP is composed of a large number of highly densely interconnected that work together to solve a specific problem. With a feed-forward information flow, it is organised in layers. Signals flow progressively through the several layers from the input to the output layer in the main topology of an MLP network.

3.1.3 Intermediate layers exist between the input and output levels. Because they are not noticeable at the input or output, they are also known as hidden layers. Each unit is used to determine the difference between a weights vector and the vector given by the previous layer's outputs. A transfer function, also known as activation, is applied to the result to produce the input for the following layer.

The following are the main steps in an MLP network's training phase: First, given a dataset's input pattern X, this pattern is forward to all the MLP's output.

second, the network is examined and the desired output is compared; third, the network is evaluated and the desired output is compared.the signal of mismatch between the network's output and the The network is notified of the desired response; and Finally, modifications to synaptic weights are performed [34].

This technique is continued for each subsequent input vector until all of the input vectors have been processed.The network is used to pass on training patterns.Support Vector Machine (SVM) 3.1.3 (SVM). The dataset is segmented into two classes by SVM, which is separated by a linear border between the normal and attack classes that maximises the margin. SVM seeks out the hyperplane with the greatest distance between it and the closest positive and negative samples [35, 36]. The basic construction of an SVM network is similar to that of a regular RBF network, except that the kernel activating function is used instead of the exponential activating function (which is commonly Gaussian). A polynomial kernel, Gaussian radial basis kernel, or two - layered feed-forward neural network kernel can all be used to activate the kernel.

3.2 The three datasets used in this study are briefly described in this section.

3.2.1. Ionosphere.The ionosphere dataset was gathered using radar in Goose Bay, Labrador. Radar signals are divided into two categories: good and bad. The data that reveal indications of some form of construction in the ionosphere are good data. Those returns that do not let transmission signals to penetrate over the ionosphere are considered bad [18]. There are 34 readings and 351 records in this collection.

3.2.2. Forest CoverType is a type of forest cover. At the University of Colorado, the Forest CoverType dataset was created. It's made to estimate the type of forest cover in unknown areas. It's been used in a series of data stream classification studies. There are 581, 012 occurrences and 54 attributes in this dataset [18, 37]. It is regarded as one of the most extensive datasets. Because of restricted memory capacity, the number of features in our sample was reduced to 25000.

Sensor Discrimination (section 3.2.3). This set of data contains 12 numerical values for samples of an unknown chemical.

There are three classifications in this labelled dataset: group A, group B, and false alarm [38]. The receiver node is used to establish which class an unknown sample belongs to after receiving 12 numerical values.

To put it another way, the receiver should say whether this unknown sample belongs in group A or group B. Whenever the sample does not fall into either of the first two groups, it is termed false alarm. There are 12 readings and 2211 records in this collection.

4.Proposed Methodology:

The classification algorithm is used to develop an intelligent neural network architecture for efficient energy management in WSNs in this paper. The selection sensor algorithm used in [18] is utilized in our work. The Ionosphere, Forest CoverType, and Sensor Discrimination datasets were utilised to assess the performance of the three intelligent algorithms in terms of classification accuracy in this work. Furthermore, for all completed experiments, 30% of the dataset is used for training data, with the remaining 70% used for testing. By establishing the shared and common parameters, we can give a fair comparison between the three classifiers, namely Naive Bayes, MLP, and Linear-SVM..

The Lifetime Extension Component is calculated as follows:

LEC=Total Sensor node/Number of sensor consumed

Two key actions were taken in [11] in order to reduce energy usage and increase the lifespan factor. The following are the two steps:

(1) The most prominent sensor nodes in WSNs were chosen after ranking them from most to least important in terms of utilisation, and

(2) Naive Bayes and MLP classification methods were used to classify them. It is important to note that in our research, we introduce an intelligent model for efficient energy management in WSNs utilising a classification approach based on SVM with linear kernel, which would be a polynomial kernel with exponent 1.

The following are the four parts of our proposed method:

(1) Preprocessing
(2) Processing:
  (a) Ranking:
  (i) Determine the feature/relevance sensor's level.
  (ii) Sort the items in ascending order.
(3) Machine Learning
(4) Evaluation of performance

Sensor Discrimination, ionosphere, and Forest CoverType The input dataset must be cleaned and formatted before moving on to the preprocessing stage. In the processing block, On the chosen dataset, two functions are applied. The The first is the Rank function, which ranks the features/sensors in order of importance. The significance level computation process as well as the sorting process are two consecutive procedures included in this function. The independent significance features test is a built-in procedure in MATLAB [39] that is used to calculate the significance level of a feature/sensor. This approach is known as the independent significance features test, according to Weiss and Indurkhya [40]. (IndFeat).

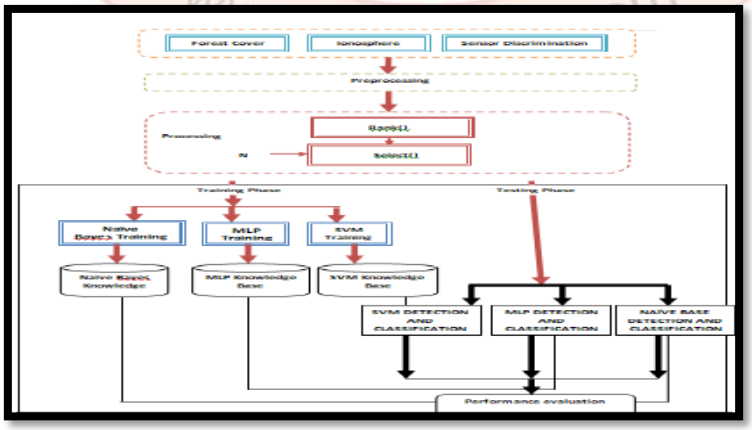

Figure: Structure of Proposed System

This method is commonly used in artificial intelligence engineering applications to quickly detect and remove poor features. To put it another way, the number of inputs that must be considered during the selection procedure will be drastically reduced. As a result, it can be utilised as a preliminary step in the selection process. Furthermore, it cuts down on the amount of time it takes to complete the final selection procedure. The sorting process, on the other hand, sorts the output of the level of significance calculation operations in descending order.

The Rank function returns an array of features/sensors that are organized from most significant to least significant. The Rank function's job is to figure out how significant each feature/sensor is. Then it sorts them in descending order, with the most key features or sensors at the top and the least important at the bottom.

On the Sensor Discrimination dataset, Figure 2 illustrates an example of the output while calculating the significant level procedure and sorting process. The diagram shows how the Ranking function's processes will be carried out in a sequential order. The Select function is then used to choose the first N features/sensors. If N = 10, for example, this method will return the numbers of the first 10 features/sensors.
Similarly, if N = 20, the first 20 features/sensors' numbers are returned, and so on.

The machine learning block is the fourth block, which applies the specified classifier (Naive Bayes, MLP, or Linear-SVM) to the N features/sensors.

Two steps are done in this block: the first is the training or learning phase, which allows the intelligent system to construct the appropriate knowledge base. The intelligent system picks up on existing relationships/correlations in the built environment.

Table 1: Experimental parameters Simply

Factor	Value
%Testing	65%
%Training	35%
Learning rate for MLP	0.35
Number of epochs for MLP	600
Number of hidden layers for MLP	1
Number of hidden neurons for MLP	(# selected sensors + # classes)/2
Kernel for SVM	Linear kernel (polynomial kernel with exponent being 1)

expressed, the training phase is a process of the intelligent system evolving to provide the optimum possible response in the testing phase. The testing phase involves putting the proposed system to the test with test datasets. This phase's output data demonstrate the system's performance and efficacy in terms of classification and computational speed.

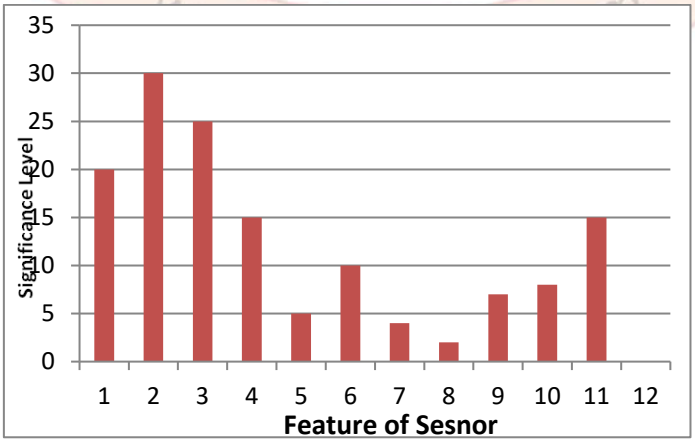

Figure:1 The result of the significance process calculation

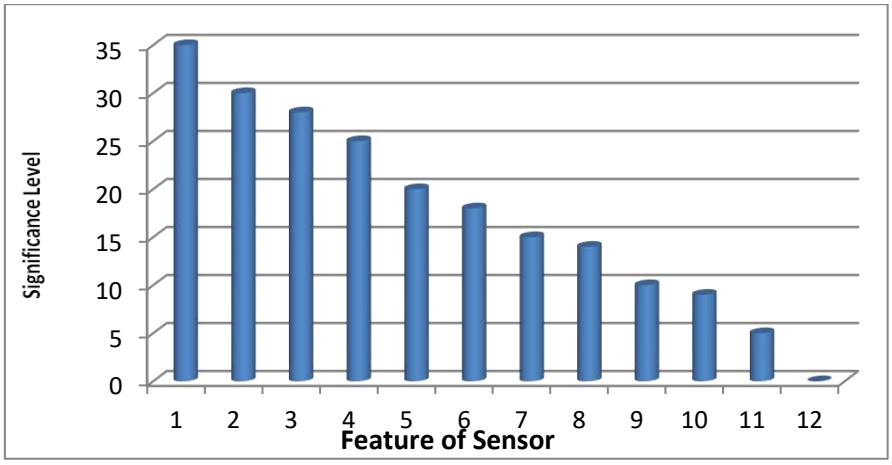

Figure:2 The result of a descending order sorting method

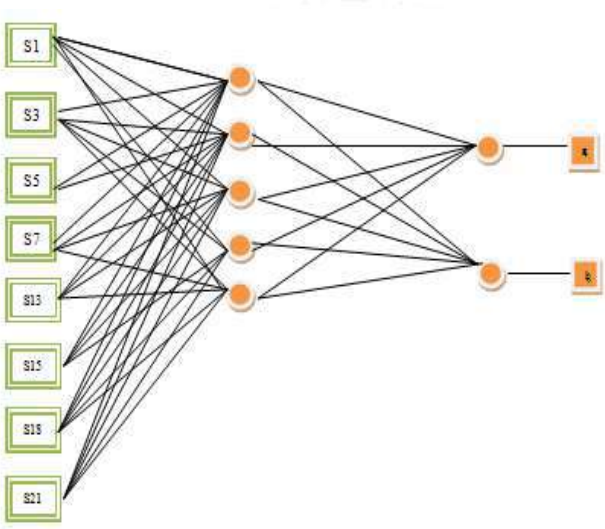

Figure 3: Experiment 1, NN structure for the selection of 10

5. Hands-on Experience:

The Ionosphere dataset, which is a radar dataset collected from 34 widely different sensor nodes, was used in this experiment. The selection algorithm presented in [18] was applied in MATLAB. This algorithm (shown in Figure 3) prioritized the sensors according to the importance of their data.

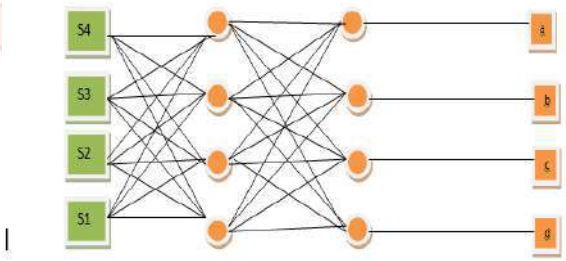

Figure 4: Experiment 3, NN structure for the selection of 4

The Forest CoverType dataset, which was created at the University of Colorado, was used in this experiment. The Forest CoverType of unknown regions, which has 581,012 records and 54 incoming values, can be predicted by studying the received data from the sensors.

6. Results Discussion

The confusion matrix [30, 42] is used to assess the performance of the three intelligent classification algorithms.

False positive (FP), true positive (TP), false negative (FN), and true negative (TN) are the four possible outcomes [42, 43], where (1) FP occurs when the actual class of test sample is negative and is classified incorrectly as positive; (2) TN occurs when the actual class of test sample is negative and is classified correctly as negative; (3) FN occurs when the actual class of test sample is positive and is classified incorrectly as negative; and (4) TP occurs when the actual class of test sample is positive

7. Conclusions

An intelligent model for efficient energy management in WSNs is presented in this paper. It examines the differences between Naive Bayes, MLP, and Linear-SVM. The goal is to figure out which intelligent categorization model is best for efficient energy management in WSNs. Different tests were run on three benchmarking datasets in order to evaluate the performance of the three classifiers.

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Hip Implant by Cluster Analysis of Anthropometry Parameters of Femur

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Abstract:

Background and Objective: A range of research told that there is extensive variations in the sizes and shapes of femur bone across different ethnic groups and geographical locations, thus particular bone-implant fit is challenging to achieve. Prosthesis of mismatched sized can caused serious problems for patients. Thus aim of the study was to design standard hip implant based on anatomical parameter of respective population. Materials and Methods: Eleven osteological parameter of femoral prosthesis of 125 patient (67 male and 59 female) were evaluated, these eleven parameter were grouped to obtain scatter diagram. Then cluster analysis in SPSS software V25 was carried out by using slink clustering method. Results: After studying scatter diagram it was found that 15% population had irregular anatomy then rest of population. So, remaining data put under cluster analysis gives 8 (4 for men and 4 for women) sets of standard anatomical parameter for designing hip implant. Conclusion: These eight standard hip implant satisfy 85% population of Vidarbha region.

Index Terms *- Hip implant, standard anatomical parameter, femoral prosthesis, mismatched sized, cluster analysis, Slink method, osteological parameter.*

I. Introduction

Importance of hip geometry has been well defined in previous studies1-5. Due to wide variation in anatomy of femoral prosthesis, it is difficult to achieve precise bone implant fit. Asians have a smaller distal femur size than that of the western population6,7. But maximum artificial femoral prosthesis are standardize and manufacture in European and North American region8 and currently available western orthopaedic implants do not match the dimensions of the proximal femoral of Indian population. The usage of these over-sized and unsuitable implant affect outcome of the surgery reported with problems such as stress shielding, micro-motion and loosening9-12. This standard hip implant were not useful for population of Vidarbha region because they were not based on anthropometry of respective population13.

The variations in dimensions may need to be considered when designing the appropriate implant14. To eliminate mismatch between femur and implant and to attain suitable fitment, it was necessary to design a few standard implant based on shape and size of proximal femur of respective population. So, objective of the study was to design standard hip implant based on anatomical parameter of Vidarbha region population.

II. Materials And Methods

Present study was carried out since 2014 in Vidarbha region central part of India. An eleven anatomical parameter of femur were identified from X-ray image of 125 patients, in the age group of 50-70 years. Out of total patients 67 were male and 58 were female. Each X-ray image of 125 patients was processed in DICOM Viewer 4.2.1 software. By means of linear and angular measure tool in software all anatomical parameter of femur were measured. The exact position of each anatomical parameter from where its value was measured shown in Fig. 1 and the measured value of each anatomical parameter designated by alphabets in Fig. 1 exposed in Fig. 2. Following were the anatomical measurements used for study:

C Femoral head diameter (FHD): Diameter of femoral head in frontal plane

C Femoral neck diameter (FND): Diameter of femoral neck in frontal plane

C Horizontal offset (HO): The horizontal distance between the centre of the femoral head and the shaft axis in frontal plane.

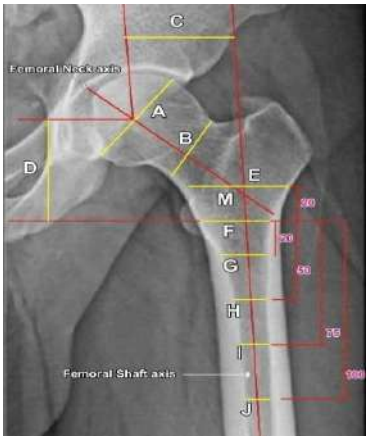

Fig. 1: Anatomical parameter on femur

Fig. 2: Measured value of anatomical parameter on femur

C Vertical offset (VO): The vertical distance between the center of the femoral head and the middle of lesser trochanter level

C Canal width (CW): The CW 20 mm above from lesser trochanter at E in frontal plane of femur

C Canal width (CW): The CW in frontal plane, passing through the middle of the lesser trochanter

C Canal width (CW): The CW 20 mm below from lesser trochanter at G in frontal plane of femur

C Canal width (CW): The CW 50 mm below from lesser trochanter at H in frontal plane of femur

C Canal width (CW): The CW 75 mm below from lesser trochanter at H in frontal plane of femur

C Canal width (CW): The CW 100 mm below from lesser trochanter at J in frontal plane of femur

C Neck-shaft angle (NSA): The angle between the shaft axis and the neck axis

III. Grouping of anatomical parameter: The measured value of anatomical parameter of femur were divided into three groups for prosthesis designing purpose (i) A, B, E, F and G were important for deciding Anterior-Posterior cross section of prosthesis (ii) H, I, J, used for determine distal length and (iii) C, D and M for orientation of neck of the prosthesis.

IV. Finding out dissimilar set of object: Aimed at finding dissimilar set of data a standard deviation of each parameter was calculated and on the basis of standard deviation scatter diagram of each parameter was plot. After examining scatter diagram it was found that some set point were not in range because anatomical parameters of some patients were irregular i.e., there anatomy not in range with rest of patients and they requisite customized hip implant. Such patients were omitted and remaining patient was used for cluster analysis.

V. Cluster analysis: Romesburg defined cluster analysis is mathematical method, can be used to find out which objects in a set are similar. Cluster analysis has an endless list of user because classification (which object in set are similar and dissimilar) are essential building blocks in field of research. Cluster analysis carried out using following six steps: (1) Obtain data matrix, (2) Standardize data matrix, (3) Calculate resemblance matrix, (4) Implement clustering method, (5) Reposition data and resemblance matrix and (6) Compute cophenetic correlation coefficient. In existing study IBM SPSS Statistic software (Version 25) was used to execute hierarchical clustering with slink clustering method for four cluster and standard deviation ranging from -1 to 1. A slink clustering method calculate closest members of two cluster. After completing cluster analysis in SPSS software input data was split on basis of fourth cluster.

Results

The database of the measured values of each anatomical parameters for first 10 patients out of 125 patients were presented in Table 1. To find out dissimilar data base total 22 scatter diagram was obtained, few of them given below in Fig. 3 as a sample. After analyzing scatter diagram it was found that 15% patients (In male category 12 patients out of 67 patients and 7 patients out of 59 patients from female) had abnormal anatomy. These patients were omitted and listed in Table 2.Remaining 85% database of patient was used for

cluster analysis. After completing cluster analysis in SPSS software forecast values of each parameter were summarized in Table 3. Total 8 (4 Male and 4 Female) sets of standard anatomical parameters provide standard sizes hip implant designs, which was found suitable for Vidarbha region population. In this study conventional X-ray technique has been used for understanding the femur bone geometry. The outcome of current study make available eight set of standard anatomical parameter for hip implant design which satisfy maximum population of Vidarbha region. Equally they achieve proper fitment because they were standardize on anthropometry of respective population and reduces chance of revision surgery. It also reduces operating time and achieve successful positioning in hip joint.

Discussion

Surgeon who perform hip replacement surgeries must depend on implant manufacture to provide proper implants

Parameters	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	H (mm)	I (mm)	J (mm)	M (deg)
1	51.1	34.3	47.0	66.4	52.4	32.1	19.6	13.2	11.5	11.5	**131.3**
2	51.6	39.5	51.8	61.8	51.1	31.1	20.4	14.3	13.4	12.9	**120.3**
3	43.7	27.7	46.6	59.0	47.7	30.7	19.8	15.7	15.1	12.0	**125.7**
4	44.7	31.9	43.5	70.3	41.3	27.8	18.8	15.0	14.4	10.5	**134.9**
	40.5	27.1	37.8	48.9	44.4	25.1	18.0	14.0	3.6	11.5	**124.2**
	49.6	29.6	47.6	59.6	51.2	29.6	19.2	14.3	13.6	12.3	**123.5**
	49.3	36.2	34.9	54.6	49.2	30.7	20.6	12.7	11.6	10.4	**141.8**
	51.2	34.1	37.8	53.2	50.5	32.4	22.1	15.7	14.4	13.3	**124.3**
	53.8	35.1	44.4	55.0	60.0	33.7	19.4	15.3	14.9	12.2	**124.0**
	45.4	**28.3**	**40.1**	**41.8**	**51.0**	**34.4**	**23.4**	**18.3**	**15.0**	**14.9**	**132.0**

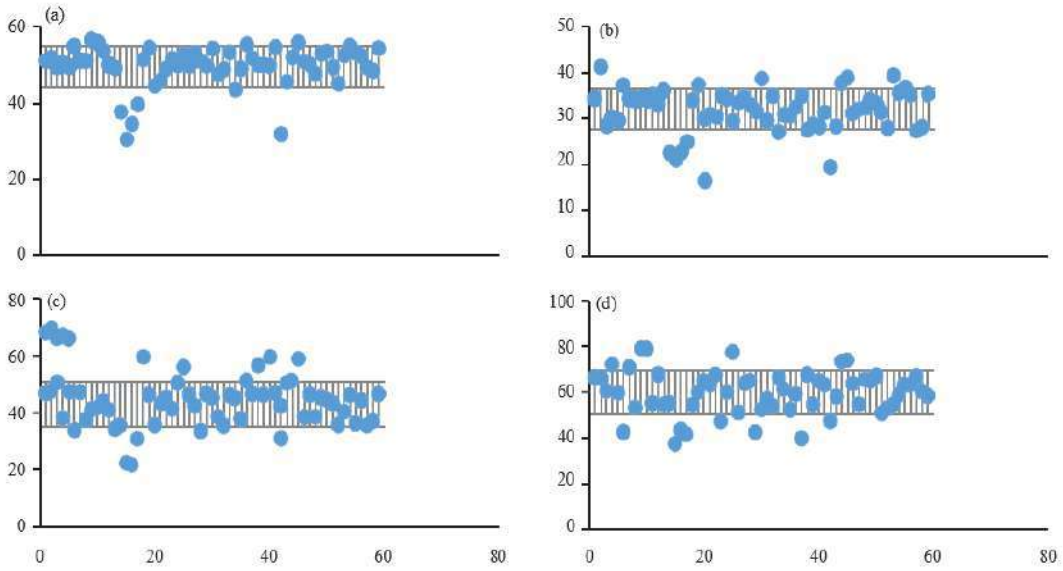

Fig. 3(a-d): Dissimiam of measured anatomical parameter as per, (a) Femoral head diameter, (b) Femoral neck diameter, (c) Horizontal offset and (d) Vertical offset.

Table 2: Irregular anatomical parameter of femur Patients having irregular anatomical parameters

	Male												Female						
AP	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
A (mm)		58	58	38	31	35	40	32	59					40	53	53			**34**
B (mm)	37			23	21	23	25	20	39					23	34	33	23	32	
C (mm)	34				23	22	31	31	59				46	30		33			**30**
D (mm)	43	79	79		38	44	41	47	74	40			37		66	64		43	**37**
E (mm)	37	56		36	35	38	40	36		57		57		34	37		54		
F (mm)	18	40	40	22	17		21	17			42	42		21			36	39	**22**
G (mm)	11	29	29		8	15	14	12		30	32	27		15			28	32	**15**
H (mm)	11	20	19	11	6	9	10	10		20	28	21		12			20	22	**10**
I (mm)		17		10	5	7	9	9		18	25	19		11			17	22	**9**
J (mm)				9	6	7	9	8		18	25			9.5				20	**7**
M (deg)	118					142			117				118			141			

Table 3: Anatomical parameter for designing standard implant

		Male				Female			
AP	N	1	2	3	4	1	2	3	**4**
A (mm)	106	55.7	49.5	47.1	53.4	51.0	45.7	43.1	**48.4**
B (mm)	106	36.5	34.0	31.8	35.2	29.1	27.7	26.0	**26.9**
C (mm)	106	50.2	43.6	40.6	47.6	43.9	41.5	39.6	**43.1**
D (mm)	106	70.3	61.2	56.7	65.8	59.9	57.2	52.7	**54.9**
E (mm)	106	51.0	47.4	43.4	54.4	58.3	54.1	44.6	**49.8**
F (mm)	106	32.3	30.3	27.8	34.8	38.1	35.3	29.0	**32.4**
G (mm)	106	22.3	21.2	19.4	23.4	26.5	24.3	20.2	**22.3**
H (mm)	106	16.2	15.1	13.8	16.9	19.8	18.9	15.1	**17.4**
I (mm)	106	14.3	13.3	12.2	15.2	17.2	16.4	13.1	**14.8**
J (mm)	106	12.3	11.5	10.5	13.2	14.8	12.1	11.4	**13.6**
M (deg)	**106**	**141.0**	**126.0**	**120.0**	**133.0**	**135.5**	**130.5**	**120.0**	**125.0**

Sized but there were limitation in design of implant. The proposed approach for standardize a hip implant was simplest and quite accurate. The proposed implant improve longer term outcome and clinical functionality for Vidarbha region population by reducing loosening rate and complication rate. There was inconsistency in measurement parameter. Thus it was challenging to attain specific bone implant fit. Statistical analysis showed no significant differences between left and right femora but significant differences were found between male and female subjects8,16. Also, the neck shaft angle varies17 from 125-132E. It was noted that Nigerians were taller than average Indians so their femoral heads were bigger than that of Indians18. The femoral neck diameter and neck shaft angle for Hong Kong Chinese population were small when compared with their western counterpart19. The undersized and overhanging hip implant could lead to replace soft tissue and patella20. Improper choice of implant could create serious problem for patient in long period21,22. There is a deficiency of literature relating to the effect of improperly sized implants on patient outcome.

However, forecast result are based on measured anthropometric data, it is some time subject to variation by the system utilized. This study will help medical practitioner in particular and common population in general.

Significance Statement

It was disclosed that the current finding (eight standard hip implant) can provide suitable fitment to the majority of the population. It is innovative step and more purposeful to prevent general complications like prosthetic loosening and dislocation. While a small percentage of population will always be requiring the customized prosthesis for exact fitment. The current outcome will also assist and enhance facts of hip region for the clinicians or thopaedicians and radiologists.

Conclusion

To validate the need of designing a hip implant based on particular location, an effort has been made for collection of data (Anatomical Parameter) of vidhrabha region population and scatter diagram is formed on basis of standard deviation. After examine a scatter diagram it found that 15% population had irregular shape of hip prosthesis. Cluster analysis was carried out on remaining dataset, which offered 8 set of standard anatomical parameter, on this basis 8 standard hip implant could design for population of the study region. These 8 set of standard hip implant serve 85% of population.

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Technical Review on Educational Data Mining

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Abstract-

Importance of education is to develop good society in terms of cultural, social and economic. Educational data mining (EDM) is a new area for knowledge discovering from large amount of educational data. Researchers from the glob are trying to search the outline and elements which give betterment of education. This paper shows the review of data present in the world and methodology used for collecting and clearing them before applying data mining techniques. It represents different techniques used by different research for educational data mining. It gives kind of result for selecting proper technique for proper data mining in educational data.

Keywords: Educational Data Mining, Dropout, Data Mining, Decision Trees

1. Introduction

Education has different meaning as per the situation. Education is very broad term for considering individual. Basically it is a character appearance of a single person known as education. The education reflected from the society of different persons who represent their culture. In education sector the schools, colleges and universities and so on represent education. The newly education system which will be implemented from 2022-2023 by the Indian government for focusing the aim regarding education system by 2040 with equitable access to the highest-quality education for all learners regardless of social or economic background [1]. The system divides the education parts such as Fundamental, Preparatory, Middle, Secondary and Higher education. Education gives the development of the persons or society. It gives good impact on the society and the nation. The development may be attitudes, modern values and economic growth of a person by education due to which equality and social justice is occurring.

Data is important for any sector. We are living around the data, now a days we are using World Wide Web (WWW), Whatsapp, Facebook etc. which having lot of important data around us. The person tries to find out the meaningful data from the huge data by applying knowledge discovery from data or KDD process. Data mining technique can be applied for meaningful data [2]. In educational field, Data Mining is used to understanding of learning process of students. Educational Data Mining (EDM) is growing area for data mining to better understand students [3].

2. Layout For Drop-Out Learner

Different scholars have used different model or layout for drop out learner. The architecture [4] used is based on ETL process. The abbreviation of ETL is Extract, Transform and Load.

It is business oriented system in which author study the operational system to support business. The model [5][6] which predicting students result at school level which are failure. It involved the stages Data collection, Preprocessing, Data mining and Interpretation. Early student success prediction is also layout by the authors by showing the model [7].

Layout of primary involvement of elements, database creation, processing and output of educational data using Data Mining is as follows in Fig. 1.

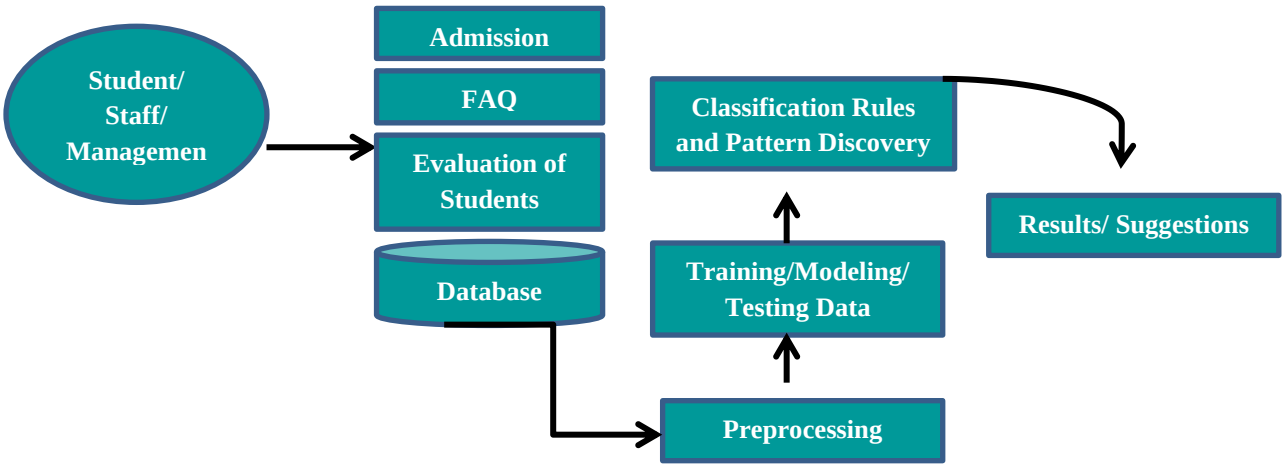

Fig. 1. Educational System Layout

i. Data-Variable-Users

To predict probability of drop out student or performance of student from educational institutional data from different sources are compulsory. Researcher focuses on outcome in particular course such as information system in open polytechnic based on admission data [7]. By using white box data mining technique, researcher predicts student failure in school level [6]. In this study the highly imbalance data is focuses and the students which are on high risk will be detecting so that they can be early guided. The aim [4] study the variables that responsible for the drop out as well as to develop a model of predication which identifying drop out students.

The questionnaire supplied to the three university students for two continuous years from which data is collected [8]. The EDM models and results of the project carried out from the Thailand University. The aim of research is to predicting student performance and dropout based on characteristics before admission, admission details and initial exam performance in the university. Objective of the research is to reduce the number of features, remove irrelevant, redundant data and reduce the size of data set for feature selection algorithm [9]. The less educational qualification [10] decreases possibility of getting good employment in the company or private sectors. Thus dropout students identify as early as possible.

ii. Preprocessing

Pre-processing of data is one of the important steps in data mining process. Generally incomplete, noisy and inconsistent data are received from various sources such as web and social media [2]. The Quality decisions will be taken on quality data. The WEKA software is used to remove noisy data i.e. data cleaning techniques. [11][12][13]. Cleaning process in which missing values will be fill out using data approach. Before applying mining technique the preprocesses data work is done by the researcher [14][15]. Data cleaning and transformation process were manually done by replacing missing values with the standard values.

iii. Data Mining Techniques

Decision Trees, Genetic Algorithm, Artificial Intelligence, Neural Networks, Classification, Clustering, Regression, Association Rules, Nearest Neighbor method etc. are the algorithms and techniques used for knowledge discovery from databases [16]. These techniques are used for Educational Data Mining purpose also. Algorithm [6] are used for feature selection dataset, number of algorithms are applied for features ranking higher in multiple algorithms. 15 important features are selected from original 77 features. Some of the authors also use WEKA for performing out data mining techniques. Association rule mining is used to identify causes of student dropout [11][16].

The researcher [17] constructed a CHAID prediction system in which 7-class response variable by using predictive variable to obtained feature selection technique. In this simple linear regression technique was used to construct a regression model.

The researcher [9] applies feature selection before applying data mining techniques. Researcher uses filter model, hybrid model and wrapper models for features selection. Different studies [18] focus mainly on feature selection like investigating the familiar subset features with little cardinality for gaining good predictive performance with techniques of data mining and calculating better subsets with different cardinality. The basic steps namely subset generation, subset evaluation, stopping criterion and validation are used for feature selection procedure in early days.

3. Conclusion

The major problem for a research is unavailability of global dataset. Various techniques will be applicable for preprocessing of noisy data. Every day Data mining techniques are perform their performance nicely with the EDM and now a days different dimensional and not properly arrange data can also properly arrange. The survey of this paper show that educational data mining is even a large field for research in the education sector which uses more techniques to mining the educational data as well as to plan or develop new education effective for the educator and nation.

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Artificial Intelligence Using Neural Network Based D. S. S. For Iris Detection

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Abstract:-

Neural network-based decision support system, is used for persons identification from IRIS recognition. In this case DECISION SUPPORT SYSTEM (D.S.S.) will work as a classifier estimate non linear and complex decision boundaries between different classes. The neural network configuration using MLP, RBF, SVM. The various parameter of neural network will be varied carefully in order to obtained the optimal configuration in view of minimum mean square error and maximum classification accuracy and simplicity of neural network model, the available data set ratio of these partition will varied gradually. In each of neural network configuration. The variable parameter test and train by neural solution software.

Finally an optimal neural network based D.S.S. will be designed in each category of neural network and then shall be overall comparison among different neural network configuration. In this case of decision support system confusion matrix and classify accuracy are important to identify person iris image.

Keywords: *Iris recognition, neural network-based decision support system, Classify accuracy. MLP ,RBF, SVM*

Introduction:-

Today's E-Security are in critical need of finding accurate, Secure and cost-effective alternatives to passwords and personal identification numbers as financial losses increase dramatically year over year from computer-based fraud such as computer hacking and identity theft. Biometric solutions address these fundamental problems, because an individual Biometric data is unique and cannot be transferred Biometric is automated methods of identifying a person or verifying the identity of a person based on physiological or behavioral characteristic.

For Example, of physiological char. Include hand, finger image and facial characteristic and iris recognition behavioral char. Are trends which can be learn or acquired dynamic signature verification, speaker verification and key stroke dynamic are example of behavioral char. Biometrics system uses a hardware to capture the Biometric information and software to maintain and manage the system in general, the system translates these Biometric profile known as template that templates is stored in a data base the Biometric system then compares this templates to the new image created every time a user accesses system then compares this templates to the new image created every time a user accesses the system for an enterprise Biometric provides value into two ways Biometric adds a unique identification to network authentication, one that is extremely difficult to duplicate smart cards and token also provides a unique identifier but an Biometric has an advantage over these devices a user cannot lose or forget his or her finger print, retina or voice the practical application for Biometric are diverse and expanding and range from healthcare to govt, financial services, transportation and public safety and justice. Such application are on line identification for E-commerce access control of a certain building or restricted area, offline personal identification, financial automated teller machine (ATM), online ticket purchase etc.

Feature Extraction

In order to provide an accurate recognition of an individuals, the most discriminating information present in an iris pattern has been extracted. Only the significant features of the iris have been encoded so that comparison between templates is done. the feature extraction stages.

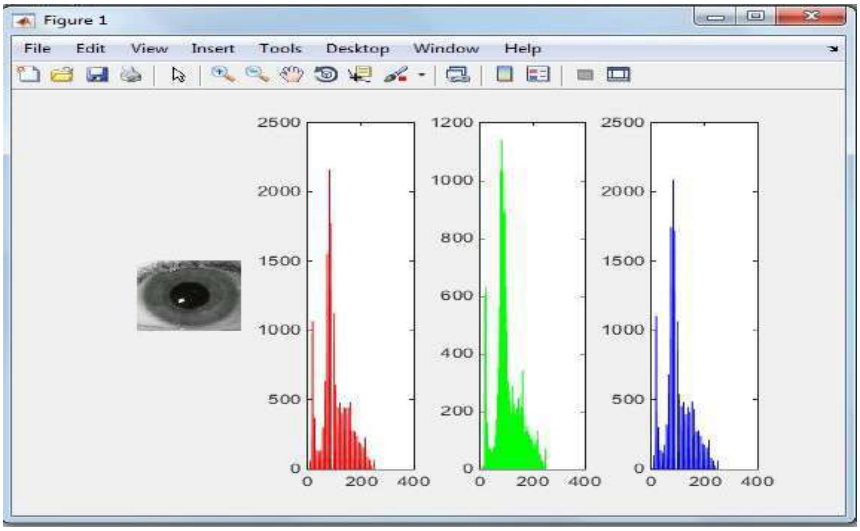


Fig , Histogram of Iris

Problem Formulation :- In this paper preliminary part of the work is given .
Neural network based decision support system, is used for persons identification from IRIS recognition.In this case the D.S.S. (DECISION SUPORT SYSTEM) will work as a classifier estimate non linear and complex decision boundaries between different classes. The neural network configuration to be used for this research work are as

1) Multilayer Perceptron (MLP)
2) Radial based function network (RBF)
3) Self Organizing map (SOM)
4) Support Vector Machine.

The various parameter of neural network will be varied carefully in order to obtained the optimal configuration in view of minimum mean square error and maximum classification accuracy and simplicity of neural network model, the available data set ratio of these partitions will varied gradually. For e.g. 70% training, 20% testing, 10% cross validation and various possible combination like permutation and combination like this will be form. The order of testing and training will be swapped for reverse tagging. The different data partitioning ensures that the trained neural network s not dependent on any specific data partition to produce the best results and the learning is almost independent of data is essential. In each of the neural network configuration. The variable parameters are as Hidden layer, Number of neurons in each hidden layer, Transfer function of neurons output layer, Learning rule or training algorithm to be used such as standard back propagation algorithm, conjugate gradient algorithm, delta algorithm and quick propagation , Number of cluster Centers, Learning rate and value of step size and momentum. All possible Variable parameter of neural network will be varied systematically until the most optimal configuration is reached, where mean square error on the training, testing and cross-validation data set is the lowest regardless of data partitions and classification accuracy for cross validation and testing data set will approach 100% ideally. Finally an optimal neural network based D.S.S. will be designed in each category of neural network and then shall be overall comparison among different neural network configuration. In this case of decision support system confusion matrix and classify accuracy are important to Identify person iris image. In this case mean square error is not very important digestive parameter, it is only used to control and monitor learning algorithm and training of neural network, neural network is trained on the different data partition and it is tested on a separate data partition that was never presented to neural network, while training. This is done for proper generalization and true learning.

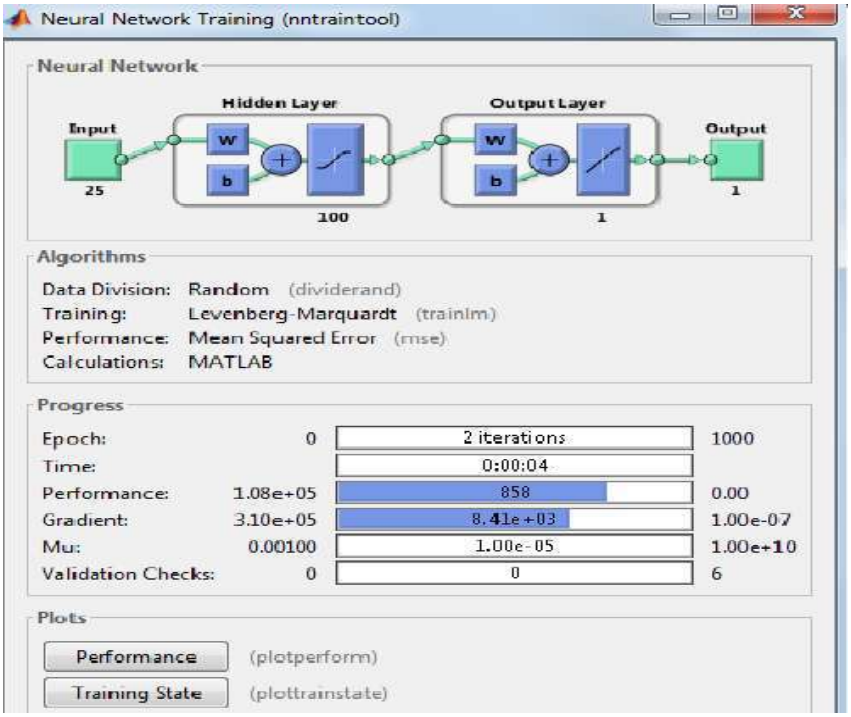
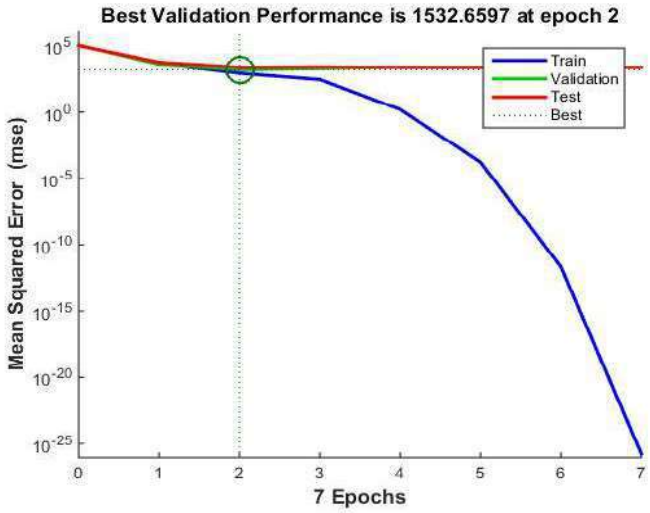


Fig. neural network training

If the train button is pressed on the menu the neural network traing (nntraintool) would be activated from the neural network toolbox. The result of train network is shown in fig 4.1

In this figure the neural network algorithm would be displayed with 25 input two layers with weight and bias .Hiden layer are 100 and one output layer. According to the present result of training system the epoch is 2 iteration for 1000 epochs. Running time is 0.004 hours .The performance is 858 for 1.08e+05 target. The gradient is 8.41e+03 for 1.00e-07 and validation check is 0 for 6 must be displayed on the command window.

According to the fig 4.1 the neural network training system has been accomplished and known by the user neural network toolbox is very useful to simulation of this right iris recognition .



The result is found by the algorithm and we can get the number of epochs used and which epoch gives the best result as shown in fig 4.2.As shown in fig 4.2 a plot fo epochs MSE has been plotted .The epochs gets the best validation performance at epoch no. 2 . The MSEW is the lowest at this point and hereafter no significant changes takes place and no further decrease takes place. Hence this is the best validation performance is 1532.6597 at epoch

Conclusion:-

In this the iris preprocessing steps that includes iris localization, normalization and enhancement and then applied to the small singular program on MATLAB. Software converts that image into the numerical data.

Numerical data then applied to the Neural solution and then trained the Network and classify the images using multilayer perception (MLP), Radial based function Network (PDF) and the images and gives the accuracy of that images. In this work, Iris recognition system based on neural networks base decision support system is used for persons identification from iris images. Multilayer perceptron network is one of the best techniques to identify Iris images of a person.

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Competency Development and Mapping of An Engineering Graduates Employability Skills

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Abstract:

Hiring fresh engineering graduates for Industry has become a crucial task for the industry as well as for the agencies. At the commencement of employment, graduate engineer training is essential, additional training is both time consuming and costly for the industry. Industry work on three main elements man machine and money. Among these three the main element of industry is man i.e., humans. The existing economic globalization demands novel methods to workforce management. Nowadays industry is in need of high skilled workforce, thus the skilled graduates demand is increasing day by day, and low skilled employees demand is increasing and is on declining side. Multi-tasking role are expected by the employees to be performed. More agility is required, proactive, self-disciplined, organized, Creative etc. are the recruiters from the upcoming graduates. The practice of determining critical competencies for a company is called skill mapping or competency mapping. Competency mapping is a growing HR approach that focuses on the characteristics that are necessary for job success and matches them to the skills of the current workforce. Its is expected by the academicians and the Engineering institutes to focus more towards the competency development and mapping of engineering graduate. It can be achieved by imparting various technical and non-technical trainings, providing internship opportunities, conducting workshops, Seminars etc.

Keywords: *Competency mapping, Skill, Employability, Globalization, Gap, Graduates, Engineering.*

Introduction:

Process of identifying key competencies of employees for an organization is termed as Competency mapping of skill mapping. Competency mapping is an evolving HR practice focusing on factors required for success at any job and matching it with skills of workforce available.[1] It Involves various skills which are related and expected to be performed in the job. It reveals the working capabilities, ingenious, adaptability, stress handling capacity, forecasting skills, problem solving abilities, decision making sills and many more. This analysis helps the industry and the perspective candidate to compare suitability of engineer for the respective job. Its also help in reducing the training or the on-job training cost of the industry. More reliable workforce can be developed for future. In order to remain in alive and active in today's competitive environment, every industry is striving for maximum efficiency and effectiveness. Industry is divided into two categories: production and service. They are making every effort to make their system more efficient. All of their strategies and approaches for increasing the performance and efficiency of their operations point to one fundamental factor: "Skill and Competency." As a result, firms that want to improve their performance turn to skills and competencies as a key area. Every sector, particularly those in manufacturing, places a premium on ability and competency.[2] Individuals must have convenient capacities in order to be 'employable.' Employers frequently describe a set of abilities that they expect from an employee, in addition to solid technical understanding and subject knowledge. It's like Team working, Problem solving, Self-management, Knowledge of the business, Literacy and numeracy relevant to the post, ICT knowledge, Good interactive and communication skills, Ability to use own initiative but also to follow instructions and Leadership skills where necessary are some skills needed.[3]

Importance of Competency Mapping:

Using a competency map to drill down to the specific skills, knowledge, abilities, and behaviors required for the job is beneficial. Competency mapping has the advantage of establishing criteria for employee training and development that are especially matched to our company's needs. It involves exploring the skills which are required for particular job position and role while performing duty. The goal of applying competency mapping is to ensure the organization's competitiveness, efficiency, and effectiveness[4]. These ability marking necessities serve as the indicator for employees. Employees' performance assessment forms are properly filled out depending on their degree of talents, which qualifies them for a certain function in the organization. Human resource department is responsible for analyzing the strengths and weaknesses of personnel after they have been assigned based on their competency.[5] The finest organizations always coming up with new methods to interact with their employees on a personal level. Building a more personal relationship with employees is becoming increasingly popular among the greatest places to work. It increases the productivity at workplace, reduces the work pressure, increases the quality of work, workplace environment[6]. Competency mapping has the advantage of establishing criteria for staff training and development that are precisely matched to your company's requirements[7]. It is a rapid and effective process that concentrates on and analyses how workers operate, and it normally takes one or two days to complete. Making a competence map can help you drill down to the specific skills, knowledge, abilities, and behaviors needed for each unit of work[7]. The competence map becomes a very helpful and practical tool for enterprises because of this approach.

Advantage of Competency Mapping for Industry:

- Increased Productivity
- Better workplace environment
- Increased Job Retention
- Better achievement of goal
- Sense of Responsibility

Figure 1 Advantage of Competency Mapping for Industry:

Advantage of Competency Mapping for Employee:

- Performance Excellence
- Improves clarity in work
- Job Satisfaction
- Better appraisal
- Better understanding of Job Role

Figure 2 Advantage of Competency Mapping for Industry

Competency Mapping & Development

Boyatzis(1980) – "A capacity that exists in a person that leads to behavior that meets the job demands within parameters of organizational environment, and that, in turn brings about desired results".[8] Unless the industry is not ready for competency mapping, it would become very difficult to get a better achievement at the workplace. competency mapping is also one of the leading concepts which is accepted worldwide[9]. It has shown

a tremendous increase in the qualitative approach towards achieving the Vision and Mission of any organization. It also gets in line with the organization goal as well as with the individual Goal. it is giving a wider spectrum for a better career enhancement and performance appraisal.[10] A capacity to recognize, interpret, and apply emotional information about oneself that leads to or causes successful or exceptional performance is an emotional intelligence skill[11]. The capacity to notice, analyses, and apply emotional information about others that leads to or causes successful or superior performance is referred to as social intelligence[12]. An intellectual intelligence competence is the dimensions to think critically about and evaluate information and circumstances in a way that leads to or causes successful or exceptional performance.

Figure 3 Competency Mapping & Development

HR Planning: Human resource planning (HRP) it is an incessant progression of disciplined scheduling ahead to ensure that an organization's most important asset—quality employees—is utilized to its full latent. Human resource planning certifies that personnel and occupations are a good match, while preventing manpower shortages or surpluses.

Competencies can be developed

One of the main recompenses of the ability or behavioural tactic to talent is that we reach an area of human talent that may be developed later in life. Although our understanding of skills has grown, one of the most noteworthy advances made in the prior years[13].

- an ageing and increasingly diversified workforce requiring greater employer support to remain productive at work
- increasing levels of chronic disease in the general population
- rising costs of ill-health in the workplace associated with increased absenteeism and reduced performance
- external societal pressures such as growing expectations that employers will promote wellness programmes as a duty of corporate social responsibility[14]
- a need for employers to distinguish their offerings to attract recruits in an increasingly competitive labor market
- attempts by government to reduce public health expenditure

Government is also planning to increase the presence of for universities in a global ranking our country is planning to have almost more than 20 universities and the list of top 200 universities of world. It will definitely attract the focus of top Global recruiters towards India. As when the Global recruiters come out for recruitment they especially focus on the top universities of the world If these top universities are being targeted for the Global recruitment it is a mandatory to make and raise a standard of university to this top level which will ultimately increase the growth[11].

Employability Skill development for Competency Mapping.

Employability skills are those skills which are required by and fresh graduate to start their company in organisation. These are the skills which will help the graduate to attend his or her first employment of their life[15]. Employers for the recruiters are always in search of such skills which are beyond your experience and qualification. When it comes to experience and qualification it has certain limitations because you cannot learn the things beyond your qualification and beyond your expectation it is expected by industry. Employability skill

is something which comes between your qualification and expectations it is more over incline toward the self-initiative, or self-learning, for proactiveness of an individual to learn new skills which will help them for a smooth working at workplace[16]. As your education and your qualification along with your experience will only make you eligible for the recruitment process of any organisation based on your qualification and education you will be able to appear in the recruitment process of an organisation but once you have not cleared the organisation recruitment process you want to be able to get a selection. The selection of a candidate in any recruitment process is purely based on the employability skill which acquired and which is shown to the employer during the screening process[17]. In general company is always ready to train the fresh graduates on the required skills. Skills may vary from organisation to organisation and sector 2 sector. They always are in search for such candidates who initially purchase certain soft skill interpersonal skills before hiring because once they identify that you already possess certain skills which are expected by the recruiter it will help them to train the graduate[18]. On the other hand, the fresh graduates who is not having any of the above-mentioned skills it is very difficult and it is very harder for the industry to train such a graduate on a required skill. Soft skill for employability skills is also considered as the building blocks for your future they will help you to get an acquaint yourself with better career and the candidate having a good command on soft skill definitely will get more opportunities in the state as compared to any other candidate. There are many different employability skills some among them are most important are in the areas of as mentioned below[19]:

- Creating a good Repo with co-workers: it is very important whenever you are working in an organisation you have to create a good rapport with your co-workers. having a good tune with your co-workers will definitely help you to create healthier and more supported work environment.
- Being more trustworthy and independent: following the deadlines and fulfilling the given task in a given set of time definitely makes you more Independent and dependable in organisation. it reflects that the said employee is more reliable when it comes to following the deadlines.
- Proactiveness: proactiveness is an attribute which is expected from every employee nowadays. organizations now are in search of such candidates those who to apply their own logic and skills to get the job done in the set time. employers don't want such candidate who always wait for someone else to instruct them and get the work done from them[20].

Apart from this some of the most important employability skills which are expected in a job market are listed below:

- ✓ Communication skill
- ✓ Emotional intelligence
- ✓ Aptitude skills
- ✓ Team building
- ✓ Negotiation skill
- ✓ Persuasion Skill
- ✓ Influencing skill
- ✓ Conflict Resolution Skill
- ✓ Mediation skill
- ✓ Problem Solving Skills
- ✓ Decision making Skills Etc

Conclusion:

Competency Mapping is a need of hour. Regular assessments and mapping of engineering graduates must be practiced. As a result, skills are a crucial aspect of an individual's personality that should be examined in order to assess their potential. To do so, we'll need to use competence mapping, which is a useful method for identifying an employee's work and behavioural abilities. Various employability skills listed above can be considered as a quality parameter for reference check. All the stake holders of the industry including Employer, Employee and Academician must take initiatives. These initiatives will surely help towards building and developing of knowledge economy for the nation.

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Introduction to the Quantum Computing: A Comparative Study with Classical Computing

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Abstract:

The flow of electrons is referred to as electricity. Because electrons can transport themselves to the other side of a blocked passage through a process called quantum tunnelling, transistors cannot be utilized as switches as their size shrinks to the size of a few atoms. Quantum mechanics is a field of physics that investigates the physical universe at the atomic level. At this level, particles behave differently than in the classical universe, taking on multiple states at once and interacting with particles that are thousands of miles away. Superposition and entanglement are examples of the phenomena. At the crossroads of mathematics, computer science, and physics, quantum computing is a novel and interesting field. It is concerned with the use of quantum physics to improve compute performance. Quantum computing is a novel type of computing that is based on quantum mechanics and interacts with a probabilistic and unpredictable physical reality. Because quantum mechanics is a more general model of physics than classical mechanics, it leads to a more generic model of computing, quantum computing, which has the ability to tackle challenges that classical computing cannot.

Keywords: *Computers, Classical computation, Quantum computing, Bits and Qubits, Quantum computing challenges*

Introduction:

Today's developments in computing are resulting in powerful tiny integrated circuits. The capacity of a chip doubles every two years, according to Moore's law. As we go closer to 10 nm, strange things happen with the electrons, revealing quantum nature, and the laws of classical physics are no longer respected at such scales. As a result, either new semiconductor devices must be developed that can sidestep quantum nature or quantum nature must be embraced. Scientists are currently opting to embrace quantum nature, i.e., to use quantum mechanics principles to develop innovative computers known as quantum computers [1-4].

Any type of calculation that contains both arithmetical and non-arithmetical processes and follows a well-defined paradigm (e.g. an algorithm) is referred to as computation. Computers are mechanical or electronic machines that do computations [1-5]. In today's world, most personal computers calculate 64 bits of data at a time. A 64-qubit quantum computer would be 2 to the 64th power quicker or 18 billion billion times faster. (It's worth noting that billion billion is correct). We wanted to explore the fundamental concepts of computation, how they are achieved using transistors in classical computing, the speed limitations of classical computing, the difference between classical and quantum computing, and the introduction and challenges of quantum computing to a general audience in this paper.

Computation: (Classical approach)

Binary computing is also known as classical computing. Information is stored in the form of classical bits, which are logically represented by either a 0 (OFF) or a 1 (ON) in this traditional approach to computing. It's analogous to turning on an ON or OFF a light switch. All current computers are built around the transistor. We regard this event to represent the 1(ON) when the transistor allows the current to travel through it, and we consider this activity to represent the 0 (OFF) when the transistor blocks the current from passing through it. We can manipulate the state of a bit in traditional computers by employing various combinations of transistors connected to each other. They're known as logic gates. In classical computing, we know that logic gates can perform logical operations. AND, OR, NOT, NAND, NOR, and other logic gates are examples. Transistors are small semiconductor devices that are used to amplify and also switch electric or electronic signals. They were used to manufacture integrated circuits on a piece of silicon (IC). In traditional computers, the number of transistors has a 1:1 connection with power. As a result, in order to enhance computation power, the number of transistors must be raised while the size of the chip must be reduced [2-6].

Limit of Classical computation:

Computers are getting smaller and faster day by day because electronic components are getting smaller and smaller. But this process is about to meet its physical limit.

Gordon Moore, the co-founder of Intel, discovered in 1965 that the number of transistors on a silicon microprocessor chip had doubled every year since its discovery, while the prices had been cut in half. Moore's Law is the name given to this phenomenon. Moore's Law is significant because it indicates that computers are becoming smaller and more powerful with time.

This leads to the concept of creating the tiniest computer by shrinking the circuit down to the size of an atom. Due to the "Quantum tunnelling" phenomenon, an electron can cross the barrier and appear on the other side when the size is lowered at the atomic level. As a result, these circuits will be unable to function as switches. It demonstrates that beyond 5–7 nanometres, the size of the circuits in a traditional computer has hit its limit. As a result, the power of classical computing can only be increased up to a limit [3-5].

Quantum computing: (An introduction)

Quantum computing is a sort of computer that uses the collective properties of quantum states to accomplish calculations, such as qubits, superposition, interference, and entanglement. The devices that perform quantum computations are known as quantum computers. A quantum computer is a machine that performs calculations based on the laws of quantum mechanics, which is the behaviour of particles at the sub-atomic level. Unlike traditional classical computers, which utilize binary bits 0 and 1 independently to store and manipulate the information, they use their own quantum bits, also known as 'Qubits,' to store and manipulate data. The computers using such type of computing are known as ‘Quantum Computers'. Circuits using transistors, logic gates, and Integrated Circuits are not possible in such small computers. As a result, it uses subatomic particles such as atoms, electrons, photons, and ions as bits, together with their spins and states of information. They can be stacked on top of one other to create new combinations. As a result, they may execute in parallel and efficiently use memory, making them more powerful. Quantum computing is the only model that can challenge the Church-Turing thesis, allowing quantum computers to dominate classical computers exponentially faster in speed [7-12].

Quantum Bits (Qubits): Representation of Data

A qubit, or quantum bit, is the fundamental unit of quantum information in quantum computing. The quantum bit can represent 0, 1, or both at the same time. A quantum bit can exist in superposition, which means that it can exist in multiple states at once. A single atom is used to represent a bit of data, and it can be in one of two states: |0> and |1>.

Qubits includes

- An atom in an excited or ground state.
- Polarisation of a single photon, in which the two states are vertical polarisation and horizontal polarisation.
- Spin of the electron, in which the two levels are spin up and spin down.

A linear superposition of a qubit's two orthonormal basis states can be used to represent its general quantum state in quantum mechanics (or basis vectors). |0> and |1> are the most common symbols for these vectors. They are pronounced "ket 0" and "ket 1," respectively, and are written in the traditional Dirac or "bra–ket" notation. The computational basis, which consists of the two orthonormal basis states {|0>,|1>}, is said to cover the two-dimensional linear vector (Hilbert) space of the qubit. In 2^n-dimensional Hilbert space, ‘n’ qubits are represented by a superposition state vector [7-12].

Qubits have unique qualities that enable them to solve complex problems considerably more quickly than traditional bits. Superposition is one of these qualities, which states that a qubit can store a combination of "0" and "1" at the same time. It refers to a quantum system's ability to exist in several states at the same time. A quantum bit can be in superposition, meaning it can be in multiple states at the same time [7-12].

Entanglement is a quantum particle-to-quantum particle correlation that is extremely strong. Quantum systems' ability to display correlations between states within a superposition is known as entanglement. Consider two qubits, each of which is in the state |0> + |1> (a superposition of the 0 and 1). We can entangle the two qubits so that one qubit's measurement is always correlated with the other qubit's measurement [7-12].

Comparison between Quantum computing and classical computing:

Classical Computing	Quantum Computing
1) Conventional computing is based on the classical phenomenon of electrical circuits being in a single state at a given time, either on or off.	1) Quantum computing is based on the phenomenon of Quantum Mechanics, such as superposition and entanglement, the phenomenon where it is possible to be in more than one state at a time.
2) Information storage is bit based on voltage or charge etc.	2) Information storage is Quantum bit based on direction of an electron spin.
3) Classical computers use binary codes i.e. bits 0 or 1 to represent information.	3) Quantum computers use Qubits i.e. 0, 1 and both of them simultaneously.
4) No restrictions exist on copying or measuring signals.	4) Severe restrictions exist on copying and measuring signals.
5) Power increases in a 1:1 relationship with number of transistors.	5) Power increases exponentially in proportion to number of qubits.
6) Can operate at room temperature.	6) Requires ultra-cold environment.
7) It has low error rates.	7) It has high error rates.
8) Circuit behaviour is governed by classical physics.	8) The circuit behaviour is governed by quantum physics or quantum mechanics.
9) Well suited for everyday processing.	9) Well suited for tasks like optimization problems, data analysis, simulation, etc.
10) Information processing is carried out by logic gates e.g. NOT, AND, OR etc.	10) Information processing is carried out by Quantum logic gates. E.g. Hadamard, controlled-NOT, Pauli's X, etc.
11) It is large scale integrated multi-purpose computer.	11) It is high speed parallel computer based on quantum mechanics.
12) CMOS transistors are the basic building blocks of conventional computers.	12) Superconducting Quantum Interference Device or SQUID or Quantum Transistors are the basic building blocks of quantum computers.
13) Logic gates are not reversible.	13) Quantum logic gates are reversible.

Advantages of Quantum computing:

1) **They can tackle complex problems-** Quantum computers, according to researchers, will be able to solve complex mathematical problems that ordinary computers are unable to accomplish in a reasonable amount of time.
2) **They are quick-** In the end, quantum computers may be able to provide processing power on a scale that ordinary computers may never be able to equal. Google, for example, claimed in 2019 that it could perform a calculation in approximately 200 seconds that would take a traditional supercomputer 10,000 years to complete.
3) **Computer power beyond imagination-** It provides computing power capable of processing massive volumes of data (2.5 Exabyte per day, equivalent to 5 million laptops) generated all over the world and extracting meaning from it.
4) **Lower power consumption-** Due to the teleportation phenomena known as 'quantum tunnelling,' it can work in parallel and consume less electricity, reducing power consumption by 100 to 1000 times.
5) **Greatest for simulation-** Quantum computers are the best for simulating data. Many algorithms have been developed to simulate diverse phenomena such as weather forecasts, chemical simulations, and so on.
6) **Medicine creation-** These computers are more effective in the medical industry. They have the ability to detect ailments and formulate drug formulas. These computers can be used to diagnose and test a variety of ailments in scientific laboratories.
7) **High privacy-** These computers have strong encryption capabilities and are adept at cryptography. The security of quantum computers cannot be breached. China just launched a satellite that employs quantum computing, claiming that the satellite cannot be hacked.

8) **Employed in the manufacture of radar missiles-** Quantum computing is also used in the manufacture of radar missiles. This technique can help increase the accuracy of radar weapons.
9) **Used in artificial intelligence-** These computers are excellent at artificial intelligence. They can make more precise judgements than regular computers. These computers will allow scientists to do more effective study.
10) **Machine learning-** Machine learning techniques are an excellent way to apply quantum computing. Users can write less code and rely on machine learning to improve results.
11) **No overheating-** It can handle complex problems without overheating since the quantum system is kept cold up to 0.2 Kelvin for stability.
12) **Optimization-** It can quickly handle problems like determining the optimum route and scheduling trains and aircraft. It would also be capable of processing 1 trillion chess moves per second. Quantum computers will be able to break even the most secure and impenetrable encryption systems. It would, however, create hack-proof alternatives.
13) **Industrial revolution-** It has the potential to revolutionise industries ranging from pharmaceuticals to petroleum. It will be able to develop new medications. Financial institutions' marketing algorithms can be enhanced. Artificial intelligence can be improved in the near future.

Quantum Computing's Drawbacks: (Challenges)

1) **Low security and high mistake rate**- the systems are not very secure, and there is always a threat. Furthermore, the mistake rate is extremely high and must be reduced.
2) **The security of the present Internet of Things (IoT) might fall down** due to quantum computer advancements. Databases of government and commercial large corporations, banks, and defence systems can all be hacked using cryptographic techniques. Given these factors, quantum computers have the potential to be disastrous for humanity's future. ***Considering these facts, quantum computers can be terrible for our future.***
3) Secure communication or any type of internet transaction could be cracked, with the data being misused or resold.
4) Today's quantum computers are mostly prototypes that are still huge, difficult, and costly. At the same time, they continue to have a number of issues that their developers have yet to fully resolve.
5) The Quantum Computer will function as a separate device and will not be able to completely replace traditional computers. Because classical computers are superior at certain tasks to quantum computers, such as email, excel, and so on.
6) It has not yet been fully conceived, as only portions of it are being executed and people are still imagining how it will look.
7) Qubits are unable to disregard noise in their native state. As a result, the quantum system is more prone to errors. It has a problem with decoherence. The most difficult problem is figuring out how to deal with any unwanted deviations or noise in quantum computers.
8) It is extremely delicate and prone to errors. Subatomic particles such as atoms and electrons are affected by all kinds of vibrations. Noise, malfunctions, and even failures are conceivable as a result. It causes "Decoherence," or the loss of quantum coherence.
9) **Algorithm creation-** For each type of calculation, a separate algorithm must be written. Quantum computers cannot function in the same way as traditional computers; they require specific algorithms to complete jobs in their environment.
10) **The low temperature required-** Because the processing in these computers is done at a very deep level, a temperature of minus 460 degrees F is required. This is the universe's coldest temperature, and maintaining it is extremely difficult.
11) **Software development-** In addition to hardware, further software development is necessary to construct.

Applications of Quantum computing:

1) **Healthcare sector:**
   a) Research
   b) Diagnostics
   c) Treatment
   d) Drug Design & Development
   e) Full-speed DNA sequencing and analysis
   f) Developing the ideal decision-making aid
   g) Improving imaging solutions
   h) Creating the safest medical data systems ever

2) Cryptography & Cybersecurity

Due to the increasing number of cyber-attacks that occur daily around the world, the online security environment has become rather vulnerable. Quantum computing, along with machine learning, can aid in the development of various strategies to combat these cyber-threats. Quantum computing can also aid in the development of encryption systems, commonly known as quantum cryptography.

3) Finance and Banking:

a) High-frequency automated trading
b) Fraud detection
c) Big data analytics
d) Business optimization, including risk management and compliance
e) Risk profiling, trading optimization, and targeting and prediction.

4) Weather Forecasting:

Currently, typical computers take longer to analyse weather conditions than the weather itself. However, a quantum computer's capacity to crunch large volumes of data quickly and accurately. Meteorologists will be able to develop and analyse more precise climate models with quantum computers, which will provide more insight into climate change and strategies to mitigate it.

5) Machine Learning and Artificial Intelligence

Quantum computing could bring up new possibilities in artificial intelligence, which frequently includes the combinatoric processing of enormous amounts of data to produce better predictions and choices (think facial recognition or fraud detection). Quantum machine learning is an emerging topic of research that identifies ways that quantum algorithms can speed up AI.

6) Automotive sector
7) Energy
8) Advanced Manufacturing
9) Computational chemistry
10) Entertainment and Quantum gaming industry
11) Logistics optimisation
12) Traffic optimisation
13) Industry specific applications
14) Biotechnological development
15) Defence and security sector
16) Various engineering fields applications

And may there be many more.....

Conclusion:

Quantum computing will spawn a slew of new technical applications, opening up new commercial opportunities and assisting in the resolution of some of the world's most pressing problems. Quantum theory's previously unexplored effects can now be employed as a resource in technologies with far-reaching applications, such as secure communication networks, ultra-precise sensors, pharmacological studies of chemical reactions, innovative materials, and fundamentally new computing paradigms. Governments and organizations all around the world, including Google, Microsoft, Intel, Toshiba, and IBM, have been investing heavily in order to realize this potential in recent years. Despite tremendous advances, quantum computing has a number of hurdles, including the difficulty of manufacturing a large-scale quantum computer, the development of novel quantum algorithms, and the cost of construction. Quantum computers have the potential to transform computation by allowing for the solution of previously unsolvable problems. While no quantum computer has yet been developed to perform calculations that a classical computer cannot, significant progress is being made.

Quantum computing encompasses a wide range of concepts, including quantum physics, superconductivity, nanotechnology, and others. Each of them is a complex field that is still in its early stages of development. As a result, creating a physical system that follows the principles of all of these professions is a

monumental task. Quantum computing has enormous potential, allowing us to achieve things that were previously thought to be unachievable with traditional computers.

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Sports Results Prediction Using Supervised Learning

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Abstract-

Different Machine Learning techniques are used to predict the score and outcome of various sports. We have analyzed different model design hypotheses to assess our model's performance which helped us choose the best algorithm to predict the winner of the match. The main algorithm used is logistic regression however, for collating, Support VectorMachine (SVM) and Naïve Bayes has been used.

Predictive analysis has enforced the prediction of success rate of each team depending on the statistics of previous matches or tournaments which would help others to see where they stand andwho their competitors are. Sports managers are striving to model appropriate strategies that can work well for assessing the opponent's potential in a match. The challenge of predicting sports results is based on several parameters and it differs from sport to sport. So, it is important to consider all the essential ones in order to increase the accuracy rather than just focusing on the score to predict the outcome. Also, this area has always been something interesting for sports fanatics, magazine makers and others who are interested in approximating the odds of a game in advance. This system would aid in easy generation of results, display of ranking and regulating the selection of the tournament dates.

Keywords- Logistic regression, Support Vector Machine (SVM), Predictive Analysis

I. Introduction

A system for predicting the results of various sports matches that are based on previous results ofthe team's performance and conduct. We also strive to find accurate probabilities for a home win,a draw, or an away win for each match.

A particularly important element of Data Science in sports like football and cricket is the ability to evaluate a team's performance in games and use that information to attempt to predict the resultof future games based on this data. Outcomes from sports matches can be difficult to predict, withsurprises often popping up. Football is an interesting example as matches have fixed length. It alsopossesses a single type of scoring event: goals that can happen an infinite amount of times duringa match, and which are all worth 1 point. The possible outcomes for a team taking part in a footballmatch are win, lose or draw. Similarly, in cricket, the possible outcomes are same as football. Butthere are many parameters for consideration like teams, runs per over, overall runs, run rate etc. Normally, predictions are done based on goals or runs for respective sport and it can therefore seem quite straightforward to predict the outcome of a game. Traditional predictive methods havesimply used match results to evaluate team performance and build statistical models to predict theresults of future games. For instance, a team with many scoring opportunities could be unlucky and convert none of their opportunities into goals or runs, whereas a team with a single scoring opportunity could score a point. This makes match results an imperfect measure of a team's performance and therefore an incomplete metric on which to predict future results.

Our primary goal is to create a model that predicts outcome of a sports match with sufficient accuracy. This accuracy can be determined by attaining 70% precision when predicting results of the match. More specifically, every match consists of characteristics of the players and thematch and based on these features our algorithms predict the outcome. The outcome is, for example in tennis where zero bit (0) corresponds to a win for Player 1 and one bit (1) a win for Player 2. No draw is possible here. In sports where a draw is possible, other representationsare necessary. In contrast to tennis, a draw is possible in football and cricket, and we have shroud both the scenarios.

Proposed System:

Deliberating the existing system, we have come up with the idea of using multiple classification and regression techniques namely Logistic Regression, SVM, Naïve Bayes, etc and with the helpof few technologies like Weka to anticipate the results. We have considered the factors like scores,home and away team (for any sport), strategies used, time, location (city and country) etc. Using such methods, we have compared as to which

algorithm gives efficient results. As we used previous data sets to train it, the methods would help us easily identify trends and patterns as it understands behavior and historical data. There is no human intervention(automation) in this approach. There is continuous improvement as the algorithm learns to make more accurate predictions faster. It can also handle multi-dimensional and multi-variety of data, and they can dothis in dynamic and uncertain environment. Our research will hopefully be informative and use tothose performing future research in this application area.

Challenges

The following are several challenges on the path to achieving the objectives:

- Data availability & quality.
  Finding a public database of the sports data with the necessary statistical depth to generate expected goals metrics is an essential part of the project. However, the leading sports data providers do not make their information publicly available. We did scour various public databasesto find one that is suitable for us to use. The alternative approach in the case where we do not finda suitable database would be to find websites displaying the required data and using web scrapingtechniques to create our own usable database.
- Research and understanding of prediction landscape.
  In order to design our models and test different hypotheses, we undertook a thorough backgroundresearch of prediction techniques and develop a mathematical understanding of various Machine Learning algorithms that have been used for our predictions.
- Testing different models and parameters.
  An important challenge has been to make the model training and testing tasks as quick and easy as possible, in order to test and compare different models. A robust pipeline will have to be builtto enable us to find the best possible models.

II. Literature Survey

Machine learning (ML) is one of the intelligent methodologies that have shown promising resultsin the domains of classification and prediction. One of the expanding areas necessitating good predictive accuracy is sport prediction, due to the large monetary amounts involved in betting. In addition, club managers and owners are striving for classification models so that they can understand and formulate strategies needed to win matches. These models are based on numerousfactors involved in the games, such as the results of historical matches, player performance indicators, and opposition information.

One of the common machine learning tasks, which involves predicting a target variable in previously unseen data, is classification. The aim of classification is to predict a target variable (class) by building a classification model based on a training dataset, and then utilizing that modelto predict the value of the class of test data. This type of data processing is called supervised learning since the data processing phase is guided toward the class variable while building the model. Some common applications for classification include loan approval, medical diagnoses, email filtering, among others. Sport prediction is usually treated as a classification problem, with one class (win, lose, or draw) to be predicted.

In sport prediction, large number of features can be collected including the historical performanceof the teams, results of matches, and data on players, to help different stakeholders understand theodds of winning or losing forthcoming matches. The decision of which team is likely to win is important because of the financial assets involved in the betting process; thus bookmakers, fans, and potential bidders are all interested in approximating the odds of a game in advance. Once a predicted result for the match is obtained, an additional problem is to then decide whether to bet on the match, given the bookmaker's odds. In addition, sport managers are striving to model appropriate strategies that can work well for assessing the potential opponent in a match. Therefore, the challenge of predicting sport results is something that has long been of interest to different stakeholders, including the media. The increasing amount of data related to sports that is now electronically (and often publicly) available, has meant that there has been an increasing interest in developing intelligent models and prediction systems to forecast the results of matches.

In this proposal, a critical survey of the literature on ML for sport result prediction, focusing on the use of Logistic Regression for the given problem is provided. Several studies have used many otherapproaches but using classification model and comparing them with other efficient algorithms likeBayesian networks, K Means, Support Vector Machine, Generalized boosted models(GBM) etc helped us in providing which is the best way to achieve the predicted outcome in order to derive highly accurate classification models in other domain.

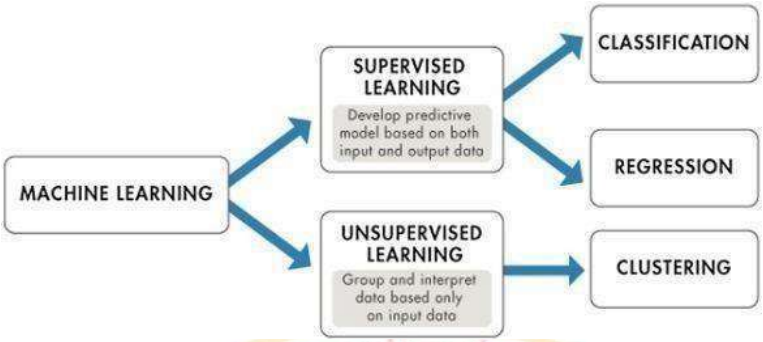


Fig1: Machine learning Algorithms: The above diagram shows different algorithms insupervised learning and unsupervised learning.

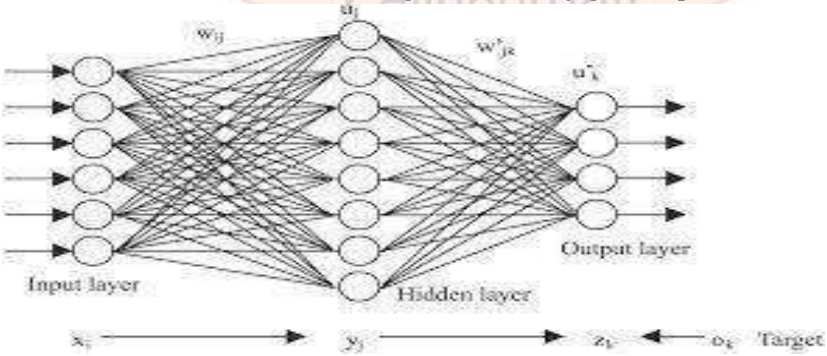
Existing Solutions

This paper's objective by authors Li Yan-Xia, Li Lin, Wang Qiang is to improve the managementlevels of college sports work in the new era, that will proportionally affect the party's education policy, if it is extensively implemented. It also strives to improve the scientific level of college sports management work to achieve maximum operation by providing a useful reference.

Design and development of this system allows us to enter the world of office automation. In the system described above; it is composed of seven modules: sports teaching, physical fitness tests, sports competitions, extra-curricular sports activities, files management, professional team training, venues and equipment management, etc.

Rory P.Bunker and Fadi Thabtah have developed via ANN i.e., Artificial neural networks recentlywhich showed good results. They have used unsupervised learning methods as well to distinguishbetween good and poor teams.

Artificial Neural Networks (ANNs) are perhaps the most applied approach among ML mechanisms to the sport result prediction problem. An ANN usually contains interconnected components (neurons) that transform a set of inputs into a desired output. The power of ANN comes from the non-linearity of the hidden neurons in adjusting weights that contribute to the finaldecision. ANN output often relies on input features and other components associated with the network, such as these weights. Weights associated with interconnected components are continuously changing to accomplish high levels of predictive accuracy. These changes are performed by the ANN algorithm to fulfil the desired model's accuracy given earlier by the user.An appealing feature of ANNs is that they are quite flexible in terms of how the class variable is defined whether it is probability of victory or whether two classes are used with home goals and away goals represented in the two various classes.



(Fig: 2.2.1) Artificial Neural Networks: The above diagram represents a simple artificial neural network with one hidden layer.

Data from the first eight rounds of the competition and five features were used, consisting of yardsgained, rushing yards gained, turnover margin, time of possession, and betting line odds. Unsupervised methods based on clustering were used to distinguish between good and poor teams.An ANN with backward propagation (BP) was then used.

Purucker achieved 61% accuracy compared with 72% accuracy of the domain experts. The BP algorithm was found to be the most effective approach. A limitation of this study is that only a relatively small number of features were used.

Kahn extended the work of Purucker and achieved greater accuracy, performing slightly better than experts in the NFL who were making predictions on the same games. Data on208 matches inthe 2003 season were collected. The features that were used were total yardage differential, rushingyardage differential, turnover differential, away team indicator and home team indicator. There were two classes: away team outcome and home team outcome – a value of1 indicating that the team lost the match, and a value of +1 indicating that the team won the match. The problem was treated as a classification problem. The first 192matches were used as the training data set, and the remaining rounds (week 14 and 15) were used as the test set. Through testing, a network structure of 10-3-2 was found to be optimal. Accuracy of75% was achieved across the week 14 and 15 matches. The results were compared to the predictions of eight sports casters fromESPN.com. Across the same matches, the domain experts predicted an average of 63% of matches correctly.

Related Work Classified by Sport

FOOTBALL

Football is perhaps the World's pre-eminent sport, so it is not surprising that there has been a substantial amount of research on football prediction. Among all sports, football prediction is oneof the most widely and deeply researched area. We thus survey prediction related researches for football, a representative of the sports as our target domain, and categorize them into a few groups. These studies mostly deal with mathematical/statistical models or methods but there are a few researches based on machine learning techniques.

Statistical analysis has been done on football prediction. Many researchers suggested their own models or processes to analyze the results of football matches. They usually showed that their methods represent the results of football matches well. Many models and methods, like Poisson regression models, a logistic regression model using seed positions, and an updating process for the intra-match winning probability, were used to analyze the results of football matches. Most ofthese works also give some predictions as well, but they are more focused on statistical analysis of the results of football matches. The technique was based on a Poisson regression model but wascomplicated by the data structure and the dynamic nature of teams' performances.

The author study multiple techniques in data mining and result prediction to devise a good modelfor predicting matches. They use these major models: GBM (Generalized Boosted Models) and NB (Naive Bayes).

II. Naive Bayes

For Bayesian networks, we handle the uncertainty and formulize the sports strategies using a rule-based reasoner, but at the same time the strategies of a team or a player can be represented by crisplogic rule through which highly scholastic results are obtained.

All these studies relied on previous match results that is win/draw/lose or scores as training data and forecasted the results of a league or tournament matches. The expert NB also relied on information about the playing status of key players and on home ground advantage.

Their results of football prediction using FC Barcelona in 2008- 2009 they split their data set intonon psychological factors such as record of 5 previous matches weather conditions, results for or against team, players mean age, number of key players injured, mean number of goals scored in home and away fixtures.

III.GBM

Using GBM they attain 60% accuracy on an average, while the other models weren't accurate. Tofurther improve the results, more data and statistics can be considered such as opponent's team overall form in that season. Head to Head results and info about each team previous games.

They proposed a logistic regression model in 2016 Barclay's premier league match results with anaccuracy of 40.5. This was developed using4 significant variables: Home defines, home offense, away offense, away defense. The only limitation is only, one team was taken into consideration for predicting the outcomes. The author presents an approach to estimate football match results with neural networks, initially they classified the match into different categories using learning vector quaternization.

Neural Network has been used to determine the strength contrast between two opponents. They used specific Back propagation networks on data that have been designed according to classifyingresult.

We proposed a model to predict outcomes of football matches in English premier league. We trainthe final dataset on various machine learning classifiers and compare the performances of each classifiers and choose the one which yields the best results. We could bring in sentiment analysisand features such as individual player and team performance metrics, studying the trending hashtags on Twitter on match day to further enhance the accuracy of the model.

Statistical analysis forms one of the major strands on football predictions, they generally aim to show that their models or methods represent the results of football matches well; they should fit well. Many models and methods such as Poisson Regression Model, Logistic Regression Model using seed positions were used to analyze and interpret the results. Some of the works in this areatook more statistical approaches in predicting football matches. They use littleknowledge/information and are heavily based on pure statistical models, such as an ordered probity model and Poisson models.

A critical analysis of the literature in machine learning focusing on the application of artificial neural networks is done through this paper. In doing so, we identify the various data sources, learning methodologies, appropriate means of model evaluation and finally the specific challengesof predicting sports results. This is also one of the expanding areas which provide us a good predictive accuracy due to the large monetary amounts involved in betting and gambling.

CRICKET

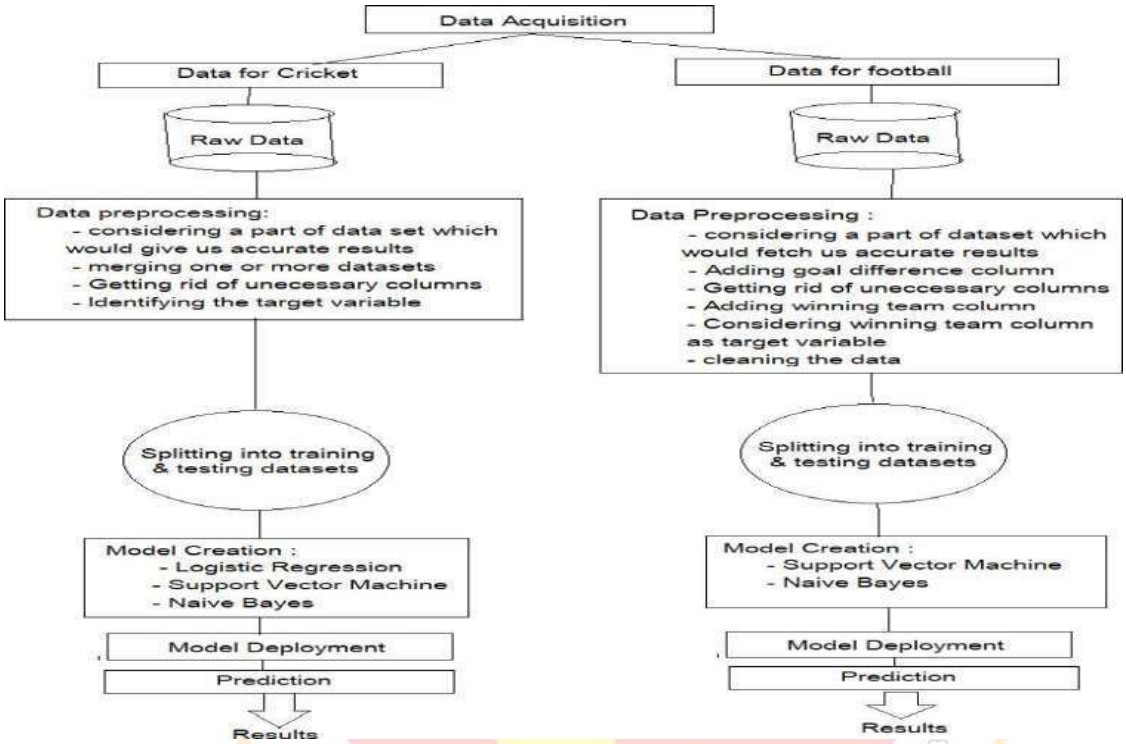
In literature, Duckworth and Louis proposed a solution called DL method to reset targets in rain interrupted matches which was adopted in the international cricket council 1998. It also consists of players performances, optimal batting order, strength of the opponent team and the performanceof their batsmen and bowlers. Various factors affecting the game, including home team advantage,day and night effect, toss etc. uses Bayesian classifier to predict the outcome of the match. We have modern classification techniques- Naive Bayes, Random Forest, Support Vector Machines.

Linear regression and nearest neighboring clustering algorithms conducted a comparative study based on their outcomes and performances. They take both the historical data and instantaneous state of the match while the game is in progress. A separate model for each team is prepared in which each team is analyzed. Random Forest is an ensemble method used for classification, regression and other tasks that operate by constructing many decision trees during training phase in classification, the output is the class which is the mode of the classes predicted by the individualtress. While in regression, mean prediction of individual trees is given as final output. This has anadvantage of correcting the flaw of decision trees which tend to overfit the training set with respectto every other team. The reason behind this is to avoid any duplicate data entry.

III Design Of The Proposed System

System Design (Block Diagram)

We explain the general design of our model and how we attacked the problem, providing a few flowcharts to help simplify the representation. Once the input dataset has been pre- processed, it is split into two features sets; one feature set that concerns features related to thehome ground and another one for the away team features. Once the dataset is split, a numberof different learning algorithms are applied on the two feature sets to derive predictive models for the match result. These models are then compared to seek the one that can be utilized for forecasting upcoming match results.



Data Set Description

Football

We have considered 4 datasets, to predict the FIFA 2018 Tournament match results. Theyare, namely: Fifa_rankings, World Cup 2018 Dataset, Fixtures and the Results datasets. Wehave obtained them from Kaggle, which has an abundant amount of data and resources, and played a huge part in achieving our goal.

i. **Fifa_rankings**: This dataset contains all available FIFA men's international soccerrankings and includes 211 teams. It includes features like the position, team name and the points scored by each team and has a size of 4.23KB with 3 columns and 211 rows.

ii. **World Cup 2018 Dataset**: This is the dataset that contains the history of all previous matches, scores and titles of all participating teams to help us predict whowill qualify and predict who will win. It also has all the participating teams, and thematch schedule with orders of the matches. The dataset contains 32 entries, each team will have 3 matches in the group stage, so each match is mentioned vs whom,the history between those 2 teams with wins minus losses. It has a size of 3KB.

iii. **Fixtures**: This dataset has all the individual match locations, the home team and away team names, the date the match took place and which group they belong to. Ithas 6 columns and 64 rows, amounting to a size of 1MB.

iv. **Results**: This dataset includes 38,903 results of international football matches starting from the very first official match in 1972 up to 2019, totaling up to 2.63MB.The features exists are date, home_team, away_team, home_score, away_score, tournament, city, country, and the matches range from FIFA World Cup to FIFI Wild Cup to regular friendly matches.

Cricket

In the case of cricket, we have reviewed three datasets, to predict the IPL 2016 match results. They are, namely: Matches, Deliveries, and Results. Like football datasets, we haveobtained them from Kaggle.

i. **Matches:** This dataset describes features like city, date, team1, team2, toss_winner, toss_decision, result, winner, win_by_runs, win_by_wickets, venue, and the umpires. It contains 636 rows and 15 columns having a total size of 114 KB.

ii. **Deliveries:** This particular dataset has the innings, batting and bowling team, overs, balls, batsman, bowler, the various kinds of runs scored, and the players dismissed.It has more than 1.5Lakh records with 20 columns and a size of 15MB.

Description of modules

Steps followed to obtain the results are.

i. Importing packages
ii. Loading the dataset
iii. Performing data exploratory analysis for semifinal
iv. Training and Testing the dataset
v. Prediction based on criteria

IV Results

Detailed report of the result going for semifinals

Brazil and Portugal
Winner: Brazil
Probability of Brazil winning:0.348
Probability of Draw: 0.262
Probability of Portugal winning: 0.191

Germany and Argentina
Winner: Germany
Probability of Draw:0.243
Probability of Argentina winning: 0.242
Detailed report of the result going for semifinals
Germany and Brazil
Winner: Germany
Probability of Germany winning: 0.200
Probability of Draw: 0.280
Probability of Brazil winning: 0.519
The winner is predicted as Germany using support vector machine (SVM)

V Conclusion And Future Scope

In this report, we presented a sports data mining approach to predict the winners of various games. Instead of using the traditional approach of comparing the statistics of the two competing teams and projecting the outcome, our approach predicts the outcomes based on the historical results of games. The competing teams are compared to other teams and game results are pulled from thosesimilar teams and used in predicting their winning probability.

In the future, this project can be extended by taking player's statistics for more accurate analysis on the algorithms we have worked on and we can also use many other algorithms and approachesto improve the

accuracy of the prediction like Naive Bayes algorithm with principle component analysis, artificial neural networks, and many other algorithms. We can also improve the performance of the current implementation related to both, feature creation and model training aswell as the prediction. In terms of future addition to the project, this project could be implementedas a web application and the same strategy for predicting the results can be used for other sports as well. In coming years, E-sports will be the biggest sports around, hence, predictions play a major role to keep the audience engaged.

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Compressing and de-noising of Biomedical Signals

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Abstract

Compressing and de-noising signals of ECG (Electrocardiograph), EEG (Electroencephalograph), GSR (Galvanic skin response), EOG (Electrooculography) and EMG (Electromyograph) is important in signal processing. Several steps are involved to process biomedical signals, among which the first step related to pre-processing, in which a noisy signal is processed for generating noise-free signal, which can be utilized for further operations. This work gives a detailed understanding of de-noising techniques those have been used. These techniques utilize the benefits of artificial neural networks (ANN), adaptive filtering, Remez Exchange Algorithm and finite impulse response (FIR) filtering. These techniques have been implemented for de-noising of biosignals, individually as well as combining with other techniques, for better results. The application of the method to simulated and biomedical signals shows its potential.
Keywords : Biomedical signals, anolog, digital, FIR Filters, Remez Exchange Algorithm

1 Introduction:

Biomedical instrumentation is the branch of Medical Sciences where the medical instruments are to be studied. Biomedical instruments are used to record, analyze & process the biomedical signals. Biomedical signals are extracting the information from biological systems like brain, muscles or heart etc, under investigation. The extracting information may be so simple to note the pulse rate of a person from wrist or so complex like analyzing the information from heart by using ECG. There are various sources for extracting signals from the biological system [1-2].

They are:

i. Bioelectric signal:- ECG (Electrocardiograph), EEG (Electroencephalograph), GSR (Galvanic skin response), EOG (Electrooculography) and EMG (Electromyograph) are the bioelectric signals. These signals are generated from the nerve cells or muscle cells. These signals are collecting from the cell membrane potential which may be excited under certain conditions to generate an action potential.

ii. Bioacoustic Signals:- Lung sounds, heart sounds, bowel sounds, and joint sounds are the bioacoustic signals generated from the human body in easy and noninvasive way during its working.

iii. Biochemical Signals:- Neurotransmitters are the chemical messengers from the body that control and regulate the body. These signals are extracted from the chemical measurement of living tissues & samples which are taken from living being.

iv. Biomechanical Signals:- This signals are extracted from some mechanical function of the biological system. The flow of blood & pressure signals, all types of motion & displacement signals are the example of the biomechanical signals.

v. Biomagnetic Signals:- MMG (Mechanomyogram) or MEG (Magneto-encephalogram) are the examples of biomechanical signals which are observed from the surface of muscles when it is contracted. Biomagnetic signals are obtained from the magnetic field produced by electrical currents occurred naturally in the brain of the living things.

vi. Bio-optical Signals:- Bio optical signals can observe either naturally or the signals may be introduced to measure a biological parameter with an external light medium.

vii. Bio-impedance Signals:- An electrical impedance signal can be obtained due to the changes in blood volume or blood resistivity from human being.

The biomedical signals are extracted from the biomedical instruments. Therefore it is useful to study of biomedical instruments.

2. Significance of Biomedical Signals

Biomedical signals are the collection of electrical signals acquired from any organ. This signal is normally a function of time. It may be in terms of its amplitude, frequency and phase. The analysis of these signals is very important for researchers as well as for careful medical diagnosis. It is also essential for proper treatment of

patients. If the signals are not properly diagnosed and analyzed, it will lead to wrong diagnosis and can be dangerous for the lives. Careful analysis of biomedical signals such as ECG, EMG, and EEG are very important for proper diagnosis of disease. These signals are noisy as well as artefacts which have to be removed for proper treatment of a patient. Presently, extensive efforts and research have been done in this area for developing better algorithms, upgrading existing methodologies, improving detection techniques to reduce noise, and to acquire accurate biosignals [3-4].

3. Sources of errors and significance of reduction of noise

Accurate measurement of biomedical signals depends on the properties of electrodes and its interaction with the skin, amplifier design and the conversion and subsequent storage of the biomedical signal from analog to digital form. Biomedical signals are influenced by electrical noise and some other factors.

3.1 Electrical noise and factors influencing biomedical signal:

The amplitude of biomedical signals is very small before being amplified. Biomedical signals collecting from any organ acquire noise while traveling through different tissues or blood vessels. Therefore it is important to understand the characteristics of the electrical noise. The electrical noise, which will be affected biomedical signals, can be categorized into the following types [5-6]:

i. Power line interference
ii. Base line drift
iii. Electrode contact noise
iv. Motion artifacts
v. Muscle contraction
vi. Instrumentation noise generated by electronic devices
vii. Electrosurgical noise

Power line interference and base line drift: This noise could be occurred due to stray effect of the alternating current and loose contact of the electrodes to the patient as well as faulty electrodes. This error can cause due to power line interference or not properly earthen measuring instruments and the patients. This noise is reduced by using notch filter [7].

Inherent noise in electronics equipment: This noise is induced by the electronics equipments and cannot be eliminated. But it can be reduced by using high quality electronic components.

Ambient noise: This type of noise is procreated by the electromagnetic radiation from the surfaces of our body. It is almost impossible to avoid this. The ambient noise may have the amplitude that is one to three orders of magnitude greater than the biomedical signal.

Motion artifact: There are two major sources of motion artifact:

1) The electrode contact with the surface of our body and
2) The cable of electrode.

Motion artifact can be reduced by properly designed set up of the electronic circuitry.

Inherent instability of signal: The amplitude of biomedical signal is random in nature. It is influenced by the firing rate of the motor units. In most of the situation, firing frequency region is of the order of 0 to 20 Hz. This class of noise is considered to be unwanted and therefore there is a need of removal of the noise [4].

Electrosurgical noise: Electrosurgical noise is procreated by different medical equipment present within the patient care environment at frequencies between 100 kHz and 1 MHz, lasting for about 1 to 10 seconds [8]. The electrosurgical noise completely destroys the ECG signal and is presented in large amplitude [5].

The specific requirement of biomedical amplifiers [9];

- ECG amplifier
  - Frequency range is about 0.05- 100Hz.
  - Safety and protection: leakage current below safety standard limit of 10 μA.
  - Electrical isolation from the power line and the (earth) ground.
  - Safety against high defibrillation voltages.

- EEG amplifier
  - Gain must deal with microvolt or lower levels of signals.
  - Components must have low thermal and electronic noise.
  - Other factors are similar to ECG.
- EMG amplifier
  - Slightly improved amplifier BW suffices.
  - Post-processing circuits are always needed (e.g. rectifier and integrator).
- EOG amplifier
  - High gain with very good low frequency or even DC response.
  - DC-drifting electrodes should be selected with great care.
  - Often active DC or drift cancellation or correction circuit may be necessary.

From the above background, it seems that the quality of biomedical signal can be improved by-

a) Design the instrumentation amplifier with increase in Signal to Noise ratio (SNR), high common mode rejection ratio (CMRR), low input referred noise voltage and low dc offset as well as very low power consumption.

b) The distortion of biomedical signal must be as small as possible by avoiding unnecessary filtering, notch filters and distortions of signal peaks.

4. Techniques used for reduction of noise

The amplitude of biomedical signals is very small. Therefore it is easily contaminated by noise. Due to noisy signal, there may be misleading of diagnosis and hence it is necessary to reduce noise from the original signals. Exclusive amplifiers designed with specific features and various filter circuits are used for reduction of noise from the biomedical signals.

***Table 1.1: Electric potentials of biomedical signals* [9]**:

Biopotential	Frequency Range	Signal Amplitude	Electrode
Electrocardiogram (ECG)	0.05 - 100 Hz	1 - 5 mV	Surface
Electromyogram (EMG)	20 - 2000 Hz	0 - 10 mV	Surface, needle
Electroencephalogram (EEG)	0.5 - 40 Hz	0.001 - 0.01 mV	Surface
Electro-oculography (EOG)	DC -10 Hz	0.01 - 0.1 mV	Contact
Action potential of neurons	0 -10 KHz	50 - 90 mV	Glass pipette

4.1 Exclusive amplifiers:

The biomedical signals are extracted from organ of human beings and it is the input to the amplifier. This input consists of five components:

i. The desired biopotential,
ii. The undesired biopotential,
iii. A power line interference signal of 50 Hz (60 Hz in some countries) and its harmonics,
iv. Interference signals generated by the tissue/electrode interface, and
v. Noise.

Essential factors to be considered for measuring equipments [8]:

- High amplification
- High CMRR (High differential gain and low common mode gain)
- High input impedance
- Low Noise
- Stability against temperature and voltage fluctuations
- Electrical safety, isolation and defibrillation protection.

Therefore proper design of the amplifiers is the extensive task. Table 1.2 shows the biopotential amplifiers design consideration for various biomedical signals.

Table 1.2 Biopotential amplifiers design consideration [10].

Biopotential	Exclusive amplifier design consideration	Additional features desired
ECG	Moderate gain, Bandwidth, noise, CMRR, Input Impedance	Electrical safety, isolation, defibrillation protection
EEG	High gain, very low noise filtering	Safety, isolation, low electrode-skin resistance
EMG	Gain and bandwidth of Op-Amps	Post acquisition data processing
EOG	DC and low drift	Electrode-skin junction potential. Artifact reduction

Now many companies are used CMOS technology for designing of high performance amplifiers, which provides increase in gain and CMRR along with low power consumption [4]. Along with high performance amplifiers, various filter circuits are also used for reduction of unwanted signals or noise. These filter circuits are classified in number of ways:

i. Analog or digital Filters
ii. Passive or active filters
iii. Audio (AF) or radio frequency (RF) filters

4.2 Analog filters

Analog filters are designed to processed analog signals, while digital filters are processed analog signals using digital techniques. Op Amp based active filters are called analog filters. Passive filter uses passive elements such as resistors, capacitors and inductors, while active filter employs transistors or operational amplifiers in addition to the resistors and capacitors. RC filters are commonly used for low frequency signals or audio signals, whereas LC or crystal filters are used for high frequency signals or radio frequency signals. The crystal provides more stable operations at high frequency due to high value of figure of merit. In audio frequencies, inductors are not used because it is bulky, expensive and may dissipate more power. It also emits magnetic field [11].

Active filters offer the advantages over passive filters:

a) Gain and frequency adjustment: The operational amplifier is capable of providing desired gain. Therefore input signal is not attenuated. Frequency response of active filter is excellent.
b) No loading problem: The active filter uses Op Amp having high input resistance and low output resistance and therefore it does not cause any loading effect.
c) Cost: Usually active filter is more economical than the passive filter. Because the circuit uses Op Amp which is not expensive and the absence of inductor.

Although active filters are most widely used in communication system and signal processing. Active filters are more extensively used in telephone, radio, television, radar, space satellites and **biomedical instruments**. The most commonly used filters are;

i. Low pass filter
ii. High pass filter
iii. Band pass filter
iv. Band reject filter
v. All pass filter

4.3 Digital Filters

Digital filters are important class of Linear Time Invariant (LTI) digital signal processing (DSP) systems. It is designed to modify the frequency characteristics of the input signal x (n). Digital filters are extensively used because of certain advantages over Analog filters. Digital filters have the potential to achieve much better signal to noise ratio than Analog filters. Digital Filters have emerged as a strong option for removing noise, shaping spectrum and minimizing Inter-Symbol Interference (ISI) in communication architectures.

Digital Signal Processing (DSP) is used in video compression, digital set-top box, cable modems, digital versatile disk, portable video systems/computers, digital audio, multimedia and wireless communications, digital radio, digital still and network cameras, speech processing, transmission systems, radar imaging, acoustic beam formers, global positioning systems, and biomedical signal processing. The field of DSP is always been driven by the advances in DSP applications and in scaled Very-Large-Scale-Integrated (VLSI) technologies [12].
The design of digital filter involves five steps [13]:

i. Filter Specification
ii. Coefficient calculation
iii. Realization
iv. Analysis of Finite word length Effects
v. Implementations

Digital Signal Processing Systems (DSPS) relate input signals x (n) to the output y (n). The relationship between the output sequence of this system and may be represented by the operator as y (n) = F [x (n)]. The Fig. 1.1 shows Discrete-time signal representation.

Figure 1.1: Discrete-time signal representation.

4.4 FIR Filter [14];

FIR filter is a digital filter without feedback. The block diagram of FIR filter is shown in the Fig. 1.2. If x (n) is the input at n^{th} time, and $x\,(n-1)$ is the delayed input then the filter output $y\,(n) = x\,(n) + x\,(n-1)$,

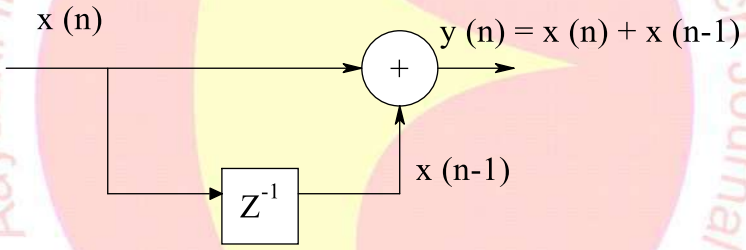

Figure 1.2: *A simple FIR filter*

The general transfer function of an FIR filter in the z transform is given by

$$H(z) = \sum_{l=0}^{M} b_l z^{-l} = H_0 z^{-M} \prod_{l=0}^{M} (z - z_l) \qquad (1)$$

A filter with the above transfer function will be always stable, i.e. an input of finite amplitude will lead to an output that is also finite. This can be inferred from the location of the poles in the z-plane (the two-dimensional plane formed by plotting the real part of z along the abscissa, and the imaginary part along the ordinate). The poles correspond to the points in the z-plane where the denominator of *H (z)* is zero; their counterparts are the zeros, where the numerator becomes zero. For the FIR filters, all poles are at the origin (z= 0), and the zeros are at the z_l in the equation above. When the poles of a transfer function are within the unit circle (i.e. $|z| < 1$), then filter is stable; this clearly stated that the case of FIR filters.
The advantage of FIR filters is that they can be designed to have linear phase. FIR filters have a linear phase response if and only if its impulse response is symmetric or anti-symmetric, that is $h\,(n) = \pm\, h\,(M - n)$. Such filters may introduce delay in the output signal with respect to corresponding input signal, but all frequencies are delayed by the same amount. These filters thus distort the features of the signal that are not linear in their phase-response.

FIR filters can be designed by using optimization packages or by using approximations to the ideal infinite-impulse responses by cutting the finite length using the different types of tapered windows. The main drawback of FIR filters is that in order to satisfy demanding specifications, FIR filters require a relatively high

number of multiplications, additions and storage elements or large memory space. This makes FIR filters potentially more expensive than IIR filters in applications where the arithmetic operations or storage elements are costly, or need to be limited in number. FIR filters has the benefit of achieving linear phase, this motivates the widespread use of it.

4.5 FIR Filter Designing Methods:

Basically FIR Filter has three methods of designing [15] :

i. Window Method
ii. Frequency Sampling Method
iii. Optimal Method (Remez Exchange Method)

4.5.1 Window Method:

The impulse response *h (k)* is related to the inverse Fourier transform of *H (ω)*. In this case, the pair of transformation is used which couples discrete time domain signals (sequence of samples) with a continuous spectral description.

Discrete Time Fourier Transformation is represented by the equation,

$$H(\omega) = \sum_{k=-\infty}^{\infty} h(k) e^{-j2\pi fTk} \qquad (2)$$

There are many types of window functions:

i. Kaiser Window
ii. Hamming Window
iii. Hanning Window
iv. Rectangular window
v. Blackmann window

By using Kaiser Window, it is quite possible to obtain separate control upon length or order of Filter. In Kaiser Window, there are two main parameters, the length of window and the shape parameter β. An important advantage of the window method is its Simplicity. It is simple to understand and simple to apply. It involves a minimum amount of computational efforts. The major disadvantage of it is its lack of flexibility.

The window method uses the Fourier series in conjunction with a class of functions known as window functions.

4.5.2 Frequency Sampling Method [15]**:**

When a desired frequency response has been specified, then the frequency-sampling method for FIR filter design is used which is the simplest and most direct technique. It consists of uniform sampling of the desired frequency response, and an inverse DFT technique is used to obtain the corresponding finite impulse response. But the results are not optimal because the response generally deviates from what is desired between the samples. When the desired frequency-response is under sampled then the resulting impulse response will be time aliased to some extent. It is important to evaluate the final impulse response by the use of a simulated DTFT (FFT with lots of zero padding) comparing to the originally desired frequency response.

4.5.3 Remez Exchange Algorithm [16]:

The Remez Exchange Algorithm is a standard method for filter designing. It minimizes the filter length and error between desired frequency response and actual frequency response. The Error function is defined as the difference between the ideal filter response and the practical filter response.

The magnitude of the error $|E(\omega)| = |W(\omega)[D(\omega) - P_c(\omega)]|$

Where

$D(\omega)$ is the ideal filter response or desired filter response,
$P_c(\omega)$ is the actual or practical filter response and (3)
$W(\omega)$ is the weight function.

The Remez algorithm is not a general linear programming approach, but it is very robust, converges very rapidly to the optimal solution, and is widely used.

Optimal Filter Design Method is used to design a filter, in which filter coefficients are adjusted again and again until a particular error is minimized. The various methods of optimal filter design are as follows:

i. Least square method.

ii. Equiripple method.
iii. Maximally flat.
iv. Generalized equiripple.
v. Constrained band equiripple.

5. Results and discussion

We started working with digital filter like FIR filter. We found that the source of noise doesn't have any fix band of interference, so we were planned for adaptive filtering algorithms. The algorithms differentiate in a way of updating the coefficient (h) of filter sample by sample inputs. After an extensive experimentation over the adaptive algorithms, it is observed that the performance of filters depend on the SNR values of input signal, μ value (Step size), number of taps and other factors. Finally, we choose Artificial Intelligent based filtering algorithms for dynamic solution. These techniques have only two processes- training and testing. Training process based on subset outcomes of adaptive filtering algorithm in initial stages, which may not require in later time even on change of source input as well, called trained filter / smart filter. Such intelligent filters give the freedom of selection of signal with different SNR values; also not bother about number of parameter settings which lead one more step towards the auto filter concept. The goal of our proposed work is to develop an algorithm which will use for removing noise excellently.

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Noise Reduction of Electromyography (EMG) signals by Artificial Neural Network (ANN) Technique

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Abstract

Electromyography (EMG) signals can be used for clinical/biomedical application and modern human computer interaction. EMG signals acquire noise while traveling through tissue, inherent noise in electronics equipment, ambient noise, and so forth. In this paper, it is shown that a Focused Artificial Neural Network ANN can elegantly solve to reduce the noise from EMG signal. It is seen that the performance of the proposed ANN clearly outperforms the best techniques. It is observed that ANN Filters work excellently as compared to adaptive filters and also observed that as the number of testing samples of biomedical signals.

Keywords: EMG, SNR, MSE, MATLAB, ANN

1 Introduction:

Biomedical signals are the collection of electrical signals and analysis of these signals is very important for researchers as well as for careful medical diagnosis. It is also essential for proper treatment of patients. If the signals are not properly diagnosed and analyzed, it will lead to wrong diagnosis and can be dangerous for the lives. Careful analysis of biomedical signals such as ECG, EMG, and EEG are very important for proper diagnosis of disease. These signals are noisy as well as artefacts which have to be removed for proper treatment of a patient. Presently,extensive efforts and research have been done in this area for developing better algorithms, upgrading existing methodologies,improving detection techniques to reduce noise, and to acquire accurate bio-signals [1-4].

The EMG signal is a biomedical signal that measures electrical currents generated in muscles during its contraction representing neuromuscular activities. The nervous system always controls the muscle contraction and relaxation. Hence, the EMG signal is a complicated signal, which is controlled by the nervous system and is dependent on the anatomical and physiological properties of muscles. EMG signal acquires noise while traveling through different tissues. The main reason for the interest in EMG signal analysis is in clinical diagnosis and biomedical applications. So far, research and extensive efforts have been made in the area, developing better algorithms, upgrading existing methodologies, and improving detection techniques to reduce noise and to acquire accurate EMG signals. Noise removal from noisy EMG signal is a filtering problem. Here the Neural Network model is trained to separate known noise from EMG signal. Neural Networks (NNs) have been efficiently used for nonlinear multivariable function approximation [5-7].

The main objective of our research work is to develop artificial intelligent model for reduction of noise from biomedical signal. This paper deals with intelligent removal of noise from the EMG signal using ANN-based Techniques.

2. Experimental : Performance measures by using following two factors**;**

i) Signal to Noise Ratio (SNR):

The output SNR (SNR_{out}), is calculated from power of the input signal x (n) and an noise signal e (n) and is given by,

$$SNR_{out} = 10 \ Log_{10} \left[\frac{\text{Signal Power}}{\text{Noise Power}} \right]$$

Where, SNR_{out} is the ratio of the two powers expressed in decibels.

ii) Mean Square Error (MSE)

The formula for the mean square error is given by,

$$MSE = \frac{1}{N} \sum_{i=1}^{N} \left(\hat{y}_i - y_i \right)^2$$

Where, N = number of samples in the set of data,

y_i = Actual network output, and

$\hat{y}_i$ = Desired network output.

2.1 Experimental Arrangement

i) Database Descriptions:

To design ANN Model, a sufficiently large amount of data is required for training and testing. We have collected standard data bases for biomedical signal from the https://physionet.org, http://www.emglab.net and etc.

ii) Software Specification Requirement: MATLAB:

MATLAB is very rich in command toolbox. Although MATLAB is intended primarily for numerical computing, an optional toolbox uses the MuPAD, symbolic engine, allowing access to symbolic computing capabilities. Matlab for designing artificial intelligent model. MATLAB has enormous Toolboxes. Out of which, we used Signal processing toolbox, Neural network toolbox, Fuzzy logic toolbox, Filter design toolbox, Curve fitting toolbox, and Data based toolbox for design the filters [8-9].

In this paper, we have simulated the MATLAB codes for the data conversion, adaptive filter algorithm, artificial intelligent ANN Model training and its testing.

iii) Software Implementation details:

The GUI has been constructed by using Matlab codes. Other set of codes have been used to run the various algorithms for noise removal in Matlab simulator. The main GUI contains four parts as shown in the following Fig. 1.1.

1] File input and its conversion
2] Adaptive filter algorithm and its Input parameter section
3] Output parameters section
4] Artificial intelligent noise removal section.

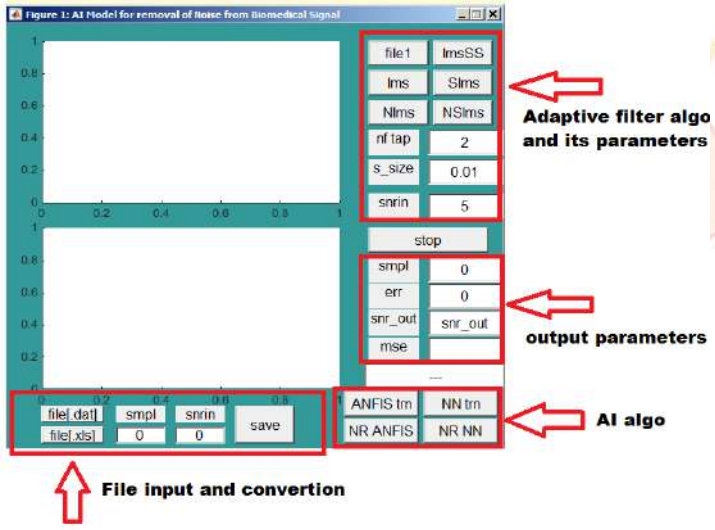


Figure 1.1: Artificial Intelligent Model for reduction of biomedical signal

2.2 Artificial intelligent noise removal algorithm: We have designed an artificial intelligent model for removal of noise from the biomedical signal by using Matlab coding on the basis of Sugeno architecture and run the

programme which creates graphical user interface. The Fig. 1.2 shows the block diagram of proposed artificial intelligent model.

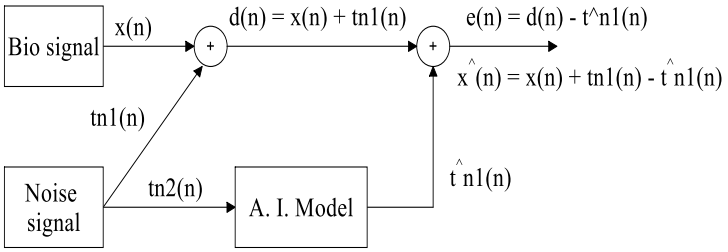


Figure 1.2: Block diagram of proposed A. I. Model

2.3 ANN based Noise Removal Algorithm:

Similar basic steps have been processed for training and weight storage of Neural Network Model as like an ANFIS. First we have trained the Neural Network by processing flowchart shown in Fig. 1.3 using 'allwe' file of relevant algorithm. Then processed the same steps used in ANFIS Model to save the weights, MF and MFT parameters. Once parameters have been saved then network was ready to test. Then we have tested neural network by performing steps as given in Flowchart of Fig. 1.4 on various biomedical signals.

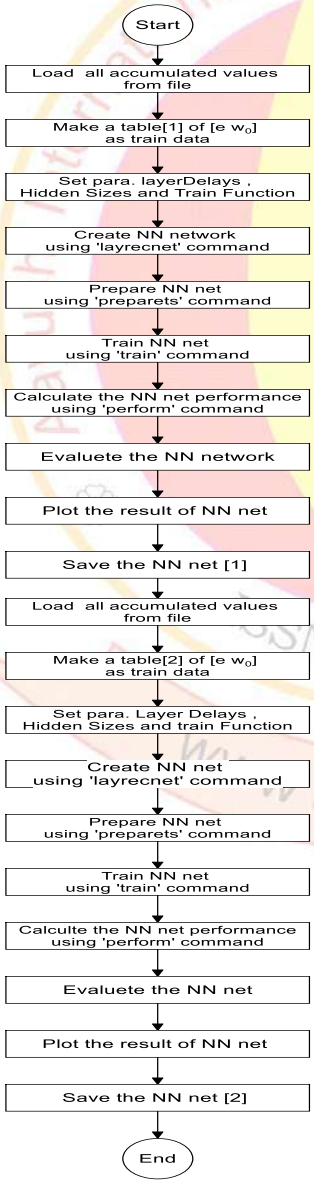


Fig.1.3: Flow chart of training of ANN Model

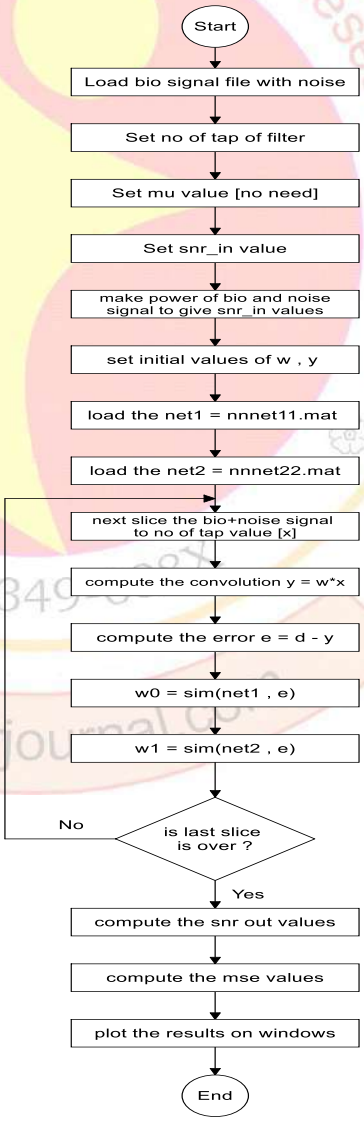


Fig.1.4: Flow chart of testing of ANN Model

2.4 Simulations

The major objective of this study was to investigate a noise removal filters. For this, simulations are carried out on EMG signals. The results are obtained on the output parameter section of MATLAB based GUI for removal of noise from biomedical signals [10-15].

We have taken various data-based files of EMG from cited resources given in database descriptions. First, we have converted these files into MATLAB format file that is .mat format for further processing and saved as .mat files.

Then we processed the adaptive filters on saved files. We have used LMS related algorithms namely LMS, Sign LMS, Sign LMS, Normalized LMS and Normalized LMS Sign for different step sizes, tap values and different SNR in values.

For the illustration of all these simulation process, in shortest way, we have taken the screen snap for LMS related algorithm mentioned above for ANN Model. After application of adaptive filtering process, we have gathered all needful data in the allwe_algo_name .mat file for the further training and testing of artificial intelligent algorithm such as noise removal Neural Network.

During the adaptive filtering, training and testing process, the all information regarding input parameters, output parameters and process status along with plots, etc. have available on the GUI panel. For ready outcome in notable way, we have summarized all the observations in tabular form.

The adaptive Filters based on LMS algorithms have been trained on ECG and EMG (Blue lines) signal (File name- 100.mat) of samples = 500. It is shown in Fig. 1.3

The various biomedical signals having sample size= 500: ECG and EMG (Blue lines) and biomedical signals with noise (Red lines) have been used for testing of Artificial intelligent and ANN model as shown in Fig. 1.4. a,b,c,d,. The performance parameters such as signal to noise ratio and MSE have been observed from GUI for various step sizes using different adaptive algorithms on ECG1 Signal as given in Table 1.1 and Table 1.2.

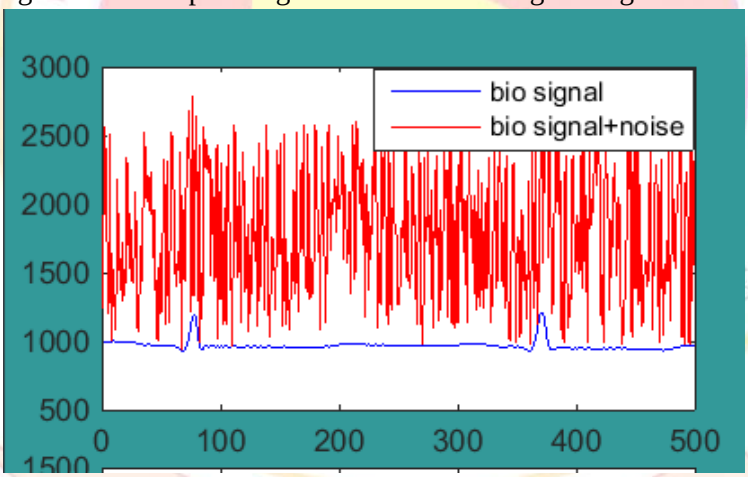
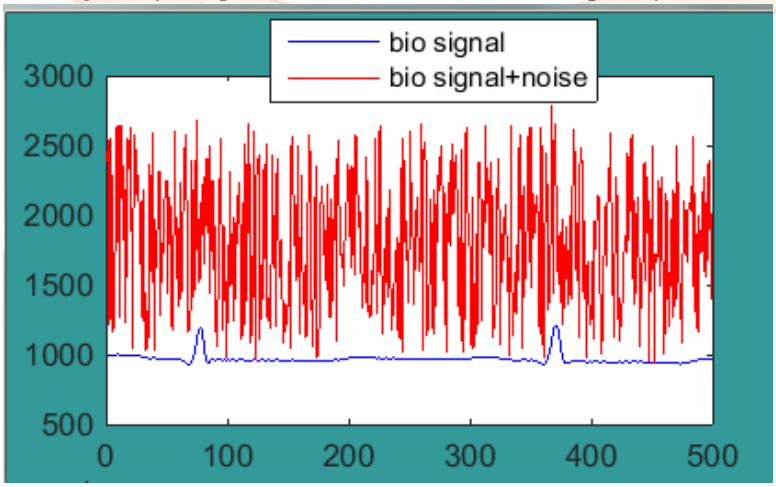


Figure 1.3: ECG signal of Samples= 500 used to train the adaptive filters LMS algorithms



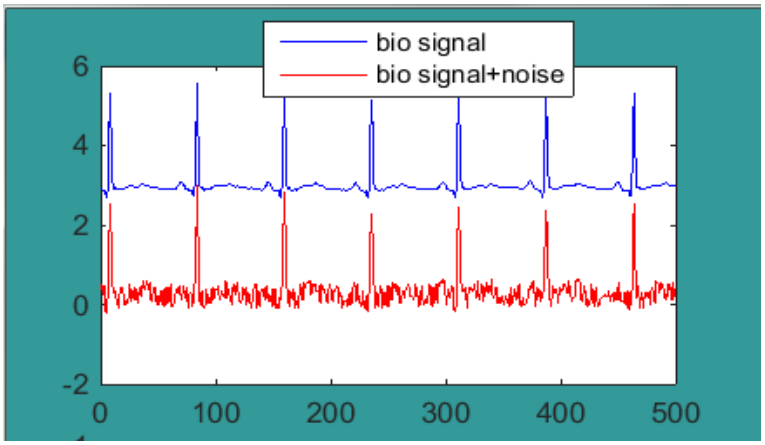


Figure 1.4 .a,b.: Blue line shows biomedical signals (ECGs and EMGs) and Red line shows biomedical signals with noise

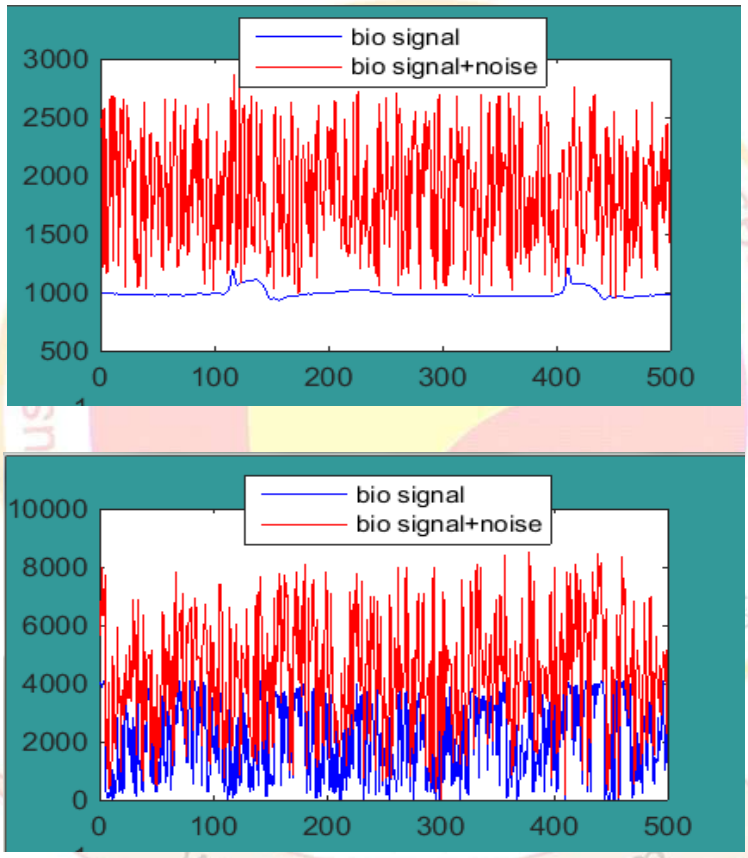


Figure 1.4.c,d: Blue line shows biomedical signals (ECGs and EMGs) and Red line shows biomedical signals with noise

Simulation Result for various Step under Adaptive Filters:

Table 1.1: Signal to noise ratio for various step sizes using different adaptive algorithms (on ECG1 Signal).

Step Size	SNR_out				
	LMS	**NLMS**	**NSLMS**	**SLMS**	**SSLMS**
1e-7	-0.19906	26.7339	26.7339	7.97304	26.7338
1e-8	0.21109	26.7339	26.7339	24.324	26.7339
1e-9	1.23573	26.7339	26.7339	26.7018	26.7339
1e-10	10.2783	26.7339	26.7339	26.7336	26.7339
1e-11	24.5255	26.7339	26.7339	26.7339	26.7339

1e-12	26.7039	26.7339	26.7339	26.7339	26.7339
1e-13	26.7336	26.7339	26.7339	26.7339	26.7339
1e-14	26.7339	26.7339	26.7339	26.7339	26.7339
1e-15	26.7339	26.7339	26.7339	26.7339	26.7339

Table 1.2: Mean square error for various step sizes using different adaptive algorithms

Step Size	**MSE**				
	LMS	**NLMS**	**NSLMS**	**SLMS**	**SSLMS**
1e-7	977169	1980.05	1980.05	148854	1980.09
1e-8	889108	1980.05	1980.05	3448.79	1980.05
1e-9	702247	1980.05	1980.05	1994.74	1980.05
1e-10	87545	1980.05	1980.05	1980.20	1980.05
1e-11	3292.4	1980.05	1980.05	1980.05	1980.05
1e-12	1993.78	1980.05	1980.05	1980.05	1980.05
1e-13	1980.19	1980.05	1980.05	1980.05	1980.05
1e-14	1980.05	1980.05	1980.05	1980.05	1980.05
1e-15	1980.05	1980.05	1980.05	1980.05	1980.05

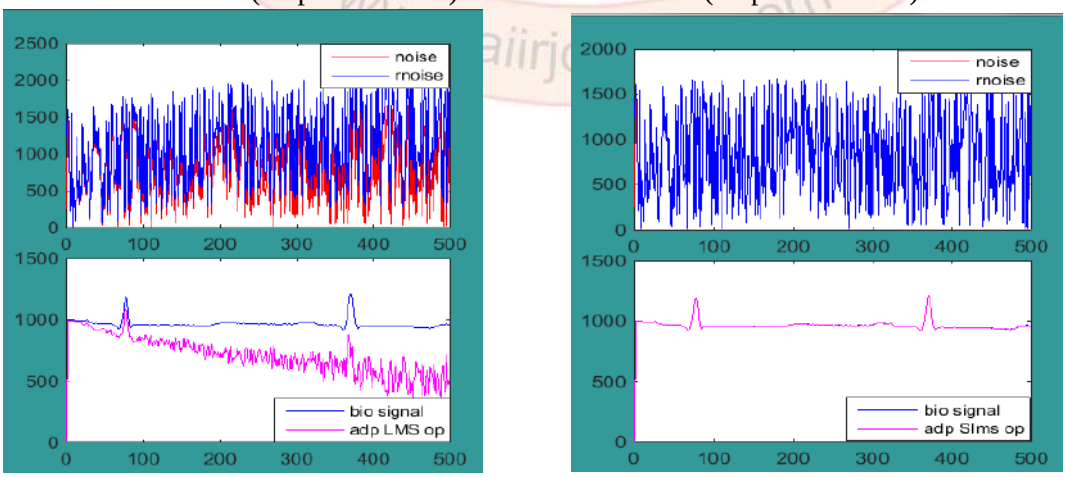
Table 1.1 shows that SNR_out for various step sizes on LMS related algorithms. From this, we have observed that NLMS and NSLMS performed better at step sizes from 1e-07 to 1e-15. But overall, all algorithms have good performance on step size 1e-10, which governs the rate of convergence and speed of tracking ability.
However, use of small step size is to ensure a small steady state error but it may decreases the convergence speed of the adaptive filter. However, increase in step size is to improve the convergence speed of the adaptive filter, but it might cause the adaptive filter to become unstable, so we have to select optimum value of step size [15,16]. The adaptive filter processed on LMS related algorithms using ECG 1 (100.mat file). The outcomes are depicted on GUI in Fig. 1.5.
Number of Samples used for Adaptive filters = 500.

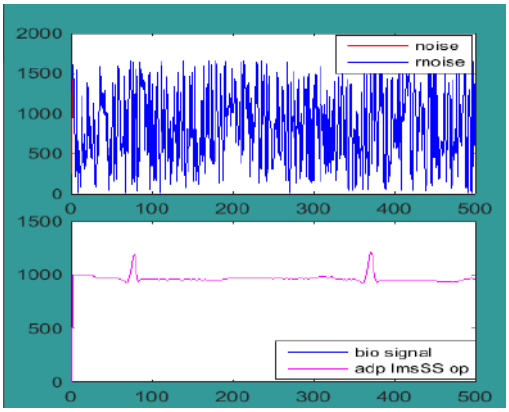
The Percent Root mean square Difference (PRD) indicates the reconstruction fidelity by point wise comparison with the original data. Another definition of error measure is called PRD and is given by:

$$PRD = \sqrt{\frac{\sum_{n=1}^{N}[x[n]-\hat{x}[n]]^2}{\sum_{n=1}^{N}[x[n]-\bar{x}]^2}} \times 100$$

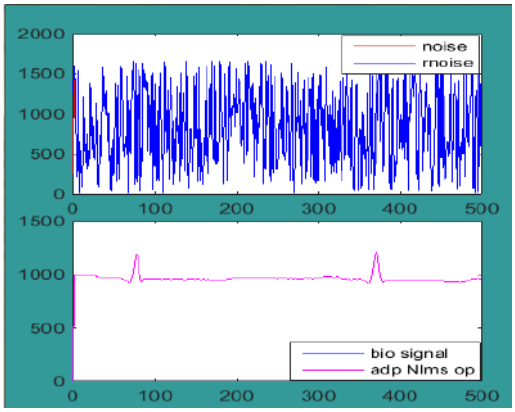
Where x[n] and x [n] are the original and reconstructed signals of length N, respectively and x is the average value of the signal. PRD provides a numerical measure of the residual root mean square (RMS) error and the observed value of prd_val = 0.0461 [10-11].

LMS (Step size=1e-10) SLMS (Step size= 1e-10)





SSLMS (Step size= 1e-10)



NLMS (Step size= 1e-10)

NSLMS (Step size= 1e-10)

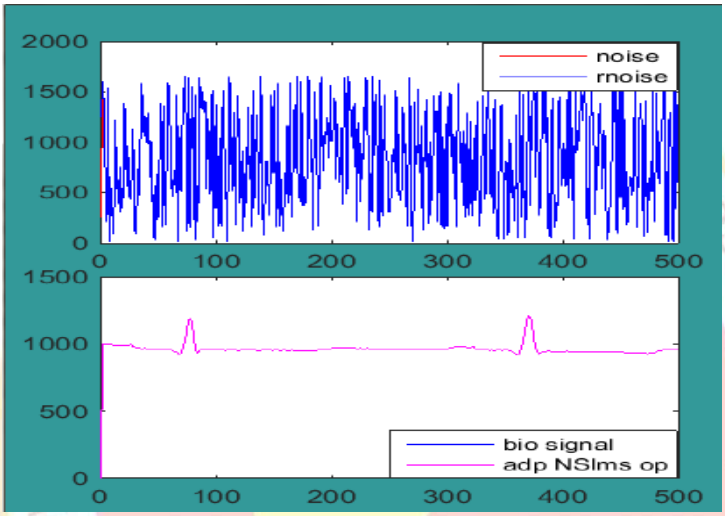


Figure1.5: Simulation Result of Adaptive Filters for the ECG 1 signal (LMS, Sign LMS, Sign Sign LMS, Normalized LMS & Normalized LMS Sign algorithms)

Table1.3: Report of Adaptive filters for various algorithms.(No. of Samples = 500)

Algorithm	**Parameters [μ =1e-10 and No. of Taps= 2]**		
	SNR in	SNR out	MSE
LMS	0	10.333	86450.1
SLMS	0	26.7336	1980.19
SSLMS	0	26.7339	1980.05
NLMS	0	26.7339	1980.05
NSLMS	0	26.7339	1980.05

From the Tables 1.1 and 1.2, we have to select proper value of step size which gives the good SNR out and minimum MSE. Thus we have preferred optimum value of step sizes which shows the best fit of straight line. Then we have developed adaptive filters for various LMS algorithms. The SNR out and MSE of various adaptive filters is shown in the Table 1.3.

3. Results and Discussion

The higher level of noise reduction is possible by performing adaptive noise cancellation techniques, otherwise this level of reduction of noise is difficult to achieve by using conventional filtering methods. As per the simulation results, it is observed that LMS algorithm has some limitations such as instability when the power

of input signal changes or the value of step size varies resulting in change of the rate of convergence. Thus SSLMS, NLMS and NSLMS algorithms are evolved from LMS algorithm to overcome the above-mentioned limitations. From the Table 1.1 and 1.2, it is inferred that the SSLMS, NLMS and NSLMS algorithm shows far greater stability with different step size. This combined with good convergence speed and relative computational simplicity. Thus, the SSLMS, NLMS and NSLMS algorithms are ideal for the real-time adaptive noise cancellation system. The amount of variation in non-stationary signals is difficult to control. LMS and SLMS have relatively poor performance for non-stationary as compared to SSLMS, NLMS and NSLMS and if we have to improve the performance of LMS and SLMS, the step size should have to reduce resulting in long convergence time. It is observed that ANN Filters works excellently as compared to adaptive filter and also observed that as the number of testing samples of biomedical signal (100.mat file) increases then the SNR value increases, while that of MSE decreases.

Thus, from the overall observations, we have concluded that the artificial intelligent networks ANN can be used to reduce noise from various biomedical signals intelligently. The SSLMS, NLMS and NSLMS are more precise and consistence as compared LMS and SLMS algorithms for wide range of step sizes [17-21].

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Adaptive Neural-Based Fuzzy Inference System (ANFIS) : A Survey

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Abstract

The main aim of this study is to develop a flow prediction method, based on the adaptive neural-based fuzzy inference system (ANFIS) coupled with stochastic hydrological models. In comparison with the Mamdani model, the Sugeno model is based on automatic learning from the data and can accurately approximate a function using few rules. It has a stronger and more flexible illustration capability than the Mamdani model.

Keywords: ANFIS, Fuzzy Systems, Mamdani, Sugeno , Membership Function

Introduction: Fuzzy Systems

Fuzzy systems suggest a mathematical system that interprets the subjective human knowledge of the real time processes. This is a way to manipulate practical knowledge with some level of uncertainty. Fuzzy sets theory was introduced by Lofti Zadeh in 1965. The general architecture of a fuzzy system is depicted in Figure 1.1 The behavior of these systems is described by using a set of fuzzy rules such as *IF <premise> THEN <consequent>*. These system uses linguistics variables with symbolic terms. Each term represents a fuzzy set. The terms of the input space compose the fuzzy partition. The fuzzy system consists of three stages [1-4]:

1. The values of numerical inputs are mapped by a function according to a degree of compatibility of the respective fuzzy sets. This operation is called fuzzification.
2. The fuzzy system processes the rules in accordance with the firing strengths of the inputs.
3. The resultant fuzzy values are transformed again into numerical values. This operation is called defuzzification.

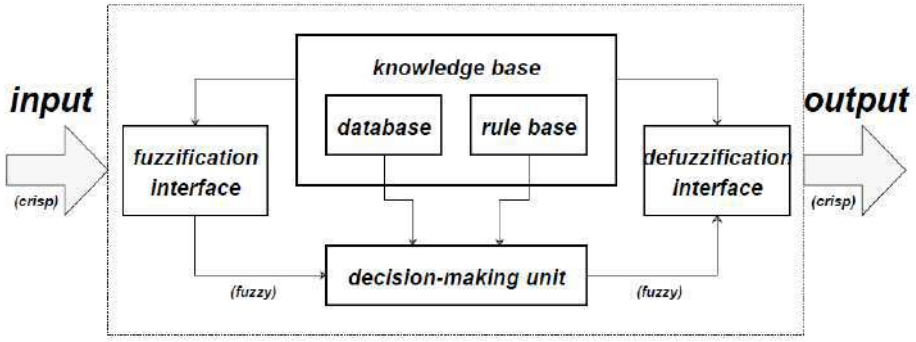

Figure1.1: Basic Components of Fuzzy System

In an FIS, the knowledge base is comprised of the fuzzy rule base and the database. The database contains the linguistic term sets considered in the linguistic rules and the MFs defining the semantics of the linguistic variables, and information about domains. The rule base contains a collection of linguistic rules that are joined by AND/OR operator. Expert can provide his knowledge in the form of linguistic rules *(Hao Yu et al.)*. The fuzzification process collects the inputs and then converts them into linguistic values or fuzzy sets. The decision logic which is called as fuzzy inference which generates output from the input, and finally the defuzzification process produces a crisp output for control action.

Interpretations of a certain rule or the rule base depend on the FIS model. The Mamdani and the Tagaki-Sugeno-Kang (TSK) or simply Sugeno model are two popular FISs. TheMamdani model is a non-additive fuzzy model that aggregates the output of fuzzy rules using the maximum operator, while the Sugeno model is an additive fuzzy model that aggregates the output of rules using the addition operator [1-4].

Mamdani inference model

Fuzzy variables are pasteurized by fuzzy logic rules with MIN and MAX operators. The fuzzy logic can be interpreted as the extended Boolean logic: for binary 0 and 1, the MIN and MAX operators, AND and OR

operators in Boolean logic, respectively. This has been depicted in the Table 1.1 and for fuzzy variables, the MIN and MAX operators [1-4].

Table 1.1: Binary Operations Using Boolean Logic and Fuzzy Logic

A	B	A AND B	MIN (A,B)	A OR B	MAX (A, B)
0	0	0	0	0	0
0	1	0	0	1	1
1	0	0	0	1	1
1	1	1	1	1	1

Table 1.2: Fuzzy Variables Operations Using Fuzzy Logic

A	B	MIN (A,B)	MAX (A, B)
0.3	0.5	0.3	0.5
0.3	0.7	0.3	0.7
0.6	0.4	0.4	0.6
0.6	0.8	0.6	0.8

In Mamdani model, let's assume that we have two fuzzy control rules:
R1: if *x* is *A1* and *y* is *B1* then *z* is *C1* and also
R2: if *x* is *A2* and *y* is *B2* then *z* is *C2*
Fact: *x* is *x0* and *y* is *y0*
Consequence: *z* is *C*
The inference procedure of the Mamdani model with the min (AND) and max (OR) operators and fuzzy inputs is shown in Figure 1.2.

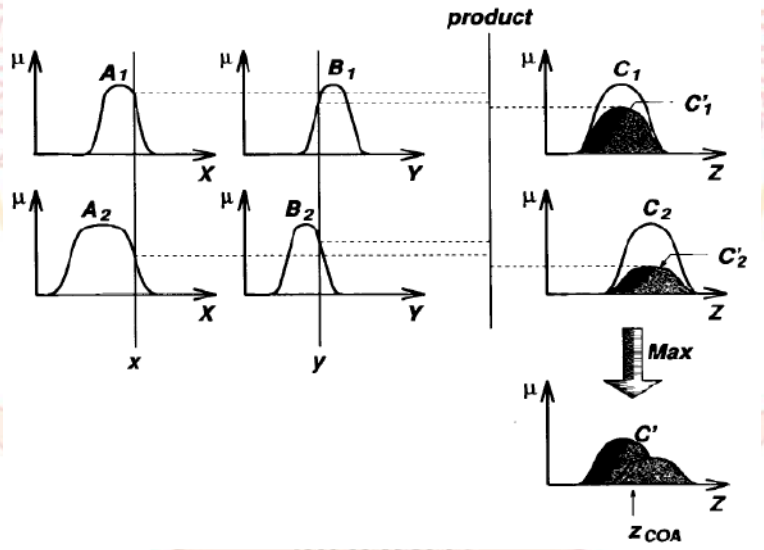

Figure 1.2: Mamdani Inference Model

The fuzzy implication is modeled by Mamdani's minimum operator and the sentence connective is also interpreted as propositions and defined by max operator[4].
The firing levels of the fuzzy rules denoted by α_i, i = 1, 2, are computed by
$\alpha_1 = A_1(x_0) \wedge B_1(y_0)$, $\alpha_2 = A_2(x_0) \wedge B_2(y_0)$
The individual rule outputs are obtained by
$C'_1(w) = (\alpha_1 \wedge C_1(w))$, $C'_2(w) = (\alpha_2 \wedge C_2(w))$
Then the overall system output is computed by the individual rule outputs

$C(w) = C'_1(w) \vee C'_2(w) = (\alpha_1 \wedge C_1(w)) \vee (\alpha_2 \wedge C_2(w))$

Finally, to obtain a deterministic control action, employ any defuzzification strategy. For the instance, defuzzified value of fuzzy set is defined as its fuzzy centroid:

$$Z_o = \frac{\int z\, C(z)\, dz}{\int C(z)\, dz}$$

The Mamdani Model consists of five layers as depicted in Fig. 1.3.

Details are given below*;*

Layer 1: Input layer

Layer 2: Input membership or fuzzification layer

- Neurons represent fuzzy sets used in the antecedents of fuzzy rules determine the membership degree of the input.
- Activation function: The membership function.

Layer 3: Fuzzy Rule Layer

- Each neuron corresponds to a single fuzzy rule.
- Conjunction of the rule antecedents: *product*
- Output: the firing strength of fuzzy rule R_i ,$\mu_{Ri} = \mu_{Aj} \times \mu_{Bk}$
- The weights in layer 3 and layer 4 : the normalized degree (certainty factors) of confidence of the corresponding fuzzy rules.

They are adjusted during training.

Layer 4: Output membership layer

- Disjunction of the outputs: $\mu_{C\,i} = \mu_{Rj} \oplus \mu_{Rj} = \sum \mu_{Rj}$*: sum.*
- The integrated firing strength of fuzzy rule neurons R_j and R_k.
- Activation function: The output membership function.

Layer 5: Defuzzification layer

- Each neuron represents a single output. (Ex.- Centroid Method).

Learning:

- A various learning algorithm may be applied: Back propagation.
- Adjustment of weights and modification of input/output membership functions.
- Sum-Product composition and centroid defuzzification was adopted; a corresponding ANFIS was constructed easily.
- Extra complexity with max-min composition – no better learning capability or approximation power.

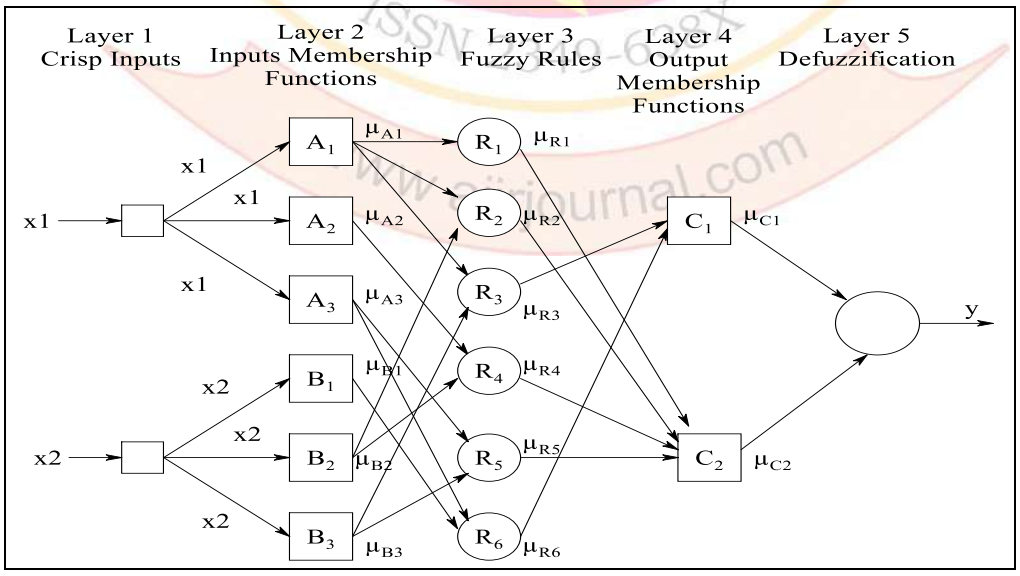

Figure1.3: Neuro Fuzzy Equivalent System

The Mamdani model offers a high semantic level and a good generalization capability. It contains fuzzy rules built from expert knowledge. However, FISs based only on expert knowledge may result in insufficient accuracy. For accurate numerical approximation, the Sugeno model can usually generate a better performance.

Sugeno inference model

However, TSK or Sugeno architecture is more popular than Mamdani architecture where the defuzzification layer was replaced by normalization and weighted average. The TSK architecture does not require MAX operators, but a weighted average is applied directly to regions selected by MIN operators. TSK architecture is actually very straightforward method, in which the output weights are proportional to the average function values at the selected regions by MIN operators. The TSK fuzzy system works as a lookup table. Sugeno and Takagi use the following architecture which is graphically represented in Figure 1.4.

R_1: if x is $A_1$and y is B_1then $z_1 = p_1x + q_1y + r_1$

R_2: if x is $A_2$and y is B_2then $z_2 = p_2x + q_2y + r_2$

Fact: x is $x_0$and y is y_0

Consequence: z

The firing levels of the fuzzy rules are computed by

$w_1 = A_1(x_0) \wedge B_1(y_0)$, $w_2 = A_2(x_0) \wedge B_2(y_0)$

Then the crisp control action is demonstrated as

$$Z_0 = \frac{w_1 z_1 + w_2 z_2}{w_1 + w_2}$$

If we have n rules in our rule-base system then the crisp control action is calculated as

$$Z_0 = \frac{\sum_{i=1}^{n} w_i z_i}{\sum_{i=1}^{n} w_i}$$

Where w_i denotes the firing level of the i^{th} rule, i= 1, 2 . . . , n

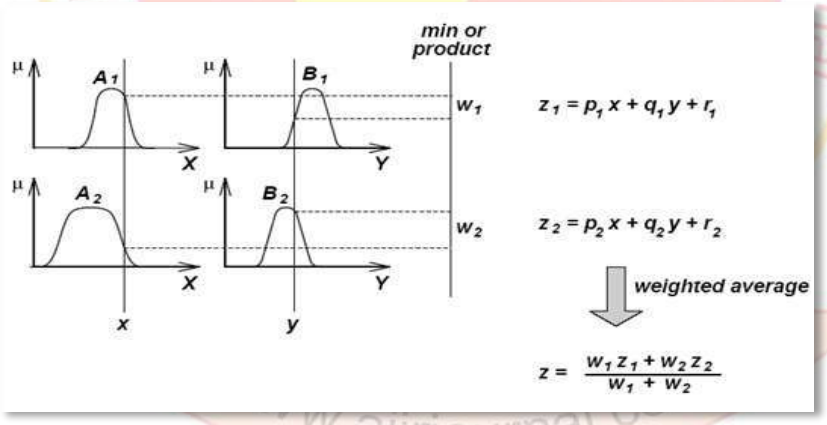

Figure 1.4: Sugeno Fuzzy Model

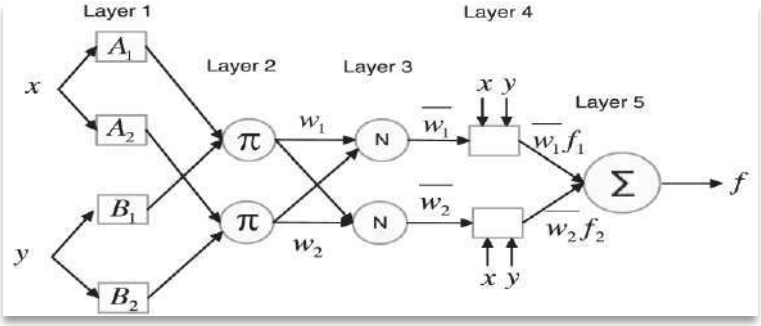

Figure 1.5: Equivalent ANFIS architecture

The TSK model normally selects *z* as first-order polynomial, hence the model is also called the first-order TSK model. When *z* is selected as constant, it is termed as the zero-order TSK model and can be regarded as a special case of the Mamdani model.

In comparison with the Mamdani model, the Sugeno model is based on automatic learning from the data and can accurately approximate a function using few rules. It has a stronger and more flexible illustration capability than the Mamdani model. In the Sugeno model, rules are extracted from the data, but the generated rules may have no meaning for experts. The Sugeno model has found more successful applications in building the fuzzy systems.

The Sugeno Model consists of five layers as depicted in Fig. 1.5, called ANFIS architecture. Details are given below;

Layer 1: Fuzzification layer

Every node I in the layer 1 is an adaptive node with a node function.

$O_{1,I} = \mu_{Ai}(x)$ for i=1,2 or : membership grade of a fuzzy set A1,A2 $O_{1,I} = \mu_{Bi-2}(y)$ for i=3,4.

Parameters in this layer: premise (or antecedent) parameters.

Layer 2: Rule layer

A fixed node labeled as Π where the output is the product of all the incoming signals: $O_{2,I} = w_i = \mu_{Ai}(x)\ \mu_{Bi}(y)$ *for i=1,2….,* firing strength of a rule.

Layer 3: Normalization layer

A fixed node labeled N.

The i-th node calculates the ratio of the i-th rule's firing strength to the sum of all rules' firing strength: $O_{3,I} = \underline{w_i} = w_i / (w_i + w_i)$ for*i=1,2.*

Outputs of this layer are stated as normalized firing strengths.

Layer 4: Defuzzification layer

An adaptive node with a node fn$O_{4,I} = \underline{w_i} f_i = \underline{w_i}\ (p_i x + q_i y + r_i)$ for*i=1,2,……..,* where $\underline{w_i}$is the normalized firing strength from layer 3 and $\{p_i\ ,\ q_i\ \ r_i\}$ is the set of parameter pf this node are called the Consequent Parameters.

Layer 5: Summation neuron

A fixed node which computes the overall output as the summation of all incoming signals.

Overall output = $O_{5,1} = \sum \underline{w_i} f_i = \sum \underline{w_i} f_i / \sum \underline{w_i}$.

ANFIS learning:

A learning algorithm of the least-squares estimator including the gradient descent method.

Forward Pass: adjustment of *consequent parameters, pi, qi, ri.*

Rule consequent parameters are known by the least-square estimator.

Find a least-square estimate of $k=[r_1\ p_1\ q_1 .. r_2\ p_2\ q_2\ ..r_n p_n q_n]$, k^*, that minimizes the squared error $e=|O_d - O|^2$.

$E = e^2 / 2 = (O_d - O)^2 / 2$.

The consequent parameters are adjusted while the antecedent parameters remain fixed.

Backward Pass: adjustment of antecedent parameters.

The antecedent parameters are tuned while the consequent parameters are kept fixed.

(Ex.) Bell activation function: $1/ [1 + ((x-c)/a)^{2b}]$.

Membership Function:

A fuzzy set is wholly characterized by its membership function (MF). Since most fuzzy sets in use have a universe of conversation X consisting of the real line R, it would not be practical to list all the pair defining a membership function. A more convenient and brief way to define an MF is to express it as a mathematical formula *[5].*

1. Triangular MF:

$$traingle\ (x; a,\ b,\ c) = \max \left[\min \left(\frac{x-a}{b-a}, \frac{c-a}{c-b} \right), 0 \right]$$

2. Trapezoid MF:

$$trapezoid\ (x;a,\ b,\ c,\ d) = \max\left(\min\left(\frac{x-a}{b-a}, 1, \frac{c-a}{c-b} \right), 0 \right)$$

3. Gaussian MF:

$$gaussian\ (x;\ 6\ ,\ c) = \exp\left\{ -\left[\frac{x-c}{6} \right]^{2} \right\}$$

1. Generalized Bell MF:

$$bell\ (x;\ a,\ b,\ c) = \frac{1}{1 + \left| \frac{x-c}{a} \right|^{2b}}$$

2. Sigmoidal MF:

$$sigmoid\ (x;\ a,\ b,\ c) = \frac{1}{1 + \exp\left[a\ (x - c\ ) \right]}$$

In the proposed model, we have used Generalized Bell Membership Function. So, brief discussion is given here. Figure1. 7.6 depict the meaning of parameters in Generalized Bell Function. These parameters are referred as premise parameters.

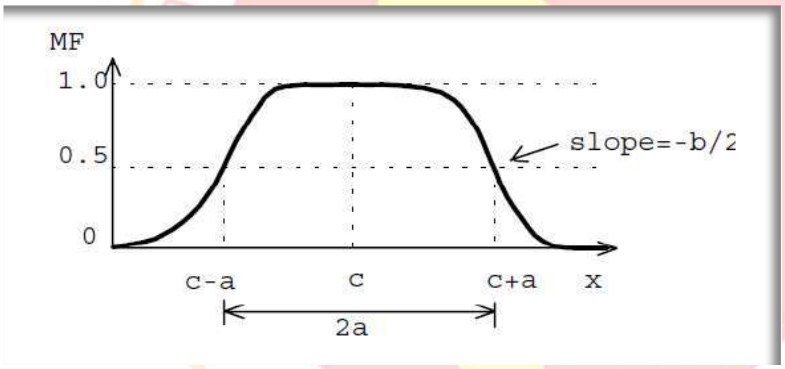

Figure1.6: Meaning of parameters in Generalized Bell Function

The parameter b is usually positive. If it is negative, the shape of this MF becomes an upside-down bell. However, each of these parameters has a physical meaning: *c* determines the centre of the corresponding membership function; *a* is the half width; and *b* (together with *a*) controls the slopes at the crossover points.

Note that this MF is the overview of Cauchy distribution used in probability theory, so it is also referred to as the Cauchy MF. Because of their smoothness and concise notation, Gaussian and bell MFs are becoming increasingly popular for specifying fuzzy sets [2-3].

Advantages and disadvantages of Fuzzy Systems [8-10]:

The advantages of the fuzzy systems are:

- It has capacity to represent inherent uncertainties of the human knowledge with linguistic variables.
- It has ability to interact with the expert of the domain with the engineer designer.
- It represents the natural rules, so it can easily interpret the results.
- It can easily widen the base of knowledge through the addition of new rules.
- It is robust method in relation with the possible disturbances in the system.

Disadvantages of fuzzy system are:

- It is incapable to generalize or answer to what is written in its rule base.
- It is not robust in relation to the topological changes in the system. Topological changes will have to demand alterations in the rule base.
- It has to depend on the existence of a expert to determine the inference logical rules.

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Importance of Artificial Intelligence in Healthcare: A Review

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Abstract

Artificial intelligence (AI) has been developing very rapidly in the various area of biomedical software's algorithms, hardware implementation, and etc. In this review, we summarize the importance of AI, role of AI, in the various branches of biomedical research. The aim of this review is to keep track of new scientific accomplishments, to understand the availability of technologies, to appreciate the tremendous potential of AI. New progress and breakthroughs will continue to push the frontier and widen the scope of AI application, and fast developments are envisioned in the near future.
Keywords: AI, Necessity, Role, Importance

1. Introduction:

Artificial Intelligence (AI), where computers perform tasks that are usually assumed to require human intelligence, is currently being discussed in nearly every domain of science and engineering. Major scientific competitions like Image Net Large Scale Visual Recognition Challenges are providing evidence that computers can achieve human-like competence in image recognition. AI has also enabled significant progress in speech recognition and natural language processing. All of these advances open questions about how such capabilities can support, or even enhance, human decision making in health and health care. Two recent high-profile research papers have demonstrated that AI can perform clinical diagnostics on medical images at levels equal to experienced clinicians, at least in very specific examples [1,2].

Artificial intelligence (AI) is defined as the intelligence of machines, as opposed to the intelligence of humans or other living species. AI can also be defined as the study of ‘‘intelligent agents”—that is, any agent or device that can perceive and understand its surroundings and accordingly take appropriate action to maximize its chances of achieving its objectives. AI also refers to situations wherein machines can simulate human minds in learning and analysis, and thus can work in problem solving. This kind of intelligence is also referred to as machine learning (ML). Typically, AI involves a system that consists of both software and hardware. From a software perspective, AI is particularly concerned with algorithms. An artificial neural network (ANN) is a conceptual framework for executing AI algorithms. It is a mimic of the human brain—an interconnected network of neurons, in

which there are weighted communication channels between neurons . One neuron can react to multiple stimuli from neighboring neurons and the whole network can change its state according to different inputs from the environment [3-9].

The role of artificial intelligence in healthcare has been a huge talking point in recent months and there's no sign of the adoption of this technology slowing down, well, ever really. AI in healthcare has huge and wide reaching potential with everything from mobile coaching solutions to drug discovery falling under the umbrella of what can be achieved with machine learning. That being said, many healthcare executives are still too shy when it comes to experimenting with AI due to privacy concerns, data integrity concerns or the unfortunate presence of various organizational silos making data sharing next to impossible. However, the future of healthcare & the future of machine learning and artificial intelligence are deeply interconnected.

2. The Necessity of Artificial Intelligence:

“Artificial intelligence will be an important tool to help us all end the injustice in the uneven distribution of healthcare, and to make it more accessible and affordable for every person on Earth."

The use of Artificial Intelligence, or AI, is growing rapidly in the medical field, especially in diagnostics and management of treatment. To date there has been a wide range of research into how AI can aid clinical decisions and enhance physicians' judgement. In recent years, AI and machine learning have emerged as powerful tools for assisting diagnosis. This technology could revolutionise healthcare by providing more precise diagnoses.

The importance of AI as a component of the diagnostic process has been steadily increasing since building systems became more practical. There is ongoing enthusiasm for and hype about AI and both researchers and practitioners focus equally on this technology from multiple perspectives. There is no uniform definition for the term AI, but considered as "the ability of a machine to perform cognitive functions that we associate with human minds, such as perceiving, reasoning, learning, interacting with the environment, problem solving, decision-making, and even demonstrating creativity". AI is generally associated with human-like behavior and covers a wide range of research areas, such as natural language processing or robotics. However, current practical applications, including healthcare and disease diagnostics, are narrowed down to a specific task, and are being developed using machine learning. Algorithms exploit medical data to generate predictions and continuously learn and develop over time by constantly processing new and updated data. Algorithms acquire information through different types of knowledge and input or over multiple years of experience. Therefore, AI empowered systems are able to process more knowledge compared with humans, possibly outperforming them for certain medical tasks [10-12].

Role of Artificial Intelligence

The field of healthcare is evolving at an increasing speed, and this is accompanied by a significant increase in the amount of data and challenges in terms of cost and patient outcomes, so AI applications have been used to reduce these challenges. Artificial Intelligence is very useful in solving problematic healthcare challenges and offers a number of advantages over traditional data analytics and clinical decision-making techniques.

The following are the most important examples of the role of artificial intelligence (AI) in healthcare and medicine:

AI in Medical Diagnosis:

Artificial Intelligence has the potential to revolutionize medical diagnostics. Unnecessary routine laboratory testing increases unnecessary financial costs. Therefore, artificial intelligence applications have been used to narrow the circle of laboratory analyzes that the patient may need. AI can detect the presence of early disease as soon as possible as it can automate a large portion of the manual work and speed up the diagnosis process.

Improving Clinical Workflow:

Artificial intelligence is currently being used to efficiently manage workflow and analyze imaging. AI can be used to improve clinical workflow, support better clinical insights, reduce clinical variability, aid in setting study priorities, and minimize physician burnout.

Artificial intelligence has the power to take over the time-consuming task of data input so that clinicians can focus on improving labor utilization, increasing daily productivity and providing the highest quality of care to patients.

Predicting ICU Transfers:

Unplanned transfer of patients to the ICU can have poor outcomes and sometimes even death in patients. Therefore, artificial intelligence has been used to reduce the percentage of these cases, by finding patients with severe cases.As artificial intelligence systems use patients 'medical records, laboratory results, and their vital signs to manage patients' condition before it deteriorates, and forcing them to be transferred to the intensive care unit. Artificial intelligence systems can guide clinicians on where to start treatment.

Predicting Hospital Acquired Infections:

Artificial intelligence can standardize the diagnosis of infections with Infection Prevention and Control (IPC) implications, and facilitate the dissemination of IPC expertise. AI provides opportunities to improve diagnosis through objective pattern recognition. Using AI-driven models, clinicians can monitor high-risk patients, predict which patients are most likely to develop central-line infections and intervene to reduce risk.

Developing the Next Generation of Radiology Tools:

Artificial intelligence can help develop the next generation of imaging tools that will provide accurate information and detailed enough to replace the need for tissue samples in some cases. The next generation of artificial intelligence is expected to be more effective in the healthcare system and there will be further

improvements in performance. All of these developments promise to increase accuracy and reduce the number of routine tasks that exhaust time and effort [13-18].

3. Pros & Cons of Artificial Intelligence

- **Provides Real-Time Data**
  Real-time analytics can help improve physician-patient relationships. Making vital patient data available through mobile devices can engage patients in their treatments. Mobile alerts can inform doctors and nurses of urgent changes in patient statuses and emergencies.
- **Streamlines Tasks**
  For example, intelligent radiology technology is able to identify significant visual markers, saving hours of intense analysis. Other automated systems exist to automate appointment scheduling, patient tracking and care recommendations.
  AI essentially allows hospitals to accept a wide array of plans, benefiting potential and existing patients.
- **Saves Time and Resources**
  As more vital processes are automated, medical professionals have more time to assess patients and diagnose illness and ailment. AI is accelerating operations to save medical establishments precious productivity hours. In any sector, time equals money, so AI has the potential to save hefty costs.
- **Assists Research**
  AI enables researchers to amass large swaths of data from various sources. The ability to draw upon a rich and growing information body allows for a more effective analysis of deadly diseases. Related to real-time data, research can benefit from the wide body of information available, as long as it's easily translated.
- **May Reduce Physician Stress**
  Some latest research reports over half of the primary physicians feel stressed from deadline pressures and other workplace conditions. AI helps streamline procedures, automate functions, instantly share data and organize operations, all of which help relieve medical professionals of juggling too many tasks.

4. Limits of Ai In Medicine

- **Needs Human Surveillance**
  Although AI has come a long way in the medical world, human surveillance is still essential. For example, surgery robots operate logically, as opposed to empathetically. Health practitioners may notice vital behavioral observations that can help diagnose or prevent medical complications.
- **May Overlook Social Variables**
  Patient needs often extend beyond immediate physical conditions. Social, economic and historical factors can play into appropriate recommendations for particular patients. For instance, an AI system may be able to allocate a patient to a particular care center based on a specific diagnosis. However, this system may not account for patient economic restrictions or other personalized preferences.
- **May Lead To Unemployment**
  Although AI may help cut costs and reduce clinician pressure, it may also render some jobs redundant. This variable may result in displaced professionals who invested time and money in healthcare education, presenting equity challenges.
- **Inaccuracies are Still Possible**
  Medical AI depends heavily on diagnosis data available from millions of cataloged cases. In cases where little data exists on particular illnesses, demographics, or environmental factors, a misdiagnosis is entirely possible. This factor becomes especially important when prescribing particular medicine.
- **Susceptible To Security Risks**
  As AI uses data to make systems smarter and more accurate, cyber-attacks will incorporate AI to become smarter with each success and failure, making them more difficult to predict and prevent. Once damaging threats out-maneuver security defences, the attacks will be much more challenging to address [19-22].

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Semi-Static Thermal Stress Analysis of A Medium Thick Disk With A Time- Dependent Heat Source

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Abstract

This paper survey the semi-static thermal stresses of medium thick discs with time-dependent heat source investiture. The lower and upper faces of the plate are kept at zero temperature, while the inner and outer circular curved surfaces are thermally insulated. Laplace transformers have been found to be convenient for obtaining special temperature distribution solutions, which satisfy the time-dependent heat conduction equation.The function of the thermoelastic air and the harmonic potential functions are used to obtain the components of displacement and the stress associated with it. The results are obtained in the form of a basal function. The results of temperature, displacement, and stress are numerically calculated and graphed according to specific functions.

Keywords*: Heat conduction equation, medium thick disk, thermal stress, Laplace transform*

1. Introduction

Many studies have appeared in the literature about the transient response of the plate and its associated thermal stresses. The following references are chosen because they include mathematical methods for deriving the response formulas contained in present description. In classical papers, Nowacki [1] has determined steady-state thermal stresses in a thick circular plate subjected to an axisymmetric temperature distribuion on the upper face with zero temperature on the lower face and the circular edge. Further Roy Choudhuri [2] has succeeded in determining the quasi-static thermal stresses in a circular plate subjected to transient temperature along the circumference of a circle over the upper face with lower at zero temperture and the fixed circular edge thermally insulated.Nasser [3, 4] proposed the concept of heat sources in generalized thermoelasticity and applied to a thick plate problem.In all aforementioned investigations an axisymmetrically heated thick plate has been considered and its results are more useful in engineering problems. Recently, Kulkarni and Deshmukh [5] present paper deals with the determination of a quasi-static thermal stresses in a thick circular plate subjected to arbitrary initial temperature on the upper face with lower face at zero temperature and the fixed circular edge thermally insulated using Lapalce method. Similarly, Kulkarni and Deshmukh [6]has also determinated the transient heat conduction and thermal stresses of a thick annular disc subjected to arbitrary heat flux on the upper and lower surfaces where as the fixed circular edges are at zero temperature, using integral transform technique.Varghese and Lalsingh [7] has determined the thermo-elastic stress in a thick disc due to interior heat generation within the solid, under thermal boundary condition, which is subjected to arbitrary initial temperature on the upper and lower face at zero temperature, and the fixed circular edges with additional sectional heat supply, using unconventional integral transform.Okumura [8] has analysed the thermal-bending stresses in an annular sector by the theory of moderately thick plates.Saidi and Baferani [9] investigated the thermal buckling of simply supported moderately thick functionally graded annular sector plate using first order shear deformation plate theory and obtained the solution by using an analytical method.Hu et al. [10] presented a set of high order partial differential equations for elastic rectangular thick plate with four edges completely clamped support base on Mindlin theory and solved by the double finite integral transform method.Saheb and Aruna [11] developed a simple and efficient coupled displacement field method to study the buckling load parameters of the simply supported moderately thick rectangular plates.Genckal et al. [12] studied the dynamic responses of composite plates on elastic foundation subjected to impact and moving loads by using Galerkin's method, then the equations are solved by using the Runge-Kutta method.However, they did not consider a thermoelastic problem in which a source is generated on the basis of a linear function of temperature that satisfies the time-dependent heat conduction equation. Based on previous literature on moderately-thickness annular disks, the authors observed that no analytical procedure was established in view of the generation of

internal heat sources in the body. Due to the lack of research in this area, the author was motivated to conduct this research. Theoretical calculations have been studied using dimensional parameters, while the graphical calculations are carried out using dimensionless parameters. The success of this novel research lies in new mathematical procedures that have adopted a simpler optimized design approach in terms of material utilization and technical performance, particularly in determining the thermoelastic behavior of moderately-thickness disks engaged as the foundation of pressure container, furnaces, etc.

2. Formulation of the Problem

We consider a moderately thick annular plate occupying the space $D:\{(r,z)\in R^2:\ a<r<b,\ 0<z<l\}$ under unsteady-state temperature field with a time-dependent internal heat sources within it.

2.1 Unsteady-state temperature field

The governing equation for heat conduction in isotropic solids is given as follows

$$\left\{\nabla^2-\frac{1}{\kappa}\frac{\partial}{\partial t}\right\}T(r,z,t)=-q_0\,l\,\Phi(t)[H(r-r_0)-H(r-r_1)],\ r_0<r<r_1 \qquad (1)$$

in which $T=T(r,z,t)$ is the temperature change,

$$\nabla^2\equiv\frac{\partial^2}{\partial r^2}+\frac{1}{r}\frac{\partial}{\partial r}+\frac{\partial^2}{\partial z^2}$$

and

$$\Phi(t)=\begin{cases}(\Phi_0/T_0)\,t, 0\le t\le t_0\\ \Phi_0, \qquad t>t_0\end{cases} \qquad (2)$$

subjected to the boundary conditions

$$T\big|_{t=0}=T\big|_{z=0}=T\big|_{z=l}=\left.\frac{\partial T}{\partial r}\right|_{r=a}=\left.\frac{\partial T}{\partial r}\right|_{r=b}=0 \qquad (3)$$

2.2 Displacement and stress field

Let u_r and u_z be components of displacement is expressed as

$$\begin{aligned}2Gu_r&=\frac{\partial}{\partial r}\left[r\frac{\partial\phi_1}{\partial r}+z\frac{\partial\phi_3}{\partial z}-4(1-\upsilon)\phi_1\right]+\frac{\partial\chi}{\partial r},\\ 2Gu_z&=\frac{\partial}{\partial z}\left[r\frac{\partial\phi_1}{\partial r}+z\frac{\partial\phi_3}{\partial z}-4(1-\upsilon)\phi_3\right]+\frac{\partial\chi}{\partial z}\end{aligned} \qquad (4)$$

in which G and υ denote the shear modulus and Poisson's ration, respectively, and

$$\nabla^2\phi_1=0,\ \nabla^2\phi_3=0,\ \nabla^2\chi=\frac{\alpha E}{1-\upsilon}\tau. \qquad (5)$$

where ϕ_1, ϕ_3 are harmonic functions, χ is a thermoelastic potential function, $\tau=T-T_i$ is temperature change with T_i as initial temperature,respectively.

The components of stress taking account of heat is as follows

$$\begin{aligned}\sigma_{rr}&=2G\left(\varepsilon_{rr}+\frac{\upsilon}{1-2\upsilon}e\right)-\frac{\alpha E\tau}{1-2\upsilon},\ \sigma_{\theta\theta}=2G\left(\varepsilon_{\theta\theta}+\frac{\upsilon}{1-2\upsilon}e\right)-\frac{\alpha E\tau}{1-2\upsilon},\\ \sigma_{zz}&=2G\left(\varepsilon_{zz}+\frac{\upsilon}{1-2\upsilon}e\right)-\frac{\alpha E\tau}{1-2\upsilon},\ \sigma_{rz}=2G\varepsilon_{rz}\end{aligned} \qquad (6)$$

in which

$$\varepsilon_{rr}=\frac{\partial u_r}{\partial r},\varepsilon_{\theta\theta}=\frac{u_r}{r},\varepsilon_{zz}=\frac{\partial u_z}{\partial z},\varepsilon_{rz}=\frac{1}{2}\left(\frac{\partial u_r}{\partial z}+\frac{\partial u_z}{\partial r}\right) \quad (7)$$

$$e=\frac{\partial u_r}{\partial r}+\frac{u_r}{r}+\frac{\partial u_z}{\partial z}$$

where $\sigma_{rr},..,\sigma_{rz}$ are the components of stresses, $\varepsilon_{rr},..,\varepsilon_{rz}$ are the components of strain, α represent the coefficient of linear thermal expansion and E is Young's modulus and e is the cubical dilation, respectively.For thetraction-free surfaces the stress functions

$$\sigma_{rz}\big|_{z=0}=\sigma_{zz}\big|_{z=0}=\sigma_{rz}\big|_{z=l}=\sigma_{zz}\big|_{z=l}=0 \quad (8)$$

The equations (1) to (8) constitute the mathematical formulation of the problem.

3. Solution tothe Problem

3.1 Solution for the temperature distribution

Applying the Laplace transformation in Eqs. (1) and (4)

$$\left\{\nabla^2-\frac{p}{\kappa}\right\}\bar{T}(r,z,p)=-\frac{q_0\Phi_0 l}{p^2 t_0}(1-e^{-pt_0})[H(r-r_0)-H(r-r_1)] \quad (9)$$

$$\bar{T}\big|_{z=0}=\bar{T}\big|_{z=l}=\frac{\partial\bar{T}}{\partial r}\bigg|_{r=a}=\frac{\partial\bar{T}}{\partial r}\bigg|_{r=b}=0 \quad (10)$$

in which the symbol ($\bar{}$) represents a function in the transformed domain and $\bar{T}(r,z,p)$ is the transformed function of $T(r,z,t)$ with Laplace parameter as p.

Now applying the finite Fourier sine transform in Eqs. (9) one obtains

$$\left\{\frac{\partial^2}{\partial r^2}+\frac{1}{r}\frac{\partial}{\partial r}-\beta_m-\frac{p}{\kappa}\right\}\bar{\bar{T}}(r,m,p)=-\frac{q_0\Phi_0 l}{p^2 t_0}(1-e^{-pt_0})[H(r-r_0)-H(r-r_1)] \quad (11)$$

$$\frac{\partial\bar{\bar{T}}}{\partial r}\bigg|_{r=a}=0,\ \frac{\partial\bar{\bar{T}}}{\partial r}\bigg|_{r=b}=0 \quad (12)$$

where $\bar{\bar{T}}(r,m,p)$ is the transform of $\bar{T}(r,z,p)$ with respect to nucleus is $\sin(m\pi z/l)$.

To obtain the expression for the temperature $\bar{\bar{T}}(r,m,p)$ of Eqs. (11)-(12), we assume

$$\bar{\bar{T}}(r,m,p)=\sum_{n=1}^{\infty}A_n J_0(\alpha_n r) \quad (13)$$

Assume

$$H(r-r_0)-H(r-r_1)=f(r)=\sum_{n=1}^{\infty}B_n J_0(\alpha_n r) \quad (14)$$

Putting Eq. (13) and (14) in Eq. (11), one obtains

$$A_n=\frac{\kappa q_0 l(1-e^{-pt_0})}{t_0 p^2(p+\gamma_{mn})}B_n \quad (15)$$

in which

$$\gamma_{mn}=\beta_m^2\kappa+\alpha_n^2\kappa.$$

Taking the theory of Bessel function on Eq. (15), one obtains

$$B_n \int_a^b r[J_0(\alpha_n r)]^2 dr = \int_a^b r\, f(r)\, J_0(\alpha_n r) dr = \int_{r_0}^{r_1} r\, J_0(\alpha_n r) dr \qquad (16)$$

since

$$f(r) = \begin{cases} 1 \text{ for } r_0 < r < r_1 \\ 0 \text{ for } a < r < r_0 \text{ and } r_1 < r < b \end{cases}$$

Hence

$$B_n = \frac{2}{\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} \qquad (17)$$

Using Eqs. (13), (15), (17) we get,

$$\bar{\bar{T}}(r, m, p) = \frac{2\kappa q_0 l}{t_0} \sum_{n=1}^{\infty} \frac{(1 - e^{-pt_0})}{p^2(p + \gamma_{mn})\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} J_0(\alpha_n r) \qquad (18)$$

Now applying the inverse Fourier sine transform to Eq. (18), one yield

$$\bar{T}(r, z, p) = \frac{4\kappa q_0}{t_0} \sum_{n=1}^{\infty}\sum_{m=1}^{\infty} \frac{(1 - e^{-pt_0})}{p^2(p + \gamma_{mn})\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} \qquad (19)$$
$$\times J_0(\alpha_n r)\sin(m\pi z / l)$$

Applying the Laplace inversion theorems on Eq. (19),one yield

$$\tau = T(r, z, t) = \frac{4\kappa q_0}{t_0} \sum_{n=1}^{\infty}\sum_{m=1}^{\infty} \frac{1}{\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} J_0(\alpha_n r)\sin\left(\frac{m\pi z}{l}\right) \qquad (20)$$
$$\times\{\Phi_n(r, z, t) - \Phi_n(r, z, t - t_0) H(t - t_0)\}$$

where

$$L^{-1}\left\{\frac{1 - e^{-t_0 p}}{p^2[p + \gamma_{mn}]}\right\}$$
$$= L^{-1}\left\{\frac{1 - e^{-t_0 p}}{\gamma_{mn}}\left[\frac{1}{p^2} - \frac{1}{\gamma_{mn}}\left(\frac{1}{p} - \frac{1}{p + \gamma_{mn}}\right)\right]\right\}$$
$$= \Phi_n(r, z, t) - \Phi_n(r, z, t - t_0) H(t - t_0)$$

in which

$$\Phi_n(r, z, t) = \frac{1}{\gamma_{mn}}\left(t - \frac{1 - e^{-\gamma_{mn} t}}{\gamma_{mn}}\right)$$

3.3 Solution for potential functions and thermal stresses

Now assume ϕ_1, ϕ_3 are harmonic functions and χ is a thermoelastic potential function that satisfies Eq. (5) as

$$\chi(r, z, t) = \frac{\alpha E}{1 - \upsilon}\frac{4\kappa q_0}{l\kappa t_0} \sum_{n=1}^{\infty}\sum_{m=1}^{\infty} \frac{\gamma_{mn}}{\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} J_0(\alpha_n r)\sin\left(\frac{m\pi z}{l}\right) \qquad (21)$$
$$\times\{\Phi_n(r, z, t) - \Phi_n(r, z, t - t_0) H(t - t_0)\}$$

$$\phi_1(r, z, t) = \frac{\alpha E}{1 - \upsilon}\frac{4\kappa q_0}{l\kappa t_0} \sum_{n=1}^{\infty}\sum_{m=1}^{\infty} \frac{\gamma_{mn}}{\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\}$$
$$\times\{C_1 J_0(\alpha_n r) + D_1(\alpha_n r) J_1(\alpha_n r)\}\sin(m\pi z / l) \qquad (22)$$
$$\times\{\Phi_n(r, z, t) - \Phi_n(r, z, t - t_0) H(t - t_0)\}$$

$$\phi_3(r,z,t)=\frac{\alpha E}{1-\upsilon}\frac{4\kappa q_0}{l\kappa t_0}\sum_{n=1}^{\infty}\sum_{m=1}^{\infty}\frac{\gamma_{mn}}{\alpha_n}\left\{\frac{r_1J_1(\alpha_n r_1)-r_0J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2-a^2[J_0(\alpha_n a)]^2}\right\}$$
$$\times\{E_1J_0(\alpha_n r)+F_1(\alpha_n r)J_1(\alpha_n r)\}\sin(m\pi z/l) \quad (23)$$
$$\times\{\Phi_n(r,z,t)-\Phi_n(r,z,t-t_0)H(t-t_0)\}$$

Using Eqs. (21)-(23) in Eq. (4),onegetsthe required displacement components.The components of stress given in Eq. (6) can be obtained using displacement componentsand strain components given in Eq. (7). Finally C_1, D_1, E_1 and F_1 are the unknown constants which can to be determined using traction free conditions given in Eq. (8) as

$$X_1C_1+Y_1D_1+Z_1E_1+T_1F_1=R_1,\ X_2C_1+Y_2D_1+Z_2E_1+T_2F_1=R_2,$$
$$X_3C_1+Y_3D_1+Z_3E_1+T_3F_1=R_3,\ X_4C_1+Y_4D_1+Z_4E_1+T_4F_1=R_4 \quad (24)$$

where,

$$X_1=-a_1J_1-a_2J_{0,2}+a_3,\ Y_1=(a_1J_{0,2})/2+J_0(a_4-a_3+a_5)-a_6J_{1,13}$$
$$Z_1=-a_1J_1+2\beta\alpha_nJ_1a_3-\alpha_n^2J_2,\ T_1=-a_7J_2+(a_1/2-a_8)J_{0,2},$$
$$R_1=[a_1J_1(a)+J_0(a)/2-a_9][a],$$
$$X_2=-a_1J_1-2\Im_{12}(a_4-a_5)-a_2J_{0,2}C_L+aS_L\alpha_n^2J_{1,13}/2+\Im_{11}[-1+2(1-\nu)$$
$$-3aa_4+aa_5]-\Im_{13},$$
$$Y_2=(a_1C_L/2+a_4S_L-a_5S_L\alpha_n)J_{0,2}+[-a_2C_L/\alpha_n+S_L\alpha_n+2(1-\nu)S_L\alpha_n$$
$$+6\Im_{14}+a_3]J_{1,13}+(1/4+\Im_{14})J_{2,24},$$
$$Z_2=J_1[a_{10}S_L+\Im_{15}-C_L(a_1+La_1/a-2a_8)]-(\alpha_n+\Im_{16})2L\Im_{16},$$
$$T_2=\Im_{16}(2\Im_{14}+a_4-aa_5)-\Im_{15}J_{0,2}-(1/2+\Im_{14})K,$$
$$R_2=a\{a_1J_1C_L+2a_4\Im_{12}+(1+4\Im_{14})K1+a_8(C_L)'+(1/a)[4\Im_{14}(J_0S_L)']$$
$$+(1+4\Im_{14})2(J_1S_L\alpha_n)'+(1+4\Im_{14})(J_1S_L)''\},$$
$$X_3=2\alpha_n\beta[J_{1r}(12-16\nu)-2r\alpha_n(J_{0r}-J_{2r})],$$
$$Y_3=\alpha_n[(-J_{0r}+J_{2r})\beta(12-16\nu)+2r\beta\alpha_n(3J_{1r}-J_{3r})],$$
$$Z_3=8\alpha_n\beta J_{1r},\ T_3=4\alpha_n\beta(-J_{0r}+J_{2r}),$$
$$R_3=8[-\Im_{11}\beta J_{1r}-(1/2)\Im_{11}J_{0r}+(\Im_{11}\beta J_{0r})'][r],$$

$$X_4=2\alpha_n\beta[J_{1r}C_L(12-16\nu)-(2r\alpha_n\beta C_L-4S_L\alpha_n)(J_{0r}-J_{2r})+rS_L\alpha_n^2(J_{1r}-J_{3r})],$$
$$Y_4=\alpha_n[(-J_{0r}+J_{2r})\beta C_L(12-16\nu)+2r\beta\alpha_nC_L(3J_{1r}-J_{3r})+4S_L\alpha_n(3J_{1r}-J_{3r})$$
$$+rS_L\alpha_n^2(3J_{0r}-4J_{2r}+J_{4r})],$$
$$Z_4=4\alpha_n[2\beta J_{1r}(C_L-\beta LS_L)+L\beta\alpha_nC_L(J_{0r}-J_{2r})-4S_L\alpha_n((1-\nu)J_{0r}+(1-\nu)J_{2r})],$$
$$T_4=2\alpha_n[(2L\beta^2S_L+\beta C_L)(J_{0r}-J_{2r})+L\beta\alpha_nC_L(3J_{1r}-J_{3r})-12\alpha_nC_L],$$
$$R_4=8[-\Im_{11}\beta J_{1r}-(1/2)\Im_{11}J_{0r}+(\Im_{11}\beta J_{0r})'][r],$$

$$a_1=\beta\nu\alpha_n/(1-2\nu),\ a_2=a\beta\nu\alpha_n^2/[2(1-2\nu)],\ a_3=2(1-\nu)\nu/(1-2\nu),a_4=\nu/[2a(1-2\nu)],$$
$$a_5=[2(1-\nu)\nu]/[a(1-2\nu)],a_6=a\beta\nu\alpha_n^2,a_7=\alpha_n/[2a(1-2\nu)],a_8=2\beta\nu(1-\nu)\alpha_n/(1-2\nu),$$
$$a_9=\beta\nu J_0'/(1-2\nu),a_{10}=\alpha_n/(1-2\nu),S_L=\sin(L\beta),C_L=\cos(L\beta),$$
$$\Im_{11}=J_{0,2}S_L\alpha_n^2,\Im_{12}=J_1S_L\alpha_n,\Im_{13}=a\nu\alpha_n^2S_LJ_{1,13}/[2(1-2\nu)],$$
$$\Im_{14}=\nu/[4(1-2\nu)],\Im_{15}=L\beta^2\nu\alpha_nS_L/(1-2\nu),\Im_{16}=\beta J_{0,2}C_L\alpha_n,$$

$$J_{0,2}=J_0(a\alpha_n)-J_2(a\alpha_n), J_{2,4}=J_2(a\alpha_n)-J_4(a\alpha_n),$$
$$J_{1,3}=J_1(a\alpha_n)-J_3(a\alpha_n), J_{1,13}=J_1(a\alpha_n)+[J_1(a\alpha_n)-J_3(a\alpha_n)]$$
$$J_{2,24}=-[J_0(a\alpha_n)-J_2(a\alpha_n)]-(1/2)[J_2(a\alpha_n)-J_4(a\alpha_n)],$$
$$J_{(0,2)r}=J_0(r\alpha_n)-J_2(r\alpha_n)$$

Using Cramer's Rule, one obtains constants as

$$C1=\frac{\Delta_2}{\Delta_1};D1=\frac{\Delta_3}{\Delta_1};E1=\frac{\Delta_4}{\Delta_1};F1=\frac{\Delta_5}{\Delta_1} \quad (25)$$

where

$$\Delta_1=\begin{vmatrix} X1 & Y1 & Z1 & T1\\ X2 & Y2 & Z2 & T2\\ X3 & Y3 & Z3 & T3\\ X4 & Y4 & Z4 & T4 \end{vmatrix},\Delta_2=\begin{vmatrix} R1 & Y1 & Z1 & T1\\ R2 & Y2 & Z2 & T2\\ R3 & Y3 & Z3 & T3\\ R4 & Y4 & Z4 & T4 \end{vmatrix},\Delta_3=\begin{vmatrix} X1 & R1 & Z1 & T1\\ X2 & R2 & Z2 & T2\\ X3 & R3 & Z3 & T3\\ X4 & R4 & Z4 & T4 \end{vmatrix},$$

$$\Delta_4=\begin{vmatrix} X1 & Y1 & R1 & T1\\ X2 & Y2 & R2 & T2\\ X3 & Y3 & R3 & T3\\ X4 & Y4 & R4 & T4 \end{vmatrix},\Delta_5=\begin{vmatrix} X1 & Y1 & Z1 & R1\\ X2 & Y2 & Z2 & R2\\ X3 & Y3 & Z3 & R3\\ X4 & Y4 & Z4 & R4 \end{vmatrix}$$

The resulting equation of stresses can be obtained by substituting the unknown constant obtained from Eq. (25). The equations of stresses are rather lengthy, and the same has been omitted here for the sake of brevity but have been considered during graphical discussion using MATHEMATICA software.

4. Numerical Results, Discussion and Remarks

For the interests of simplicity of calculation, we introduce the following dimensionless values

$$\bar{r}=r/b,\ \bar{z}=z/b,\ \bar{\tau}=\kappa t/b^2,\bar{T}=T/T_0, \quad (26)$$
$$\bar{u}_i=u_i/E\alpha T_0,\bar{\sigma}_{ij}=\sigma_{ij}/E\alpha T_0\,(i,j=r,\theta)$$

Substituting the value of Eq. (26) in Eqs. (20) and components of stresses, we obtained the expressions for the temperature distribution and thermal stresses respectively for the numerical discussion. The numerical computations have been carried out formoderately thick diskhavingthe thermo-mechanical properties: modulus of elasticity E = 70 GPa, Poisson's ratio υ = 0.35, thermal expansion coefficient α = 23×10^{-6}/^{0}C, thermal diffusivity κ = 84.18×10-6 m^{2}s^{-1} and thermal conductivity λ = 204.2 Wm^{-1}K^{-1}.The physical parameter for the plate as $a=0.2\,\text{m}$, $b=1\,\text{m}$, $\text{l}=0.08\,\text{m}$ and $T_0=150^0$C.In order to examine the influence of internal heat source on the moderately thick diskplate, the numerical calculations were performed for all the variables, and numerical calculations are depicted in the following figures with the help of MATHEMATICA software. Plotted Figs. 1-2 illustrate the numerical results of temperature distribution and the thermal stresses of the moderately thick disk due to internal heat generation within the solid.From the Fig.1(a) it is noted that the behaviour of temperature trend is decreasing along redial direction in different value of time due to the available internal heat supply.

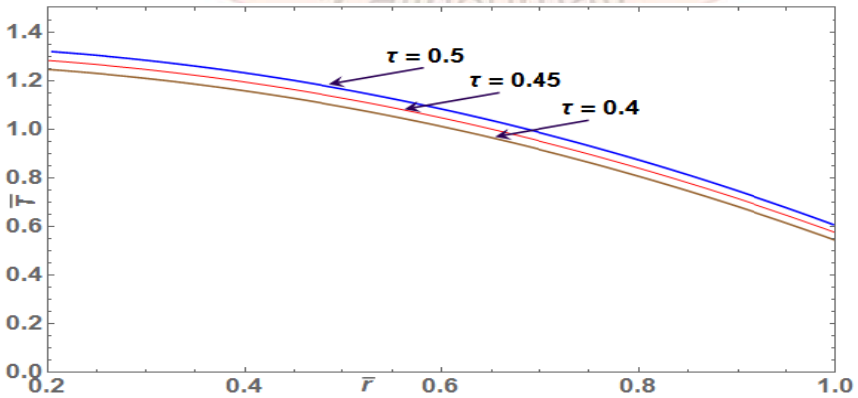

Fig. 1(a): Temperature distribution along $\bar{r}$ -direction for different values of time

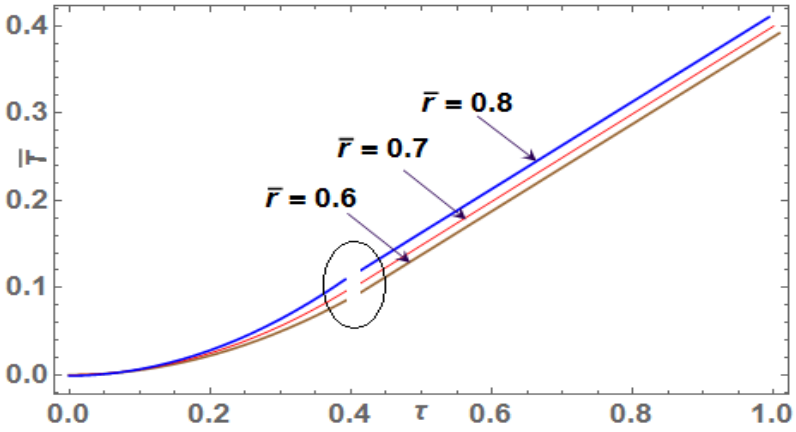

Fig. 1(b): Temperature distribution along time for different values of $\bar{r}$

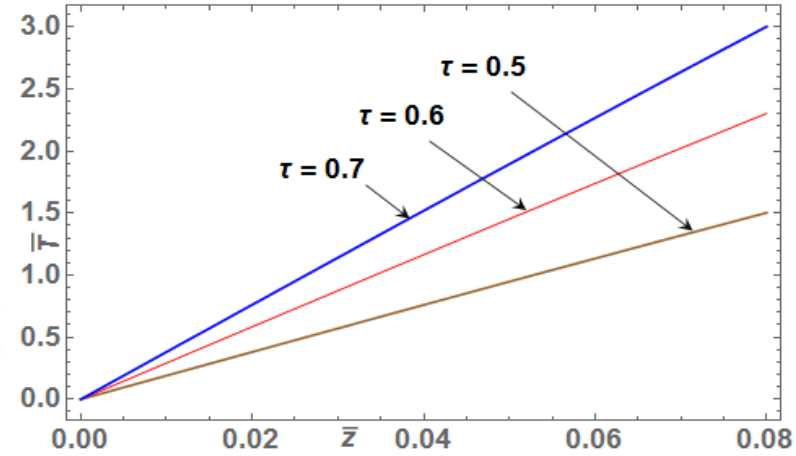

Fig. 1(c): Temperature distribution along $\bar{z}$ *-direction for different values of time*

Fig. 1(b) shows the temperature distribution with increase of time trend for different radius value. In this figure, temperature increases gradually towards the outer end to the internal heat energy, but a discontinuity in temperature was observed at $\bar{\tau} = 0.4$, and it may be due to the fixed time parameter $\bar{\tau}_0 = 0.4$ .In the Fig. 1(c), it is observed that the temperature increaseslinearly along the axial direction for different value of time due to the thickness.

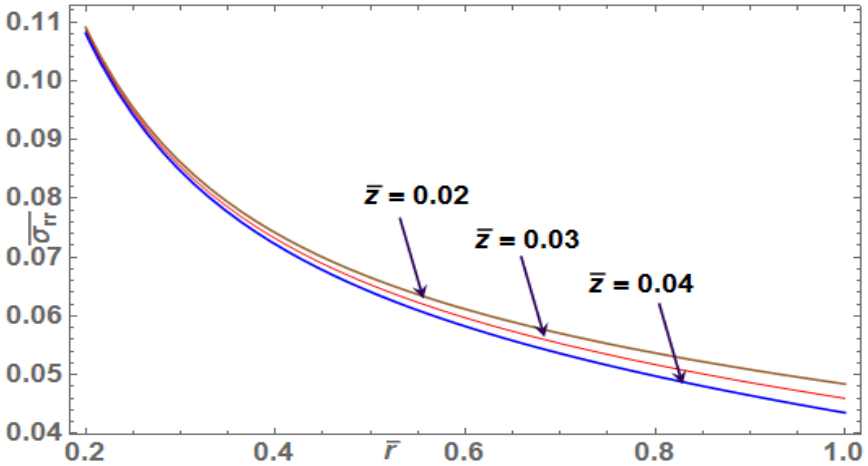

Fig. 2 (a): Radial Stress $\bar{\sigma}_{rr}$ *along* $\bar{r}$ *-direction for different values of* $\bar{z}$

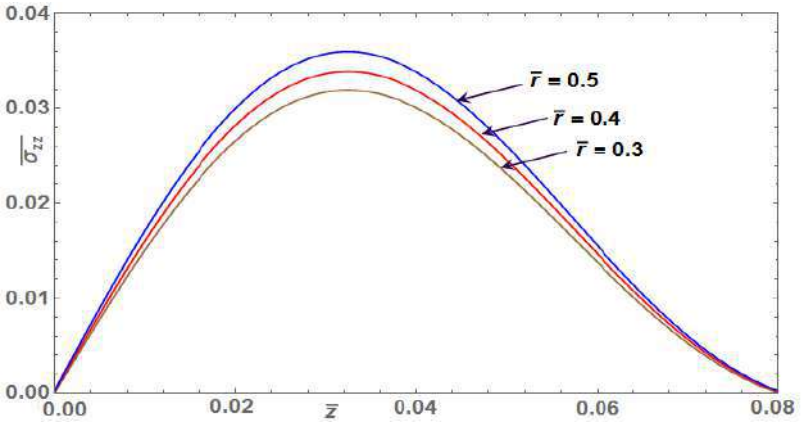

Fig. 2 (b): Axial Stress $\bar{\sigma}_{ZZ}$ along $\bar{z}$ -direction for different values of $\bar{r}$

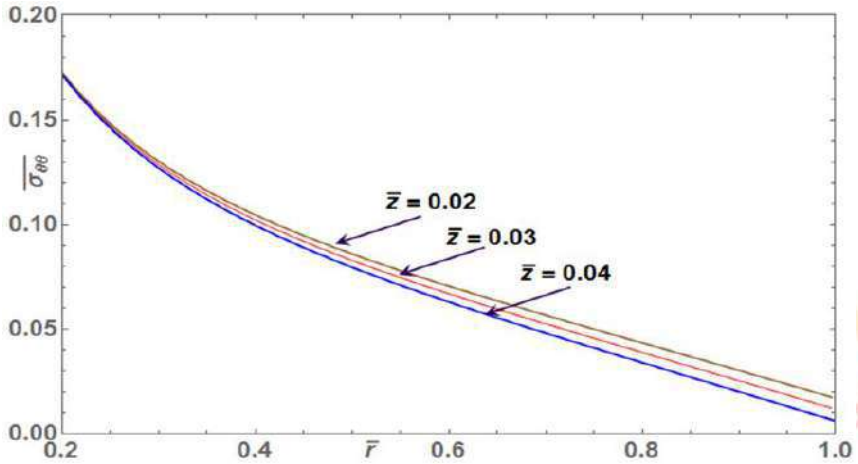

Fig. 2 (c): Tangential Stress $\bar{\sigma}_{\theta\theta}$ along $\bar{r}$ -direction for different values of $\bar{z}$

Fig. 2(a) explains that the stresses are initially on the higher side which goes on decreasing asalong the radial directionat different values of $\bar{z}$. Fig. 2(b) shows the distribution of axial stress along the $\bar{z}$ -direction. It is noted from the figure that the stress along axial direction attains amaximum at centreportion due to the accumulation of heat energy whereas at both boundaries the stress is zero.From Fig. 2(c), it can be concluded that tangential stress will be more at the initial point and gradually decreases along the radial direction.

Conclusion

The proposed analytical solution of the temporal thermal stress of a medium thick plate was stored in a cylinder coordinate system with the presence of an internal heat source. To the best of the author's knowledge, so far there have been very few reports compiling sources according to a linear function of temperature in the medium for a medium-thick plate of finite height with boundary conditions of the Direchletttype.The Using Laplace integral transformation techniques and classical methods, the thermal distribution, thermal stress, is resolved. Compared to other methods proposed by the researchers, the integral transformation technique presented here is relatively simple and widely applicable. This is how our search results can be described astemperature plate is assumed to satisfy the general quasi-static heat conduction equation with a ramp-type internal heat source. The advantage of this method is its versatility and mathematical ability to handle various types of mechanical and thermal boundary conditions.

1. The advantage of this method is its simplicity and its mathematical power to handle a variety of mechanical and thermal boundary conditions.
2. The maximum stress in the region outside the central core may be due to heat, stress, concentration, or internal heat sources available under the region considered.

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Strength of the Singularity in Radiating Dyon Solution on anti-de Sitter Background.

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Abstract:

Here we study the structure of space-time singularities formed during the radial in-fall of a coherent stream of charged "photons"-a piece of the radiating dyon metric. we study the strength of singularities which develop in the space time on the anti-de-sitter background. It is shown that the singularities formed in gravitational collapse of radiating dyon solution in anti-de-sitter background are not hidden inside the event horizon. It is also shown that final outcome of collapse gives naked singularity arising in space-time is gravitationally strong, therefore naked singularities are strong in Tripler's sense.

I Introduction

It would be interesting to study whether the singularity forming at the end of gravitational collapse is observable by external observer. One important conjecture related to the singularities known as cosmic censorship hypothesis (CCH) given by Roger Penrose [1]. This states that the collapse of a physically reasonable initial data yields a space-time singularity which is always hidden inside the event horizon. It has two conjecture , i.e., weak and strong. According to the weak conjucture, singularity formed by gravitational collapse is not visible to a far away observer. The strong cosmic censorship hypothesis states that the singularity cannot be observed even by an observer who is very close to it. Wald [2] discussed some examples to justify the validity of weak form of CCH.

When a massive star is on the verge of completing its nuclear cycle, then the thermonuclear reactions in the interior of the star cannot counter balance the immense gravitational pull of the star. Under most general conditions general relativity predicts that such a collapse must end in a singularity, which may or may not be clothed by an event horizon. A singularity may be physically described as a region in the space-time with extreme curvature, vanishing volume and unbounded gravitational forces. However, general relativity remains silent on the nature (BH or NS) or physical properties of such a singularity. This is basically due to the fact that mathematical structure breaks down preventing analysis at and beyond the singularity. This has triggered extensive research on Gravitational collapse during the past few decades. After all one would always like to know whether, and under what conditions gravitational collapse leads to the formation of a black hole (BH). A few decades back R. Penrose (1969) proposed the cosmic censorship hypothesis (CCH), which states that the singularities formed in gravitational collapse of physically reasonable matter cannot be seen by any distant observer in the universe. It implies that the singularities formed in asymptotically flat space-times are always bounded by event horizons and hence are destined to be black holes. With the announcement of this proposal, study of gravitational collapse has gained special importance, because one would always like to know that whether there exists any physical collapse solutions that lead to naked singularities (NS), which will serve as counterexamples of CCH [3]. Important cases of naked singularities analyzed so for include dust collapse [4-9], radiation collapse [10-17] and strange quark matter [18-19].

A.Chamorro and K.S.Virbhadra have obtained an exact solution of the Einstein- Maxwell equations which are a magnetic charge generalization to the Bonnor-Vaidya solution and describe the gravitational and electromagnetic fields of a non-radiating massive radiating dyon [20]. The paper is based on the composite charges i.e. an electric charge and a magnetic charge bound together by their gravitational interaction. Hence it would be interesting to study the nature of the singularities formed in the gravitational collapse of such composite space-time [21]. In this paper, we study the strength of singularity in Radiating Dyon solution on anti-de-sitter background. We also show that gravitational constant does affect the nature of singularity.
We conclude the paper in V section by some concluding remarks.

II Radiating Dyon Solution in Anti-de-sitter space-time

The metric, which describes the gravitational field of non-rotating massive radiating dyon as found by Chamorro and Virbhadra [20] is

$$ds^2 = -\left(1 - \frac{2m(v,r)}{r}\right)dv^2 + 2dvdr + r^2(d\theta^2 + sin^2\theta d\emptyset^2), \quad (1)$$

Where

$$m(v,r) = f(v) - \frac{\left(q_e^2(v)+q_m^2(v)\right)}{2r} - \frac{\Lambda r^3}{3} \quad (2)$$

Here $f(v)$ is the standard Vaidya mass, $q_e(v)$ and $q_m(v)$ are electric and magnetic charge parameters respectively. These parameters depend on the Eddington advanced time coordinate v.

The model considered in this paper is obtained from an energy-momentum tensor of the form

$$G_i^k = R_i^k - \frac{1}{2}Rg_j^k = 8\pi(E_i^k + N_i^k) \quad (3)$$

Where

$$\{x^\mu\} = \{v,\ r,\ \theta,\ \emptyset\}, \qquad (\mu = 0,\ 1,\ 2,\ 3).$$

E_i^k is related to the electromagnetic tensor F_{ki} in the familiar way

$$E_i^k = \frac{1}{4\pi}\left[-F_{im}F^{km} + \frac{1}{4}g_i^k F_{mn}F^{mn}\right] \quad (4)$$

$$N_i^k = V_i V^k \quad (5)$$

is the energy-momentum tensor of the null fluid. V^k is the null fluid current vector satisfying $g_{ik}V^iV^k = 0$. Electric current vector $J_{(e)}^i$ and magnetic current vector $J_{(m)}^i$ are given by

$$\frac{1}{\sqrt{-g}}\frac{\partial}{\partial x^k}\left(\sqrt{-g}F^{ik}\right) = 4\pi J_{(e)}^i \quad (6)$$

$$\frac{1}{\sqrt{-g}}\frac{\partial}{\partial x^k}\left(\sqrt{-g}\,{}^*F^{ik}\right) = 4\pi J_{(m)}^i \quad (7)$$

Where ${}_{*F^{ik}}$ is the dual of the electromagnetic field tensor F^{ik} and is given by

$${}^*F^{ik} = \frac{1}{2\sqrt{-g}}\in^{iklm} F_{lm}\ , \quad (8)$$

Where $\in^{iklm}$ is the Levi-Civita tensor density.

The non-vanishing components of the Einstein tensor for the above metric are given by

$$G_0^0 = G_1^1 = -G_2^2 = -G_3^3 = \frac{\left(q_e^2(v)+q_m^2(v)\right)}{r^4}\ , \quad (9)$$

$$G_0^1 = k^2\ , \quad (10)$$

Where

$$k^2 = \frac{2(q_e\dot{q_e} + q_m\dot{q_m} - \dot{f}r)}{r^3} \quad (11)$$

Here the over dot denotes the derivative with respect to the retarded coordinate v.

Energy-momentum tensor of the electromagnetic field and null fluids are given by

$$E_0^0 = E_1^1 = -E_2^2 = -E_3^3 = \frac{\left(q_e^2(v)+q_m^2(v)\right)}{8\pi r^4}\ , \quad (12)$$

$$N_0^1 = \frac{k^2}{8\pi} \quad (13)$$

III Nature of the Singularities in Monopole-Radiating Dyon Solution

The physical solution is for < 0 **,** the space-time becomes flat with $f(v) = 0$, $q_e(v) = 0$, $q_m(v) = 0$**.** At $v = T$, Say, the radiation is turned off. For$v > T$, $\dot{f}(v) = \dot{q_e}(v)\,\dot{q_m}(v) = 0$, i.e. $f(v), q_e^2(v)\ and\ q_m^2(v)$ are positive definite . Thus the metric for $v = 0\ to\ v = T$ is radiating dyon solution and for $v > T$ it becomes a static dyon solution [22].

To investigate the structure of the collapse, we need to consider the radial null geodesics define by $ds^2 = 0$. $\left(k^\theta = k^\emptyset = 0\right)$. The equation for outgoing radial null geodesic for metric (1) is given by

$$\left(1-\frac{2m(v,r)}{r}\right)dv^2-2dvdr=0$$

i.e.

$$\frac{dr}{dv}=\frac{1}{2}\left(1-\frac{2m(v,r)}{r}\right).$$

Using the mass function (2) , above equation becomes

$$\frac{dr}{dv}=\frac{1}{2}\left(1-\frac{2f(v)}{r}+\frac{q_e^2(v)+q_m^2(v)}{r^2}+\frac{\Lambda r^2}{3}\right) \quad (14)$$

In general, Eq. (14) does not yield an analytic solution. However, if $f(v)\propto v$, $q_e^2(v)\propto v^2$, $q_m^2(v)\propto v^2$,Eq. (14) becomes homogeneous and can be solved in terms of elementary functions[23].

In particular, we take

$$f(v)=\lambda v, \quad (15)$$

and

$$q_e^2(v)=\begin{cases}0\ , & v\le 0\\ \frac{\mu^2v^2}{2}\ , & 0<v\le T\\ \mu^2T^2(const)\ , & v>T\end{cases} \quad (16)$$

$$q_m^2(v)=\begin{cases}0\ , & v\le 0\\ \frac{\delta^2v^2}{2}\ , & 0<v\le T\\ \delta^2T^2(const)\ , & v>T\end{cases} \quad (17)$$

Where λ, μ^2 and δ^2 are some positive constants. Inserting the expressions for $f(v)$, $q_e^2(v)$ and $q_m^2(v)$ into Eq.(2) we obtain the mass function for monopole radiating dyon solution as

$$m(v,r)=\lambda v-\frac{\mu^2v^2+\delta^2v^2}{4r}-\frac{\Lambda r^3}{6} \quad (18)$$

It follows that with the choice of above mass function, the metric (1) becomes self-similar [1] (a spherically symmetric space-time is a self similar if $g_v(ct,cr)=g_v(t,r)$ and $g_{rr}(ct,cr)=g_{rr}(t,r)$ for every >0) admitting a homothetic killing vector ξ^a given by

$$\xi^a=v\frac{\partial}{\partial v}+r\frac{\partial}{\partial r} \quad (19)$$

and satisfies

$$L_\xi g_{ab}=\xi_{a;b}+\xi_{b;a}=2g_{ab}\ , \quad (20)$$

Where L denote the Lie derivative.

Defining $k^a=dx^a/dk$ as a tangent to radial null geodesics, where k is an affine parameter, it follows that $\xi^a k_a$ is constant along radial null geodesics.

Thus

$$\xi^a k_a=uk_u+rk_r=C, \quad (21)$$

Where C is a constant. Radial null geodesic equations of metric (1), on using the null condition $k^ak_a=0$, takes the simple form

$$\frac{dk^v}{dk}-\left(\frac{m'}{r}-\frac{m^2}{r^2}\right)(k^u)^2=0,$$

$$\frac{dk^r}{dk}+\left(\frac{\dot{m}}{r}-\frac{m'}{r}+\frac{m^2}{r^2}+\frac{2mm'}{r^2}-\frac{2m^2}{r^3}\right)(k^v)^2+2\left(\frac{m'}{r}-\frac{m^2}{r^2}\right)k^vk^r=0 \quad (22)$$

Let

$$k^v=\frac{dv}{dk}=\frac{P(v,r)}{r}, \quad (23)$$

Then from the null condition $k^ak_a=0$ we obtain

$$k^r=\left(1-\frac{2m}{r}\right)\frac{P}{2r},$$

Also

$$k_r=k_1=g_{1j}k^j=g_{10}k^0$$

$$k_r = \frac{P}{r} \tag{24}$$

And

$$k_v = k_0 = g_{0j}k^j = g_{00}k^0 + k^1$$

Therefore

$$k_v = -\frac{P}{2r}\left(1 - \frac{2\lambda u}{r} - 2a + \frac{\mu^2u^2+\delta^2u^2}{2r^2} + \frac{\Lambda r^2}{3}\right) \tag{25}$$

Eq. (21), (24) and (25) yields

$$P = \frac{12C}{12+(12-2\Lambda r^2-6)X+12\lambda X^2-3(\mu^2+\delta^2)X^3} \tag{26}$$

Where X is a self-similarity variable defined by $X = v/r$. The singularity occurring at $r = 0$ is naked if the outgoing radial null geodesic equation has atleast one real positive root [24]. In the case of pure Vaidya space-time it has been shown that for a mass function $m(u) = \lambda v/2$, the central singularity is naked for $\lambda \leq 1/8$, and the collapse ends into black hole if $\lambda > 1/8$ [25].

Hence it would be interesting to investigate whether the gravitational collapse of Vaidya space-time could yield a naked singularity under the influence of the gravitational constant and composite field produced by electric and magnetic charges.

With the help of Eq. (18), the equations of the outgoing radial null geodesics for the metric (1) are given by

$$-\left(1 - \frac{2m}{r}\right)dv^2 + 2dvdr = 0$$

Therefore

$$\frac{dr}{dv} = \frac{1}{2}\left(1 - \frac{2m}{r}\right)$$

i.e.

$$\frac{dr}{dv} = \frac{1}{2}\left(1 - \frac{2\lambda v}{r} + \frac{\mu^2v^2+\delta^2v^2}{2r^2} + \frac{\Lambda r^2}{3}\right) \tag{27}$$

Let

$$X_0 = \lim_{\substack{u\to 0\\ r\to 0}} \frac{v}{r} = \lim_{\substack{u\to 0\\ r\to 0}} \frac{dv}{dr}$$

Hence Eq. can be written as

$$X_0 = \lim_{\substack{u\to 0\\ r\to 0}} \frac{dv}{dr} = \frac{2}{1 - 2\lambda X + \frac{\mu^2}{2}X^2 + \frac{\delta^2}{2}X^2 + \frac{\Lambda r^2}{3}}$$

i.e.

$$X_0 = \frac{12}{6-12\lambda X+3(\mu^2+\delta^2)X^2+2\Lambda r^2}$$

$$3(\mu^2 + \delta^2)X^3 - 12\lambda X^2 + (6 + 2\Lambda r^2)X - 12 = 0 \tag{28}$$

The above equation governs the nature of the singularity. If this equation has at least one real and positive root, then the singularity will be naked. If the equation has no positive root, then the collapse ends into a black hole.

In particular, for $\lambda = 0.1,\ \mu = 0.01,\ \delta = 0.02,\ \Lambda = 0.1,\ r = 0.1$, one of the roots of Eq. (28) is $X_0 = 794.9794$, indicating that the gravitational collapse in this case ends into a naked singularity.

IV Strength of the naked singularity

It has seen the nakedness of the singularity in the previous section; in this section we study the strength of singularity. The Clark and Krolak Criterion the strength of singularities has been analyzed and shown that these naked singularities are gravitationally strong. If the naked singularity is not strong then it cannot be considered as a physically reliable singularity and hence such naked singularities may not be considered as counter examples to CCH. A naked singularity is said to be strong if at least along one radial null geodesic with affine parameter k, with k = 0 at the singularity, one should have

$$\Psi = \lim_{k\to 0} k^2 R_{ab}k^a k^b > 0 \tag{29}$$

Where k^a is tangent to the null g**e**odesics and R_{ab} is the Ricci tensor

using Eq. (22) and (23) we write

$$\Psi = \lim_{k\to 0} k^2 R_{ab}k^a k^b = \lim_{k\to 0} k^2 \frac{2\dot{m}}{r^2}(k^v)^2 \tag{30}$$

$$= [4\lambda - X(\mu^2 + \delta^2) \lim_{k\to 0} \left(\frac{kP}{r^2}\right)^2 \quad (31)$$

as singularity is approached, $k \to 0, r \to 0$ *and* $X \to X_0$ and using L-Hospital's rule, we find that

$$\Psi = \frac{4\lambda - (\mu^2+\delta^2)X_0}{1+\frac{\Lambda r^2}{3} - 2\lambda X_0 + \frac{1}{2}(\mu^2+\delta^2){X_0}^2} \quad (32)$$

Thus the singularity is strong if $4\lambda - (\mu^2 + \delta^2)X_0 > 0$

For our particular case (i.e. λ=0.1, μ=0.01, δ=0.02, Λ=0.1, r=0.1, $X_0 = 794.9794$)

We have $4\lambda - (\mu^2 + \delta^2)X_0 = 0.00251$. Thus the naked singularity arising in the radiating dyon solution in the anti-de-sitter space-time is a strong curvature singularity.

V Concluding Remarks

Here we studied the appearance of singularity that is not hidden by horizon this singularity is called a naked singularity. In the present work we have studied strength of singularity in radiating dyon solution on anti-de-sitter background. It has been shown that the singularities formed in gravitational collapse of radiating dyon solution in anti-de-sitter background are not hidden inside the event horizon. Thus one can argue that composite charged field (electric and magnetic charges) and gravitational constant does not affect to gravity and cannot prevent a naked singularity from forming completely, so that CCH actually violets.

Also, using the clark and krolak criteria [25] the strength of singularities has been analyzed and shown that the naked singularities in the composite solution in anti-de-sitter background are gravitationally strong.

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Fractional Derivative Models for Large Deflection of Beams and Plates: A Review Article

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Abstract:

The article investigates the present review of the fractional order thermoelastic problem for large deflection with homogeneous material properties within a finite length plate. The fractional time derivative heat conduction differential equation is mostly solved using numerical or integral transformation technique. The large deflection of a plate when placed on the elastic foundation is formulated from the potential energy equation neglecting the second strain invariant.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords: *temperature distribution, large deflection, fractional order, thermal stress*

1. Introduction:

Although thermo-mechanical phenomena in the majority of practical engineering applications are adequately simulated with the classical Fourier heat conduction equation, there is an important body of problems that require due consideration of thermo-mechanical coupling: it is appropriate in these cases to apply the generalized theory of thermoelasticity. Serious attention has been paid to the generalized thermoelasticity theories in solving thermoelastic problems in place of the classical uncoupled/coupled theory of thermoelasticity. The absence of any elasticity term in the heat conduction equation for uncoupled thermoelasticity appears to be unrealistic since due to the mechanical loading of an elastic body, the strain so produced causes variation in the temperature field. Moreover, the parabolic type of the heat conduction equation results in an infinite velocity of thermal wave propagation, which also contradicts the actual physical phenomena.

2. Research Background :

The equation of equilibrium for the large deflection of a heated plate as derived by Basuli [1] on the basis of Berger's approximations is givenunder uniform load and stationary distribution [i.e. $T(r,\theta,z) = T_0(r,\theta) + g(z)T(r,\theta)$] as

$$D\nabla^2(\nabla^2 - \beta_1^2)\, w(r,\theta,t) = -\frac{E\alpha\, f(\mathrm{l})}{1-\upsilon}\nabla^2 T \tag{1}$$

where

$$f(\mathrm{l}) = \int_{-1/2}^{1/2} z\, g(z)\, dz$$

and β_1^2 is a normalising constant of integration.

In deriving the large deflection equation of a heated plate, we have generalized the aforesaid equation of equilibrium for the transient temperature distribution, as

$$\nabla^2(\nabla^2 - \beta_1^2)\, w(r,\theta,t) = -\frac{\nabla^2 M_T}{D(1-\upsilon)} \tag{2}$$

where $w(r,\theta,t)$ is the normal transverse deflection along the *z*-direction, ∇^2 indicates the two-dimensional Laplacian operator in (r, θ), the constant υ denotes the Poisson's ratio of the plate, $D = E\mathrm{l}^3/12(1-\upsilon^2)$ is the flexural stiffness of the plate and β_1^2 is to be determined from

$$u_{,r} + u/r + [w(r,\theta,t)_{,r}]^2/2 + v_{,\theta}/r + [w(r,\theta,t)_{,\theta}]^2/2r^2 = \beta_1^2 l^2/12 + (1+\upsilon)\alpha N_T \quad (3)$$

The result of the above heat conduction gives thermally induced resultant moment and resultant force as [2, pp. 381]

$$M_T = \alpha E \int_{-l/2}^{l/2} z\,T(r,\theta,z,t)\,dz \quad (4)$$

$$N_T = \alpha E \int_{-l/2}^{l/2} T(r,\theta,z,t)\,dz \quad (5)$$

with α as the coefficient of linear thermal expansion and *E* symbolize Young's Modulus of the material of the plate, respectively.

Eqs. (5) and (6) have to be solved for heated thin simply supported annular sector plate along the edges for which the boundary conditions are

$$w(r,\theta,t)\big|_{r=a} = w(r,\theta,t)_{,r}\big|_{r=a} = 0 \quad (6)$$

$$w(r,\theta,t)\big|_{r=b} = w(r,\theta,t)_{,r}\big|_{r=b} = 0 \quad (7)$$

3. Literature Review:

The development of this theory was accelerated by the advent of second sound effects observed experimentally. In heat transfer problems involving very short time intervals and/or very high heat fluxes, it has been revealed that the inclusion of second sound effects in the original theory yields results that are realistic and very much different from those obtained with the classical theory of elasticity. Analytical approaches have been developed many decades ago for one-dimensional multilayer heat conduction problems based on variables separation and methods of finite integral transformation [3-6]. De Monte [7] applied the eigenfunction expansion approach to solve the unstable heat conductivity problem on a two-dimensional two-layered isotropic slab with homogeneous boundary condition.Recently, on a three-layered solid aerosol particle heated by laser energy, a series of solution have beenobtained for heat conduction [8]. The concise preliminary study in the review is by no means comprehensive. Considering a few typical examples, Benjeddou and Andrianarison [9] introduced the equivalent of the Reissner's mixed variational theorem for thermoelastic media by introducing the transverse thermal field-temperature increase relationship as a restriction through a Lagrange multiplier. Few classical cases of quasi-static and steady-state that contribute to uncoupled heat transfer and thermal stress analysis were also investigated. Blanc and Touratier [10] studied the Discrete Layer approach for thermoelastic responses in linearly elastic multi-layered composite plates using quadratic Lagrangian interpolations to establish the one-dimensional finite displacement. Pelassa and Massabo [11] derived the generalized displacements and stresses on simply supported multi-layered wide plates and beams subjected to steady-state thermal and mechanical loading and obtained the closed-form solutions using a multi-scale homogenized model. Sayyad et al. [12] used an exponential shear deformation concept to intervene the thermal stress analysis of cross-ply laminated composite plates in which Navier's solutions for simply supported boundary conditions subjected to thermal loads varying linearly across the thickness were considered. Li et al. [13] developed a semi-analytical model to predict the evolution of stress within a multilayered coating system during cyclic thermal loading in which temperature gradient through each layer thickness was obtained using finite element analysis. Darban and Massabo [14] used the matrix method to formulate the problems of two-dimensional thermoelasticity in simple supported multi-layered beams and plates having an arbitrary number of layers that may be in imperfect mechanical and thermal contact. Kreja and Sabik [15] developed their finite element software based on the first-order shear deformation principle, incorporating several modifications including the correction of transverse shear rigidity and the deployment of zig zag-type functions. In all previous studies, the

aim was to maximize the structural support's load-carrying capacity either by locating the supports or by adjusting their stiffness using a numerical approximation.

The best methodologies for solving these problems have been obtained withboth analytical and numerical approaches. Nevertheless, owing to either non-availability or logical complexity of the corresponding exact solutions, numerical solutions are favoured and widespread in practice. Rather, restricted use of analytical solutions should not minimize their value to numerical solutions; because correct solutions, probably, offer insight into the problem's governing physics, which is seldom prevalent in any numerical solution. Rather, it is comparatively easier to evaluate closed-form solutions to achieve optimal design options for any particular task of interest. But it is not always possible to obtain consistent analytical solutions. However, it is much desired sincegreater information can be achieved through the mathematical process of an analytical solution relative to a discrete numerical solution.It can even be used as a guideline to evaluate and verify the numerical algorithms. Even though useful, analytical approaches are rarely seen in several multi-stacked or multi-layered geometries in multi-dimensional transient thermoelastic problems.

Meanwhile, it has also been discovered that fractional calculus is efficiently used to change several existing models of physical processes, see Hilfer [16], Sherief et al. [17], Tenreiro et al. [18]. It can also be stated that the whole theory of fractional derivatives and integrals was developed in the second half of the 19th century.A good overview of the subject can be noticed in Podlubny [19], Kaczorek [20-21], Sherief and El-Latief [22], Siedlecka and Kukla [23], Abbas [24], Xiong and Niu [25], Mahakalkar et al. [26], Mittal and Kulkarni [27], Hussein [28] and so on.

4. Conclusion:

During the literature review, it was noted that most of the papers on thermoelasticity were taken to derive the temperature, displacement, and stresses in different types of solid due to different thermal loading. Here there is ample possibility of introducing an fractional-order derivative still exist. By intorduing fractional order approach to derive the temperature, displacement and stresses in different types of solid will provide a new dimension in thermoelastic world. Few investigations were cited so far for the determination of the temperature, displacements and its stresses for solid or composite multilayered bodies. The theoretical and experimental studies of the heated structural profile are of considerable practical importance in a wide range of fields such as mechanical, aerospace and food engineering fields throughout the past years. The further analysis of such fractional-order problems may, as it seems, stimulate evaluation of methods. Hence it is strongly desired the rigorous study of fractional-order behaviour of homogenous and nonhomogeneous of different bodies in the different coordinate system with or without an internal heat source.

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Thermoviscoelastic media with fractional-order effect: An overview & prospective

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Abstract:

The article investigates the present review of thermoviscoelastic theories with fractional order derivative effects on different objects. The main theme of the thermoviscoelastic problems is to establish operational methods to solve the governing differential equations. In the thermoviscoelastic problems, we have considered a few practical problems of technical interest, taking into account offractional order derivative effect by using numerical or exact procedures.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords:*temperature distribution, thermal stresses, thermoviscoelastic,fractional order, vibration, deflection, integral transform.*

1 Introduction:

Thermoelasticity investigates the relation between a material's elastic properties and temperature or between its thermal conductivity and thermal stress. Another complex problem faced by engineers and applied mathematicians is finding solutions to the fundamental problems in their field of study, partial differential equations in some cases. Using the well-known principles of classical mechanics and thermodynamics, the body's deformation undergoes the resultant stresses under the combined influence of external loads, body forces, and heat conduction is calculated. This relationship of temperature and displacement fields, where mechanical and thermal causes cause deformation, results in 'Thermoelasticity'. Temperature variations allow the material to undergo thermal effects. Some of these are thermal strains, stress, and deformation. Thermal deformation means that as the thermal energy and/or temperature of the material increases, so does the vibration of the atom or molecules and this changes in vibration resulting in the stretching of molecular bonds, which causes the material to expand, of course, if the thermal energy and temperature of the material decrease, the material will compress or contract. Thermal effects produce heat transfer by conduction within an elastic surface, and this distribution of thermal energy produces a temperature field within the material. Many solids undergo a volumetric transition with variance in temperature, and thus the presence of a temperature range typically causes stresses caused by limit or interval constraints. If the temperature variation is high enough, these stresses can reach levels that can lead to structural failure, especially in brittle materials. Therefore, understanding stress analysis can be helpful for several issues, including high-temperature variation.

The classical coupled dynamical theory of thermoelasticity wasdeveloped by Biot [1] by assuming that the elastic changes affect the temperature and vice-versa. However, this theorywasbasedon the Fourierlaw of heat conduction. Therefore whenthis theorywascombined withthelawofenergy conservation, aparabolic type heat conductione quation was obtained and predicted an infinite speed of the thermal signal, which contradicted the physical fact.The generalized theories of thermoelasticity have come into existence and attracted several researchers during the last few decades. The generalized theories were specially formulated to account for the finite speed of propagation of thermal signals, which waster medas a second sound effect. In this respect, wewould like to mention here one of the earliest development of the second sound theory for ther moelasticity by Fox [2], in which heapplied the principles of modern continuum the rmodynamics. Further, the two well established and well-studied generalized ther mo-elasticity the ories were also developed by Lordand Shulman [3] and Green and Lindsay [4]. Sherief [5] obtained the fundamental solution of generalized thermoelasticity with one relaxation time. To review and present generalized theories, one can refer to Ignaczak [6] and Chandrasekharaiah [7]. The uniqueness theorem for generalized thermo-viscoelasticity withone relaxation

timeunder different conditions is proved by Ezzat and El-Karamany [8,9]. El- Karamany and Ezzat [10,11] investigated the propagation of discontinuities of solutions in this theory. Ezzat [12] introduced a new model of the equations of generalized thermo-viscoelasticity for an electrically conducting is otropic media permeated by a primary uniformmagnetic field, considering the volume's rheological properties. Among the contributions tothe generalized theory are Ezzat et al.[13, 14], Othman et al.[15], Lata et al.[16], Kumari and Mukhopadhyay [17], El-Karamany and Ezzat [18] and Abbas and Kumar [19].

Viscoelasticity is the material property that exhibits viscous and elastic characteristics when undergoing deformation. Viscous materials, like honey, resist shear flow and strain linearly with time when stress is applied. Elastic materials strain when stretched and quickly return to their original state once the stressisre moved. Viscoelastic materials have elements of both of these properties and, assuch, exhibittime-dependent strain. At the same time, elasticity is usually the result of bond stretching a long crystallographic plane in anordered solid; viscosity results from the diffusion of atoms or molecules inside an amorphous material [20]. Linear viscoelastic materials are rheological materials that exhibit time-temperature rate-of-loading dependence. When their response is a function of the current input and the current and past input history, the characterization of the viscoelastic response can be expressed using the convolution (hereditary)integral. The mechanical-model representation of linear viscoelastic behaviour results was investigated by Gross [21]. One can refer to Atkinson and Craster [22] to review fracture mechanics and generalizations to the viscoelastic materials. A general review of time-dependent material properties has been exhibited in Refs. [23–26]. A further literature review has been described as 'the foundation and inspiration for substantive, useful research' will be done in later sections.

2 Research Background :

The system of governing equations of the linear theromoviscoelasticity theory with fractional order of heat transfer consists of the following [27]:

i. The equation of motion

$$\sigma_{ji,j} = \rho u_{i,tt} \tag{1}$$

ii. The constitutive equation

$$S_{ij}(x,t) = \int_0^t R(t-\xi)\frac{\partial e_{ij}(x,\xi)}{\partial \xi}d\xi = \hat{R}(e_{ij}) \tag{2}$$

in which

$$S_{ij} = \sigma_{ij} - \frac{\sigma_{kk}}{3}\delta_{ij}, \varepsilon_{ij} = \frac{1}{2}(u_{i,j} + u_{j,i}), e_{ij} = \varepsilon_{ij} - \frac{e}{3}\delta_{ij}, e = \varepsilon_{kk}, x = (x_1, x_2, x_3) \tag{3}$$

and $\hat{R}(t)$ is the relaxation modulus functions such that $R(\infty) > 0$ given by

$$\hat{R}(t) = 2\mu(1 - A\int_0^t f(t)\,dt). \tag{4}$$

The function $f(t)$ is taken in the form

$$f(t) = \exp[-\beta t]t^{a^*-1} \tag{5}$$

where $0 < a^* < 1, \beta > 0, 0 \le A < \Gamma(a^*)$.

iii. The stress-strain temperature relation

Assuming that the relaxation effects of the volume properties of the material are ignored, we have

$$\sigma = K\left[e - 3\alpha_T\left(1 + \frac{\nu^\alpha}{\alpha!}\frac{\partial^\alpha}{\partial t^\alpha}\right)\upsilon\right] \tag{6}$$

iv. The fractional heat equation

$$\kappa\upsilon_{,ii} = \rho C_E\frac{\partial}{\partial t}\left(1 + \frac{\nu^\alpha}{\alpha!}\frac{\partial^\alpha}{\partial t^\alpha}\right)\upsilon + \gamma T_0\frac{\partial}{\partial t}\left(1 + n\frac{\tau^\alpha}{\alpha!}\frac{\partial^\alpha}{\partial t^\alpha}\right)e \tag{7}$$

where n is equal to zero or one, and a comma denotes material derivatives.

3 Literature Review:

Many researchers have studied the development and applications of fractional-order equations. The fascinating and recent applications of fractional differential equations in physics, chemistry, biology, engineering, finance, and other research fields built over the last few decades are now not difficult to find. Some of the applications include: diffusion processes [28,29], mechanics of materials [30,31], combinatorics [32,33], inequalities [34], analysis [35], calculus of variations [36-41], signal processing [42], image processing [43], advection and dispersion of solutes in porous or fractured media [44], modeling of viscoelastic materials under external forces [45], bioengineering [46], relaxation and reaction kinetics of polymers [47], random walks [48], mathematical finance [49], modeling of combustion [50], control theory [51], heat propagation [52], modeling of viscoelastic materials [53] and even in areas such as psychology [54,55]. It is easy to find hundreds, if not thousands, of new applications in which the fractional calculus approach is more than welcome.

Differential equations of fractional order have been the focus of many studies because of their continuous appearance in different applications in fluid mechanics, viscoelasticity, science, material science and building. Ezzat [56] recently established a new fractional heat conduction equation model utilizing the Taylor–Riemann series expansion of time-fractional order. Sherief etal.[57] introduced afractional formula of heat conduction, proved a uniqueness theorem, and derived a reciprocity relation and a variational principle. Onecanreferto Ezzat and Fayik [58]and Ezzatand El-Bary[59] for a survey of fractional calculus applications. Abbas [60] considered the fractional thermoelastic problem in the presence of a constant magnetic field exposed to a moving plane of heat source. Magneto electro-thermoelasticity was studied in the contex to fanewconsiderationoffractional Green–Naghdiheatconduction law without energy dissipation by Hendy et al. [61]. Yu et al. [62] solved a one-dimensional problem in fractional order generalized electro-magneto-thermoelasticity. Boetal.[63] introducedanovelcompactnumericalmethodforsolvingthe two-dimensional non-linear fractional reaction–subdiffusion equations, while Zhangetal.[64]introduced a time-space spectral method for the time-space fractional Fokker–Planck equation and its inverse problem.

A great number of computational techniques may be found in the research of viscoelastic problems in Danyluketal.[65], Vinogradov and Milton[66], Ashishetal.[67],Aldawody etal.[68]and Sheriefetal.[69]. One of the most popular methods is the Laplace transform, which is a viable strategy for viscoelasticity since the equations may be transformed into pseudo-elastic ones. However, this procedure presents some difficulties when viscous parametersvarya longtime or when imposed by complicated time-dependent boundary conditions. Many inverse transforms cannot be solved analytically.Subsequently, the numerical method for the Laplace inverse change is quickly created and connected. De Chant [70]discussed the limitations of the numerical inversion method in the face of discontinuities and asymptotic methods.Syngellakis[71]pointed out that numerical inversions of the Laplace transform by employing the finite-element and boundary element are effective approximate methods.Temel[72]obtained some solutions in the realspacere sorting the Durbin's numerical method of the inverse Laplace transform. Because of the complexity of the constitutive relations, it is challenging to find analytical solutions of viscoelasticity, and the numerical method is taken into accountas of late withth eassistance of the quick advancement of the PC innovation, especially the boundary element method, which is given in El-Karamany and Ezzat [73,74]. WangandAi[75] established an extended precise integration model to analyse the thermo-mechanical behaviour of multi-layered transversely isotropic materials in the Cartesian coordinate system. Aiand Wang[76]introduced ananalytical layer element solution to axisymmetric thermal consolidation of multi-layered porous thermoelastic media containing a deeply buriedheat source.

4 Conclusion:

During the literature review, it was noted that the expected thermal profile addresses thermoviscoelastic media with a fractional-order effect. The literature still fails to provide the exact solution of the fractional heat conduction equation in two or three-dimensional problems using fractional-order derivate. The present work

determines the thermal profile by solving heat conduction equations throughout thermodynamics that provide an exact solution to thermoviscoelastic problems.

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Thermoelastic media with memory-dependent derivative effect: An overview & prospective

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Abstract:

The article investigates the present review of thermoelastic theories with memory-dependent derivative effects on different objects. The main theme of the thermoelastic problems is to establish operational methods to solve the governing differential equations. In the thermoelastic problems, we have considered a few practical problems of technical interest, taking into account of memory-dependent derivative effect by using numerical or exact procedures.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords: *temperature distribution, thermal stresses, memory-dependent derivative vibration, deflection, integral transform.*

Introduction:

In several areas of engineering, solid objects are commonly used as integral structural elements. With thermal loading, such structural elements are likely to be subjected to many forms of static loading or excitation, such as seismic, mechanical, hydrodynamic, blast, aerodynamic, etc. Engineers and scientists worldwide are making unwavering efforts to develop and build economic and productive systems with a very low likelihood of failure. Thermal effects produce heat transfer by conduction within an elastic surface, and this distribution of thermal energy produces a temperature field within the material. Many solids undergo a volumetric transition with variance in temperature, and thus the presence of a temperature range typically causes stresses caused by limit or interval constraints. If the temperature variation is high enough, these stresses can reach levels that can lead to structural failure, especially in brittle materials. Therefore, understanding stress analysis can be helpful for several issues, including high-temperature variation.

Thermoelasticity investigates the relation between a material's elastic properties and temperature, or between its thermal conductivity and thermal stress. Another complex problem faced by engineers and applied mathematicians is finding solutions to the fundamental problems in their field of study, which is partial differential equations in some cases. Using the well-known principles of classical mechanics and thermodynamics, the body's deformation undergoes the resultant stresses under the combined influence of external loads, body forces, and heat conduction is calculated. This relationship of temperature and displacement fields, the situation where mechanical and thermal causes cause deformation, results in the word 'Thermoelasticity'. Temperature variations allow the material to undergo thermal effects. Some of these are thermal strains, stress, and deformation. Thermal deformation means that as the thermal energy and/or temperature of the material increases, so does the vibration of the atom or molecules and this changes in vibration result in the stretching of molecular bonds, which causes the material to expand, of course, if the thermal energy and temperature of the material decrease, the material will compress or contract.

The enormous demand for science and engineering works deals with Fractional-Order Equations' dynamical systems that involve derivatives and non-integer integrals. They explain various substances' memory and hereditary properties and cope with the tremendous demand for science and engineering work. Meanwhile, it is also discovered that fractional calculus is used effectively to modify many current models of physical processes, see Hilfer [1], Sherief et al. [2], Tenreiro et al. [3]. It can also be claimed that the entire theory of fractional derivatives and integrals was established in the second half of the 19th century. A good overview of the subject will be noticed in Podlubny [4], Kaczorek [5-6], Sherief and El-Latief [7], Siedlecka and Kukla [8],

Abbas [9], Xiong and Niu [10], Mahakalkar et al. [11], Mittal and Kulkarni [12], Hussein [13] and so on. The memory effect comes from the convolution operator presented in the most popular Riemann-Liouville fractional integral, which is defined as $I^{RL}_{\alpha,\alpha} f(x) = (1/\Gamma(\alpha))\int_a^x (x-t)^{\alpha-1} f(t)dt = \Phi_\alpha \bigstar f(x)$, where $\bigstar$ denotes the convolution operator, α is the fractional-order and Φ_α is the standard power function given as $\Phi_\alpha(t) = t^{\alpha-1}/\Gamma(\alpha)$. A further literature review has been described as 'the foundation and inspiration for substantive, useful research' will be done in later sections.

Research Background :

The classic heat conduction theory is based on the Fourier law [14,15]

$$q(x,t) = -k\nabla T(x,t) \qquad (1)$$

in which $q(x,t)$ is the heat flux vector, x denotes the point in the considered region, t is the time, k is the thermal conductivity of the material, ∇ is the gradient operator, and $T = T(r,t)$ is the temperature, respectively.

Introduction of single-phase-lag to evade discrepancy between the mathematical model and the observations [16-18]

$$q(x,t+\tau) = -k\,\nabla T(x,t) \qquad (2)$$

in which τ is the phase lag of the heat flux or so-called relaxation time.

Expanding the left-hand side of Eq. (2) into the Taylor series with respect to the variable τ, one obtains [19] as

$$q(x,t) + \frac{\tau^\alpha}{\Gamma(1+\alpha)}\frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\,\nabla T(r,t), 0 < \alpha \le 1 \qquad (3)$$

where α is introduced to keep the dimension in order.

The fractional generalization [20,21] of the classical Cattaneo model by introducing fractional Taylor formula [22] as

$$q(x,t) + \tau^\alpha \frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\,\nabla T(x,t), 0 < \alpha \le 1 \qquad (4)$$

where without losing the generality $\Gamma(1+\alpha)$ appearing in Taylor series is merged in τ^α terms, Γ is the gamma function, α is introduced to keep the dimension in order and $\partial^\alpha / \partial t^\alpha$ is the fractional time derivative based on Caputo fractional definition [23].

For the limiting case of $\tau = 0$ (or $\alpha = 0$), Eq. (4) reduces to classical Fourier heat conduction and the standard Cattaneo heat conduction equation for $\alpha = 1$ as

$$q(x,t) + \tau\frac{\partial}{\partial t} q(x,t) = -k\,\nabla T(x,t) \qquad (5)$$

The heat conduction equation in the context of fractional-order generalized thermoelasticity proposed by Sherief [24] gives

$$q(x,t) + \tau\frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\,\nabla T(x,t), 0 < \alpha \le 1 \qquad (6)$$

Here it should be noted that the estimated ranges [25] of relaxation time (in seconds) usually involves $(10^{-11} : 10^{-14})$ for metals, $(10^{-8} : 10^{-10})$ for gases, and $(10 : 10^{2})$ for porous materials, respectively.

Wang and Li [26] have introduced a memory-dependent derivative (MDD). The first order $(\alpha = 1)$ of function f which is simply defined in an integral form of a common derivative with a kernel function $K(t-\zeta)$ on a slipping interval $[t-\omega, t]$ in the form

$$q(x,t) + \tau D^{(1)}_\omega q(x,t) = -k\,\nabla T(x,t) \qquad (7)$$

where

$$D_{\omega}^{(1)} f(x,t) = \frac{1}{\omega} \int_{t-\omega}^{\omega} K(t-\zeta) f'_{\zeta}(x,\zeta) dx, \ \omega > 0,$$

$D_{\omega}^{(1)} \to \partial / \partial t$, ω is delay time, and $K(t-\zeta)$ is the kernel function.

Heat conduction equation in MDD thermoelasticity introduced by Ezzat [27]

$$q(x,t) + \omega D_{\omega}^{(1)} q(x,t) = -k \nabla T(x,t) \quad (8)$$

By combining Eq. (8) with the energy conservation equation

$$-\Delta \cdot q(r,t) = \rho C_v \frac{\partial T}{\partial t}(r,t) \quad (9)$$

Now combining Eq. (8) and (9) leads to the heat conduction equation as

$$\kappa \nabla T(x,t) = (1 + \tau_{\omega} D_{\omega}) \rho C_v \frac{\partial T}{\partial t}(r,t) \quad (10)$$

where $\kappa = \rho C_v / k$ is the thermal diffusivity, ρ is the density of the material, C_v is the specific heat capacity, and $\Delta = \nabla^2 = \nabla \cdot \nabla$ is Laplace operator is a second-order differential operator.

Literature Review:

Many researchers have studied the development and applications of fractional-order equations. The fascinating and recent applications of fractional differential equations in physics, chemistry, biology, engineering, finance, and other research fields built over the last few decades are now not difficult to find. Some of the applications include: diffusion processes [28,29], mechanics of materials [30,31], combinatorics [32,33], inequalities [34], analysis [35], calculus of variations [36-41], signal processing [42], image processing [43], advection and dispersion of solutes in porous or fractured media [44], modeling of viscoelastic materials under external forces [45], bioengineering [46], relaxation and reaction kinetics of polymers [47], random walks [48], mathematical finance [49], modeling of combustion [50], control theory [51], heat propagation [52], modeling of viscoelastic materials [53] and even in areas such as psychology [54,55]. It is easy to find hundreds, if not thousands, of new applications in which the fractional calculus approach is more than welcome.

Fractional-order derivatives have been successfully used in mechanics to model memory-effect damping forces or to characterize state feedback controllers, as demonstrated by Bagley and Torvik [56]. It is noticed by Wang and Hu [57] that the term fractional-order derivative whose order is between 0 and 2 often acts as a damping force in fractional-order vibration systems with a single degree of freedom. Fractional calculus has therefore been effectively used to change many current physical process models. The first use of fractional derivatives was made by Abel [58], who applied fractional calculus to the solution of the integral equation of the tautochrone problem formulation. Fractional derivatives were used by Caputo [59,60] and Caputo and Mainardi [61,62], and their findings were in substantial agreement with the empirical evidence for describing viscoelastic materials.

Some authors have worked on fractional derivative in the thermoelastic analysis of most recent literature, which can be summarised below: Povstenko [63] proposed a quasi-static uncoupled theory of thermoelasticity based on the heat conduction equation with a time-fractional derivative of order α. Povstenko [64] formulated the theory of diffusive stress based on the time-fractional diffusion equation. Povstenko [65] also obtained the temperature distribution and thermal stresses in an infinite medium with a spherical cavity using the integral transform technique.Youssef and Al-Lehaibi [66] developed a novel theory for the generalized thermoelasticity model based on fractional-order generalized thermoelasticity. Similarly, Youssef and Al-Lehaibi [67] constructed a model of an elastic material with constant parameters in the half-space in the context of the fractional-order generalized thermoelasticity theory. Sherief et al. [68] developed a new theory of thermoelasticity using the methodology of fractional calculus. Ezzat and El-Karamany [69] attempted to generalize these results to include a magnetic field's effects in two-temperature thermoelasticity. Youssef and Al-Lehaibi [70] developed a mathematical model of an elastic material with a cylindrical cavity in the context

of the fractional-order generalized thermoelasticity theory. Povstenko [71] obtained the theory of thermal stresses based on the heat conduction equation with the Caputo time-fractional derivative of order $0 < \alpha \leq 2$. Youssef [72] found a half-space filled with an elastic material taken as constant elastics' parameters in the standard model of thermoelasticity in fractional-order. Sur and Kanoria [73] constructed a new theory of two-temperature generalized thermoelasticity in the context of a new consideration of heat conduction with fractional orders.Youssef [74] considered a half-space filled with an elastic material with constant elastic parameters, and the governing equations were written in the form of the two-temperature generalized thermoelasticity theory of fractional order. Youssef et al. [75] developed a cylindrical nano-beam mathematical model with constant elastic parameters with fractional order heat conduction. Wang e al. [76] studied thermoelastic behaviours involving the effect of thermal inertia during the macro- and micro-scales heat conduction. Bhattacharya and Kanoria [77] obtained the two-temperature thermo-elasto-diffusion interaction inside a spherical shell in the context of fractional order generalized thermoelasticity. Zenkour and Abouelregal [78] determined the thermoelastic displacement, stress, conductive temperature, and thermodynamic temperature in an infinite isotropic elastic body with a spherical cavity based on the two-temperature generalized thermoelasticity theory (2TT). Youssef [79] derived a new theory of thermoelasticity based on the fraction order of strain, which is considered a new modification to Duhamel-Neumann's stress-strain relation. Bachher [80] considered a one-dimensional problem for a homogeneous and isotropic thermoelastic infinite porous material under the dependence of modulus of elasticity and thermal conductivity on reference temperature subjected to periodically varying heat sources in the context of the fractional-order generalized thermoelasticity with one relaxation time parameter. Santra et al. [81] proposed the three-dimensional generalized thermoelastic coupled problem for a homogeneous isotropic and thermally conducting thermoelastic medium under the effect of rotation in fractional context order generalized thermoelasticity.Yadav et al. [82] employed the theory of generalized thermoelasticity with fractional order strain to study the problem of one-dimensional disturbances in a viscoelastic solid in the presence of a moving internal heat source and subjected to a mechanical load. Bassiouny and Abouelnaga [83] investigated the thermoelastic properties of a sandwich structure made of three piezoelectric layers in the context of fractional-order theory two-temperature generalized thermopiezoelasticity. Gupta and Das [84] applied the eigenvalue approach method and Laplace transform, a general solution scheme for the thermoelastic deformation of an unbounded transversely isotropic medium fractional-order generalized thermoelasticity with an instantaneous heat source. Sheoran and Kundu [85] presented a comprehensive review of relevant literature to highlight the role of fractional calculus in thermoelasticity.Abbas [86] investigated the temperature, displacement, and stresses due to thermal shock loading on the inner surface cavity in an infinite medium with a cylindrical cavity in the context of the fractional-order generalized thermoelasticity theory. Bachher and Sarkar [87] studied the theory of generalized thermoelasticity based on the heat conduction equation with the Caputo time-fractional derivative is used to study the magneto-thermoelastic response of a homogeneous isotropic two-dimensional rotating elastic half-space solid. Povstenko et al. [88] studied a control problem of thermal stresses in an infinite cylindrical body in which the time-fractional heat conduction equation defined the temperature distribution with the Caputo derivative of the order $0 < \alpha \leq 2$. Xiong and Niu [89] developed the principle of fractional-order generalized thermoelastic diffusion for anisotropic and linear thermoelastic diffusive media. Chirilă and Marin [90] continued the work on dipolar thermoelastic materials, which are a particular case of multipolar continuum mechanics. The fractional-order derivative effect on a two-dimensional problem with weak, normal and strong conductivity due to thermal shock was examined by Abbas [91].

Conclusion:

The literature reviewed noted that the use of the expected thermal profile addresses thermomechanical problems with the memory response effect. The literature still fails to provide the exact solution of the heat conduction equation in two or three-dimensional problems using memory-dependent derivate. The thermal profile is determined by solving heat conduction equations with memory-dependent derivative effects throughout thermodynamics that provide an exact solution to thermoelastic problems.

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Thermoelastic effect of moving heat source in a hollow cylinder with time-fraction derivatives

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Abstract:

The present analysis comprises the mathematical model designed on thermal response in a thin hollow cylinder by a time-fractional thermo-elasticity of order $0 < \alpha \le 2$ *and confined to a region* $R: a \le r \le b, 0 \le z \le h, 0 \le \phi \le 2\pi$ *. The thin hollow cylinder is further analyzed utilizing an internal moving heat source assumed to be in a circular trajectory of radius* r_1 *, in which* $a \le r_1 \le b$ *around the centre of the cylinder with constant angular velocity* ω *. The mathematical calculation found the solution using integral transform and Greens theorem for the temperature and stress. The resultant of this calculation provides a series form of Bessel function and trigonometric function.*

Keywords*: Thermal stress, hollow cylinder, fractional derivative, internal heat sources, integral transform*

1. Introduction:

The breakdown of classical thermoelasticity countered by Fourier type heat conduction is observed in many physical processes such as medium of amorphous nature materials [1,2] like glass, and having some porosity, colloids etc. The fractional-order derivatives and integral technique are always preferred over the classical approach in constructing a mathematical model. Popovych [3] has discussed a thin thermosensitive plate for making the model on heat fields. Popovych [4] found the solution of the heat conduction equation to deal with the problems of thermo-sensitive bodies with convective heat transfer. Popovych [5, 6] determined solutions of heat-conduction in thermo-sensitive bodies. Youssef [9] established the uniqueness theorem and devised a new construction of analysis of thermoelasticity with respect to a fractional order. Jiang and Xu [10] investigated the time-fractional heat conduction equation with a time-fractional derivative for the general orthogonal curvilinear coordinate.

Meanwhile, Ezzat [11,12] elaborated on the uses of the concept of fractional thermoelasticity for porous asphaltic materials. Kumar and Kamdi [23] worked on finding the temperature distribution and thermal stresses by using the finite Marchi-Zgrablich and Laplace transform technique. An annular fin's two-dimensional thermoelastic problems were designed with the fractional-order derivative. Kumar and Kamdi [24] analyzed a problem on a finite hollow cylinder to evaluate the temperature and thermal stresses in the context of fractional order. Thakare et al. [25] considered nonhomogeneous thick hollow cylinders and obtained time-fractional heat transfer analysis employing internal heat generation and thermal stresses. Thakare and Warbhe [26] attempted to analyze a nonlocal Caputo type time-fractional heat conduction equation with internal moving heat sources and presented a mathematical model of a thin circular plate. The same result and study proof have been depicted in [7, 8, 14-21].

The current article elaborates on thermal behaviour in the thin hollow cylinder by using *h* Robin's boundary condition connected with the internal moving heat source. The solution to the heat conduction equation in the designed problem was obtained with the help of the Integral transform technique and Green's theorem. The resultant solution is found to contain a series form of Bessel function and trigonometric function. This study finds a vital role in an industry where materials are in the vicinity of heat.

2. Formulation:

A thin hollow isotropic cylinder with inner radius *a*, outer radius *b* and thickness *h* is defined in space $R: a \le r \le b, 0 \le z \le h, 0 \le \phi \le 2\pi$. An internal moving heat source along the circular trajectory of the radius r_1 is moving with constant angular velocity ω inside the cylinder. The heat generation by means of moving heat source activity may depend upon position and time in the form $g(r,\phi,z,t)\ w/s^3$. The thermoelastic problem is presented in the form of a time-fractional heat conduction equation of Caputo type of order α . It is defined for the function $f(t)$ by [14] as

$$\frac{d^\alpha f(t)}{dt^\alpha} = \frac{1}{\Gamma(n-\alpha)} \int_0^t (t-\tau)^{n-\alpha-1} \frac{d^n f(\tau)}{d\tau^n} d\tau, \quad t > 0 \ , \ n-1 < \alpha < n, \tag{1}$$

where the Laplace transform rule as given as

$$L\left\{\frac{d^\alpha f(t)}{dt^\alpha}\right\} = s^\alpha L\{\bar{f}(s)\} - \sum_{k=0}^{n-1} f^{(k)}(0^+)\, s^{\alpha-1-k}, \quad n-1 < \alpha < n. \tag{2}$$

in which the transform parameter is *s* and *n* refers to a positive integer.

The equation for temperature distribution in a thin hollow cylinder as a time-fractional differential equation of heat conduction with heat generation term is presented as follows:

$$\nabla^2 T + g_s^i \frac{1}{2\pi k r} \delta(r-r_1)\delta(\phi-\phi')\delta(z-\xi)\delta(t-\tau) = \frac{1}{k'}\frac{\partial^\alpha T}{\partial t^\alpha} \tag{3}$$

where

$$\nabla^2 = \frac{\partial^2}{\partial r^2} + \frac{1}{r}\frac{\partial}{\partial r} + \frac{1}{r^2}\frac{\partial^2}{\partial \phi^2} + \frac{\partial^2}{\partial z^2}$$

and volumetric heat source $g(r,\phi,z,t)$ in cylindrical coordinates is given by

$$g(r,\phi,z,t) = g_s^i \frac{1}{2\pi r} \delta(r-r_1)\delta(\phi-\phi')\delta(z-\xi)\delta(t-\tau)$$

Here g_s^i denotes an instantaneously moving heat source fixed at (r_1, ϕ', ξ) and releasing its energy spontaneously at time τ, $T = T(r,\phi,z,t)$ is temperature distribution, *k* is the thermal conductivity of the material of the cylinder, $k' = k/\rho c_p$ is thermal diffusivity, ρ *is* density, c_p is the specific heat of the material.

Also

$$\phi' = \omega t \tag{4}$$

with initial conditions as,

$$T = f(r,\phi,z) \quad at\ t = 0, r = -\infty;\ 0 < \alpha \le 2$$
$$\frac{\partial T}{\partial t} = 0, \qquad at\ \ t = 0\ , \qquad 1 < \alpha \le 2 \tag{5}$$

and corresponding boundary conditions,

$$k\frac{\partial T}{\partial r} - h_1 T = 0 \quad at\ r = a \tag{6}$$

$$k\frac{\partial T}{\partial r} + h_1 T = 0 \quad at\ r = b \tag{7}$$

$$k\frac{\partial T}{\partial z} - h_1 T = 0 \quad at\ z = 0 \tag{8}$$

$$k\frac{\partial T}{\partial z} + h_1 T = 0 \quad at\ z = h \tag{9}$$

where h_1 denotes the heat transfer coefficient of the cylinder.

The above equations (3) to (9) constitute the mathematical formulation of the problem under consideration.

3. Formulation of thermoelastic Problem

Following [7], on introducing a thermal stress function χwe get

$$\sigma_{rr} = \frac{1}{r}\frac{\partial \chi}{\partial r} + \frac{1}{r^2}\frac{\partial^2 \chi}{\partial r^2} \tag{10}$$

$$\sigma_{\phi\phi} = \frac{\partial^2 \chi}{\partial r^2} \tag{11}$$

$$\sigma_{r\phi} = -\frac{\partial}{\partial r}\left(\frac{1}{r}\frac{\partial \chi}{\partial r}\right) \tag{12}$$

For a traction free surface

$$\sigma_{rr} = 0,\ \sigma_{r\phi} = 0\ at\ r = a\ or\ r = b \tag{13}$$

where

$$\chi = \chi_c + \chi_p \tag{14}$$

in which χ_c and χ_p denotes complementary and particular solutions.

Next,

χ_c Satisfies the equation $\nabla^4 \chi_c = 0$ (15)

χ_p Satisfies the equation $\nabla^4 \chi_p = -\lambda E \nabla^2 \Gamma$ (16)

in which temperature change is given as $\Gamma = T - T_i$, T_i refers for initial temperature. Further, in the case of a thin cylinder, the thickness can be neglected.

We have Laplace operators as

$$\nabla^2 = \frac{\partial^2}{\partial r^2} + \frac{1}{r}\frac{\partial \chi}{\partial r} + \frac{1}{r^2}\frac{\partial^2}{\partial \phi^2}$$

4. Solution

In order to find the solution to the heat conduction equation, we first define the integral transform of $T(r,\phi,z,t)$ as

$$\bar{T}(\beta_m, v, a_n, t) = \int_R T(r,\phi,z,t) R_v(\beta_m r)\cos v(\phi - \phi')\, z(a_n z) dv \tag{17}$$

with its inverse as

$$T(r,\phi,z,t) = \sum_{m,n,v=0}^{\infty} \frac{\bar{T}(\beta_m, v, a_n, t) R_v(\beta_m r)\cos v(\phi - \phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \tag{18}$$

$$R_v(\beta_m r) = J_v(\beta_m r)[\beta_m Y_v'(\beta_m b) + H J_v(\beta_m b)] - Y_v(\beta_m r)[\beta_m Y_v'(\beta_m b) + H J_v(\beta_m b)] \tag{19}$$

where

$$H = \frac{h_1}{k}$$

and

$$z(a_n z) = \alpha_n \cos(a_n z) + H \sin(a_n z) \tag{20}$$

Normalization integral is denoted as

$$N(\beta_m) = \int_a^b r\left[R_v(\beta_m r)\right]^2 dr$$

$$N(\beta_m) = \frac{\frac{2}{\pi^2}\left\{\left[\frac{b^2(H^2+\beta_m^2)-v^2}{\beta_m^2 b^2}\right]\left[\beta_m J_v'(\beta_m a) + HJ_v(\beta_m a)\right]^2\right.}{\left[\beta_m J_v'(\beta_m a) + HJ_v(\beta_m a)\right]^2}$$

$$\left. - \frac{\left[\frac{a^2(H^2+\beta_m^2)-v^2}{\beta_m^2 a^2}\right]\left[\beta_m J_v'(\beta_m \beta) + H J_v(\beta_m \beta)\right]^2\right\}}{\left[\beta_m J_v'(\beta_m a) + H J_v(\beta_m a)\right]^2} \tag{21}$$

Next,

$$N(V) = \int_0^{2\pi}\left[\mathrm{Cos}\, v(\phi - \phi')\right]^2 d\phi = \pi \tag{22}$$

$$N(a_n) = \int_0^h \left[Z(a_n z)\right]^2 dz = \left(a_n^2 + H^2\right)\frac{h}{2} + H \tag{23}$$

where β_m denotes the roots of the transcendental equation

$$\begin{aligned}&[\beta_m J_v'(\beta_m a) + HJ_v(\beta_m a)][\beta_m Y_v'(\beta_m b) + HY_v(\beta_m b)]\\ &-[\beta_m J_v'(\beta_m b) + HJ_v(\beta_m b)][\beta_m Y_v'(\beta_m a) - HY_v(\beta_m a)] \;= 0\end{aligned} \tag{24}$$

and a_n denotes the roots of the transcendental equation

$$\tan a_n h = \frac{2\alpha_n H}{a_n{}^2 - H^2} \tag{25}$$

and $v \in W$, in which W is a set of whole numbers.

By taking the integral transform of equation (3) and using following Green's theorem given in [6], one obtains

$$\int_R \nabla^2 T \varphi_k \, dv = \int_R \nabla^2 T \varphi_k \, dv + \sum_{i=1}^{N}\int_{s_1}\left\{\psi_k \frac{\delta T}{\partial n_i} - T\frac{\delta \psi_k}{\partial n_i}\right\} ds_i \tag{26}$$

$$\frac{d^\alpha \bar{T}}{dt^\alpha} + k'(\beta_m^2 + a_n^2)\bar{T} = \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(a_n \xi)\partial(t - \Gamma) \tag{27}$$

Applying Laplace transform and using its inversion formula to equation (27) by using the initial condition, one obtains

$$\bar{T} = \bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)\left(t-\tau\right)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)\left(t-\tau\right)^\alpha]$$

By taking inverse integral transform, we obtain

$$T = \sum_{m,n,v=0}^{\infty} \frac{R_v(\beta_m r)\cos v(\phi-\phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \quad (28)$$

$$\Gamma = \sum_{m,n,v=0}^{\infty} \frac{R_v(\beta_m r)\cos v(\phi-\phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (29)$$

5. Solution to the thermoelastic problem:

Assume the value of χ_c and χ_c satisfying equation (15), (16), respectively as

$$\chi_c = \sum_{v=0}^{\infty} (Ar^{v+2} + Br^{-v+2})\cos v(\phi-\phi') + (Cr^{v+2} + Dr^{-v+2})\sin v(\phi-\phi') \quad (30)$$

$$\chi_p = \lambda E \sum_{m,n,v=0}^{\infty} \frac{R_v(\beta_m r)\cos v(\phi-\phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (31)$$

using (30), (31) in(14) one obtains

$$\chi = \sum_{v=0}^{\infty} (Ar^{v+2} + Br^{-v+2})\cos v(\phi-\phi') + (Cr^{v+2} + Dr^{-v+2})\sin v(\phi-\phi') + \sum_{m,n,v=0}^{\infty} \frac{R_v(\beta_m r)\cos v(\phi-\phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (32)$$

Using (32) in (10) to (12), one obtains

$$\sigma_{rr} = \sum_{v=0}^{\infty} [A(2+v-v^2)r^v + B(2-v-v^2)r^{-v}]\cos v(\phi-\phi') + (Cr^{v+2} + Dr^{-v+2}) \times\sin v(\phi-\phi') + \lambda E \sum_{m,n,v=0}^{\infty}\left[\frac{\beta_m}{r} R_v'(\beta_m r) - \frac{v^2}{r^2} R_v(\beta_m r)\right] \frac{\cos v(\phi-\phi')\, z(a_n z)}{\beta_m^2 N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (33)$$

$$\sigma_{\phi\phi} = \sum_{v=0}^{\infty} [A(v^2+3v+2)r^v + B(v^2-3v+2)r^{-v}]\cos v(\phi-\phi') + [C(v^2+3v+2r^v) + D(v^2-3v+2)r^{-v})]\sin v(\phi-\phi') + \lambda E \sum_{m,n,v=0}^{\infty}\left[\frac{\beta_m}{r} R_v'(\beta_m r) - \frac{v^2}{r^2} R_v(\beta_m r)\right] \frac{\cos v(\phi-\phi')\, z(a_n z)}{\beta_m^2 N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (34)$$

$$\sigma_{r\phi} = \sum_{v=0}^{\infty}[A(v^2+v)r^v + B(v-v^2)r^{-v}]\sin v(\phi-\phi') + [C(-v^2-v)r^v) + D(v^2-v)r^{-v})]\cos v(\phi-\phi') + \lambda E \sum_{m,n,v=0}^{\infty}\left[\frac{\beta_m}{r}R_v'(\beta_m r) - \frac{v^2}{r^2}R_v(\beta_m r)\right]\frac{\cos v(\phi-\phi')\, z(a_n z)}{\beta_m^2 N(\beta_m) N(v) N(a_n)} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (35)$$

Applying the prescribed condition (13), we have

$$A = \lambda E \sum_{m,n,v=0}^{\infty} \frac{a^{-v-2} z(a_n z)}{\beta_m^2 N(\beta_m) N(v) N(a_n)}\left\{\left(\frac{v+v^2-2-v^2}{2v(v^2-1)}\right)R_v(\beta_m a) - \left(\frac{1}{2v}\right)\beta_m a R_v'(\beta_m a)\right\} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (36)$$

$$B = \lambda E \sum_{m,n,v=0}^{\infty} \frac{a^{-v-2} z(\alpha_n z)}{\beta_m^2 N(\beta_m) N(v) N(\alpha_n)}\left\{\left(\frac{2+v-2v^2-v^3}{2v(v^2-1)}\right)R_v(\beta_m a) + \left(\frac{1}{2v}\right)\beta_m a R_v'(\beta_m a)\right\} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (37)$$

Substituting the above values of *A* and *B* in Eqs. (33) to (35), one obtains

$$\sigma_{rr} = \lambda E \sum_{m,n,v=0}^{\infty} a^{-v-2} r^v \left[\frac{7v^2-3v^4-v^3+v^5-4}{2v(v^2-1)}R_v(\beta_m a) - \frac{2+v\ -v^2}{2v}\beta_m a R_v'(\beta_m a)\right] + \left[\frac{-7v^2-v^3+3v^4+v^5+4}{2v(v^2-1)}R_v(\beta_m a) - \frac{2-v\ -v^2}{2v}\beta_m a R_v'(\beta_m a)\right] + \sum_{m,n,v=0}^{\infty}\left[\frac{\beta_m}{r}R_v'(\beta_m r) - \frac{v^2}{r^2}R_v(\beta_m r)\right]\frac{\cos v(\phi-\phi')\, z(\alpha_n z)}{\beta_m^2 N(\beta_m) N(v) N(\alpha_n)} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (38)$$

$$\sigma_{\phi\phi} = \lambda E\left\{\sum_{m,n,v=0}^{\infty} a^{-v-2} r^v \left[\frac{(v^2+3v+2)(-v^3+2v^2+v-2)}{2v(v^2-1)}R_v(\beta_m a) - \frac{v^2+3v+2}{2v}\beta_m a R_v'(\beta_m a)\right] + a^{v-2} r^{-v}\left[\frac{(v^2-3v+2)(-v^3-2v^2+v+2)}{2v(v^2-1)}R_v(\beta_m a) - \frac{v^2+3v+2}{2v}\beta_m a R_v'(\beta_m a)\right] + \left[\frac{\beta_m}{r}R_v'(\beta_m r) - \frac{v^2}{r^2}R_v(\beta_m r)\right]\frac{\cos v(\phi-\phi')\, z(a_n z)}{\beta_m^2 N(\beta_m) N(v) N(a_n)} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (39)$$

$$\sigma_{r\phi} = \lambda E \sum_{m,n,v=0}^{\infty} a^{-v-2} r^{v} \left[\frac{(-v^5+v^4+3v^3-v^2-2v)}{2v(v^2-1)} R_v(\beta_m a) - \frac{v^2+v}{2v} \beta_m a R'_v(\beta_m a) \right]$$
$$+ a^{v-2} r^{-v} \left[\frac{(v^5+v^4-3v^3-v^2+2v)}{2v(v^2-1)} R_v(\beta_m a) - \frac{v-v^2}{2v} \beta_m a R'_v(\beta_m a) \right]$$
$$+ \left[\frac{\beta_m}{r} R'_v(\beta_m r) - \frac{v^2}{r^2} R_v(\beta_m r) \right] \frac{\cos v(\phi-\phi') z(\alpha_n z)}{\beta_m^2 N(\beta_m) N(v) N(\alpha_n)} \qquad (40)$$
$$\times \left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi) (t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha] \right]$$
$$\times \left\{ E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha] - 1 \right\}$$

6. Numerical calculations:

Dimensions- For the sake of convenience, we choose the inner radius $a = 1m$, outer radius $b = 2.5m$, the thickness of the hollow cylinder $h = 0.2\,m$

Material Properties-

Thermal diffusivity (*m/s*)	Thermal conductivity (*W/mK*)	Density (Kg/m^3)	Specific heat (J/Kg K)	Poisson ratio	CTE (I/K)	Lame's constant
112.34 X 10^{-6}	386	8954	383	0.35	16.5 X 10^{-6}	26.67

Analysis of numerical Solutions

The numerical results and values are summarized and represented by a graph between temperature and stress distribution for weak, normal and strong conductivity. It has been done with MATEMATICA software for the finite hollow cylinder.

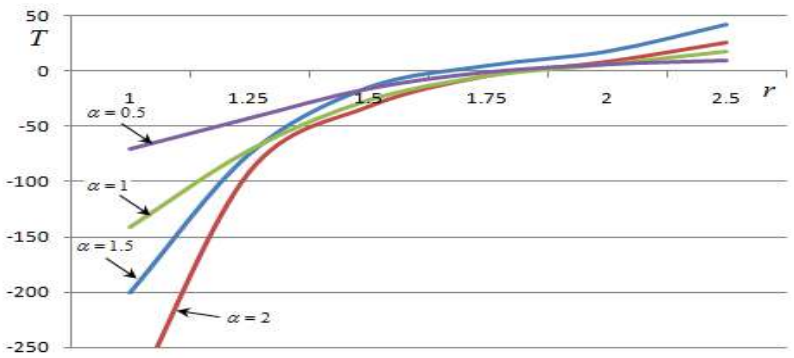

Figure 1: Temperature versus *r* for different values of α

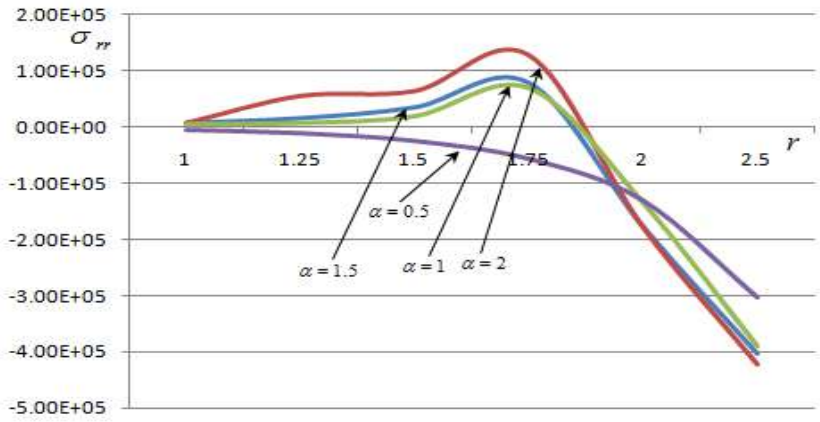

Figure 2: σ_{rr} versus *r* for different values of α

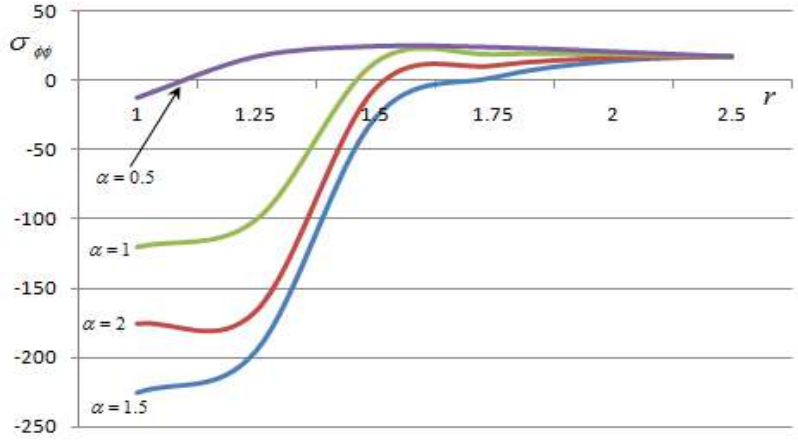

Figure 3: $\sigma_{\phi\phi}$ versus r for different values of α

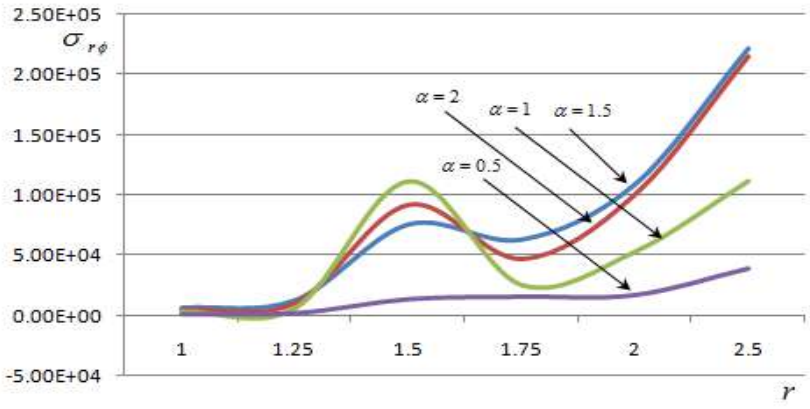

Figure 4: $\sigma_{r\phi}$ versus r for different values of α

Figures 1 to 4: The effect of different values α along the radial direction on temperature and stress distribution variation has been depicted graphically. It indicates the direct impact of the different values of the fractional-order parameter α on the thermal quantities. Studying these parameters helps to understand the properties of any material for domestic and industrial use.

7. Conclusion

In the present analysis, efforts are taken to find a numerical solution to the time-fractional order thermoelastic problem of a thin hollow cylinder that is subjected to an internal moving heat source. The analytical product of temperature change and corresponding stresses has been obtained by using Green's theorem approach and the Integral transform technique. The graphical study established the proportionality relation of wave propagation speed with fraction order. It would provide the base for researchers in thermodynamics and thermoelasticity. This model will be the initial base for designing new materials and applies to real-life situations.

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Hygrothermal Effects On Nanocomposites Objects: A Review Article

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Abstract:

This review article describes the hygrothermal effects on nanocomposite objects. The hygrothermoelastic effects on nanocomposites objects investigation aim to develop operational methods for solving the governing differential equations. In the hygothermoelastic problems, we used numerical algorithms to analyze a few real problems of technical importance while considering the geometry of nanocomposite materials. Few basic equations for hygrothermoelastic problems are discussed.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords:*Hygrothermoelasticity, Nanocomposite objects,Moisture diffusion, Temperature distribution,Thermal stresses.*

Introduction:

Although composites materials are increasingly used in marine, offshore, aeronautics, and civil infrastructures applications, their advantages include lightness, high strength, and high stiffness to weight ratios; however, their durability and long-term integrity are still not comprehensively understood. In such applications, composite materials are exposed to harsh and changing environments ranging from temperature variations and moisture exposure, including elevated temperature immersion and "hot-wet" exposures [1,2,3]. In particular, water diffusion in polymer matrix composite materials may promote material degradation, residual strength reduction, Plasticization, and lowering polymer matrices glass transition temperature, a global decrease in material performance [4, 5]. Thus, it is well known that hygrothermal effects of Polymer Matrix Composites (PMCs) cause degradation of mechanical properties due to the combined effect of moisture and temperature. Given the strong correlation between the rate of deterioration and moisture uptake, the diffusion process in such materials must be understood as a step toward the prediction of long-term durability [6]. Moisture diffusion through polymer or Fibre Reinforced Plastic (FRP) is intrinsically related to its molecular structure, water–polymer interaction, and the degradation processes resulting thereof. The swelling due to moisture absorption leads to the weakening of the fiber/polymer interface and hence affects the long-term durability of the composites [7–11]. Globally research is concentrated on developing PMCs with superior moisture barrier properties. Nanoclay as a filler material in polymers has shown great promise to improve such properties due to increased diffusion path based on tortuosity, which is dependent on the degree of exfoliation in polymers [12]. Thus,the review of the above literature outlines the investigation of the effects of hygrothermal on FRP, and the influence of nano-clay addition on improved mechanical/moisture barrier was well observed.

Literature Review:

The exclusive properties of nanoscale beams are due to their size, and this size plays an essential role in static and dynamic analysis. In front of the difficulties of classical continuum mechanics in considering the size effect in modeling the behaviour of this kind of structure, various size-dependent continuum theories have been developed. These theories include nonlocal continuum theory, strain gradient theory, or a combination of both (nonlocal strain gradient theory), modified couple stress theory, micropolar theory, and the surface elasticity theory.

In this regard, few manuscripts were reviewed like, Karličić et al. [13] used the nonlocal thermoelastic theory to investigate the free banding vibration and stability behaviour of MNBS embedded in Winkler's type of elastic medium and obtained the closed-form solutions for the natural frequencies, and the critical buckling

loads are derived by using the separation of variables method and the trigonometric method. Ebrahimi and Barati [14] developed a nonlocal higher-order beam model for free vibration analysis of magneto-electro-elastic functionally graded nanobeams via Hamilton's principle and solved it using the analytical method. Zarei et al. [15] dealt with the dynamic buckling of a sandwich truncated conical shell composed of polymer–carbon nanotubes–fiber multiphase nanocomposite layers in hygrothermal environments by employing Hamilton's principle. The previously published papers mostly exposed the static and dynamic characteristics of composite or smart material structures to the thermal environment. Recently, a few papers have been published using time-fractional thermoelasticity theory to study the effects of temperature on the material properties under thermal load. For example, Cajić et al. [16] analyzed the free vibration of a nanobeam resting on a viscoelastic foundation using the combined Eringen's nonlocal elasticity and fractional derivative viscoelasticity constitutive equations to model the system and obtained the solution via the Laplace integral transform method. Eyebe et al. [17] studied the nonlinear vibration of a nanobeam resting on the fractional-order viscoelastic Winkler–Pasternak foundation is studied using nonlocal elasticity theory. Thus, several authors (citations are given in the trailing section) have previously investigated the associated hygrothermoelastic problems.

Research Background :

Few basic equations are briefed here are just for reference as

The basic equation for hygrothermoelasticiy:

This subsection summarizes the results of the previous authors' work, namelythe relationship between temperature, dissolved moisture content and vapour concentration, and control equations. As the small variations, σ and ω are related to the mass of absorbed moisture as

$$M = \text{constant} + \sigma C - \omega T \tag{1}$$

Then the equation for moisture diffusion is

$$D''\nabla^2 C = \gamma \frac{\partial M}{\partial t} + \frac{\partial C}{\partial t} \tag{2}$$

and the thermal diffusion is

$$\mathrm{D}''\nabla^2 T = \frac{\partial T}{\partial t} - \varepsilon \frac{\partial M}{\partial t} \tag{3}$$

Now eliminating M from Eqs. (2) and (3) using Eq. (1), one gets

$$D\nabla^2 C = \frac{\partial C}{\partial t} - \psi \frac{\partial T}{\partial t} \tag{4}$$

$$\mathrm{D}\nabla^2 T = \frac{\partial T}{\partial t} - \varphi \frac{\partial C}{\partial t} \tag{5}$$

in which notation is used from the manuscript of Henry [18].

The basic equation for non-simple hygrothermoelasticiy:

Chen and Gurtin [19] propose the classification of real materials into simple and non-simple materials by considering two temperatures viz., thermodynamic and conductive. The respective theory explains that the two temperatures were not identical for non-simple materials, unlike simple materials in which they are identical. The studies were further extended to deformable bodies by Chen et al. [20] and showed that such materials contain an additional term involving the time derivative of the Laplacian of the conductive temperature, and they have shown that the two temperatures are related by

$$\phi = T - b\nabla^2 T,\ b > 0 \tag{6}$$

The key element that sets the two-temperature thermoelasticity theory apart from the classical theory is the material parameter. Therefore, in the case of a non-simple medium, Eq. (2) can be written as

$$D\left(1+\frac{b}{k}\frac{\partial}{\partial t}\right)\nabla^2\phi=\frac{\partial T}{\partial t}-\varphi\frac{\partial C}{\partial t} \qquad (7)$$

The basic equation for hygrothermoelasticiy:

Zhang and Li [21] formulated fractional hygrothermoelasticity theory within the framework of fractional calculus by coupling the classical Fourier's and Fick's laws to anomalous diffusion, which is characterized by the time-fractional diffusion-wave equation

$$D\nabla^2 C=\frac{\partial^\alpha C}{\partial t^\alpha}-\lambda\frac{\partial^\alpha T}{\partial t^\alpha} \qquad (8)$$

$$D\nabla^2 T=\frac{\partial^\beta T}{\partial t^\beta}-\eta\frac{\partial^\beta C}{\partial t^\beta} \qquad (9)$$

Several authors have previously investigated the associated hygrothermoelastic problems. Chang and Weng [22] proposed a linear hygrothermoelastic theory to analyze transient responses in an axisymmetric double-layer annular cylinder subjected to hygrothermal loading using the Hankel transform method. Sugano [23] obtained analytical solutions for the heat and moisture equation and its associated hygrothermal stress in a functionally graded material plate under the prescribed surface temperature and moisture load. Chiba and Sugano [24] analyzed transient heat and moisture diffusion and the resulting hygrothermal stress field in a layered plate subjected to hygrothermal loadings at the external surfaces. Brischetto [25] examined the hygrothermal loading effects in the bending of two-dimensional multilayered composite plates on Carrera's Unified Formulation framework. Ishihara et al. [26] formulated and quantified the hygrothermal field in porous media exposed to heat and moisture, considering nonlinear coupling. Saadatfar and Aghaie-Khafri [27] studied the static behaviour of a functionally graded magnetoelectroelastic hollow sphere subjected to hygrothermal loading in the spherically symmetric state. Ensour [28] presented the interaction of electric potentials, electric displacement, and elastic deformations to describe the hygrothermal responses in inhomogeneous piezoelectric hollow cylinders subjected to both mechanical load and electric potential. Zhao et al. [29] proposed the steady-state solution for three-dimensional hygrothermoelastic media based on the potential theory methodology. Previously published papers exposed the static and dynamic characteristics of composite or smart material structures to the hygrothermal environment. Recently, few papers have been published using time-fractional hygrothermoelasticity theory to study the effects of temperature and moisture concentrations on the material properties under hygrothermal load. Benkhedda et al. [30] evaluated the hygrothermoelastic stress in composite plates during moisture desorption, taking into account the change of mechanical characteristics induced by temperature and moisture variation. Zhang and Li [31] formulated fractional hygrothermoelasticity theory within the framework of fractional calculus by coupling the classical Fourier's and Fick's laws to anomalous diffusion, which is characterized by the time-fractional diffusion-wave equation. Peng et al. [32] presented a hyperbolic diffusion law with different phase lags of thermal and moisture fluxes to simulate coupled heat-moisture diffusion-propagation behaviour and studied transient hygrothermal and elastic response of an infinitely long cylinder subjected to sudden hygrothermal loadings. Zhang et al. [33] proposed a hygrothermal elastic problem within the framework of time-fractional calculus theory for a centrally symmetric sphere subjected to physical heat and moisture flux at its surface by using the integral transform method. Very recently, Zhang et al. [34] investigated the time-fractional diffusion-wave equations introduced to describe the coupled heat conduction and moisture diffusion in a hollow pipe using the separation of variables and the Laplace transform. However, previous researchers have not solved the high-dimensional hygrothermoelastic problems in nanocomposites objects as we know that innovative fibre-reinforced composites have gained extensive use within the region and physical science engineering industries. The benefits of those materials result from their high strength, stiffness, and damping at the side of low concrete weight, though, it is susceptible to hygrothermoelastic stress due to its intrinsic heterogeneity evolving at the microscopic macroscopic level. It reduces construction, operation, and development prices, whereas up structural

responsibility and enhances safety. It's crucial for a decent style of multilayered composite structures to correctly account for hygrothermoelastic stresses; even inside the context of an uncoupled theory, the hygrothermal fields are uncoupled from the strain ones; this task is scarcely unconventional.

Conclusion:

According to the literature study, using hypothesized hygrothermal effects on nanocomposite objects addresses hygrothermomechanical difficulties in many ways. The exact solution of the heat conduction equation in two or three dimensions using memory-dependent derivate has yet to be found in the literature. The thermal profile is determined throughout thermodynamics by solving heat conduction equations with memory-dependent derivative effects that provide a precise solution to thermoelastic problems.

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Thermoelastic problems with fractional order derivative: An overview & prospective

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Abstract:

The article investigates the present review of thermoelastic theories with fractional order derivative effects on different objects. The main theme of the thermoelastic problems is to establish operational methods to solve the governing differential equations. In the thermoelastic problems, we have considered a few practical problems of heat conduction, taking into account of fractional order derivative effect by using numerical or exact procedures.

AMS Subject classifications: 35B07; 35G30; 35K05: 44A10
Keywords:temperature distribution, thermal stresses, fractional order derivative, deflection, integral transform.

Introduction:

In several areas of engineering, solid objects are commonly used as integral structural elements. With thermal loading, such structural elements are likely to be subjected to many forms of static loading or excitation, such as seismic, mechanical, hydrodynamic, blast, aerodynamic, etc. Engineers and scientists worldwide are making unwavering efforts to develop and build economic and productive systems with a very low likelihood of failure.

Thermoelasticity, which is a branch of applied mathematics which specially deals with the study of temperature change and coupling between mechanical deformation and thermal energy calculated in terms of stress. “It can also be defined as it is a branch of science that deals with the analysis of stresses caused by thermally induced strains which are in the elastic range”.It consists of study of heat conduction, thermoelastic displacement and thermal stresses, etc. The most of the material tend to expand if there temperature rises and to a first approximation, the Expansion and Compression is proportional to the temperature change. This temperature changes induced by expansion and compression is based on thermoelasticity.

Thermoelasticity investigates the relation between a material's elastic properties and temperature, or between its thermal conductivity and thermal stress. Another complex problem faced by engineers and applied mathematicians is finding solutions to the fundamental problems in their field of study, which is partial differential equations in some cases. Using the well-known principles of classical mechanics and thermodynamics, the body's deformation undergoes the resultant stresses under the combined influence of external loads, body forces, and heat conduction is calculated. This relationship of temperature and displacement fields, the situation where mechanical and thermal causes cause deformation, results in the word 'Thermoelasticity'.

The convolution operator presented in the most popular Riemann-Liouville fractional integral, which is defined as where denotes the convolution operator, is the fractional-order and is the standard power function given as .

Research Background :

The classic heat conduction theory is based on the Fourier law [27,28] (1)
in which is the heat flux vector, denotes the point in the considered region, is the time, is the thermal conductivity of the material, is the gradient operator, and is the temperature, respectively.

Introduction of single-phase-lag to evade discrepancy between the mathematical model and the observations [29-31] (2)

in which is the phase lag of the heat flux or so-called relaxation time.

Expanding the left-hand side of Eq. (2) into the Taylor series with respect to the variable , one obtains [32] as (3)

where is introduced to keep the dimension in order.

The fractional generalization [20,21] of the classical Cattaneo model by introducing fractional Taylor formula [33] as (4)

where without losing the generality appearing in Taylor series is merged in terms, is the gamma function, is introduced to keep the dimension in order and is the fractional time derivative based on Caputo fractional definition [34].

For the limiting case of (or), Eq. (4) reduces to classical Fourier heat conduction and the standard Cattaneo heat conduction equation for as (5)

The heat conduction equation in the context of fractional-order generalized thermoelasticity proposed by Sherief [35] gives (6)

Here it should be noted that the estimated ranges [36] of relaxation time (in seconds) usually involves for metals, for gases, and for porous materials, respectively.

Literature Review:

fractional calculus is the generalisation of the ordinary differential and integration to non integer order. The fractional order theory of thermoelasticity was derived by Sherief et al [8]. It is a generalisation of both the couple and the generalisation theories of thermoelasticity. Open dimensional problem for a half space was solved by Sherief and Abdellatief in [9]. In this work, a new theory of thermoelasticity is derived using the methodology of fractional calculus. The theories of coupled thermoelasticity and of generalisedthermoelasticity with one relaxation time follow as limit cases.

Biot [10] Formulated the theory of coupled thermoelasticity to eliminate the paradox inherentinthe classical uncoupled theory that elastic changes have no effect of temperature. Lord and Shulman [13] introduced the theory of generalisedthermoelasticity with one relaxation time for the special case of an isotropic body. This theory was extended by Dhaliwal and Sherief [11] to include the anisotropic case. In this theory a modified law of heat conduction including both the heat flux and it's time derivative replaces the conventional Fourier's law. Uniqueness of solution for this theory was proved under different conditions by Ignaczak [24] and Ignaczak [25], Sherief and Dhaliwal [11] and Sherief [23]. The state space approach to this theory was developed by Anwar and Sherief [22], and Sherief. The fundamental solution for this theory was obtained by Sherief [20], Sherief and Hamza [21] have solved some two-dimensional problems. Sherief et al., [8] extended this theory to deal with micropalar materials in .Sherief et al., [18] and Sherief and Saleh [19] developed the theory of Thermoelastic diffusion. Green and Lindsay [12] developed to theory Of generalisedthermoelasticity with two dimensions with two relaxation times which is based on generalised inequality of thermodynamics.

Fractional calculus has been used successfully to modify many existing models of physical processes. The first application of fractional derivatives was given by Abel, who applied fractional calculus in the solution of an integral equation that arises in the formulation of the Tautocrone problem. One can state that the whole theory of fractional derivatives and integrales was established in the second-half of the 19th century. Caputo and Mainardi [2], Caputo [3] found Good agreement with experimental result when using fractional derivative for description of viscoelastic material and established the connection between fractional derivatives and the theory of linear viscoelasticity. Povstenko , [6] determined the solution for cauchy problem for time- fractional quasi-static uncoupled theory of thermoelasticity. Povstenko [7] solved Thermoelastic problems of infinite cylinders with time fractional diffusion-wave equation by applying integral transform technique and several problems with Dirichlrt's equation and Neumann boundary conditions was simplified.

The theory of fractional calculus has been used successfully to model polymers material. In this proposed thesis entitled - " Studies of some thermoelastic problems in context of fractional order theory of thermoelasticity". We will investigate the mathematical model for solving fractional order equations will be presented in a random sequence.

Conclusion:

The literature reviewed noted that the use of thermal profile addresses thermomechanical problems with the fractional derivative effect. The literature still fails to provide the exact solution of the heat conduction

equation in three-dimensional problems using time-dependent fractional derivate. The thermal profile is determined by solving heat conduction equations with fractional derivative effects throughout thermodynamics that provide an exact solution to thermoelastic problems.

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Generalized thermoelasticity with memory-dependent derivative: An overview & prospective

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Abstract:

The article investigates the present review of generalized thermoelastic theories with memory-dependent derivative effects on different objects. The main theme of the thermoelastic problems is to establish operational methods to solve the governing differential equations. In the thermoelastic problems, we have considered a few practical problems of technical interest, taking into account of fractional order derivative effect by using numerical or exact procedures.

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Introduction:

In several areas of engineering, solid objects are commonly used as integral structural elements. With thermal loading, such structural elements are likely to be subjected to various forms of static loading or excitation, such as seismic, mechanical, hydrodynamic, blast, aerodynamic, etc. Engineers and scientists worldwide are making unwavering efforts to develop and build economic and productive systems with a very little likelihood of failure. Thermal effects produce heat transfer by conduction within an elastic surface, and this distribution of thermal energy develops a temperature field within the material. Many solids undergo a volumetric transition with variance in temperature, and thus the presence of a temperature range typically causes stresses caused by limit or interval constraints. If the temperature variation is high enough, these stresses can reach levels that can lead to structural failure, especially in brittle materials. Hence, understanding stress analysis can be helpful for several issues, including high-temperature variation.

Thermoelasticity can be generalized as investigating the relationship between a material's elastic properties and temperature or between its thermal conductivity and thermal stress. Another complex problem faced by engineers and applied mathematicians is finding solutions to the fundamental problems in their field of study, partial differential equations in some cases. Using the well-known principles of classical mechanics and thermodynamics, the deformation that the body undergoes, the resultant stresses under the combined influence of external loads, body forces, and heat conduction is calculated. This relationship of temperature and displacement fields, where mechanical and thermal causesdeformation, results in 'Thermoelasticity'. Temperature variations allow the material to undergo thermal effects. Some of these are thermal strains, stress, and deformation. Thermal deformation means that as the thermal energy and/or temperature of the material increases, so does the vibration of the atom or molecules and this changes in vibration result in the stretching of molecular bonds, which causes the material to expand, of course, if the thermal energy and temperature of the material decreases, the material will compress or contract.

The enormous demand for science and engineering works dealt with Fractional-Order Equations' dynamical systems that involve derivatives and non-integer integrals. They explain various substances' memory and hereditary properties and cope with the tremendous demand for science and engineering work. Meanwhile, it also discovered that fractional calculus is used effectively to modify many current models of physical processes, see Hilfer [1], Sherief et al. [2], Tenreiro et al. [3]. It can also be claimed that the entire theory of fractional derivatives and integrals was established in the second half of the 19th century. A good overview of the subject will be noticed in Podlubny [4], Kaczorek [5-6], Sherief and El-Latief [7], Siedlecka and Kukla [8], Abbas [9], Xiong and Niu [10], Mahakalkar et al. [11], Mittal and Kulkarni [12], Hussein [13] and so on. The memory effect comes from the convolution operator presented in the most popular Riemann-Liouville fractional

integral, which is defined as $I_{\alpha,\alpha}^{RL} f(x) = (1/\Gamma(\alpha))\int_a^x (x-t)^{\alpha-1} f(t)dt = \Phi_\alpha \bigstar f(x)$, where $\bigstar$ denotes the convolution operator, α is the fractional-order and Φ_α is the standard power function given as $\Phi_\alpha(t) = t^{\alpha-1}/\Gamma(\alpha)$. A further literature review has been described as 'the foundation and inspiration for substantive, useful research' will be done in later sections.

Research Background :

The classic heat conduction theory is based on the Fourier law [14,15]

$$q(x,t) = -k\nabla T(x,t) \qquad (1)$$

in which $q(x,t)$ is the heat flux vector, x denotes the point in the considered region, t is the time, k is the thermal conductivity of the material, ∇ is the gradient operator, and $T = T(r,t)$ is the temperature, respectively.

Introduction of single-phase-lag to evade discrepancy between the mathematical model and the observations [16-18]

$$q(x,t+\tau) = -k\nabla T(x,t) \qquad (2)$$

in which τ is the phase lag of the heat flux or so-called relaxation time.

Expanding the left-hand side of Eq. (2) into the Taylor series with respect to the variable τ, one obtains [19] a

$$q(x,t) + \frac{\tau^\alpha}{\Gamma(1+\alpha)}\frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\nabla T(r,t), 0 < \alpha \le 1 \qquad (3)$$

where α is introduced to keep the dimension in order.

The fractional generalization [20,21] of the classical Cattaneo model by introducing fractional Taylor formula [22] as

$$q(x,t) + \tau^\alpha \frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\nabla T(x,t), 0 < \alpha \le 1 \qquad (4)$$

where without losing the generality $\Gamma(1+\alpha)$ appearing in Taylor series is merged in τ^α terms, Γ is the gamma function, α is introduced to keep the dimension in order and $\partial^\alpha / \partial t^\alpha$ is the fractional time derivative based on Caputo fractional definition [23].

For the limiting case of $\tau = 0$ (or $\alpha = 0$), Eq. (4) reduces to classical Fourier heat conduction and the standard Cattaneo heat conduction equation for $\alpha = 1$ as

$$q(x,t) + \tau\frac{\partial}{\partial t} q(x,t) = -k\nabla T(x,t) \qquad (5)$$

The heat conduction equation in the context of fractional-order generalized thermoelasticity proposed by Sherief [24] gives

$$q(x,t) + \tau\frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\nabla T(x,t), 0 < \alpha \le 1 \qquad (6)$$

Here it should be noted that the estimated ranges [25] of relaxation time (in seconds) usually involves $(10^{-11} : 10^{-14})$ for metals, $(10^{-8} : 10^{-10})$ for gases, and $(10 : 10^{2})$ for porous materials, respectively.

Wang and Li [26] have introduced a memory-dependent derivative (MDD). The first order $(\alpha = 1)$ of function f which is simply defined in an integral form of a common derivative with a kernel function $K(t-\zeta)$ on a slipping interval $[t-\omega, t]$ in the form

$$q(x,t) + \tau D_\omega^{(1)} q(x,t) = -k\nabla T(x,t) \qquad (7)$$

where

$$D_{\omega}^{(1)} f(x,t) = \frac{1}{\omega} \int_{t-\omega}^{\omega} K(t-\zeta) f'_{\zeta}(x,\zeta) dx, \ \omega > 0,$$

$D_{\omega}^{(1)} \to \partial / \partial t$, ω is delay time, and $K(t-\zeta)$ is the kernel function.

Heat conduction equation in MDD thermoelasticity introduced by Ezzat [27]

$$q(x,t) + \omega D_{\omega}^{(1)} q(x,t) = -k \nabla T(x,t) \qquad (8)$$

By combining Eq. (8) with the energy conservation equation

$$-\Delta \cdot q(r,t) = \rho C_v \frac{\partial T}{\partial t}(r,t) \qquad (9)$$

Now by combining Eq. (8) and (9) leads to the heat conduction equation as

$$\kappa \nabla T(x,t) = (1 + \tau_{\omega} D_{\omega}) \rho C_v \frac{\partial T}{\partial t}(r,t) \qquad (10)$$

where $\kappa = \rho C_v / k$ is the thermal diffusivity, ρ is the density of the material, C_v is the specific heat capacity, and where $\Delta = \nabla^2 = \nabla \cdot \nabla$ a Laplace operator is a second-order differential operator.

Literature Review:

Many researchers have studied the development and applications of fractional-order equations. The fascinating and recent applications of fractional differential equations in physics, chemistry, biology, engineering, finance, and other research fields built over the last few decades are now not difficult to find. Some of the applications include: diffusion processes [28,29], mechanics of materials [30,31], combinatorics [32,33], inequalities [34], analysis [35], calculus of variations [36-41], signal processing [42], image processing [43], advection and dispersion of solutes in porous or fractured media [44], modeling of viscoelastic materials under external forces [45], bioengineering [46], relaxation and reaction kinetics of polymers [47], random walks [48], mathematical finance [49], modeling of combustion [50], control theory [51], heat propagation [52], modeling of viscoelastic materials [53] and even in areas such as psychology [54,55]. It is easy to find hundreds, if not thousands, of new applications in which the fractional calculus approach is more than welcome.

Fractional-order derivatives have been successfully used in mechanics to model memory-effect damping forces or characterize state feedback controllers, as demonstrated by Bagley and Torvik [56]. It is noticed by Wang and Hu [57] that the term fractional-order derivative whose order is between 0 and 2 often acts as a damping force in fractional-order vibration systems with a single degree of freedom. Fractional calculus has therefore been effectively used to change many current physical process models. The first use of fractional derivatives was made by Abel [58], who applied fractional calculus to the solution of the integral equation of the tautochrone problem formulation. Fractional derivatives were used by Caputo [59, 60] and Caputo and Mainardi [61,62], and their findings were in substantial agreement with the empirical evidence for describing viscoelastic materials.

Some authors have worked on fractional derivatives in the thermoelastic analysis of most recent literature, which can be summarised below: Povstenko [63] proposed a quasi-static uncoupled theory of thermoelasticity based on the heat conduction equation with a time-fractional derivative of order α. Povstenko [64] formulated the theory of diffusive stress based on the time-fractional diffusion equation. Povstenko [65] also obtained the temperature distribution and thermal stresses in an infinite medium with a spherical cavity using the integral transform technique.Youssef and Al-Lehaibi [66] developed a novel theory for the generalized thermoelasticity model based on fractional-order generalized thermoelasticity. Similarly, Youssef and Al-Lehaibi [67] constructed a model of an elastic material with constant parameters in the half-spacein the context of the fractional-order generalized thermoelasticity theory. Sherief et al. [68] developed a new theory of thermoelasticity using the methodology of fractional calculus. Ezzat and El-Karamany [69] attempted to generalize these results to include a magnetic field's effects in two-temperature thermoelasticity. Youssef and Al-Lehaibi [70] developed a mathematical model of an elastic material with a cylindrical cavity inthe context of the fractional-order generalized thermoelasticity theory. Povstenko [71] obtained the theory of thermal stresses

based on the heat conduction equation with the Caputo time-fractional derivative of order $0 < \alpha \leq 2$. Youssef [72] found a half-space filled with an elastic material taken as constant elastics' parametersin the standard model of thermoelasticity in fractional-order. Sur and Kanoria [73] constructed a new theory of two-temperature generalized thermoelasticity in the context of a new consideration of heat conduction with fractional orders.Youssef [74] considered a half-space filled with an elastic material that had constant elastic parameters was considered, and the governing equations were written in the form of the two-temperature generalized thermoelasticity theory of fractional order. Youssef et al. [75] developed a cylindrical nano-beam mathematical model with constant elastic parameters with fractional order heat conduction. Wang e al. [76] studied thermoelastic behaviours involving in the effect of thermal inertia during the macro- and microscales heat conduction. Bhattacharya and Kanoria [77] obtained the two-temperature thermo-elasto-diffusion interaction inside a spherical shell in the context of fractional order generalized thermoelasticity.Zenkour and Abouelregal [78] determined the thermoelastic displacement, stress, conductive temperature, and thermodynamic temperature in an infinite isotropic elastic body with a spherical cavitybased on the two-temperature generalized thermoelasticity theory (2TT). Youssef [79] derived a new theory of thermoelasticity based on the fraction order of strain, which is considered a new modification to Duhamel-Neumann's stress-strain relation. Bachher [80] considered a one-dimensional problem for a homogeneous and isotropic thermoelastic infinite porous material under the dependence of modulus of elasticity and thermal conductivity on reference temperature subjected to periodically varying heat sources in the context of the fractional-order generalized thermoelasticity with one relaxation time parameter. Santra et al. [81] proposed the three-dimensional generalized thermoelastic coupled problem for a homogeneous isotropic and thermally conducting thermoelastic medium under the effect of rotation in fractional context order generalized thermoelasticity.Yadav et al. [82] employed the theory of generalized thermoelasticity with fractional order strain to study the problem of one-dimensional disturbances in a viscoelastic solid in the presence of a moving internal heat source and subjected to a mechanical load. Bassiouny and Abouelnaga [83] investigated the thermoelastic properties of a sandwich structure made of three piezoelectric layers in the context of fractional-order theory two-temperature generalized thermopiezoelasticity. Gupta and Das [84] applied the eigenvalue approach method, and Laplace transform, a general solution scheme for the thermoelastic deformation of an unbounded transversely isotropic medium fractional-order generalized thermoelasticity with an instantaneous heat source. Sheoran and Kundu [85] presented a comprehensive review of relevant literature to highlight the role of fractional calculus in thermoelasticity.Abbas [86] investigated the temperature, displacement, and stresses due to thermal shock loading on the inner surface cavity in an infinite medium with a cylindrical cavity inthe context of the fractional-order generalized thermoelasticity theory. Bachher and Sarkar [87] studied the theory of generalized thermoelasticity based on the heat conduction equation with the Caputo time-fractional derivative is used to study the magneto-thermoelastic response of a homogeneous isotropic two-dimensional rotating elastic half-space solid. Povstenko et al. [88] studied a control problem of thermal stresses in an infinite cylindrical body in which the time-fractional heat conduction equation defined the temperature distribution with the Caputo derivative of the order $0 < \alpha \leq 2$. Xiong and Niu [89] developed the principle of fractional-order generalized thermoelastic diffusion for anisotropic and linear thermoelastic diffusive media. Chirilă and Marin [90] continued the work on dipolar thermoelastic materials, which are a particular case of multipolar continuum mechanics. The fractional-order derivative effect on a two-dimensional problem with weak, normal and strong conductivity due to thermal shock was examined by Abbas [91].

Conclusion:

The literature reviewed noted that the use of the expected thermal profile addresses generalized thermomechanical problems with the memory response effect. The literature still fails to provide the exact solution of the heat conduction equation in two or three-dimensional problems using memory-dependent derivate. The present work determines the thermal profile by solving heat conduction equations throughout thermodynamics that provide an exact solution to generalized thermoelastic problems.

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Thermoelastic vibrations analysis of a thin isotropic solid elliptic cross section

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1.Introduction

The present paper considers the realistic problem of a thin isotropic solid elliptic cross section profile subjected to point-impulsive source on the upper face, zero temperature at lower face, and with simply supported thermally insulated on the curved surface are studied using a typical classical technique. For the theoretical measurements the dimensional parameter was taken, while the dimensionless parameter was used for graphical measurements. In basic equation formulation we have considered the equations of motion, the displacement potential and finally obtained the components of stress in terms of thermoelastic displacement potential function. Finally, by considering a circle as a special kind of ellipse, it is seen that the temperature distribution in a circular solution can be derived as a special case from the present mathematical solution.

2.Formulation of the problem

Taken a thin elliptic isotropic solid assuming the space $D:\{(\xi,\eta,z)\in R^3: 0<\xi<\xi_0, 0<\eta<2\pi, -\ell/2\le z\le \ell/2\}$ in elliptic cylindrical coordinates (ξ,η,z) which is related to the rectangular coordinates (x,y,z) by $x=c\cosh\xi\cos\eta, y=c\sinh\xi\sin\eta, z=z$ (1)

where $c=(a^2-b^2)^{1/2}$ and $2c$ is the length of the interfocal line of the ellipse. The curves $\eta=$ constant denotet a family of confocal hyperbolas while the curves $\xi=$ constant constitute a family of confocal ellipses. Thus, at every point in space, both sets of curves intersect each other orthogonally. Its elliptic cross-section using the semi-major and semi-minor axial lengths a and b, respectively, as shown in Fig. 1. The parameter ξ defines the interfocal line having the range $\xi\in(0,\xi_0)$, and by using Eq. (1), the coordinate ξ_0 of the surface of the elliptic solid is obtained as $\xi_0=\tanh^{-1}(b/a)=(1/2)\mathrm{In}\,[(a+b)/(a-b)]$.

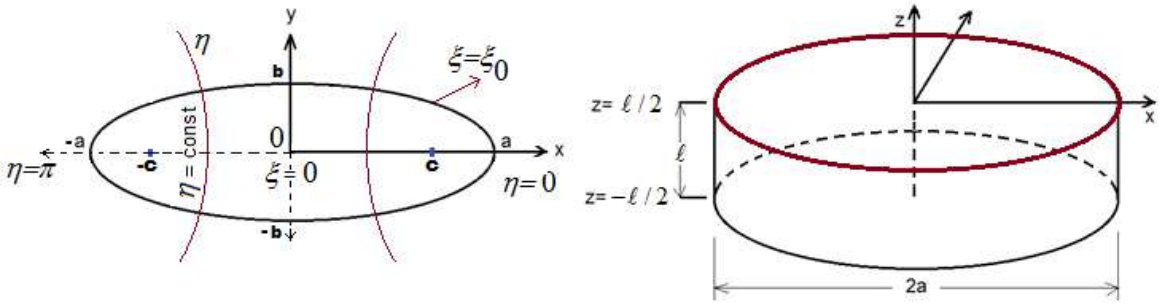

Figure 1: Elliptic solid plate configuration geometry

3. Temperature distribution analysis

We assume that the temperature is given by

$$T(\xi,\eta,z,t)=\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}A_{2n}\,Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\sin\left\{\gamma_{2n}\left[z+\left(\frac{\ell}{2}\right)\right]\right\}e^{-\omega t} \quad (2)$$

in which ω being a constant, $ce_{2n}(\eta,q)$ is the ordinary Mathieu function, $Ce_{2n}(\xi_0,q)$ is a modified Mathieu function, $q_{2n,m}$ is a root of the equation $Ce_{2n}(\xi,q_{2n,m})=0$ and according to McLaclan [26], $ce_{2n}(\eta,q)=\sum_{r=0}^{\infty}A_{2r}^{(2n)}\cos 2r\eta,\ Ce_{2n}(\xi,q)=\sum_{r=0}^{\infty}A_{2r}^{(2n)}\cosh 2r\xi$ (3)

with $A's$ being the functions of q, and the constant A_{2n} can be found from the nature of the temperature prescribed on the upper face. Further assuming that the lower face of the plate is kept at zero temperature as $T(\xi,\eta,z,t)|_{z=-\ell/2}=0$ (4)

while thermally insulated curved surface is expressed as $\frac{\partial}{\partial\xi}T(\xi,\eta,z,t)|_{\xi=\xi_0}=0$ (5)

and the sectional heat supply is impacted over the portion $0 < \xi < \xi_0$ that varying with time according to point-impulsive source as $T(\xi,\eta,z,t)|_{z=\ell/2} = e^{-\omega t}\delta(\xi-\xi_0)f_0(\eta)$ (6)

in which $f_0(\eta) = 1(0 \le \eta \le 2\pi)$ at $\xi = \xi_0$ and $\delta()$ is the Dirac delta function. Now the differential equation governing transient temperature distribution $T = T(\xi,\eta,z,t)$ for an elliptic plate can be defined as $\frac{2}{c^2(\cosh 2\xi - \cos 2\eta)}\left(\frac{\partial^2 T}{\partial \xi^2} + \frac{\partial^2 T}{\partial \eta^2}\right) + \frac{\partial^2 T}{\partial z^2} = \frac{1}{\kappa}\frac{\partial T}{\partial t}$ (7)

where $\kappa = \lambda/\rho C$ is the thermal diffusivity, in which λ is thermal conductivity and heat capacity per unit volume is ρC, with ρ as density and C as specific heat, respectively. Substituting Eq. (2) in Eq. (7), one obtains $\gamma_{2n} = [\alpha_n^2 + (\omega/\kappa)]^{1/2}$ (8)

where $\alpha_n^2 = -4q_{2n,m}/c^2$

Using Eqs. (2), (7) and (8), one obtains

$\delta(\xi-\xi_0) = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\, Ce_{2n}(\xi, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m})\sin\{\gamma_{2n}\ell]\}$ (9)

Here the series quoted on the right-hand side of Eq. (9) is obtained from the well-known theorem of Fourier-Mathieu series [26] for any point within the considered range. Now, multiply Eq. (9) on both the sides by $(\cosh 2\xi - \cos 2\eta)Ce_{2p}(\xi, q_{2p,r})ce_{2p}(\eta, q_{2p,r})$ and integrate with respect to η from 0 to 2π, and with respect to ξ from 0 to ξ_0, then by the orthogonality property [26], all terms vanish except when $p = n, r = m$, therefore, by the theory of Mathieu function, one obtains

$$A_{2n,m} = \frac{\int_0^{\xi}\int_0^{2\pi} Ce_{2n}(\xi,q_{2n,m})\, ce_{2n}(\eta,q_{2n,m})\, \delta(\xi-\xi_0)(\cosh 2\xi - \cos 2\eta)\, d\xi d\eta}{\pi e^{\omega t}\int_0^{\xi} Ce_{2n}^2(\xi,q_{2n,m})[\cosh 2\xi - \Theta_{n,m})\, d\xi} \quad (10)$$

$$\text{Where}\Theta_{n,m} = \frac{1}{\pi}\int_0^{2\pi} ce_{2n}^2(\eta, q_{2n,m})\cos 2\eta\, d\eta$$

Hence inserting the Eqs. (8) and (10) into Eq. (2), one obtains the desired temperature distribution that satisfies the boundary conditions.

At $t = 0$, initial temperature $T_i = T_i(\xi,\eta,z,t)$ is given as

$$T_i(\xi,\eta,z,t) = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\, Ce_{2n}(\xi, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m})\sin\{\gamma_{2n}[z + (\ell/2)]\} \quad (11)$$

Hence the temperature change $\tau = T - T_i$ is obtained as

$$\tau = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\, Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m})\sin\left\{\gamma_{2n}\left[z + \left(\frac{\ell}{2}\right)\right]\right\}(e^{-\omega t} - 1) \quad (12)$$

4. Basic equation formulation

The equations of motion are written as follows

$$\begin{aligned}(\lambda+2\mu)\frac{\partial e}{\hbar\partial\xi} - 2\mu\frac{\partial\tilde{\omega}_z}{\hbar\partial\eta} + 2\mu\frac{\partial(\hbar\tilde{\omega}_\eta)}{\hbar\partial z} - (3\lambda+2\mu)\alpha\frac{\partial\tau}{\partial\xi} &= \rho\frac{\partial^2 u_\xi}{\partial t^2},\\ (\lambda+2\mu)\frac{\partial e}{\hbar\partial\eta} + 2\mu\frac{\partial\tilde{\omega}_z}{\hbar\partial\xi} - 2\mu\frac{\partial(\hbar\tilde{\omega}_\xi)}{\hbar\partial z} - (3\lambda+2\mu)\alpha\frac{\partial\tau}{\partial\eta} &= \rho\frac{\partial^2 u_\eta}{\partial t^2}\end{aligned} \quad (13)$$

in which the scale factor $\hbar$, dilatation e and rotations $\tilde{\omega}_\xi, \tilde{\omega}_\eta, \tilde{\omega}_z$ are represented by

$$\begin{aligned}&\hbar^2 = c^2(\cosh^2\xi - \cos^2\eta) = (c^2/2)(\cosh 2\xi - \cos 2\eta),\\ &\hbar_\xi^2 = \hbar_\eta^2 = c^2\hbar^2, \hbar_z = 1,\ e = \frac{\partial(\hbar u_\xi)}{\hbar^2\partial\xi} + \frac{\partial(\hbar u_\eta)}{\hbar^2\partial\eta},\\ &2\tilde{\omega}_\xi = -\frac{\partial u_\eta}{\partial z}, 2\tilde{\omega}_\eta = \frac{\partial u_\xi}{\partial z}, 2\tilde{\omega}_z = \frac{\partial(\hbar u_\eta)}{\hbar^2\partial\xi} - \frac{\partial(\hbar u_\xi)}{\hbar^2\partial\eta}\end{aligned} \quad (14)$$

and, where λ and μ are the Lame's constants and they are related to Young's Modulus E and Poisson's ratio υ through the equations given below

$$\lambda = \frac{\upsilon E}{(1+\upsilon)(1-2\upsilon)}, \mu = \frac{E}{2(1+\upsilon)}$$

Applying the divergence and curl operation to Eqs. (11), one obtains

$$\begin{aligned}(\lambda+2\mu)\nabla^2 e + \mu\frac{\partial^2 e}{\partial z^2} - (3\lambda+2\mu)\nabla^2\tau &= \rho\frac{\partial^2 e}{\partial t^2},\\ \mu\nabla^2(2\tilde{\omega}_z) + \mu\frac{\partial^2(2\tilde{\omega}_z)}{\partial z^2} - (3\lambda+2\mu)\nabla^2\tau &= \rho\frac{\partial^2(2\tilde{\omega}_z)}{\partial t^2}\end{aligned} \quad (15)$$

in which $\nabla^2 = (1/\hbar^2)(\partial^2/\partial\xi^2 + \partial^2/\partial\eta^2)$

The solution of the previous Eq. (11) without body forces can be expressed by using the displacement potential φ and ψ as

$$\left.\begin{aligned} u_\xi &= \left(\frac{\partial\varphi}{\hbar\partial\xi} - \frac{\partial\psi}{\hbar\partial\eta}\right)\sin\left(\frac{m\pi z}{2\ell}\right)e^{-\omega t} \\ u_\eta &= \left(\frac{\partial\varphi}{\hbar\partial\eta} + \frac{\partial\psi}{\hbar\partial\xi}\right)\sin\left(\frac{m\pi z}{2\ell}\right)e^{-\omega t} \end{aligned}\right\},\ m = 1,3,5,.. \qquad (16)$$

in which the potential functions φ and ψ must satisfy the following governing equations

$$\nabla^2\varphi = K\tau, \nabla^2\psi = 0 \qquad (17)$$

with the initial condition $\varphi = 0 \quad at \quad t = 0, \qquad (18)$

where $K = \alpha\,(1+\upsilon)/(1-\upsilon)$ is restraint coefficient. The components of stress in terms of thermoelastic displacement potential are

$$\begin{aligned} \sigma_{\xi\xi} &= \lambda\left\{\frac{\partial(\hbar u_\xi)}{\hbar^2\partial\xi} + \frac{\partial(\hbar u_\eta)}{\hbar^2\partial\eta}\right\} + 2\mu\left\{\frac{\partial(u_\xi)}{\hbar\partial\xi} + \frac{u_\eta}{\hbar^2}\frac{\partial(\hbar)}{\partial\eta}\right\} - K\tau, \\ \sigma_{\eta\eta} &= \lambda\left\{\frac{\partial(\hbar u_\xi)}{\hbar^2\partial\xi} + \frac{\partial(\hbar u_\eta)}{\hbar^2\partial\eta}\right\} + 2\mu\left\{\frac{\partial(u_\eta)}{\hbar\partial\eta} + \frac{u_\xi}{\hbar^2}\frac{\partial(\hbar)}{\partial\eta}\right\} - K\tau, \qquad (19) \\ \sigma_{\xi\eta} &= \mu\left\{\frac{\partial}{\partial\eta}\left(\frac{u_\xi}{\hbar}\right) + \frac{\partial}{\partial\xi}\left(\frac{u_\eta}{\hbar}\right)\right\} \end{aligned}$$

Eqs. (1) to (19) establishes the mathematical formulation of the problem under consideration.

5.Approach to the problem

5.1 Displacement distribution

By assuming the suitable displacement function φ which satisfies Eqs. (1)-(2) as

$$\varphi = \frac{K\kappa}{\omega}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\, Ce_{2n}(\xi, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m}) \times \sin\{\gamma_{2n}[z + (\ell/2)]\}(1 - e^{-\omega t}) \qquad (20)$$

Now suitable form of ψ satisfying second expression of Eq. (14) is given by

$$\psi = -\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}[C_{2n}\sinh 2\xi + D_{2n}\alpha_n^2\xi\sin 2\eta]Ce_{2n}(\eta, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m}) \times \sin\{\gamma_{2n}[z + (\ell/2)]\}(1 - e^{-\omega t}) \qquad (21)$$

The expressions for displacements may be put as

$$\begin{aligned} u_\xi = \frac{1}{\hbar}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\{K\kappa Ce'_{2n}(\xi, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m}) + \omega[C_{2n}\xi \\ \times Ce_{2n}(\xi, q_{2n,m}) + D_{2n}\alpha_n^2\xi^2]ce'_{2n}(\eta, q_{2n,m})\}\sin(m\pi z/2\ell)e^{-\omega t} \qquad (22) \\ \times \sin\{\gamma_{2n}[z + (\ell/2)]\}(1 - e^{-\omega t}) \end{aligned}$$

$$\begin{aligned} u_\eta = \frac{1}{\hbar}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\{K\kappa Ce_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m}) \\ -\omega\,[C_{2n}\{\xi Ce'_{2n}(\xi, q_{2n,m}) + Ce_{2n}(\xi, q_{2n,m})\} \\ +2D_{2n}\alpha_n^2\xi]ce_{2n}(\eta, q_{2n,m})\}\sin(m\pi z/2\ell)\, e^{-\omega t} \qquad (23) \\ \times \sin\{\gamma_{2n}[z + (\ell/2)]\}(1 - e^{-\omega t}) \end{aligned}$$

5.2 Thermal stresses solution

The expressions for stresses related to displacement as given in Eq. (16) may be put as

(24)

$$\sigma_{\eta\eta} = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\frac{A_{2n}}{\omega\hbar}\Big\langle\frac{1}{\hbar}\Big[[\lambda\{K\kappa Ce''_{2n}(\xi,q_{2n,m})\,ce_{2n}(\eta,q_{2n,m}) - \omega[C_{2n}Ce'_{2n}(\xi,q_{2n,m}) + D_{2n}\alpha_n^2 ce'_{2n}(\eta,q_{2n,m})]\} + (\lambda+2\mu) \times \{\kappa KCe_{2n}(\xi,q_{2n,m})\,ce''_{2n}(\eta,q_{2n,m}) - \omega[C_{2n}Ce'_{2n}(\xi,q_{2n,m}) + D_{2n}\alpha_n^2 ce'_{2n}(\eta,q_{2n,m})]\}\Big] + \frac{1}{\hbar^{3/2}}\Big[\Big[\lambda\sinh 2\xi\{K\kappa\, Ce'_{2n}(\xi,q_{2n,m}) \times ce_{2n}(\eta,q_{2n,m}) - \omega[C_{2n}Ce_{2n}(\xi,q_{2n,m}) + D_{2n}\alpha_n^2\xi ce'_{2n}(\eta,q_{2n,m})]\}\Big]\Big] + (\lambda+2\mu)\sin 2\eta\{\kappa KCe_{2n}(\xi,q_{2n,m})\,ce'_{2n}(\eta,q_{2n,m}) - \omega[C_{2n}\eta \times Ce'_{2n}(\xi,q_{2n,m}) + D_{2n}\alpha_n^2 ce_{2n}(\eta,q_{2n,m})] - K\omega\hbar Ce_{2n}(\xi,q_{2n,m}) \times ce_{2n}(\eta,q_{2n,m})cosec(m\pi z/2\ell)e^{\omega t}\sin\{\gamma_{2n}[z+(\ell/2)]\}\sin(m\pi z/2\ell)\Big\rangle \times e^{-\omega t}\sin\{\gamma_{2n}[z+(\ell/2)]\}(1-e^{-\omega t}) \quad (25)$$

$$\sigma_{\xi\eta} = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\lambda\Big\langle\{K\kappa Ce'_{2n}(\xi,q_{2n,m})\,ce_{2n}(\eta,q_{2n,m}) + D_{2n}\,\omega\alpha_n^2\xi^2 ce'_{2n}(\eta,q_{2n,m})\} + \{\hbar\omega\,[C_{2n}\xi Ce'_{2n}(\xi,q_{2n,m}) + 2D_{2n}\alpha_n^2\xi]ce_{2n}(\eta,q_{2n,m})\Big\rangle\sin(m\pi z/2\ell) \times e^{-\omega t}\sin\{\gamma_{2n}[z+(\ell/2)]\}(1-e^{-\omega t}) \quad (26)$$

6. Special case and numerical calculations

We add the following dimensionless values in order to facilitate the computation

$$\left.\begin{aligned}&\bar{b}=b/a,\ \bar{a}=a/a,\ e=c/a,\ \bar{z}=[z-(-\ell/2)]/a,\ \tau=\kappa t/a^2,\\&\overline{T}(\xi,\eta,t)=T(\xi,\eta,t)/\theta_k,\bar{\phi}(\xi,\eta,t)=\phi(\xi,\eta,t)/E\alpha_t\tau a^2,\\&\bar{\sigma}_{ij}=\sigma_{ij}/E\alpha_t\tau\ (i,j=\xi,\eta)\end{aligned}\right\} \quad (3.27)$$

Substituting the value of equation (27) in equations (12), (16) and (19), we obtained the expressions for the temperature, displacement and stresses respectively for our numerical discussion. The numerical computations have been carried out for Aluminum metal with parameter a = 2.65 cm, b = 3.22 cm, ℓ= 0.08 cm, Modulus of Elasticity $E = 6.9 \times 10^{6}$ N/cm^{2}, Shear modulus $G = 2.7 \times 10^{6}$ N/cm^{2}, Poisson ratio υ = 0.281, Thermal expansion coefficient, $\alpha_t = 25.5 \times 10^{6}$ cm/cm-^{0}C, Thermal diffusivity κ = 0.86 cm^{2}/sec, Thermal conductivity λ = 0.48 cal sec^{-1}/cm^{0}C with $q_{n,m}$ =0.0986, 0.3947, 0.8882, 1.5791, 2.4674, 3.5530, 4.8361, 6.3165, 7.9943, 9.8696, 11.9422, 14.2122, 16.6796, 19.3444, 22.2066, 25.2661, 28.5231, 31.9775, 35.6292, 39.4784 are the positive. The numerical calculations are depicted in the following figures with the help of MATHEMATICA software. Figs.2-11 illustrates the numerical results of dimensionless temperature and stresses of elliptical plate, under thermal boundary condition that are subjected to arbitrary initial temperature on the upper and lower face at zero temperature and boundary conditions. Fig. 2 indicates the angular variation of temperature distribution along radial direction of the plate. Due to extra heat source the optimum amount of temperature is achieved on the outside edge. The distribution of the dimensionless temperature gradient at each time increases towards the heated area of the central part of ellipse boundary.

As shown in Fig. 3, temperature is reached to a minimum at both extreme ends, i.e. at due to more compressive force, while due to tensile force, the temperature at the centre is high, giving an average bell-shaped curve for various values of ξ. Fig. 4 as probable due to less thickness, the temperature along $\bar{z}$ axis for different values of η varies linearly from zero temperature to the highest due to the availability of sectional heat supply at $z = \ell/2$.

Figs. 5 and 7 illustrates that the displacement distribution along η is high due to the sectional heat supply accompanied by the low distribution that exists on the inner centre of the ellipse at the outer side. Fig. 6 shows the displacement distribution beside axial direction and it was observed that with lower angular angle the displacements are little curvy and with higher angle it is following sinusoidal nature.

From Fig. 8, it was noted that the displacement distribution along ξ gets lower value for different values of z. Fig. 9, it was observed that the radial, tangential and shear stresses follows a sinusoidal trend, the large expansion and tensile stress arises at the inner, mid and outer edge, which lies in the axial direction. It was detected from Fig. 10 that the thermal stresses attains zero at ξ=0 and the radial and tangential stresses increases gradually along the radial direction, while the shear stress decreases along ξ direction. But the nature of all stresses behaves oppositely along the time span as observed in the Fig. 11

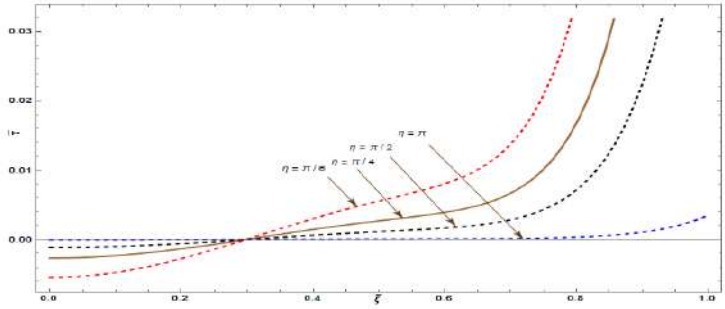

Figure 2: Temperature distribution $\overline{T}$ trending towards ξ for various values of η.

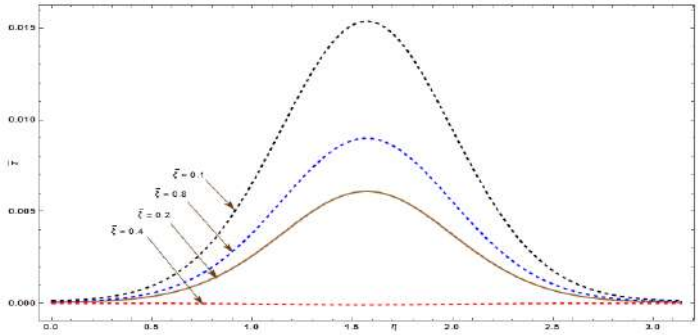

Figure 3: Temperature distribution $\overline{T}$ trending towards η for various values of ξ.

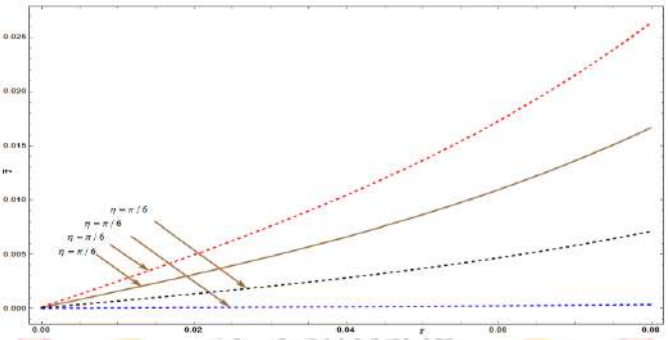

Figure 4: Temperature distribution $\overline{T}$ trending towards z for various values of η.

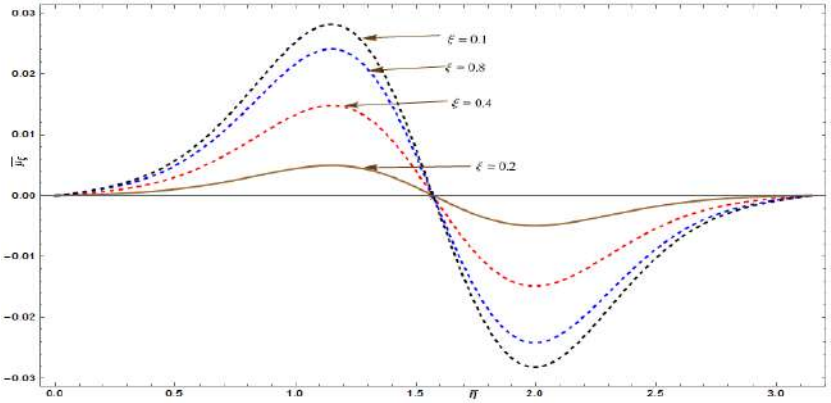

Figure 5: Displacement distribution trending towards η for various values of ξ.

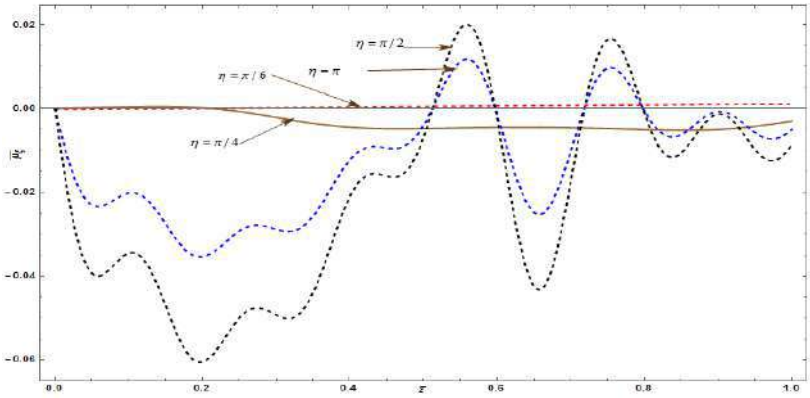

Figure 6: Displacement distribution trending towards z for various values of η.

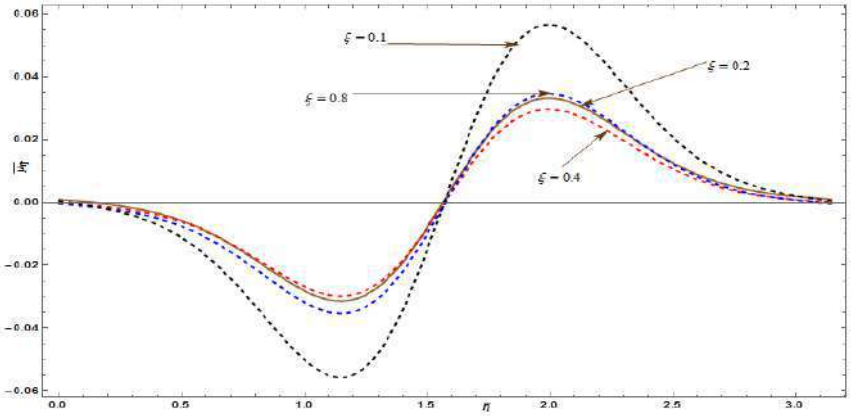

Figure 7: Displacement distribution trending towards η for various values of ξ.

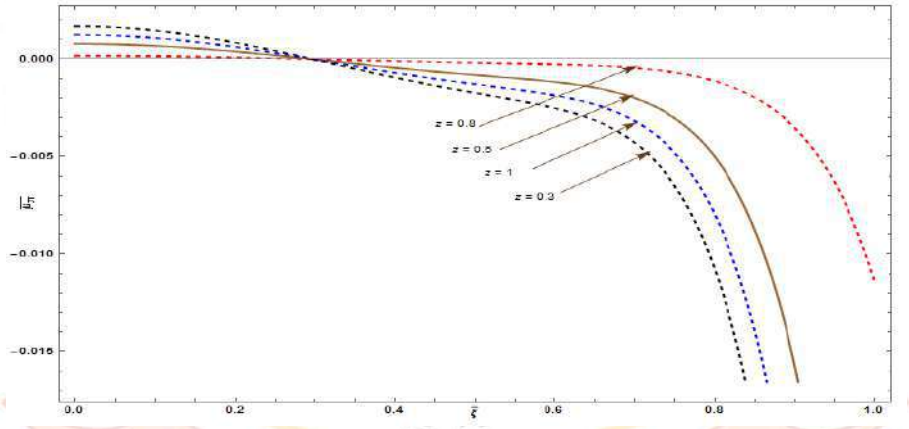

Figure 8: Displacement distribution trending towards ξ for various values of z.

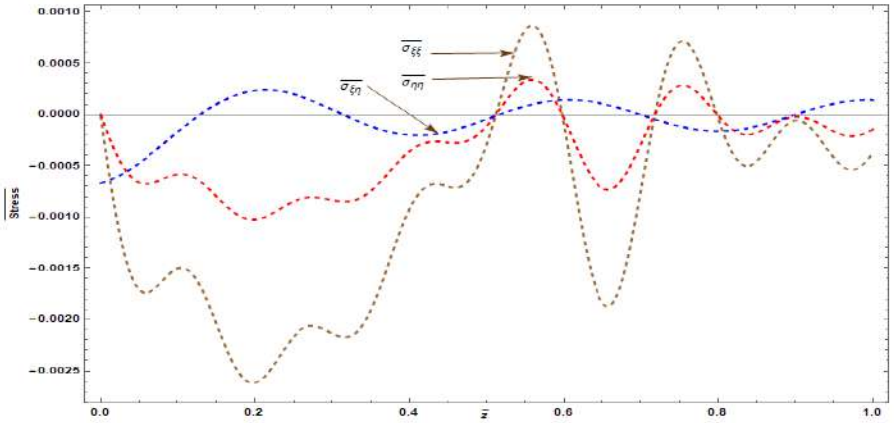

Figure 9: Thermal stresses distribution trending towards z

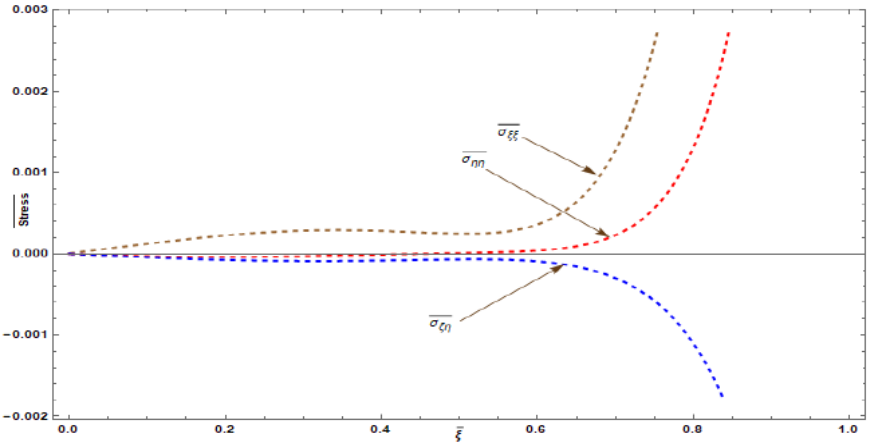

Figure 10: Thermal stresses distribution trending towards ξ

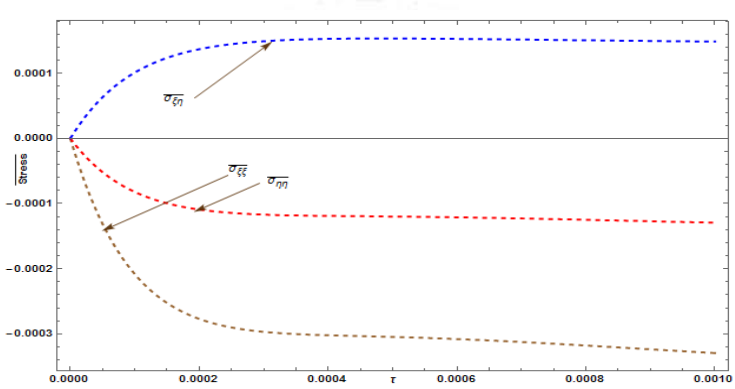

Figure 11: Thermal stresses distribution trending towards τ

7. Conclusion

In this article, we describe the theoretical treatment of thermally induced vibrations and their related stresses. The temperature distribution of the normal and modified Mathieu function forms is used to determine the thermal stress by the proposed classical method. The results obtained during the study are described below.

1. The benefit of this approach is its simplicity and mathematical ability to accommodate various forms of mechanical and thermal boundary conditions in vibration analysis under thermal load.
2. Owing to the maximum expanstion outside the plate, the maximum tensile stress moves from the outer surface and its absolute value increases with radius. This can be due to heat, stress, concentration or available heat source under known temperature fields.

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A short note on Shafer-Fink's double inequality involving Arcsine function

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In this article, we present the very sharp bounds of the form $\left(1-\frac{2}{3}x^2\right)^a$ *for the inverse trigonometric Sinc function* $\frac{sin^{-1}x}{x}$, *which tighten the bounds of this kind in the existing literature, where* a *is some real number.*

Subject Classification: *26A09, 26D05, 33B10.*
Keywords: *Inverse Circular functions, arcsine function, Shafer-Fink type inequality, inverse Sinc function.*

1 Introduction

Shafer introduced the following inequality (1.1), that can be seen in [5]

$$\frac{3x}{2+\sqrt{1-x^2}} < \frac{6(\sqrt{1+x}-\sqrt{1-x})}{4+\sqrt{1+x}+\sqrt{1-x}} < \sin^{-1}x, \ for x > 0. \tag{1.1}$$

The above inequality was generalized by Fink [3] as follows:

$$\frac{3x}{2+\sqrt{1-x^2}} \le \sin^{-1}x \le \frac{\pi x}{2+\sqrt{1-x^2}}, \ for \ 0 \le x \le 1, \tag{1.2}$$

where 3 and π are the best possible constants for (1.2). The above double inequality is termed as the Shafer-Fink's inequality in the literature. The gradual development for the bounds of $\sin^{-1}x$can be seen in [2]-[5] and the references therein.

Recently, Bagul and Dhaigude [2] proved inequality involving simple efficient bounds for $\sin^{-1}x$ as follows:

Theorem 1.1 *[2, Theorem 2] Let* $x \in (0,1)$ *and* $d \in (0,1]$. *Then the function* $f(x) = \frac{ln\left(\frac{sin^{-1}x}{x}\right)}{ln(1-dx^2)}$ *is strictly decreasing if* $d \le 1/2$. *In particular, we have following several inequalities*

$$\frac{1}{(1-dx^2)^{\alpha}} < \frac{\sin^{-1}x}{x} < \frac{1}{(1-dx^2)^{\beta}} \tag{1.3}$$

with the best possible constants $\alpha = 1/6d$ *and* $\beta = \frac{ln(2/\pi)}{ln(1-d)}$.

If we put $d = 1/2$, then 1.3 yields the following inequality

$$\frac{1}{(1-\frac{x^2}{2})^{1/3}} < \frac{\sin^{-1}x}{x} < \frac{1}{(1-\frac{x^2}{2})^{\beta_2}} \tag{1.4}$$

where $\beta_2 = \frac{\ln(2/\pi)}{ln(1/2)} \approx 0.651496.$

Authors in [2] claimed that the inequality given by (1.4) is the sharpest inequality of kind (1.3). Here, in this article, we refine the upper and lower bounds of inequality (1.4) and that will be discussed in the next section.

2 Main Result

This section is dedicated to the main theorem of this article, the statement of which is given below:

Theorem 2.1 *If* $x \in (0,1)$ *and* k *is any real number in* $(0,1)$, *then the following inequality holds good*

$$\frac{1}{(1-\frac{2x^2}{3})^{\eta_1}} < \frac{\sin^{-1}x}{x} < \frac{1}{(1-\frac{2x^2}{3})^{\eta_2}} \tag{2.1}$$

*Corresponding Author

for the best possible constants $\eta_1 = 1/4$ *and* $\eta_2 = \ln\left(\frac{k}{\sin^{-1}k}\right)/\ln\left(1-\frac{2k^2}{3}\right)$.

To prove the above theorem, we need following lemmas:

Lemma 2.2 *([l'Hôpital's rule of monotonicity] [1], [6]) Let* α, β *be two real valued functions which are continuous on* $[a,b]$ *and differentiable on* (a,b)*, where* $-\infty < a < b < \infty$ *and* $\beta'(x) \neq 0$*, for* $\forall x \in (a,b)$*. Let,*

$$r_1(x) = \frac{\alpha(x)-\alpha(a)}{\beta(x)-\beta(a)} \text{ and } r_2(x) = \frac{\alpha(x)-\alpha(b)}{\beta(x)-\beta(b)}.$$

Then

i) $r_1(x)$ *and* $r_2(x)$ *are increasing on* (a,b) *if* α'/β' *is increasing on* (a,b) *and*

ii) $r_1(x)$ *and* $r_2(x)$ *are decreasing on* (a,b) *if* α'/β' *is decreasing on* (a,b).

The strictness of the monotonicity of $r_1(x)$ *and* $r_2(x)$ *depends on the strictness of monotonicity of* α'/β'.

Lemma 2.3 *If* $x \in (0,1)$*, then* $\sigma(x) = 216x^6 - 424x^4 + 190x^2 + 48$ *is positive.*

Proof.

Differentiating $\sigma(x)$ with respect to x and equating to 0, then we get $\sigma'(x) = 1296x^5 + 1696x^3 + 380x = 4x(324x^4 - 424x^2 + 95) = 0$. This implies that either $x = 0$ or $324x^4 - 424x^2 + 95 = 0$. This is quartic equation in x. To solve this equation, we put $x^2 = y$, which gives us $324y^2 - 424y + 95 = 0$ a quadratic equation in y. This can be solved by traditional method. We get $x^2 = y = 0.287$ or $x^2 = y = 1.022$. Now we solve these quadratic equations in x . Finally, we have $\{0, \pm 0.535724, \pm 1.010940\}$, which is the solution set of $\sigma'(x) = 0$.

Now, we check the nature of $\sigma''(x)$ at $\{0, 0.535724, 1.010940\}$, because they all lie in the smallest neighbourhood of $(0,1)$ i.e. the region of investigation. Differentiating $\sigma'(x)$ w.r.t. x, which gives us $\sigma''(x) = 6480x^4 - 5088x^2 + 380$.

$\sigma''(0) = 380 > 0$ $\sigma(x)$ hasminima 48 at 0,

$\sigma''(0.535724) = -546.50516 < 0$ $\sigma(x)$ hasmaxima 72.711763 at 0.535724

and

$\sigma''(1.010940) = 1948.3177 > 0$ $\sigma(x)$ hasminima 29.8 90716 at 1.010940.

From above information, we confirm that the graph of $\sigma(x)$ never touches $x-$axis on $(0,1)$, that means it lies completely inside the strip $(0,1) \times (0,\infty)$ and hence in the first quadrant. Therefore, we conclude that, $\sigma(x)$ is positive on $(0,1)$.

Lemma 2.4 *If* $x \in (0,1)$*, then*

$$\rho(x) = \frac{(24x^6-108x^4+144x^2-45)(\sin^{-1}x)}{\sqrt{1-x^2}} - 48x^7 + 116x^5 - 98x^3 + 45x$$

positive increasing.

Proof. For this, we must show that $\rho'(x) > 0$. First we find the derivative of each term in $\rho(x)$ as follows:

$$\frac{d}{dx}\left(\frac{(24x^6 - 108x^4 + 144x^2 - 45)(\sin^{-1}x)}{\sqrt{1-x^2}}\right)$$

$$= \frac{24x^6-108x^4+144x^2-45}{(1-x^2)} + \frac{(-120x^7+468x^5-576x^3+243x)(\sin^{-1}x)}{(1-x^2)^{3/2}}$$

and

$$\frac{d}{dx}(-48x^7 + 116x^5 - 98x^3 + 45x) = -336x^6 + 580x^4 - 294x^2 + 45$$

With this information, $\rho'(x)$ is given by the following expression

$$\rho'(x) = \frac{(-120x^7+468x^5-576x^3+243x)(\sin^{-1}x)}{(1-x^2)^{\frac{3}{2}}} + \frac{336x^8-892x^6+766x^4-195x^2}{(1-x^2)}$$

i.e.

$$\rho'(x) = \frac{x^2}{(1-x^2)} \cdot \lambda(x),$$

where

$$\lambda(x) = \frac{(-120x^6+468x^4-576x^2+243)(\frac{\sin^{-1}x}{x})}{\sqrt{1-x^2}} + 336x^6 - 892x^4 + 766x^2 - 195$$

Now we use $\frac{\sin^{-1}x}{x} > 1$ and $\frac{1}{\sqrt{1-x^2}} > 1$ in the above expression of $\lambda(x)$, which boils down to

$$\lambda(x) > (-120x^6 + 468x^4 - 576x^2 + 243) + 336x^6 - 892x^4 + 766x^2 - 195,$$

i.e. $\lambda(x) > \sigma(x)$ where $\sigma(x) = 216x^6 - 424x^4 + 190x^2 + 48$. $\sigma(x)$ is a polynomial in x. And we want to show that, $\sigma(x) > 0$ on $(0,1)$. By lemma 2.3, $\sigma(x) > 0$ on $(0,1)$.Therefore, $\lambda(x) > 0$ and hence $\rho'(x)$, because $\frac{x^2}{(1-x^2)} > 0$ on $(0,1)$. So, $\rho(x)$ is increasing and hence positive on $(0,1)$, as $\rho(0) = 0$.

Lemma 2.5 *A real valued function*

$$\mu(x) = \frac{(4x^3-3x)(\sin^{-1}x)}{\sqrt{1-x^2}} + (6-6x^2)(\sin^{-1}x)^2 + 2x^4 - 3x^2$$

is positive increasing on $(0,1)$.

Proof. The first differentiation of $\mu(x)$ with respect to x gives rise to the following:

$$\mu'(x) = \frac{(4x^4-12x^2+9)(\sin^{-1}x)}{(1-x^2)\sqrt{1-x^2}} - 12x(\sin^{-1}x)^2 + \frac{(-8x^5+18x^3-9x)}{(1-x^2)},$$

Again by differentiating w.r.t. x, we get

$$\mu''(x) = \frac{(-28x^5+52x^3-21x)(\sin^{-1}x)}{(1-x^2)^2\sqrt{1-x^2}} - 12(\sin^{-1}x)^2 + \frac{(24x^6-54x^4+33x^2)}{(1-x^2)^2},$$

Another differentiation of above gives us $\mu^{(3)}(x)$, which is given below:

$$\mu^{(3)}(x) = \frac{(24x^6-108x^4+144x^2-45)(\sin^{-1}x)}{(1-x^2)^3\sqrt{1-x^2}} + \frac{(-48x^7+116x^5-98x^3+45x)}{(1-x^2)^3},$$

With slight rearrangement of terms, above equation can be written as

$$\mu^{(3)}(x) = \frac{1}{(1-x^2)^3} \cdot \rho(x),$$

where

$$\rho(x) = \frac{(24x^6-108x^4+144x^2-45)(\sin^{-1}x)}{\sqrt{1-x^2}} - 48x^7 + 116x^5 - 98x^3 + 45x.$$

By lemma 2.4, $\rho(x)$ is positive increasing on $(0,1)$. Also, for $x \in (0,1)$, we have $\frac{1}{(1-x^2)^3} > 0$. This implies that $\mu^{(3)}(x) > 0$, so, $\mu(x)$ is increasing and hence positive. As required.

Proof of Theorem 2.1. Denote,

$$f(x) = \frac{\ln\left(\frac{x}{\sin^{-1}x}\right)}{\ln\left(1-\frac{2x^2}{3}\right)} := \frac{f_1(x)}{f_2(x)},$$

where $f_1(x) = \ln\left(\frac{x}{\sin^{-1}x}\right)$ and $f_2(x) = \ln\left(1-\frac{2x^2}{3}\right)$ with $f_1(0^+) = 0 = f_2(0^+)$.

Differentiating with respect to x, we get

$$\frac{f_1'(x)}{f_2'(x)} = \frac{(2x^2-3)(\sin^{-1}x\sqrt{1-x^2}-x)}{4x^2\sin^{-1}x\sqrt{1-x^2}} = \frac{1}{4}f_3(x) \ say,$$

where

$$f_3(x) = \frac{(2x^2-3)(\sin^{-1}x\sqrt{1-x^2}-x)}{x^2\sin^{-1}x\sqrt{1-x^2}} := \frac{f_4(x)}{f_5(x)} say.$$

Now, we show that $f_3(x)$ is increasing i.e. to show that $f_3'(x) > 0$. For this it is sufficient to show that the numerator $N(x)$ (say) of $f_3'(x)$ is positive.

To get the expression for $N(x)$, we differentiate $f_3(x)$ w.r.t. x

$$\begin{aligned} N(x) &= f_5(x)\cdot f_4'(x) - f_4(x)\cdot f_5'(x) \\ &= \frac{(4x^4-3x^2)(\sin^{-1}x)}{\sqrt{1-x^2}} + (6x-6x^3)(\sin^{-1}x)^2 + 2x^5 - 3x^3 \\ &= x\cdot\mu(x), \end{aligned}$$

where

$$\mu(x) = \frac{(4x^3-3x)(\sin^{-1}x)}{\sqrt{1-x^2}} + (6-6x^2)(\sin^{-1}x)^2 + 2x^4 - 3x^2.$$

By lemma 2.5, $\mu(x)$ is positive on $(0,1)$.

$$\therefore N(x) > 0 \;\; f_3'(x) > 0.$$

This means that $\frac{1}{4}f_3(x) = \frac{f_1'(x)}{f_2'(x)}$ is increasing on $(0,1)$. So, by lemma 2.2 $f(x)$ is increasing on $(0,1)$.

Therefore, for $0 < x < 1$ and some $k \in (0,1)$ we must have $f(0^+) < f(x) < f(k)$, where $\eta_1 = f(0^+) = 1/4$ and $\eta_2 = f(k) = \frac{\ln\left(\frac{k}{\sin^{-1}k}\right)}{\ln\left(1-\frac{2k^2}{3}\right)}$. Hence the result follows.

3 Conclusion

From our findings in this paper depicted in the theorem 2.1, we conclude that the upper and lower bounds in the inequality (2.1) are sharper than that of the inequality (1.4) of kind (1.3).

4 Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical approval This article does not contain any studies involving human participants or animals performed by any of the authors.

Informed consent Informed consent was obtained from all participants in this study.

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Thermoelastic analysis of a semi-infinite cylinder with moving sectional heat supply

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Abstract

The aim of this paper is concerned with the transient thermoelastic analysis of the axisymmetric problem of a semi-infinite solid cylinder having an internal heat source considering a moving boundary. It is assumed that the upper edge of the cylinder is heated with an arbitrary sectional heat supply that moves with a constant velocity. The potential functions, displacements and the associated thermal stress distribution are determined. As an illustration, numerical analysis is carried out for different velocity values of the moving boundary for the temperature and the thermal stresses precisely.
Keywords: *Heat conduction, thermal stresses, homogeneous, potential function, moving heat*

1. Introduction

It is assumed that most materials tend to expand if the temperature rises, and in the first approximation, expansion and compression are proportional to temperature changes. This temperature change caused by expansion and compression is based on thermoelasticity, a branch of applied mathematics specializing in the coupling between temperature and mechanical deformation and thermal energy calculated by stress. It is also assumed that the homogeneous materials and elastic properties are the same at every point in the body and constant during translation. However, the properties do not have to be the same in all directions for homogeneous materials. Isotropic materials have the same elasticity in all directions. Therefore, the material must be uniform and isotropic such that the transverse strain is the same at each point of the particular component. The uniformly loaded homogeneous and isotropic plate has attracted the focus of researchers over the past long time because of its application to various machines and structures.

Some authors have worked on homogeneous materials in the most recent literature, which can be summarised below. Aksoy et al. [1] performed the thermoelastic stress analysis of a cylinder made of laminated isotropic material under thermomechanical loading. Deshmukh et al. [2] investigated the thermoelastic behaviour of circular plates, and the simply supported plates with thermal bending moments caused by moving heat sources and point heat sources were investigated. Janjgava [3] solved the thermoelastic two-dimensional problem by considering the micro-temperature. Kedar et al. [4] discussed the transient heat conduction problem of finite and semi-infinite thick cylinders and determined the thermal stress by the quasi-static method.

Further, it is also noted that the moving heat source is the subject of transient heat transfer and is suitable for engineering problems, especially for welding. At the beginning of the 20th century, welding engineers began to study moving heat sources, both empirically and theoretically [5]. Kim [6] obtained the temperature distribution around a rectangular shape source moving at a constant speed along the axis of a bar using a Fourier series procedure. Shokouhmand and Ghaffari [7] performed the temperature analysis of the nonlinear and transient magneto-thermal coupled problem with moving coils studied by a valid finite element program, which is considered a moving heat source using numerical methods. Deshmukh et al. [2] obtained the most exciting result of dynamic thermal stresses in a circular plate by a moving heat source subject to certain boundary conditions using the integral transform technique. Things become complicated when internal heat persists on the object under consideration and further becomes unpredictable when part of the heat is affected. Both analytical and numerical techniques have proven to be the best way to solve such problems. In previous works, the temperature and stress distributions were analyzed analytically or numerically using a computer code, and this study points out the importance of the topic in a workpiece. This work presents the temperature distributions and associated thermal stresses in a cylindrical profile workpiece with an internal heat source subjected to heated partly-axially from its outer surface by a moving uniform heat source.

Mathematical modelling

For this study, a solid cylinder is heated partly-axially from its outer surface (processed surface) by a moving uniform heat source under stagnant ambient conditions is considered to analyze the transient temperature distributions analytically. As already known, heat is released in a solid subjected to manufacturing processes such as grinding, hardening, cutting, coating, metal forming, etc. Temperature differences occurring in this solid because of non-uniformities of the released heat, cooling and/or thermal properties of the solid material may cause thermal stress. This study also presents the thermal stresses proportional to the temperature differential. The axisymmetric geometric model of the considered cylinder and the coordinate system is shown in figure 1.

2.1 The governing heat conduction equation

The governing equation of temperature distribution is given as follows

$$\frac{\partial^2\theta}{\partial r^2}+\frac{1}{r}\frac{\partial\theta}{\partial r}+\frac{\partial^2\theta}{\partial z^2}+Q=\frac{1}{\kappa}\frac{\partial\theta}{\partial t} \tag{1}$$

subjected to boundary conditions

$$\theta=0 \quad \text{at} \quad t=0 \tag{2}$$

$$\theta=0 \ \text{at} \ \ r=a \tag{3}$$

$$\frac{\partial\theta}{\partial z}-\theta=-\theta_0 \ \text{at} \ \ z=vt \tag{4}$$

in which $\theta(r,z,t)$ is the temperature distribution function, and $\kappa=\lambda/\rho C$, λ is the thermal conductivity of the material, ρ is the density and C is the calorific capacity, assumed to be constant, respectively.

2.2 The governing thermal displacements and stress equations

The Navier's equations without the body forces can be expressed as

$$\begin{aligned}\nabla^2 u_r-\frac{u_r}{r^2}+\frac{1}{1-2\nu}\frac{\partial e}{\partial r}-\frac{2(1+\nu)}{1-2\nu}\alpha\frac{\partial\theta}{\partial r}=0\\ \nabla^2 u_z-\frac{1}{1-2\nu}\frac{\partial e}{\partial z}-\frac{2(1+\nu)}{1-2\nu}\alpha\frac{\partial\theta}{\partial z}=0\end{aligned} \tag{5}$$

where u_r and u_z are the displacement components in the radial and axial directions, respectively and the dilatation e as

$$e=\frac{\partial u_r}{\partial r}+\frac{u_r}{r}+\frac{\partial u_z}{\partial z} \tag{6}$$

The displacement functions represented by the Goodier's displacement potential function $\phi(r,z,t)$ and Michell's function $M(r,z,t)$ is given as

$$\begin{aligned}u_r=\frac{\partial\phi}{\partial r}-\frac{\partial^2 M}{\partial r\partial z},\\ u_z=\frac{\partial\phi}{\partial z}+2(1-\nu)\nabla^2 M-\frac{\partial^2 M}{\partial z^2}\end{aligned} \tag{7}$$

in which Goodier's thermoelastic potential must satisfy the equation

$$\nabla^2\phi=\frac{1+\nu}{1-\nu}\alpha\theta \tag{8}$$

and Michell's function must satisfy the equation

$$\nabla^2\nabla^2 M=0 \tag{9}$$

where

$$\nabla^2 = \frac{1}{r}\frac{\partial}{\partial r}\left(r\frac{\partial}{\partial r}\right)+\frac{\partial^2}{\partial z^2}$$

The component of the stresses can be given as

$$\begin{aligned}
\frac{\sigma_{rr}}{2G} &= \frac{\partial^2\phi}{\partial r^2}-\nabla^2\phi+\frac{\partial}{\partial z}\left(\upsilon\nabla^2 M-\frac{\partial^2 M}{\partial r^2}\right),\\
\frac{\sigma_{\theta\theta}}{2G} &= \frac{1}{r}\frac{\partial\phi}{\partial r}-\nabla^2\phi+\frac{\partial}{\partial z}\left(\upsilon\nabla^2 M-\frac{1}{r}\frac{\partial M}{\partial r}\right),\\
\frac{\sigma_{zz}}{2G} &= \frac{\partial^2\varphi}{\partial z^2}-\nabla^2\phi+\frac{\partial}{\partial z}\left((2-\upsilon)\nabla^2 M-\frac{\partial^2 M}{\partial z^2}\right),\\
\frac{\sigma_{rz}}{2G} &= \frac{\partial^2\phi}{\partial r\partial z}+\frac{\partial}{\partial r}\left((1-\upsilon)\nabla^2 M-\frac{\partial^2 M}{\partial z^2}\right)
\end{aligned} \tag{10}$$

where G is the shear modulus and υ is the Poisson's ratio.

The boundary conditions on the traction free surface are

$$\sigma_{rr}=\sigma_{rz}=0 \text{ at } r=a \tag{11}$$

The equations (1) to (11) constitute the mathematical formulation of the problem under consideration.

2.3 Temperature distribution and its associated stress in dimensionless quantities

For the sake of simplicity, the following dimensionless quantities are introduced as

$$\begin{aligned}
&T=\theta/\theta_0, \tau=\kappa t/a^2, \bar{r}=r/a=\xi, \bar{z}=z/a, \bar{\nu}=\nu a/\kappa,\\
&\bar{M}=\frac{1-\upsilon}{(1+\upsilon)\alpha\theta_0 a^3}, \bar{\phi}=\frac{1-\upsilon}{(1+\upsilon)\alpha\theta_0 a^2}\phi, \bar{u}_i=\frac{1-\upsilon}{(1+\upsilon)\alpha\theta_0 a}u_i\\
&\bar{\sigma}_{ij}=\frac{1}{2G}\frac{1-\upsilon}{(1+\upsilon)\alpha\theta_0}\sigma_{ij}\ (i,j=r,z)
\end{aligned} \tag{12}$$

Substituting the Eq. (12) in Eqs. (1)-(4), (7), (9)-(10) and (11), one obtains the expressions in dimensionless form as

$$\frac{\partial^2 T}{\partial\xi^2}+\frac{1}{\xi}\frac{\partial T}{\partial\xi}+\frac{\partial^2 T}{\partial\zeta^2}+\bar{\nu}\frac{\partial T}{\partial\zeta}+Q=\frac{\partial T}{\partial\tau} \tag{13}$$

$$T=0 \text{ at } \tau=0 \tag{14}$$

$$T=0 \text{ at } \xi=1 \tag{15}$$

$$\frac{\partial T}{\partial\zeta}-T=-1 \text{ at } \zeta=\bar{z}-\bar{\nu}\tau=0 \tag{16}$$

$$\begin{aligned}
\bar{u}_\xi &= \frac{\partial\bar{\phi}}{\partial\xi}-\frac{\partial^2\bar{M}}{\partial\xi\,\partial\zeta},\\
\bar{u}_z &= \frac{\partial\bar{\phi}}{\partial\zeta}+2(1-\nu)\nabla^2\bar{M}-\frac{\partial^2\bar{M}}{\partial\zeta^2}
\end{aligned} \tag{17}$$

$$\Delta^2\bar{\phi}=\bar{T} \tag{18}$$

$$\Delta^2\Delta^2 M=0 \tag{19}$$

$$\bar{\sigma}_{\xi\xi} = \frac{\partial^2\bar{\phi}}{\partial\xi^2} - \Delta^2\bar{\phi} + \frac{\partial}{\partial\zeta}\left(\upsilon\Delta^2\bar{M} - \frac{\partial^2\bar{M}}{\partial\xi^2}\right),$$

$$\bar{\sigma}_{\theta\theta} = \frac{1}{\xi}\frac{\partial\bar{\phi}}{\partial\xi} - \Delta^2\bar{\phi} + \frac{\partial}{\partial\zeta}\left(\upsilon\Delta^2\bar{M} - \frac{1}{\xi}\frac{\partial\bar{M}}{\partial\xi}\right), \qquad (20)$$

$$\bar{\sigma}_{zz} = \frac{\partial^2\bar{\phi}}{\partial\zeta^2} - \Delta^2\phi + \frac{\partial}{\partial\zeta}\left((2-\upsilon)\Delta^2\bar{M} - \frac{\partial^2\bar{M}}{\partial\zeta^2}\right),$$

$$\bar{\sigma}_{rz} = \frac{\partial^2\bar{\phi}}{\partial\xi\partial\zeta} + \frac{\partial}{\partial\xi}\left((1-\upsilon)\Delta^2\bar{M} - \frac{\partial^2\bar{M}}{\partial\zeta^2}\right)$$

$$\sigma_{\xi\xi} = \sigma_{\xi\zeta} = 0 \quad \text{at } \xi = 1$$

$$\sigma_{\zeta\zeta} = \sigma\xi\zeta = 0 \quad \text{at } \zeta = 0 \qquad (21)$$

where

$$\Delta^2 = \frac{1}{\xi}\frac{\partial}{\partial\xi}\left(\xi\frac{\partial}{\partial\xi}\right) + \frac{\partial^2}{\partial\zeta^2}$$

3. The solution to the Problem

3.1 Solution for temperature distribution

In order to solve Eq. (13) under the boundary condition (15), we firstly introduce the integral transform [6] of order $n = 0$ over the variable r, then the integral transform and its inversion theorem are written as

$$H_{0j}\{f(\xi)\} = \bar{f}(\mu_j) = \int_0^1 \xi f(\xi) J_0(\mu_j\xi) d\xi, \; j = 1,2,..\infty$$

$$H_{0j}^{-1}\{\bar{f}(\mu_j)\} = f(\xi) = \sum_{j=1}^{\infty} \bar{f}(\mu_j) J_0(\mu_j\xi), 0 \le \xi \le \xi_0 \qquad (22)$$

in which μ_j are the roots of $J_0(\mu_j\xi) = 0$ and $J_0(\,)$ is the Bessel functions of the first kind of order $n = 0$.

Applying the transform defined by Eq. (22) to the Eqs. (14) and (16), and using Laplace transform, one obtains

$$\frac{\partial^2\bar{T}}{\partial\zeta^2} + \bar{v}\frac{\partial\bar{T}}{\partial\zeta} - (\mu_j^2 + p)\bar{T} + \frac{\delta(\zeta)J_0(\mu_j)}{p+\varpi} = -Q \qquad (23)$$

where $\bar{T}$ is the transformed function of T. The symbol ($\bar{}$) means a function in Hankel transformed domain, ($\tilde{}$) is for the function in Laplace transformed domain and p is Laplace parameter.

The solution of Eq. (23), in conjunction with the condition (16), one finds in the form

$$\tilde{\bar{T}}(\mu_j,\zeta,p) = \frac{Q}{p+\mu_j^2} + \left[1 - \left(\frac{Q}{p+\mu_j^2}\right)\right]\left(\frac{2\exp[-1/2\,\zeta(\nu+\sqrt{4(p+\mu_j^2)+\nu^2})]}{2+\nu+\sqrt{4(p+\mu_j^2)+\nu^2}}\right) \qquad (24)$$

Further taking the inverse transform of Eq. (24) and making use of the convolution theorem, one obtains

$$\bar{T}(\mu_j,\zeta,t) = Q\exp(-\tau\mu_j^2) + 2\exp(-2\zeta(\nu+1)^2)[(-1+\mu_j^2-\nu) \times \int_0^{\tau}\exp[s(1-\mu_j^2+\nu)]ds + Q\int_0^{\tau}\exp[-(\tau-s)\,\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\} \qquad (25)$$

Lastly, by the application of the inverse formulae Eq. (22), one gets the solution of the boundary value problem

$$T(\xi,\zeta,t)=\sum_{j=1}^{0} J_0(\mu_j\xi)\{Q\exp(-\tau\mu_j^2)+2\exp(-2\zeta(\nu+1)^2)[(-1+\mu_j^2-\nu)\times\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[\tau(1-\mu_j^2+\nu)]ds]\} \quad (26)$$

3.2 Solution for Goodier's potential and the Michell's function

Assuming the potential function which satisfies Eq. (18) as

$$\phi(\xi,\eta,\tau)=\sum_{j=1}^{0} A_1 J_0(\mu_j\xi)\exp[-2\zeta(\nu+1)^2]Q\exp(-\tau\mu_j^2)\{\exp[2\zeta(\nu+1)^2]+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (27)$$

Substituting Eq.(25) into Eq. (18), one obtains

$$A_1=8(1+\nu)^2\left[\mu_j^2-\mu_j(\mu_j+1)\frac{1}{\xi}\frac{J_1(\mu_j\xi)}{J_0(\mu_j\xi)}\right] \quad (28)$$

Similarly, assume Michell's function satisfying Eq. () as

$$M(\xi,\zeta,\tau)=\sum_{j=1}^{0}[B_1 J_0(\mu_j\xi)+B_2\mu_j\xi J_0(\mu_j\xi)]Q\exp(-\tau\mu_j^2)\{\exp[2\zeta(\nu+1)^2]+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (29)$$

Substituting Eqs. (27)-(29) into Eq. (20), one obtains

$$\bar{\sigma}_{\xi\xi}=\sum_{j=1}^{0}\{A_1[\mu_j^2(J_0(\mu_j\xi)-\frac{1}{\xi}J_1(\mu_j\xi))-(\mu_j^2J_0(\mu_j\xi)-\frac{\mu_j}{\xi}J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4]-2[B_1+B_2\mu_j]\{\upsilon(\mu_j^2J_0(\mu_j\xi)-\frac{\mu_j}{\xi}J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4-\mu_j^2(J_0(\mu_j\xi)-\frac{1}{\xi}J_1(\mu_j\xi))\}(\nu+1)^2\}\exp[-2\zeta(\nu+1)^2]Q\exp(-\tau\mu_j^2)\{\exp[-2\zeta(\nu+1)^2]+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (30)$$

$$\bar{\sigma}_{\theta\theta} = \sum_{j=1}^{0} \{A_1[-\frac{\mu}{\xi} J_1(\mu_j\xi) - (\mu_j^2 J_0(\mu_j\xi) - \frac{\mu}{\xi} J_1(\mu_j\xi)[\mu+1])4(\nu+1)^4]$$
$$-2[B_1 + B_2\mu_j]\{\upsilon(\mu_j^2 J_0(\mu_j\xi) - \frac{\mu}{\xi} J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4$$
$$+\frac{\mu}{\xi} J_1(\mu_j\xi)\}(\nu+1)^2\}\exp[-2\zeta(\nu+1)^2]Q\exp(-\tau\mu_j^2)\{\exp[-2\zeta(\nu+1)^2]$$
$$+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds$$
$$+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (31)$$

$$\bar{\sigma}_{\zeta\zeta} = \sum_{j=1}^{0} \{A_1[J_0(\mu_j\xi)4(\nu+1)^4 - (\mu^2 J_0(\mu_j\xi) - \frac{\mu}{\xi} J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4]$$
$$-2[B_1 + B_2\mu_j]\{(2-\upsilon)(\mu_j^2 J_0(\mu_j\xi) - \frac{\mu}{\xi} J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4$$
$$-J_0(\mu_j\xi)4(\nu+1)^4\}(\nu+1)^2\}\exp\{-2\zeta(\nu+1)^2\}Q\exp(-\tau\mu_j^2)\{\exp[-2\zeta(\nu+1)^2]$$
$$+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds$$
$$+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (32)$$

$$\bar{\sigma}_{\xi\zeta} = \sum_{j=1}^{0} \{A_1[J_0(\mu_j\xi)4(\nu+1)^4 - (\mu_j^2 J_0(\mu_j\xi) - \frac{\mu_j}{\xi} J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4]$$
$$+[B_1 + B_2\mu_j]\{(1-\upsilon)(-\mu^3 J_1(\mu_j\xi) - 4\mu_j[\mu_j+1](\nu+1)^4$$
$$\times\left[\frac{\mu_j\xi J_0(\mu_j\xi) - J_1(\mu_j\xi)[\mu_j+1]}{\xi^2}\right] + \mu_j J_1(\mu_j\xi)4(\nu+1)^4\}\exp[-2\zeta(\nu+1)^2]Q$$
$$\times\exp(-\tau\mu_j^2)\{\exp[-2\zeta(\nu+1)^2] + (2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)$$
$$\times\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds + Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/4(\nu+1)^4\} \quad (33)$$

Now substituting Eqs. (30) and (33) into Eq. (21), one obtains

$$B_1 = 0$$

$$B_2 = \frac{-A_1[J_0(\mu_j)4(\nu+1)^4 - (\mu^2 J_0(\mu_j) - \mu J_1(\mu_j)[\mu+1])4(\nu+1)^4]}{\mu_j\{(1-\upsilon)(-\mu^3 J_1(\mu_j) - 4\mu[\mu+1](\nu+1)^4\mu\ J_0(\mu_j) - J_1(\mu_j)[\mu+1] + \mu J_1(\mu_j)4(\nu+1)^4\}}$$

4. Numerical Results, Discussion and Remarks

The numerical computations have been carried out for Aluminium (pure) annular sector plate with the thermo-mechanical properties: modulus of elasticity E = 70 GPa, Poisson's ratio υ = 0.35, thermal expansion coefficient α = 23×10^{-6}/^{0}C, thermal diffusivity κ = 84.18×10-6 m^{2}s^{-1} and thermal conductivity λ = 204.2 Wm^{-1}K^{-1}. The physical parameter for the sector plate as $a = 1$m, $b = 1$m, $l = 0.08$ m and $T_0 = 150^0$C. In order to examine the influence of heating on the plate, numerical calculations were performed for all the variables. The numerical calculations are depicted in the following figures with the help of MATHEMATICA software.

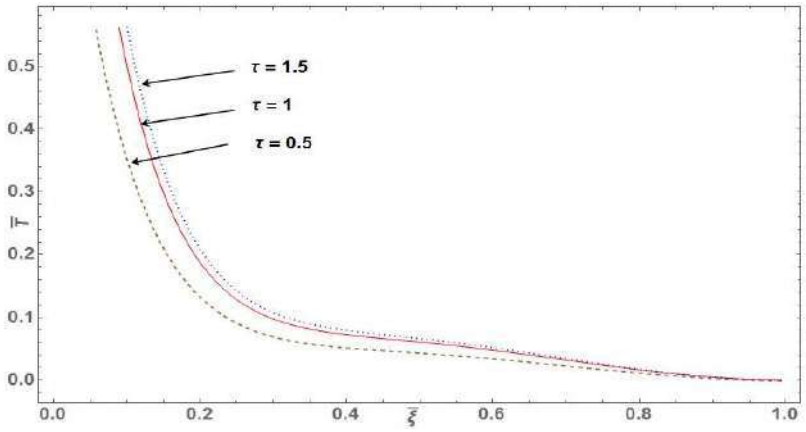

Fig. 1: Temperature distribution along ξ-direction for different time

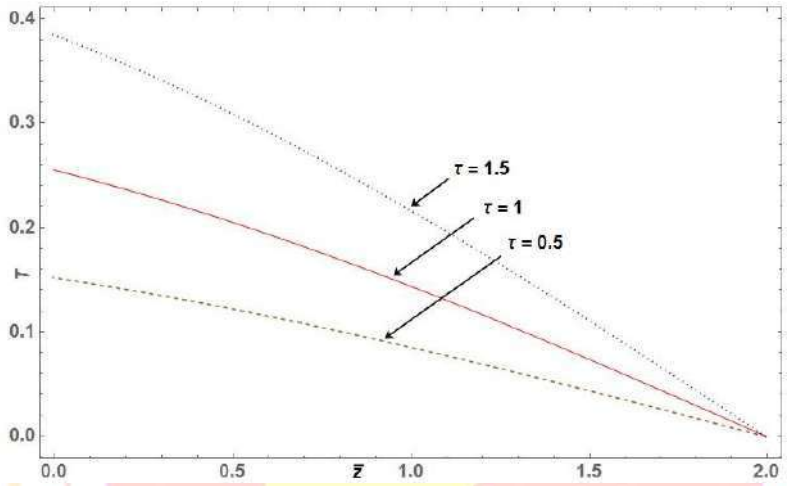

Fig. 2: Temperature distribution along z-direction for different time

Fig. 1 illustrates the temperature distribution along the radial direction for different values of time, and it decreases as the time proceeds along the radial direction but attains its maximum at the inner core. The maximum value of temperature magnitude occurs at the outer edge due to additional heat supply with available internal heat energy throughout the body. Fig. 2 indicates the temperature distribution along the axial direction of the plate for different values of time, but the curve shows a straight line due to the shallowness of the cylinder and the maximum value of temperature magnitude occurring at the edge, that is energized due to sectional heat supply.

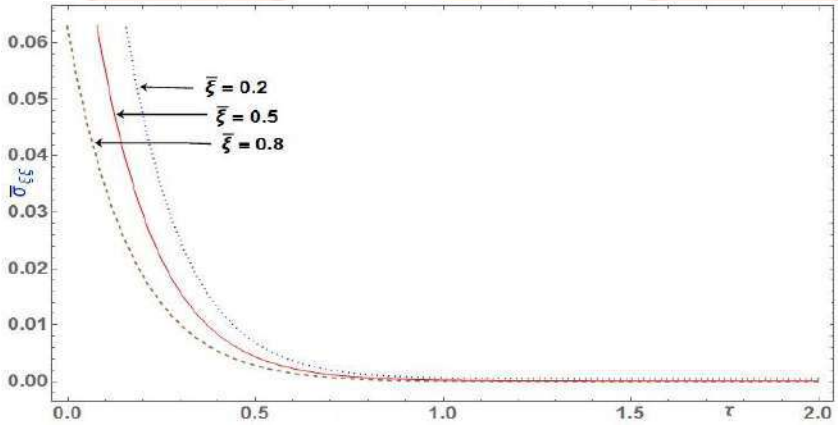

Fig. 3: Radial stress distribution along τ-direction for different ξ

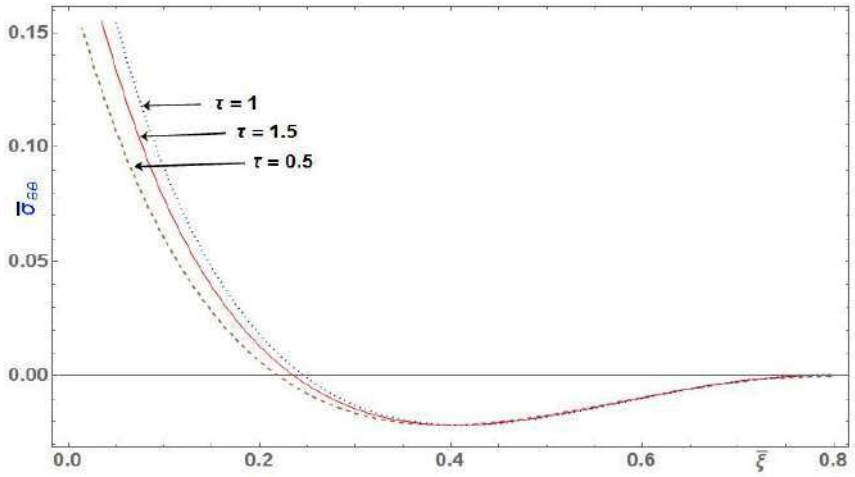

Fig. 4: Tangential stress distribution along ξ-direction for different time

Fig. 3 depicts the thermal radial stress along the axial direction for different values of the time. The expansion occurs, and its magnitude increases at the inner edge; it may be due to compressive force, whereas maximization towards the outer edge may be due to energized heat supply. The tangential stress decreases gradually along the radial direction with the thermal load, as shown in Fig. 4. The stresses attain certain maxima and decrease gradually at the outer edge towards infinity.

1. Conclusion

This study has treated the thermoelastic problem of a semi-infinite cylinder in which sources are generated. We successfully obtained the temperature distribution, displacements and stress functions with additional sectional heating available at the cylinder's edge. Then, the numerical calculations were carried out. We may conclude that the system of equations proposed in this study can be adapted to the design of useful structures or machines in engineering applications to determine thermoelastic behaviour with radiation.

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Magnetized Bianchi Type-III Perfect Fluid Cosmological Model in Brans-Dicke Theory of Gravitation

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Abstract:
In this paper, we investigate the role of relativistic charged perfect fluid in Bianchi type-III cosmological model in Brans-Dicke theory of gravitation. Solutions of the models are obtained by volumetric exponential expansion, power law expansion and power law relation between scalar field ϕ and the scale factor a .Some physical and kinematical properties of the model are also discussed.
Keywords: *Bianchi type-III universe, Brans-Dicke theory of gravitation, electromagnetic field, perfect fluid, constant vector potentials.*

1. Introduction:

Brans and Dicke (BD) theory of gravitation is a well-known modified version of Einstein's theory. (Brans and Dicke 1961) formulated a theory of gravitation in which, besides a gravitational part, a dynamical scalar field is introduced to account for variable gravitational constant and to incorporate Mach's [1]Principle in Einstein's theory. In this theory, the scalar field has the dimension of the universe of a gravitational constant and its role is confined to its effect on gravitational field equations.[2] BD scalar-tensor theory of gravitation is quite important in view of the fact that scalar fields play a vital role in inflationary cosmology. In recent years, there has been a renewed interest of the gravitational constant.[3] The latest inflationary models (Mathiazhagan and Johri 1984),possible "graceful exit" problem (Pimental 1997) and extended chaotic inflations (Linde 1990) are based on BD theory of gravitation.[4-6]

The scalar-tensor theories have been subject of considerable interest in the study of various cosmological models due to their relevance for the inflationary expansion of the universe and to solve many outstanding problems in cosmology. Several aspects of BD cosmology have been extensively investigated by[7] many authors. Bardeen et al. (1983) explored the inflationary universe models which provide a mechanism for galaxy formation by generating small scale density fluctuation in the universe, Banerjee et al.(1990) studied Bianchi type-I string cosmological models with and without a source-free magnetic field, Johri and Desikan (1994) have investigated cosmological models with constant deceleration parameter in Nordtvedt's theory,[8] Bianchi type-III cosmological model with a negative constant deceleration parameter in BD theory of gravity in presence of perfect fluid has been studied by Adhav et al.(2012), Katore et al. (2012) explored plane symmetric space-time filled with dark energy models in BD theory, Bhoyar et al. (2018) studied Bianchi type-III and Kantowski Sachs cosmological model containing magnetic field with variable cosmological constant. [9-11]

Lorenz-Petzold (1982), Kumar et al. (2008), Pawar et al. (2009), Rao et al.(2011), Naidu et al.(2012), Kandalkar et al. (2014),Mete et al. (2018), are some of the authors who have investigated several aspects of BD theory of gravitation.[12-15]

Tikekar and Patel (1992) have obtained some exact Bianchi type-III cosmological solutions of massive string in the presence of magnetic field,[16] Singh and Shri Ram (1996) have presented a technique to generate new exact Bianchi type-II cosmological solutions of massive strings in the presence and absence of the magnetic field, Tripathy et al. (2009) and Pradhan (2007) studied string cosmological models in the presence of the electromagnetic field,[17-20] A detailed discussion of BD cosmology is given by Singh et al. (2010),Singh J. K and Sharma N. K (2010a) have investigated some Bianchi type-II cosmological models in BD theory,

Shamir et al. (2012) explored anisotropic dark energy Bianchi type-III cosmological models in BD theory of gravity, Solanke and Karade (2016,2017) have investigated Bianchi type-I and III universe[21] field with perfect fluid and scalar field coupled with electromagnetic fields in theory of gravity. Recently Katore et al. (2018) have investigated Bianchi type-I dark energy cosmological model with power-law relation in BD theory of gravitation.[22-25]

In this paper, we discuss Bianchi type-III perfect fluid cosmological model with electromagnetic field in BD theory of gravitation.

2. The Metric And Field Equation:

We consider a spatially homogeneous Bianchi Type-III space time in the form

$$ds^2 = -dt^2 + A^2dx^2 + B^2e^{-2mx}dy^2 + C^2dz^2, \quad (1)$$

where A, B and C are functions of t and m is a constant.

Brans-Dicke field equations for the combined scalar and tensor fields are

$$G_j^i = \frac{-8\pi}{\phi}T_j^i - \frac{\omega}{\phi^2}\left(g^{ii}\phi_{,i} - \frac{1}{2}g_j^i\phi_{,k}\phi^{,k}\right) - \frac{1}{\phi}\left(g^{ii}\phi_{i;j} - g_j^i\phi_{;k}^{,k}\right), \quad (2)$$

where G_j^i is Einstein's tensor, ϕ is a dimensionless coupling constant and T_j^i is energy momentum tensor for perfect fluid with conservation equation.

$$\phi_{;k}^{,k} = \frac{1}{\sqrt{-g}}\left[\sqrt{-g}\phi^k\right]_{,k} \quad (3)$$

3. Energy Momentum Sources:

The energy momentum tensor for matter under discussion given by

$$T_j^i = {}^pT_j^i + E_j^i, \quad (4)$$

where ${}^pT_j^i$ is energy momentum tensor for perfect fluid and E_j^i is energy momentum tensor for electromagnetic field is given by

$$E_{ij} = \frac{1}{4}F_{ab}F^{ab}g_{ij} - F_{ai}F_{bj}g^{ab}. \quad (5)$$

Here the electromagnetic field tensor F_{ij} has the expression

$$F_{ij} = \frac{\partial A_i}{\partial x^j} - \frac{\partial A_j}{\partial x^i}. \quad (6)$$

where A_i is a four potential vector.

To achieve the compatibility with the metric (1), we assume electromagnetic vector potential as

$$A_i = [\lambda(x)v_1(t), v_2(t), v_3(t), v_4(t)]. \quad (7)$$

From equations (6) and (7), we deduce

$$F_{14} = \lambda\dot{v}_1,\ F_{24} = \dot{v}_2,\ F_{34} = \dot{v}_3,\ F_{43} = -\dot{v}_3. \quad (8)$$

Using equations (6), (7) and (8), we obtained

$$F_{ab}F^{ab} = -2\left[\frac{\lambda^2\dot{v}_1^2}{A^2} + \frac{\dot{v}_2^2}{B^2e^{-2mx}} + \frac{\dot{v}_3^2}{C^2}\right], \quad (9)$$

The energy momentum tensor for a perfect fluid is given by

$${}^pT_j^i = (\rho + p)u^iu_j - p\delta_i^j, \quad (10)$$

where ρ is the density, p is the pressure of perfect fluid and four velocity u_i is given by

$$g_{ij}u^i u^j = -1.$$

For co-moving coordinate system, we have

$$u_x = 0, \quad u_y = 0, \quad u_z = 0, \quad u_t \neq 0. \tag{11}$$

Accordingly equation (10), provides

$${}^pT_1^1 = {}^pT_2^2 = {}^pT_3^3 = -p, \; {}^pT_4^4 = \rho, \; T_i^j = 0 \quad \forall i, j \tag{12}$$

Using equations (5), (9) and (12), we obtained

$${}^pT_1^1 + E_1^1 = \frac{1}{2}\frac{\lambda^2 \dot{v}_1^2}{A^2} - \frac{1}{2}\frac{\dot{v}_2{}^2}{B^2 e^{-2mx}} - \frac{1}{2}\frac{\dot{v}_3{}^2}{C^2} - p, \tag{13}$$

$${}^pT_2^1 + E_2^1 = {}^pT_1^2 + E_1^2 = \frac{\lambda \dot{v}_1 \dot{v}_2}{A^2}, \tag{14}$$

$${}^pT_3^1 + E_3^1 = {}^pT_1^3 + E_1^3 = \frac{\lambda \dot{v}_1 \dot{v}_3}{A^2}, \tag{15}$$

$${}^pT_2^2 + E_2^2 = -\frac{1}{2}\frac{\lambda^2 \dot{v}_1^2}{A^2} + \frac{1}{2}\frac{\dot{v}_2^2}{B^2 e^{-2mx}} - \frac{1}{2}\frac{\dot{v}_3^2}{C^2} - p, \tag{16}$$

$${}^pT_3^2 + E_3^2 = {}^pT_2^3 + E_2^3 = \frac{\dot{v}_2 \dot{v}_3}{B^2 e^{-2mx}}, \tag{17}$$

$${}^pT_3^3 + E_3^3 = -\frac{1}{2}\frac{\lambda^2 \dot{v}_1^2}{A^2} - \frac{1}{2}\frac{\dot{v}_2^2}{B^2 e^{-2mx}} + \frac{1}{2}\frac{\dot{v}_3^2}{C^2} - p \tag{18}$$

$${}^pT_4^4 + E_4^4 = \frac{1}{2}\frac{\lambda^2 \dot{v}_1^2}{A^2} + \frac{1}{2}\frac{\dot{v}_2^2}{B^2 e^{-2mx}} + \frac{1}{2}\frac{\dot{v}_3^2}{C^2} + \rho. \tag{19}$$

4. Conservation Law:

The Conservation equation is given by

$$\frac{\partial}{\partial x^i}\left(\sqrt{-g}F^{ij}\right) = 0. \tag{20}$$

Equation (20) with different combination of i and j gives following equations

$$\left[\frac{\dot{v}_1}{v_1}\right]^{\bullet} + \frac{\dot{v}_1^2}{v_1^2} + \frac{\dot{v}_1}{v_1}\left[\frac{\dot{B}}{B} + \frac{\dot{C}}{C} - \frac{\dot{A}}{A}\right] = 0, \tag{21}$$

$$\left[\frac{\dot{v}_2}{v_2}\right]^{\bullet} + \frac{\dot{v}_2^2}{v_2^2} + \frac{\dot{v}_2}{v_2}\left[\frac{\dot{A}}{A} + \frac{\dot{C}}{C} - \frac{\dot{B}}{B}\right] = 0, \tag{22}$$

$$\left[\frac{\dot{v}_3}{v_3}\right]^{\bullet} + \frac{\dot{v}_3^2}{v_3^2} + \frac{\dot{v}_3}{v_3}\left[\frac{\dot{A}}{A} + \frac{\dot{B}}{B} - \frac{\dot{C}}{C}\right] = 0, \tag{23}$$

$$\phi^{;k}_{;k} = -\ddot{\phi} - \dot{\phi}\left[\frac{\dot{A}}{A} + \frac{\dot{B}}{B} - \frac{\dot{C}}{C}\right]. \tag{24}$$

From the vanishing components of Einstein's tensor and using (5) and (7), we deduce

$$\frac{\dot{v}_1 \dot{v}_2}{v_1 v_2} = \frac{\dot{v}_1 \dot{v}_3}{v_1 v_3} = \frac{\dot{v}_2 \dot{v}_3}{v_2 v_3} = 0, \tag{25}$$

$$\frac{\dot{v}_1}{v_1} = \frac{\dot{v}_2}{v_2} = \frac{\dot{v}_3}{v_3} = \frac{\dot{D}}{D}, \tag{26}$$

where D is an unknown function of t

Integrating equation (26) with respect to t, we get

$$v_1 = k_1 D,\ v_2 = k_2 D,\ v_3 = k_3 D, \tag{27}$$

where k_1, k_2 and k_3 are constants.

Using equations (25) and (27), we get

$$\left(\frac{\dot{D}}{D}\right)^2 = 0. \tag{28}$$

With an aid of equation (27), we can write the equations (21) to (23) as

$$\left(\frac{\dot{D}}{D}\right)^{\bullet} + \left(\frac{\dot{D}}{D}\right)^2 + \frac{\dot{D}}{D}\left(\frac{\dot{B}}{B} + \frac{\dot{C}}{C} - \frac{\dot{A}}{A}\right) = 0, \tag{29}$$

$$\left(\frac{\dot{D}}{D}\right)^{\bullet} + \left(\frac{\dot{D}}{D}\right)^2 + \frac{\dot{D}}{D}\left(\frac{\dot{A}}{A} + \frac{\dot{C}}{C} - \frac{\dot{B}}{B}\right) = 0, \tag{30}$$

$$\left(\frac{\dot{D}}{D}\right)^{\bullet} + \left(\frac{\dot{D}}{D}\right)^2 + \frac{\dot{D}}{D}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} - \frac{\dot{C}}{C}\right) = 0. \tag{31}$$

We attempt to express the component of T_j^i in terms of T_4^4 already used as in (Solanke and Karade (2016,2017). For this, we consider the expression as

$$\frac{\lambda^2 \dot{v}_1^{\,2}}{A^2} + \frac{\dot{v}_2^{\,2}}{B^2 e^{-2mx}} + \frac{\dot{v}_3^{\,2}}{C^2} = \left[\frac{\lambda^2 v_1^{\,2}}{A^2}\left(\frac{\dot{D}}{D}\right)^2 + \frac{v_2^{\,2}}{B^2 e^{-2mx}}\left(\frac{\dot{D}}{D}\right)^2 + \frac{v_3^{\,2}}{C^2}\left(\frac{\dot{D}}{D}\right)^2\right] = 0 \tag{32}$$

$$\frac{\lambda^2 \dot{v}_1^{\,2}}{A^2} + \frac{\dot{v}_2^{\,2}}{B^2 e^{-2mx}} + \frac{\dot{v}_3^{\,2}}{C^2} = \left[\frac{\lambda^2 v_1^{\,2}}{A^2} + \frac{v_2^{\,2}}{B^2 e^{-2mx}} + \frac{v_3^{\,2}}{C^2}\right]\left(\frac{\dot{D}}{D}\right)^2 = 0 \tag{33}$$

$$T_4^{\,4} = \frac{1}{2}\frac{\lambda^2 \dot{v}_1^{\,2}}{A^2} + \frac{1}{2}\frac{\dot{v}_2^{\,2}}{B^2 e^{-2mx}} + \frac{1}{2}\frac{\dot{v}_3^{\,2}}{C^2} + \rho = \rho, \tag{34}$$

$$T_1^1 = -p = T_2^2 = T_3^3,$$

5. Solution of Field Equations:

Considering the non-vanishing component of Einstein's tensor from equation (3), we derive

$$\frac{\ddot{B}}{B} + \frac{\ddot{C}}{C} + \frac{\dot{B}\dot{C}}{BC} = \frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right), \tag{35}$$

$$\frac{\ddot{A}}{A} + \frac{\ddot{C}}{C} + \frac{\dot{A}\dot{C}}{AC} = \frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right) - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{C}}{C}\right), \tag{36}$$

$$-\frac{m^2}{A^2} + \frac{\ddot{A}}{A} + \frac{\ddot{B}}{B} + \frac{\dot{A}\dot{B}}{AB} = -\frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right), \tag{37}$$

$$-\frac{m^2}{A^2} + \frac{\dot{A}\dot{B}}{AB} + \frac{\dot{B}\dot{C}}{BC} + \frac{\dot{A}\dot{C}}{AC} = \frac{8\pi\rho}{\phi} + \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right), \tag{38}$$

$$\frac{\dot{A}}{A} - \frac{\dot{B}}{B} = 0. \tag{39}$$

Integrating (39) with respect to t, we get

$$A = k_4 B, \tag{40}$$

where k_4 is a constant of integration. Without loss of generality let us assume k_4 as unity so that equation (40) written as

$$A = B. \tag{41}$$

Using equations (41) and (35) to (38), we yield

$$\frac{\ddot{B}}{B} + \frac{\ddot{C}}{C} + \frac{\dot{B}\dot{C}}{BC} = \frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right), \tag{42}$$

$$-\frac{m^2}{B^2} + \frac{2\ddot{B}}{B} + \frac{\dot{B}^2}{B^2} = \frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right), \quad , \tag{43}$$

$$-\frac{m^2}{B^2} + \frac{2\dot{A}^2}{A^2} + \frac{\dot{B}\dot{C}}{BC} + \frac{\dot{A}\dot{C}}{AC} = \frac{8\pi p}{\phi} + \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right). \tag{44}$$

Since the field equations are highly nonlinear with three equations and five unknown. Therefore two extra conditions can be considered to solve the field equations.

Let us choose power law form of metric potential (Katore et al. (2018) given by

$$B = \alpha t^n, \text{ and } C = \beta t^n \tag{45}$$

The power law relation between scalar field ϕ and the scale factor a has already used by Johri and Desikan (2014) in the context of Robertson Walker Brans-Dicke models. Thus the power law relation between ϕ and the scale factor a is $\phi = \eta a^m$, where a is constant of proportionality. The average scalar factor is given by

$$a = (ABC)^{\frac{1}{3}} = k_5 t^n, \tag{46}$$

where $k_5 = \alpha^{\frac{2}{3}}\beta^{\frac{1}{3}}$ is a constant.

Hence scalar field ϕ is obtained as

$$\phi = k_5 t^{mn}$$

$$\phi = k_5 t^s,$$

where $s = mn$ is a constant.

Using equations (24) and (25), we have

$$\frac{\dot{D}}{D} = k_6, \tag{47}$$

where k_6 is a constant of integration.

Integrating equation (47), we deduce

$$D = e^{k_6 t}. \tag{48}$$

Using equations (46) and (27), we have

$$v_1 = k_1 e^{k_6 t}, \tag{49}$$

$$v_2 = k_2 e^{k_6 t}, \tag{50}$$

$$v_3 = k_3 e^{k_6 t}, \tag{51}$$

v_4 remained undetermined.

The metric in (1), with the help of (45), can be redefined in the form

$$ds^2 = \alpha^2 t^{2n}(dx^2 + e^{-2mx})dy^2 + \beta^2 t^{2n} dz^2 - dt^2 . \quad (52)$$

6. Physical and Kinematical Properties of the Model:

The physical and kinematical properties of the model (52) are obtained as follows.

For the investigated model the pressure p and the density ρ are given by

$$p = \frac{k_5 t^s}{8\pi}\left[\frac{2n(n-1)+n^2}{t^2} + \omega\frac{s^2}{2t^2} + \frac{s^2(s-1)}{t^2} + \frac{2sn}{t^2}\right], \quad (53)$$

$$\rho = \frac{k_5 t^s}{8\pi}\left[\frac{4n^2}{t^2} - \frac{m^2}{\alpha t^n} - \omega\frac{s^2}{2t^2} + \frac{3sn}{t^2}\right], \quad (54)$$

where k_5 is a constant of integration.

The physical quantities of observational interest in cosmology are,

The spatial volume is obtained as

$$V = \sqrt{-g} = \left(\alpha^2 \beta t^{3n}\right)e^{-mx}. \quad (55)$$

The expansion scalar become

$$\theta = 3H = \left(2\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right),$$

$$\theta = 3H = \frac{3n}{t}, \quad (56)$$

The shear scalar is given by

$$\sigma^2 = \frac{1}{2}\sum_{i=1}^{3} H_i^2 - \frac{\theta^2}{6} = 0 \quad (57)$$

The mean anisotropic parameter A_m as

$$\Delta = \frac{1}{3}\sum_{i=1}^{3}\left(\frac{H_i - H}{H}\right)^2$$

$$\Delta = 0. \quad (58)$$

The mean Hubble parameter

$$H = \frac{n}{t}. \quad (59)$$

The deceleration parameter is given by

$$q = \frac{d}{dt}(H) - 1 = \frac{1-n}{n} \quad (60)$$

The cosmic Jerk parameter is given as,

$$J = q + 2q^2 - \frac{\dot{H}}{H}$$

$$= \frac{(n-1)(n-2)}{n^2}. \quad (61)$$

7. Conclusion:

In this paper, we have presented Bianchi Type-III charged fluid universe in BD theory of gravitation in presence of perfect fluid with electromagnetic field. The spatial volume V of the model increases with time showing the spatial expansion of the universe. It is observed that Hubble's parameter H vanishes with extremely large value and continue to decrease with time. The scalar expansion and the physical parameters energy density and pressure diverge at $t = 0$ and they all vanish as t approaches to infinity. The scalar field increases with time and at $t = 0$, it vanishes. The recent observations of type Ia supernovae reveal that the present universe is accelerating and the value of deceleration parameter lies somewhere in the range $-1 < q < 0$. It follows that one can choose the value of n in the range $0 < n < 1$ to ensure that the derived model is consistent with observations. It is also seen that the value of the cosmic jerk parameter is positive throughout the entire history of this model. This shows that our model strongly agrees to present day observations.

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The behaviour of Composite Objects Subjected to Hygrothermal Environment : A Review Article

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Abstract:

The article investigates the present review of hyrgrothermoelastic theories with different thermal loading effects on various objects. The main theme of the hyrgrothermoelastic problems is to establish operational methods to solve the governing differential equations. In the hyrgrothermoelastic problems, we have considered a few practical problems of technical interest, considering hygrothermal loading using numerical or exact procedures.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords: *temperature distribution, moisture concentration, thermal stresses, hyrgrothermoelastic, fractional order, deflection, integral transform.*

Introduction:

Compared to usual metal structures, multilayered materials still expertise the amplified application in automobile, marine, aerospace, and civil and mechanical structures because of their higher strength and stiffness to weight ratios. It may be because of material property; analysing and coming up with these materials are a lot of difficult than metallic materials. Most structures, categorically for composite materials, are sometimes subjected to dynamical environmental conditions like temperature and moisture throughout initial manufacture and final practice. The effects of warmth and wetness on the stresses and deformation of those materials and structures are of great interest. Innovative fibre-reinforced composites have gained extensive use within the region and physical science engineering industries. The benefits of those materials result from their high strength, stiffness and damping at the side of low concrete weight, though it is susceptible to hygrothermoelastic stress due to their intrinsic heterogeneity evolving at the microscopic and macroscopic level. It reduces the prices in construction, operation and development, whereas up structural responsibility and enhances safety. A decent style of multilayered composite structures must account for hygrothermoelastic stresses correctly; even inside an uncoupled theory, the hygrothermal fields are uncoupled from the strain ones; this task is scarcely unconventional.

Research Background :

This subsection summarises the previous authors' work results, namely the nonlinear relationship between temperature, dissolved moisture content and vapour concentration, and control equations. Many researchers [1,2] following the alternative microscopic approach proposed by Henry [3] have suggested that slight variations, $\sigma = \partial M / \partial C$ and $\omega = -(\partial M / \partial T)$ are related to the mass of absorbed moisture as

$$M = \text{constant} + \sigma C - \omega T \qquad (1)$$

in a unit mass of solid to the mass of moisture, C, in a unit volume of void space and the temperature, T, and to keep equations readily soluble, we assume σ and ω as constant to avoid mathematical complexity. Now taking the rate of change of C in which mass of moisture is being absorbed or given off by the solid as $\gamma(\partial M / \partial t)$, where $\gamma = [(1-\alpha)/\alpha]\rho_S$, ρ_S is the true density, α is the ratio of the capacities for the diffusing material of equal volumes of the solid and the surrounding medium, D'' is vapour diffusion coefficient under no-absorption condition, respectively. Then the equation for moisture diffusion is

$$D''\nabla^2 C = \gamma \frac{\partial M}{\partial t} + \frac{\partial C}{\partial t} \qquad (2)$$

The rate of evolution of heat per unit volume is $k\rho'(\partial M/\partial t)$, where $\rho' = [(\rho - \rho_p)/(\rho_s - \rho_p)]\rho_s$ is the mass of solid per unit volume of the whole, and the equation for the thermal diffusion is

$$\mathsf{D}''\nabla^2 T = \frac{\partial T}{\partial t} - \varepsilon\frac{\partial M}{\partial t} \tag{3}$$

in which D'' is the thermal diffusion coefficient under the condition of no absorption, $\varepsilon = k/c_v$, with k being the overall thermal conductivity of the material, c_v is the total calorific capacity, and $\kappa = k/c_v\rho$ is representing thermal diffusivity, respectively.

Now eliminating M from Eqs. (2) and (3) using Eq. (1), one gets

$$D\nabla^2 C = \frac{\partial C}{\partial t} - \psi\frac{\partial T}{\partial t} \tag{4}$$

$$\mathsf{D}\nabla^2 T = \frac{\partial T}{\partial t} - \varphi\frac{\partial C}{\partial t} \tag{5}$$

in which ψ is the adiabatic coefficient, φ is isothermal coefficient, D is vapour diffusion coefficient under isothermal condition, D is the thermal diffusion coefficient under the state of constant vapour concentration and it is represented as

$$D = \frac{D''}{\gamma\sigma+1},\ \psi = \frac{\gamma\omega}{\gamma\sigma+1},\ \mathsf{D} = \frac{\mathsf{D}''}{1+\varepsilon\omega},\ \varphi = \frac{\varepsilon\sigma}{1+\varepsilon\omega} \tag{6}$$

Literature Review:

Several authors have previously investigated the associated hygrothermoelastic problems. Chang and Weng [4] proposed a linear hygrothermoelastic theory to analyse transient responses in an axisymmetric double-layer annular cylinder subjected to hygrothermal loading using the Hankel transform method. Sugano [5] obtained analytical solutions for the heat and moisture equation and associated hygrothermal stress in a functionally graded material plate under the prescribed surface temperature and moisture load. Chiba and Sugano [6] analysed transient heat and moisture diffusion and the resulting hygrothermal stress field in a layered plate subjected to hygrothermal loadings at the external surfaces. Brischetto [7] examined the hygrothermal loading effects in the bending of two-dimensional multilayered composite plates on Carrera's Unified formulation framework. Ishihara et al. [8] formulated and quantified the hygrothermal field in porous media exposed to heat and moisture, considering nonlinear coupling. Saadatfar and Aghaie-Khafri [9] studied static behaviour of a functionally graded magneto-electro-elastic hollow sphere subjected to hygrothermal loading in the spherically symmetric state. Ensour [10] presented the interaction of electric potentials, electric displacement and elastic deformations to describe the hygrothermal responses in inhomogeneous piezoelectric hollow cylinders subjected to mechanical load and electric potential. Zhao et al. [11] proposed the steady-state solution for three-dimensional hygrothermoelastic media based on the potential theory methodology. Previously published papers exposed the static and dynamic characteristics of composite or smart material structures to the hygrothermal environment.

Recently, a few papers have been published using time-fractional hygrothermoelasticity theory to study the effects of temperature and moisture concentrations on the material properties under hygrothermal load. Benkhedda et al. [12] evaluated the hygrothermoelastic stress in composite plates during moisture desorption, taking into account the change of mechanical characteristics induced by temperature and moisture variation. Zhang and Li [13] formulated fractional hygrothermoelasticity theory within the framework of fractional calculus by coupling the classical Fourier's and Fick's laws to anomalous diffusion, which is characterised by the time-fractional diffusion-wave equation. Peng et al. [14] presented a hyperbolic diffusion law with different phase lags of thermal and moisture fluxes to simulate coupled heat-moisture diffusion-propagation behaviour and studied transient hygrothermal and elastic response of an infinitely long cylinder subjected to sudden

hygrothermal loadings. Zhang et al. [15] proposed a hygrothermal elastic problem within the framework of time-fractional calculus theory for a centrally symmetric sphere subjected to physical heat and moisture flux at its surface by using the integral transform method. Very recently, Zhang et al. [16] investigated the time-fractional diffusion-wave equations introduced to describe the coupled heat conduction and moisture diffusion in a hollow pipe using the separation of variables and the Laplace transform.

Conclusion:

During the literature review, it was noted that most of the papers on hygrothermoelasticity were taken to derive the temperature, moisture, displacement, and stresses in different types of solid due to hygro-thermal taken for different structures. Few investigations were cited so far to determine the temperature, moisture, displacements, and stresses for composite multilayered bodies. The theoretical and experimental studies of the heated structural profile have been of considerable practical importance in various fields such as mechanical, aerospace, and food engineering throughout the past years. The further analysis of such hygrothermoelastic problems may, as it seems, stimulate the evaluation of methods. Hence, the rigorous study of hygrothermoelastic behaviour of composite homogenous and nonhomogeneous of different bodies with or without an internal heat source is strongly desired.

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Analysis of Thermoelastic Large Deflection Bending in Elliptic Plate on Elastic Foundation due to Thermal Loading

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Abstract

In this paper, the three-dimensional transient asymmetric heat conduction equation comprised of internal source and sectional thermal flux outflow decreasing linearly with time from the surface on an elliptical plate is analysed by means of Laplace integral technique. The associated large deflection of a plate placed on the elastic foundation is formulated from the potential energy equation neglecting the second strain invariant and its expression is obtained in the form of Mathieu functions. The numerical calculations of the distribution of the transient temperature, thermal deflection and the maximum normal bending stress are carried out on the outer elliptical boundary and illustrated graphically. Finally, the corresponding results for circular plates have been presumed when the ellipse degenerates to a circle. The results reveal that the highest tensile stress exists on the major axis of the circular core relative to the elliptical core, which suggests the propagation of low heating due to inadequate heat penetration into the elliptical surface.

Keywords: *Temperature distribution, large deflection, Berger, elliptical, Mathieu function, bending moments, stresses*

1. Introduction

As a result of the increased construction materials are considered in engineering application under server load intensity or thermal environments, the interest in elliptical objects with thermoelastic problems has grown considerably. An extensive investigation has been done on small and large deflections of the plate on an elastic foundation based on the linear theory of elasticity due to its practical interest of their wide applications in structures. The determination of large deflection and its associated bending stress of plates, especially of thin plates, are of vital importance in the design of machine structures, because of excessive deflection may cause undesirable thermal stress. It is well known that the classical large deflection of thin plate problems is very complicated and usually lead to the non-linear differential equation which is difficult to solve exactly.

In this regard, Berger [1] neglected the second invariant from the potential energy equation and was able to furnish a simple fourth-order differential equation. However, there doesn't seem to be any physical justification for this approximation. But in comparison of the outcomes with known solutions indicates that it has a broad scope in simplifying the problem; thus, Berger's approach yields adequately accurate results [2]. Previously also few authors have obtained a large deflection based on the total strain energy concept devised by Berger. Even few reports have been based on the calculus of variation [3], Hamilton's principle [4], and many others have performed large deflection studies for different objects [5, 6] and for various materials [7, 8]. It is also observed that few authors [3, 9] have investigated the large deflection solution when the plates on an elastic foundation are uniformly heated. Recently, Horibe and Asano [10] proposed a solution for the large deflection of beams resting on Pasternak type elastic foundation. Bhad et al. [11,12] have investigated thermoelastic deflection for the elliptic plate, and Dhakate et al. [13] performed thermal stress analysis on an annular sector plate using integral transform techniques.

A brief overview of the theoretical work with the bending analysis on elastic foundations insights of various approximate methods is cited below. Addou et al. [14] used a basic quasi three-dimensional hyperbolic theory to examine the influence of Winkler / Pasternak / Kerr base and porosity on the dynamic behavior of functionally graded plates. Chaabane et al. 2019 [15] used a hyperbolic shear deformation theory to present an analysis of the static and dynamic actions of simply supported functionally graded beams resting on the elastic

base utilizing the method of Hamilton. Mahmoudi et al. [16] derived the governing equations using the principle of virtual displacements, and a refined quasi-threedimensional shear deformation theory has been developed for the thermo-mechanical study of functionally graded sandwiched plates resting on a two-parameter elastic base. Kaddari et al. [17] introduced a new kind of quasi three-dimensional hyperbolic shear deformation theory to address static and free vibration of dynamically graded, elastic-based porous surfaces in which the equations of motion have been derived from the Hamilton principle. Bourada et al. [18] obtained the analytical solutions of the buckling and free vibrational behaviors using the theory of Hamilton and the Navier method. They performed the dynamic and stability analysis of the simply supported single-walled Carbon Nanotubes reinforced concrete beam on elastic-foundation using an integral first-order shear deformationbeamprinciple. Abualnour et al. [19] proposed a novel displacement field to investigate the thermo-mechanical bending action of the antisymmetric cross-ply laminates. Quite recently, few scholars such as Bousahla et al. [20], Bellal et al. [21] and Shariati et al. [22] investigated the structural behaviors of plate resting on elastic foundation using integralfirst shear deformation theory or four variable trigonometric integral plate theory. In the above articles, the aim was to increase the structural support's load-bearing ability either by finding the supports or by adjusting the rigidity. Compared to the freely hinged extreme or simply supported boundaries or point-supported surfaces, the studies on the bending analysis on elastic foundations were limited due to the mathematical difficulties in handling more complicated boundary conditions, and generally, numerical methods have been applied in these studies.

The most recent literature, the research on thermal bending effect was conducted by several scholars, which can be summarized as given below. Eltaher et al. [23] derived the governing equations using Hamilton's principle to study the combined effects of nonlocal elasticity and surface properties on static and vibration characteristics of piezoelectric nano-beams and solved it numerically using the finite-element method. Belbachir et al. [24] used the principle of virtual work to obtain governing equations. They discussed a refined plate theory to explain the reaction of antisymmetric cross-ply laminated plates undergoing uniform nonlinear thermo-mechanical loading. Zarga et al. [25] determined the governing equations based on the principle of virtual work and used the basic theory of quasi-3D shear deformation to study the thermo-mechanical bending of functionally graded material sandwich boards. Belbachir et al. [26] performed the flexural analysis of antisymmetric cross-ply laminated plates under nonlinear thermal loading using a refined plate theory with four variables. Matouk et al. [27] used a novel integral Timoshenko beam theory to analyze the free vibrational action of the functionally graded nano-beams incorporated into the hygro-thermal system and reposed on the elastic base. Refrafi et al. [28] used a novel shear deformation hypothesis to analyze the hygrothermal and mechanical buckling responses of simply supported functionally graded sandwich plate seated on Winkler-Pasternak elastic base. Tounsi et al. [29] proposed a simple four-variable trigonometric integral shear deformation model to study the static behavior of advanced functionally graded ceramic-metal plates supported by a two-parameter elastic foundation. Boussoula et al. [30] developed the governing equations based on the principle of virtual work to perform thermomechanical flexural analysis of functionally graded material sandwich plates. A new principle of refined trigonometric shear deformation is used by Chikr et al. [31] to analyze the buckling nature of material sandwich plates centered on a twoparameter elastic structure under various boundary conditions by applying the theory of abstract displacements. The best approach for solving these problems can be through both theoretical and computational methods. But due to either non-availability or mathematical complexity, numerical solutions are still favored and widespread in practice. It is also noted that previous researchers have not considered the transient distribution of temperature during their thermoelastic bending analysis, captivating the plate mainly in elliptic coordinates.

From the above point of view, this paper is concerned with the analysis for thermalbending maximum stresses of an elliptic plate of uniform thickness, in such a way that the origin coincides with the centee of the plate and the axes are along the major and minor axis of ellipse respectively. In this paper, an elliptical plate placed on the elastic foundation of Winkler type is considered. The foundation is assumed to be such that its reaction is proportional to the deflection. During the problem formulation, we have initially investigated the problem from a different point of view by incorporating inside a thermal source of heat at a rate of

$(\lambda / K)\exp(-\beta t)$ per unit volume in a temperature field differential equation and a thermal flux $(Q_0 / K)(1-\nu t)$ outflow decreasing linearly with time. In the second part following Berger's method, the evaluation of large deflection of a heated clamped plate placed on the elastic foundation has been investigated under transient temperature distribution. Finally, the thermal maximum stress components are obtained based on the concept that bending stresses are distributed linearly over the thickness of the plate. Furthermore, the method is applicable to the bending of the circular plate, which has been deduced when the ellipse degenerates to a circle.

2. Basic thermoelastic deflection formulation

The potential energy obtained taking in account the strain energy due to thermal bending and stretching in mid-surface during transient temperature change is given as

$$V = \frac{D}{2}\iint_s \left\{ \left[(\nabla^2 W)^2 + \frac{12}{l^2} e_1^2 \right] - 2(1-\upsilon)\left[\frac{12}{l^2} e_2 + \frac{\partial^2 W}{\partial x^2}\frac{\partial^2 W}{\partial y^2} - \left(\frac{\partial^2 W}{\partial x \partial y} \right)^2 \right] + \frac{k}{D} W^2 \right\} ds \qquad (1)$$
$$- \frac{E\alpha_t}{1-\upsilon}\iint_s \int_{-l/2}^{l/2} (e_1 - z\nabla^2 W)\,\tau\, ds dz$$

in which W is the lateral displacement, D the flexural rigidity, E Young's modulus, α_t the coefficient of thermal expansion, υ is Poisson ratio, k is the reaction of foundation per unit area per unit deflection, ∇^2 is a Laplacian operator in Cartesian coordinate, s the surface under consideration, e_1 is first invariant and e_2 is second invariant, respectively, and is represented as

$$\nabla^2 = \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}, \qquad ds = dxdy, \qquad e_1 = e_x + e_y, \qquad e_2 = e_x e_y - \gamma_{xy}^2 / 4,$$

$$e_x = \frac{\partial u}{\partial x} + \frac{1}{2}\left(\frac{\partial W}{\partial x} \right)^2, \qquad e_y = \frac{\partial u}{\partial y} + \frac{1}{2}\left(\frac{\partial W}{\partial y} \right)^2, \qquad \gamma_{xy} = \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial W}{\partial x}\frac{\partial W}{\partial y}$$

with u and v is the in-plane displacement in cartesian coordinate (x, y).

By adding potential energy due to the thermal load and of the foundation reaction to the energy expression of Eq. (1) and neglecting the terms containing the second strain invariant, the modified energy expression becomes

$$V = \frac{D}{2}\iint_s \left\{ (\nabla^2 W)^2 + \frac{12}{l^2} e_1^2 - 2(1-\upsilon)\left[\frac{\partial^2 W}{\partial x^2}\frac{\partial^2 W}{\partial y^2} - \left(\frac{\partial^2 W}{\partial x \partial y} \right)^2 \right] + \frac{\kappa}{D} W^2 \right\} dx\, dy \qquad (2)$$
$$- \frac{1}{1-\upsilon}\iint_s [e_1 N_T - \nabla^2 W M_T]\, ds$$

Applying Euler's variational [32] equations to Eq. (2), one yield

$$\nabla^4 W - \alpha^2 \nabla^2 W + \frac{\kappa}{D} W = -\frac{12\alpha}{l^3}\nabla^2 M_T \qquad (3)$$

in which M_T is bending resultant moment, N_T is a resultant force, $\alpha^2 = 12e_1 / l^2$ is a normalised constant of integration.

3. Formulation of the Problem

It is well known that elliptical-cylindrical coordinates (ξ,η) are the most appropriate for elliptic boundary conditions that are expressed in rectangular coordinates which are maintaining the relationship $x+iy=c\cosh(\xi+i\eta)$. into

$$x=c\cosh\xi\cos\eta,\ y=c\sinh\xi\sin\eta,\ z=z \tag{4}$$

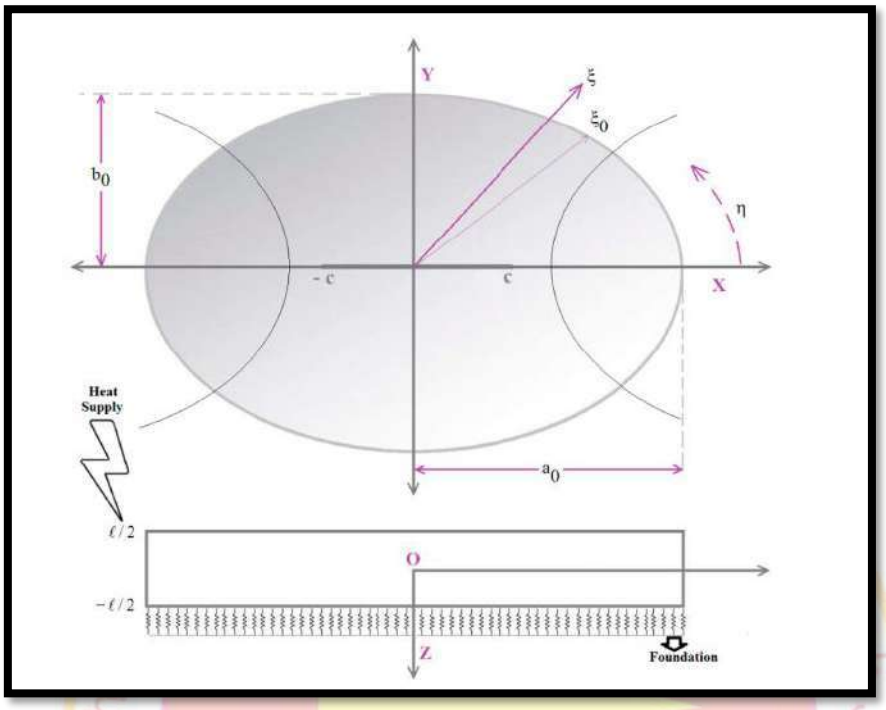

Fig.1 Elliptic plate geometry on an elastic foundation

in which $\xi=$ represents the family of confocal ellipses, $\eta=$ represents the family of confocal hyperbolas and they both in the form of curves interacts each other orthogonally at each instant. Here c being an interfocal distances between two foci of the ellipse and defined as $2c=2(a_0^2-b_0^2)^{1/2}$ with a_0 is the diameter along a semimajor axis and b_0 a diameter along the semiminor axis. The parameter ξ defines the interfocal line having the range $\xi\in(0,\ \xi_o)$, $\xi_o=\tanh^{-1}(b_o/a_o)$ and the parameter η is taken as $\eta\in(0,2\pi)$, as shown in Figure 1.

3.1 Temperature distribution

The modified form of the heat conduction differential equation in the non-simple in accordance with the first law of thermodynamics takes the following form

$$h^2\left(\frac{\partial^2T}{\partial\xi^2}+\frac{\partial^2T}{\partial\eta^2}\right)+\frac{\partial^2T}{\partial z^2}=\frac{1}{\kappa}\frac{\partial T}{\partial t}-\left(\frac{\xi_0}{2\pi l}\right)\frac{\lambda}{K}\exp(-\beta t) \tag{5}$$

subjected to the initial and thermal boundary conditions

$$T\big|_{t=0}=T\big|_{\xi=\xi_0}=T\big|_{z=-l/2}=0 \tag{6}$$

$$T\big|_{z=l/2}=-(Q_0/K)(1-\nu t)h^2(\cosh^2\xi-\cos^2\eta)^{1/2} \tag{7}$$

in which $T=T(\xi,\eta,z,t)$ is the temperature distribution, $\tau=T-T_i$ the temperature change with $T_i=T_i(\xi,\eta,z,t)$ is the initial temperature at $t=0$, $h^{-2}=(c^2/2)(\cosh 2\xi-\cos 2\eta)$ the scalar factor,

$f(\xi,\eta,t) = -(Q_0/K)(1-\nu t)\ h^2(\cosh^2\xi - \cos^2\eta)^{1/2}$ denoted the prescribed surface temperature (i.e. sectional heat supply source) on the upper face, Q_0 is constant heat flux intensity, ν the uniform speed, β represents the surface reflectance, λ is the absorption coefficient of the material, and $\kappa = K/\rho C_V$ representing thermal diffusivity in which K is the thermal conductivity of the material, ρ is the density, and C_V is the calorific capacity, respectively.

3.2 **Transient thermal bending stress**

The resultant bending moments per unit width is given [11] as

$$M_\xi = -Dh^2\left\{\left(\frac{\partial^2 W}{\partial\xi^2}+\nu\frac{\partial^2 W}{\partial\eta^2}\right)-\frac{(1-\upsilon)\sinh 2\xi}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial W}{\partial\xi}+\frac{(1-\upsilon)\sin 2\eta}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial W}{\partial\eta}\right\}-\frac{M_T}{1-\upsilon}$$

$$M_\eta = -Dh^2\left\{\left(\upsilon\frac{\partial^2 W}{\partial\xi^2}+\frac{\partial^2 W}{\partial\eta^2}\right)+\frac{(1-\upsilon)\sinh 2\xi}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial W}{\partial\xi}-\frac{(1-\upsilon)\sin 2\eta}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial W}{\partial\eta}\right\}-\frac{M_T}{1-\upsilon} \quad (8)$$

$$M_{\xi\eta} = D(1-\upsilon)h^2\left\{\frac{\partial W}{\partial\xi}\sin 2\eta+\frac{\partial W}{\partial\eta}\sinh 2\xi-\frac{\partial^2 W}{\partial\xi\partial\eta}(\cosh 2\xi-\cos 2\eta)\right\}$$

The maximum normal bending stresses are distributed linearly over the thickness of the plate is

$$\sigma_{\xi\xi} = \left[\frac{M_{\xi\xi}}{\lambda^2/6}\right]\frac{z}{\lambda/2}, \sigma_{\eta\eta} = \left[\frac{M_{\eta\eta}}{\lambda^2/6}\right]\frac{z}{\lambda/2}, \sigma_{\xi\eta} = \left[\frac{M_{\xi\eta}}{\lambda^2/6}\right]\frac{z}{\lambda/2} \quad (9)$$

The resultant moment and resultant force are represented as

$$M_T = \alpha E\int_{-1/2}^{1/2} z\tau(z)dz,\ N_T = \alpha E\int_{-1/2}^{1/2}\tau(z)dz \quad (10)$$

The boundary condition of the clamped plate is given as

$$W(\xi,\eta,t)\big|_{\xi=\xi_0} = \left.\frac{\partial W(\xi,\eta,t)}{\partial\xi}\right|_{\xi=\xi_0} = 0 \text{ for all } t \quad (11)$$

The Eqs (1) to (11) constitute the mathematical formulation under consideration.

4. **Solution to the problem**

4.1 **Solution for the temperature distribution**

Taking Laplace transform of Eqs. (5)-(7), one gets

$$h^2\left(\frac{\partial^2\bar{T}}{\partial\xi^2}+\frac{\partial^2\bar{T}}{\partial\eta^2}\right)+\frac{\partial^2\bar{T}}{\partial z^2}-\frac{s}{\kappa}\bar{T} = -\frac{\lambda}{K}\frac{1}{s+\beta} \quad (12)$$

$$\bar{T}\big|_{\xi=\xi_0} = \bar{T}\big|_{z=-1/2} = 0 \quad (13)$$

$$\bar{T}\big|_{z=1/2} = -\frac{Q}{K}\left(\frac{1}{p}-\frac{\alpha}{p^2}\right)h^2(\cosh^2\xi-\cos^2\eta)^{1/2} \quad (14)$$

in which $\bar{T}(\xi,\eta,z,p)$ is the transformed function of $T(\xi,\eta,z,t)$ and p the Laplace parameter.

Now to obtain the solution to Eq. (12), we assume

$$\bar{T} = \left(z+\frac{1}{2}\right)\frac{\lambda\kappa}{p(p+\beta)}\sum_{n=0}^{\infty} C_{2n}Ce_{2n}(\xi,q)ce_{2n}(\eta,q) \text{ with } Ce_{2n}(\xi_0,q)=0 \text{ at } \xi=\xi_0 \quad (15)$$

in which $q=\alpha_{2n,m}c^2/4$, C_{2n} will be determined from the nature of sectional heat supply prescribed on the upper face, $ce_{2n}(\eta,q)$ is the ordinary Mathieu function of the first kind of order n and $Ce_{2n}(\xi,q)$ is the modified Mathieu function of the first kind of order n, and denoted [33] as

$$ce_{2n}(\eta,q)=\sum_{r=0}^{\infty}A_{2r}^{(2n)}\cos 2r\eta,\ Ce_{2n}(\xi,q)=\sum_{r=0}^{\infty}A_{2r}^{(2n)}\cosh 2r\xi \tag{16}$$

with A's being the function of q. Now as q has those values $q_{2n,m}$ which makes $Ce_{2n}(\xi_0,q)$ zero and thus $\alpha_{2n,m}$ depends on m and n.

Hence Eq. (15) can be rewritten as

$$\bar{T}=\left(z+\frac{1}{2}\right)\frac{\lambda\kappa}{p(p+\beta)}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m}) \tag{17}$$

which satisfies both boundary condition of Eq. (13).

Now we consider the Eq. (14) using Eq. (17) as

$$\frac{\lambda\kappa l}{p(p+\beta)}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})$$
$$=-\frac{Q_0}{K}\left(\frac{1}{p}-\frac{\alpha}{p^2}\right)h^2(\cosh^2\xi-\cos^2\eta)^{1/2} \tag{18}$$

Using inversion transform of t on Eq. (18), one yield

$$\frac{\lambda\kappa l}{\beta}[1-\exp(-\beta t)]\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})$$
$$=-\frac{Q_0}{K}(1-\nu t)h^2(\cosh^2\xi-\cos^2\eta)^{1/2} \tag{19}$$

Now multiplying Eq. (19) on both sides by $Ce_{2p}(\xi,q_{2p,r})ce_{2p}(\eta,q_{2p,r})(\cosh 2\xi-\cos 2\eta)$ and integrating with respect to η from limits 0 to 2π, and with respect to ξ from 0 to ξ_0. Then by the orthogonal property [33], all terms vanish when $p=n,\ r=m.$

Hence, C_{2n} depends on m as well as on n and further simplifying by taking $h\cosh\xi_0=a$ and $e<1$ as the eccentricity, and considering the theory of uniform convergence, one yield

$$C_{2n}=\frac{-\frac{2a\pi Q}{K}(1-\nu t)h^2\int_0^{\xi_0}Ce_{2n}(\xi,q_{2n,m})\left[A_0^{2n}\left(1-\frac{e^2}{2^2}-\ldots\right)+A_2^{2n}\left(\frac{-e^2}{24}\ldots\right)+\ldots\right]\cosh 2\xi d\xi}{\frac{\lambda\kappa l}{\beta}[1-\exp(-\beta t)]\int_0^{\xi_0}Ce_{2n}^2(\xi,q_{2n,m})[\cosh 2\xi-\Theta_{2n,m}d\xi} \tag{20}$$

Again applying the rules of the Laplace inversion theorem to Eq. (17), one arrives at the required expression for temperature change stated above as

$$\tau=T=\frac{\lambda\kappa}{\beta}[1-\exp(-\beta t)]\left(z+\frac{1}{2}\right)\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m}) \tag{21}$$

4.2 **Solution for the thermal displacement**

Substituting Eq. (21) into Eq. (10), one obtains

$$M_T=\frac{\lambda\kappa l^3}{12\beta}[1-\exp(-\beta t)]\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m}) \tag{22}$$

$$N_T = \frac{\lambda\kappa l^2}{2\beta}[1-\exp(-\beta t)]\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} C_{2n}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \quad (23)$$

Now considering Eq. (3) in elliptic coordinate and taking Eq. (22) in the account, one obtains

$$\nabla_1^4 W - \alpha^2\nabla_1^2 W + \frac{\kappa}{D}W + \frac{\alpha\lambda\kappa}{\beta}[1-\exp(-\beta t)]\nabla_1^2\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} C_{2n}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) = 0 \quad (24)$$

in which ∇_1 is the two-dimensional Laplacian operator in (ξ,η).

In order to find the complete solution of above Eq. (24), one must obtain a solution that comprised of complementary function and the particular integral which satisfies the boundary conditions given in Eq. (11). To obtain the complementary function of Eq. (24) which can be represented as

$$\nabla_1^4 W_c - \alpha^2\nabla_1^2 W_c + \frac{\kappa}{D}W_c = (\nabla_1^2 + \delta_1^2)(\nabla_1^2 - \delta_2^2)W_c = 0 \quad (25)$$

where

$\delta_1^2 + \delta_2^2 = -\alpha^2$

and

$\delta_1^2\delta_2^2 = -\kappa / D$.

Thus, we assume a solution as

$$W_c = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}Ce_{2n}(\xi, q_{2n,m}^1)ce_{2n}(\eta, q_{2n,m}^1) + \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} B_{2n}Ce_{2n}(\xi, -q_{2n,m}^2)ce_{2n}(\eta, -q_{2n,m}^2) \quad (26)$$

in which $q_{2n,m}^i = c^2\delta_i^2/4\ (i=1,2)$, A_{2n} and B_{2n} are constants is determined using boundary conditions given in Eq. (11) as

$$A_{2n} = \frac{1}{2\pi A_0^{2n}\phi_1},\ B_{2n} = \frac{1}{2\pi A_0^{2n}\phi_2} \quad (27)$$

in which

$$\phi_1 = Ce_{2n}(\xi_0, q_{2n,m}^1)C'e_{2n}(\xi_0, -q_{2n,m}^2) - C'e_{2n}(\xi_0, q_{2n,m}^1)Ce_{2n}(\xi_0, -q_{2n,m}^2),$$

$$\phi_2 = C'e_{2n}(\xi_0, q_{2n,m}^1)Ce_{2n}(\xi_0, -q_{2n,m}^2) - Ce_{2n}(\xi_0, q_{2n,m}^1)C'e_{2n}(\xi_0, -q_{2n,m}^2)$$

and the prime dash represents the differentiation with respect to the variable ξ.

The particular integral of Eq. (24) can be obtained as

$$W_p = -\frac{\alpha\lambda\kappa[1-\exp(-\beta t)]}{\beta(\alpha_{2n,m} - \delta_2^2)(\alpha_{2n,m} - \delta_1^2)}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} C_{2n}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \quad (28)$$

Thus, the complete solution of Eq. (24) can be obtained by adding Eqs. (26) and (28).

$$W = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle\{A_{2n}Ce_{2n}(\xi, q_{2n,m}^1)ce_{2n}(\eta, q_{2n,m}^1) + B_{2n}Ce_{2n}(\xi, -q_{2n,m}^2) \times ce_{2n}(\eta, -q_{2n,m}^2)\} - B_{11}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m})\Big\rangle \quad (29)$$

In order to determine the α, the first invariant e_1 is transformed to elliptic coordinates as

$$h_\xi h_\eta\left[\frac{\partial}{\partial\xi}\left(\frac{u_\xi}{h_\eta}\right) + \frac{\partial}{\partial\eta}\left(\frac{u_\eta}{h_\xi}\right)\right] + \frac{h_\xi h_\eta}{2}\left[\left(\frac{\partial W}{\partial\xi}\right)^2 + \left(\frac{\partial W}{\partial\eta}\right)^2\right] = \frac{\alpha^2 h^2}{12} + (1+\upsilon)\alpha_t\tau \quad (30)$$

in which the scale factors is given as $h_\xi = h_\eta = (1/c)(\sinh^2\xi + \sin^2\eta)^{1/2}$, $h_z = 1$.

Here u_ξ and u_η are the displacement in elliptical coordinates with $u_\xi = 0$ at $\eta = \pi/2$, $\xi = \xi_0$ and $u_\eta = 0$ at $\eta = 0$, $\xi = \xi_0$, thus the first term reduces to zero.

Now integrating the reduced Eq. (30), one yield

$$\alpha = \frac{1}{ch}\left\{\frac{6}{\phi_3}\int_0^{2\pi}\int_0^{\xi_0}\left[\left(\frac{\partial W}{\partial \xi}\right)^2 + \left(\frac{\partial W}{\partial \eta}\right)^2\right] d\xi d\eta - 2\phi_3(1+\upsilon)\alpha_t \tau\right\}^{1/2} \tag{31}$$

where

$\phi_3 = \pi \cosh 2\xi_0 \sinh \xi_0$.

4.3 **Solution for the resultant bending moments per unit width**

Substituting Eq. (29) into Eq. (8), one obtains

$$\begin{aligned} M_\xi = -Dh^2 \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle & A_{2n}\{Ce''_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) \\ & + \upsilon Ce_{2n}(\xi, q^1_{2n,m})ce''_{2n}(\eta, q^1_{2n,m}) - A_{11}\{\sinh 2\xi \\ & \times Ce'_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, q^1_{2n,m}) \\ & \times ce'_{2n}(\eta, q^1_{2n,m})\}\} + B_{2n}\{Ce''_{2n}(\xi, -q^2_{2n,m})ce_{2n}(\eta, -q^2_{2n,m}) \\ & + \upsilon Ce_{2n}(\xi, -q^2_{2n,m})ce''_{2n}(\eta, -q^2_{2n,m}) - A_{11}\{\sinh 2\xi \\ & \times Ce'_{2n}(\xi, -q^2_{2n,m})ce_{2n}(\eta, -q^2_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, -q^2_{2n,m}) \\ & \times ce'_{2n}(\eta, -q^2_{2n,m})\}\} - B_{11}\{Ce''_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \\ & + \upsilon Ce_{2n}(\xi, q_{2n,m})ce''_{2n}(\eta, q_{2n,m}) - A_{11}\{\sinh 2\xi Ce'_{2n}(\xi, q_{2n,m}) \\ & \times ce_{2n}(\eta, q_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m})\}\} \\ & - C_{11}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m})\Big\rangle \end{aligned} \tag{32}$$

$$\begin{aligned} M_\eta = -Dh^2 \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle & A_{2n}\{\upsilon Ce''_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) \\ & + Ce_{2n}(\xi, q^1_{2n,m})ce''_{2n}(\eta, q^1_{2n,m}) + A_{11}\{\sinh 2\xi \\ & \times Ce'_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, q^1_{2n,m}) \\ & \times ce'_{2n}(\eta, q^1_{2n,m})\}\} + B_{2n}\{\upsilon Ce''_{2n}(\xi, -q^2_{2n,m})ce_{2n}(\eta, -q^2_{2n,m}) \\ & + Ce_{2n}(\xi, -q^2_{2n,m})ce''_{2n}(\eta, -q^2_{2n,m}) + A_{11}\{\sinh 2\xi \\ & \times Ce'_{2n}(\xi, -q^2_{2n,m})ce_{2n}(\eta, -q^2_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, -q^2_{2n,m}) \\ & \times ce'_{2n}(\eta, -q^2_{2n,m})\}\} - B_{11}\{\upsilon Ce''_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \\ & + Ce_{2n}(\xi, q_{2n,m})ce''_{2n}(\eta, q_{2n,m}) + A_{11}\{\sinh 2\xi Ce'_{2n}(\xi, q_{2n,m}) \\ & \times ce_{2n}(\eta, q_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m})\}\} \\ & - C_{11}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m})\Big\rangle \end{aligned} \tag{33}$$

$$\begin{aligned} M_{\xi\eta} = D(1-\upsilon)h^2 \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle & A_{2n}\{\sin 2\eta Ce'_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) \\ & + Ce_{2n}(\xi, q^1_{2n,m})ce'_{2n}(\eta, q^1_{2n,m})\sinh 2\xi - (\cosh 2\xi - \cos 2\eta) \\ & \times Ce'_{2n}(\xi, q^1_{2n,m})ce'_{2n}(\eta, q^1_{2n,m})\} + B_{2n}\{\sin 2\eta Ce'_{2n}(\xi, -q^2_{2n,m}) \\ & \times ce_{2n}(\eta, -q^2_{2n,m}) + \sinh 2\xi Ce_{2n}(\xi, -q^2_{2n,m}) \\ & \times ce'_{2n}(\eta, -q^2_{2n,m}) - (\cosh 2\xi - \cos 2\eta)Ce'_{2n}(\xi, -q^2_{2n,m}) \\ & \times ce'_{2n}(\eta, -q^2_{2n,m})\} - B_{11}\{\sin 2\eta Ce'_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \\ & + \sinh 2\xi Ce_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m}) \\ & - (\cosh 2\xi - \cos 2\eta)Ce'_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m})\}\Big\rangle \end{aligned} \tag{34}$$

where

$$A_{11}=\frac{1-\upsilon}{\cosh 2\xi-\cos 2\eta},\quad B_{11}=\frac{\alpha\lambda\kappa[1-\exp(-\beta t)]C_{2n}}{\beta(\alpha_{2n,m}-\delta_2^2)(\alpha_{2n,m}-\delta_1^2)},\quad C_{11}=\frac{\lambda\kappa l^3[1-\exp(-\beta t)]C_{2n}}{12(1-\upsilon)\beta}.$$

4.4 Solution for the thermal bending stress

Substituting Eqs. (32)-(34) into Eq. (9), one obtains

$$\begin{aligned}\sigma_{\xi\xi}=&-\frac{12Dh^2z}{l^3}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle A_{2n}\{Ce_{2n}''(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)\\&+\upsilon Ce_{2n}(\xi,q_{2n,m}^1)ce_{2n}''(\eta,q_{2n,m}^1)-A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)-\sin 2\eta Ce_{2n}(\xi,q_{2n,m}^1)\\&\times ce_{2n}'(\eta,q_{2n,m}^1)\}\}+B_{2n}\{Ce_{2n}''(\xi,-q_{2n,m}^2)ce_{2n}(\eta,-q_{2n,m}^2)\\&+\upsilon Ce_{2n}(\xi,-q_{2n,m}^2)ce_{2n}''(\eta,-q_{2n,m}^2)-A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,-q_{2n,m}^2)ce_{2n}(\eta,-q_{2n,m}^2)-\sin 2\eta Ce_{2n}(\xi,-q_{2n,m}^2)\\&\times ce_{2n}'(\eta,-q_{2n,m}^2)\}\}-B_{11}\{Ce_{2n}''(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\\&+\upsilon Ce_{2n}(\xi,q_{2n,m})ce_{2n}''(\eta,q_{2n,m})-A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})-\sin 2\eta Ce_{2n}(\xi,q_{2n,m})\\&\times ce_{2n}'(\eta,q_{2n,m})\}\}-C_{11}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\Big\rangle\end{aligned}\tag{35}$$

$$\begin{aligned}\sigma_{\eta\eta}=&-\frac{12Dh^2z}{l^3}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle A_{2n}\{\upsilon Ce_{2n}''(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)\\&+Ce_{2n}(\xi,q_{2n,m}^1)ce_{2n}''(\eta,q_{2n,m}^1)+A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)-\sin 2\eta Ce_{2n}(\xi,q_{2n,m}^1)\\&\times ce_{2n}'(\eta,q_{2n,m}^1)\}\}+B_{2n}\{\upsilon Ce_{2n}''(\xi,-q_{2n,m}^2)ce_{2n}(\eta,-q_{2n,m}^2)\\&+Ce_{2n}(\xi,-q_{2n,m}^2)ce_{2n}''(\eta,-q_{2n,m}^2)+A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,-q_{2n,m}^2)ce_{2n}(\eta,-q_{2n,m}^2)-\sin 2\eta Ce_{2n}(\xi,-q_{2n,m}^2)\\&\times ce_{2n}'(\eta,-q_{2n,m}^2)\}\}-B_{11}\{\upsilon Ce_{2n}''(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\\&+Ce_{2n}(\xi,q_{2n,m})ce_{2n}''(\eta,q_{2n,m})+A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})-\sin 2\eta Ce_{2n}(\xi,q_{2n,m})\\&\times ce_{2n}'(\eta,q_{2n,m})\}\}-C_{11}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\Big\rangle\end{aligned}\tag{36}$$

$$\begin{aligned}\sigma_{\xi\eta}=&\frac{12D(1-\upsilon)h^2z}{l^3}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle A_{2n}\{\sin 2\eta Ce_{2n}'(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)\\&+\sinh 2\xi Ce_{2n}(\xi,q_{2n,m}^1)ce_{2n}'(\eta,q_{2n,m}^1)-(\cosh 2\xi-\cos 2\eta)\\&\times Ce_{2n}'(\xi,q_{2n,m}^1)ce_{2n}'(\eta,q_{2n,m}^1)\}+B_{2n}\{\sin 2\eta Ce_{2n}'(\xi,-q_{2n,m}^2)\\&\times ce_{2n}(\eta,-q_{2n,m}^2)+\sinh 2\xi Ce_{2n}(\xi,-q_{2n,m}^2)ce_{2n}'(\eta,-q_{2n,m}^2)\\&-(\cosh 2\xi-\cos 2\eta)Ce_{2n}'(\xi,-q_{2n,m}^2)ce_{2n}'(\eta,-q_{2n,m}^2)\}\\&-B_{11}\{\sin 2\eta Ce_{2n}'(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})+\sinh 2\xi Ce_{2n}(\xi,q_{2n,m})\\&\times ce_{2n}'(\eta,q_{2n,m})-(\cosh 2\xi-\cos 2\eta)Ce_{2n}'(\xi,q_{2n,m})ce_{2n}'(\eta,q_{2n,m})\}\Big\rangle\end{aligned}\tag{37}$$

5. Transition to the circular plate

When the elliptical plate tends to a circular plate of radius a, the semi-focal $c\to 0$ and therefore α_m is the roots of the transcendental equation $J_0(\alpha_m)=0.$

Also $e \to 0$ [as $\xi \to \infty$], $\cosh 2\xi\, d\xi \to 2\cosh 2\xi \sinh 2\xi\, d\xi \to 2rdr/l^2$, $\sinh\xi \to \cosh\xi$, $\mathrm{h}\cosh\xi \to r$ [as $h \to 0$], $\cosh\xi\, d\xi \to r\, dr$, $\mathrm{h}\sinh\xi\, d\xi \to dr$.

Using results from [33]

$Ce_0(\xi, q_{0,m}) \to p_0' J_0(\lambda_m r)$, $Ce_0'(\xi, q_{0,m}) \to p_0' J_0'(\lambda_m r)$, $Ce_0''(\xi, q_{0,m}) \to p_0' J_0''(\lambda_m r)$, $ce_0(\eta, q_m) \to 1/\sqrt{2}$, $A_0^{(0)} \to 1/\sqrt{2}, A_2^{(0)} \to 0$, $\Theta_{2m} \to 0$, $\lambda_{0,m}^2 = \alpha_{0,m}^2 / a^2 = \alpha_m^2 / a^2 = \lambda_m^2$, $p_0' = Ce_0(0, q_{0,m})$ $ce_0(2\pi, q_{0,m}) / A_0^{(0)}$.

Eq. (21) degenerates into temperature distribution into a circular plate

$$\tau = T = \left(z + \frac{1}{2}\right) \sum_{m=1}^{\infty} C_m p_0' J_0(\lambda_m r) \tag{38}$$

in which

$$C_m = -\frac{\pi Q(1-\nu t)}{K\mathrm{l}} \left\{ \left[\int_0^a r J_0(\lambda_m r) dr \right] / \left[\int_0^a r J_0(\lambda_m r)^2 dr \right] \right\}$$

The aforementioned degenerated results agree with the results [34].

6. Numerical Results, Discussion and Remarks

Firstly, introduce the dimensionless parameter for numerical computations as follows

$$\left.\begin{aligned} &\bar{\xi} = \xi / \xi_0,\ \bar{z} = [z - (-\mathrm{l}/2)]/\xi_0,\ e = c/\xi_0, \tau = \kappa t / \xi_0^2 \\ &\bar{\theta} = T/T_0, \bar{W} = W/\alpha\theta_0\xi_0, \bar{N}_{ij} = N_{ij}/E\xi_0^3, \bar{F}_{ij} = F_{ij}/E\xi_0^2\theta_0, \\ &\bar{M}_{ij} = M_{ij}/E\xi_0^3,\ \bar{\sigma}_{ij} = \sigma_{ij}/E\alpha\theta_0 \quad (i, j = \xi, \eta) \end{aligned}\right\} \tag{39}$$

The numerical computations have been carried out for an Aluminum elliptic plate with physical parameter as ξ_0 = 1 m, $\lambda = 0.06$ m and reference temperature as 273 K.

The thermomechanical properties[34] take the form as

- Modulus of elasticity E, 70 GPa
- Thermal diffusivity κ, 84.18 m^2/s
- Poisson's ratio υ, 0.35
- Thermal expansion coefficient α, 23 x 10^{-6} / ^{o}C
- Thermal conductivity G, 204.2 W/mK

To study the results of heating on the elliptic plate, numerical calculations for all variables have been performed and the numerical calculations are seen in the following figures with the use of MATHEMATICA software. In Figures (2)-(13) explains that numerical results of the dimensionless temperature distribution, thermal deflection and its associated bending stresses of the elliptic plate under the boundary conditions and that are subjected to sectional heat supply on the upper face, the lower face at zero temperature.

Figure 2 displays the dimensionless temperature field in an elliptic plate along the radial direction for a separate fixed time. The temperature distribution is initially at zero at the right boundary (i.e. $\xi = \xi_0$), and then increases along the radial direction towards the left boundary (i.e. $\xi = 0$). It may be due to the available internal heat generation and sectional prescribed temperature. Initially, the end of the plate is at compressed state, and gradually tensile force increases towards the mid-plate.

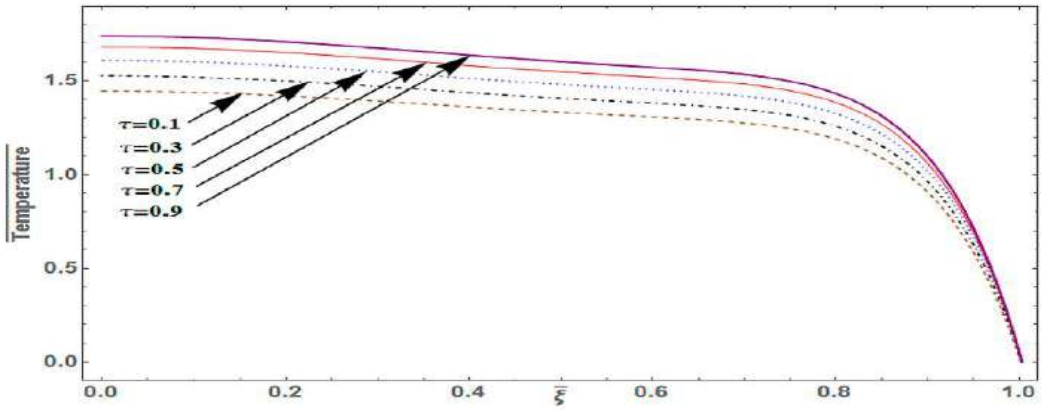

Figure 2. The dimensionless temperature in an elliptic plate along $\bar{\xi}$ *for various locations of* τ.

Figure 3 illustrates the dimensionless temperature distribution along the angular direction for different values of $\bar{\xi}$. In the central part of the elliptic plate, thermal expansion is more significant, thereby giving high tensile force, while at both endpoints, temperature decreases to the minimum. Probably, due to an internal heat source, the temperature variation is more stable, and energy storage is more responsive to the heat sources.
Figure 4 demonstrates the distribution of the temperature along the thickness direction of the plate. Due to the external heat supply, the maximum values of temperature magnitude increase from the upper face and at each instance reduces towards the axial direction; and attains minimum on the lower face at zero temperature.

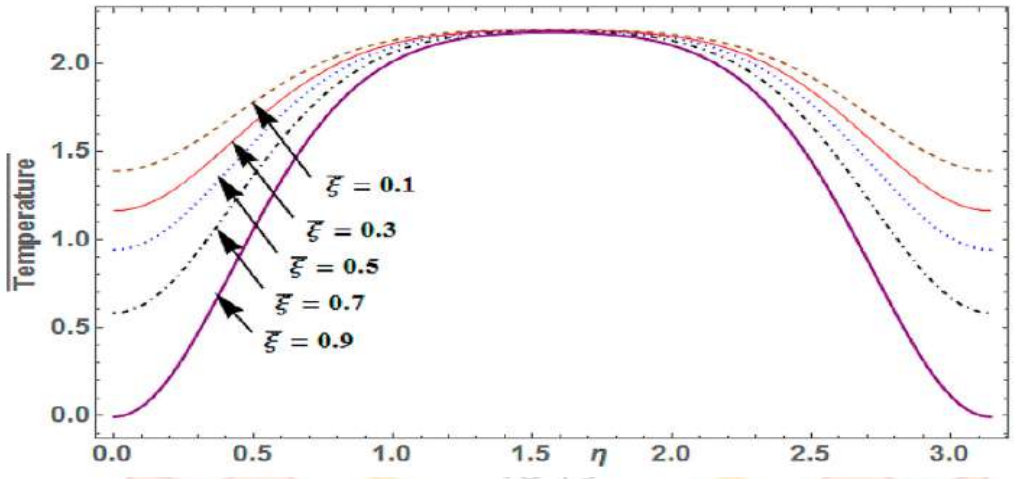

Figure 3. The temperature in an elliptic plate along η *for various locations of* $\bar{\xi}$.

Figure 5 indicates thermal deflection along the $\bar{\xi}$ direction for different values of η and fixed value of $\bar{z} = 0.06$, and reaches the outer limit at zero to satisfy the condition $\overline{W} = \partial\overline{W}/\partial\bar{\xi} = 0$ at $\bar{\xi} = \bar{\xi}_0$. The dimensionless large deflection is maximum at the center of the plate due to accumulation of heat source at the inner core. Figure 6 shows that initially, the deflection is zero at $\tau = 0$ and gradually increases along the timeline up to $\tau = 0.25$, and finally, its uniformity is attained. Figure 7 and 9 depicts the dimensionless radial $\bar{\sigma}_{\xi\xi}$ and tangential stresses $\bar{\sigma}_{\eta\eta}$ in the η direction at fixed $\bar{\xi} = 0.6$ and $\tau = 0.6$. The facts shows that radial and tangential stress achieves its highest possible tensile stress at left and right boundaries while the compressive stress is higher at the central part. The resulting finding shows that the two stress produces the same thermal effect apart from small magnitude variation.

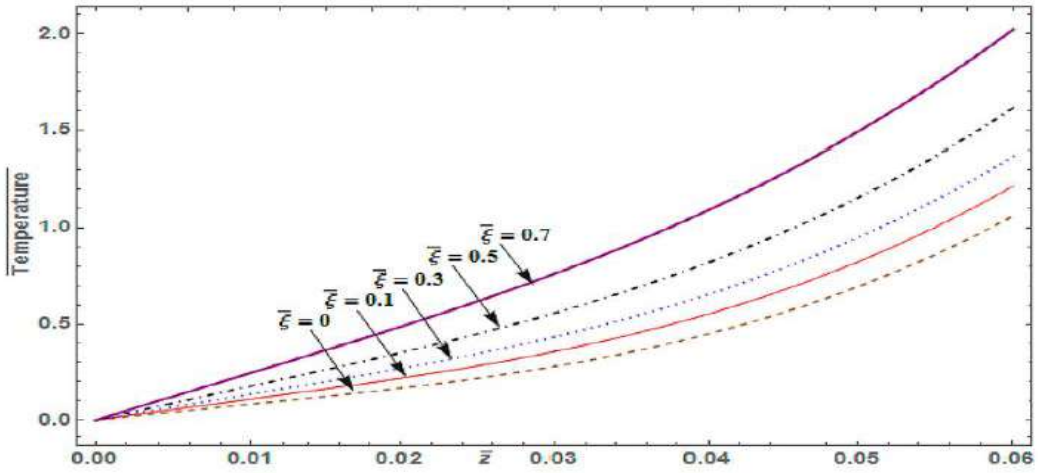

Figure 4. The dimensionless temperature in an elliptic plate along $\bar{z}$ for various locations of $\bar{\xi}$.

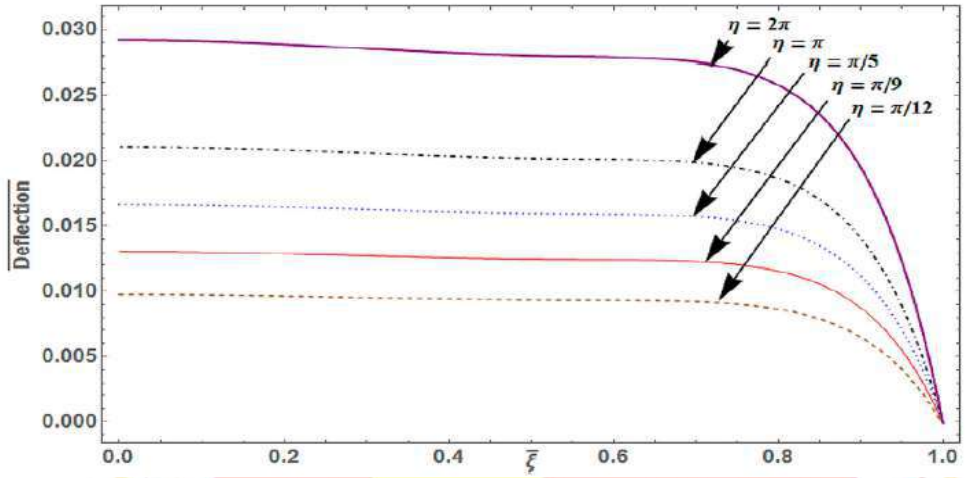

Figure 5. The dimensionless deflection along $\bar{\xi}$ for various locations of η.

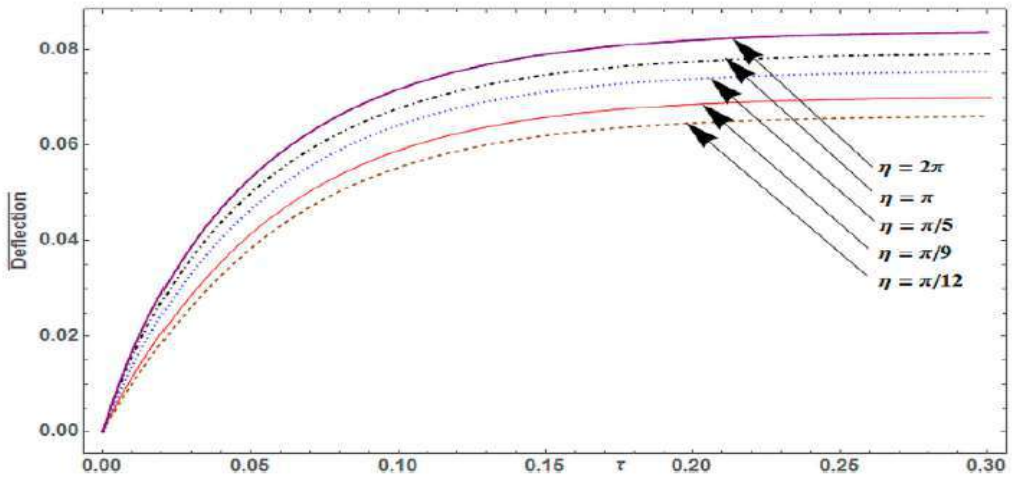

Figure 6. The dimensionless deflection along τ for various locations of η.

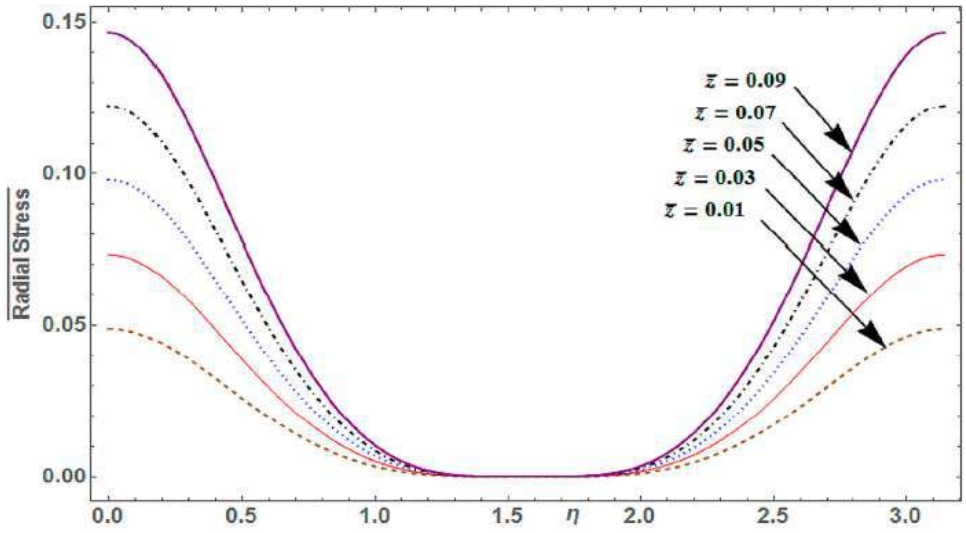

Figure 7. The dimensionless thermal radial stress along η for various locations of $\bar{z}$.

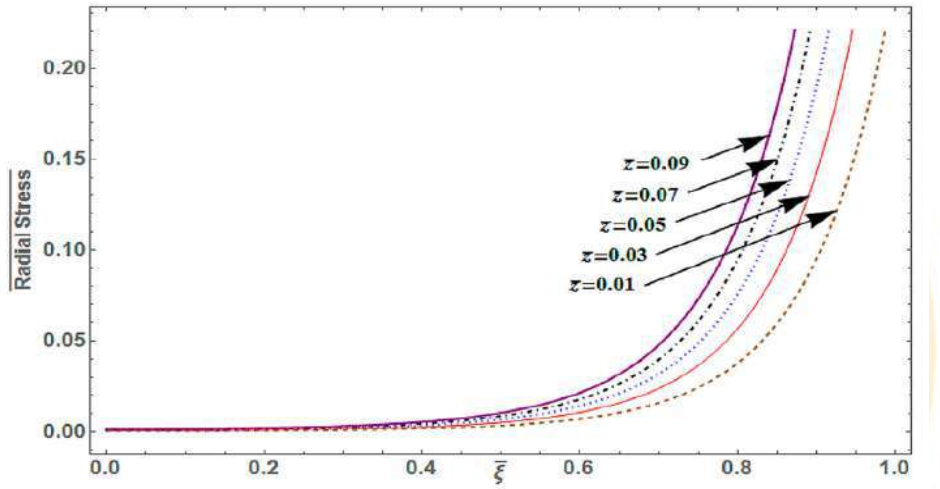

Figure 8. The dimensionless thermal radial stress along $\bar{\xi}$ for various locations of $\bar{z}$.

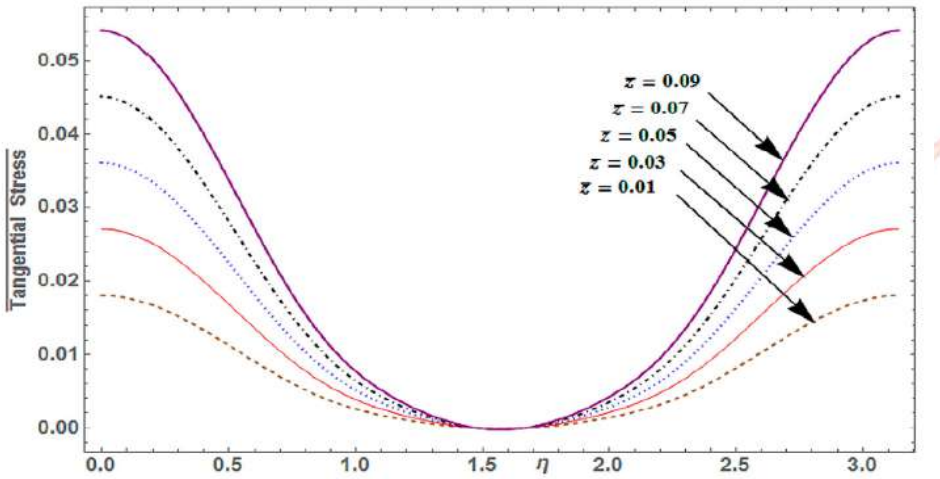

Figure 9. The dimensionless thermal tangential stress along η for various locations of $\bar{z}$.

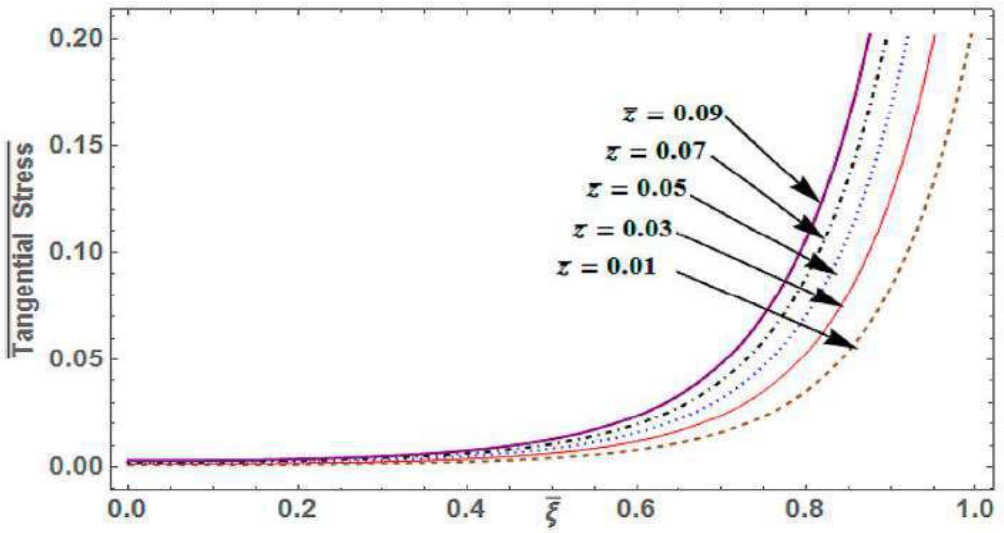

Figure 10. The dimensionless thermal tangential stress along $\bar{\xi}$ for various locations of $\bar{z}$.

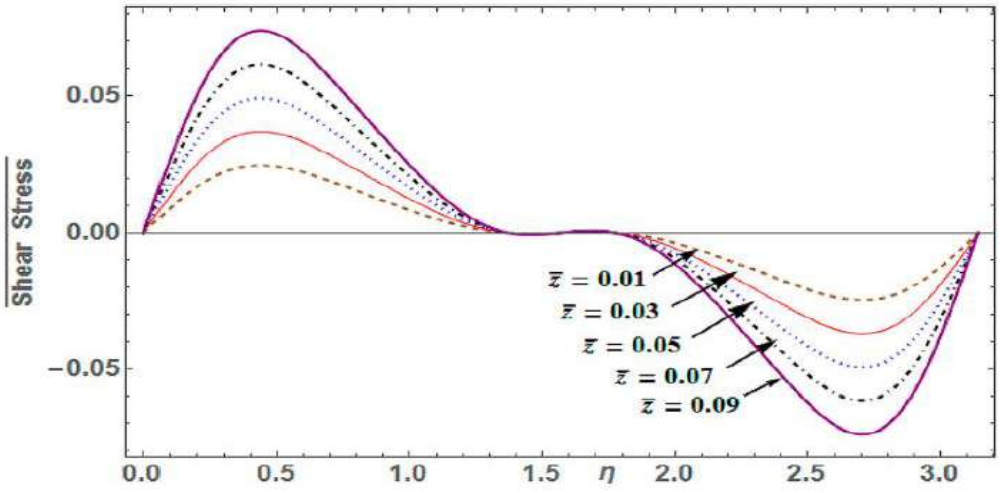

Figure 11. The dimensionless thermal shear stress along η for various locations of $\bar{z}$.

Figure 8 and 10 shows the distribution of radial $\bar{\sigma}_{\xi\xi}$ and normal stress $\bar{\sigma}_{\eta\eta}$ along the $\bar{\xi}$- direction at fixed $\eta = \pi/3$ and $\tau = 0.6$. The nature of stress gradually increases along the radial direction and attains maximum magnitude towards the outer edge. This could probably be due to the sectional prescribed temperature.

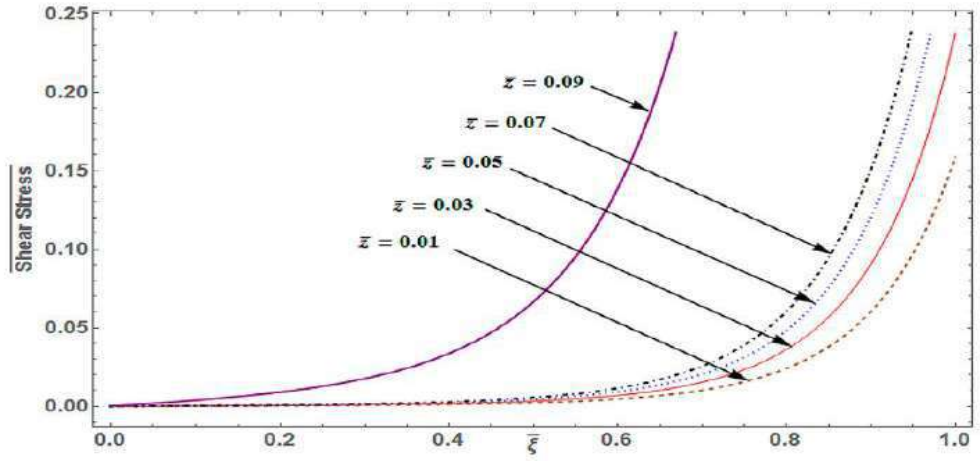

Figure 12. The dimensionless thermal shear stress along $\bar{\xi}$ for various locations of $\bar{z}$.

Figure 11 shows a plane sinusoidal heat propagating along the angular direction, and it attains zero when they are odd. The behavior may be due to the absorption of heat dissipated by sectional heat and internal heat supply. Figure 12 shows the distribution of shearing stress $\overline{\sigma}_{\xi\eta}$ along the $\overline{\xi}-$ direction at fixed $\eta = \pi / 3$ and $\tau = 0.6$. The result demonstrates that the influence of radius on $\overline{\sigma}_{\xi\eta}$ is more than those on $\overline{\sigma}_{\xi\xi}$ and $\overline{\sigma}_{\eta\eta}$. Figure 13 shows that the resulting moment reveal patterns that vanishes in the middle of the plate, but changes its characteristics as $\overline{\xi} \to 1$. This may be due to the distribution of internal heat supply available and the transfer of thermal energy into the outer curve. The residual bending moments ($\overline{M}_{\xi\xi}$, $\overline{M}_{\eta\eta}$) trend is maximum and displays positive values on the outer side, while the resultant moment ($\overline{M}_{\xi\eta}$) drops towards the negative magnitude value. The $\overline{\sigma}_{\xi\xi}$, $\overline{\sigma}_{\eta\eta}$ and $\overline{\sigma}_{\xi\eta}$ has maximum compressive stress inside the plate, whereas, the tensile stress occurs on the outer surface of the plate.

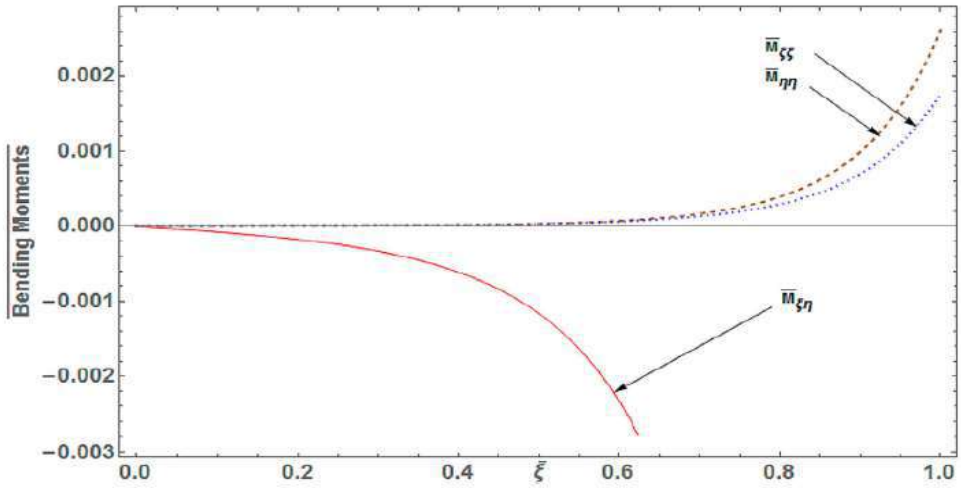

Figure 13. Bending Moments along $\overline{\xi}$ for a fixed value of $\eta = \pi / 4$.

7. Conclusion

In this paper, we have described the theoretical treatment of stress analysis distribution for the thermosensitive elliptic plate with a clamped edge. The temperature distribution and the deflection in the form of ordinary and modified Mathieu functions are used to determine thermal stresses by proposed classical methods. The analytical technique proposed here is relatively simple and widely applicable compared with methods proposed by other researchers. The advantage of this approach is its generality and its mathematical power to handle different types of mechanical and thermal boundary conditions during small deflection under thermal loading. The aforementioned thermo-sensitivity concept can be very well applicable in the field of hybridizing metallurgy, ceramics, solid state physics and chemistry. They have a lot of application in the biomedical field and so forth.

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State-space approach to the thermoelastic problem of a one-dimensional semi-infinite rod

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Abstract

In this paper, a transient of generalised thermoelasticity in an isotropic homogeneous elastic infinite rod which is unstrained and unstress initially and has uniform temperature distribution, is tackled by solving the coupled one dimensioned equation of heat conduction and equation of motion by following the state space approach of modern control theory in Laplace transform domain for small value of time. The subsequent temperature distribution and deformation from which stresses are calculated. The results are explained by numerical calculation and illustrated graphically.
Keywords: *Transient Temperature, Isotropic Homogeneous, Coupled Thermoelasticity, Thermal Displacement*

1. Introduction

Chandrasekharaiah and Srinath [1] explained that the linear theory of thermoelasticity without energy dissipation for homogeneous and isotropic materials is used to study plane waves in a half-space. Abbasi [2] obtained the Finite Element Method (FEM) solution of the vibration behaviour of a Functionally Graded Material (FGM) Timoshenko beam under lateral thermal shock with coupled thermoelastic assumption. Adams and Bert [3] obtained the results using the interaction between the strain and temperature fields and further investigated the effect of accounting for the orthotropic material properties in the governing elastic and thermal equations. Sharma and Grover [4] derived a closed-form expression for the transverse vibrations of a homogeneous isotropic, thermoelastic thin beam under clamped and simply supported conditions based on the Euler-Bernoulli theory. Okumura [5] has analysed the thermal-bending stresses in an annular sector by the theory of moderately thick plates. Kawamura [6] has analysed the equations of motion governing thermally induced vibration of plates with inhomogeneous material properties through the thickness direction are presented. Kar [7] problem deals with the thermo-elastic interaction due to step input of temperature on the boundaries of a homogeneous isotropic spherical shell in the context of generalised theories of thermo-elasticity. This paper deals with the study of waves propagation in an infinite rod by following state-space approaches using the Laplace transform.

2. Formulation of the problem

Consider a bounded isotropic homogeneous elastic material undergoing small temperature variation. The displacement component and the small temperature variation from an equilibrium temperature are connected by following differential equations

$$\mu u'_{j,kk} + (\lambda + \mu) u'_{k,kj} = (3\lambda + 2\mu)\alpha\theta'_{,j} + \rho\ddot{u}_j \tag{1}$$

$$\theta'_{,ii} = \frac{C_v}{k}(\dot{\theta}' + \tau\ddot{\theta}') + \frac{1}{k}(3\lambda + 2\mu)\alpha T_0(\dot{u}'_{i,i} + \tau\ddot{u}'_{i,i}) \tag{2}$$

and the stress is

$$\sigma'_{ij} = E\varepsilon'_{ij} - E\alpha(\theta' - T_0) \tag{2a}$$

where i and j take value $1, 2$ and 3 and few other notations are given below

- λ and μ are Lame's constants.
- α is the coefficient of linear thermal expansion.
- C_v is the specific heat at a constant volume
- κ is the thermal conductivity
- T is the relaxation time

- T_0 is the temperature in the equilibrium state
- , (comma) denote partial differentiation to space coordinates
- . (Dot) denote partial differentiation w.r.to time

Now define the following dimensionless quantities,

$$x_i = \frac{\kappa}{C_v C} x_i' \ , \ u = \frac{\kappa u'}{C_v C} \ , \ \theta = \theta' T_0 \ , \ t = \frac{\kappa}{C_v C} t' \ , \ \sigma_{ij} = \frac{\sigma'_{ij}}{\mathrm{E}\,\alpha(\theta' - T_0)}$$

where

$$C^2 = \frac{(\lambda + 2\mu)}{\rho} \tag{3}$$

Introduction the above quantities in Eq. (1) and (2) and suppressing the primes, one obtains

$$\mu u_{j,kk} + (\lambda + \mu) u_{k,kj} = \eta \theta_{,j} + \rho C^2 \ddot{u}_j \tag{4}$$

$$\theta_{,ii} - \dot{\theta} + m\ddot{\theta} = \beta(u_{\kappa,\kappa} + m\ddot{u}_{\kappa,\kappa}) \tag{4}$$

$$\sigma_{ij} = E\,\varepsilon_{ij} - E\alpha(\theta - \mathrm{T}_0) \tag{5}$$

where

$$\beta = \frac{(3\lambda + 2\mu)\alpha}{C_v} \ , \ m = \frac{T\,C^2 C_v}{\kappa} \ , \ \text{and} \ \ \eta = T_0(3\lambda + 2\mu)\alpha$$

From Eq. (4) and Eq. (5), one deduces the one-dimensional equations as follows

$$(\lambda + 2\mu)\frac{\partial^2 u}{\partial x^2} - \eta \frac{\partial \theta}{\partial x} = \rho C^2 \frac{\partial^2 u}{\partial t^2} \tag{6}$$

$$\frac{\partial^2 \theta}{\partial x^2} - \beta \frac{\partial^2 u}{\partial t\,\partial x} - \beta m \frac{\partial^3 u}{\partial t^2\,\partial x} - m\frac{\partial^2 \theta}{\partial t^2} = \frac{\partial \theta}{\partial t} \tag{7}$$

$$\sigma_x = E\,\varepsilon_x - E\alpha(\theta - \mathrm{T}_0) \tag{7a}$$

In this paper, the general case of wave prorogation in thermoelastic couple half-space is considered, the boundary conditions are expressed as

$$\left.\frac{\partial u}{\partial x}\right|_{x=0} = \exp[-\alpha t] \ , \tag{8}$$

$$\theta(x,t)\big|_{x=0} = 0 \ , \tag{9}$$

$$\sigma_x\big|_{x=0} = 0, \tag{9a}$$

3. Solution to the heat conduction equation

Define Laplace Transform as follows

$$\bar{u}(x,s) = \int_0^\infty u(x,t)\exp[-st]dt \tag{10}$$

$$\bar{\theta}(x,s) = \int_0^\infty \theta(x,t)\exp[-st]dt \tag{11}$$

Taking Laplace Transform of Eq. (6) and Eq. (7), one obtains the resulting equations in the form

$$\frac{\partial^2 \bar{u}}{\partial x^2} = \frac{\rho C^2 s^2}{\lambda + 2\mu}\bar{u} + \frac{\eta}{\lambda + 2\mu}\frac{d\bar{\theta}}{dx} \tag{12}$$

$$\frac{\partial^2 \theta}{\partial x^2} = s(1 + ms)\bar{\theta} + \beta s(1 + ms)\frac{d\bar{u}}{dx} \tag{13}$$

One can write Eq. (12) and Eq. (13) as

$$\frac{d\bar{u}(x,s)}{dx} = \bar{u}', \quad \frac{d\bar{\theta}(x,s)}{dx} = \bar{\theta}', \tag{14}$$

$$\frac{d^2\bar{u}(x,s)}{dx^2} = A\bar{u} + B\bar{\theta}', \quad \frac{d^2\bar{\theta}(x,s)}{dx^2} = C\bar{\theta} + D\bar{u}', \tag{15}$$

The homogeneous matrix form of Eq. (14) and Eq. (15) is expressed as

$$\frac{d}{dx}\begin{bmatrix} \bar{u}(x,s) \\ \bar{\theta}(x,s) \\ \bar{u}'(x,s) \\ \bar{\theta}'(x,s) \end{bmatrix} = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ A & 0 & 0 & B \\ 0 & C & D & 0 \end{bmatrix}\begin{bmatrix} \bar{u} \\ \bar{\theta} \\ \bar{u}' \\ \bar{\theta}' \end{bmatrix} \tag{16}$$

where the prime indicates differentiation w.r.to x and

$$A = \frac{\rho C^2 s^2}{\lambda + 2\mu}, \quad B = \frac{\eta}{\lambda + 2\mu}, \quad C = s(1 + ms), \quad D = \beta Q \tag{17}$$

One can write Eq. (16) as

$$\frac{\partial \upsilon(x,s)}{\partial x} = Q(s)\upsilon(x,s) \tag{18}$$

Substituting $\upsilon(x,s) = \chi(s)\exp[\gamma x]$ in Eq. (18), one obtains

$$\frac{\partial \chi(s)}{\partial x}\exp[\gamma x] = Q(s)\chi(s)\exp[\gamma x] \tag{19}$$

$$Q\chi = \gamma\chi,$$

where γ is a scalar.

Thus, one obtains the eigenvalue problem

$$\chi(s)\exp[\gamma x] = Q(s)\chi(s)\exp[\gamma x] \tag{20}$$

Here $Q\chi = \gamma\chi$, where γ is the eigenvalue and χ is the corresponding eigenvector of Q.

The characteristic equation corresponding to the matrix Q can be written as

$$|Q - \gamma I| = \begin{bmatrix} -\gamma & 0 & 1 & 0 \\ 0 & -\gamma & 0 & 1 \\ A & 0 & -\gamma & B \\ 0 & C & D & -\gamma \end{bmatrix} = 0 \tag{21}$$

$$\text{i.e } \gamma^4 - \gamma^2(A + BD + C) + AC = 0 \tag{22}$$

The eigenvector χ corresponding to the eigenvalue γ can be calculated from $|Q - \gamma I|\chi = 0$

$$\text{i.e. } \begin{bmatrix} -\gamma & 0 & 1 & 0 \\ 0 & -\gamma & 0 & 1 \\ A & 0 & -\gamma & B \\ 0 & C & D & -\gamma \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} \tag{23}$$

$$\text{i.e.} \quad \left.\begin{aligned} -\gamma x_1 + 0x_2 + x_3 + 0x_4 &= 0 \\ 0x_1 - \gamma x_2 + 0x_3 + x_4 &= 0 \\ A x_1 + 0x_2 - \gamma x_3 + B x_4 &= 0 \\ 0x_1 + C x_2 + D x_3 - \gamma x_4 &= 0 \end{aligned}\right\} \qquad (24)$$

Solving Eq. (24) by Cramer's rule, one obtains

$$\chi = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} (C-\gamma^2)/\gamma \\ -D \\ C-\gamma^2 \\ -D\gamma \end{bmatrix} \qquad (25)$$

Eq. (22) is quadratic in γ whose roots are

$$\gamma = \pm\gamma_1 \, , \pm\gamma_2 \qquad (26)$$

$$\gamma_1 = \left[\frac{(A+BD+C)+\sqrt{(A+BD+C)^2-4CA}}{2}\right]^{1/2} \qquad (27)$$

$$\gamma_2 = \left[\frac{(A+BD+C)-\sqrt{(A+BD+C)^2-4CA}}{2}\right]^{1/2} \qquad (28)$$

Hence the matrix of eigen vectors $\chi(s)$ is

$$\chi = \begin{bmatrix} (C-\gamma_1^2)/\gamma_1 & (C-\gamma_2^2)/\gamma_2 & (C-\gamma_1^2)/-\gamma_1 & (C-\gamma_2^2)/-\gamma_2 \\ -D & -D & -D & -D \\ C-\gamma_1^2 & C-\gamma_2^2 & C-\gamma_1^2 & C-\gamma_2^2 \\ -D\gamma_1 & -D\gamma_2 & D\gamma_1 & -D\gamma_2 \end{bmatrix} \qquad (29)$$

and the solution of Eq. (18) is given by

$$\upsilon(x,s) = \chi(s)Y \qquad (30)$$

where

$$Y = \begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \end{bmatrix} = \begin{bmatrix} C_1 & \exp[\gamma_1 x] \\ C_2 & \exp[-\gamma_1 x] \\ C_3 & \exp[\gamma_2 x] \\ C_4 & \exp[-\gamma_2 x] \end{bmatrix} \qquad (31)$$

Substituting Eq. (29) and Eq. (31) into the Eq. (30), one obtains

$$\begin{bmatrix} \bar{u}(x,s) \\ \bar{\theta}(x,s) \\ \bar{u}'(x,s) \\ \bar{\theta}'(x,s) \end{bmatrix} = \begin{bmatrix} (C-\gamma_1^2)/\gamma_1 & (C-\gamma_2^2)/\gamma_2 & (C-\gamma_1^2)/-\gamma_1 & (C-\gamma_2^2)/-\gamma_2 \\ -D & -D & -D & -D \\ C-\gamma_1^2 & C-\gamma_2^2 & C-\gamma_1^2 & C-\gamma_2^2 \\ -D\gamma_1 & -D\gamma_2 & D\gamma_1 & -D\gamma_2 \end{bmatrix} \begin{bmatrix} C_1 & \exp[\gamma_1 x] \\ C_2 & \exp[-\gamma_1 x] \\ C_3 & \exp[\gamma_2 x] \\ C_4 & \exp[-\gamma_2 x] \end{bmatrix} \qquad (32)$$

Applying the physical condition of the problem as in Eq. (6) and Eq. (7), the solution of equation Eq. (18) can be written as

$$\bar{u}(x,s) = C_2[(C-\gamma_1^2)/\gamma_1]\exp[-\gamma_1 x] + C_4[(C-\gamma_2^2)/\gamma_2]\exp[-\gamma_2 x] \qquad (33)$$

$$\bar{\theta}(x,s) = -D\{C_2\exp[-\gamma_1 x] + C_4\exp[-\gamma_2 x]\} \qquad (34)$$

Applying Laplace Transform to Eq. (8) and Eq. (9), one obtains

$$\frac{\partial \bar{u}}{\partial x} = \frac{1}{s+\alpha} \tag{35}$$

$$\bar{\theta}(x,s) = 0 \tag{36}$$

Applying transformed boundary conditions Eq. (35) and Eq. (36) into the Eq. (33) and Eq. (34), one obtains

$$\bar{u}(x,s) = -\left\{ \frac{1}{(s+\alpha)\left(\gamma_1^2 - \gamma_2^2\right)} [(C-\gamma_1^2)/\gamma_1] \exp[-\gamma_1 x] + \frac{1}{(s+\alpha)\left(\gamma_2^2 - \gamma_1^2\right)} [(C-\gamma_2^2)/\gamma_2] \exp[-\gamma_2 x] \right\} \tag{37}$$

$$\bar{\theta}(x,s) = -D\left\{ \frac{1}{(s+\alpha)\left(\gamma_1^2 - \gamma_2^2\right)} \exp[-\gamma_1 x] + \frac{1}{(s+\alpha)\left(\gamma_2^2 - \gamma_1^2\right)} \exp[-\gamma_2 x] \right\} \tag{38}$$

Substituting the value of A, B, C, D, γ_1 and γ_2 from Eq. (17), Eq. (27) and Eq. (28) into the Eq. (37) and Eq. (38), and inverting by Laplace Transform for large value of s (i.e. small value of time t), one obtains

$$u(x,t) = \frac{1}{V_1 V_3}\left[\frac{(t-V_1 x)^2}{2} + (m-V_1)^2 (t-V_1 x) \right] - \frac{1}{V_2 V_3}\left[\frac{(t-V_2 x)^2}{2} + (m-V_2)^2 (t-V_2 x) \right] \tag{39}$$

$$\theta(x,t) = \frac{\beta}{V_3}\left[(t-V_1 x) + mu(t-V_1 x) - (t-V_2 x) \right] - mu\ (t-V_2 x) \tag{40}$$

where,

$$V_1 = \left\{ \frac{[1+(1+B\beta)m] + \sqrt{1+m^2(1+2B\beta)+2m(B\beta-1)}}{2} \right\}^{1/2} \tag{41}$$

$$V_2 = \left\{ \frac{[1+(1+B\beta)m] - \sqrt{1+m^2(1+2B\beta)+2m(B\beta-1)}}{2} \right\}^{1/2} \tag{42}$$

$$V_3 = \sqrt{1+m^2(1+2B\beta)+2m(B\beta-1)} \tag{43}$$

4. Numerical Results, Discussion and Remarks

For the interests of simplicity of calculation, we introduce the following dimensionless values

$$C_V = 383.1, \quad \tau = 10^{-14}, \quad K = 386, \lambda = 9.5\times 10^{10},$$

$$\mu = 4.5\times 10^{10}, \alpha = 17\times 10^{-6}, p = 8954$$

One obtains the expressions for the temperature, displacement respectively for our numerical discussion

corresponding graphs are plotted as follows

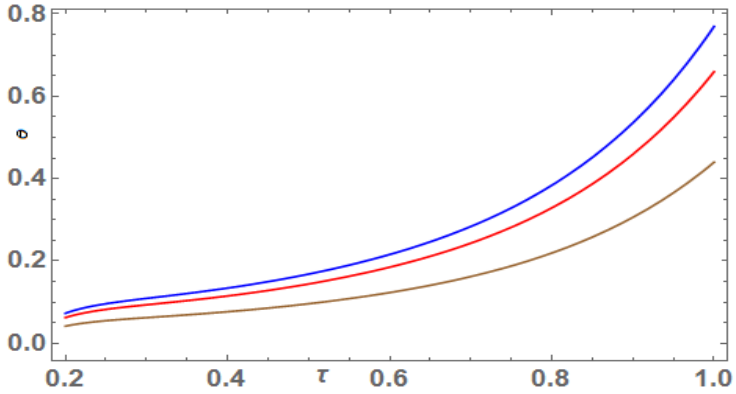

Fig. 2 (b): Temperature distribution along time form not equal to zero

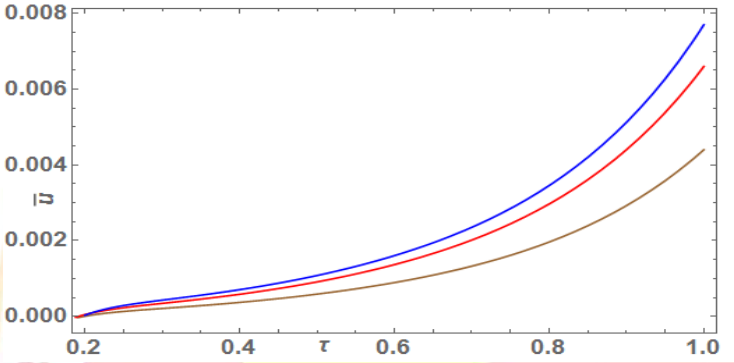

Fig. 2 (b): Temperature distribution along time for m=0

Conclusion

From this study of a transient problem of generalised thermoelasticity in an isotropic homogeneous elastic infinite rod, it is clear that the effect of thermoelastic parameter 'm' for the generalised coupled thermoelasticity of a single parameter as expected is not much pronounced in the displacement and temperature fields. The temperature field has a small oscillatory character about the time axis, while the displacement field decreases as time increases.

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An analysis for thermal stresses in a thin elliptic annulus plate with elastic supports on the curved surfaces

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Abstract

In this study, integral operational methods are used to investigate the thermally induced transverse vibration of a thin elliptic annulus plate with elastic supports at both radial boundaries. The axisymmetric temperature distribution is determined by the heat conduction differential equation and its corresponding boundary conditions by employing a unified integral transform technique by use of Mathieu functions and modified Mathieu functions. The solution of thermally induced vibration of the plate with both ends encased with elastic supports is obtained by employing an integral transform for double Laplace differential equation. The thermal moment is derivedon the basis of temperature distribution, and its stresses are derived based on resultant bending moments per unit width. The numerical calculations of the distributions of the transient temperature and its associated stress distributions are shown in the figures.

Keywords: Thermoelastic vibrations, elliptic annulus plate, elastic supports, heat conduction, thermal stresses, integral transform

1. Introduction

The thermoelastic vibration analysis is necessitated in many engineeringsscience applications such as design and computation of structures and mechanical devices, maintenance or predictions of breakdown. These reasons make the study of thermoelastic vibrations in structures and the control of their behaviour under dynamic loads an interesting study.

A short history of the research investigations associated with the thermoelastic vibrations insights using various operational and approximate methods like the Ritz energy method, Galerkin's method, finite element models and perturbation theory are reviewed that is used to solve the system.For example, Chen et al. [1] introduced three displacement functions to decompose three displacement components so that the three-dimensional equations of motion of a transversely isotropic body are uncoupled. Further expanding these functions in terms of orthogonal series, the equations of free vibration problem of a transversely isotropic cylindrical shell with ends simply supported are simplified to be readily dealtwith. Sato [2, 3] obtained solutions for composite elliptical membrane consisting of confocal elliptical parts under certain conditions during free as well as forced vibration analysis. Hutchinson and El-Azhari [4] use exact series solutions to the exact governing equations and present highly accurate resonance frequencies of stress-free cylinders on the basis of the linear three-dimensional theory of elasticity. Very recently, Bhad et al. [5, 6] and Dhakate [7]determined the thermally induced transverse vibration of a uniform thin elliptical object using few new integral transform methods. The aim of this work is to determine the thermal bending stresses using the exact formal solution of the partial differential equation prevailing the transverse vibration in terms of Mathieu functions and modified Mathieu functions. During problem formulation, we have initially solved heat conduction equation using the integral operation method. Secondly, we shall study the thermoelastic symmetrical vibration with elastic supported boundaries conditions using the theory of integral transform. Finally, the analytical solution for the thermal stress components is obtained based on resultant bending moments per unit width. The results presented here will be more useful in engineering problems particularly in vibrational analysis and in determining the state of strain in elliptical disk constituting foundations for reactors, pressure vessels, furnaces, etc.

2. Formulation of the problem

It is assumed that a thin elliptical annulus plate is occupying the space $D:\{(\xi,\eta,z)\in R^3 : a<\xi<b,\ 0<\eta<2\pi,\ 0<z<\lambda\}$ under transient temperature state having internal heat source within it, while supports at the boundaries as non-rigid. The geometry of the elliptical annulus plate indicates that an elliptic-cylindrical

coordinate system (ξ,η,z) is the most appropriate choices of the reference frame, which are related to the rectilinear coordinate system (x,y,z) by the relation $x=c\cosh\xi\cos\eta,\ y=c\sinh\xi\sin\eta,\ z=z$. The curves $\eta=$ constant represent a family of confocal hyperbolas while the curves $\xi=$ constant constitute a family of confocal ellipses. Both sets of curves intersect each other orthogonally at every point in space. The geometry parameters are given as $\xi\in[a,b],\ \eta\in[0,2\pi)$ and $z\in(0,\lambda)$.

2.1 Temperature distribution analysis

The heat conduction equation and boundary conditions are given as

$$\nabla^2\theta+\frac{\partial^2\theta}{\partial z^2}+\frac{Q(\xi,\eta,t)}{\lambda}=\frac{1}{\kappa}\frac{\partial\theta}{\partial t} \qquad (1)$$

in which $\theta(\xi,\eta,z,t)$ is temperature of the plate at point (ξ,η,z) at t time, ∇^2 denotes the two-dimensional Laplacian operator in elliptical coordinate, $Q(\xi,\eta,t)$ represents an energy generation term, $\kappa=\lambda/\rho C$ represents thermal diffusivity in which λ being the thermal conductivity of the material, ρ is the linear density, C is the specific heat of the material, assumed to be constant and the metric coefficient h is given as

$$h^{-2}=(c^2/2)(\cosh 2\xi-\cos 2\eta). \qquad (2)$$

The heat generation term is assumed in the form

$$Q(\xi,\eta,z,t)=Q_0\delta(\xi-a_0)\delta(\eta-2\pi)\delta(z-\lambda_0) \qquad (3)$$

in which Q_0 is typical value of the internal heat generation per unit time and per unit volume, $\delta(\ )$ is the Dirac delta function specifying the distribution of the internal het generation in which $\xi\neq a_0, a_0\in[a,b]$ and $z\neq\lambda_0$, $\lambda_0\in[0,\lambda]$.

The temperature distribution in the elliptical plate is obtained as a solution of the equation (1) with the following initial and boundary conditions

$$\left.\begin{aligned}&\theta(\xi,\eta,z,0)=0,\\&\theta(a,\eta,z,t)+k_1\frac{\partial\theta}{\partial\xi}(a,\eta,z,t)=0,\theta(b,\eta,z,t)+k_2\frac{\partial\theta}{\partial\xi}(b,\eta,z,t)=0,\\&\theta(\xi,\eta,0,t)=0,\theta(\xi,\eta,\lambda,t)=f(\xi,\eta,z,t)\end{aligned}\right\} \qquad (4)$$

with $f(\xi,\eta,z,t)$ as thesectional heat supply on the lower face, $k_i=k(T/\rho_i),\ i=1,2$ as the surface coefficients linearly related to the corresponding heat transfer coefficients which are supported by elastic supports [8, pp.1343] submerged in a non-viscous medium at the internal and external radial surfaces (i.e. $\xi=a$ and $\xi=b$),whereas T is the tension submitted to the upper face of plate, $\rho_i,\ i=1,2$ are the elastic constants of the supports given by the Hooke's law and they, in general, are different and k is the heat flux.

2.2 Thermal deflections formulation

During the formulation we assume few postulates that (i) the thickness of the elliptical annulus plate is small compared with the other dimensions of theplate, (ii) strain is nil at the middle surface of the plate, (iii) transverse shear and normal strains are neglected during investigation, (iv) shear stress is small compared to other stress, influence of shear and rotary inertia is neglected, and (v) finally the temperature distribution depends upon variable position and time. The differential equation for the transverse displacement in an elliptical annulus plate with small amplitude, in elliptic-cylindrical coordinate system and with the restriction that the transverse displacement on a point on the middle plane can be considered in two parts: the quasi-static solution $\omega_{st}(\xi,\eta,t)$, in which inertia effects and damping are disregarded, satisfying the equation

$$D\nabla^2\nabla^2\omega_{st}(\xi,\eta,t)=-\frac{M\theta(\xi,\eta,t)}{1-\upsilon} \qquad (5)$$

and the dynamic solution $\omega_d(\xi,\eta,t)$ satisfying the equation

$$D\nabla^2\nabla^2\omega_d(\xi,\eta,t)+\frac{1}{\alpha^2}\frac{\partial^2}{\partial t^2}\omega_d(\xi,\eta,t)+\frac{p(\xi,\eta,t)}{T}=-\frac{1}{\alpha^2}\frac{\partial^2}{\partial t^2}\omega_{st}(\xi,\eta,t) \qquad (6)$$

Now putting together both equations (5) and (6), yields the complete solution as

$$D\nabla^2\nabla^2\omega(\xi,\eta,t)+\frac{1}{\alpha^2}\frac{\partial^2}{\partial t^2}\omega(\xi,\eta,t)+\frac{p(\xi,\eta,t)}{T}=-\frac{M_\theta(\xi,\eta,t)}{1-\upsilon} \qquad (7)$$

in which $\omega(\xi,\eta,t)=\omega_d(\xi,\eta,t)+\omega_{st}(\xi,\eta,t)$ is the normal transverse deflection along the z-direction taking into account the effect of inertia, $\alpha^2=T/\rho\lambda$, $p(\xi,\eta,t)$ is the external pressure applied normally to the thin elliptical annulus plate, $D=E\lambda^2/[12(1-\upsilon^2)]$ is the modulus of rigidity of the annulus plate, E is the modulus of elasticity constant υ denotes the Poisson's ratio, and M_θ is the thermally induced resultant moment

$$M_\theta=\alpha E\int_0^\lambda z\,\theta(\xi,\eta,t)\,d\theta \qquad (8)$$

with α and E denoting coefficient of linear thermal expansion and Young's modulus of the material of the elliptical annulus plate, respectively. The Laplace operator in the elliptical coordinates has the form

$$\nabla^2=h^2(\partial/\partial\xi^2+\partial/\partial\eta^2) \qquad (9)$$

If we suppose that the boundaries of the thin annulus plate, $\xi=a$ and $\xi=b$, are supported by elastic supports [9, pp.1343] submerged in a non-viscous medium, then the boundary conditions, expressed in mathematical forms, as

$$\left.\begin{aligned}\omega(\xi,\eta,\lambda,t)+k_1\frac{\partial}{\partial\xi}\omega(\xi,\eta,\lambda,t)\Big|_{\xi=a}&=0,\\ \omega(\xi,\eta,\lambda,t)+k_2\frac{\partial}{\partial\xi}\omega(\xi,\eta,\lambda,t)\Big|_{\xi=b}&=0\end{aligned}\right\} \qquad (10)$$

and the initial conditions as

$$\omega(\xi,\eta,t)\big|_{t=0}=g_1(\xi,\eta),\ \ \omega(\xi,\eta,t)_{,t}\big|_{t=0}=g_2(\xi,\eta) \qquad (11)$$

2.3 Thermal bending stresses

The maximum normal stresses acting on those sections are parallel to ξz or ηz planes. Furthermore, the thermal stress components can be determined using small deflection and resultant moment as

$$\left.\begin{aligned}\sigma_{\xi\xi}&=\frac{6}{\lambda^2}\left\{Dh^2\left[\left(\frac{\partial^2\omega}{\partial\xi^2}+\upsilon\frac{\partial^2\omega}{\partial\eta^2}\right)-\frac{(1-\upsilon)\sinh 2\xi}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial\omega}{\partial\xi}+\frac{(1-\upsilon)\sin 2\eta}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial\omega}{\partial\eta}\right]+\frac{M_\theta}{1-\upsilon}\right\}\\ \sigma_{\eta\eta}&=\frac{6}{\lambda^2}\left\{Dh^2\left[\left(\upsilon\frac{\partial^2\omega}{\partial\xi^2}+\frac{\partial^2\omega}{\partial\eta^2}\right)+\frac{(1-\upsilon)\sinh 2\xi}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial\omega}{\partial\xi}-\frac{(1-\upsilon)\sin 2\eta}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial\omega}{\partial\eta}\right]+\frac{M_\theta}{1-\upsilon}\right\}\\ \sigma_{\xi\eta}&=\frac{6}{\lambda^2}\left\{Dh^2\left[\frac{\partial\omega}{\partial\xi}\sin 2\eta+\frac{\partial\omega}{\partial\eta}\sinh 2\xi-\frac{\partial^2\omega}{\partial\xi\partial\eta}(\cosh 2\xi-\cos 2\eta)\right]\right\}\end{aligned}\right. \qquad (12)$$

The equations (1)-(12) constitute the mathematical formulation of the problem under consideration.

3. Solution to the problem

3.1 Temperature distribution

In order to solve fundamental differential equation (1), firstly we introduce the here a finite transform (refer Appendix) over the variables (ξ,η) as

$$\bar{f}(\pm q_{2m}) = \int_a^b \int_0^{2\pi} S_{2m}(k_1,k_2,\xi,\pm q_{2m})\,(\cosh 2\xi - \cos 2\eta) \times ce_n(\eta,\pm q_{2m})\, f(\xi,\eta)\, d\xi\, d\eta \qquad (13)$$

In this way, we may define the inversion theorem of equation (13) in the form

$$f(\xi,\eta) = \sum_{m=0}^{\infty} \sum_{n=1}^{\infty} \bar{f}(\pm q_{2m}) S_{2m}(k_1,k_2,\xi,\pm q_{2m}) ce_n(\eta,\pm q_{2m}) / N_{2m,n} \qquad (14)$$

in which

$$N_{2m,n} = \pi \int_a^b S_{2m}^2(k_1,k_2,\xi,\pm q_{2m})(\cosh 2\xi - \Theta_n)\, d\xi$$

and

$$\Theta_n = \frac{1}{\pi}\int_0^{2\pi} \cos 2\eta\, ce_n^2(\eta, q_{2m})\, d\eta = A_0^{(n)} A_2^{(n)} + \sum_{r=0}^{\infty} A_{2r}^{(n)} A_{2r+2}^{(n)} \qquad [8, p.177]$$

The notations of the Mathieu functions used in this paper follow those adopted by McLachlan [8]. So, the symbols ce_n and Ce_{2m} denote the Mathieu and modified Mathieu functions of order n and m respectively. The prime $(')$ attached Ce_{2m} and ce_n represent the $\xi-$ and $\eta-$ derivatives respectively. The symbols $A^{(n)}$ is the Fourier coefficients of the Mathieu functions. On applying integral transform to the differential equation (13), and taking into account the boundary conditions (4), the differential equation (1) transformed into

$$\frac{\partial^2 \bar{\theta}}{\partial z^2} - \alpha_{2m}^2 \bar{\theta} + \frac{Q_0}{\lambda}\delta(z-\lambda_0)\exp[\alpha_{2m}^2(a_0 - 2\pi)] = \frac{1}{\kappa}\frac{\partial \bar{\theta}}{\partial t} \qquad (15)$$

with initial and boundary conditions

$$\left.\begin{aligned} &\bar{\theta}(q_{2m},\eta,z,0)\big|_{t=0} = 0 \\ &\bar{\theta}(q_{2m},\eta,0,t)\big|_{z=0} = 0, \bar{\theta}(q_{2m},\eta,\lambda,t)\big|_{z=\lambda} = \bar{f}(q_{2m},z,t) \end{aligned}\right\} \qquad (16)$$

in which $\alpha_{2m}^2 = 4q_{2m}/c^2$, $\bar{\theta}$ is the transformed function of θ respectively.

Applying Fourier sine transform to the eq. (16), using the boundary conditions (16), one yields,

$$\frac{\partial \bar{\bar{\theta}}}{\partial t} + \kappa\left(\alpha_{2m}^2 + \frac{\wp^2\pi^2}{\lambda^2}\right)\bar{\bar{\theta}} = \kappa\left(\frac{Q_0}{\lambda}\right)\sin\left(\frac{\wp\pi\lambda_0}{\lambda}\right)\exp[-\alpha_{2m}^2(a_0+2\pi)] + \kappa\left(\frac{\wp\pi}{\lambda}\right)[(-1)^{\wp+1}\,\bar{f}(q_{2m},\wp,t)] \qquad (17)$$

with initial condition as

$$\bar{\bar{\theta}}(q_{2m},\eta,z,0)\big|_{t=0} = 0 \qquad (18)$$

Applying Laplace transform to the equation (17) and taking into account the condition (18), the equation after mathematical simplification reduce to

$$\bar{\bar{\theta}}^*(q_{2m},\wp,s) = \left\{\frac{Q_0\kappa}{\lambda}\left[\sin\left(\frac{\wp\pi\lambda_0}{\lambda}\right)\exp[-\alpha_{2m}^2(a_0+2\pi)]\right] + \left(\frac{\kappa\wp\pi}{\lambda}\right)(-1)^{\wp+1} \times \bar{\bar{f}}(q_{2m},\wp,s)\right\} \Big/ \left[s + \kappa\left(\alpha_{2m}^2 + \frac{\wp^2\pi^2}{\lambda^2}\right)\right] \qquad (19)$$

Applying inverse Laplace transform on equation(19), one obtains

$$\bar{\bar{\theta}}(q_{2m},\wp,t)=\frac{Q_0\kappa}{\lambda}\exp[-\kappa(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})]\ \bar{g}(q_{2m},\wp)+(-1)^{\wp+1}\left(\frac{\kappa\wp\pi}{\lambda}\right)$$
$$\times\int_0^t \bar{f}(q_{2m},\wp,\tau)\exp[-\kappa(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})(t-\tau)]d\tau \quad (20)$$
$$\text{in which } \bar{g}(q_{2m},\wp)=\sin\left(\frac{\wp\pi\lambda_0}{\lambda}\right)\exp[-\alpha_{2m}^2(a_0+2\pi)].$$

Applying inversion theorem of the finite Fourier Sine transform on equation (20), one obtains,

$$\bar{\theta}(q_{2m},z,t)=\frac{2}{\lambda}\sum_{\wp=1}^{\infty}\left\{\frac{Q_0 k}{\lambda}\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})]\bar{g}(q_{2m},\wp)+(-1)^{\wp+1}\left(\frac{k\wp\pi}{\lambda}\right)\right.$$
$$\left.\times\int_0^t \bar{f}(q_{2m},\wp,\tau)\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})(t-\tau)]d\tau\right\}\sin\left(\frac{\wp\pi z}{\lambda}\right) \quad (21)$$

Applying inversion theorem of the transformed rules defined by equation(14) on equation(21), the temperature is obtained as,

$$\theta(\xi,\eta,z,t)=\frac{2}{\lambda}\sum_{m=0}^{\infty}\sum_{n=1}^{\infty}\sum_{\wp=1}^{\infty}\left\{\left(\frac{Q_0 k}{\lambda}\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})]\bar{g}(q_{2m},\wp)\right.\right.$$
$$\left.+(-1)^{\wp+1}\left(\frac{k\wp\pi}{\lambda}\right)\int_0^t \bar{f}(q_{2m},\wp,\tau)\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})(t-\tau)]d\tau\right) \quad (22)$$
$$\left.\times\sin\left(\frac{\wp\pi z}{\lambda}\right)S_{2m}(k_1,k_2,\xi,\pm q_{2m})ce_n(\eta,\pm q_{2m})/N_{2m,n}\right\}$$

The function is given in equation (22) represents the temperature at every instant and at all points of the elliptic annulus plate of finite height under conditions of radiation type on the surface.

3.2 Thermal deflections analysis

Substituting the equation (22) in equation (8), the thermally induced resultant moment is obtained as

$$M_\theta=\frac{2\lambda\alpha E}{\pi^2}\sum_{m=0}^{\infty}\sum_{n=1}^{\infty}\sum_{\wp=1}^{\infty}\left\{\left(\frac{Q_0 k}{\lambda}\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})]\bar{g}(q_{2m},\wp)\right.\right.$$
$$\left.+(-1)^{\wp+1}\left(\frac{k\wp\pi}{\lambda}\right)\int_0^t \bar{f}(q_{2m},\wp,\tau)\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})(t-\tau)]d\tau\right) \quad (23)$$
$$\left.\times\left(\frac{-\wp\pi\cos(\wp\pi)+\sin(\wp\pi)}{\wp^2}\right)S_{2m}(k_1,k_2,\xi,\pm q_{2m})ce_n(\eta,\pm q_{2m})/N_{2m,n}\right\}$$

In order to solve fourth order differential equation (7), using another integral transformation (refer Appendix) of order *m*and *n*over the variable ξ and η as

$$\bar{f}(q_{2m,n})=\int_a^b\int_0^{2\pi}(\cosh 2\xi-\cos 2\eta)\ Be_{2m}(k_1,k_2,\xi,q_{2m,n})$$
$$\times ce_{2m}(\eta,q_{2m,n})\,f(\xi,\eta)d\xi\,d\eta \quad (24)$$

The inversion theorem of (24) is

$$f(\xi,\eta)=\sum_{m=0}^{\infty}\sum_{n=1}^{\infty}\bar{f}(q_{2m,n})\zeta_{2m,n}(k_1,k_2,\xi,\eta,q_{2m,n})/C_{2m,n} \quad (25)$$

in which

$$\zeta_{2m,n}(k_1,k_2,\xi,\eta,q_{2m,n}) = \grave{B}e_{2m}(k_1,k_2,\xi,q_{2m,n})ce_{2m}(\eta,q_{2m,n})$$

and

$$C_{2m,n} = \pi\int_a^b(\cosh 2\xi - \Theta_{2m,n})\grave{B}e^2_{2m,n}(k_1,k_2,\xi,q_{2m,n})\,d\xi$$

On applying integral transform defined in equation (24) to the differential equation (7), and taking into account the boundary conditions (10), the differential equation transformed into

$$4Dq^2_{2m,n}\,\bar{\omega}(q_{2m,n},t) + \frac{1}{\alpha^2}\frac{\partial^2}{\partial t^2}\bar{\omega}(q_{2m,n},t) + \frac{\bar{p}(q_{2m,n},t)}{T} = \frac{\bar{F}(q_{2m,n},t)}{1-\upsilon} \qquad (26)$$

in which $F(\xi,\eta,t) = -\nabla^2 M_\theta$, $\bar{\omega}(q_{2m,n},t)$ and $\bar{F}(q_{2m,n},t)$ are the transformed function of $\omega(\xi,\eta,t)$ and $F(\xi,\eta,t)$ respectively.

Using Laplace transform on equation (26), the differential equation is reduces to

$$4Dq^2_{2m,n}\,\bar{\bar{\omega}}(q_{2m,n},s) + \frac{1}{\alpha^2}s^2\bar{\bar{\omega}}(q_{2m,n},s) + \frac{\bar{\bar{p}}(q_{2m,n},s)}{T} = \frac{\bar{\bar{F}}(q_{2m,n},s)}{1-\upsilon} \qquad (27)$$

in which $\bar{\bar{\omega}}(q_{2m,n},t)$ and $\bar{\bar{F}}(q_{2m,n},t)$ are the transformed function of $\bar{\omega}(q_{2m,n},t)$ and $\bar{F}(q_{2m,n},t)$ respectively.

Using the inverse Laplace theorem and the inverse theorem defined in equation (25), one obtains,

$$\begin{aligned}\omega(\xi,\eta,t) = \sum_{m=0}^{\infty}\sum_{n=1}^{\infty}\frac{\zeta_{2m,n}(k_1,k_2,\xi,\eta,q_{2m,n})}{C_{2m,n}}\Bigg\{\, & g_1(\xi,\eta)\\ & \times\cos(2q_{2m,n}\alpha\sqrt{D}) + \frac{g_2(\xi,\eta)}{2q_{2m,n}\alpha\sqrt{D}}\sin\left(2q_{2m,n}\alpha\sqrt{D}\right)t \qquad (28)\\ & + \frac{\alpha}{2q_{2m,n}\sqrt{D}}\int_0^t\left(\frac{\bar{F}(q_{2m,n},\tau)}{1-\upsilon} - \frac{\bar{p}(q_{2m,n},\tau)}{T}\right)\\ & \times\sin\left(2\alpha\sqrt{D}\,q_{2m,n}\right)(t-\tau)\,d\tau\Bigg\}\end{aligned}$$

The resulting equation of stresses can be obtained by substituting Eqs. (23) and (28).

4. Numerical Results, Discussion and Remarks

For the sake of simplicity of calculation, we introduce the following dimensionless values

$$\left.\begin{aligned}&\bar{\xi} = \xi/b,\ \bar{z} = [z-(-\lambda/2)]/b,\ e = c/b,\ \tau = \kappa t/b^2,\\ &\bar{\theta} = \theta/\theta_0,\ \bar{h}^2 = h^2b^2,\ \bar{\omega} = \omega/\alpha\theta_0 b,\\ &\bar{M}_\theta = M_\theta/Eb^3, \bar{\sigma}_{ij} = \sigma_{ij}/E\alpha\theta_0\ \ (i,j=\xi,\eta)\end{aligned}\right\} \qquad (29)$$

The mathematical computations have been carried out for Aluminum (pure) elliptic annulus plate with the thermo-mechanical properties are considered as modulus of elasticity E = 70 GPa, Poisson's ratio υ = 0.35, thermal expansion coefficient α = 23×10^{-6} /0C, thermal diffusivity κ = 84.18×10^{-6} m^2 /s^{-1}, density ϱ = 2712 kg/m^3 and thermal conductivity λ = 204.2 Wm^{-1} K^{-1}. The q_{2m} = 0.0989, 0.3987, 0.889, 1.5792, 2.4694, 3.5550, 4.8861, 6.3467, 7.9993, 9.8696, 11.9523, 14.2322, 16.6792, 19.0234, 21.2164, 23.6036, 25.0374, 27.7169, 29.2712, 31.0449are the positive and real roots of the $Ce_{2m}(\xi_o,q)Fey'_{2m}(\xi_i,q) - Fey_{2m}(\xi_o,q)Ce'_{2m}(\xi_i,q) = 0$. The physical parameter as $\bar{a}$ = 0.3 m, $\bar{b}$ = 1 m, $\bar{\lambda}$ = 0.05 m, and reference temperature θ_0 as 150^{0}C. For numerical thermoelastic analysis, we have considered various values of time as $\tau\,(<\tau_0 = 2,$ a fixed value). In order to examine the influence of heating on the plate, the numerical calculations

were performed for all the variables and numerical calculations are depicted in the following figures with the help of MATHEMATICA software.

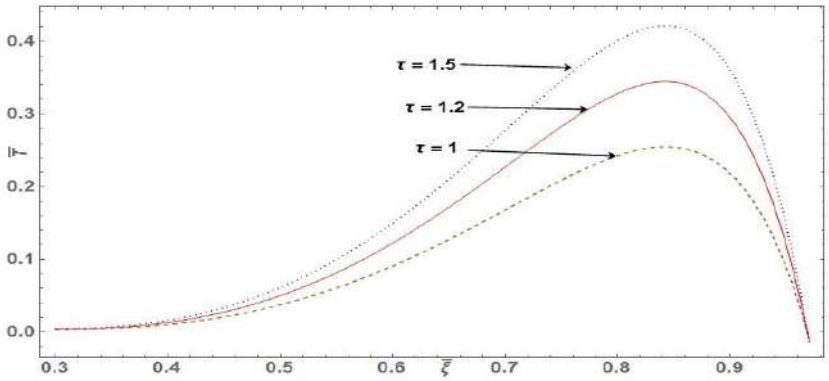

Fig. 1(a): Temperature distribution along radial direction for different values τ.

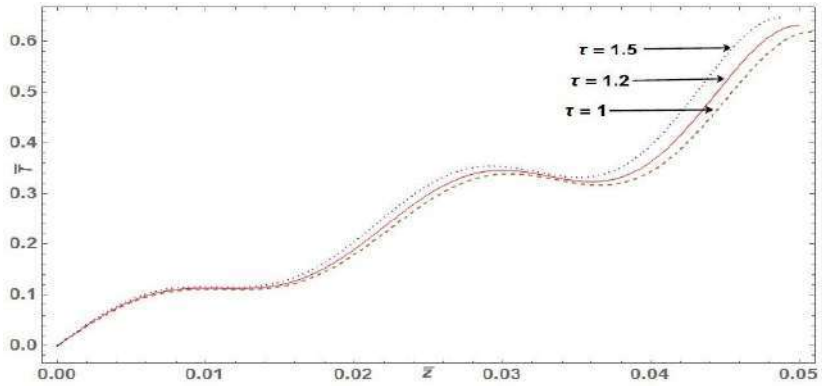

Fig. 1(b): Temperature distribution along $\bar{z}$ - direction for different values τ.

Figs. 1–3 illustrates the numerical results of temperature distribution, thermal deflection and stresses on elliptic annulus plate. As shown in Fig. 1(a), the temperature increases as the time proceeds along radial direction and is greatest at the other edge of the plate due to the combined energy of internal heat generation and known temperature. Fig. 1(b) shows that the temperature distribution along the $\bar{z}$ -direction for different values of time τ , which is maximum towards outer edge due to energized heat supply.

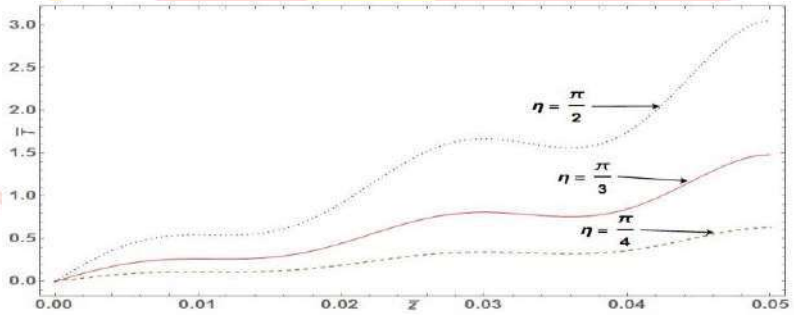

Fig. 1(c): Temperature distribution along $\bar{z}$ - direction for different values η.

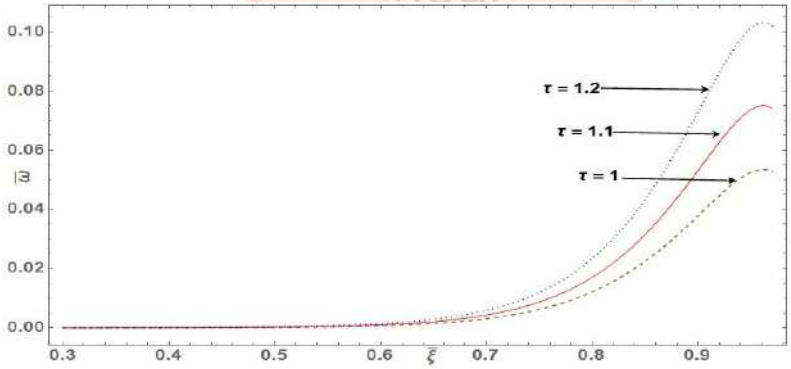

Fig. 2(a): Thermal deflection along radial direction for different τ.

Fig. 1(c) depicts that the temperature distribution along $\bar{z}$ -direction for different values of η attains maximum expansion at its outer core. There is an increment in the rate of heat propagation with thickness which leads to compressive force in the inner part and expands more on the outer surface whenever graph were plotted for temperature distributions, stress functions and deflection.Figs. 2(a) and 2(b) illustrates that the thermal deflection distribution over plate with elastic supported edges. Fig. 2(a) shows that the changes of thermal deflection along ξ-direction for different time parameter. The deflection is highest at the other edge of the plate due to the combined effect of internal and external supplied energy.

Fig. 3(a)-3(c) shows the variation of thermal radial stress $\sigma_{\xi\xi}$, tangential stress $\sigma_{\eta\eta}$ and shear stress $\sigma_{\xi\eta}$ along radial direction for different time parameter τ. From Fig. 3(a), the large compressive stress occurs at the inner edge while the tensile stress occurs at the outer edge which drops along the radial direction.

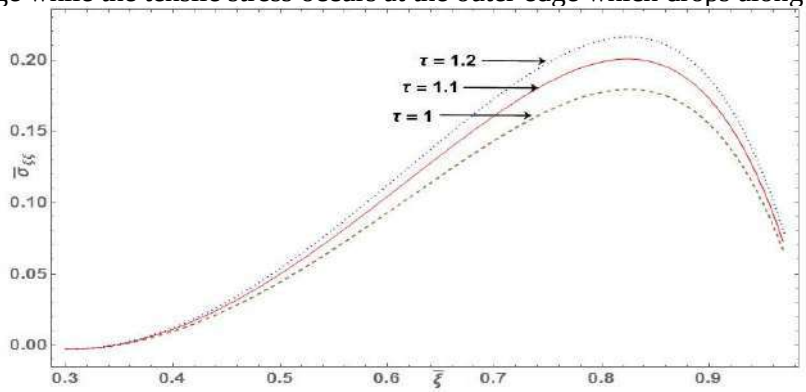

Fig. 3(a): Radial stress $\bar{\sigma}_{\xi\xi}$ along radial direction for different τ.

Fig. 3(b)-3(c) illustrates the thermal radial stress $\sigma_{\xi\xi}$, shear stress $\sigma_{\xi\eta}$ along angular direction for different values of $\bar{\xi}$. it is evident from the fig. 3(d) that at the early stage, radial stress increases gradually and maximum radial stress occurs at the mid-core and suddenly attains minimum value. The similar curve nature was observed for the angular stress along angular direction for different values of $\bar{\xi}$ and has been omitted here for the sake of brevity. It is observed from fig. 3(e) that shear stress has large influence of negative forces at the mid core for η- direction.

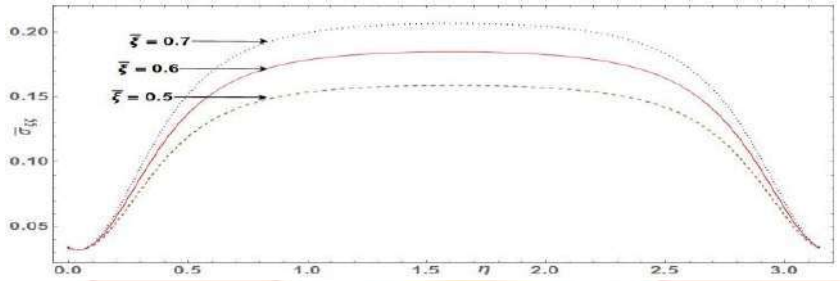

Fig. 3(b): Radial stress $\bar{\sigma}_{\xi\xi}$ along angular direction for different $\bar{\xi}$.

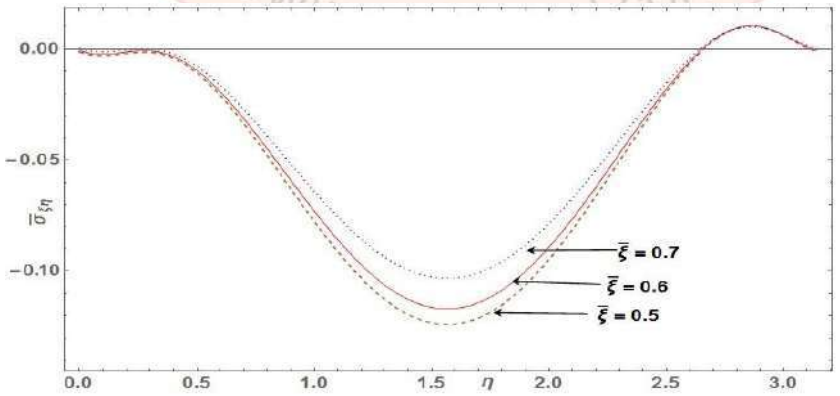

Fig. 3(c): Shear stress $\bar{\sigma}_{\xi\eta}$ along angular direction for different $\bar{\xi}$.

5. Conclusion

In this article, we have described the theoretical treatment of dynamic thermally induced vibration with its deflection and its associated stresses. The analytical technique proposed here is relatively simple and widely applicable compared to the methods proposed by other researchers. The results obtained while carrying research are described as follows

- The maximum tensile stress shifting from the outer surface due to maximum expansion of an outer part of the plate, its absolute value increases with the radius. This could be due to heat, stress, concentration or available internal heat sources under known temperature field.
- The value of radial stress $\bar{\sigma}_{\xi\xi}$ shows discontinuity at the boundaries whereas plateau type curve at the middle part along angular direction.

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Knowledge and Attitude of Health Care Professionals Regarding Placental Stem therapy

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Abstract

Background: The notion of stem cells is a developing concept. Stem cells are undifferentiated cells, capable of self-regeneration and differentiation into specific lineage cells. Self-regeneration can be maintained along many generations, increasing the number of cells.1 Aim: The present study aims to assess the knowledge and attitude of health care professionals regarding placental stem cell therapy. , Objectives: 1. To assess the knowledge of health care professionals regarding placental stem cell therapy. 2. To assess the attitude of health care professionals regarding placental stem cell therapy. 3. To co-relate the knowledge and attitude with various demographic variables. Methods: A descriptive survey approach with Purposive sampling was used to select 150 health care professionals working NMCH, Nellore, Andhra pradesh. Results: Maximum no. of health care professionals (55.3%) had inadequate knowledge and most of them (98%) had positive attitude. Conclusion: The study concluded that, 55.33% of health care professionals had inadequate knowledge and 98% of health care professionals had positive attitude.

Key words: Knowledge, Attitude, Health Care Professionals, Placental Stem Cell therapy.

Introduction

The notion of stem cells is a developing concept. Stem cells are undifferentiated cells, capable of self-regeneration and differentiation into specific lineage cells. Self-regeneration can be maintained along many generations, increasing the number of cells. Umbilical Cord blood (UCB), which is also called "placental blood," is the blood that remains in the umbilical cord and placenta following birth and after the cord is cut. Umbilical cord blood could be considered as a rich source of stem cells.2

The Cord blood is one of the richest and non controversial sources of stem cells. Cord blood is the blood left in the umbilical cord and placenta after the birth of the child and is collected within 10-15 minutes after the cord has been cut off by simple venipuncture, in the umbilical vein followed by gravity drainage in to a sterile anti- coagulant filled blood collection.3

The placenta is one of the most important sources of stem cells, and has been studied extensively over the past period. The placenta fulfills two main desiderata of cell therapy: obtaining of an as high as possible number of cells and use of non-invasive methods for their harvesting. Stem cells in cord blood have exceptional properties that make them desirable, such as high proliferative potential, increased ability for self-renewal, and decreased ability for antigen presentation.4

Need For The Study

During the 1970's researcher discovered that umbilical cord blood could supply the same kind of hematopoietic stem cells as bone marrow donor. And so, umbilical cord blood banking began by collecting and storing umbilical cord blood. Cord blood stem cells are currently used in the treatment of several life-threatening diseases, and play an important role in the treatment of blood and immune system related genetic diseases, cancer and blood disorders.5

The first clinically documented use of cord blood stem cells was in the successful treatment of a six-year-old boy affected by Fanconi anemia in 1988. Since then, cord blood has become increasingly recognized as a source of stem cells that can be used in stem cell therapy.6

Rajeshwari C (2015) conducted a study on knowledge and attitude of health professionals regarding placental stem cell, preservation and utilization. The study concluded that 84% of health professionals had inadequate knowledge and 25% had neutral attitude.7

Perlow JH. (2018) conducted a study to determine the Knowledge on umbilical blood banking among 425 patients. The data were collected by using questionnaire. This revealed that 37% patients had no knowledge regarding umbilical cord blood banking, 2.6% patients had knowledge and 74% patients were minimally informed about umbilical cord blood banking only 14% patients were educated about umbilical cord blood banking by their

nurses, although 90% patients expected their obstetrician to answer their questions on umbilical cord blood banking. This study concluded that patients are poorly informed about umbilical cord blood banking and they are expecting information from the health care professionals.8

Though there are many benefits of cord blood these fascinating stem cells are continued to be discarded as a medical waste even today due to the lack of Knowledge and negative attitude caused by the high cost involved. It is the responsibility of the health professionals to create awareness about Cord Blood Banking and to motivate its utilization by general public to move towards this bio health insurance. 9

Problem Statement

A study to assess the knowledge and attitude of health care professionals regarding placental stem cell therapy at NMCH, Nellore, A.P.

Objectives of The Study

1. To assess the knowledge of health care professionals regarding placental stem cell therapy.
2. To assess the attitude of health care professionals regarding placental stem cell therapy.
3. To co-relate the knowledge and attitude with various demographic variables such as age, sex, work experience, educational status and designation.

Delimitations

The study is delimited to:

1. Health care professionals who are working at NMCH, Nellore, A.P
2. Who are willing to participate in the study.

Materials & Methods:

Research approach: Non-experimental descriptive approach
Research design: Descriptive cross-sectional research design
Setting: The present study was conducted in NMCH, Nellore, A.P
Sample: Health care professionals in NMCH, Nellore, A.P and who fulfilled the inclusion criteria were selected for the study.
Sampling technique: Purposive sampling technique
Sample size: The sample size of the study was 150 health care professionals.
Criteria for sample selection
Inclusion criteria:

- Health care professionals working in NMCH, Nellore, A.P.
- Health care professionals who are present during study period and are willing to participate during the study period.

Exclusion criteria:

- Health care professionals not working in NMCH, Nellore, A.P.

Description of the tool
The tool is divided into three parts.
Part I: This part of tool included demographic information of study subjects such as age, sex, work experience, educational status and designation.
Part II: This part consisted of 20 structured multiple choice questions to assess the knowledge of health care professionals regarding placental stem cell therapy.
Part- III: This part consisted of 12 statements concerning the attitude of health care professionals regarding placental stem cell therapy. The statements were developed for the respondents to respond on five points Likert's scale i.e. strongly agree, agree, uncertain, disagree and strongly disagree.

Results& Discussion:

Table-1: Frequency, Percentage distribution of health care professional's knowledge regarding placental stem cell therapy. (N=150)

Level of knowledge	Frequency (n)	Percentage (%)
Adequate (≥50%)	67	44.66
Inadequate(<50%)	83	55.33

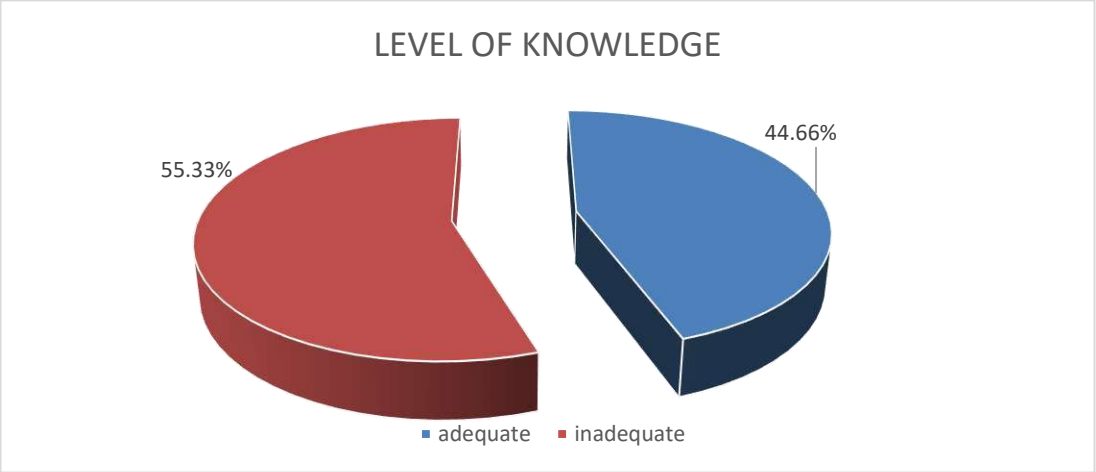

Fig-1: Frequency, Percentage distribution of health care professional's knowledge regarding placental stem cell therapy.

Table-2: Frequency, Percentage distribution of health care professional's attitude regarding placental stem cell therapy. (N=150)

Level of attitude	Attitude	
	Frequency (n)	**Percentage (%)**
Positive (≥50%)	147	**98**
Negative (<50%)	**3**	**2**

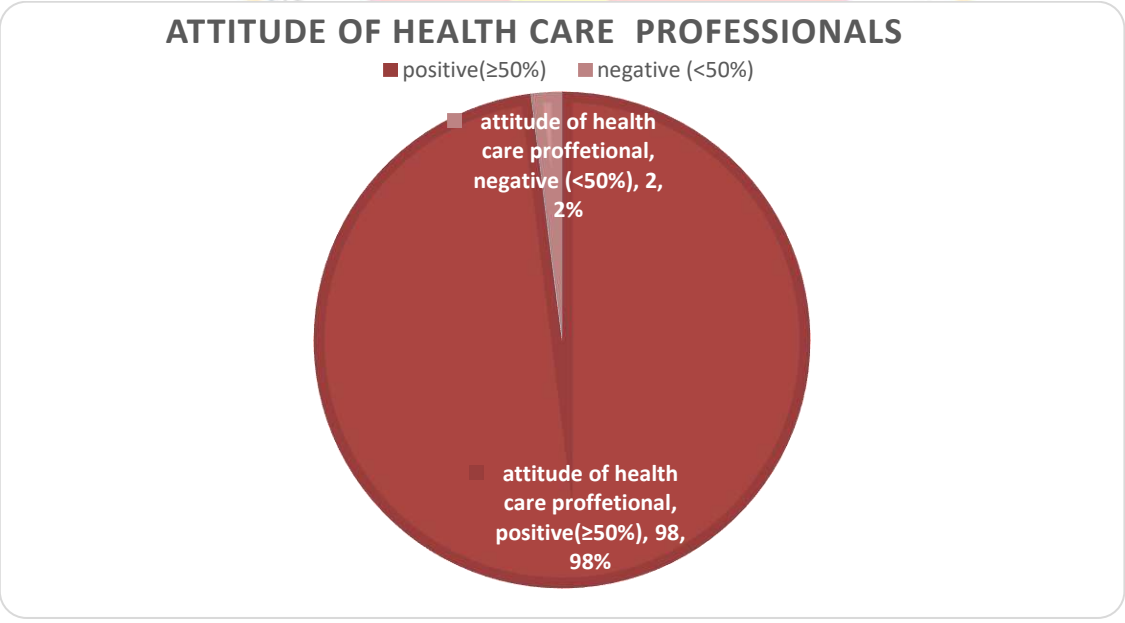

Fig-2: Frequency, Percentage distribution of health care professional's attitude regarding placental stem cell therapy.

Major Findings Of The Study

- The study shows that 44.66% of health care professionals were having adequate knowledge and 55.33% of health care professionals were having inadequate knowledge.
- Majority of health care professionals (98%) had positive attitude and only 2% of them had negative attitude regarding placental stem cell, cord blood banking and its utilization.
- The co-relation of attitude regarding placental stem cell, cord blood banking and its utilization according to age, sex, work experience, educational status and designation was found statistically non significant at ($p<0.05$) level.

Conclusion:

The study concluded that, 55% of health care professionals were having inadequate knowledge and 98% health care professionals had positive attitude regarding placental stem cell, cord blood banking and its utilization.

Recommendations

- On the basis of present findings it is recommended that a large sample should be studied in order to provide better picture of knowledge and attitude regarding stem cell, cord blood banking and its utilization.
- The study may be conducted at different community setting.
- The instrument used for assessing knowledge and attitude towards stem cell, cord blood banking and its utilization can further be developed and field tested for standardizing.
- There should be in- service workshop and seminar to enhance the health care professionals knowledge regarding stem cell, cord blood banking and its utilization.

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Isolation of Fusarium Oxysporum F.Sp. Lycopersici Causing Fusarium Wilt of Tomato and Their Control

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ABSTRACT

Diseases are a major limiting factor for tomato production. Diseases can be classified into two groups. The first are those caused by infectious microorganisms that include fungi, bacteria, viruses and nematodes. These diseases are contagious and can spread from plant to plant in a field, often very rapidly when environmental conditions are favourable. Present investigation of isolation and their control measures of fusariumwilt on tomato. the Pathogen was isolated from infected plant parts by tissue isolation technique on Potato Dextrose Agar (PDA) medium.

Keyword: - Tomato, Isolation, Fusarium, Control measures etc

I. INTRODUCTION

Diseases are a major limiting factor for tomato production. Diseases can be classified into two groups. The first are those caused by infectious microorganisms that include fungi, bacteria, viruses and nematodes. These diseases are contagious and can spread from plant to plant in a field, often very rapidly when environmental conditions are favourable. The second group includes those caused by non-infectious physical or chemical factors, such as adverse environmental factors, nutritional or physiological disorders and herbicide injury. Non-infectious diseases cannot spread from plant to plant; however, the distribution of the disease may be quite uniform and extensive if an entire planting was exposed to the adverse factor.

It is critical for effective disease control to recognize the difference between infectious and non-infectious diseases, and the type of microorganism causing an infectious disease be determined. For example, use of a fungicide to control a non-infectious disease, such as blossom-end rot, is a wasted expense that will not correct the problem.

Wilt diseases are caused by pathogens that invade the vascular system (xylem tissue) and disrupt water flow through the plant. Fusarium wilt is the major wilt disease of tomato in Oklahoma. Verticillium wilt is easily confused with Fusarium wilt.

The first symptom is usually a yellowing of the lower leaves, which gradually wilt and die. Symptoms may first occur on only one side of the plant (Figure 1). The disease progresses up the stem until all of the foliage is killed

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and the plant dies. If stems or petioles from wilted areas of diseased plants are cut, a reddish-brown discoloration can be seen between the pith (center of the stem) and the outer green part of the stem (Figure 2). The fungus survives and persists indefinitely in field soil. The fungus is also seedborne and is thought to spread long distances in this manner. The disease is most serious in sandy soils and at temperatures between 80 F to 90 F. Soils become infested by planting infected transplants and from movement of infested soil by wind and water erosion or on farm implements.

Uys*et al.* (1996) studied tomato diseases and disorders in the main tomato growing regions of South Africa during survey between 1992-1995. Early blight caused by *Alternaria solani,* was the most prevalent leaf disease, followed by bacterial leaf spot.Ramgiry et al. (1997) survey conducted and report that Alternaria solani and *Pencillium notatum* were the most frequent causal agents of tomato decay in fields and vegetable markets in Jhabua of Madhya Pradesh.Bhatt *et al.* (2000) recorded the *Alternaria alternat*a as the causal agent of leaf blight disease of tomato and capsicum, which was the first confirmed record of this fungus from Kumaon hills of Uttar Pradesh. Kanjilal *et al.* (2000). Conducted the survey on field and post-harvest diseases of hybrid and desi cultivars of tomatoes in four districts of West Bengal, (India) and revealed that among fungal diseases, the blight caused by Alternaria sp.was the most predominant with the crop loss in the field ranged from 70 to 100 per cent.Tumwine et al. (2002) conducted survey on tomato early blight situation and current practices for disease management in Uganda during 1996-1999. Ten districts solani as major disease. Kamble (2006) conducted a survey in Thane and Raigad districts in Konkan region of Maharashtra on early blight of tomato caused by *Alternaria solani .*

II. MATERIAL AND METHODS

1) Collection of material

The present experiment conducted *In Vitro* at Department of Botany, MSP Art, science and K.P.T commerce, College, Manora District Washim. During this experiment, plant sample were collected from Tomato infected by fusarium wilt disease in growing track of washim

2) Isolation of *Fusarium oxysporum f.sp. lycopersici*method followed by C.V.Chudhary in 2006.

Pathogen was isolated from infected plant parts by tissue isolation technique on Potato Dextrose Agar (PDA) medium. Diseased parts were cut into small pieces with the help of sterilized blade. Pieces were washed with sterilized distilled water and disinfected with 1 per cent $HgCl_2$ solution for 10 seconds. Thus, obtained disinfected tissues were immediately washed thrice with sterilized distilled water and aseptically transferred on PDA plates. Inoculated Petri plates were incubated at room temperature (27±2 °C). The obtained culture was purified by using hyphal tip culture method, and maintained on same medium for the further investigations.

III. RESULTS AND CONCLUSION

1) Isolated *Fusarium oxysporum f.sp. lycopersici* (fungus) from infected tomato leaves

Control Measures

Fusarium wilt can be difficult to manage once it is introduced and there is no known cure once it has become established within an area. However, there are preventative and disease reduction measures that can be implemented:

- **Select resistant varieties.** For fields with a history of Fusarium wilt, planting resistant varieties of tomato will inhibit severe symptoms. See the *Southeastern US Vegetable Crop Handbook* for a list of varieties with resistance. Seek guidance from a specialist to help identify which race is present in your field.
- **Use grafted tomatoes.** Tomato rootstocks that are resistant to Fusarium wilt are available and can be used with a susceptible scion variety. See vegetablegrafting.org for more information.
- **Crop rotations for 3-5 years**. Rotating away from tomato crops will reduce inoculum (spores) in the soil. This will not guarantee the elimination of disease, but will reduce the severity and incidence of infection on the subsequent crop. Weeds, such as pigweed, mallow, and crabgrass, can be hosts for the Fusarium wilt pathogen, so frequent maintenance of the infested area is necessary during this period of time.
- **Only plant healthy transplants.** Closely inspect transplants for symptoms of disease before planting to decrease the likelihood of introducing disease.
- **Wash tractors and equipment between fields**. Infested soil can be carried to other fields on equipment and tools. Frequent cleaning is highly recommended, particularly if moving from an infested field to a clean field.
- **Use sterile potting media**. If you are starting your own seedlings, use of a sterile soilless potting media is suggested to minimize the chance of introduction of the disease.
- **Manage soil pH**. Raising soil pH to a neutral range (6.5 - 7.0) by using lime will reduce the persistence of the pathogen.
- **Avoid excessive nitrogen**. High levels of nitrogen and low levels of potassium in the soil can increase a plant's susceptibility to Fusarium wilt. Avoid over-application of high nitrogen fertilizers and use a soil test to determine nutrient levels.

Chemical methods

The most effective method in preventing tomato from Fusarium wilt infections is by mixing the tomato seeds with chemical fungicides. However, the use of chemical fungicides can be harmful to other living organisms besides reduction of soil microflora.

There is a constant threat that pathogens may become resistant to fungicide treatment. As for example, various pathogens became resistant to methyl benzimidazole. Other classes of fungicides were tested against *F. oxysporum*f.sp. lycopersici. The demethylationinhibiting (DMI) fungicides (prochloraz, propiconazole and cyproconazole/propiconazole) act by inhibiting the demethylation step in the biosynthesis of sterols needed in fungal walls. Prochloraz proved to be the most effective fungicide against the Fusarium wilt pathogens of tomato.

Biological methods

Biological control is a non-chemical measure that has been reported in several cases to be as effective as chemical control.

However, the efficacy of biological control was occasionally inadequate and variability in control level may be high. Understanding the mechanisms involved in biological control might enable enhancing control efficacy and reducing the inconsistency and variability

IV. CONCLUSION

Treating fusarium wilt of tomatoes is not possible. Affected branches or entire plants can only be destroyed, as they will die eventually. Prevention is the only way to avoid the damage of fusarium wilt in your tomato garden. Start with varieties that resist the disease. Also, avoid planting tomatoes in the same spot year after year. The fungus persists in the soil for a long time. Make sure that the soil drains well where you plant tomatoes to deter fungal growth. Use raised beds, if necessary. If you have had issues with fusarium wilt in the past, or if you just grow a lot of tomatoes, practice good garden tool hygiene

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A Synthesis and Fluorescence Properties of Trivalent Europium Doped Yttrium Vanadate and YVO4 : Eu_{3+} @SiO_2 for Biological Application

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ABSTRACT

The red emitting Eu^{3+} doped YVO_4 phosphor were synthesized via co-precipitation method. The Core shell structured of Europium doped Yttrium Vanadate caped with SiO_2 was obtained by using TEOS (Tetraethyl Orthosilicate) to modified the biological properties. The structure confirmation and morphological properties of as-synthesized material were investigated by using powder X-ray diffraction (XRD) and Scanning electron microscopy (FE-SEM). The photoluminescence (PL) study of as-synthesized material were studied using spectrophotometer which reveals that intense red emission corresponds to $^5D_0$ -$^7F_2$ transition of Eu^{3+} ions in the host lattice under the UV excitation. The biocompatibility of as-synthesized material shows the good potential for biological applications.

Keywords: Co-precipitation method; YVO_4:Eu^{3+}@SiO_2; biological application; optical material.

I. INTRODUCTION

The red emitting Eu3+ doped YVO4 is one of the best and very demanding phosphor in the in the field of luminescence [1]. Because of its high chemical and thermal stability as well as low phonon energy. The quantum efficiency of YVO4:Eu3+ phosphor is almost 70%. YVO4:Eu3+ phosphor is an important commercial red emitting luminescence material used in display applications. Various dopants can act as luminescent centre (activator) and/or as a sensitizer in YVO4 host, which absorbs the light energy and transfer to the luminescent centre [2, 3]. In the resent years, luminescence materials caped with core shell of SiO2 are widely used for various applications [4]. Moreover, the SiO2 silica shell can enhance the photochemical and stability of the core particles. Such kinds of materials are generally used in biomedical targeting and drug-delivery systems [5, 6]. There are several reports on luminescence materials caped with tetraethyl orthosilicate (TEOS) with improving the luminescence intensity such as Lin et al. synthesized Gd2O3:Eu3+@SiO2 nanophosphor by using sol-gel method with size of silica spheres in the range 60 -250 nm

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[7], Yu et al. synthesized YVO4:Eu3+@SiO2 by using Pechini sol-gel process [8], Bao et al. synthesized YVO4:Eu/SiO2 core–shell composite by using simple citrate sol–gel method with particles size in the range of 300–500 nm [9],Cheng et al. synthesize YVO4:Eu3+@SiO2 composite microspheres. The microspheres were fabricated by using facile surface protected etching method for biological application [10] and Lai et al. synthesized functional YVO4:Eu3+, Bi3+@SiO2 submicron-sized core-shell particles by using hydrothermal and sol–gel methods for solar cell application [11] etc. Most of the researcher preferred sol-gel method and pechini method but these methods required very costly organic additives at the time of synthesis.

Inspiring from the above discussions, the present work planned to study the luminescent properties of Europium doped Yttrium Vanadate and YVO4:Eu3+@SiO2 phosphor synthesized by using simple co-precipitation methods for biological application, which is main accomplishment of the present work.

II. EXPERIMENTAL

Synthesis

The phosphor YVO4:Eu3+ was prepared by co-precipitation method. The starting chemicals Y2O3 (99.99%, AR) and Eu2O3 (99.90%, AR) were mixed together in a china clay basin. A small quantity of deionized water added then HNO3 was added drop by drop and heated slowly at 50°C. After that the solution was further heated to get excess of acid boiled off. The resulting solution was considered as Y(NO3)3:Eu, to this soluble solution, NH4VO3 (AR) dissolved in deionized water and then added drop by drop [12]. The precipitate so obtained was filtered out, washed with deionized water and acetone, and dried at 50ºC. The final product was calcined at 900ºC.

Preparation of YVO4:Eu3+@SiO2 core-shell particles

The particles of YVO4:Eu3+ with 20 ml of deionized water, sonicated for 30 min and then the silica shells caped over YVO4:Eu3+ were prepared by hydrolysis of TEOS in an alcohol solvent in the presence of water with ammonia was added drop by drop in the solution of YVO4:Eu3+. The mixture was stirred 30 min and to agitated by using ultrasonification for 1 h to disperse the core particles. The reaction was continue in the ultrasonicator to obtain more dispersed core and uniform SiO2 coating on the core[13, 14]. Then YVO4:Eu3+@SiO2 core-shell particles were formed.

Characterization of samples

The phase purities of YVO4:Eu3+ samples were studied using Rigaku miniflex II X-ray Diffractometer and Cu Kα (λ = 1.5406 Å) radiation in the range 10° to 90°. PL and PL excitation (PLE) spectra were measured on fluorescence spectrophotometer (Hitachi F-7000) at room temperature. The parameters such as spectral resolution, width of the monochromatic slits (1.0 nm), photomultiplier tube (PMT) detector voltage and scan speed were kept constant throughout the analysis of samples.

III. RESULTS AND DISCUSSION

X-ray diffraction

The formation of the YVO4 in the crystalline phase synthesized by co-precipitation synthesis method was confirmed by XRD pattern as shown in Fig. 1. The XRD pattern for YVO4:Eu3+ agreed well with the standard data from ICDD file (01-082-1968). Also the XRD pattern show that the formed material was completely crystalline and in single phase, where a= b = 7.11 and c = 6.28 Å. The space group for YVO4 is I41/amd(141) [3].

Scanning electron microscopy

Fig. 2 (A) shows the SEM images of the YVO4:Eu3+ and YVO4:Eu3+@SiO2 core–shell particles. In Fig. 2 (A) that the YVO4:Eu3+ particles have an average particle size in the range of 100-120 nm and the surfaces of the YVO4:Eu3+ particles were smooth. After coating SiO2 on the YVO4:Eu3+ particles, the particle size of YVO4:Eu3+@SiO2 core–shell became increases with spherical nature as shown in Fig. 2 (B) [15].

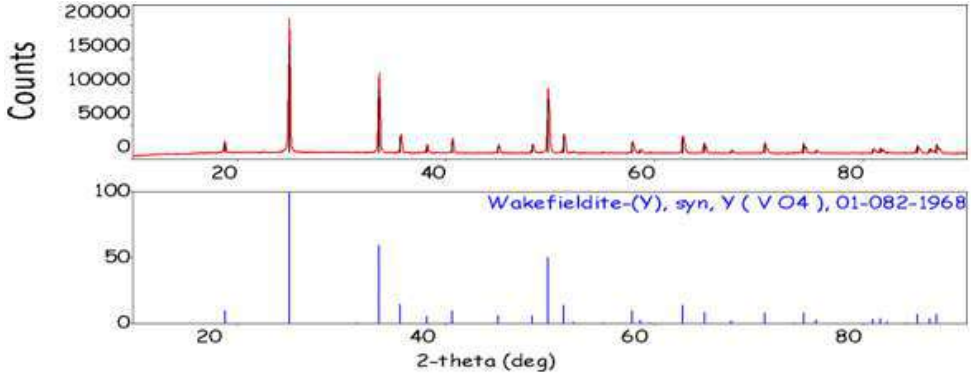

Figure 1: XRD pattern of YVO4:Eu3+.

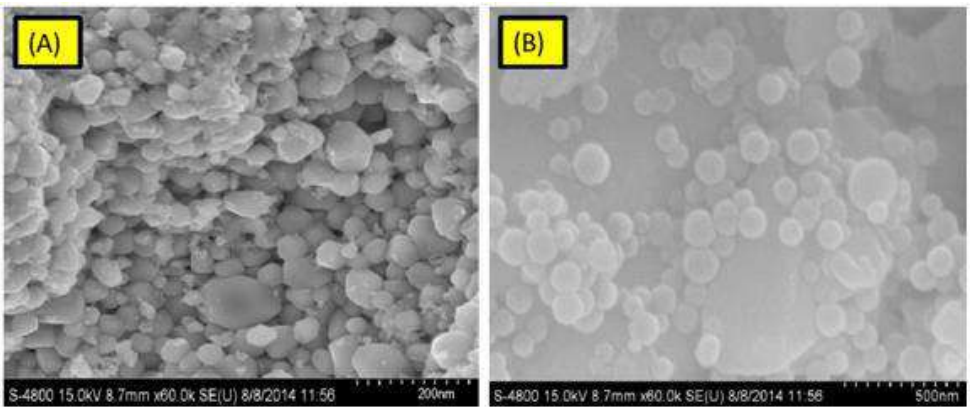

Figure 2: SEM image of YVO4:Eu3+ (A) and YVO4:Eu3+@SiO2 (B).

Photoluminescence study

In Fig. 3 shows YVO4:Eu3+@SiO2 core–shell particles givis strong red emission under UV excitation than YVO4:Eu3+ with similar peak position. The most intense excitation band centered at 318 nm monitoring at

621 nm is due to the overlapping of the O2- Eu3+ charge transfer band (CTB) and the VO 3- absorption [16]. One small peak was observed at 395 nm due to the 4f–4f transitions of Eu3+. The emission spectra consist of number of peaks in the visible range. From the Fig. 3 It is clearly seen that the two emission spectra of YVO4:Eu3+ and YVO4:Eu3+@SiO2 consist of five peak in the range 500 to 700 nm corresponds to 5D0 to 7FJ (J= 1, 2 and 3) transitions of Eu3+ ions. The emission peak at 539 nm and 596 nm is corresponding to magnetic dipole of 5D0 -7F1 transition, whereas the two peak at 617 and 621 nm corresponding to 5D0 -7F2 transition of Eu3+ ions which are due to the electric dipole transitions. The electric dipole transition exhibits more intense peak than magnetic dipole transition only when the impurity ion is situated at the non-inversion center of the crystal. Moreover, the emission peak at 648 nm is corresponding to 5D0 -7F3 transition [12].

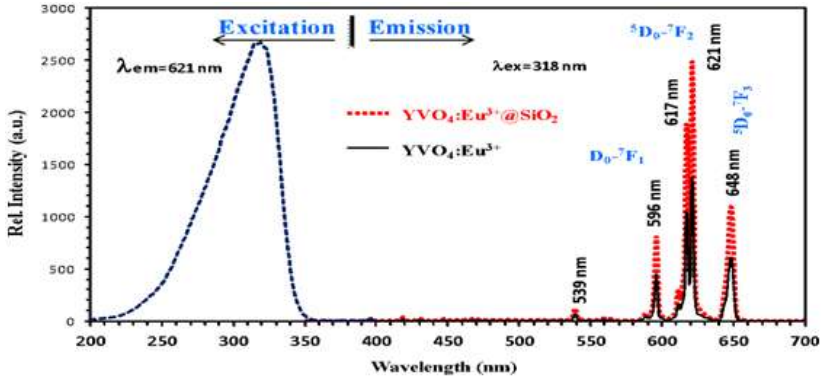

Figure 3: PL excitation and two emission spectra of YVO4:Eu3+ (Black solid line) and YVO4:Eu3+@SiO2 (Red dotted line).

HeLa cell cytotoxicity and drug release properties of YVO4:Eu3+@SiO2 material

The potential use of the luminescence phosphors in biological fields, the cytotoxic measurements by MTT assays (It is a colorimetric assay for assessing cell viability) on HeLa cells was studied. The effects of YVO4 with different concentrations on HeLa cell viabilities are depicted in Fig. 4. It is clearly a show that the assay results demonstrate the YVO4:Eu3+@SiO2 was almost no toxicity upon incubation with HeLa cells. The viability of HeLa cells varied with increasing concentration. Thus it was found that the prepared sample shows no cytotoxicity using the MTT assays [17].

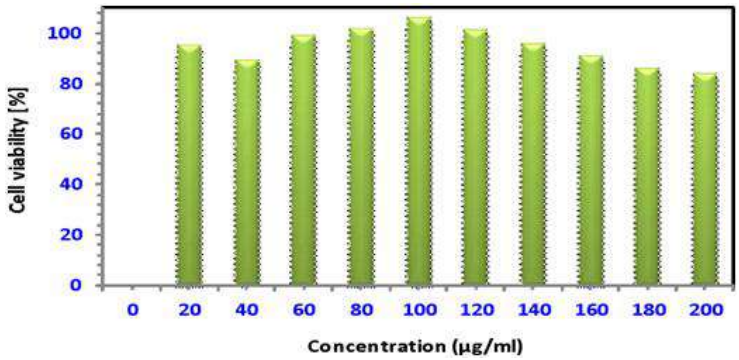

Figure 4: Viability experiments of Hela cells with various concentrations of YVO4@SiO2 after 24 h of incubation.

IV. CONCLUSIONS

The YVO4 synthesized by co-precipitation method which is low cost, low temperature and not required any other additive for initiation of process of synthesis. The YVO4:Eu3+@SiO2 shows optimum PL emission than YVO4:Eu3+ phosphor. The obtained YVO4:Eu3+@SiO2 core-shell phosphor has spherical morphology, submicron size and narrow size distribution. The cytotoxicity tests of as prepared sample indicate that the YVO4:Eu3+ particles capped with SiO2 show the no cytotoxicity. Moreover, our strategy developed other core-shell yttrium based phosphor in the future.

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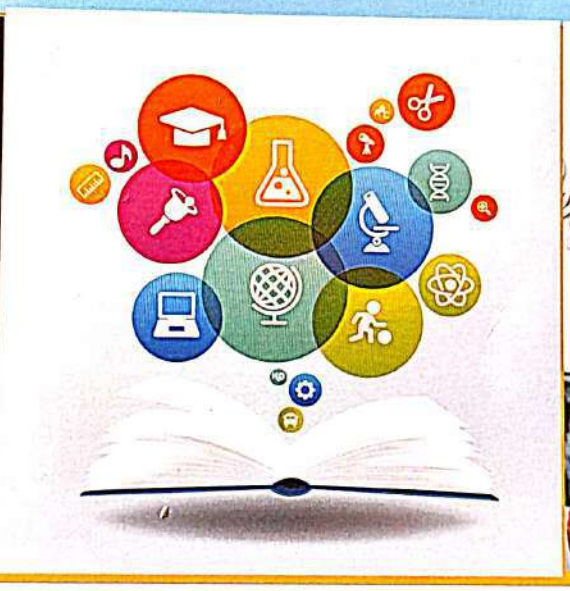

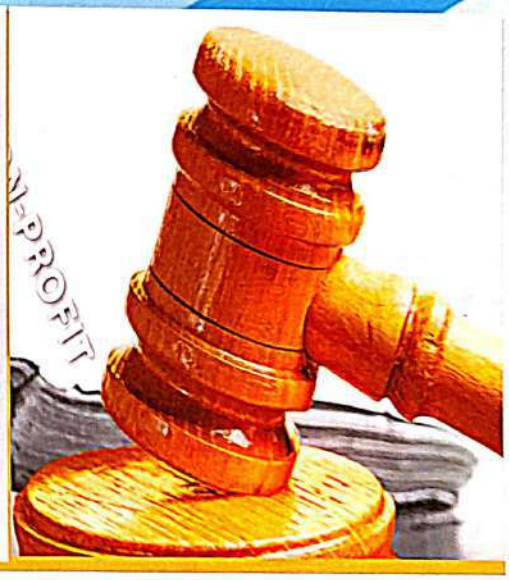

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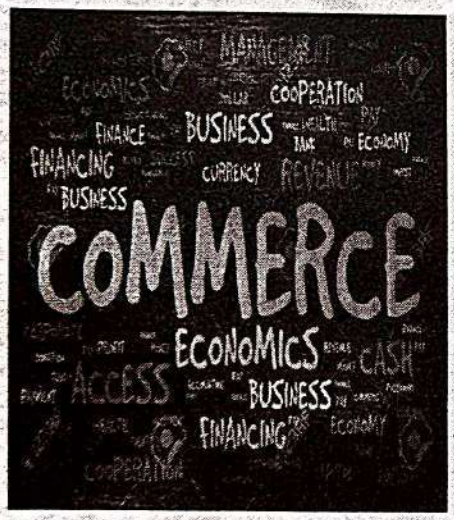

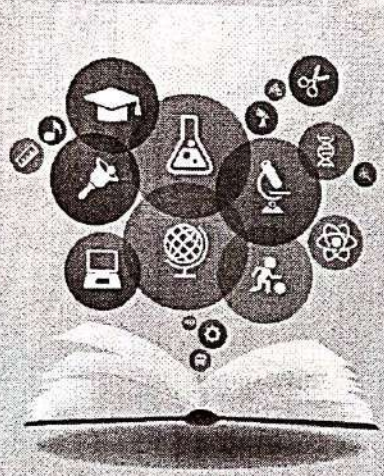

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Changing Role of Libraries in Information Services

Dr. Narendra A. Thakare

Matoshri Subhadrabai Patil Mahavidyalaya , Manora

Mob. 9421746757

Abstract :

The present paper deals that new era of librarian plays a key role in developing information policy for the organization ensuring that access to all information resources. from internal record to external database is provided in the most strategically effective and cost effective manner. the library and information professionals are required to acquire such knowledge and skill as the library is one of the highly information technology influenced service profession.

With the development of ICT libraries nature has changed from traditional libraries to automated library. hybrid library. electronic library and virtual library. As library environment change then automatically the librarian role for this libraries have also changed . presently librarian play many role like Knowledge Manager. Researcher Legal Advisor. Teacher and many more.

Introduction:

Information technology is defined as "a combination of computer and telecommunication technology which makes possible new systems to help people for doing the work in a better manner". Technological services save the time of user as well as library personnel also. Modern technology has brought dramatic changes in library management and library services. The face of library is changing due to implementation of information and communication technology . All libraries are using partly or fully the communication technology in their libraries. librarian also insisting to provide the electronic based services of libraries to the users, These electronic base services save the time of user as well as library staff and user also get information in less time and to the point information by single click on the computer at their place.

The location and provision of information services has dramatically changed over the last ten years. There is no need to leave the home or office to locate and access information now readily available on-line via digital gateways furnished by a wide variety of information providers. Information electronically accessible from a wide variety of globally distributed information repositories. Information is no longer simply text and picture . It is electronically in a wide variety of formats. many of which are large . complex and often integrated.

The various reasons to application of Information and communication technology in libraries.

- To increase the efficiency of library operations.
- Improve the effectiveness of existing services.
- Offer a wide range of new services.
- Perform task which cannot be done by the manual system.
- Improve accuracy and control over operations.
- Reduce duplication of efforts.
- Library consortium is possible other libraries.
- To provide readymade databases.
- Facilitate marketing or information services.
- Provide gateway access to global digital information resources
- Meet users rising expectations for complex information needs.

Following services should be provided by the library to it's users.

- Circulation services.
- Database search services .
- Reference services.
- Reference support for projects /presentation/ assignment.
- Assistance in how to search faster/ web search.
- User education and training programmers.
- OPAC
- Internet facility
- Current awareness services.
- SDI services.
- List of new arrival

Changing Role of Library :

• Traditional library emphasis on the storage and preservation of physical items. where as digital library require less space to store and preservation of library material.

• Traditional library bound to provide service within the time limit . but the digital virtual and electronic library provide the services to their user 24 x7 means 365 days.

• To acquire the information user can visit the library physically where as in digital library user can use the library from their home or from any part of the geographical area with the help of computer.

• Some traditional libraries are providing the hybrid method in their library. Some material is in hard from and some material in soft form .

Changing Role of Library Services.

- Library at your door step.
- Online services to all user.
- Information communication technology application in the library.
- Tailoring services in this services librarian provide the only to the point information
- Consolidation and repackages.
- Time management
- Total quality management
- E-book and e-journals services
- Database services etc.

New Challenges for Library and information Service Professionals :

We live in a dynamic turbulent world and the turbulence is set to increase its pace in the future. In a fast changing . expanding diverse global digital information environment. libraries are facing a variety of complex challenges from multiple sectors of the knowledge society in the 21th Century. The major challenges are.:

- Information Explosion
- Information and Communication Technology revolution .
- Explosive growth and usage of web resources
- Dwindling Library budgets
- Escalating cost of printed documents
- Intensive use of digital resources
- Heightened level of users expectations
- Interactive virtual learning environment
- Changing nature of number of information resources
- New patterns of scholarly publishing and communication

- Development of digital. Virtual and Hybrid Libraries
- Online Bookshops and Information services.

Changing Role of Library and Information services professionals :

In the modern World the role of the LIS professionals is adapting to changing technologies. information environment and customers expectations. Library professionals are increasingly responsible not only to provide traditional library information services but also to deliver online information services according to the actual user needs. Librarians need to keep up with their user's expectation to survive and service them . Librarians need to become information knowledge navigators who data into information.

In the 21st century everyone is going through many occupational changes to face the future challenges. Information and Communication Technology has transformed the role of not only libraries but also library professional in the changing environment in which they now work. Library professional are functioning under great pressure to become more efficient to deliver more effective services to the users. As the role of LIS professionals is changing to face the new challenges posed by ICT . They must be keen to stay at the forefront of innovation in the library world. LIS professionals need to be confident and competent that they can prepare for new challenges. Deal with emerging technologies manage change effectively and claim new professional role. A well-informed competent and creative LIS professional shall play multiple evolving role in the 21st century. As the information industry has changed the expectations of information users have soared and librarians have come to fear for their position and profession. As we race into the future. Librarians should begin to think about the position of the library in the new environment. LIS professional are functioning under great pressure to keep pace with the constantly changing technological environment.

Conclusion :

LIS professionals face complex challenges posed by rapid revolutionary advances in ICT. Libraries have to redesign their position to meet evolving needs. Librarians need to implement new practices and new technologies manage change and improve performance and competencies to face future challenges of knowledge society. They need to develop professional competencies to adapt changing technologies. In order to deliver timely value added quality content and world-class services to the users from their desktop.

Library information professionals have to recognize the expanding nature of the technological changes and professional challenges that they face in the modern world and realize to improve the range of professional competencies required to adapt and manage the changing technology successfully. The challenges represented by these competencies must be seized and acted upon today in order to ensure that librarians have better future in the twenty first century. LIS professionals must strive struggle and improve new skills and knowledge about new technologies that will be needed to provide responsive Library Information Services to the user in the twenty first century.

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समाज सुधारकांचे शिक्षणविषयक विचार

प्रा. डॉ. नरेंद्र आप्पासाहेब ठाकरे
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मानोरा, जि. वाशिम, महाराष्ट्र, (India)
मो. नं. ९४२१७४६७५७

प्रस्तावना :

प्रत्येक शतकामध्ये समाजाला सुयोग्य वळण लावण्यासाठी समाज जीवनात महत्वपूर्ण बदल घडविण्यासाठी एखादा क्रांतीसूर्य जन्माला येतो, या विधानाची प्रचिती देणारा क्रांतीसूर्य म्हणजे ज्योतीराव फुले. एकोणविसाव्या शतकात महाराष्ट्रातील अग्रस्थानी असणारे समाज सुधारक देह म्हणजे महात्मा ज्योतीराव फुले.

पददलितांच्या उध्दारासाठी, स्त्री शिक्षणासाठी समानता व सत्यासाठी झिजविणाऱ्या महात्मा ज्योतीराव फुले यांचा जन्म सातारा जिल्ह्यातील कटगुण गावी 20 फेब्रुवारी 1827 रोजी झाला. वडील गोविंदराव गो-हे, फुलमाळयाच्या धंद्यावरुन त्यांचे आडनाव फुले झाले. 1848 साली पुण्यातील भिडे वाडयात मुलींसाठी पहिली शाळा ज्योतीबांनी सुरू केली. आपली पत्नी सावित्रीबाई यांना शिकवुन शिक्षीकेचे काम करण्यास प्रोत्साहन दिले.

ज्योतीबा शाळेतील गरिब मुलांना पाटया, पेन्सीली, पुस्तके, प्रसंगी कपडे पुरवित असत. स्त्री शिक्षणानंतर ज्योतीबांनी अस्पृश्योद्वाराचे. कार्य हाती घेऊन गुलामगिरी ग्रंथ लिहून दलीतांच्या अन्यायास वाचा फोडली. सार्वत्रिक शिक्षणावर भर देऊन ज्योतीबांनी दिनबंधु वृत्तपत्र सुरु केले. 1873 साली त्यांनी सत्यशोधक समाजाची स्थापना केली. आपल्या लिखानामधून, पोवाडयामधुन, व्याख्यानामधून स्त्रीयांच्या, दलीतांच्या, शेतकऱ्याच्या कामगारांच्या अन्यायाला वाचा फोडली. मनुष्य जातीने श्रेष्ठ ठरत नसुन गुणांनी ठरतो, इश्वर सर्वव्यापी असुन सर्व त्याचीच लेकरे आहेत असे त्यांनी सांगीतले. इंग्लंडचा राजपुत्र एकदा पुण्यास आला होता. तेव्हा त्याच्या सभेस ज्योतीबा शेतकऱ्यांच्याच पोशाखात गेले. देशातील गरिबांचे वर्णन करुन आम्हाला चांगले शिक्षण देऊन गरीबी दुर करा असे आपल्या तडफदार भाषणातुन त्यांना सांगीतले. अशा या थोर समाज सेवकाचा महात्मा पदवी देऊन लोकांना गौरव केला.

ज्योतीराव फुले यांचे शिक्षण विषयक कार्य :

समाजातील अनिष्ट प्रवृत्ती नष्ट करायच्या असतील तर सर्वप्रथम समाजाच्या प्रत्येक स्तरापर्यंत शिक्षण पोहोचले पाहिजे, ही ज्योतीरावांची विचारधारा होती. शेतकऱ्यांचा आसूड या पुस्तकाच्या उपोद्घातात ते म्हणतात,

विद्येविना मति गेली, मतिविना निती गेली,
नितीविना गती गेली, गती विना वित्त गेले,
वित्तविना शुद्र खचले, इतके अनर्थ एका अविद्येने केले.

स्त्रीया व शुद्रांना शिक्षण मिळाले पाहिजे, तेव्हाच त्यांचे दैन्य नाहीसे होईल असा त्यांना ठाम विश्वास होता. म्हणुनच सदाशिवराव गोवंडे, सदाशिवराव हाटे, परांजपे, मोरोपंत वाळवेकर यासारख्या मित्रमंडळीशी त्यांनी विचारविनीमय केला आणि सन 1848 साली बुधवार पेठेतील भिडेवाडा येथे मुलींची पहिली शाळा सुरु झाली. स्त्रियांना विशेषतः कनिष्ठ वर्गातील स्त्रियांना शिक्षणाचा अधिकार नाही, या हजारो वर्षाच्या रुढीवर ज्योतीरावांनी घणाघाती घाव घातले. स्त्रिने शिक्षण घेणे म्हणजे भ्रष्टाचार ! स्त्रि

शिक्षणामुळे सुखाचे वाटोळे होऊन स्त्रीला अकाली वैधव्य प्राप्त होते. अशा प्रकारच्या अंधश्रध्दांनी बरबटलेल्या समाजाकडून ज्योतीरावांना कडाडून विरोध झाला. पण ज्योतीराव कळवळून सांगत होते,

आता तरी तुम्ही मागे घेऊ नका | धिक्कारुन टाका मनुस्मृता ||
विद्या शिकताच पावाल ते सुख । घ्यावा माझा लेख ज्योती म्हणे।।

मुलींच्या या शाळेत शिकविण्याकरिता अध्यापिका पाहिजे, याराठी त्यांनी आपल्या पत्नीला सावित्रीबाईंना शिकविले. अत्यंत साध्या, प्रेमळ, सहनशिल व पतिपारायण अशा सावित्रीबाईंनी ज्योतीरावांच्या स्त्रि शिक्षण विषयक कार्यात मनापासुन भाग घेतला. शिक्षीकेला शाळेत जातांना शेणाचे गोळे, दगड मारले गेले. त्यामुळे होणाऱ्या वेदनापेक्षा स्त्री शिक्षणाचे मोल अधिक होते. सावित्रीबाईच्या प्रेरक आधारामुळे आणि मित्रमंडळींच्या खंबीर सहकार्यामुळे 3 जुलै 1851 मध्ये चिपळुनकर वाड्यात त्यांनी शाळा सुरु केली 17 सप्टेंबर 1851 मध्ये रास्ते वाडयात शाळेची स्थापना केली, तर 15 मार्च 1852 मध्ये वेताळ पेठेत शाळा सुरु झाली. विचारांना कृतीत उतरविण्यासाठी लागणारे उदंड धाडस ज्योतीरावामध्ये होते. त्यामुळेच मुलींच्या शाळेबरोबरच पुण्यामध्ये त्यांनी अस्पृश्यासाठी शाळा काढली. समाजाच्या शिक्षण पोहचविण्यासाठी सन 1955 मध्ये रात्र शाळेची स्थापना सर्व स्तरात केली. ज्योतीरावांचे हे क्रांतिकारी कर्मठ समाजाला पैलवणारे नव्हते. त्यांना खिळ घालण्यासाठी काही दृष्ट प्रवृत्तीच्या लोकांनी अघोरी मार्ग निवडला, ज्योतीरावांच्या घरी मारेकरी धाडले, पण सामाजीकता, बंधुतेचा वसा घेतलेल्या ज्योतीबांच्या तेजाने मारेकऱ्यांनी शस्त्रे टाकुन दिली. आणि निर्भयी ज्योतीरांवाना शरण गेले. परंपरेच्या जोखडात अडकलेल्या अंधश्रध्दाळु समाज ज्योतीरावांना विरोध करीत असला तरी इंग्रज सरकारने समाजाला गती देणाऱ्या नवि दिशा देणाऱ्या ज्योतीरावांच्या कार्याचा गौरव केला. 16 नोव्हेंबर 1852 मध्ये मेजर कॅन्डी यांच्या अध्यक्षतेखाली शिक्षण कार्याबद्दल सरकारी विद्या खात्याकडून त्यांचा सत्कार करण्यात आला.

समाजधुरंधर ज्योतीराव फुले :

समाजाच्या प्रगतीसाठी स्त्रिया व शूद्रांना शिक्षण देण्याबरोबरच इतर अनिष्ट सामाजिक प्रथांचे निर्मुलन आवश्यक आहे हे जाणून त्यादृष्टीने ज्योतीरावांचे कार्य सुरु झाले.

विधवा विवाह :

राजा राममोहन रॉय यांच्या प्रयत्नांनी सन 1821 मध्ये सतीची चाल कायद्याने बंद झाली. स्त्रीचे जीवंतपणी चितेवर जाणे यामुळे थांबले, तरी विधवेच्या जीवनात नेहमीच अत्याचाराची विटंबनेची चिंता रचली जायची. त्यात बिचारी होरपळून जायची, विधवेची विटंबना थांबावी म्हणून त्यांनी विधवा विवाहाला चालना दिली. 8 मार्च 1860 रोजी त्यांनी पहिला विधवा विवाह पुण्यात घडवून आणला. शेणवी समाजातील एका विधवा स्त्रिचा विवाह या समाजातील विधुराशी लावून दिला. स्त्री जीवनात क्रांती घडविणाऱ्या या घटनेमुळे त्यांच्यावर टिकेची झोड उठली, पण ते अविचलत राहिले. विधवांना अत्याचारांच्या मालिकेतून मुक्त करुन सुरक्षित जीवनाचा मार्ग त्यांनी प्राप्त करुन दिला.

केशवपन निषेध :

विधवा स्त्रिच्या डोक्यावरील सर्व केस कादून तिला विद्रुप करणाऱ्या निर्घुण रूढी विरुद्ध त्यांनी प्रचार केला न्हावी समाजामध्ये जागृती केली. याची परिणिती म्हणजे एप्रिल 1890 मध्ये मुंबईत न्हावी समाजाची सभा झाली. त्यात सुमारे पाचशे न्हावी समाजाची सभा झाली. त्यात सुमारे पाचशे न्हावी व्यावसायिकांनी केशवपनांचे काम करणार नाही, असे ठणकावून सांगीतले. ज्योतीरावांनी सांगीतलेल्या समाज परिवर्तनाचाच हा एक भाग आहे.

शिक्षणामुळे सुखाचे वाटोळे होऊन स्त्रीला अकाली वैधव्य प्राप्त होते. अशा प्रकारच्या अंधश्रध्दांनी बरबटलेल्या समाजाकडून ज्योतीरावांना कडाडून विरोध झाला. पण ज्योतीराव कळवळून सांगत होते,

आता तरी तुम्ही मागे घेऊ नका | शिक्काकरुन टाका मनुमता ।।
विद्या शिकताच पावाल ते सुख । घ्यावा माझा लेख ज्योती म्हणे।।

मुलींच्या या शाळेत शिकविण्याकरिता अध्यापिका पाहिजे, यासाठी त्यांनी आपल्या पत्नीला सावित्रीबाईंना शिकविले. अत्यंत साध्या, -प्रेमळ, सहनशिल व पतिपारायण अशा सावित्रीबाईंनी ज्योतीरावांच्या स्त्रि शिक्षण विषयक कार्यात मनापासुन भाग घेतला. शिक्षीकेला शाळेत जातांना शेणाचे गोळे, दगड मारले गेले. त्यामुळे होणाऱ्या वेदनापेक्षा स्त्री शिक्षणाचे मोल अधिक होते. सावित्रीबाईच्या प्रेरक आधारामुळे आणि मित्रमंडळींच्या खंबीर सहकार्यामुळे 3 जुलै 1851 मध्ये चिपळुनकर वाड्यात त्यांनी शाळा सुरु केली 17 सप्टेंबर 1851 मध्ये रास्ते वाडयात शाळेची स्थापना केली, तर 15 मार्च 1852 मध्ये वेताळ पेठेत शाळा सुरु झाली. विचारांना कृतीत उतरविण्यासाठी लागणारे उदंड धाडस ज्योतीरावामध्ये होते. त्यामुळेच मुलींच्या शाळेबरोबरच पुण्यामध्ये त्यांनी अस्पृश्यासाठी शाळा काढली. समाजाच्या शिक्षण पोहचविण्यासाठी सन 1955 मध्ये रात्र शाळेची स्थापना सर्व स्तरात केली. ज्योतीरावांचे हे क्रांतिकारी कर्मठ समाजाला पैलवणारे नव्हते. त्यांना खिळ घालण्यासाठी काही दृष्ट प्रवृत्तीच्या लोकांनी अघोरी मार्ग निवडला, ज्योतीरावांच्या घरी मारेकरी धाडले, पण सामाजीकता, बंधुतेचा वसा घेतलेल्या ज्योतीबांच्या तेजाने मारेकऱ्यांनी शस्त्रे टाकुन दिली. आणि निर्भयी ज्योतीरांवाना शरण गेले. परंपरेच्या जोखडात अडकलेल्या अंधश्रध्दाळु समाज ज्योतीरावांना विरोध करीत असला तरी इंग्रज सरकारने समाजाला गती देणाऱ्या नवि दिशा देणाऱ्या ज्योतीरावांच्या कार्याचा गौरव केला. 16 नोव्हेंबर 1852 मध्ये मेजर कॅन्डी यांच्या अध्यक्षतेखाली शिक्षण कार्याबद्दल सरकारी विद्या खात्याकडून त्यांचा सत्कार करण्यात आला.

समाजधुरंधर ज्योतीराव फुले :

समाजाच्या प्रगतीसाठी स्त्रिया व शूद्रांना शिक्षण देण्याबरोबरच इतर अनिष्ट सामाजिक प्रथांचे निर्मुलन आवश्यक आहे हे जाणून त्यादृष्टीने ज्योतीरावांचे कार्य सुरु झाले.

विधवा विवाह :

राजा राममोहन रॉय यांच्या प्रयत्नांनी सन 1821 मध्ये सतीची चाल कायद्याने बंद झाली. स्त्रीचे जीवंतपणी चितेवर जाणे यामुळे थांबले, तरी विधवेच्या जीवनात नेहमीच अत्याचाराची विटंबनेची चिंता रचली जायची. त्यात बिचारी होरपळून जायची, विधवेची विटंबना थांबावी म्हणून त्यांनी विधवा विवाहाला चालना दिली. ८ मार्च 1860 रोजी त्यांनी पहिला विधवा विवाह पुण्यात घडवून आणला. शेणवी समाजातील एका विधवा स्त्रिचा विवाह या समाजातील विधुराशी लावून दिला. स्त्री जीवनात क्रांती घडविणाऱ्या या घटनेमुळे त्यांच्यावर टिकेची झोड उठली. पण ते अविचलत राहिले, विधवांना अत्याचारांच्या मालिकेतून मुक्त करुन सुरक्षित जीवनाचा मार्ग त्यांनी प्राप्त करून दिला.

केशवपन निषेध :

विधवा स्त्रिच्या डोक्यावरील सर्व केस काढून तिला विद्रुप करणाऱ्या निर्घृण रूढी विरुद्ध त्यांनी प्रचार केला न्हावी समाजामध्ये जागृती केली. याची परिणिती म्हणजे एप्रिल 1890 मध्ये मुंबईत न्हावी समाजाची सभा झाली. त्यात सुमारे पाचशे न्हावी समाजाची सभा झाली. त्यात सुमारे पाचशे न्हावी व्यावसायिकांनी केशवपनांचे काम करणार नाही, असे ठणकावून सांगीतले. ज्योतीरावांनी सांगीतलेल्या समाज परिवर्तनाचाच हा एक भाग आहे.

बालहत्या प्रतिबंध :

काही वेळा विधवांना अत्याचार सोशीत मातृत्वाला सामोरे जावे लागे. कलंकिता हा बोल लागू नये म्हणून भ्रूणहत्येचे प्रकार घडत असतात. मूल जन्माला आले तर अनौरस संतती म्हणून हिणवले जात असते. हि दुरावस्था टाळण्यासाठी ज्योतीरावांनी सावित्रीबाईंच्या मदतीने आपल्या घरातच बालहत्या प्रतीबंधक गृह स्थापन केले. विधवांची प्रसूती आणि निराधार बालकांसाठी अनाथाश्रम असे त्यांचे स्वरूप होते.

अनौरस संततीला मान्यता :

विधवेच्या मुलाला अनौरस संतती म्हणून त्यांची समाजात अवहेलना केली जात असते. अशा संततीला निर्भय, निकोप वातावरण मिळावे म्हणून त्यांनी प्रयत्न केले. या प्रयत्नांना कृतीची जोड दिली. त्यांनी व सावित्रीबाईंनी अनाथ बालकाश्रमातील यशवंत ला दत्तक घेतले. याला माया ममत्व, सुसंस्कार आणि शिक्षणाचा लाभ झाला. हाच त्यांचा पुत्र पुढे डॉक्टर झाला.

द्विभार्याप्रतिबंध :

पुरुषाने एकापेक्षा अनेक लग्न केल्याने स्त्रीला दुःसह स्थितीला सामारे जावे लागे. अशा परिस्थितीत त्यांनी द्विभार्याप्रतिबंधक चळवळ सुरु केली.

अस्पृश्यांसाठी पाणवठा खुला :

आधी केले. मग सांगितले ही वृत्ती असल्याने ज्योतीरावांनी सन 1868 मध्ये आपल्या घरचा हौदा अस्पृश्यांना पाणी पिण्यासाठी खुला केला. त्याकाळी पाणी या मुलभूत गरजेसाठीही भेदभावामुळे समाजातल्या कनिष्ठ वर्गाला विलक्षण त्रासाला सामोरे जावे लागत होते.

कर्मकांडाऐवजी समाजोपयोगी उपक्रम :

मृत्युनंतर वडीलांच्या बाराव्याच्या वेळी कुठल्याही कर्मकांडात न अडकता ज्योतीराव व त्यांचा भाऊ राजाराम यांनी वडीलांच्या स्मरणार्थ आंधळयापांगळ्यांना जेवण घातले. गरीब मुलांना पाटी-पेन्सीली दिल्या. वडीलांच्या स्मृतीसाठी हा पायंडा त्यांनी सुमारे दिडशे वर्षापूर्वी घातला. समाजापुढे आदर्श ठेवला.

शेतकरी, कामकरी यांचे ज्योतीराव :

शेतकरी आणि कामकरी यांच्या दुःखाचे आणि दारिद्र्याचे निवारण करण्यासाठी चळवळ उभारणारे पहिले पुढारी अशा शब्दात धनंजय किर यांनी ज्योतीरांवाचा गौरव केला आहे. शेतकऱ्यांचा आसुड या पुस्तकात त्यांनी शेतकऱ्यांच्या अवनत स्थितीचे चित्र रेखाटून त्यावर उपाय योजनाही सुचविली आहे. दुष्काळ विषयक विनंती पत्रक काढून त्यांनी मदतीचे आवाहन केले. त्यातुन दुष्काळग्रस्त शेतकऱ्यांविषयी असणारी आस्था अंतःकरणाला भिडते.

सत्यशोधक समाजाची स्थापना :

उच्चनीच भाव, स्त्रीदास्य, मूर्तीपुजा, कर्मकांड इ. गोष्टींचे उच्चाटन करून समताप्रधान समाज निर्माण करण्यासाठी व अंधश्रद्धेचे निर्मुलन करुन वैचारिक कांती करण्यासाठी त्यांनी सन 1873 मध्ये 'सत्यशोधक समाजाची स्थापना केली.

महात्मा ज्योतीरांवाचे वाङ्मय :

आपल्या शैक्षणिक, सामाजिक विचारांच्या प्रसारासाठी तसेच आपल्या कार्याला बळकटी यावी, विचार सर्वदूर पसरावेत या हेतूने ज्योतीरावानी गुलामगिरी, शेतकऱ्यांचा आसुड इ. पुस्तके तृतीय रत्न हे नाटक, पोवाडे, अखंडादी काव्यरचना केली.

अखंडादी काव्यरचना व त्यातील मूल्यविचार :

ज्योतीराव आपल्या अभंगाना अखंड असे संबोधतात. त्यांची बरीचशी स्फुट रचना अभंग वृत्तात आहे. मात्र मानवता, सद्विवेक, सदाचार, समता यातून सार्वजनिक सत्य सांगणारा आपला वेगळा आशय स्पष्ट व्हावा, म्हणून वेगळीक सुचविणारे अखंड असे अभिधान त्यांनी योजिलेले दिसते. अखंडमधून काही मुल्ये व्यक्त होतात. उदा.

*मानवाचा धर्म एकच, धर्मराज्य भेद मानवा नसावे।। सत्याने वर्तावे ।। ईशासाठी ।।
*स्त्री पुरुष समानता :- स्त्री पुरुषांसाठी शाळा त्या घालाव्या । विद्या शिकवाव्या ।। भेद नाही ।।
*श्रमप्रतिष्ठा जगाच्या कल्याणा देह कष्टवावा । कारणी लावावा । सत्यासाठी ।।
*सौजन्यशीलता - परा । लाभ होता संतोष मानीतो । साहय देतो घेतो । सदगुणांचे।।
*सद्विवेक - दृढ मनी धरी सद्विवेकास ।। तेच संतानास ।। सुख देई ।।

एकंदरीत, महाराष्ट्रातील समाज सुधारकांचें अग्रणी असणाऱ्या महात्मा ज्योतीराव फुलें यांचे विचार, त्यांचें आजही दिशादर्शक असे आहे.

सत्य धर्माचीया वाट । जोती दाविली धोपट ।।
अवघे विष्व आपुले घर । सत्य हाची परमेश्वर ।।
सत्याची धरा कास । ज्योतीबाची आण तुम्हास ।।
सोडा तुम्ही वर्ण धर्म । जातीभेद हे पापकर्म ।।
शिकवा विद्या लहानथोर । नाश पावेल घोर अंधार ।।

सारांश :

महाराष्ट्र ही केवळ मर्दाची व संताचीच भूमी नसुन ती विचारवंत व समाज सुधारकांचीही भूमी आहे. अशा या महाराष्ट्रात पेशवाईच्या अस्तानंतर जे थोर विचारवंत होऊन गेलेत त्यांच्यात महात्मा ज्योतीराव फुले यांचे स्थान निःसंशय श्रेष्ठ आहे. महाराष्ट्रात इंग्रजी राजवट स्थिरावल्यानंतरही आधुनिक शिक्षणाची दारे केवळ वरीष्ठ समाजाच्या वस्तीतच उघडत होती. बहुजन समाजाच्या वस्तीत मात्र अजुनही अज्ञानाच्या काळोखाचा राबता होता. परिणामी भारतीय स्त्रि आणि अस्पृश्यादी बहुजन समाज अज्ञान व अंधश्रध्दांच्या डोहात अजुनही गटांगळया खात होता. शतकानुशतकापासून चालत आलेली बहुजन समाजाची ही दैन्यावस्था वरवरच्या मलमपट्टीने संपणार नव्हती. हजारो वर्षाचा हा रोग थातुरमातुर उपायांनी बरा होणे शक्य नव्हते. त्यासाठी आवश्यकता होती तो रोग समुळ नष्ट करणाऱ्या प्रभावी उपचारांची. महात्मा ज्योतीबा फुलेंच्या रुपाने महाराष्ट्रात एक असा निष्णात धन्वंतरी निपजला की त्याने या रोगाच्या मुळावरचा घाव घातला.

महात्मा ज्योतीबा फुलें यांनी 24 सप्टेंबर 1873 रोजी पुणे येथे सत्यशोधक समाजाची स्थापना केली. सत्यशोधक समाजाच्या कार्यकत्यांनी बहुजन समाजात शिक्षणाचा प्रसार केला. शिक्षण घेऊ इच्छिणाऱ्या गरीब विद्यार्थ्यांसाठी शिष्यवृत्ती उपलब्ध करुन दिली. अशा प्रकारे समाजामध्ये शिक्षण विषयक विचार रुजविण्याचे कार्य महात्मा ज्योतीबा फुले यांनी केले.

संदर्भ सूची :

अनसुया कुंभार, त्रिवार वंदन तुम्हा, लातुर : विद्याभारती प्रकाशन.
डॉ. अशोक नाईकवाडे, युगप्रवर्तक महात्मा फुले, गौरव ग्रंथ.
मदन मार्डीकर, इतिहास, मुंबई : हिमालया पब्लिशिंग हाऊस.
उत्तमराव पाटील, ज्योतीपर्व, पृ. 19.

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A Review of Quality Improvement in Higher Education Institutions through IQAC

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Abstract:
The National Assessment and Accreditation Council (NAAC) established IQAC in institutes of higher education, which has resulted in numerous significant improvements in colleges, universities, and institutes of higher education. The IQAC has been integral to the development and maintenance of quality assurance within academic systems. IQAC formulate action plan for performance evaluation, assessment, accreditation, and quality improvement of higher education institutions. The key objective of the (IQAC) is to create a system for educational institutions to consistently improve their academic and administrative performance. The IQAC can advocate measures to improve institutional performance. The article provides a brief overview of the role of the IQAC in higher education quality improvement.

Keywords: IQAC, NAAC, Assurance, Higher Education Institutions (HEIs).

Introduction:
India has one of the world's most extensive educational systems. Access to higher education has improved as a result of the introduction of diverse programmes in new and emerging fields. This sparked considerable concern about the quality and relevance of higher education, as well as the need for the creation of an independent national accreditation agency. As a result, the University Grants Commission (UGC) established the NAAC in 1994 as an autonomous entity. Continuous efforts are required to ensure that the quality is maintained and sustained. As Foster correctly states, "Quality is never an accident," but rather requires "high intention, sincere effort, intelligent direction, and skillful execution." In other words, quality does not come to us by accident, but rather requires continuous efforts on the part of an individual or an institution. NAAC's goal is to make quality assurance an important element of higher education institutions' operations (HEIs). In recent years, there has been an increase in the number of institutions offering higher education in India, as well as the number of students enrolled. In the 21st century, education quality has surpassed quantity as the defining factor. Every higher education institution should strive for quality and excellence. The IQAC's main goal is to create a structure for institutions to improve their overall performance in a conscious and consistent manner. The creation of the IQAC is the first step toward internalizing and institutionalizing quality improvement efforts. The sense of engagement in all of IQAC's constituents is critical to the institution's success. The NAAC has been making constant efforts to improve and sustain quality in higher education by introducing new concepts, guiding principles, and certain metrics of developing quality in institutions of higher learning.

NAAC and IQAC at Colleges and Universities of Higher Education:
IQAC has been established by the NAAC, Bangalore, as a post-accreditation quality maintenance strategy for all colleges and institutions. Because quality improvement is a continual activity, the IQAC must become an important component of the institution's system and work toward achieving the institution's goals, which include quality improvement and maintenance in practically all fundamental parts. The IQAC's main goal is to create a mechanism for consciously and consistently improving the institution's overall performance. This is something that any university or institution should anticipate from IQAC.

The IQAC and Its Purpose:
The IQAC can become an integral element of an institution's system and work toward the goals of quality sustenance and enhancement because quality enhancement is a continual process. The IQAC's main goal is to create a framework for taking consistent and catalytic action to improve the institution's academic and administrative performance. The IQAC should develop strategies for assuring timely, efficient, and progressive performance of academic, administrative, and financial activities in order to promote measures for institutional functioning toward quality enhancement. For quality assurance, continuous improvement, self-assessment, and external peer evaluation

are unavoidable. An institution that understands its strengths, limitations, potentials, and shortcomings is more likely to succeed in fulfilling its educational objective. The IQAC assures that higher education institutions are improving their quality. The NAAC's parameters and guidelines can assist institutions in the formation and functioning of the IQAC.

Strategies:
IQAC will develop mechanisms and procedures for:

- Ensuring timely, efficient, and progressive performance of academic, administrative, and financial tasks;
- Ensuring the relevance and quality of academic and research programmes;
- Ensuring equitable access to and affordability of academic programmes for various sections of society;
- Optimising and integrating modern teaching and learning methods;
- Ensuring the credibility of evaluation procedures;
- Ensuring the adequacy, efficiency, and progress of academic, administrative, and financial

Objectives:

- The IQAC of the College is constituted to achieve the following objectives:
- To develop and progress a heightened level of clarity and focus in institutional functioning towards creation, sustenance and enhancement of quality and facilitate internalization of the quality culture permeating every sphere of the Institution.
- To facilitate the integration of the various activities of the institution and institutionalize the best practices.
- To provide a sound basis for decision making imbibing all the dimensions of service quality to improve institutional functioning.
- To act as a change agent in the Institution.
- To coordinate and improve internal communication to facilitate greater policy implementation and quality assurance towards its stakeholders.

Functions of the IQAC

- Establishing and implementing quality benchmarks/parameters for the College's various academic and administrative activities.
- Assisting in the construction of a learner-centered environment conducive to high-quality education and faculty development in terms of knowledge and technology adoption for participatory teaching and learning.
- Organize for student, parent, and other stakeholders to provide feedback on quality-related institutional processes.
- Dissemination of data on higher education's numerous quality indicators.
- Inter- and intra-institutional workshops, seminars on quality-related topics, and quality circles promotion.
- Documentation of the College's numerous programs/activities, resulting in quality improvement.
- Serving as the College's nodal agency for coordinating quality-related activities, such as the adoption and dissemination of best practises.
- Establishment of a college-wide quality culture.
- Preparation of the College's Annual Quality Assurance Report (AQAR) in the approved format, based on the quality parameters/assessment criteria developed by the appropriate quality assurance authority.
- In accordance with the 2010 UGC Regulations, IQAC will serve as the Documentation and Record-Keeping Cell.

Composition of the IQAC and its Functional Aspects:

Every institution can establish an IQAC under the chairmanship of the institution's head. Aside from the president of the school, the leaders of major academic and administrative units, a few distinguished educators, representatives of local management, and stakeholders may be invited to join the IQAC. It is advisable to select individuals from a variety of backgrounds who are known for their honesty and teaching excellence, as well as their understanding of the institutional environment's realities.
The following is a possible IQAC composition:

- Chairperson: Head of Institution
- Teachers from all levels to represent (three to eight)
- A member of the management team
- A small number of senior administrative officers
- One nomination from each of the following groups: local society, students, and alumni
- Employers, industrialists, and stakeholders each have one nominee.
- One of the senior professors serves as the IQAC's coordinator/director.

The management representative could be someone who understands the institution's goals, constraints, and strengths and is dedicated to its improvement. Representatives from the local society should be of high social standing and have made substantial contributions to society. The coordinator's position is critical in ensuring that all of the members work together effectively. The IQAC coordinator could be a senior/competent individual with experience and exposure to quality issues. The coordinator may have extensive understanding of computers, data management, and their numerous operations, such as communication.

Furthermore, rather of relying on institutional control, the foundation for developing quality assurance procedures and instruments is devotion and commitment to development.

An efficient quality assurance system should:

- make a difference for students, both in terms of added value and measurement of outcomes
- be owned and regarded as valid by the institutions
- be pertinent to higher education's goals
- encourage variety
- should be a cyclical process, not a collection of irregular snapshots
- deal with the issue of standards
- be conducted by peers from around the country and around the world
- be carried out at the subject or programme level
- include international comparative data
- be reported in ways that a lay audience may understand

The IQAC's role in the overall development of the college/institute can be very important. The Principal, as chairman of IQAC, the co-coordinator of IQAC, and the members of IQAC should be able to create a conductive environment in terms of NAAC core elements such as teaching and learning, co-curricular and extra-curricular activities, teachers' academic and professional development, research and consultancy, and students' supportive services, among others. The principal/head of the institute, as well as the IQAC coordinator, should devise a strategy at the start of the academic year and endeavor to implement it as efficiently as feasible. The IQAC should ensure that as many instructors as possible participate in national and international conferences, as well as other research and training initiatives. The IQAC shall also make consistent efforts to provide suitable student support services to the college's students, as well as ensure that the maximum number of students participate in all of these student support services. The IQAC play an important role in the college/academic institution's planning, monitoring, and evaluation. At the start of the academic year, the IQAC should create an academic calendar based on the academic plan of the affiliating university. Teaching and practical schedules, examination slots, guest lectures, tours and excursions, day celebrations and observations, local programmes and institutional programme, industrial visit, co-curricular and extra-curricular and cultural activities/programmes, and research activities should all be included in the academic calendar. Furthermore, IQAC will have frequent meetings with professors and staff to analyze and monitor the academic plan at various times during the year. If you think about it, you can adjust and modify some things whenever and wherever you need to. The IQAC of that particular college/institute will then be able to create a pleasant environment within the campus grounds. The proportion of professors in IQAC formation varies depending on the size and complexity of the institution. The principles provided above are simply suggestions and are intended to assist institutions in carrying out high-quality sustenance operations. The nominated members must serve in IQAC for a minimum of two years and meet at least once every quarter. The meeting must have a quorum of two-thirds of the total number of members. The action taken reports of IQAC must be documented with official signatures and kept in an electronic manner that may be retrieved. It is a good idea to rotate the IQAC coordinator every two to three years to bring new ideas and activities into the institution. Senior administrators, as well as those in charge of institutional services such as the library, computer center, estate, student welfare, administration, academic assignments, examinations, and planning and development, are the best candidates for membership in IQAC. Every year, after one year from the date of accreditation, institutions must submit an AQAR. The minimal institutional prerequisites for volunteering for the second, third, or subsequent cycle's certification are a functional IQAC and timely submission of AQARs. The AQAR may be included in the institution's annual report. In light of

the new methodology, NAAC has released a revised accreditation framework. The new AQAR format's tools and parameters are developed in such a way that preparing an AQAR will make it easier for HEIs to prepare for subsequent accreditation cycles. The IQAC's position can also play a part in bringing about good changes in the college/management. Institute's The IQAC should also organize some orientation workshops for the colleges administrative and other supportive employees so that a sense of responsibility may be instilled in them. The IQAC should also ensure that administrative work is decentralized and that students and staff are treated with respect so that a positive atmosphere can be developed and a positive perception of the college can be established among students, which will, in turn, benefit society. Another important aspect is that IQAC will include other stakeholders like as management, alumni and parent teacher association members, as well as industrial officials.

Conclusions:

IQAC's work has been critical in bringing about numerous constructive developments on and around the college grounds. Furthermore, IQAC has the ability to create a positive academic environment on the premises, ensuring that quality is maintained and improved over time. Because it works to improve and sustain quality, IQAC plays a unique and vital role in enhancing quality in higher education institutions. The sense of belonging and engagement that IQAC can instill in all of its participants is critical to the institution's success. The head of the institution and the IQAC coordinator lead from the front, quality and excellence follow. The IQAC's work is the first step toward internalizing and institutionalizing quality improvement efforts.

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मानवी शरीराचा व्यापार हा प्रामुख्याने अन्नावर अवलंबून असतो. अन्न ही मानवी जीवनाचे अस्तित्व टिकविण्यास आवश्यक अशी प्राथमिक गरज आहे. शरीराची वाढ होणे, झिज भरुन काढणे, उष्णता निर्मिती, कार्यशक्ती हे सर्व अन्नामुळे घडून येते. त्यामुळे आहारात घेतलेले अन्न पोषणदृष्टया समतोल असायला पाहिजे.

समतोल आहार म्हणजे शरीराला आवश्यक असणारे पोषकतत्वे त्या व्यक्तीच्या वयानुसार शरीर स्थितीनुसार, कार्यानुसार तसेचे प्राप्त भौगोलिक परिस्थितीत गरजेनुसार पाहिजे त्या–त्या आहारात कमी कालावधीकरिता शरीर पोषणाच्या भविष्याकरिता तरतूद असणे अशा आहाराला समतोल आहार म्हणता येईल.

मानवाला बऱ्याच जबाबदाऱ्या पार पाडाव्या लागतात. ती मग स्त्री असो किंवा पुरुष.

स्त्रियांच्या बाबतीत पाहिले असता आपण म्हणतो की, स्त्री म्हणजे खरे तर गृहकृतदक्ष महिला, स्त्री ही घरातच असणारी, घरकामे करणारी, करवून घेणारी, मुलांच्या शाळा, कॉलेजच्या वेळा सांभाळणारी, सगळयांचे जेवण, खाणे बनविणारी, पतीराज कामावरुन घरी आले की, त्याच हातात गरमागरम चहा, नास्ता देणारी फक्त घर, घर आणि घरातच असणारी परिस्थितीशी तडजोड करुन निमुटपणे जगणारी, जो काय संघर्ष असेल तो स्वत:शी करणारी तोही मनातच/प्रत्येकाच्या गरजा पुरवताना तिच्या नाकी नऊ येते आणि हे सर्व करीत असताना तिला प्रत्येकाची गर्जी सांभाळावी लागते. येते आणि हे सर्व करीत असताना तिला प्रत्येकाची मर्जी सांभाळावी लागते. त्यामध्ये तिची परिस्थिती अशी होऊन जाते की सोडल तर धावते आणि पकडलं तर चावते. सगळयांचे मन सांभाळताना ती नेहमीच स्वत:कडे दुर्लक्ष करीत असते. स्त्री हीच आरोग्याचा केंद्रबिंदु माणून तिची लहाणपणापासून अखेरपर्यंत जोपासना केली तरी समाजाचा काय तर देशाच्या आरोग्याची पातळी निश्चित उंचावेल. स्त्री ही कुटुंबाचा आहार टरते. तयार करणे, सर्वांना देते. अखेरपर्यंत संसाराचा गाढा ओढते. स्त्री हा समाजाचा आवश्यक घटक आहे. आजकाल त्यात नोकरी करणाऱ्या स्त्रियांचा आकडा वाढत चाललाय त्याचप्रमाणे पुरुषाची सुध्दा घर, नोकरी आणि इतरही बाबतीत फार ओढताण होते. आणि धावपळीमुळे त्यांनासुध्दा त्याच्या आहाराकडे लक्ष द्यायला वेळ नसतो. म्हणून त्यांच्या गरजा व आरोग्याच्या पातळीवर प्रकाश टाकणे आणि त्यात सुधारणा आणणे आवश्यकच आहे.

उद्दिष्टे :–

१) मानवाचा आहार विषयक गैरसमज.
२) मानवाला आहार विषयक सवयी लावणे.
३) आरोग्य चांगले ठेवण्यासाठी आहार विषयक सल्ला.
४) समतोल आहाराच्या कमतरतेचे परिणाम
५) पोषक घटकविषयी विस्तृत माहिती

मानवाचा आहार विषयक गैरसमज :–

मानवाला आपले जीवन सक्षमक करण्यासाठी आहाराच्या माध्यमातून आवश्यक घटक मिळत असताना चुकीच्या पध्दतीने आहार घेतल्यामुळे आजारही निर्माण होतात. आहार कशा पध्दतीने असावा किती प्रमाणात असावा, नेमके काय किती आणि केव्हा घ्यायला पाहिजे आणि आपल्या कामानुसार, शक्तीनुसार कसा आहार घ्यायला पाहिजे, हे त्यांना माहित असायला पाहिजे. शरीर अवयवच्या क्रिया सुरळीत राहण्यासाठी आहार अत्यंत महत्त्वाचा आहे.

या बाबतीत मानवच स्वत:चा शत्रू आहे, असे म्हटले तर वावगे ठरणार नाही. बहुसंख्य लोकांचे खाणेपिणे अवेळी असते. आवडते ते खूप खायचे आणि जे आवश्यक आहे त्याकडे दुर्लक्ष करायचे. प्रत्येक वयात विशेषत:

तारुण्यात प्रवेश करताना, प्रौढावस्थेत आणि वृध्दावस्थेत आहाराबाबत मानवाने अतिशय जागरुक असले पाहिजे. त्यांचा आहार हा त्यांच्या वय, लिंग, कामाचे स्वरुप यावर अवलंबून असायला पाहिजे. परंतु सर्वसाधारण घरांमध्ये यावर विचारसुध्दा होत नाही. त्यामुळे मानवामध्ये विकार वाढत जातात. चुकीच्या आहारामुळे त्याच्या वजनावर परिणाम होत आहे. वनज वाढल्यामुळे ते डायटिंगकडे वळतात आणि त्यामुळे त्याचे वनज कमी होत नाही. उलट आहारातून मिळणाऱ्या पोषक मूल्यांना ते मुकतात आणि त्याचा परिणाम म्हणजे नवीन समस्या निर्माण होतात.

मानवाला आहार विषयक सवयी लावणे :–

- रोज सकाळी एक ग्लास गाईचे कोमट दूध प्यावे.
- नाचणीचे सत्व, खजूर, गव्हाची गुळ घालून पातळ खीर यापैकी पदार्थाचा नाश्ता करावा.
- स्त्रीयांनी पाळीच्या आधी एक आठवडा जड अन्न, रात्री उशिरा जेवण हे कटाक्षाने टाळावे त्यापेक्षा भरपूर तूप घालून मुगाची खिचडी, आमटी, भात, पातळ सूप असा आहार घ्यावा त्यामुळे पाळीचा त्रास होत नाही.
- तुपामध्ये तळून लसणाच्या दोन पाकळया खावयात.
- बहुबीज, अधिक असणारी फळे जसे पेरु, डाळींब इत्यादी खावीत.
- कडधान्ये, तूप, ताक, पालेभाज्या व फळे आवर्जुन खावी.

आरोग्य चांगले ठेवण्यासाठी आहार विषयक सल्ला :–

आपल्या शरीराचे ऐका –

रात्रीच्या जागरणामुळे प्रवासामुळे एखाद्या वेळेस शरीर व्यायामाला विरोध कसा असेल तर त्याचे ऐका त्या दिवशी तुम्ही योगा व प्राणायाम करु शकता.

भुकेच्या वेळेस नक्की खा :–

जेवण पुढे मागे ढकलून नको त्या वेळेस नको ते पदार्थ खाण्यापेक्षा जेवणाच्या वेळा पाळा. काहीच शक्य नसेल तर किमान डाळ, फुटाणे, शेंगदाणे यापैकी काहीही खावे, त्याबरोबरीने नोकरी करणाऱ्यांनी एखादी काकडी, गाजर बरोबर न्यावे.

पोट भरल्यावर खाणं थांबवावं :–

कितीही आवडीचा पदार्थ असला तरी एका वाढव्यानंतर थांबावो. त्यामुळे जास्तीचे उष्मांक पोटात जाणार नाहीत. कॉफी, चहा, थंड पेय यातून मिळणाऱ्या पोषक उष्मांकापेक्षा ताक, पन्हे, कोकम, सरबत, मिल्कशेक इत्यादी पेये घ्यावीत.

स्नायूंवर भर द्यावा :–

स्नायू वाढविण्यासाठी प्रथीनेयुक्त आहार व व्यायाम करावा. तरुणाईत वाढलेले स्नायू वृध्दपणा लांबविण्यासाठी उपयोगी पडतात.

जास्त चरबीयुक्त पदार्थ टाळा :–

तळलेले पदार्थ, प्रक्रिया केलेले मटन इत्यादी पदार्थांवर निर्बंध घालावे. वाफवलेले, कमी तेलावर शिजवलेले ताजे पदार्थ आहारात जास्त असावे. व्यायाम शाळेत जाणे व त्याचप्रमाणे सायकल चालविणे, गड चढणे, पोहणे इत्यादी व्यायाम प्रकारांमध्ये तरुणाईने भाग घ्यावा.

- किमान दोन वेळा नास्ता व २ वेळा जेवण घ्या.
- जेवण गरम घ्यावे.
- वनज ससत तपासावे नवीन अन्न पदार्थाचा रोजच्या जेवणात वापर करावा.
- भाजीचे प्रमाण जास्त असावे. लाल, हिरव्या, पिवळया भाज्या आवर्जून खाव्यात.

समतोल आहाराच्या कमतरतेचे परिणाम :–

- डोळे, नखे, त्वचा, मूत्र, मल इत्यादींचा स्वाभाविक रंग बदलून त्यांना पिवळा, लाल किंवा किंचित हिरवा रंग येतो.
- शरीराचे तापमान वाढते किंवा आतून गरम वाटणे तोंडाची चव आंबट वा कडू होणे.
- चक्कर येणे, झोप कमी घेणे, डोळयासमोर अंधारी येणे, निस्तेजपणा येणे, त्वचा, डोळे, केस यांच्यावरची चकाकी कमी होणे, पचन मंदावणे योग्य पोषण न झाल्यामुळे मासिक पाळीचे विकार, डोळयाखालील वर्तुळे उमटणे.
- सौंदर्यविषयक समस्या
- सतत चहा घेतल्या गेल्यामुळे आम्लपित्ताची तक्रार, अल्सर, बध्दकोष्ठता, ॲनिनियासारखे विकार, पाठदुखी, सांधेदुखी

निष्कर्ष :–

आपल्या राजेच्या कामात सुधारणा करायला हवी. त्यांनी सकाळी भरपूर नास्ता घ्यावा. त्यात अंकुरीत कडधान्य गव्हाची सोजी, अंडी, थालीपीठ, इडली, दोसा घ्यावा जोडीला एक ग्लास दुध किंवा ताक व फळ घ्यावी. पोळी करताना सोयाबीनयुक्त पोळया किंवा नाचणीच पीठ घालून पोळी करावी. कणिक दुधात भिजवावी तसेच टमाटर, काकडी, मेथी, मुळा, गाजर घ्यावे तसेच फळेसुध्दा घ्यावे.

जास्तीत जास्त मिश्र पध्दतीचा वापर करुन स्वयंपाक करावा. दाण्याचा कुट, तिळ कुट, खसखस हे पदार्थ वापरावे. तेल घाणीवरचे ताजे वापरने आवश्यक रिफाईन्ड तेल टाळावित. डाळ शिजवताना त्यात एक चमचा मेथी दाणे आवश्य घालावे. याप्रमाणे थोडेफार बदल केल्यास संतुलीत आहाराचे नियम पुष्कळ अंशी पाळले जातील. जास्तीत जास्त आहार घटक एका वेळी भोजनात असावे. कारण हे सर्व एका टिम प्रमाणे काम करतात. अशाप्रकारे मानवो आपल्या खाण्यापिण्याकडे लक्ष दिल्यास आरोग्य विषयक बऱ्याच समस्या कमी होतील आणि जीवन सुखकर होईल.

संदर्भ ग्रंथ :–

मानव विकास – लिना कांडलकर
पोषण आणि आहारशास्त्र – त्रिवेणी फरकाडे
सकाळ वृत्तपत्र गुरुवार, १६ जुलै २००९
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Smt .Savitabai Uttamrao Deshmukh Mahavidyalay, Digras

Our Inspiration

SHRI SANJAYRAO UTTAMRAO DESHMUKH
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Founder ,Shri Durgamata Bahu-Uddeshiye Kridava Shaishanik Sanstha Chincholi No 2 Digras

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SAU. VAISHALI SANJAYRAO DESHMUKH
Secreatary, Shri Durgamata Bahu-Uddeshiye Kridava Shaishanik Sanstha Chincholi No 2 Digras

Message

I am pleased to know that Smt. Savitabai Uttamrao Deshmukh Mahavidyalay, Digras is organizing One Day Multidisciplinary National Level Conference on Emerging Trends in Higher education and Human Rights on Friday 29th April 2022. To improve the quality of higher education is the need of the time. It has to be more inclusive to the last segment of the society. The institution has to pay valuable contribution to the entire development of the rural and urban students; I hope through this conference the scholars will throw light on this aspect. Information and Technology (IT) based education helps them to learn and gain more. For the faculties, Higher Education should not only to promote Research and innovation but also be an agent of change. I am sure that the conference will gain much attention on the emerging trends of development and modernization of Higher Education.

On this occasion I extend my warm greetings to the organizers and participants of the conference.

Hon'ble Sanjay U. Deshmukh

Ex.State Minister of Sports (MS)

Principal's Message

I am very much happy that our IQAC,Smt. Savitabai Uttamrao Deshmukh Mahavidyalay is going to organize One Day Multidisciplinary National Level Conference on Emerging Trends in Higher education and Human Rights. This National Conference is a type of platform to generate new, innovative, sustainable and strategic ideas on the field of Higher Education. I am very much glad with the theme chosen for the conference which is more relevant and suitable in the present scenario of Higher Education. Today's world is the world of Information and Technology and every corner of the world is touched by its effects. And the higher education is not an exception to it. Inculcation of innovative ideas is indispensable need of Higher Education; which will definitely fulfill by such conference. The present event will play the role of catalyst in this process of innovation and research. I extend my warm wishes and grand success for the conference.

Dr.Vijay M. Gawande
Off.Principal,
Smt. Savitabai Uttamrao Deshmukh Mahavidyalay,
Digras, Dist. Yavatmal

It is with utmost pride and pleasure we place the special issue of One Day Multidisciplinary National level Conference on Emerging Trends in Higher Education and Human Rights. held on Friday 29th April 2022 . It was a venture organised by IQAC, Smt. Savitabai Uttamrao Deshmukh Mahavidyalay, Digras, Dist.Yavatmal run by Shri Durga Mata Bahuuddeshiya Krida va Shaikshanik Sanstha, Chincholi No.2, Tq.Digras, Dist. Yavatmal. Special invitees were the founder of the institution Shri. Sanjayrao Deshmukh (Ex State Minister of Sports, Maharashtra); Dr. Subhash Gawai (Chairman BOS of Political Science SGB Amravati University); Dr. Dhananjay Sontakke (HOD Sociology, Priyadarshani Mahila Mahavidyalay, Wardha); Dr. Sandip Kale (HOD Political Science Yashawant Mahavidyalay, Seloo).

The objective of this conference to give access to academicians, facilities and research scholars to share their genuine thoughts and innovative ideas.For the proceeding of the conference 117 faculties and research scholars contributed by their scholarly, genuine, informative and knowledgeable research papers. An Editorial board comprises of Dr. Tukaram Kamble, Dr Dipak Ulemale, Dr Damodar Dudhe, Dr. Vijay Gawande, Dr. Avinash Jadhav, Dr. Priti Gawande, , Asst.Prof. Goldie Jambhulkar and Asst.Prof. Syed Anisoddine. All these members have been imbibed by the spirit of Higher Education in the context of Multidisciplinary nature of their respective teaching subjects and are committed to the cause.

The present volume contains the literature related to emerging trends in Higher Education, Arts and Humanities, It is the specialty of this volume that it tries to bring the knowledge from all branches of higher education. The editorial board members have faith in the scholarly articles of the present volume will bring change in the higher education through its multidimensional streams and disciplines. The participants discussed various topics of human values, gender issues, environment, Indian polity, economy, history, art, culture, literature and criticism.

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Vermicomposting And Its Importance In Improvement Of Soil Nutrients And Agricultural Crops

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ABSTRACT

The tremendous increase in population, urbanization, industrialization and agricultural production results in accumulation quantities of solid wastes. This has created serious problem in the environment. In order to dispose this waste safely it should be converted effectively. This is achieved by bio-composting and vermicomposting of farm, urban and agro-industrial waste. It is being increasing realized that composting is an environment friendly process, convert wide variety of wastes into valuable agricultural inputs. Compost is excellent source of humus and plant nutrients, on application of which improve soil biophysical properties and organic matter status of the soil. This present review focused on vermicomposting and its importance in improvement of soil nutrition and agricultural crops. This review assesses the following topics: vermicomposting, raw materials of vermicomposting, microbiology of vermicomposting, effect of vermicompost materials in agriculture and physico-chemical properties of soil, and importance of vermicompost. Recycling organic wastes through vermicomposting is being considered as an economically viable solution. Earthworms are considered as natural bioreactors while proliferate along with other microorganisms and provide required conditions for the biodegradation of wastes.

Key words: Composting, Vermicomposting, Earthworm, Organic wastes, Soil nutrients and Agricultural crops.

INTRODUCTION

Composting, generally defined as the biological aerobic transformation of an organic byproduct into a different organic product that can be added to the soil without detrimental effects on crop growth [1]. In the process of composting, organic wastes are recycled into stabilized products that can be applied to the soil as an odorless and relatively dry source of organic matter, which would respond more efficiently and safely than the fresh material to soil organic fertility requirements. The conventional and most traditional method of composting consists of an accelerated biooxidation of the organic matter as it passes through a thermophilic stage (45° to 65°C) where microorganisms liberate heat, carbon dioxide and water. However, in recent years, researchers have become progressively interested in using another related biological process for stabilizing organic wastes, which does not include a thermophilic stage, but involves the use of earthworms for breaking down and stabilizing the organic wastes. Composting is a biotechnological process by which different microbial communities convert organic wastes into a stabilized form. During the process, thermophilic temperatures arise because of the heat released due to biological activityThe treatment by composting leads to the development of microbial populations, which causes numerous physicochemical changes within mixture. These changes could influence the metal distribution through release of heavy metals during organic matter mineralization or the metal solubilization by the decrease of pH, metal biosorption by the microbial biomass or metal complexation with the newly formed humic substances (HS) or other factors.

VERMICOMPOSTING

Earthworms are often referred to as farmer's friends and natures ploughmen. Earthworms are extremely important in soil formation, principally through their activities in consuming organic matter, fragmenting and mixing it intimately with mineral particles to form aggregates. During their feeding, earthworms promote microbial activity greatly, which in turn accelerates the breakdown of organic matter and stabilization of soil aggregates. Vermicomposting is a simple biotechnological process of composting, in which certain species of earthworms are used to enhance the process of waste conversion and produce a better end product. Vermicomposting differs from composting in several ways. The process is faster than composting because the material passes through the earthworm gut, a significant but not yet fully understood transformation takes place, whereby the resulting earthworm castings (worm manure) are rich in microbial activity and plant growth

regulators, and fortified with pest repellence attributes as well in short, earthworms, through a type of biological alchemy are capable of transforming garbage into 'gold'.

Raw materials for vermicomposting

The residues like sugarcane trash, press mud, sugar factory effluent, broiler ash, spent wash, etc, should be bio processed and added to the soil, to complete their natural cycle. Bicycling of these residues through vermiculture biotechnology reduces the use of chemical fertilizers derived from non-renewable sources. "BIOAGRO" compost was produced from the city garbage. By the addition of neem cake, rock phosphate and gypsum in small quantities to this compost "BIOAGRORICH" compost were made. Organic wastes such as poultry manure, cattle dung, pig manure as well as agricultural waste like sugarcane trash were fed to earthworm to hasten the process of decomposition. Karthikeyan*et al.*, reported that the waste consist of decomposable organic matter with high carbon nitrogen ratio. Swati Pattnaik and Vikram Reddy reported that the vegetable market waste is leftover and discarded rotten vegetables fruits and flowers in the market. This urban waste can be converted to a potential plant nutrient enriched resource compost and vermicompost that can be utilized for sustainable land restoration practices.

Microbiology of vermicomposting

Due to inoculation of microorganisms the period of composting was reduced by about 4 weeks. The results also indicate that by utilizing mesophillic cellulolytic fungi, the process of composting a high C/N homogenous material can be accelerated and the quality of the resulting composting can be improved. Various studies also indicated the possibility of augmenting the quality of compost through inoculation with Azotobacter and phosphate solubilizing microorganisms in the presence of rock phosphate.

Edward *et al.,* studies the symbiotic interaction between earthworms and microorganisms in the breakdown and fragment organic matter progressively. The gut isolates included the Actinomycetes, Streptomyces lipmanii and the oxalatedegrading bacterium Pseudomonas oxalaticus and anaerobes have not been enumerated from the worm gut but several nitrogen fixers (Clostridium butyricum, Clostridium beijerinkii and Clostridium paraputrificum) have been isolated from Eiseniafoetida casts, microbial growth was limited by the amount of available carbon immobilization of phosphate in earthworm casts is probably caused by mainly abiotic processes, carbon mineralization by soil microflora fertilizer with glucose and phosphorous was limited by nitrogen, except in freshly deposited casts.

EFFECT OF VERMICOMPOST MATERIALS IN AGRICULTURE

Vermicomposting is a process of biotransforming and stabilizing organic materials (often waste) into humus by the combined activity of earthworms and microorganisms . Earthworms excrete partially digested materials, known as vermicasts or castings, which are more homogeneous in composition than the source material, have reduced levels of contamination, and contain elevated levels of plant growth regulators or symbiotic microbes and organic acids such as humic and fulvic acids . It also resulted in higher content of phosphorus significantly . The casting by earthworms was seen to improve, the soil organic matter and nutrient status, by recycling available nutrients especially N, P, K, Ca and Mg . Application of coir dust coir pith into soil contributes 20.7 kg N, 10.5 kg, P2O5 and 30.8 kg K2O ha annually. Coir pith being a rich potash source also helps to retain moisture in the soil for a long time.

EFFECT OF VERMICOMPOST ON PHYSICO-CHEMICAL CHARACTERISTICS OF SOIL

The composted organic wastes exert variety of physical, chemical and biochemical influences upon the soil faking the soil a favourable substrate for plant growth. It maintains the soil in a proper homeostaitc state. It also removes excessive amounts of heavy metals such as copper and lead and there by served as a means of detroxification. Kumaresan*et al.,* reported that there was a slight decrease of pH due to the organic acids released during the decomposition of the various farm wastes. The application of organic wastes into soil has considerably increased the available K status also. Application of vermicomposting in combination with NPK fertilizers resulted in higher content of total nitrogen compared to FYM in combination with NPK fertilizers or control. It also resulted in higher content of phosphorus significantly (Kale *et al*.,).The casting by earthworms was seen to improve, the soil organic matter and nutrients status, by recycling available nutrients especially N, P,

K, Ca and Mg. Application of coir dust coir pith into soil contributes 20.7 kg N, 10.5 kg, P2O5 and 30.8 kg K2O ha annually.

IMPORTANCE OF VERMICOMPOST

Source of plant nutrients Earthworms consume various organic wastes and reduce the volume by 40–60%. Each earthworm weighs about 0.5 to 0.6 g, eats waste equivalent to its body weight and produces cast equivalent to about 50% of the waste it consumes in a day. These worm castings have been analyzed for chemical and biological properties. Soil available N increased significantly with increasing levels of vermicompost and highest N uptake was obtained at 50% of the recommended fertilizer rate plus 10 t ha -1 vermicompost. Similarly, the uptake of N, phosphorus (P), Potassium (K) and magnesium (Mg) by rice (Oryzasativa) plant was highest when fertilizer was applied in combination with vermicompost.

Improvement of plant growth and yield

Vermicompost plays a major role in improving growth and yield of different field crops, vegetables, and flower and fruit crops. The application of vermicompost gave higher germination (93%) of mung bean (Vignaradiata) compared to the control (84%). Further, the growth and yield of mung bean was also significantly higher with vermicompost application. Likewise, in another pot experiment, the fresh and dry matter yields of cowpea (Vignaunguiculata) were higher when soil was amended with vermicompost than with biodigested slurry.

Role in Nitrogen cycle

Earthworms play an important role in the recycling of N in different agro-ecosystems, especially under jhum (shifting cultivation) where the use of agrochemicals is minimal. Karmegam and Daniel reported that during the fallow period intervening between two crops at the same site in 5- to 15-year jhum system, earthworms participated in N cycle through cast-egestion, mucus production and dead tissue decomposition. Soil N losses were more pronounced over a period of 15-year jhum system. The total soil N made available for plant uptake was higher than the total input of N to the soil through the addition of slashed vegetation, inorganic and organic manure, recycled crop residues and weeds.

Improvement of soil physical, chemical and biological properties.

Limited studies on vermicompost indicate that it increases macropore space ranging from 50 to 500 m, resulting in improved air-water relationship in the soil which favorably affects plant growth . The application of organic matter including vermicompostfavorably affects soil pH, microbial population and soil enzyme activities. It also reduces the proportion of water-soluble chemical species, which cause possible environmental contamination.

CONCLUSION

In recent years, the ecological characteristics and beneficial effects of earthworm have been clearly demonstrated, focused by scientific research. Earthworm's activity influences the rate of soil turnover, mineralization and humification of soil organic matter. Improvement in the consistency of soil texture with a concomitant increase in porosity, infiltration and soilwater retention are other characteristics of worm-worked soils. There are multiple benefits of vermitechnology; low cost production of biofertilizer, environmental management of solid wastes and agricultural residues, enhanced soil productivity, tastier quality food, among others. Vermitechnology also aids in the reduction of soil salinity, soil erosion with less runoff and wasteland development. From this present review, it is concluded that the organic wastes are effectively recycled by microorganisms followed by earthworms and plays a major role in the development of growth and yield of agricultural crops. The nutritive value of compost material is high and the composting process effectively converts the waste product into useful by-product.

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Stress and Women Health

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Abstract

Stress is a reaction to a change or a challenge. In the short term, stress can be helpful. It makes you more alert and gives you energy to get things done. But long-term stress can lead to serious health problems. Women are more likely than men to report symptoms of stress, including headaches and upset stomach. Women are also more likely to have mental health conditions that are made worse by stress, such as depression or anxiety.

What is stress?

Stress is how your body reacts to certain situations, such as sudden danger or long-lasting challenge. During stressful events, your body releases chemicals called hormones, such as adrenaline. Adrenaline gives you a burst of energy that helps you cope and respond to stress. For example, one kind of stress is the jolt you may feel when a car pulls out in front of you. This jolt of adrenaline helps you quickly hit the brakes to avoid an accident.Stress can range from mild and short-term to more extreme and long-lasting. Chronic (long-lasting) stress can affect your mental and physical health.

What are some symptoms of stress?

Stress affects everyone differently. Some ways that chronic or long-term stress affects women include:

Pain, including back pain
Acne and other skin problems, like rashes or hives
Headaches
Upset stomach
Feeling like you have no control
Forgetfulness
Lack of energy
Lack of focus
Overeating or not eating enough
Being easily angered
Trouble sleeping
Drug and alcohol misuse
Loss of interest in things you once enjoyed
Less interest in sex than usual

What causes stress?

People can feel stress from many different things. Examples of common causes of short-term stress include:

Getting stuck in traffic or missing the bus
An argument with your spouse or partner
Money problems
A deadline at work

Examples of common causes of long-term stress include:

Poverty and financial worries. Depression is more common in women whose families live below the federal poverty line.2 Women in poverty who care for children or other family members as well as themselves may experience more severe stress.3,

Discrimination. All women are at risk for discrimination, such as gender discrimination at work. Some women experience discrimination based on their race, ethnicity, or sexual orientation.5,6 Stressful events, such as learning a new culture (for those new to the United States) or experiencing discrimination, put women at higher risk for depression or anxiety.

Traumatic events. Experiencing trauma, such as being in an accident or disaster or going through emotional, physical, or sexual assault or abuse as a child or an adult, may put you at higher risk of depression7 and other disorders.8 Women are more likely than men to experience certain types of

violence, such as sexual violence,9 that are more likely to cause mental health conditions, such as post-traumatic stress disorder (PTSD).

Ongoing, low-level stress can be hard to notice, but it can also lead to serious health problems. If you feel stressed, try these tips to help you manage your stress. If you need more help managing stress, talk to a doctor, nurse, or mental health professional.

How does stress affect women's health?

Some of the health effects of stress are the same for men and women. For example, stress can cause trouble sleeping and weaker immune systems. But there are other ways that stress affects women.

Headaches and migraines. When you are stressed, your muscles tense up. Long-term tension can lead to headache, migraine, and general body aches and pains. Tension-type headaches are common in women.10

Depression and anxiety. In the past year, women were almost twice as likely as men to have symptoms of depression.11 Women are more likely than men to have an anxiety disorder, including post-traumatic stress disorder, panic disorder, or obsessive-compulsive disorder.12 Research suggests that women may feel the symptoms of stress more or get more of the symptoms of stress than men. This can raise their risk of depression and anxiety.1

Heart problems. High stress levels can raise your blood pressure and heart rate. Over time, high blood pressure can cause serious health problems, such as stroke and heart attacks. Younger women with a history of heart problems especially may be at risk of the negative effects of stress on the heart.13 Learn more about stress and heart disease.

Upset stomach. Short-term stress can cause stomach issues such as diarrhea or vomiting. Long-term stress can lead to irritable bowel syndrome (IBS), a condition that is twice as common in women as in men.14 Stress can make IBS symptoms such as gas and bloating worse.

Obesity. The link between stress and weight gain is stronger for women than for men.15 Stress increases the amount of a hormone in your body called cortisol, which can lead to overeating and cause your body to store fat.

Problems getting pregnant. Women with higher levels of stress are more likely to have problems getting pregnant than women with lower levels of stress. Also, not being able to get pregnant when you want to can be a source of stress.16

Do women react to stress differently than men do?

Yes, studies show that women are more likely than men to experience symptoms of stress. Women who are stressed are more likely than men who are stressed to experience depression and anxiety.21 Experts do not fully know the reason for the differences, but it may be related to how men's and women's bodies process stress hormones. Long-term stress especially is more likely to cause problems with moods and anxiety in women.22

How does stress affect pregnancy?

It is normal to feel stressed during pregnancy. Your body and your hormones are changing, and you may worry about your baby and the changes he or she will bring to your life. But too much stress during pregnancy can hurt you and your baby's health.

Stress during pregnancy can make normal pregnancy discomforts, like trouble sleeping and body aches, even worse. It can also lead to more serious problems, such as:

Depression. Depression during pregnancy or after birth can affect your baby's development. Learn more about depression during and after pregnancy.

Problems eating (not eating enough or eating too much). Women who are underweight or who gain too much weight during pregnancy are at risk for complications, including premature delivery (delivery before 37 weeks of pregnancy) and gestational diabetes. Get a personalized recommendation on how much weight to gain during pregnancy.

High blood pressure. High blood pressure during pregnancy puts you at risk of a serious condition called preeclampsia, premature delivery, and having a low-birth-weight infant (baby weighing less than 5½ pounds).

Talk to your doctor about your stress, and try these tips to help manage your stress. Learn about how stress affects breastfeeding too

What can I do to help manage my stress?

Everyone has to deal with stress at some point in their lives. You can take steps to help handle stress in a positive way.

Take deep breaths. This forces you to breathe slower and helps your muscles relax. The extra oxygen sends a message to your brain to calm and relax the body.

Stretch. Stretching can also help relax your muscles and make you feel less tense.

Write out your thoughts. Keeping a journal or simply writing down the things you are thankful for can help you handle stress.

Take time for yourself. It could be listening to music, reading a good book, or going to a movie.

Meditate. Studies show that meditation, a set time of stillness to focus the mind on a positive or neutral thought, can help lower stress.23 In addition to traditional medical treatments, meditation also may help improve anxiety, some menopause symptoms, and side effects from cancer treatments and may lower blood pressure. Meditation is generally safe for everyone, and free meditation guides are widely available online.

Get enough sleep. Most adults need 7 to 9 hours of sleep a night to feel rested.

Eat right. Caffeine or high-sugar snack foods give you jolts of energy that wear off quickly. Instead, eat foods with B vitamins, such as bananas, fish, avocados, chicken, and dark green, leafy vegetables. Studies show that B vitamins can help relieve stress by regulating nerves and brain cells.25 You can also take a vitamin B supplement if your doctor or nurse says it is OK.

Get moving. Physical activity can relax your muscles and improve your mood. Physical activity also may help relieve symptoms of depression and anxiety.26 Physical activity boosts the levels of "feel-good" chemicals in your body called endorphins. Endorphins can help improve your mood.

Try not to deal with stress in unhealthy ways. This includes drinking too much alcohol, using drugs, smoking, or overeating. These coping mechanisms may help you feel better in the moment but can add to your stress levels in the long term. Try substituting healthier ways to cope, such as spending time with friends and family, exercising, or finding a new hobby.

Talk to friends or family members. They might help you see your problems in new ways and suggest solutions. Or, just being able to talk to a family member or friend about a source of stress may help you feel better.

Get help from a professional if you need it. Your doctor or nurse may suggest counseling or prescribe medicines, such as antidepressants or sleep aids. You can also find a therapist in your area using the mental health services locator on the top left side (desktop view) or bottom (mobile view) of this page. If important relationships with family or friends are a source of stress, a counselor can help you learn new emotional and relationship skills.

Get organized. Being disorganized is a sign of stress, but it can also cause stress. To-do lists help organize both your work and home life. Figure out what is most important to do at home and at work and do those things first.

Conclusion:

Sress is a fact of life.stress can be short trem period or longer period .But all stess is not negative . Sress is sometime avoidable but sometimes it unavoidable. Women may feel the symptoms of stress more or get more of the symptoms of stress than men. Selfcare can help women manage stess and empower themselves to make healthy life changes.

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Innovations in Teaching Learning Process in English Language

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Abstract:-

Education is considered to be a powerful and fundamental force in the life of man which is instrumental in shaping the destiny of the individual and the future mankind.Inspite of the fact technological advancements have made headway in the process of teaching learning, it has not been found possible to replace the teacher. If teacher acquire professional competencies and commitment, then high quality learning can be achieved by bringing about positive changes in the cognitive, affective and psychomotor areas of human development of their students. In the context of the present day college realities, aims and objectives of education, a teacher is expected to perform various roles. Therefore teacher should be competent to handle various roles and the teacher ought to be relevant to the demands of teacher's job. In the field of education teachers should equip themselves to perform their professional duties meaningfully Competencies are the key in today's teacher performance. The teaching profession demands teacher to be innovative in their attitudes, flexible in their approach, always updating themselves with their subject knowledge.

English has come to be widely regarded by students and parents like as the language by students and parents like as the language of opportunity, opening the door to higher education, a better job, upward social mobility. A better foundation to the language is sure to entitle the learners to this entire prospect in the modern world. Hence we have to leave behind the traditional teaching process and follow modern and innovative techniques for betterment of students. Teaching in 21st century has been completely transformed from text book learning to modern innovative methods of teaching Use of audio – visual aids, LCD's, Language laboratory, Multimedia tools, Internet etc innovative techniques will be more beneficial for teaching process.

Introduction:-

The English language seems to take over the world in the course of twenty first century and become the global language, English has acquires the enormous importance for worldwide communication. English is also used as the intercontinental language of IT in general The amalgamation of modern IT and globalization make a formidable force for cultural and educational transformation English in India has proved to be a great inspiring force almost in all field. A.C. Bough says that "An artificial language might serve sufficiently the needs of business and travel, but no one has proved willing to make it the medium of political, historical or scientific thought, to say nothing of the impossibilities of making it serve the purpose of pure literature involving sustained emotion and creative imagination. It is the lingua franca of professional communication today.Mostemployement opportunities require an ability to understand and answer questions in English and also to succeed in interviews and at the work place. There is an increasingly utility of the English language in day to day life. In the present scenario the role of teaching and learning of English language has a tremendous importance. Now a days there is a demand of the methods of teaching and learning and it is challenging task.

Traditional class-room based teaching in which students are just passive recipients of information provided by a teacher has commonly been replaced. Living in the technological age, a wide range of tools which boost the effectiveness of second language teaching and help to avoid boredom and the routine of using only a course book can be observed in the classroom.In the theoretical part, six of them- Whiteboard, Smartphone, Skype, Blogging, Podcasts and Online games which, in our opinion, have mostly changed English language teaching and learning will be presented.

Theoretical Part

English language teaching is evolving all the time following the technological development. However, which technological innovation have had the strongest impact on teaching English? Six of them were selected which seem to be the most important ones.

Smartphones

Mobile phones enables learners to access educational materials anywhere and anytime using internet technologies. Some features of mobile devices are that they are generally cheap, portable and

flexible. Therefore mobile technology seems to be very attractive to learners and usable in the learning process. Mobile phones have several applications that can be useful in the teaching learning process, including general software, such as Word, Excel and Power point and other applications such as language learning, mathematical problem, solving software etc. Mobile phones for younger generation is not only phone or text but mainly for taking pictures, playing games and downloading different apps. Such applications can be used for that focus on general or concrete knowledge, vocabulary, listening comprehension and speaking. Google Translate is definitely the app that everyone who learns or teach foreign languages should have on their phone, It can translate almost all the languages, not just English, and can be used in many activities. It has wide usuage either when being abroad, travelling or working on a project outside the classroom. Google Docs is a free-wed-based application where the files and spreadsheets are created, edited and stored online. This enables viewing of files offline, use your device camera to scan in paper documents, access pictures and videos from Google photos.

Whiteboard:-

Interactive whiteboards have become more and more prevalent in the classroom over the years. And it is no wonder, the benefits are vast and offer teachers new, inventive ways to demonstrate core and supplemental concepts. As children become more familiar with smart technology at home, the classroom is catching up and teachers are using the benefits of technology to their advantage Using this interactive whiteboards, teachers have much more opportunities for learners to engage. Most of the learners are visual, they use colourpictures, images to organize, separate and learn information so the existing curriculum can be supported by videos, moving diagrams, stories hence teacher can increase student interest by this tool.

Skype

Skype was released 15 years ago in 2003, but its potential for teaching English is undoubtable. It is an easy and inexpensive way which gives students and taechers an opportunity to connect with the outside world without leaving their seats. In the language classroom, learners can contact native speakers everywhere in the world and fine tune their English language skills. Learning becomes more authentic, inspirational and engaging when it transcends the walls of the classroom. Skype can be used to provide a variety of authentic language experiences, including an interview with an English author or the international collaborative projects other classrooms. Moreover, it does not have to be used only for developing speaking skills. Function of instant messaging and chatting is great for students who need to practice writing and reading skills.

Podcasts

A podcast is an audio or video file which is produced in a series and could be broadcast via Internet or downloaded to a computer or mobile device. In terms of language teaching, students can listen to existing podcasts and to improve listening comprehension or to create their own podcasts and to practice speaking skills. There are many existing resources that can be used for language learning purposes. Podcast are released by broadcasters from all over the world and ars primarily intended for native speakers, also language learning podcasts are focused on the specific area of language e.g. vocabulary, colloquial language, idiomatic phrases or grammatical structures. Podcasts can be created by students on their own, or as a group, introducing some interesting personal information, stories or books and film reviews. All they need is computer, the internet and a headset. More the learners practice podcast texts, rehearse them and record them the more proficiency will come in their speech.

Blogging

As podcasts can serve as a great tool for improving learners listening and speaking skills, blogging mainly focuses on the area of reading and writing. A blog is a frequently update website that often resembles an online journal. Interms of English language teaching class blog could be used as a shared space in which teacher and students can actively participate on building its content. Blogging builds confidence, self-expression, autonomous learning and providing a space in which even the shyest student can participate. With the classroom based blogged activities, assignments can require the student blogger to communicate closely with a specific group of student bloggers. Its multimedia features, simple web publishing interactivity and ability to support cooperative can effectively facilitate language teaching and learning. It is seen that the role of teacher and classmates is crucial when students upload their posts on the blog and receives comments and feedbacks from their teachers, they feel highly motivated and learning is much more effective.

Online Games

Online games are perceived as the source of entertainment, als they can be used for teaching English. The learners are eager to solve the problems, answer the questions and complete the mission to go to the next level. By doing this it is seen that English students playing online language games tend to learn more appropriately, could retain the new words for longer period of time. If the games are fun, relaxing, motivating and confidence boosting the learners interest will increase. Among the most popular ,'The Grammar Doom' is an adventure style game where learners explore secrets hidden within an old, magical temple.

Conclusion

In this changing scenario of the world, learning is also changing. The entire world is at the finger tips. Technology helps teacher to create visual aids for teaching, improving access to resources, such as online literature, libraries, review and comment on student work more efficiently, integrated video clips into presentations and broaden choices for students to demonstrate learning. The realization that "technology is essentially" important without creative and imaginative application. Therefore it is important that the language teacher should shoulder the task of making technology interactive, interesting and learner friendly.

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Women, Peace And Security

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Abstract

On women, peace and security on 23 October 2000 that afforded an opportunity for the members of the Council to discuss the impact of armed conflict on women, and the role of women in peace processes, with women representatives of non-governmental organizations (NGOs) from various part of the world. They presented the experiences of women and girls in armed conflict and also raised the concerns of grass-roots movements of women committed to preventing and solving conflicts, and bringing peace, security and sustainable development to their communities.

Introduction

On 31 October 2000, the Security Council adopted resolution 1325 (2000) on women, peace and security, which builds on the Presidential Statement of 8 March 2000 and a series of Council resolutions on children and armed conflict, the protection of civilians in armed conflict and the prevention of armed conflict. On 24 and 25 October 2000, the Security Council held an open discussion on women, peace and security, in which 40 Member States made statements supporting the mainstreaming of gender perspectives into peace support operations and the participation of women in all aspects of peace processes. The discussion followed an Aria Formula meeting. They presented the experiences of women and girls in armed conflict and also raised the concerns of grass-roots movements of women committed to preventing and solving conflicts, and bringing peace, security and sustainable development to their communities.

In resolution 1325 (2000), the Security Council highlights the importance of bringing gender perspectives to the centre of all United Nations conflict prevention and resolution, peace -building, peacekeeping, rehabilitation and reconstruction efforts. The resolution invited the Secretary -General to carry out a study on the impact of armed conflict on women and girls, the role of women in peace-building and the gender dimensions of peace processes and conflict resolution. The present study has been prepared in response to that invitation. (See Annex for the full text of the resolution).

I. Objectives and focus of the study

The study draws on existing research, and includes inputs from the United Nations, its specialized agencies, funds and programmes. Member States, scholars, and local and international NGOs. The preparation of the study was overseen by the Special Adviser of the Secretary -General on Gender Issues and Advancement of Women in cooperation with the Inter-Agency Task Force on Women, Peace and Security. In order to ensure that the study reflects a balanced range of experiences, and draws on as many regional perspectives as possible, a Review Group was established which provided additional inputs and reviewed drafts of the study.

While many actors, including international and regional organizations, Member States and civil society, are involved in peace and s ecurity issues, the study focuses on the activities of the United Nations, and its specialized agencies, funds and programmes. It provides an overview of current responses to armed conflict by the United Nations system. Examples presented in the study are meant to be illustrative rather than comprehensive.

II. Impact of Armed Conflict on Women and Girls

Understanding the impact of armed conflict on women and girls requires attention to four specific themes. First, women and girls tend to experience conflict differently than men and boys. There is growing awareness of the gender differences and inequalities during war and in post-conflict reconstruction. Yet it is misleading to set up a dichotomy that locates women and men in totally different spheres. Women and men share experiences and are intimately connected to each other through their families and communities. Women often see their needs and interests as interwoven with the needs and interests of their male partners and other family members.

A. Violence against women and girls

Women and men often do different types of work, frequently as a result of prescribed gender roles, and may be exposed to different threats through this work. Women tend to be responsible for

the care and nurture of the family and thus shoulder heavy burdens. Collection of firewood or water often puts young girls and women at risk of dangers, which include kidnapping, sexual abuse and exposure to landmines.

B. Health of women and girls

Women and girls are wounded and killed in armed conflict just like men and boys. Women and girls also face health threats that stem from biological differences. For example, the physical vulnerability of women and adolescent girls is higher than that of men and adolescent boys due to their sexual and reproductive roles.

C. Socio-economic dimensions

Women and girls who remain in conflict zones may find themselves with few options apart from working for warlords and criminal militias or entering into exploitative informal economies. Indentured servitude and other forms of forced labour may evolve along gender and generational lines.

Displacement: women and girls as refugees, returnees and internally displaced persons

Each phase of displacement, including initial displacement, flight, protection and assistance in refugee and displaced persons camps, resettlement and reintegration has different implications for female and male refugees and IDPs. For example, women and girls may be forced into providing sexual services to men and adolescent boys in exchange for safe passage for themselves or their family or to obtain necessary documentation or other assistance.63 Children are at an increased risk of becoming separated from their parents, families or guardians. Girl children who become separated from their parents may face the risk of sexual abuse and being forced to serve in fighting forces and groups.

D. Disappearance and detention

While the last 15 years have revealed the specific vulnerabilities to sexual violence in armed conflict, there has been less emphasis of the effect of armed conflict, such as detention and disappearances. Women and girls have "disappeared" in numerous conflicts in the last decade, including in Bosnia and Herzegovina, Croatia, Kosovo and Rwanda.

E. Challenges to gender roles and relations

One of the ongoing discussions around women and armed conflict relates to the potential of building more equitable gender relations in postconflict societies. It is argued that war breaks down traditions and communities but also opens new spaces for women.

III. International Legal Framework

International law provides a framework of protection for individuals affected by armed conflict. International humanitarian law, the body of law which comes into operation at the outbreak of international or noninternational armed conflict, regulates the conduct of hostilities and protects those who are not taking part in hostilities or are no longer doing so. It is the area of law that is of primary relevance to the protection of women and girls during armed conflict. International human rights law is also applicable in times of armed conflict, and is of particular importance in the context of internal armed conflict, where international humanitarian law may not apply. International criminal law has also come to assume increasing significance in relation to crimes against women and girls during armed conflict, in particular crimes of sexual violence. The protections offered by the provisions of international refugee law are also of relevance to women and girls prior to, during and in the aftermath, of armed conflict.

A. International humanitarian law and human rights law

International humanitarian law consists of both conventional and customary rules, the principal conventional instruments of relevance to the protection of victims of armed conflict being the four Geneva Conventions of 1949 and their two Additional Protocols of 1977, which deal with international armed conflicts and non-international armed conflicts respectively.1 International humanitarian law is binding on both States and organized groups.

B. Redress for women and girls for conflict-related abuses

At the international level, the main avenues of redress for women and girls who have experienced conflict-related abuses are through claims of war crimes, crimes against humanity and genocide.

C. Reparations for victims of conflict

There are several legal avenues for victims of armed conflict to pursue claims for compensation. First, compensation may be payable by a State that is in breach of its obligations under international law. It is a wellestablished principle of international law that a State must make reparation (which can include the payment of compensation) for its internationally wrongful acts.

D. Protecting refugee and internally displaced women and girls

International legal protection for refugees, IDPs and returnees, is provided by international human rights law, humanitarian law, and, increasingly, criminal law. Provisions within refugee law further strengthen the international legal regime protecting women and girls during times of armed conflict which are of particular significance in the aftermath of conflict.

E. Challenges

A comprehensive legal framework exists at the international level to provide protection to women and girls during armed conflict and its aftermath, and this legal framework has been increasingly responsive to the experiences of women and girls in this context, in particular where sexual violence is concerned.

IV. Peace Processes

Peace processes consist of a complex range of informal and formal activities. Informal activities include peace marches and protests, intergroup dialogue, the promotion of inter-cultural tolerance and understanding and the empowerment of ordinary citizens in economic, social, cultural and political spheres. These activities are conducted by a range of actors, such as United Nations entities, international, regional, national and local organizations, and grass-roots organizations, including peace groups, women's groups, religious organizations and individuals.

A. Involvement of women and girls in informal peace processes

At the global level, women have long been active in peace and disarmament issues. Individually and in groups, women have lobbied for the goal of disarmament. The interest of women and girls in becoming involved in peace processes often stems from their experiences of armed conflict, whether prima rily as victims or as armed participants.

B. Involvement of women and girls in formal peace processes

While there are many positive results of women's work for peace in informal peace processes, they are seldom included in formal peace processes. Women are usually not represented among decision-makers and military leaders, the usual participants in these process.

C. Responses and challenges

Within the United Nations, the Department of Political Affairs (DPA) is the designated focal point for peace-building and has a mandate to identify potential or actual conflicts, to monitor political developments worldwide, and to provide early warning of impending conflicts and analyzes of options for preventive action.

V. Peacekeeping Operations

In response to the increasing complexity of crises, peacekeeping operations deployed since the early 1990s have become multifaceted. Tasks assigned to United Nations peacekeepers are no longer limited to military activities and peacekeeping efforts are not directed only at parties to a conflict. Peacekeeping operations may include monitoring of human rights, police functions and the development of institutions supporting the rule of law. They may also include the creation of State administrative structures, assistance in the conduct of elections, the repatriation of refugees, mine action programmes, and the delivery of humanitarian aid.

Conclusion

War, violent conflict, terrorism and violent extremism have differential and devastating consequences for women and girls. In the face of this, women are all over the world are leading movements for peace and to rebuild communities, and there is strong evidence suggesting that women's participation in peace processes contributes to longer, more resilient peace after conflict. Yet, despite this, women remain largely invisible to, and excluded from, peace processes and negotiations.

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Advance Teaching Methods and Strategies

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Asso. Professor (S.S.S.K.R. Innani Mahavidyalaya, Karanja lad)

Have you ever thought about how each classroom teacher's things differently? In Modern Era we answer what are teaching style's, why are there multiple teaching style's, what are the different styles and which style work the Best Today's?

Teaching styles also called teaching methods, are considered to be the general principals, educational and managements strategies for class room instruction.

Once we understood that everybody learns differently, it became obvious that there need to be different teaching styles to accommodate the learning styles.

- **Why have different teaching styles?**

Everybody learns different ideas at different times at different pace's. some people can learn something on the first try after being told what to do where as other's might need to have hands on experience in order to learn and possibly repeat it a few times to really get the hang of things.

Different teaching styles (methods) are necessary because the students needs to be able to learn what the teacher is teaching other words it can also depends on college mission statement. The classroom demographics, the educations as philosophy of the teacher and most importantly the subject area.

- **Types of Teaching Method's**

There are five main types of Teaching Styles and Methods

- **Lecture style method**

Also known as the Authority method involves sitting and listening to the instructor speak about a pre assigned topic while the students take notes and memorizes to the best of their ability what is being said. This is the popular style in Schools and Universities due to its lack of allowance of student participation and inability to meet individual needs in this method sitting and listening to the instructor speak about a pre-assigned topic while the students takes notes and memorize to the best of their ability what is being said.

- **Coaching Style Method**

Also knows as the Demonstrator Method, the Demonstrator Method tries to maintain authority in the classroom, even so, instead of using only a verbal lecture to give information and teach, this style coached students using gateways like multimedia presentations, class activities and demonstration's. For subjects like music, art's and physical education subjects demonstration styles is perfect because is usually necessary to acquire a full understanding of the subject. Interaction between teachers and students to solve a difficulties in teaching.

- **Activity Based or Action method Style**

Is also known as the Facilitator Style tries to encourage Self Learning through peer-to-teacher learning. Teacher's ask students to questions rather than give them the answer to developing a deeper understanding of the topic by using self discovering and develop problem-solving skills. In this method teacher interacts with students on an individual basis, which can be difficult with a large number of students.

- **Group Method or The Delegator Style**

Commonly used for school subjects that require group work, lab based learning or peer feedback for e.g. Science Classes and Certain Language Learning Classes. The teachers act as a delegator. However some people consider other styles to be more pro active due to the fact that the group method removes the teacher from a position of authority.

- **Hybrid Method**

Also known as a blended method, integrated teaching style that incorporates personal preferences, individual personalities and specific interests into their teaching. It used in subject like English, Science based because it's easy to incorporate extra curricular knowledge into developed, deeper knowledge of a particular topic. It criticized that this method weaken's the learning process because the teacher tries to be all things to all students.

- **Teaching Style Inventory**

Teaching style can also categories in four parameters

1) Teacher – centered approach
2) Students centered approach
3) High-tech material use
4) Low-tech material use

In student centered approach to learning teachers and students share the focus and interact equally while the teachers still maintain authority.

One another method to use is Inquiry Based Learning which makes the teacher more of supportive figure.

In teacher centered approach to learning the students put their attention on the teachers students work alone, and collaboration is prevented. This is the useful method in theory quite paying full attention to the teacher while being able to make individual decisions.

- **High-tech Approach Teaching Method**

In modern day many colleges and classes are taking advantage of the recent technology. Which has enabled us to developed High-tech Approach. In comparatively traditional method which is mostly used in High-tech technology. But if there's a slow internet connection it's near impossible to use this method.

Inquiry based learning can involve technology by asking the students a questions about world and they have to do some research. The findings could be presented in the forms of a website, self made videos or power points.

Some colleges or teachers may not enjoy or have the money for High-tech learning and instead, they opt of a Low-Tech Approach is known as a tactile learning of Hands-on learning. This is a teachers centered approach that uses the concept of Multiple Intelligences. instead of lectures, students used physical activities to learn. For e.g. drawing, role-playing and building.

Phytoplankton Diversity Of Sonala Dam, Sonala, Dist. Washim, Maharashtra

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Absract:

Phytoplankton community structure, composition and species diversity in aquatic ecosystem are determined by several physico-chemical parameters. Spatial and temporal variations in phytoplankton distribution are widely affected by thehydro-chemical and physical factors. The productivity of an aquatic environment is directly correlated with the density of plankton. The plankton population in any aquatic system is biological wealth of water for fishes and constitutes a vital link in the food chain.The present paper mainly focuses on the study of phytoplankton of Sonala dam, Sonala, Dist. Washim.The members of Chlorophyceae, Cyanophyceae, Bascillariophyceae and Euglenaceae were observed in water samples atfour different stations of dam. The highest number of genus Oscillatoria (84), Euglena (81), Pinnularia (73) and Spirogyra (58) are observed in different water samples.

Keywords: Phytoplanktons,Water pollution,Diversity, Sonala dam

1. Introduction:-

Plankton is a general term for those organisms that drift or swim feebly in the surfacewater of ponds, lakes,streams, rivers, estuaries and oceans. Phytoplankton are autotrophs and belonging to first trophic level. They are the most important component of trophic structure which helps in transfer of energy to higher trophic levels. Phytoplanktons are primary producer community and consist mainly of algae such as diatoms, dinoflagellates and variety of forms from other divisions of plant kingdom. The phytoplankton, in a water body, is an important biological indicator of the water quality. Phytoplanktons are the major primary producer in an aquatic ecosystem which is grazed by zooplankton [Sharma].

Plankton is the most sensitive floating community which is being the first target of water pollution, thus any undesirable change in aquatic ecosystem affects diversity as well as biomass of this community. The measurement of planktons productivity helps to understand conservation ratio at various trophic level and resources as an essential input for proper management of reservoir.The primary production of organic matter is in the form of phytoplanktons which are more intense is reservoir, lake than in rivers [Mahor]. Phytoplanktons are the grass of lakes and oceans and most species have worldwide . Most of phytoplanktons are not visible to naked eye but when concentrated are responsible for the characteristic greenish colour and reduced transparency of some lake waters.The scientific management of water body for its healthiness and fish production require a thorough understanding of its trophic structure, their population characteristics and the nature of nutrient cycling with a view to achieving optimum fish production[Deorari]. The present study is aimed to determine the diversity of phytoplankton in Sonala Dam in Washim district, that can help to sustainable development in many points of view.

2. MATERIAL AND METHOD

2.1 Study Area

The study area of Sonala dam is located at 77^0, 12', 30" Longitude and Latitude of 20^0, 19', 00" in Sonala village of Washim district in Maharashtra (India). It is an earthen dam with 19.20 meter maximum height and 446.90 hectares of submergence with 132.50 square kilometer of catchment area. The reservoir is constructed in the basin of Adan River, a tributary of Godavari River. In the view of human activities, four sampling stations have been selected around the dam.

2.2 Method:

Surface water samples were collected from fours stations. 100 liters of surface water samples from selected sites was filtered through a plankton net of bolting No 20 (76 µm mesh size)and filtrate samples were fixed in 1 litre plastic bottle with 5% Lugol's solution which helped to arrest cell activity, for sedimentation and better staining. The samples were stored in the laboratory for overnight

sedimentation and the supernatant 900 ml of water was siphoned and 1 mlsub sample was used from the remaining 100 mlhomogenized sample for quantitative and qualitative estimation. The qualitative estimation or identification ofphytoplankton was done with the help of keys given by Smith , Agarkar (1975), Adoni , Michael and Sharma ,Edmondson (1963), Dhanapathi and Altaff while the quantitative estimation of phytoplankton was done by "lac keys" dropping method using the formula.

3.Observations:

The water samples are collected from the four different stations of Sonala dam. Thesewater samples were observed under microscope. The different types of phytoplankton are reported and observed. The phytoplankton's mainly belongs to class Cyanophyceae,Chlorophyceae, Bacillariophyceae and Euglenaceae etc.The genus like S*pirogyra, Coelastrum, Pandorina, Scenedesmus, Volvox, Chara, Nitella, Chlamydomonas, Nostoc, Oscillatoria, Spirulina, Lyngbya, Oedogonium, Navicula, Pinnularia, Nitzschia, Cymbella,*
Gomplonema, Gyrosigma, and *Cyclotella* etc. were observed.

Table No. 1

Sr. No.	Class	Type of phytoplankton	Number of phytoplanktons in different sites of dam			
			Station 1	Station 2	Station 3	Station 4
1	Chlorophyceae	Spirogyra	14	13	15	16
		Scenedesmus	05	03	07	06
		Pandorina	04	04	03	05
		Coelastrum	08	05	06	07
		Volvox	10	12	10	11
		Chara	02	01	01	00
		Nitella	01	01	02	01
		Chlamydomonas	10	8	9	15
2	Cynophyceae	Nostoc	07	05	03	04
		Oscillatoria	18	20	24	22
		Spirulina	06	02	02	03
		Lyngbya	12	10	08	09
		Oedogonium	05	04	03	03
3.	Bacillariophyceae	Navicula	15	12	18	17
		Pinnularia	18	20	18	17
		Nitzchia	12	12	10	11
		Cymbella	04	02	02	02
		Gomphonema	01	01	00	00
		Gyrosigma	00	00	01	00
		Cytotella	02	01	02	01
4	Euglenaceae	Phacus	00	01	01	01
		Euglena	20	18	22	21

4. Discussion:

The water samples were collected from the four different stations of Sonala dam. During the observation highest number of algae was observed from Cyanophyceae (Oscillatoria), Euglenaceae (Euglena), Bascillariophyceae (Pinnularia) and Chlorophyceae (Spirogyra).

There are 6500 species of Chlorophyceae recorded worldwide by Singh (1960). Phytoplankton diversity appeared as paradox Hutchinson (2007). The relationship between phytoplankton diversity and environmental factors has great importance in an assessment of pollution status Buric et.al. (2007) the phytoplankton in a particular water body was essential for choosing an appropriate method for maintenance of desired ecosystem, Perkyatko et.al. (2007). Bhivgude et.al.

(2010) observed Chlorophyceae is a dominant species than other zooplanktons noted by Prescott (1939). Barhate (1985) considered that high percentage of dissolved oxygen is favorable for growth and development of Cyanophyceae. Phytoplanktons are primary producer and very useful tools for the biomonitoring of water body, Stoermer (1977). In the present paper the highest number of genus reported from four different stationsare Oscillatoria (84), Euglena (81), Pinnularia (73), and Spirogyra (58) etc.

CONCLUSION

Plankton communities exhibit a major biotic component of an aquatic ecosystem an emphasis has been given to identify various plankton species as indicators of particular type of water pollution. Prasad and singh (1958) emphasized the importance of biological survey in monitoring water quality which is dependent on qualitative and quantitative composition of aquatic population. The most important effect of organic pollution in a water body is due to enrichment of nutrients and total number of algal species. There is a clear correlation between organic pollution and blue green algae and also with certain diatoms like melosira sp. (Palmer 1969). During the present study the most pollution tolerant species of *Oscillatoria, Euglena,Pinnularia and Spirogyra* were recorded.

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Reforms & Welfare by Rajarshee Shahu

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Abstract:

For the all-around advancement of the backward classes some development policies were framed by RajarsheeShahuMaharaj. Such as removal of communal barriers on admissions to institutes of higher education, reservation of 50 percent in public sector to backward classes in 1902, abolition of most of the Vatandari and Balutedari system, 1917, introduction of free and compulsory education, built up community base hostels, etc.

Key words: welfare, reform, shudra, slavery, emancipation, etc.

RajarsheeShahu's keen eye and stern voice and noble aim of establishing a State administration for the welfare of all castes and communities guided them. He issued orders to recruit people from all castes on merit basis. He must have read the works of Mahatma Phule like BrahmanacheKasab (Priestcraft Exposed, 1869) and Phule's text Slavery, 1973. As these books described how the public services in British India were monopolized by certain upper castes like Brahmins and how they oppressed and exploited all other communities and particularly Shudras, the workers and peasants; ShetkaryachaAsud (Cultivator's Whipcord, 1883); SarvajanikSatyadharmaPustak, 1891 and other works. He must have also watched the great reforms introduced in Victorian and Edwardian England.

Here is a quote from RajarsheeShahu's speech available while laying the foundation stone of the Maratha building on 15th April 2019. As he said, 'To give all people a chance to advance in Social, Industrial, Educational and Administrative matters and learn to discharge their due share of responsibility, is what I call communal representation. I deem it my duty to help and encourage those who have fallen behind and accordingly I do lend a helping hand to those who are downtrodden. Parents do not see much necessity to look after such of their children, who having become of age are able to take after such of themselves. They pay more regard to such of their flock as are undeveloped and cannot stand on their own legs. To some of these they only give their support and others they carry on their shoulders. This is apparently a case of discrimination; but only fools can blame such parents. I do nothing more than copy such wise parents when I give greater facilities and greater encouragement to the backward and the depressed classes. I liberally entertained them in State service, given them Sanads to practice and having directed them to the fountain of learning I cherish hopes of their early salvation. I feel it an injustice to see my efforts in the cause of elevating the non-Brahmins interpreted to mean enmity to the Brahmines.

Some Brahmines who are professional politicians argue that communal representation is a way of dragging back the Brahmins from their advanced position. This is plainly a mistake. We acknowledge the eminent place which our Brahmin friends have reached. What we urge on them is while you can run; we can hardly walk, for we have not yet learned to stand on our legs. To save us from the trouble of walking you are pleased to carry us on our shoulders. You thank you for this kindness; but pray, consider that the effect of your kindness would be to make us perpetually maimed. If you do not let us learn to walk through trial and error we shall never learn to do so. Admire and encourage us while we are rising and falling in our efforts to walk but put not obstacles in our way. Our endeavors are motivated by our desire to stand independentlywithout a support. Therefore do not misunderstand us''.

The most spectacular and enduring legal measures undertaken by ShahuMaharaj were in the field of education. He regarded modern education as the foundation for the economic, social and political progress of the people. He resisted proposals of certain All India leaders for political reforms on the ground that until the masses were educated, no economic or political reforms would be real or effective and political power would only lend to make the rich and exploitation castes more powerful in suppressing and oppressing the masses.

He vigorously tried to spread universal education, irrespective of caste and creed. He was a pioneer in providing facilities for education at all levels to all communities by starting the movement

of Hostels, by encouraging drama, music and art and by enacting various measures from time to time for the benefit of the masses and particularly the backward and untouchable castes.

The following notification was issued in 1902-

"Endeavors have been made in recent years in the Kolhapur State to foster and encourage the education of all classes of the subjects; but so far His Highness regrets to have to record that those endeavors have not in the case of the more backward classes met with the success that was hoped for. His Highness has had the matter under very careful consideration and has come to the conclusion that this want of success is due to the fact that the rewards for Higher education are not sufficiently widely distributed. To remedy this is to a certain extent and to establish within the State an incentive to the backward classes of His Highness's subjects to study up to higher standard. His Highness has decided that it is desirable to reserve for those classes a larger share of employment in the state service than has hitherto been the case

In pursuance of this policy His Highness is pleased to direct that from the date of this order 50 per cent of the vacancies that may occur shall be filled by recruits from among the backward classes. In all offices in which the proportion of the backward classes is at present less than 50 per cent the next appointment shall be given to a member of those classes.

A quarterly return of all appointments made after the issue of this order shall be submitted by all heads of departments. For the purpose of these orders the backward classes shall be understood to mean all castes other than Brahmins, Prabhus, Shenvis, Parsees and other advanced castes".

In 1913, the following order was passed-

"Notwithstanding the efforts that are being made for the spread of Primary Education among the backward classes, the progress hitherto made has not been satisfactory. With a view therefore to accelerate the pace, His Highness the ChhatrapatiMaharajsaheb has been pleased to order that every village in the state should have a school conducted by a person of the caste to which the majority of the villagers belong. In order to induce suitable persons to do the work, His Highness thinks it necessary to have the school masters in the list of hereditary village servants holding alienated land for the performance of their duties…".

Cambridge University conferred the degree of LLD on RajarsheeShahu on 10th June 1902 for his interest and achievement in the field of education and culture. A grand reception was given to him on 12th June 1902 at the Winchester College at Cambridge. In fact RajarsheeShahu was the leader of the dumb millions of India, in his great and outstanding efforts to educate them. He became the leader of leaders in educating the masses. RajarsheeShahu once said:

"The social differences are based upon the mere accident of birth; find no sanction from religion in any other country except ours. The ugly aspect which these social distinctions wear is most plainly reflected in the treatment which has been meted out to you by men of the higher castes. Is it not a disgraceful thing that you who are our brethren should be regarded as untouchables and should be treated in a way for less respected than cats, pigs and dogs? The principle of untouchability, I venture to think, is a recent addition to the religious scriptures which govern the life of the Hindus…".

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New Trends in English Language Teaching in India

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Abstract:

This article examines the most recent trends in English language teaching in India. English is the only valid language that everyone can understand all around the world. It is undeniable that English has become a need in today's world. It is required in various aspects of life. English has emerged as the most important global language in this era of globalization. It's difficult to teach English as a second language. It makes no difference what your background or level of experience is. Before independence, British instructors educated Indian students. Their educational methodology was comparable to that of English-speaking countries. However, after they departed India, the English language's flavour began to fade gradually in India. Language experts are working very hard these days to establish the best methods for teaching English. Mobile phones, laptops, tablets, and smart phones have become an integral part of our daily lives, and references to everything are readily available thanks to the fast internet connection. English language instruction (ELT) has changed dramatically in recent years, particularly in the last ten years.

Keywords: resent trends, globalization, methodology, ELT

Introduction:

Since the establishment of the East India Company in 1612, Indians have had interaction with the English language. However, after the British acquired control of the country, the language began to spread. English was established as a medium of instruction at all levels of education in 1813. Reformers such as Rajaram Mohan Roy recognized the value of English and saw it as a vehicle for modernization and independence. This gave English a foothold in India. Although Indian independence altered the standing of English, it had little impact on its use in Indian life or education. The language of rulers was no longer English. However, it remained the language of the elite. The English language has grown in prominence in India throughout the last four centuries, expanding even quicker in the last couple of centuries due to the language's importance in international communication. The English language is regarded as a crucial instrument for worldwide communication as well as other fields such as education. English teachers must access the open and flexible platform of e-learning and stay current to be competent and survive in this ever-changing sector of English language education. Web 2.0 services, video lectures, podcasts, tablet computers, and mobile apps can help English teachers make learning more open, effective, and massive, as well as fast and user-friendly.

Historical / Traditional Trends of English Language Teaching:

The English language teaching tradition has undergone significant changes, particularly in the twentieth century. This tradition has been practiced in language classes all across the world, in various variations, for centuries, perhaps more than any other discipline. Here are some historical or classic English language teaching trends.

1) Grammar-Translation Method: Grammar-Translation Method is India's earliest English teaching method. This method stresses both listening and speaking skills, as well as pronunciation and grammar accuracy. The Classical Procedure is another name for this method. This Classical method was renamed the Grammar Translation Method in the nineteenth century. The classroom interaction in this strategy is solely focused on the target language.

2) Direct Method: The direct method is also known as the natural method. It was developed in response to the grammar-translation technique and is intended to immerse the learner in the target language's domain in the most natural way possible. The main objective is to instill complete command of a foreign language.

3) Audio-Lingual Method: The Audio-lingual Method is a method of foreign language teaching which emphasizes the teaching of listening and speaking before reading and writing. The major type of language presentation is dialogue, and drills are the key training techniques. Mother tongue is discouraged in the classroom.

4) Communicative Language Teaching: Communicative language teaching (CLT), or the communicative approach (CA), is an approach to language teaching that emphasizes interaction as both the means and the ultimate goal of study.
5) Content & Language Integrate Learning: Content and Language Integrated Learning (CLIL) has become the umbrella term that describes both learning a foreign language while studying a content-based subject and learning a foreign language while studying a content-based subject.

Current / Emerging Trends of English Language Teaching:

1) Web 2.0 Tools: Web 2.0 tools are free digital programs that can be used for creating and sharing student-generated projects and products. They are interactive, multi-purpose, easy-to-use digital platforms that encourage students to collaborate or create and share individualized response products. Social networking sites, blogs, wikis, video sharing, and web apps are all examples of Web 2.0 features. Online 2.0 allow the average web user to create social networking profiles or personal blogs, and readers can remark directly on a page, which was not previously possible.
2) ICT Tools: ICT tools are the most up-to-date technology, equipment, and concepts utilized in Information and Communication Technology interaction between students and teachers. We all know how quickly technology evolves, and newer, more cost-effective, and more powerful technologies will continue to emerge with potential applications in education. At the same time, data demonstrates that ICTs are employed in schools for the duration of the technology's functional life, regardless of whether newer, more cost-effective, and powerful technologies arise.
3) Blended Learning: Oxford Dictionary Definition of Blended Learning: a style of education in which students learn via electronic and online media as well as traditional face-to-face teaching. Blended learning is a method of instruction that mixes face-to-face and online learning. Each (both online and offline) should ideally complement the other by utilizing their respective strengths.
4) Embodied Learning: Embodied learning is an educational method that has been around for a while in (primary) education. This method involves not just an intellectual approach to education, but also the entire body. One can think of e.g. doing math's while throwing small bags of sand to each other.
5) Flipped Learning: Flipped Learning is a pedagogical approach in which direct instruction is moved from the group learning space to the individual learning space, resulting in a dynamic, interactive learning environment in which the educator guides students as they apply concepts and engage creatively in the subject matter.
6) MOOCs: Massive Open Online Courses (MOOCs) are free online courses available for anyone to enroll in. MOOCs are a cost-effective and flexible method to learn new skills, enhance your career, and present high-quality educational experiences to a large audience. MOOCs are used by millions of people around the world for several reasons, including professional advancement, career change, college preparation, supplemental learning, lifelong learning, corporate eLearning & training, and more.
7) Google Classroom: Google Classroom is an all-in-one teaching and learning environment. Educators can use our simple and secure solution to organize, measure, and enrich learning activities. Google Classroom is a free programme available to schools, non-profits, and individuals with a Google account. Classroom makes it simple for students and teachers to communicate both within and outside of the classroom. Classroom helps you establish classes, distribute assignments, communicate, and keep organized while saving time and paper.
8) Google Forms: Google Forms is a free tool provided by Google (Google Workspace). It's simple to use and one of the most straightforward ways to collect data and store it in a spreadsheet. Google Forms began as a component of Google Sheets in 2008, two years after Sheets' initial release. You could insert a form into a spreadsheet, format it on a separate page, and view the results on another sheet. It was simple, but it served its purpose. Over time, Google added more capabilities to Forms, and in early 2016, it became its independent app. Today, you can create and manage forms at docs.google.com/forms, which includes templates and one-stop access to all of your forms.
9) Mobile Assisted Learning: Mobile learning, also known as M-learning, is a new way to access learning content using mobile devices. It's possible to learn whenever and wherever you want, as long as you have a modern mobile device connected to the Internet. The use of mobile technology at anytime and anywhere by learners makes it a crucial component of education.
10) Computer Assisted Learning: Computer-assisted learning is the technique of employing computers and computer programmes to assist students in their learning. Traditionally, the term

applied to stand-alone computer applications that aided in the reinforcement of subjects taught in schools.

11) Video Platform and Social Media: Students can gain much needed daily input and turn frequently mindless scrolling into a more meaningful activity by watching 'Study Lessons' on Netflix and using Instagram to build language learning skills, or by just following key hashtags such as #learnenglish.

Learning Outcomes and Recent Trends in English Language Teaching:

- Understand the meaning of e-content
- Get the inspiration and learn the importance of readily available applications and websites.
- Get an idea to create a quiz, questionnaire, student feedback forms and activity participation forms on particular topics of the content.
- Acquire knowledge about various educational resources for classroom teaching and learning.

Conclusion:

All over the world, the student-centered English language teachers seem to have realized that gone are the days when teachers reigned their class with all monopoly where the students remained as passive. There is rethinking regarding the growing interest in implementing the basic educational goals. Having realized the need of the hour; the English teachers convene different types of conferences and seminars to create a platform and get to know the upcoming ideologies in the ELT and also upgrade themselves professionally. Recent trends in teaching English in India have failed to acquire widespread acceptance. It continues to frighten the students due to stiff curriculums and huge syllabus for those who speak regional tongue but love to do extremely well in English. We provide Recent Trends in English Study in India in this research. The study also examines the importance of English studies concerning the absence of teachers in English studies.

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Terrorism And Human Rights

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Abstract :-

I think terrorism is the cancer of mankind if is cureless sore to humanity it always shows its barbaric face to world by its horrifying and diabolic acts with passing time this monster up grading itself with lethal venom. Mostly terrorist activities are performed on the pretext of religion but I confirm neither religion nor its books provokes for such inhuman acts. Anywhere in the world terror only can give bloodshed and destruction. Terrorists don't think about anything they just want to terrify mankind 26/11, 9/11, parliament attack, horrified daily routine of J & K condition of northeast, naxalism in Maharashtra, bleeding of Iraq and Syria, massacre of innocence in Peshawar and recently episode of Charlie. Hebdo tell the destructive saga of terrorism. The Purpose of this essay is to consider the impact on human rights of the recent rise in the importance attached to, and the perceiveddanger arising from, violent acts of terrorism. By 'human rights' is meant the law, practice and scholarship that has grown up around a subject that has enjoyed huge attention over the past 60 years, beginning with the new international order that was put in place at the end of the Second World war and exploded into public view even dramatically with the end of Cold War in 1989. If the half-century that followed the signing of the Universal Declaration of Human Right by the vast majority of the nations of the world in 1948 can without exaggeration be described be described as an 'age of human rights' then it may well be the case that next 50 year (and beyond) will in due course with equal validity be capable of being described as an 'age of terrorism' or- if one is skeptical of the empirical foundations of the claim- at very least an 'age of counter-terrorism'.

Introduction :-

Terrorism and human rights are inter-related to each other because when one starts other violates. Terrorism is global concern today and in true sense it has relation with the almighty. I have taken this topic only because I have been working of on this topic since when I lost near ones in the terror attacks from 1993 Bombay, 2002 Gujrat, 2004 and 2006 in Mumbai and the latest one in November 26 in different areas of Mumbai. Truly, this topic does not need a proper introduction but what it needs is a proper and right full stop. Terrorism itself is an attack on human rights. The direct linkage between terrorism and human rights was first recognized by world Conference on human Rights in Vienna, 1993, of the Vienna declaration and its program of Action stipulates that "acts, methods and practices of terrorism in all its form and manifestation as well as linking in some countries to drug trafficking are activities aimed at the destruction of human rights. Some Vital question of ethics, human rights, and value by means of dialogue between law and literature. Terror or terrorism has never been far from the consciousness of poetic culture since French Revolution and philosophers such as Burke and Kant were grappling contemporaneously with the curious compulsion to words terror of the modern age. Terrorism is a deliberate and systematic murder, maiming and menacing of innocent to inspire fear for political ends. Terrorism according to me is a product of fanatical violence perpetrated generally in order to realize some political ends to which all humanitarian and ethical beliefs are sacrificed. It is a use of force, threat, and a violence method to combat to achieve certain goals that is aim to induce a state of fear in the victim, that it is ruthless and against humanitarian norms and that publicity is an essential in the terrorist strategy.

Defining terrorism :-

Terror and terrorism can be viewed either from the perspective of the person of the person who applies it or from the perspective of the person subjected to it. As Hegel observed that about the master slave relationship, the possibility exchange of roles always exists. Applied terror and terrorism as function of domination alters the human relation between the parties. Hegel sees this as a dialectical exchange with social as well psychological complications.

The relation between the forces of terror as instrument of state. Terror here is in the service of the state. There is evidence that no human being can terrorize another human being without an exaltation which is the Jacobean's thought of "virtue". Terrorism by unofficial group against the

targets another state or within the state, if promoted or condoned by a government, may raise issues which are unlawful use of force by the state. Terrorism is a means to to those fanatics who uses this as one of the most valuable weapon against all the combined forces against it.

Factors of Terrorism :-

This is a question which everyone has an answer and each answer varies from one another. This shows that how people are concerned about this threat, its effect in all spheres of life. In my project I will be dealing with various promote terrorism at large. These are

- Economic aspect
- Political aspect
- Social aspect
- Religious aspect
- Ideological aspect

Politics of Terrorism in India :-

The political systems are facing a major paradox at present. It related to the stability of the nation-state which, with its unprecedented military strength and large panoply of other security arrangement, has grater chances of fending off internal opponents and external aggressors. Thus the governments, in their eagerness to secure and maintain a desired degree of obedience and loyalty, have frequently directed institutionalized violence their own citizenry as well as against other communities under their control.

Role of Police And National Human Rights Commission :-

In this chapter I will be dealing with the way police is been acting on these crucial and sentimental issues. The human rights violation in the custody and steps taken by human rights commission and media both print and electronic. India has had its share of terrorist attacks and is learning to live with it. Today, not only Mumbai and Delhi are high on list of terrorist but hi-tech hubs like Bangalore and Hyderabad have already begun to been on the terrorist radar. If Mumbai was shaken by the serial blasts in the local trains which left hundreds dead and injured and Delhi was in stock at the bombing that took place in crowded shopping area, the attacks in India's emerging high tech hubs like Bangalore and Hyderabad in previous years came as an eye opener. Today what is new is the act that the terrorist has become more sophisticated and knows how to attack in places where it would hurt the most. Take for instance, the Mumbai blast orchestrating the seven blasts in a public transportation system is not the job of the amateur. The terrorist knows that India is globally emerging as an economic superpower in IT, BPO and even conventional businesses. Over the last couple of year, intelligence agencies have continually sent warning signals of militant groups planning attacks in Bangalore and the going on high alert. Bangalore, where all the global giants like Intel, IBM, Motorola, HP, have development offices, has more than 1,500 It and BPO firms. Several Indian defense, space and scientific research institution institutions are also based in Bangalore.

Three Reasons For Terror Activities :-

1) Terrorist feel they are sending signals to international investors that India may be the safest place to be.
2) A significant number of US, firms have operations here and when the militant tendency is to get back at the Us, this is the one way of getting back.
3) Security is not as tights as it could be.

The terrorist is looking at the other means of attack i.e. through technology. There are many companies here that are working on mission critical applications for US firms. To hit back at the US government, all you need is to cripple the operations through technology and data theft.

We have in the last 15 odd years, seen 5 different kinds of terrorisms emerging in India. Of course the most significant one is the one we seen on account of cross border insurgency in Jammu and Kashmir. The second is the Punjab which we saw in the 1980's and was fortunate to have been able to overcome. The third we saw a severe problem in the south from the LTTE. Problems in the north east is continuing and the latest to join these categories is the kind of terrorism spread along the various parts of central India the Maoist insurgency from Andhra Pradesh.

Conclusion :-

Terrorism is generally understood to refer to the deliberate killing of civilians in order to spread fear through populations and force the hand of political leaders. Militant groups seeking to

overthrow authority have frequently used exemplary violence to intimidate political opponents via public opinion. States too have employed terror to intimidate and repress their opponents. In this new context, human rights organizations – and particularly non-governmental organizations (NGOs), to which this report primarily refers – were challenged to be relevant. Critics claimed they had misread the profound threat that modern terrorism poses and spent too much time defending the rights of people accused of terrorist offences and too little advocating the rights of victims. Such criticisms have been particularly directed at international human rights organizations.

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Cyber Material

Stress And Women Health

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Abstract-

Stress is a condition that women experience at one time or another, whether they are under pressure at work, managing a busy household, or dealing with personal issues. Those who are unsure of how to deal with stress at risk for developing both mental and physical alignments. fortunately, several stress management techniques can effectively reduce feeling of worry anger and frustration in a safe and healthy manner

Key words- stress, stress management techniques

Introduction

Today women work along with men in every fieldand scale great heights. They work in the defense force, drive the railway engines, work in the police department, custom hospitals, airlines, tourist agencies and almost every other field. They work with more tenacity, with more devotion. They have to walk on tightropes at home and at the workplace, yet they organize the job and the household extremely well.

In India women occupy a secondary position. However, much we talk about liberation of women, in the middle-class families, household is a priority. They look after the children, aged in - laws, sisters- in- laws, relatives and occasional guests. She has no time left for herself and her health problems are ignored. Women who have shift duties and find it extremely difficult. They do not attend to their health unless there is an urgency and they get a final warning of the disease that they are suffering from.

Women in the city who work do the same thing in their busy schedule of household management; they rush to their places of work trying to avoid late marks. In the evening when they come back, they look after children's studies, then cook a meal to get ready for the next day. They keep on rushing, be it nature's call or their own meal. In the morning they prepare breakfast for everyone but they have no time to eat it. They have a good meal in the afternoon which results in gastric conditions, constipation and weight increase. They have no time for exercise or hobbies as a result there are lots of physical complaints, back pain, lower back pain, stiff joints, obesity etc.

Scarcity of time is one major reason for stress in today's life. Knowledge of managing stress should increase your awareness and management of self, thus improving chances of success leading to tranquility and happiness in your life.

It must be understood that management of time and space are absolutely critical to the success of women. regardless of the definition of stress. Most people understand it as physical, mental or emotional strain or tension. Most of us experience that in movement of extreme danger some changes come about in our body system. Sensing the extreme danger weather use Si e a speeding truck heading towards you when you are crossing the road or a terrorist entering the bus or train you are travelling in, the brain gets the danger signal and respond to this signal by pumping certain hormones and adrenalin in our blood stream. This is done through use of adrenal glands which release rich burst of sugar from the liver. This also activates the pituitary and thyroid glands. All this happens within a few microseconds. These changes happen as if a lightning charge of energy has been exploded within a person which helps him to respond to the danger, in our examples, by running away from the speeding truck, by jumping out of the bus or train and so on. This is known as a fight orflight mechanism. To protect us from threats, nature has given us stress hormones. which instantly and spontaneously go in to action and release huge energy. It is common energy. It is common experience that when we are angry and fretting and fuming, the color of your face changes, our eyes bulge out and become red, face muscle become stiff, throat gets Choked some kinds of forth comes in the mouth and we clench our fists or use them to strike things around us. We are generally not aware that our headache indigestion, high blood pressure, fatigue, diabetesis all because of the stress we have in our lives.

Develop the right attitude towards time -

women do not have right attitude towards time. They do not understand that minutes and hours are very important in today's world and unless one is able to extract 60 seconds out of a minute, success is not possible. So having the right mind -set about time is all most important.

Develop the right attitude towards stress -

It should be understood that stress is part of living and only a dead person is without stress. So, expect that you would be under some stress whether you like it or not, so worrying about stress does not reduce stress, it increases it. Problems whether personal or related with workplace, have to be handled and worrying about them reduces the chances of their getting sorted out. Hence do not worry but do everything within your control to handle the problems. Look at the positive aspect of stress, there are many situations werestress acts as positive motivator. Stress of filing a report by media person or the stress of meeting the deadline of the publisher by author or even the stress of reaching office or venue of meeting at the appointed time, stress of student getting through in an important examination and so on, can help individuals in meeting their targets for achieving their goals. This is part of purposeful or meaningfulliving. Worrying about such things and generating stress most must be avoided. Many persons inflict or impose stress on themselves as if they are seeking stress in every situation. Anxiety and worry are part of personality of certain individuals. If you ask them how they are the most likely response of such persons would be as if they are favoring the almighty by going through their lives.

Simple techniques to manage stress -

1) learn to put things in right Perfect Two perspective
2) face the risk rather than running away from it
3)work on your strengths
4) identifying your stress factor
5) stop what you are doing when you feel stressed
6) get counselling from an expert
7) Device Your own time management program
8) device your own physical activity program

The basic principles of time saving-

1)**Make a clear list of priorities -**

Start with making a list of jobs to be finished in the day. The phone calls to be made, people to meet with, jobs waiting at the table, meeting to be attended etc., list them all in your diary. A glance will make you take note of priorities and then start- you are sure to finish in time.

2)**Tackle only one job at a time-**

Doing many things simultaneously is not easy. The very idea is based on distraction. What'smore, none of the jobs gets finished at the end of the day. You are left with so many loose ends that confusion reigns and delays happen with a domino effect. One job at a time gets your undivided attention and the job is done, all loose ends neatly tiedup. Even simpler task like watching TV while eating and then picking up the newspaper to scan quickly should be avoided.

3) **Try to delegate responsibility to your helpers-**

The irregularity of schedules compels us to seek help from others. Such help is forthcoming only If we have groomed closeness with them. Never take yourself for a superman. Recognize your own feelings and do not hesitate taking help.

4)Always do a cross check-

For every major meeting check about everything right from whether the meeting is still on and it's time and place. You can do it by pressing a few buttons without leaving your seeds but it will save you a lot if there is any last-minute change in the program.

5) **Speed up your act -**

We, especially, are always stressed for time thanks to the unpredictability of our duties. It always helps to speed up and finish before time.

6) **Avoid jobs less important-**

When the diary shows chock- a- block appointments, routine phone calls can always wait. Postpone them for some other time. Organize more jobs such that they can be tackled on the way to the office. Also, the household jobs that afforded to wait can wait, like sending goodwill messages.

7)**Plan the days' time table-**

Our day has to follow the jobs chalked out for it. If they are well planned with a proper order, wastage of time is minimum. To achieve all this, first buy a diary. Every Sunday sit specially to plan a whole week out, on the lines given below -

a) Write down the list of jobs to be finished
b) Note down the telephone calls to be made and for what purpose.
c) List the jobs in the order of priority.
d) Time to be reserved for the family
e) Time for exercise.
f) Bedtime etc. as per individual requirement.

Women can manage stress by practicing healthy self-care strategies for coping with stress. Examine your negative stress signs in each of these six life areas: physical, emotional, mental, occupational, social, and spiritual. Here are some suggestions.

Physical. Exercise, practice relaxation techniques (yoga, meditation, listen to relaxing music), eat healthy (for example, follow the Mediterranean diet), schedule leisure time, get enough sleep (7 to 9 hours/night).

Emotional. Express your emotions, repeat positive emotions, and work toward a healthy self-esteem.

Mental. Have a positive outlook, realistic thinking, resilient attitude, and be creative.

Occupational. Establish doable goals, identify home-work balance, set limits.

Social. Strive to maintain loving relationships, establish healthy boundaries, and stay connected with friends.

Spiritual. Find your meaning/purpose, focus on gratitude, stay in the present moment.

Personal wellness plan

A personal wellness plan with goals can be helpful. Goal setting can seem overwhelming. These practical steps can get you started.

- Review life areas. Examine the six life areas for potential change.
- Identify goals. Be aware of what needs to be done and set goals.
- Be specific. Know what you want to accomplish.
- Set measurable targets. Move in the right direction.
- Be realistic. Set smaller goals that are achievable.
- Identify resources. Use helpful resources to reduce potential problems.
- Set time limits. Consider reasonable, specific time limits.
- Evaluate progress. Make changes as needed.

Conclusion-

Women will continue to experience stress in their lives. A personal wellness plan with built-in periods of recovery and self-care can help women manage stress and empower themselves to make healthy life changes.

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An Assessment on a Journey of Dalit Women from Subjugation to Assertion of Human Rights

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ABSTRACT

In a rigid patriarchal social set up of India, Dalit women suffered immense oppression, not only through caste, but gender also. It is asserted that being a Dalit is a reason enough to be ready to face a life full of miseries, sufferings, degraded and dehumanized way of life. Society being a humanitarian should shudders at the realistic and authentic accounts of the life conditions of the Dalit women, her suppressions, humiliations, sufferings, dilemmas, threats and exploitation. there was the abiding need for structuring/framing the laws to secure the rights of the human beings. The United Nations Organization (UNO) laid down a common standard of achievements for all human beings with The Universal Declaration of Human Rights (UDHR) on 10 December 1948.The untiring efforts by Dr.Ambedkar in their upliftment, struggle of Dalit women's movement to bring them in mainstream, their systematic and determined efforts to realies Dalit women's rights at the wake of modernization have brought a more positive change in their situation, life and work. Their voices are increasingly becoming audible and asking attention of the government and society and their struggles are visible nationally and internationally through the feminist federations, organisations, conferences and their movements. The paper tries to analyse and assess the journey of dalit women from the previous century to their present position in asserting their rights and their involvement in various social, cultural platforms to identify their rights and fight for their human rights.

Key Words: Dalit women, social stratification, academic avenues, human rights.

In a rigid patriarchal social set up of India, Dalit women suffered immense oppression, not only through caste, but gender also. It is asserted that being a Dalit is a reason enough to be ready to face a life full of miseries, sufferings, degraded and dehumanized way of life and being a woman means a life of exploitation in the name of sex, a weak variety of human subordinating to man. Society being a humanitarian should shudders at the realistic and authentic accounts of the life conditions of the Dalit women, her suppressions, humiliations, sufferings, dilemmas, threats and exploitation. Her sufferings are two-fold: she has her own share of universal suffering as a woman and additionally, she is the victim class based exploitation such as social, religious, economic, and cultural as a Dalit woman. Furthermore, opportunities and avenues available to her for voicing her grievances and agonies are very few. Society is still following the age old laws formulated by Manu which generates the concepts like purity and pollution. In the social tier Dalit women received the last position in terms of life, respect, dignity, self esteem and the self worth and this sanction was achieved by implementing the dominant ideology in the cultural , social system and transmitting to the succeeding generations by cultivating among them the fixed patterns of opinions and outlooks.

The institutionalization and cultural marginalization of Dalit women is the result of their fear to challenge the hindu social order. In his speech at the gathering of women at the Mahad satyagrah, Dr. Ambedkar articulated the linkage between caste and gender. In directing the attention of Dalit women to specificities of women's subordination by caste, he underlined the simultaneity of their subordination as Dalits and as women. Dr. B. R. Ambedkar not only championed the cause of social awakening and justice for the deprived, downtrodden and unprivileged sections of the Indian society but also worked tirelessly throughout his life to challenge the authority of orthodox Hindu social order that upheld unjust gender relations in an institutionalized manner. Dr. Ambedkar recognized the power of education to put an end to this exploitation. Women's education was the central concern for him. He brought dalit women in the social- political movement by consciously organizing conferences and arranging meetings. His aim was to give them the power of speech, to make them establish their own identity and help them realize their personality. Several women activists responded to his call and large number of women stared taking part in his movement. They began to express their views in an honest and forthcoming manner. As a result of the awareness among women, women's association was established in 1928 in Bombay preceded by numerous conferences held for and by women all

over Maharashtra. In 1942, the establishment of *'Dalit Mahila Federation'* (Dalit Women's Federation) appeared as a major step towards initiating movement for their liberation. In one occasion, Dr. Ambedkar addressed them:

"Learn to live in cleanliness, stay away from all bad habits and vices .Give education to your children; create a sense of ambition in them. Instil in their minds the feeling that they will become great. Do not press them to marry until they have attained the capacity to bear the responsibility that comes with marriage. Those who marry should remember that it is wrong to produce many children. Even if no facilities are available to you, mothers and fathers have a responsibility to keep their children in a good condition. Every girl who marries must be ready to stand by her husband's party. Not as his slave but in a relation of equality, as his friend. If you behave according to this advice you will lift up not only yourselves but Dalit society as well, and increase respect for yourselves and for the community."[1] The emergence of Dalit literature is acknowledgement of the sorrows and the sufferings of the exploited transformed into creative structure. Dalits and Dalit women began to express their sorrows in the form of literature. They stand up to assert their rights in the caste dominant Hindu society. Many Dalit women writers use personal testimony to bring home to the readers the experience of public humiliation, sexual exploitation, hazardous, demeaning and menial jobs and being looked down upon, because they do so.

Hence, there was the abiding need for structuring/framing the laws to secure the rights of the human beings. The United Nations Organization (UNO) laid down a common standard of achievements for all human beings with The Universal Declaration of Human Rights (UDHR) on 10 December 1948.The untiring efforts by Dr.Ambedkar in their upliftment, struggle of Dalit women's movement to bring them in mainstream, their systematic and determined efforts to realies Dalit women's rights at the wake of modernization have brought a more positive change in their situation, life and work. Their voices are increasingly becoming audible and asking attention of the government and society and their struggles are visible nationally and internationally through the feminist federations, organisations, conferences and their movements. Since 1920s, Dalit women record their presence in the gatherings and were active in anti caste and anti- untouchability movements, non Brahmin movements initiated in 1930s. In 1942, 25,000 Dalit women attended the All India Depressed Classes Women Conference in Nagpur. Several organizations such as National Federation of Dalit Women,All India Dalit Women's Forum along with many state forums were formed by them to fight for their rights and to ensure the treatment of the society with dignity as human beings.[2] Not only the national level awakening programs were held by these organizations but their call of human dignity reached to the international level as Dalit women delegation was sent to 1993 World Conference against Racism and the World Conference on Women held in 1995.[3] Dalit women participated in critiques of New Economic Policy (NEP) at the 2003 Asian Social Forum and the 2004 World Social Forum, 2006 National Conference on Violence Against Dalit Women was organized in New Delhi. This conference passed the "Delhi Declaration," which laid out how Dalit women faced "disparities in the prevalence of violence, poverty, and sickness" and described the way that dominant castes were responsible for these disparities. During these conferences Dalit women advocated that discrimination based on caste and its effects on the solidarity of the society. Dalit women's involvement can also be seen in the social movements of the 1970s and early 80s.[4]

It is this period of awakening that dalit women started recording their lives and challenges through writing poetry and autobiographies. Issue of caste at the wake of modernization was first brought forth by Dalit women from their own perspective. This was a marked change from the various feminist movements in the 70s and 80s which did not address caste issues. It is a welknown and well accepted fact that Dalit literature is the direct product of Dalit agitation and movement. According to Wikipedia it "is an attempt to articulate unheard, unspoken voices" Dalit women's writing brings issues of caste identity to feminist literature. They can be viewed as protest narratives against the exploitation of Dalit women by upper caste people, as well as the internal gender hierarchies within Dalit families. By establishing Dalit women's identity as that which is affected by mutual and intersecting structures of caste and gender, dalit women's autobiographies reinforce the Dalit feminism as an intersectional category.

Meena Gopal rightly said that "today, as Dalit women's day-to-day existence undergoes major changes due to urbanization, migration and want of employment, notwithstanding technological upgradations and modernization, Dalit women in low skilled, caste-based labour continue to suffer in

the menial, filthy and highly defiling occupations such as manual scavenging, tannery and mid-wifery wherein the sexual division of labour push them to the most polluting segments of the caste-based occupations."[5] The lived experiences of Dalit women reveal that their endless sufferings are enhanced by 'thrice discriminated' identity, meaning that Dalit women are discriminated against on the basis of class, caste, and gender. Another expression she often uses for them is 'Dalits among the Dalits' or 'downtrodden among the downtrodden.'[6]

Another challenge for Dalit women is related to the legislature safety and secury in India.It is the fact that an Indian legal system is strongly criticized for delay in results, mal practices, corruption, flexible laws, more time consuming etc. which indirectly affect the whole precess of justice. It is found that about 90 per cent of the crimes against Dalit women are not reported to the police for the fear of social exclusion and threat to personal safety and security. Numerous cases are pending at the court related to the safety and security of Dalit women and their exploitation at the hands of the men of their own community. This picture becomes more gloomy when considered to rural areas.

Despite all these threats and challenges, Dalit women record their presence very actively in politics. Here also they continue to suffer from the lack of appreciation and respect from the non Dalits and men of their own community. Awareness of their marginalization, however, is increasingly evident in recent times, and the Dalit woman's voice in the public space is becoming gradually audible. Despite the work of Dalit feminist movements and non Dalit NGOs in public sphere, the challenges before them have not come to an end. this is evident in the words of asha Kowtal, General Secrerary of all India Dalit Mahila adhikar Manch (aIDMaM), an organization created by National Campaign on Dalit human rights (NCDhr) She says, 'India's population of 160 million Dalits is composed of approximately 50 per cent women who make up about 16 per cent of India's total female population,and 8 percent of the total population. "the triple discrimination of Dalit women based on Caste, Class and patriarchy often remains unexplored within the mainstream women's movements.'[7]

At present, Dalit women's condition seems to improve despite an age long cultural marginalization and stigma of their caste and class. They are outshining and excelling in every challenging field of society. Their stout but humble actions and reactions to the happening in the world is but the utopian dream of an ideal society which goes beyond the caste, class and gender issues and looks upword for the holistic development of all its citizens.

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Women Development In Sports: National Policies In India

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Abstract

The present paper is an strive to research the fame of woman empowerment in India the usage of numerous signs primarily based totally on facts from secondary sources. The examine famous that woman of India are surprisingly disempowered and that they experience incredibly decrease fame than that of guys no matter many efforts undertaken via way of means of government. The Women in Sport Movement is turning into a international phenomenon; and rightly in order girls include 1/2 of of the worldwide population. Change has been slow, however, and plenty of long-status traditions remain. However we trust that there may be high-quality capacity for the repute quo to be challenged with disruption, and extrade on the systemic level. Gender hole exists concerning get right of entry to to training and employment. Household selection making energy and freedom of motion of woman range significantly with their age, training and employment fame. It is observed that recognition of unequal gender norms via way of means of woman are nonetheless triumphing withinside the society. More than 1/2 of of the woman consider spouse beating to be justified for one motive or the different. Fewer woman have very last say on the way to spend their income. Control over coins income will increase with age, training and with location of residence. Women's publicity to media is likewise much less relative to guys. Rural woman are extra vulnerable to home violence than that of city woman.

Introduction

A big gender hole exists in political participation too.The precept of gender equality is enshrined withinside the Indian Constitution in its Preamble, Fundamental Rights, Fundamental Duties and Directive Principles . The Constitution now no longer best presents equality to ladies, however additionally empowers the State to undertake measures of advantageous discrimination in favour of ladies.Within the framework of a democratic polity, our laws, improvement policies, Plans and programmes have aimed toward ladies's development in exclusive spheres. Fromthe Fifth Five Year Plan (1974-78) onwards has been a marked shift withinside the technique to ladies's troubles from welfare to improvement. In latest years, the empowerment of ladies has been diagnosed because the imperative difficulty in figuring out the popularity of ladies. The National Commission for Women became installation via way of means of an Act of Parliament in 1990 to guard the rights and felony entitlements of ladies. The seventy three rd and seventy four th Amendments (1993) to the Constitution of India have furnished for reservation of seats withinside the nearby our bodies of Panchayats and Municipalities for ladies, laying a robust basis for his or her participation in choice making on the nearby levels.

In maximum societies, participation in sports activities has been in most cases a male domain.However, during the last many years girls in sports activities advocates have validated that girls also are ready and feature an area withinside the sports activities world. When the primary lady ball participant rotated the bases at Vassar College in 1866, sportswomen have taken their sports activities stories to heart (Sandoz & Winans, 1999). Even with out robust records of achievements girls needed to show that they have been ready in sports activities. In gift days, we see considerable variety of girls taking part in now no longer best taken into consideration minor sports activities however additionally in sort of sports activities that require high-quality prowess and skills. The increase of girls's sports activities can quality be choose with the aid of using the slow however continual enlargement of girls's activities withinside the cutting-edge Olympic Games (Bennette, Howell, and Simri, 1983). However, whilst girls first started banging on the door of sportsworld, they encountered masses of opposition. As the popularity of girls in game has now no longer observed a steady, uphill direction for the duration of records, instead, it has long gone via many peaks and valleys – instances whilst lady sports activities figures greater famous heroines and instances whilst girls have been condemned as undeserving mothers (Lutter & Jaffee, 1996). Over the years maximum goals to girls's sports activities participation had been subjective in nature, frequently

predicated upon the sentimental thesis that girls is fragile in nature and dainty in appearance (Klafs & Lyon,1978).

Women and sport leadership

Women do lead, they may be competitive, and that they have lots to provide the converting face of game. Yet globally ladies continue to be below represented as coaches, administrators, and officers in any respect ranges of competition . The patriarchal subculture of game and the marginalisation of ladies in the game place of business go away ladies feeling unsupported and isolated. Women constitute 49.5% of the worldwide populace but are handled as a minority institution in game; however, this minority institution refuse to stay or be silenced and are making themselves extra visible. The popularity quo wishes to be challenged with disruption and alternate on the systemic stage required.

National policies

The National Policy on Empowerment of Women followed in 2001 states that " All sorts of violence in opposition to ladies, bodily and mental, whether or not at home or societal levels, together with the ones bobbing up from customs, traditions or widely wide-spread practices will be treated efficaciously on the way to cast off its incidence. Institutions and mechanisms/schemes for help may be created and reinforced for prevention of such violence, together with sexual harassment at paintings region and customs like dowry; for the rehabilitation of the sufferers of violence and for taking powerful motion in opposition to the perpetrators of such violence. A unique emphasis can also be laid on programmes and measures to address trafficking in ladies and girls." Under the Operational Strategies, the Policy presents:

a) Strict enforcement of applicable felony provisions and rapid redressal of grievances with unique awareness on violence and gender associated atrocities;

b) Measures to save you and punish sexual harassment at paintings region and safety of ladies people withinside the organised/unorganized sector

c) Crime in opposition to ladies - their incidence, prevention, investigation, detection and prosecution to be reviewed often in any respect Crime Review fora on the Central, State and District levels.

d) Women's Cells in Police Stations, Women Police Stations, Family Courts, Mahila Courts, Family Counseling Centres, Legal Aid and Nayaya Panchayats to be reinforced and improved to cast off VAW and atrocities in opposition to ladies.

The Policy additionally presents that "Women's Cells in Police Stations, Women Police Stations, Family Courts, Mahila Courts, Counseling Centers, Legal Aid Centers and Nyaya Panchayats may be reinforced and improved to cast off violence and atrocities in opposition to women.

Women status in India

As some distance as India is concerned, the precept of gender equality is enshrined withinside the Constitution and unearths an area withinside the Preamble, Fundamental Rights, Fundamental Duties and Directive Principles. The Constitution now no longer handiest presents equality to woman however additionally empowers the States to undertake measures of wonderful discrimination in favour of woman. Historically the fame of Indian woman has been stimulated via way of means of their past. There is proof to expose that woman withinside the Vedic age were given maximum venerated positions withinside the society (Seth, 2001). They had the proper to training and had been loose to stay single and dedicate their complete existence to the pursuit of understanding and self realization. The married woman done all of the works and sacrifices similarly with their husbands. They had been knowledgeable in numerous disciplines of understanding together with astrology, geography, veterinary sciences or even in martial arts. There had been times of woman taking element in wars and fights. They had been surprisingly reputable inside and out of doors home. Gradually because of numerous socio-political changes, in particular at some stage in the center age, the superb fame of woman declined. The urge for equality at the a part of Indian woman commenced getting momentum at some stage in the colonial times. Noted social reformers and countrywide leaders like Raja Ram Mohan Roy, Annie Besant, Sorojini Naidu and Ishwar Chandra Vidyasagar made selfless efforts to create attention amongst woman approximately their fame and had been pretty a success in putting off numerous social evils together with sati pratha, baby marriage, and polygamy. They additionally endorsed widow remarriage and woman training. The reformers had been a success in growing a base for improvement of woman and theirs try for equality. In route of time Indian society

were given converted from conventional to a current one. Consequently woman have become extra liberal and privy to numerous methods of existence. Since they may be pretty able to breaking the conventional limitations imposed via way of means of the society at the moment are hard the patriarchal gadget aleven though in a restricted scale.

Decision Making Power

Decision making strength of girls in families is one of the essential signs of girls empowerment. It is observed that most effective 37 consistent with cent of presently married girls take part in making selections both on my own or together with their husband on their fitness care, huge family purchases, purchases for each day family wishes and on travelling their own circle of relatives individuals and household (Table 1). Forty 3 consistent with cent take part in a few however now no longer all selections and 21 consistent with cent do now no longer take part in any of the choice. As excessive as in 32.four consistent with cent instances the choice concerning the acquisition of each day family wishes is taken particularly via way of means of the respondents while the selections like go to to her household are in maximum instances taken on my own via way of means of husbands or together. Decision like important family purchases is taken together in maximum of the instances.

Freedom of Movement

Free mobility of girls is every other indicator of girls empowerment. The facts famous that approximately 1/2 of of girls are allowed to visit the marketplace or to the clinic on my own (Table 3). Only 38 consistent with cent are allowed to tour on my own to locations outdoor the village or community. While now no longer all girls are allowed to visit those locations on my own, most effective a minority aren't allowed to move at all. Compared to city girls, rural girls have much less mobility. Women's mobility is likewise suffering from their historical past traits like age, training, marital reputation, kind of own circle of relatives and many others. Table four famous that freedom of motion will increase with age aleven though it does now no longer range linearly with training. Seventy consistent with cent of the girls of the very best training institution are allowed to move on my own to the marketplace as in opposition to forty nine consistent with cent of girls and not using a training.

Acceptance of Unequal Gender Role

Women's protest in opposition to unequal gender function in phrases in their mind-set toward options for son, spouse beating and many others is every other indicator of girls empowerment. The facts supplied in Table five display that fifty four consistent with cent of girls in India agree with spouse beating to be justified for any of the precise motives. Similarly 35 consistent with cent girls agree with it to be justified in the event that they overlook their residence or children. However, settlement with spouse beating does now no longer range a good deal via way of means of girls's age and family shape, however decline sharply with training. It is to be referred to that even a number of the maximum knowledgeable girls, at the least one in 3 concurs with one or extra justifications for spouse beating. In rural regions girls are commonly extra agreeable to spouse beating than in city regions. Agreement is decrease amongst by no means married girls compared to ever married girls.

Elected Women Members

Many elements are accountable and decisive withinside the election of girls applicants consisting of literacy, economic position, liberal own circle of relatives historical past, assist of different individuals of the own circle of relatives, robust persona and many others. Since maximum of the girls lack get admission to to those, few girls get tickets or even fewer get elected from this handful of girls applicants. Table 2.thirteen indicates the elected girls Members in Lok Sabha. From the desk it's far clean that percent of girls individuals to the overall individuals has been always much less than 10 consistent with cent in every Lok Sabha beginning from 1st to twelfth one. This indicates negative participation of girls in political field.

Conclusion

The society is extra biased in desire of male infant in recognize of training, vitamins and different opportunities. The root motive of this kind of mind-set lies withinside the notion that male infant inherits the extended family in India with an exception in Meghalaya. Women frequently internalize the conventional idea in their function as natural, for this reason causing an injustice upon them. There are numerous constraints that take a look at the technique of women empowerment in India. Social norms and own circle of relatives systems in growing nations like India, manifests and

perpetuate the subordinate reputation of girls. One of such norms is the persevering with desire for a son over the start of a female infant, that's found in nearly all societies and communities. The maintain of this desire has bolstered in preference to weakened and its maximum evident proof is withinside the falling intercourse ratio (Seth, 2001).

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Comparative Study of Rural and Urban Female Literacy in Amravati District (Maharashtra State)

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Abstract

The literacy rate is an important factor in the social development of the population as the region with higher literacy rate is more prone to adopt new technologies. Literate society is always moving towards progress. The woman in any family is the foundation of the family and if the head of the household is well educated then she can help the next generation to progress by making them literate. But in Indian society even today female literacy is less than male literacy. There is also a difference in the literacy rate of women in rural and urban areas. At present rural literacy rate in India is 68.91%, male literacy is 78.57% and female literacy is 58.75%. In other words, female literacy in rural areas is 20% lower than that of men. The literacy rate in urban areas is 84.98%, male literacy is 89.67% and female literacy is 79.92%. Even in urban areas female literacy is lower than that of men. But female literacy is higher in urban areas than in rural areas. The same difference is found in the literacy rate of women in rural and urban areas of Amravati district.

This paper presents a comparative study of female literacy in rural and urban areas of Amravati district.

Key Words-Literacy, rural, urban, female, growth

Introduction

The woman is the foundation of the family and if the woman is literate then it helps the family to progress. Even today, the female literacy rate is lower than that of men, which means that in many societies there is still opposition to women's education. This condition is mainly found in rural areas. Therefore, female literacy in rural areas is lower than in urban areas.

The female population is as important in the population as the male population because without these two, population development cannot be imagined. Therefore, both components of the population must be literate. The present paper has comparative study of rural and urban female literacy in Amravati district. Increases in rural and urban female literacy have also been studied.

Objectives

The main objectives of the present research paper as follows,

1) To study the literacy of rural and urban female population and comparison in Amravati district.
2) To study the growth rate of rural and urban female literacy in the study region.

Data Source and Methodology

Present research work is carried out with the help of secondary source of data. The analysis is based on the rural and urban population data of census. The related data is complied from District Census Handbook, Amravati (2001 and 2011).

The literacy rate pf rural and urban female population as well as growth in literacy is calculated with the help of following formula,

FL = [FLP ÷ (FP – 0 to 6 Age Female Population)] x 100

FL – Female Literacy Rate
FLP – Female Literate Population
FP – Total Female Population

GRL = [(LP1 – LP0) ÷ LP0] x100

GRL – Growth Rate of Literacy
LP1 – Literacy of Current Census
LP0 – Literacy of Previous Census

Calculated values are arranged and presented in tahsil wise table. The distribution of rural and urban female literacy is shown in map of the region. The growth in literacy is shown in bar graph. The analysis is based on the census year 2001 and 2011 data.

Study Region

Study region is situated in the state of Maharashtra and conflicts in between 20^0 33' N to 21^0 47' N latitude and 76^0 43' E to 78^0 24' E longitude. District covered total 12210sq.km area with total 14 tahsils. Total population of the district is 2888445 and out of them is male and 1407677 are the female.

District abounded with Madhya Pradesh on north, Nagpur and Wardha district towards east. Yavatmal south and Akola district on west.

Literacy of Rural Female Population (2001 and 2011)

Table no 1 shows tahsil wise literacy of rural female population of the district in the year 2001 and 2011. Figure No 1 and 2 shows the distribution of rural female literacy in the year 2001 and 2011 respectively.

Table No 1

Amravati District – Rural Female Literacy (2001 and 2011)

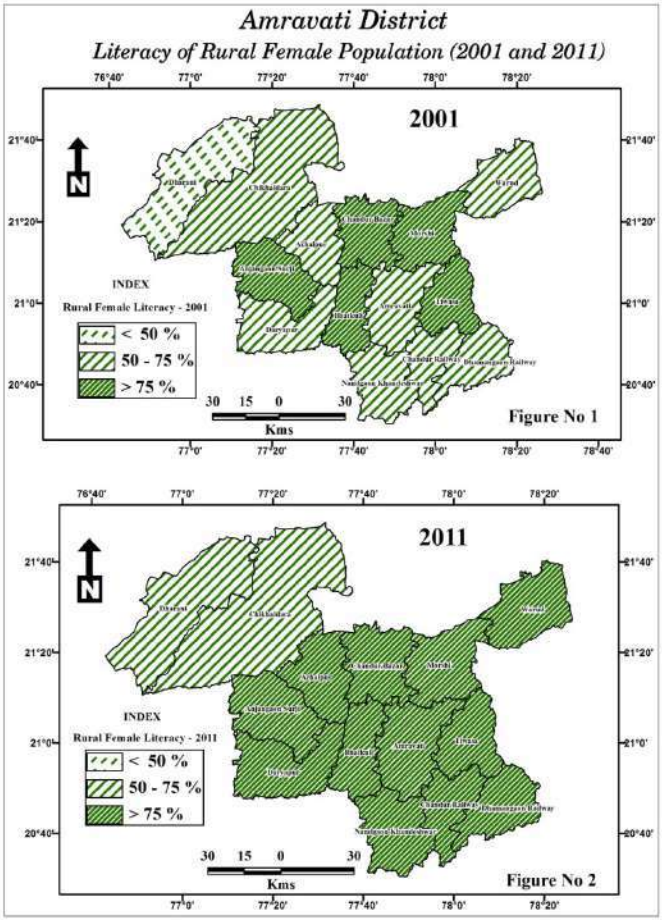
NAME	2001	2011
Dharni	49.33	65.22
Chikhaldara	51.02	66.22
Anjangaon Surji	77.23	83.78
Achalpur	72.38	82.64
Chandurbazar	75.38	83.47
Morshi	75.79	82.82
Warud	71.14	78.87
Teosa	76.36	82.86
Amravati	74.76	82.86
Bhatkuli	75.45	83.48
Daryapur	74.71	83.29
Nandgaon-Khandeshwar	73.66	80.81
Chandur Railway	70.91	80.59
Dhamangaon Railway	73.32	80.58
Total	**71.09**	**79.76**

Source – District Census Handbook, Amravati (2001 and 2011)

According to the census year 2001 female literacy in rural region was found 71.09% and in the year 201 it was recorded 79.76%. Rural female literacy is increased near about more than 8% during 2001 to 2011, but still near about 30% rural female is illiterate in the entire district.

In the year lowest literacy of rural female population was found in Dharni (49.33%) and then in Chikhaldara (51.02%). This region has rough topography and tribal population. Maximum illiteracy of female population in rural region of belongs to the scheduled tribe population. The rural female literacy of other tahsils was observed more than 70% a maximum literacy rate of rural female population was recorded in Anjangaon Surji (77.23%) and then Teosa (76.36%).

In the year 2011 tahsil wise female literacy in rural region was also increased but the ranking of literacy was near about same as 2001. Dharni (65.22%) and then Chikhaldara (66.22%) again found the lowest female literacy in rural region. The literacy of female population in rural region was increased in these tahsils but this rate is still lower than other tahsils in the district. The rural female literacy in other tahsil of the district was more than 80% and found maximum in Anjangaon Surji (83.78%).



Literacy of Urban Female Population (2001 and 2011)

Tahsil wise literacy of urban female population is presented in table no 2. Figure No 3 and 4 shows the distribution of urban female literacy in the year 2001 and 2011 respectively.

In the district Teosa, Bhatkuli, Nandgaon Khandeshwar tahsils has totally rural population. Dharni was totally rural in 2001 but in the year 2011 Dharni village was included in urban region. Therefore Dharni had no urban literacy shown in 2001 year table.

In the year 2001 total literacy of urban female population was recorded 84.38% and it was greater near about 13% than rural female literacy. In the year this urban female literacy was occurred 88.98% and it was increased more than 4% than 2001. In the year 2011 the rural female literacy was less than 9.22% than urban female literacy.

Table No 2

Amravati District – Urban Female Literacy (2001 and 2011)

NAME	2001	2011
Dharni	0.00	80.39
Chikhaldara	83.64	87.74
Anjangaon Surji	81.00	86.72
Achalpur	82.62	88.68
Chandurbazar	85.23	88.18
Morshi	82.96	87.61
Warud	81.72	87.48
Teosa	0.00	0.00
Amravati	85.54	89.84
Bhatkuli	0.00	0.00

Daryapur	84.28	86.72
Nandgaon-Khandeshwar	0.00	0.00
Chandur Railway	81.08	88.22
Dhamangaon Railway	83.39	89.15
Total	**84.38**	**88.98**

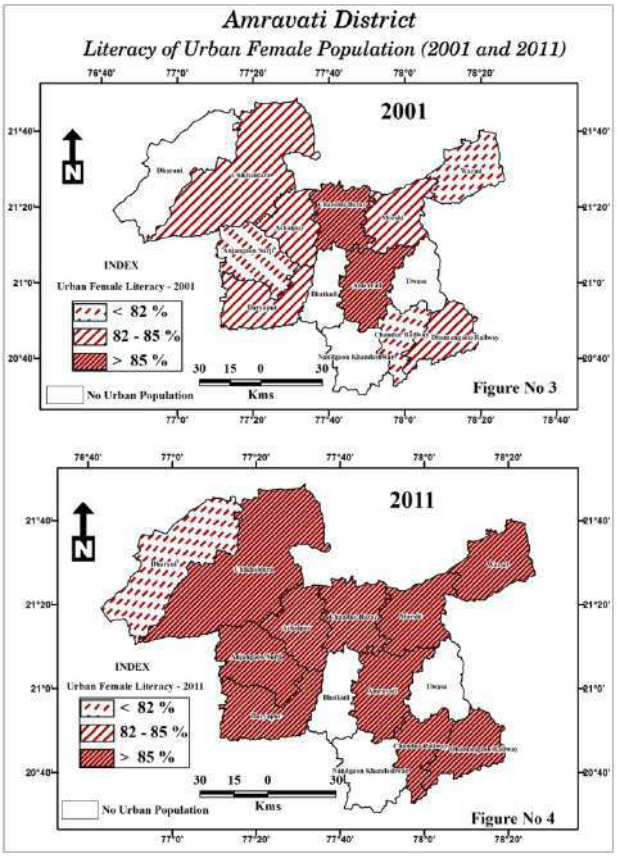
Source – District Census Handbook, Amravati (2001 and 2011)

According to the year 2001 the urban literacy of female population was more than 80% in every urban region of the district. Amravati (85.54%) and then Chandur Bazar (85.23%) was recorded highest literacy of urban female population. Amravati is the main tahsil in the district and also Amravati urban center is the district head quarter. Maximum urban population is concentrated in this city. Also the distributions of educational facilities are higher in the district. Primary educational facilities are also well developed in Chandur Bazar tahsil and therefore these two urban regions found female literacy higher in the district.

Anjangaon Surji (81%), Chandur Railway (81.08%) found the low urban literacy of female population compare to other urban parts in the district. The urban female literacy in remaining part was in between 82 to 85% on the year 2001.

According to the year 2011 Amravati had found again highest urban female literacy (89.84%). In the year 2011 female literacy in urban region was also increased but its ratio was found lower than rural literacy. Urban part of Dharni (80.39%) found lowest female literacy while other all urban part female literacy was found more than 86%.

The urban literacy of rural population was higher than rural female literacy in both years.



Growth Rate of Rural and Urban Female Literacy (2001 to 2011)

The tahsil wise growth rate of rural and urban female literacy according to the formula is shown in table no 3. Source – Author

The total growth rate of rural female literacy in the district during 2001 to 2011 was 27% and urban rate was 26.46%. The urban female literacy was higher than rural female literacy but the growth rate of rural female literacy was higher than urban female literacy.

Chikhaldara (74.99%) and Dharni (63.50%) recorded the highest growth of female literacy in rural region. These two tahsils had found low rural female literacy but growth rate is higher. The growth rate of other tahsils in rural female literacy was found in between 19 to 38%.

However, in the tahsils where rural female literacy is higher, the growth rate is lower. Anjangaon Surji, Chandur Bazar, Nandgaon Khandeshwar, Bhatkuli, Dhamangaon Railway, Morshi and Teosa found only 19 to 20% growth in rural female literacy. The maximum growth rate of urban female literacy was occurred in Chikhaldara (35.36%) tahsil. Although Chikhaldara tahsil has low female literacy rate in both rural and urban areas, it has seen the highest increase in literacy rate. This is an indication of the growing progress of the female population in the region. There are indications that the important spread of women's education is taking place more effectively in this region.

Table No 3

Amravati District – Growth Rate of Rural and Urban Female Literacy (2001 to 2011)

NAME	Growth of Rural Female Literacy	Growth Rate of Urban Female Literacy
Dharni	63.50	0.00
Chikhaldara	74.99	35.36
Anjangaon Surji	19.22	23.18
Achalpur	37.31	14.83
Chandurbazar	19.23	14.53
Morshi	19.94	20.26
Warud	22.19	19.83
Teosa	19.97	0.00
Amravati	25.88	28.97
Bhatkuli	19.42	0.00
Daryapur	25.64	14.77
Nandgaon-Khandeshwar	19.35	0.00
Chandur Railway	25.02	27.13
Dhamangaon Railway	19.91	10.08
Total	**27.00**	**26.46**

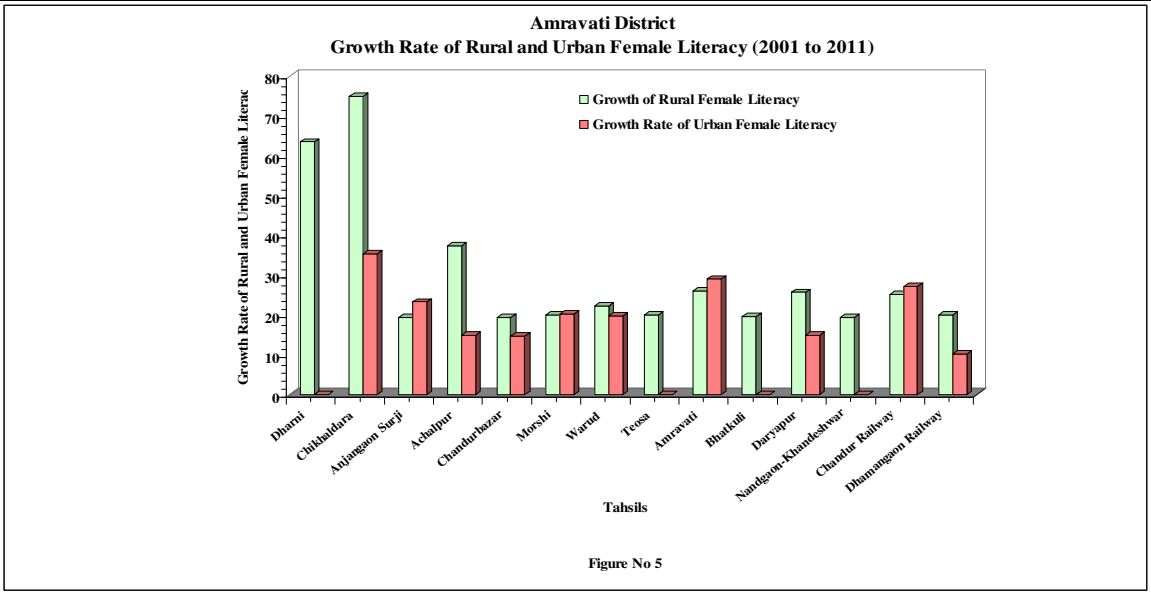


Figure No 5

Dhamangaon Railway (10.08%) has the lowest urban female literacy rate. In Chandur Bazar, Daryapur and Achalpur tahsils, the growth rate of urban female literacy is between 14% and 15%. The literacy rate in urban areas of the rest of the tahsils is between 19% and 29%. Figure No 5 shows the growth rate of rural and urban female literacy in the region.

Conclusions and Suggestions

In Amravati district, female literacy is found differently in rural and urban areas. Compared to 2001, female literacy rate has increased in 2011 in each tahsil in both rural and urban areas. The literacy rate of urban women is higher than that of rural women, but the rate of increase in female literacy is higher in rural areas. It has been found that the rate of female literacy is increasing in rural areas but not in urban areas.

Excluding the population in the age group of zero to six in rural areas of the district, about 20% women are still illiterate whereas in urban areas 10 to 12% women are illiterate. These illiterate women are predominantly adult women. The housewife must be educated for the progress of the family. For this, every educated person in the family should resolve to make the women of the house literate. It is necessary to increase the participation of women in rural areas by promoting adult literacy campaigns.

At present mobile phones, internet has reached every village and town so with the help of this literacy rate can be increased. For the overall development of the society, every woman in the household must be literate and every educated woman must convince the illiterate women of the importance of literacy. This will help in achieving 100% literacy in both rural and urban areas.

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The Role of Mother and Father in Children Educational Development

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Abstract

The 'home education' as a term, represents educational impact of the family on children. It has been proved that in various family environments, children do acquire a variety of experiences, through performing various activities and is constantly exposed to a range of influence and expectations from the people he/she cohabits. In this paper we will analyze the influence of the parents over their children's education within family environment. It will focus issues why each family has different educational potentials. In nowadays social circumstances, the family has a huge and very tough responsibility; as it has to take proper care on their health, their physical development, their overall education, the development of their intellectual affinities, as well as creation for a better moral values and convictions and attitudes, habits to a firm and well behaved cultural relations in the family itself as well as in the society where the child lives. On the other hand, the family as an institution has to create conditions for development of positive relationship towards work, which as such is a predisposition towards a better establishment of a realistic approach for a better development of the children's personality.

Keywords Children, Education, Family Relationship, Father's role, Mother's role

1. Introduction

It is an undeniable fact that parents are the ones who brought the children in life, it is simply their married. They are the ones who reproduce the human kind in a given society, as in this way they contribute to the development of the human history. Parents or family as a whole, are one of the direct holder of educational work. The term parent should be comprehended as a set of notions such as

1. Firstly, their planning and decision to children birth and the overall nativity rate
2. Secondly, their care and contribution towards rising their children'
3. Thirdly, the parents actions and activities towards an overall parental achievement of a priori set Goals

The family as a cell acts only with love and respect and it dominates the understanding, affection, sacrifice and childcare. So, in this way builds family environment, in which we live, laugh, play and develop children. The contemporary concept over their role and contribution in this regard, in a way rejects the so called single direction of influence of the parents over their children development, replacing it with an intense interaction of three factors such as; the child, the parent and the wider social environment. This interaction is constantly being seen as a mutual influence and process moving from the parent to the child and the other way around, which as such triggers a variety of factors which in one way or another may impact the children's development and education, in both, positive as well as negative sense. The parents take a crucial stand, when it comes to their children's development and education as whole, as the parents themselves are the ones to take care on the overall children physical and intellectual development, till the point they get independent and ready to face the challenges of the society they live in. Parents are aware of the work on the development of children, but at the same time they need pedagogical information on the right to education of their children.

Just for these reasons, the pedagogues and psychologists as well as other researchers, emphasize in an argumentative way, the role of the parents in their overall children's development, focusing the development of their personality in the family and wider. It has been said that the so called "children's development climate", more frequently has been seen from the perspective of three interacting factors or dimensions such as

1. Parental happiness or pleasure to their children's achievement.
2. Needs and the stress that imposes the parental role in the process.
3. The feeling regarding the parental competences towards their children overall development.

The education for life in a given family commences with the first days of the child's live. It is consisting mainly of acquiring experience which is usually affected by constant learning. In this

regard the parents as well as the family as whole, play the role of the direct leaders as well as supporters of the implementation of the education of their children. As this is one of the core factors of influence, it can be seen as the fundamental one which with no doubt has a greater influence on the overall development and creation of the human personality.

When parents involve themselves in the education process of their children, usually the outcome can be qualified as a positive and encouraging one. In this regard, they are usually connected and act under their own parental attitudes, which are transmitted through their demonstration of mutual confidentiality regarding the children's capabilities and their overall learning capacity which leads them towards succeeding over the learning, education as a complex process. Therefore, parents should get involved in supporting their children in doing their homework, as in this way they offer their parental support as one of the key strategies leading towards a successful education of their children at school. Educational level of children in the family depends more on the level of the parent's education, so this factor strongly affects family relationships and the successful development of children.

2. Mother is the first and the best teacher

The family enables children protection in that suggestively that makes parents responsible for their developing and to make their children grow into a total personality. The role of the woman or the mother as an educator represents a crucial resource to the development of the individual identity, which from researchers is seen even as more important as the very marital status of the parents and the occupation of the parents themselves. It seems that the feeling of being a mother, to the woman is more powerful than being a father of given child for the husband. Always in accordance to the biological as well as physiological relation of mother to the child, represents the first and reasonable part or segment of the child's development. This for the reason that mother assures child's life, as she is the one who brings the child in this world, and further on she raises them
from being little towards reaching a total independency in mature life.

The mother's function in this regard, has a very important role which as such may be divided into twoparts or directions: The first one is related to the child's defense, while the other one to the child's overall development. Mother's protection as a function embeds several types of actions or types of functions. The 1st type is connected to the physical protection of the child, which means that the child must be provided healthcare and hygienic conditions, so that he/she could have a healthy life in a worm home environment in every sense of the word, including here the ambiance where the child lives, which must be well enlighten, a healthy place which offers the child to be showered, feed up and taken care in general. The 2 nd type is the Psychological protection, which can be reflected through the child's emotional security and psychological protection, especially in moments when the child feels it when the mother is next to him i.e. her.

Another group of activities in this regard, are the maternal functions regarding the child's development involving here the physical development, the intellectual development as well as the emotional development of the child.

Each child which grows up and is educated in the presence of mother, for sure is expected to reach an appropriate physical, psychological as well as social development. In this regard, these children have a much better appearance, the look happy and they enjoy the childhood in general. They are communicative and as such they are ready to cooperate.

For this reason, mother's love and care to the child, is full and well completed, and as such is often accepted by other members of the very family. This type of cultivated love and affection can be qualified as a key condition for an appropriate development of the children in a given family. The children experience the physical as well as psychological effects of the mother, and as such they are taken as model which influences their further development during their emotional stage of development of their moral values as whole. This element of the so called child's identification, the child embeds it in his/her personality for years on and on,throughout his/her total lifespan. It is planted in their character as well as temperament, and as such it is reflected through his/ her attitudes and thoughts in interaction or behavior comportment with the society in general. Almost all culture have developed arrangements which enable mothers to provide for basic child care while maintaining other duties that are instrumental to family well – being.

However, depending on the economic, social as well as emotional limitations, mothers, nowadays have

a variety of opportunities to be able to reach or make real their mother's role, which helps the child's overall development and enables mothers to enjoy the fact of being mother. The modern experiences, show quite frequent derailments from this path of action, which as such can be illustrated with the fact of single mothers,mothers coming from unemployed background, under age mother etc.

3. The Father as an educator

The father in a family is a very important factor, concerning the organization of a nice and appropriately functional development of a house hold, with a specific accent on the children. Helping fathers be the 'best fathers they can be' is therefore of enormous importance to children. A god father must be a good parent and a good husband. This person is extremely important factor in the organization of the family life as a whole, which are the basic ground towards a happily and joyful family for all the members of a respective family. Many young fathers want to do things better than how they have experienced in their lives. His presence in the family has a particular importance while it leads the family members, i.e. the children to wards a feeling of safety in their life reigning on the overall family members as a compact union of members. In these circumstances of safety, the children are the ones who benefit mostly.

However, the so called subjective experiencing of the parents by their children varies in different ways and family models, and as such his relevance in a family is much more different from the one that is performed by mothers. As a result of the gender prejudices in terms of the duties to be performed in their family, especially regarding their approach and contribution towards their children's education, it turns out that mothers are more prepared to undertake their role in their children's education, rather than their fathers. Fathers make a powerful difference in defining expectation and challenging children to do their best.

As such, the children learn their responsibilities and role in the family, when they themselves grow up and become parents, which is they are mature to play the father's role in this regard. Given this theory, there has been done much research, which proves that the relationship between father and child becomes stronger. This relationship does not result to be dependent from neither of the other two relations i.e. the one between father and child neither the one mother-child.

In order to have a successfully brought up and well educated children in one family, parents are crucial and they must be careful to some elements which play a key role in raising, bringing up and educating their children; Firstly, while the parent's principal role in the family is the education and the bringing up of their children, then the main obligation of their children is to study harder and properly. For this aim, they need to be well instructed how to study, based upon rules and principles of an appropriate learning and studying. This approach would open to them the doors of the world of a behaviorist attitude towards the work, making possible for them to get to know better the relevance of working as one of the main behaviorist elements of the human kind.

Secondly, the development of the child is in fact an overall child's personality formation. The parents as educators must be able to recognize the basic features of their child, interests, temperament and especially the child's emotional features regarding the child's character.

Thirdly, the child's personality formation has resulted to be constructed mostly based upon child's socialization in general. The socialization process as such, for sure nowadays represents the most important one of all other processes involved in his formation as a child. Thus, the child commences to socialize within a given society since the early stage of his/her childhood at parents' home, circled by parental atmosphere and the relationship between family members in general. In this entourage, the child makes the first steps in the society, manifesting the basic features of behavior, which as such are the fundaments of further social development and integration of the child in a given society.

4. Conclusion

From all what was said so far, we may conclude that the education in the premises of a family life, has a double meaning: Firstly, it must be seen through the perspective of its contribution to the overall child raising up and education, which is crucial to his/her proper formation of children's personality and further on, his/her preparation for leading an independent life. On the other hand, the focus must be put on the family as whole, and the role of children which must be based on their approach and contribution concerning family problems, which should be dealt with, and finally solved by them. Offering education support to children from their parents, concerning issues such as homework, would help children to create an everyday routine of learning. This approach as such

should be stimulated by the parents themselves, by praising, vaunting and rewarding the children regarding the way they perform on this task. This approach as a value would raise within the children the sense of respecting the other family members. Using this education and bringing up methods while raising children, may be considered as one of the best known examples towards a positive overall approach to the educative and formational function with the children, who later on become successful grown up citizens. Offering educational support to them, from their parents, concerning issues such as preparing their homework, on the other hand creates the so called habits of every day routine of action to the learning process, which makes the parents vaunt and praise them, creating and strengthening this way better mutual communication between the parents and children. And again, rewarding and praising the child, is a real stimulator towards a better mutual respect and closeness between all members as a compact family.

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Digitization Of Teaching & Learning In Mathematics

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Abstract:

Digital education is the innovative use of digital tools and technologies during teaching and learning is often referred as Technology Enhanced Learning (TEL) or in other words we say digital education is the use of technology and digital tools to teach and learn. This innovative use of digital technology is beneficial for both teachers and students. In this paper we study how the digitization Technology (DT) is beneficial or helpful for mathematics teachers and students, and discuss about some digital tools which are used in teaching learning process. Also how to overcome the limitations of digital technology in teaching learning process.

Keywords: TEL, DT, Global COVID-19, ICT's, Computer algebra system (CAS) & Digital learning objects (DLO's).

Introduction:

Digitization of education is an effort to transform education by utilizing digital platforms as a medium to provide services in the educated sector. Digitization is more than using digital technologies to transform data and perform computations and tasks. In terms of post few years digitization has been carried out. A number of studies have been reported how the efficiency of digitization of education. In early 2020 the world was suffering from global COVID-19 pandemic situation that caused tremendous disturbance in all sectors of human life, School Colleges were closed as a result learning cannot be done in school / Colleges. So the teaching and learning process carried out online by using various digital platforms. The focus on mathematics is applicable for the reason that math's teaches use digital tools less than teachers in other subject and mathematics is the problematic for many students. It is necessary to know that how digital tools can help to improve students, learning because of potential of ICT's in combination with proper digital pedagogy is supportive which can help to improve students' learning Because of potential of ICT's in combination with proper digital pedagogy is supportive while teaching learning in mathematics. Smart boards classrooms, pc, Internet connectivity are the basic components of digital technology, in teaching learning process. We discuss here some digital technologies used to in teaching learning processes by teachers.

1.1 Use of mobile technology in math's teaching learning process:

The use of technology in mathematics education has been highlighted by researchers; they considered technology as essential in teaching and learning mathematics. In a survey of mathematics research found that technology produced a positive effect on student's achievement in comparison to traditional method.

Mobile techniques have been mostly popular in education in recent years. A different field in which ICT Innovations have been developed in mathematics teaching is mobile technology. Educational application is one of the area in which the fastest growth of mobile technology has been observed and it is accepted that the expansion of ICT tools along with mobile technology will continue forward. There has been increased focus on the utilization of mobile technology by teachers and students in the field of mathematics. The particular facility of mobile device include that they are portable, easily available, allow users to access the internet and widely accepted by younger generation.

This technology cross the boundaries or expand it in mathematics teaching and learning outside the traditional class room environment.

In many research researcher have concentrated on taking advantages of the features of mobile device including the benefits of being portable, mobile and the ability to photograph and video actual phenomena that can subsequently be examined and discussed from a mathematical perspective. Special features of mobile devices are ability to capture and collect data, communicate and collaborate media build and generate individual forms of expression and representation can be easily translated into the mathematical core. Creation and exploration of quadrilateral equations along with their properties in a real environment. In an external location can be facilities on location named mobile

math for mobile devices with GPS technology. Within the learning environmental, mobile devices were employed by the students for the purpose of identifying & photographing forms that resembled angles that existed naturally in their environment.

Photographic shapes were analyzed by the students through dynamic geometric app insulated on their mobile devices. The use mobile technology the context of mathematics learning & teaching is developing field of research that continues to enlarge an exponential rate.

1.2: Use of touch screens and pen-tablets:

Researcher have concluded after investigation that the attention spans of students can impacted by input devices utilized when performing or tasks supported by computer. When using touch screens students while performing tasks had an increased attention span meaning the time spent on the tasks increased and they have less distraction as compared to those who used, mouse or keyboard. It is observed that the students who used touch screens and pen tab for problem solving tasks in the mathematics has an increase attention span & less disturb while reading.

Clicking of mouse would disturb the student while working on computer screen. When using touch screen there is a stronger association between the hand gesture of the teacher /student with the use keyboard or mouse.

Recent research shows that teacher has tries to use pen based technology to promote students learning while math's teaching. This technology promotes to learn how to write equation or draw mathematical representation.

1.3: Digital Library:

A digital library is a collection documents in a organized electronic form available on the internet or on CD-Rom disks.

Reading plays an important role for student's life without visiting personally to library. Student & researcher prefer to digital library to collect information and real content.

Many education institutions digitalized their material to be available to members and the general public.

A digital library reduces our time and efforts one what required to visiting conventional library and to finding the right book while searching content only few words or titles are required from thousands of resources become easy. For conventional library reader required to note down the opening and closing time, and plant in that way. On other hand digital library is much easier and efficient with just and internet connection. We can access digital library anytime anywhere. Student can used the library materials in various digital form, e-Books, audio books, videos on demand any time any where using there referable devices. In digitalized library content is digitized and digital resources are accessible to a large number of readers regularly with focusing on the preservation of the hardcopy materials. Also student can interact and cleared their doubts arises while reading at the same time because there is facility of management Software that can provide interaction between readers and administrators.

Delay in purchasing books magazines and other content resources but digital libraries help you access the updated resources with the latest technology available. Digital libraries help engage readers by providing access to the latest publication. Overall there is increasing importance and necessity of digital libraries for highest education in the age of technological advancement and digitalization.

1.4: Role of ICT innovations in mathematical education:

Use of ICT in teaching and learning methods in math's education system is methods in which ICT tools are actively used to enhance the students learning process. Now a day's educational institutions all over the world are already using various type digital technologies for math's teacher.

There are many types innovative tools for teaching mathematics are available for example dynamic graphic tools, dynamic geometry tools, algorithmic program, language's spreadsheet data loggers, computer algebra system (CAS) which enables students to become active participation in process of developing their personal knowledge providing a more depth learning strategy innovative tools teaching becomes effective and maintaining students interest and increased in achievement level.

Online teaching platform are frequently used for discussion and Cooperation among mathematician.

Also electronic mail, online forums, Computer Conferencing useful and chat groups are also useful in virtual learning. Online classroom is one of the effective and powerful in which participants display the name of participants. For requesting there is option to raise a hand, messaging between the

users and mathematics teachers is facilitated by instant massaging the functionality for projecting slides the whiteboard plays an important role.

2. Benefits of Digitization in education:

Success of nation depends on the education system adopted by nation. This educational process required modern digital technology to make it effective and fruitful. In another way we say that the educational content must composed from digital learning objects (DLO's).

New media consortium defines DLO as a group of material i.e., text, hypertexts, graphics, picture simulations, films sounds etc, which is reasonable structured and is based on educational aims and objectives. It is multimedia content, educational content, educational software or software instruments used in computer supported education. Digital learning materials or e-materials or e-learning materials are study materials published in digital format. These include e-text book, e-workbooks educational videos, e-tests etc.

Some of the benefits of digitalization in education system are as follows:

1) The main benefit of digitization used is to increase student's engagement.
2) Student can work on difficult content with multiple, resources.
3) With digital learning the teachers is able to format their curriculum based on the needs of individuals.
4) Digital learning offers a large range of delivery methods for learning.
5) The place of chalk and duster takes place whiteboard & marker, so that it does not affect on breathing system of teacher.
6) A good digital learning strategy also teaches students how to be objective when searching the internet for information.
7) Online lessons will be valuable because the lessons can be recorded.
8) In digital learning material it make easy to teachers mark a slow and advanced students and record of their general progress.
9) There is an online record maintain in digital classroom.
10) Online teaching teachers will identify the area where students need to help.
11) Communication skill also developed by video conferencing and via messaging apps to get contact with people fast.

Benefits for students are summarized as follows:

1) Smarter Student
2) Self Motivated
3) Greater involvement of educators and parents.
4) Sharing of information.
5) Increase in scope of employability.
6) Doesn't matter distance and physical presence.
7) Save time cost and efforts.
8) Speed up the calculation, Introducing students to Technology.
9) Developed digital literacy
10) Students are become focused on Learning.
11) Audio video learning style motivates the students.
12) Attracting the attendance of the students, etc.

3. Limitations of digitization:

E-learning now made possible to many students worldwide can now used online courses without leaving the comfort of their home. There are so many opportunities to learn from experts educators interact with different students from different location. But there are in person learning these e-learning also has its share is not only advantages but also limitations we look at some of them are as follows:

1) Teachers have lack of confidence with digital technology.
2) Fears about resolving problems with the technology.
3) Access to digital technological in appropriate training.
4) Lack of time for preparation.
5) In students lack of physical activity deals them obesity heart disease diabetes, wrong posture, neck pain physical & mental strain.
6) Increase in cyber crimes and extra material affairs with use of ICT tools.

7) There is not face to face correction. So students can not able to express their real feeling.
8) Lack of concentration.
9) Over use of digital communication makes students to forget writing skills.
10) Increase in cheating in examinations.

4. Solutions on limitations of digitalization:

Use of digital technology in teaching and learning system works successfully only when there is collaboration between efforts of teacher, educational technology, institute administrators, learner etc.

There are some ways suggested to overcome the limitations of digital technology in educational system.

1) Arranging effective professional development program.
2)Provide expert teachers in professional learning.
3)Arranging training directly from software Companies to the teacher.
4) Ensure that there is enough. Technical administration and peer support is available.
5)In teachers training there must be forced on technological knowledge pedagogical knowledge and content knowledge.
6) Build relationships with students based on trust and mutual respect.
7) Build collaboration relationships with families to support learning safety and wellbeing.
8) Promoting increased interaction between only students.
9) Monitoring the students for signs of social isolation.
10) Peer to peer group activities and online lectures which require communication must be used even in an online lecture.
11) In order to protect the authenticity of online education, anti cheating measured must be used.
12) There are many communications methods for e.g. video chat, discussion boards are available to overcome the problem of face to face Communication.

Conclusion:

There is today's need that use of digital technology in everywhere. There are so many digital learning methods applications pedagogies are available to improve education system.

The research shows that different types of digital technology used in mathematical education include mobile technology; touch screened and pen tablets digital library and ICT tools, computer algebra system. Furthermore CAS's like mathematical Maple, Mu-PAD, MathCAD, desire a motion detectors and GPS etc.

These digital technologies must be included in mathematics curriculum at various stage of education.

It is necessary to analyzed as to how this system has to be used so that remove the bad impact of excess use of electronic device of information sharing on the youth and protect them from behavioral and psychological imbalance. Encourage the teacher to continue using these technologies in mathematical education.

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Research and Innovation in Commerce and Management

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Abstract -

With the development of information technology, the information age is becoming moreand more powerful in data processing and analysis.Data has penetrated into all walks of life andhasbecomeanimportantfactorinproduction.Intheeraofbigdata,E-commercehasalsoundergone great changes. How to use the huge data to provide better service experienceis thekeyto the innovation of E-commerce service model in the future. The global information and data showexplosivegrowth,andpeople'slivingenvironmentandworkingconditionshavechangeddramatically . How to make good use of these big data, so that it better serve E-commerce tradeactivitiesbecomeahottopic.Basedonthis,thispaperfirstdescribesthedefinitionandcharacteristics of big data. Then, it introduces the general situation of E-commerce developmentunder the background of big data, and focuses on the innovation of E-commerce service model.Through the new network dissemination and service model, people have more understanding andunderstandingofE-commerceinthe eraofbigdata.

INTRODUCTION

One can't deny substantial role of Commerce and Management in economic growth of our country trade& commerce has always been acting as backbone of any developing country. Commerce is considered as branch of Commerce which facilitates exchange of goods and services and when done at macro level, surelyCommerce is considered to be in existence since barter system and today its melded form, E-Commerce &M-Commerce, is nothing but its extension to incorporate business needs of modern society. Commerce aids tosatisfy human needs, enhances standard of living, generates opportunities and thereby contributes to economicselling activities, trade serves the basic purpose of commerce and can further be divided into internal trade,external trade, wholesale trade and retail trade, while aids to trade encompasses transport, banking, insurance,advertising, warehousing and middlemen who acts as agents of trade.Commerce is an ancient concept since existence of barter system. Greek Mythology believes Poseidon asfather of Commerce. Variant of Caduceus act as symbol of commerce. The caduceus further appears as aAshoka. However, Michael Aldrich is considered as inventor of Commerce.On the other, acting as foundation of any organization, management refers to the overall operational functiondirecting and controlling.

Meaning of Commerce –

Commerce is the strongest and most influential social institution in all societies these days. It is a social institution which provides goods and services. Commerce is operated for a profit-that is, individuals using the system find it advantageous to pay a money price to have other individuals make goods and render services for them. Commerce is owned privately by individuals or group of individuals or by Government or partly by Government and partly by individuals; it competes with other commercial units to make goods and render services of the highest quality, at the lowest prices and in the shortest possible time; and it is regulated by the Government commerce (short for "electronic commerce") is trading in products or services using computer networks, suchas the Internet. Electronic commerce draws on technologies such as mobile commerce, electronic funds transfer,supply chain management, Internet marketing, online transaction processing, electronic data interchange (EDI),inventory management systems, and automated data collection. Modern electronic commerce typically uses theWorld Wide Web for at least one part of the transaction's life cycle, although it may also use other technologiessuchase-mail.

Innovationonmarketingperformance

Innovationisacompany'smechanismtoadaptin a dynamic environment [6]. Innovation is a bigidea or change that is obtained from a collection ofrelated information ranging from input, process andoutput [7]. From this understanding, it is concludedthatinnovation is carried outto produce somethingof value and make a change to be able to adapt toexistingcompetition.Inrelationtomarketingperformance,innovationisoneofthestrategiesundertakenby

businessestoimprovemarketingperformance. The innovations made are expected tohave a significant impact on profit growth, marketexpansionandincreaseinsalesvolume.

E-Commerceonmarketingperformance

E-commerce is the process of buying, selling,transferringorexchangingproducts,servicesorinformation through a computer network through theInternet[11].Themostsignificantfunctionofe-commerceaccordingto[11]istheabilitytogetmanyconsumersquicklyandbyusingcosteffectivelyregardlessofdifferencesintheirgeographical location. This is very helpful for smallbusinessestoexpandtheirmarkets,withoutthedifficultyofthinkingaboutthefinancesandresourcesowned.E-commercehasseveralindicators,namelyonlinepurchases,sales, services and business processes.

OpensourceE-commerce

Open source e-Commerce is a free of charge platform that doesn□t imply licenses fee. Furthermore, opensourceusersarealsoresponsibleforinstalling,maintaining,securingandconfiguringthesoftwareontheirown servers. In order to set up an open source platform, basic technical expertise is required in the areas of webdesign and development. Software products that are distributed as open source are generally free, and users canaccessandmodifythe source code.

Advantages:

1. Freeofchargesystem;
2. Widevarietyofavailableaddons/plugins/extensions;
3. Betterflexibilitywithacustomizablesourcecode;

Disadvantages:

1. Moretechnicalknowledgerequired;
2. Performancedependsonhostingcosts
3. Nostandardintegrationwithback-endsystem;

CONCLUSION

Commerce and Management as an alternative marketing channel is making slow but steady progress in India. With the spread of education and increasing number of people becoming technology friendly, they are slowly gaining confidence in online services. Infrastructural bottlenecks, economic disparity, vulnerabilities of the payment gateway systems, inadequate legal framework are challenges that need to be addressed by all stakeholders to promote Commerce and Management in the country.

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The Effect Of Dynamic Different Martial Arts On Schools Boys And Girls On Actual Fitness And Physical Greatness

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Abstract.

Rehearsing different sorts' hand to hand fighting hopefully affects school young men and young lady's actual wellness and actual quality, which gives a reference to the finishing of different combative techniques.

Keywords: Children, Contact Martial Arts, Taekwondo, Physical Fitness, Physical Quality.

Youngsters are the establishment of future human turn of events and the eventual fate of all nations is in the possession of kids, hence, the fate of the nation must be normal when kids are in great shape and solid, and given a well-rounded schooling. Every nation gives close consideration to youngster improvement; However, with the quick speed of social turn of events, the Internet is turning out to be progressively famous, so kids are becoming acquainted with PDAs and games, and an absence of cheap food and exercise prompts unequal eating regimen and corpulence, prompting more slow friendly development. Judo karate is a type of correspondence sport. There are different types of hand to hand fighting like taekwondo, karate, karate, Kurash and judo, which were first added to the Olympic Games list in 1988 and added to the 2020 Olympic Games karate list. The principal hand to hand fighting to be remembered for the rundown of the most famous Olympic occasions on the planet. With guardians zeroing in on their youngsters' schooling and actual wellness, correspondence and hand to hand fighting has become part of their activity schedule.

In this manner, the effect of contact hand to hand fighting on youngsters' actual wellness and actual quality has drawn in a great deal of consideration. In this paper, the effect of contact combative techniques on a kid's body figure and actual quality, in light of the youngster's present actual wellness and actual attributes and the actual qualities of the contact hand to hand fighting, is summed up, giving a sign to the execution of contact combative techniques.

Numerous nations are giving close consideration to the actual wellness of youngsters by 1912, accepting that a solid body comes just from great actual wellness, and that it enables an individual to work well. In mid-December 1961, the Federal Ministry of the Interior told a gathering of the Sports Association that "we can improve exclusively by remaining solid and fortifying our actual wellness", making Germany the principal nation to think often about the actual wellness of youngsters.

One of the scientist Conducted a test looking at the actual wellness of young people and youngsters in the United States with Europe and somewhere else, and the outcomes showed that 56% of American understudies flopped something like one test, while just 8% of understudies in Europe bombed the test, and the two part harmony passed, The United States Presidential Council on Physical Fitness and Sports PCPFS, with the help of the Federal Department of Health, quickly directs the National Physical Fitness Survey for youths and kids at regular intervals, so they can find out with regards to issues and make a move without wasting any time. With the quick advancement of science and innovation and the economy after World War II, Japan as a financially evolved Asian nation had a high fame for mass games. Despite the fact that individuals all throughout the planet are putting forth a valiant effort to focus on youngsters' wellbeing, and numerous significant demonstrative frameworks have been set up, kids' actual medical issues have never been settled. As per the review, the degree of actual wellbeing of Chinese youths shows a descending pattern, which is primarily as follows: diligent decrease in perseverance quality; Periodic decreases in speed, strength, and unstable force quality increment the discovery pace of overweight and corpulence, and twofold the pace of visual weakness. The National Center for Health Statistics Centers for Disease Control and Prevention directed a National Health and Nutrition Examination Survey like clockwork starting around 1999 to screen changes in weight and BMI in youngsters and teenagers. That the pace of adolescence and juvenile corpulence is ascending in the United States. Furthermore, the measure of muscle versus fat in youngsters truly influences the advancement of kids' body quality.

In 2013, the World Health Organization brought up that deficient actual exercise turned into the world's fourth greatest danger factor for death. Requesting that individuals reinforce actual exercise and proposing the motto - "Actual exercise makes life more significant". Exercise is a significant way of working on your actual wellbeing. Furthermore, absence of activity is a significant reason for poor actual wellbeing and ailment. The connection between active work and screening time in youngsters and teenagers, and the condition of weight and cardiopulmonary wellbeing were investigated in the 2012 National Health and Nutrition Examination Survey separately, and the outcomes show that actual exercise in youths Close to weight and cardiopulmonary revival Capacity.

Judo Martial Arts is a kind of anaerobic and high-impact energy supply sport with high energy utilization and popularity for energy sources, which can unavoidably expand the body's digestion, reinforce the course of energy assimilation and retention. Can, and advances foundational blood flow, guaranteeing the body's requirement for oxygen. Furthermore, the convenient arrival of supplements, carbon dioxide, and the gathering of poisons in the body, to advance the working of the focal framework and the emission of development chemical, establishing the framework for the development and improvement of youngsters.

Insights show that youngsters' respiratory rate is multiple times higher than ordinary during arduous exercise, while cardiovascular yield is just multiple times higher than typical, which demonstrates The hold limit of the heart is particularly significant for kids' activity. Contact Martial Arts. Feeble heart stockpiling limit can harm kids' bodies on the grounds that their bodies can't withstand the impacts of activity.

While both combative techniques preparing and contest won't build the interest for oxygen in kids' bodies. The cardiopulmonary framework will expand the measure of oxygen expected to keep up with the body's oxygen supply, and it rehashes the cycle, which can successfully utilize the youngsters' circulatory framework, so it is compelling for kids' actual turn of events. Help could be given.

Studies have shown that taekwondo preparing can assist youngsters with working on their oxygen consuming potential, which exhibits the cardiovascular and respiratory framework's capacity to finish exhausting action. The higher the high-impact expected energy, the better the cardiovascular energy supply. Following 20 weeks of taekwondo preparing mediations for kids, Yang Shui tracked down a critical improvement in their respiratory and cardiovascular capacities. Exploration by the European Youth Heart Study shows that vigorous potential energy has a negative connection with weight file.

The act of combative techniques likewise assumes a positive part in working on the solid arrangement of kids. Broad exploratory outcomes show that muscle to fat ratio rates are fundamentally decreased and weight gain happens in the wake of rehearsing contact combative techniques, which completely exhibits that contact hand to hand fighting can work on youngsters' actual systems and physiology. Can further develop character. Actual quality likewise reflects actual wellness. There are five fundamental actual capacities that are known independently - strength, nimbleness, speed, perseverance and adaptability. In contact combative techniques, assuming one needs to beat a rival, he needs to arrange endeavors all through the game and react rapidly, which requires a ton of actual quality.

As indicated by the principles of contact hand to hand fighting, competitors are bound to have outrageous actual norms to help their developments. Mentors frequently consolidate methods like exchanging among assault and safeguard to further develop the reaction speed in every day preparing, and their body's adaptability and affectability. Kicking, assaulting, safeguarding and different developments in preparing are helpful for the improvement of youngsters' muscles. Moreover, contacts are generally far off in combative techniques, which require solid muscle perseverance principles to battle long haul rivals.

Taekwondo preparing can broaden the cross segment of white muscle fiber, which reinforces muscle perseverance. As indicated by the looked into information, numerous specialists accept that contact hand to hand fighting positively affect the actual advancement of youngsters, and contact combative techniques like karate, taekwondo and combative techniques are remembered for the actual training course for primary school understudies, in this manner recognizing the effect of contact hand to hand fighting on kids' wellbeing.

The outcomes show that the improvement in understudies' actual quality is identified with the nature of karate as a method for sports culture. Karate classes expect youngsters to show an assortment of activity abilities and capacities, which help to consolidate reality to assist them with moving with various lengths and measurements. Can assist with improving, to influence the coordination of development, response speed and others Physical components.

Karate elements have an effective effect on the development of students' coordination ability (L. I. Lubysheva, 2006). Beve I.V. He pointed out that the ability of children's sports coordination to practice martial arts has developed rapidly and there is no significant difference between boys and girls. Lu Ying conducted a test that compared children participating in taekwondo training with children who did not participate in cardiovascular function, sensory-motor response, and coordination ability. Results show that taekwondo improves physical health and promotes the development of coordination ability. Therefore, childhood is the best stage for human growth and development of physical quality. Contact arts training not only improves a child's body shape and physiology, but also enhances a child's physical quality in all aspects, especially strength, endurance and coordination.

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" Emerging Trends Higher Education, Human Rights "
Role of Women in Child Development.

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Abstract:

The purpose of this study is to investigate the Role of Women in child development. women and children is an important part in the development of the nation. For the developing nation, women and children is necessary in the view of progress of the family as well.

The role of the women is necessary because the women population contributes more than 49% of the nation. The Role of women in the view of the family , because a women is like a captain of the ship and she is having the responsibility and leading the family, balancing the economic condition of the family, and also having the responsibility of educating the children also.Development of children is also necessary, in the view of the progress of the nation, because they are the future citizens of the country. The future of the nation depends on the well being of the children. If they are physically and mentally fit, then only they can contribute for the leading of the nation.

Keywords: women, children, economic sector, population, Government, Welfare projects, Education etc.

Introduction: The purpose of this paper is to explain the Role of Women in child development. women and children

According to the NITI AAYOG,

The vision of the Women and Child Development (WCD) Division is to provide policy inputs for gender empowerment and improve the nutritional outcomes of women and children. The Division designs strategic and long-term policy and programme frameworks and initiatives for improving the nutrition of women and children, and monitors their progress and their efficacy. It provides advice and encourages partnerships between key stakeholders and international and national think tanks, educational and policy-research institutions. The Division also maintains a state-of-the-art resource centre on nutrition.

The Main Body of the Paper: The main body the paper is introduced the the Role of Women in child development. women and children is an important part in the development of the nation.

The purpose of this process is to develop A Developed Society Is The One That Respects And Takes Care Of The Health, Safety, And Well-Being Of Women And Children.

Together Creating Opportunities That Support Living And Livelyhood.

"If you educate a man, you educate an individual. But if you educate a woman, you educate a nation."

Women and Children constitute a larger segment of society and have an equal contribution to the nation-building process. Women and children development constitute around 70% of India's total population and are the core pillars for national development – today and for the future generations. Children are the building blocks of our future generation. It is important that they are well nurtured and given every opportunity for growth and development in a safe and sustainable environment.

Unfortunately, they are the underprivileged ones and a victim of violence, harassment, and discrimination. It is essential to ensure that women and girls are independent and socially, economically, and politically empowered.Although there has been significant support participation, and positive momentum from the governments, organizations, NGOs, etc. however the progress in realizing women and child development, safety, protection, and empowerment has not been adequate. Hence it is essential for all of us to join hands, drive awareness, and help shape a better nation together.

Ripples is an opportunity for us to make society and communities free from barriers and promote safety, respect, and dignity to Women and Children. Our goal is to create awareness and encourage safety for women in our homes, offices, and even communities. Our aim is to bring the society and communities closer and stronger with policies and processes that support women and children upliftment and gives them every opportunity to live risk-free.

Conclusion: In conclusion, Considering the above facts, the objective of women and child welfare is: (i) To improve the social, economical, health and nutritional status of women. (ii) To improve the physical, mental, intellectual, and nutritional status of children.

Women and Child Care in India: Necessity, Objectives, Important Development, Programmes!

According to Jawaharlal Nehru, the condition of a nation well reflected by looking at the status of its women. The country, in which higher attention has been paid towards women and Child care, becomes more developed than others.

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Role Of Libraries In Society

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ABSTRACT :-

Education is the backbone for the progress of any society. Libraries provide the crucial role in promoting education, research, personality development, ethics and other important values. A society connect flourish without proper education and the primary requirements of the education system is thebe knowledge available in the books. Libraries acquire books along with other reading materials organize them, preserve them and disseminate the informations to the users. Thus Libraries play an important role in development of society.

INTRODUCTION :-

A Society or human society has several different meanings. It refers to people living together in a community sharing common interest and may be having distinctive customs and institutions.

The term 'society' may also be used to refer to various distinctive cultural groups of people, Simply we may view society as an aggregate of individuals living together as inter dependant members in a highly structured systems of communities. The library play a fundamental role in our Society. They are the collectors and stewards of our heritage; they are organizers of the Knowledge in the books, they collect adding value by classifying and describing them, and as public institutions they assure equality of access for all citizens. They to use the knowledge of the past and present and lay it down for the future.

In ancient time libraries acted only at the custodian of books and. other written documents writings on clay, tablets, papyrus, paper etc. were preserved in those libraries. Libraries were existed at accommodation & personal collection of Kings, in temples and religious centers. There were limited accessibility to these collection only to the elite who were involved in acquiring knowledge had access to it.

LIBRARY AND SOCIETY

Library and society both are interlinked and interdependent. Library exists for the need of the society. A library can be referred to as a well acknowledge Social agency. It plays a vital role in Sharing our society. It transmits and disseminated the accumulated knowledge through books and other materials. The library is a social institution. Libraries form a vital part of the world's social and educational System. They are entrusted with the responsibility of carrying knowledge to the doors of those who require it, so that it can be -fruitfully utilized both by the educated and the uneducated masses Knowledge is available through books, films, recordings and other material to the people in all walks of life all library resources for their day to day life.

THE CHANGE OF SOCIETY

The library users are different types of children, adult, teenagers, senior citizens etc. The use of Internet accesses are online Source of Electronic books, E-Journals, E-paper etc. The communication Shared the electronic mail, social Network of facebook. Twitter linked etc. The sharing of ideas downloading and uploading youtube etc. Thus save the time of the reader in the library and get it the information.

ROLE OF LIBRARIES IN SOCIETY

Library is a learning institution that exists in our society from ancient time. It is a place where Interaction between human and information takes place and intends to satisfy the information and social needs. Libraries play a vital role for a nation by presenting its cultural heritage. In the modern age with the abundance of information libraries assist the society by maintaining and disseminating the relevant information as and when required.

The roles that libraries play in Supporting modern societies can be grouped under five Categories.

1) Higher Education
2) User education
3) Recreation

4) Library as a place
5) Social and cultural

Library as a place has an attraction in itself as Library is used to run and organise academic, social, and cultural activities. Libraries serve as commonly Centers with creative spaces suitable for a number of activities such as organizing cultural activities to promote social harmony, Libraries collect practices, and conserve documents relating to socio-cultural aspects of the society for future Governments.

CONCLUSION

The Library professionals are today use of information and Communication Technology in various activities of the libraries. The library is a service oriented organization created to facilitate access to learning resource of basic knowledge preservation and dissemination of information, human Culture and civilization, They develop the various skills that are Promoting the library roles. The Internet has Connected many computer and developing the network technology at the right time we the right information of the readers.

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New Trends In Teaching English Language

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Introduction

This paper shows the ELT education trend has recently been gaining in significance ineducation systems throughout the world. English Language Teaching (ELT) has tremendouslychanged over the last one decade. Language teaching in the twentieth century underwent numerous changes and innovation. In the past ten years the crucial factors have combinedto affect current perspectives on the teaching of English: (A) The decline of methods, (B) Agrowing emphasis on both bottom-up and top-down skills, (C) The creation of newknowledge about English and, (D) Integrated and contextualized teaching of multiplelanguage skills. TESOL has been and continues to be a dynamic field, in which new venuesand perspectives are describing.

Overview of Historical Trends

Generally every type of language teaching has its own technologies to maintain it. Languageteachers who followed the grammar-translation method (GTM) (in which the teacher explainedgrammatical rules and students performed translations) relied on one of the most omnipresenttechnologies in U.S. education, the blackboard a perfect vehicle for the one-way transmission of information that method implied. The blackboard was later supplemented by the overheadprojector, another excellent medium for the teacher-dominated classroom, as well as by earlycomputer software programs. On another side, the audio-tape was theperfect medium for the audio-lingual method (in which students were believed to learn bestthrough constant repetition in the target language). University provided the lab facility, wherestudents would perform the repetition drills. Late 1970s, the audio-lingual method fell intodisregard, at least in part owing to poor results achieved from expensive language laboratories.Whether in the lab or in the classroom, repetitive drills which focused only on language forand ignored communicative meaning achieved poor results. The 1980s and 1990s have seen afull-scale shift in the direction of communicative language teaching, with an emphasis onstudent engagement with authentic, meaningful, contextualized discourse. Within this generalcommunicative trend, we can note two distinct perspectives, both of which have their implications in terms of how to integrate technology into the classroom.

Modern Trends of Teaching

Computers and language teaching have been walked hand to hand for a long time andcontributed as teaching tools in the classroom. Computers and technology are still a source of uncertainties and anxiety for many teachers everywhere in the world despite the latestadvances applicable to language teaching such as specialized websites, blogs, wikis,language teaching methodology, journals, and so.

Teaching with Technology:

Teaching with the technology, deal with the ICT in the languagecurriculum. According to the authors ICT have basic features that make its use a valuablesource for input but some teachers may not trust technology or just be reluctant to includecomputer in their classrooms. Learning With technology has the capacity to transform learning environments in ways that are difficult formost educators to imagine. Some adults have in using basic computer functions such asemail, search engines, and presentation software is the much larger issue. Thecenturyteachersintegrate technology into their classroom and build the confidence to learn how touse technology in meaningful ways:

1.The pedagogical integration of technology in which they are placed for practicum experiences

2.The future teacher's degree of computer literacy;

3.The pedagogical integration of technology by instructors during university education of future teachers

4. A future teacher's expectations of success in integrating technology.

5.The value placed on technology by future teachers

As laptop computers, interactive whiteboards and broadband internet became cheaper andmore available around the world began to introduce them into classrooms, often and sadlywithout

appropriate training. This was the decade that we learned of digital immigrants anddigital natives, which created an extra gap between teachers and students who were oftenconsidered in separate camps. We also had to learn a bunch of new acronyms (IWB, ICT,URL etc), as if we didn't have enough already. Different features and uses of technology into the classroom:

Learner centeredness and Learner needs:

The English Language Teaching pedagogies whichhave focused on developing learners' communicative competence and on promote learningstrategies and learner autonomy in language classrooms. Two key concepts of the learnercentred classroom are first, placing more responsibility in the hands of the students tomanage their own learning, and second, teachers taking roles as facilitators of knowledge tohelp learners learn how to learn rather than being the source of knowledge. The followingqualities the learner should develop: (a) Showing a high degree of motivation; (b) havingself-confidence; (c) demonstrating an awareness of learning needs and of the role of language learners; (d) being strategic and enthusiastic in learning; (e) being curious andcreative in thinking; and (f) holding democratic, open-minded, and critical attitudes wereidentified by the participants as essential attributes of positive language learners.The learners' needs motivation and confidence were positively affected by their awarenessof learning: (a) a thorough orientation at the beginning of the program, (b) the teachermediation in the process of learning, and (c) the self assessment of strengths andweaknesses, most of the students said that they knew what to learn and what to do in orderto improve. They were aware that being involved in the learning process was crucial forsuccessful learning.

Corpus Linguistics:

An approach to investigating language structure and use through the analysis of large databases of real language examples stored on computer Issues open toCorpus Linguistics include The Meanings of Words across Registers, The Distribution andFunction of Grammatical Forms and Categories, The Investigation of Lexico-GrammaticalAssociations (Associations of Specific Words with Particular Gram

matical Constructions),The study of Discourse Characteristics, Register Variation, and Issues in LanguageAcquisition and Development.

Apart from the abovementioned items, Andrian under Hill lists out the following as the recent trend which are very much prevalent in English language teaching. They are

1. Networking, interest and support groups.
2. Learner centeredness and learners needs.
3. Reflective practice and teacher learning.
4. Portfolio development for teachers.
5. Syllabus design /materials development.
6. Criticism of published materials.
7. English as an International language.
8. Corpora

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Stress And Women Health In India: Improvement And Strategies

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Abstract :

India's populace has extra than doubled when you consider that 1961. Although India has been a pacesetter in growing fitness and populace policies, there had been predominant implementation issues because of poverty, gender discrimination, and illiteracy. Yet, three-quarters of the meals produced yearly in India is due to girls. In 1991, simplest 39.three% of Indian girls have been literate. The literacy stage of girls can have an effect on reproductive behavior, use of contraceptives, fitness and upbringing of kids, right hygienic practises, get entry to to jobs and the general popularity of girls withinside the society. Early marriage and childbirth became a prime determinant of girls's fitness and became additionally answerable for the triumphing socioeconomic underdevelopment in India. The standard maternal mortality for India is 572.three in line with 100,000 births, starting from 14.9% in Bihar to 1.three% in Kerala. Anemia is an oblique component in 64.4% of the maternal deaths. Trained delivery attendants presently help in approximately 60-80% of all births in girls on the time of delivery. Socioeconomic elements are answerable for maternal deaths to a big extent - cash in 18.three%, shipping in 13.7%. When the mom dies it doubles the probabilities of dying of her surviving sons and quadruples that of her daughters. Among the avoidable elements in maternal deaths, loss of antenatal care is the maximum essential. Women, if knowledgeable and aware, can enhance the fitness in their kids via way of means of easy measures like true hygiene, workout and nutritional habits. Because of poverty, most of the younger kids, specially women dwelling on streets are clean prey for crook prostitution rings, drug trafficking and outcomes of HIV infection, and excessive emotional and intellectual disturbances. Women are answerable for 70-80% of all of the healthcare furnished in India. Female healthcare carriers can play an essential position in teaching society to understand their fitness and vitamins desires. Women experts and empowerment of girls in any respect degrees are required for development of the fitness and vitamins shape in India.

Keywords: India, women, fitness, health, empowerment

Introduction :

Women, who're key in retaining healthful families, get admission to the fitness device greater than guys, each for themselves and on behalf in their children. Many come to be pregnant and deliver birth, a full-size fitness event, then generally come to be their child's number one caregiver, a position that substantially impacts family fitness standard. Elder and long-time period care troubles have an effect on women greater frequently due to the fact they stay longer; have better prices of incapacity and persistent fitness problems; and decrease earning than guys on average, which places them at extra want for kingdom and network resources, consisting of Medicaid. Across her lifespan, a woman's fitness repute subjects to herself, her own circle of relatives and to kingdom budgets. Legislators are wrestling with tight budgets and converting fitness laws—consisting of the realities of imposing federal fitness reform below the Affordable Care Act (ACA). If women's wishes are omitted in those discussions, however, states lose vital possibilities to enhance the fitness of citizens and benefit companions in growing a more healthy society.

An Overview of Women's Health :

Since the flip of the century. India's intercourse ratio has come to be an increasing number of favorable to males. This is in comparison to the state of affairs in maximum countries, in which the survival probabilities of women have advanced with growing financial boom and declining standard mortality. In India, extra woman mortality persists as much as the age of 30-a symptom of a bias in opposition to women. But there are extensive disparities in fertility and mortality amongst states and, inside states, among rural and concrete areas. The appreciably negative stages of those signs withinside the northern states of Bihar. Madhya Pradesh, Rajasthan. and Uttar Pradesh in terms of maximum southern states replicate marked social and demographic contrasts among the "Hindi belt" and the relaxation of India. The southern kingdom of Kerala, for instance, has completed fertility and mortality stages drawing near the ones of commercial countries.

The Status of Women :

The function of women in conventional Indian society may be measured through their autonomy in decisionmaking and through the diploma of get admission to they should the outdoor world. By those measures, Indian women, specifically the ones withinside the north, fare poorly. Girls are generally married as younger youngsters and are taken from their natal houses to stay of their husbands' households. There they may be ruled now no longer handiest through the guys they have got married however additionally through their new inlaws, specifically the older women. Women are often averted from running outdoor the house and travelling with out a chaperon, and this has profound implications for his or her get admission to to fitness care. The cash they earn, the dwellings wherein they stay, or even their reproductive careers aren't theirs to control. In addition, the paintings they carry out is socially devalued. This inherently inequitable social device is perpetuated thru a method of socialization that rationalizes and internalizes the woman downside.

Education :

The woman downside in India is likewise glaring in schooling. Although full-size profits had been made in woman literacy when you consider that independence and the advantages of teaching women are broadly recognized, populace boom has supposed that there are greater illiterate women nowadays than a decade ago. According to the 1991 census, handiest 39 percentage of Indian women above age 7 are literate, in comparison with sixty four percentage of males. In a few northern states, the proportion of literate women is as little as 21 to 26 percentage. A form of socioeconomic elements are chargeable for women's decrease academic attainment, consisting of direct costs, the want for woman labor, the low anticipated returns, and social restrictions. Because women's academic degree and enhancements of their fitness repute are carefully linked, growing woman schooling is fundamental to enhancing their fitness.

Diseases and Health Challenges Common to Women :

Women revel in particular fitness care demanding situations and are much more likely to be recognized with sure illnesses than guys. Chronic illnesses and situations—together with coronary heart sickness, most cancers and diabetes—are the main reasons of demise for women. Nearly 1/2 of of adults—133 million human beings—have a continual illness, and 1/2 of of these have or extra continual situations. Thirty-8 percentage of women be afflicted by one or extra continual illnesses, as compared to 30 percentage of guys. According to the Centers for Disease Control and Prevention (CDC), seventy five percentage of all U.S. fitness care greenbacks deal with human beings with continual situations. Managing continual sickness is frequently hard for the uninsured, and women are much more likely to lack coverage.

Chronic Diseases and Conditions

Heart Disease :

Heart Disease Heart sickness is the main reason of demise for women. Women might also additionally have extra diffused signs and symptoms of a coronary heart assault than guys, together with top belly pain, lightheadedness or fatigue. “Heart Month” is nationally identified in February, and the American Heart Association’s Go Red for Women marketing campaign encourages focus. Many states have followed comparable focus efforts. Two CDC supply applications—Well-Integrated Screening and Evaluation for Women Across the Nation (WISEWOMAN) and the National Heart Disease and Stroke Prevention Program (HDSP)—assist states cowl screening and associated offerings for women.

Cancer :

Cancer kills extra than 250,000 women withinside the United States annually. Access to preventive offerings below the ACA ought to assist extra women hit upon a few cancers earlier. In addition, elevating focus approximately signs and symptoms and danger elements for unique cancers is an essential factor of prevention and early diagnosis, particularly for cancers of the breast, lung, colon and pores and skin, which can be in large part preventable. States can assist make sure early breast most cancers detection via way of means of growing get entry to to mammograms. Some states have taken legislative motion to require the Human Papillomavirus (HPV) vaccine for pre-adolescent women to save you cervical most cancers or have furnished investment to make it extra conveniently to be had. In an attempt to lessen pores and skin most cancers rates, some of states ban tanning mattress use via way of means of minors.

Diabetes :

The direct clinical charges related to diabetes totaled $116 billion in 2007; CDC reviews that clinical prices for sufferers with the sickness are extra than double the charges for folks that do now no longer have it. Diabetes, the 7th main reason of demise withinside the United States, can result in extreme and steeply-priced complications, consisting of coronary heart sickness, stroke, amputations, blindness and kidney sickness. Medicaid sickness control offerings can keep states cash and assist limit complications. Some states require coverage insurance for numerous offerings and aid country diabetes prevention and manage applications inside their fitness departments.

Depression :

According to the Mayo Clinic, women are two times as in all likelihood as guys to revel in depression. The situation will have an effect on one in 5 women in some unspecified time in the future of their lives, maximum typically among a long time forty and 59. Final rules from the U.S. Department of Health and Human Services associated with important fitness blessings below the ACA require man or woman and small organization marketplace plans to cowl intellectual fitness and substance abuse remedy on a stage similar to clinical and surgical offerings (acknowledged as "parity") starting in 2014. For example, monetary requirements—together with copayments and deductibles—and remedy limitations—together with quantity of visits covered—want to be identical to the ones for remedy of different clinical situations.

Osteoporosis. According to the National Osteoporosis Foundation, the sickness influences eight million women over age 50. Osteoporosis reasons 2 million fractures at a value of $19 billion annually, and charges will upward push because the populace a long time. Medicare and Medicaid cowl about seventy five percentage of related fitness care charges, now no longer consisting of the nursing domestic charges that end result from hip and different fractures. Thirty-4 states and Puerto Rico have legal guidelines concerning osteoporosis, in most cases to elevate focus; as a minimum 14 states require coverage plans to cowl osteoporosis-associated remedies and offerings.

Prevention and Wellness :

Prevention and well being tasks guard and enhance fitness for each the complete network and sure groups. To save you sickness and sell wholesome behaviors, policymakers might also additionally don't forget tasks associated with immunizations, nutrients and oral fitness.

Promoting Healthy Lifestyles :

Eating nutritious foods, exercising, preserving a wholesome weight and decreasing unstable behaviors can assist save you many continual illnesses. States might also additionally don't forget attractive caregivers and mother and father in efforts to fight early life obesity. Parents commonly decide the varieties of meals to be had within side the domestic, offer leisure possibilities and sell day by day bodily activity. Parents additionally function fashions for his or her children, and their fitness is carefully tied to that in their children. State guidelines can affect environmental and monetary situations that inspire households to make wholesome choices. Legislators can enact guidelines that inspire wholesome meals alternatives in schools, bodily activity, and the complicated project of creating wholesome meals to be had in groups. States are also designing groups to make it less complicated to be bodily lively via way of means of selling strolling and cycling trails and making sure secure routes to school. The federal authorities has these days made network transformation offers to be had to choose groups in each country. The offers are designed to have interaction companions from numerous sectors—together with the education, transportation and enterprise sectors and faith-primarily based totally organizations—to enhance the fitness in their residents.

Strategies for Change :

Improving women's fitness calls for a robust and sustained authorities cornmitment, a positive coverage environment, and well-focused assets. The authorities's approach ought to encompass balancing the jobs of the private and non-private sectors to maximise assets and to increase care to women whom authorities applications do now no longer reach. The public region will keep to play a key position in supplying offerings which includes own circle of relatives planning, maternity care. and manipulate of infectious sicknesses that sell fairness and monetary performance and confer huge benefits. However, now no longer all fitness offerings-even the ones which can be publicly funded-want to be supplied via way of means of the state. The assignment for the authorities is to assist direct and enhance privately supplied offerings thru suitable regulatory preparations and via way of means of encouraging an enlargement in their scope to encompass merchandising and prevention, similarly

to healing care. The enlargement and strengthening of present offerings will lessen the sickness burden and the related costs. which includes productiveness losses. For those enhancements to be sustained and the woman drawback decreased, fitness structures need to be greater gender sensitive, and schooling and employment possibilities need to be expanded. Both call for- and supply-facet concerns want to be taken into account. despite the fact that green, superb offerings will generate their very own call for withinside the lengthy run.

Conclusion :

Health desires and offerings for numerous populations have come to the leading edge as states paintings to make their structures greater green and don't forget protecting extra human beings beneathneath federal fitness reform implementation. This brief, women's fitness, highlights sicknesses and fitness demanding situations not unusual place to women, possibilities to enhance get right of entry to care and powerful treatment, and techniques to save you situations and fitness issues earlier than they end up complex and expensive.

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National Policies For Women Empowerment: An Indian Scenario

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Abstract

The precept of gender equality is enshrined withinside the Indian Constitution in its Preamble, Fundamental Rights, Fundamental Duties and Directive Principles . The Constitution now no longer best presents equality to ladies, however additionally empowers the State to undertake measures of advantageous discrimination in favour of ladies.Within the framework of a democratic polity, our laws, improvement policies, Plans and programmes have aimed toward ladies's development in exclusive spheres. Fromthe Fifth Five Year Plan (1974-78) onwards has been a marked shift withinside the technique to ladies's troubles from welfare to improvement. In latest years, the empowerment of ladies has been diagnosed because the imperative difficulty in figuring out the popularity of ladies. The National Commission for Women became installation via way of means of an Act of Parliament in 1990 to guard the rights and felony entitlements of ladies. The seventy three rd and seventy four th Amendments (1993) to the Constitution of India have furnished for reservation of seats withinside the nearby our bodies of Panchayats and Municipalities for ladies, laying a robust basis for his or her participation in choice making on the nearby levels.

Introduction

The present paper is an strive to research the fame of woman empowerment in India the usage of numerous signs primarily based totally on facts from secondary sources. The examine famous that woman of India are surprisingly disempowered and that they experience incredibly decrease fame than that of guys no matter many efforts undertaken via way of means of government. Gender hole exists concerning get right of entry to to training and employment. Household selection making energy and freedom of motion of woman range significantly with their age, training and employment fame. It is observed that recognition of unequal gender norms via way of means of woman are nonetheless triumphing withinside the society. More than 1/2 of of the woman consider spouse beating to be justified for one motive or the different. Fewer woman have very last say on the way to spend their income. Control over coins income will increase with age, training and with location of residence. Women's publicity to media is likewise much less relative to guys. Rural woman are extra vulnerable to home violence than that of city woman. A big gender hole exists in political participation too.

In the closing 5 decades, the idea of woman empowerment has gone through a sea alternate from welfare orientated technique to fairness technique. It has been understood because the procedure via way of means of which the powerless advantage more manage over the situations in their lives. Empowerment in particular consists of manage over sources and ideology. According to Sen and Batliwala (2000) it results in a developing intrinsic capabilitygreater self confidence, and an internal transformation of one's recognition that permits one to conquer outside barrier. This view specifically emphasizes on vital factors. Firstly, it's far a energy to obtain favored dreams however now no longer a energy over others. Secondly, concept of empowerment is extra relevant to folks that are powerless- whether or not they may be male or female, or institution of individuals, magnificence or caste. Though idea of empowerment isn't unique to woman, but it's far precise in that and it cuts throughout all sorts of magnificence and caste and additionally inside households and households (Malhotra et al, 2002). Women empowerment is likewise described as a alternate withinside the context of a woman's existence, which permits her elevated ability for main a satisfying human existence. It receives meditated each in outside qualities (viz. health, mobility, training and attention, fame withinside the family, participation in selection making, and additionally at the extent of fabric security) and inner qualities (viz. self attention and self confidence) [Human Development in South Asia (2000) as quoted by Mathew (2003)]. UNDP (1990) for the primary time delivered the idea of Human Development Index (HDI) that developed to begin with as a broader degree of socio-financial development of a state however it have become famous as a degree of common achievements in human improvement for each the sexes.

Contrary to the overall perception that improvement is gender neutral, facts display that woman lag at the back of guys all around the global which include India in nearly all factors of existence. It is because of this that the focal point on human improvement has been to spotlight the gender measurement and persevering with inequalities confronting woman due to the fact 1995 (UNDP 1995). The Report cited that with out empowering woman typical improvement of humans isn't viable. It similarly pressured that if improvement isn't engendered, is endangered.

National policies

The National Policy on Empowerment of Women followed in 2001 states that " All sorts of violence in opposition to ladies, bodily and mental, whether or not at home or societal levels, together with the ones bobbing up from customs, traditions or widely wide-spread practices will be treated efficaciously on the way to cast off its incidence. Institutions and mechanisms/schemes for help may be created and reinforced for prevention of such violence, together with sexual harassment at paintings region and customs like dowry; for the rehabilitation of the sufferers of violence and for taking powerful motion in opposition to the perpetrators of such violence. A unique emphasis can also be laid on programmes and measures to address trafficking in ladies and girls." Under the Operational Strategies, the Policy presents:

a) Strict enforcement of applicable felony provisions and rapid redressal of grievances with unique awareness on violence and gender associated atrocities;

b) Measures to save you and punish sexual harassment at paintings region and safety of ladies people withinside the organised/unorganized sector

c) Crime in opposition to ladies - their incidence, prevention, investigation, detection and prosecution to be reviewed often in any respect Crime Review fora on the Central, State and District levels.

d) Women's Cells in Police Stations, Women Police Stations, Family Courts, Mahila Courts, Family Counseling Centres, Legal Aid and Nayaya Panchayats to be reinforced and improved to cast off VAW and atrocities in opposition to ladies.

The Policy additionally presents that "Women's Cells in Police Stations, Women Police Stations, Family Courts, Mahila Courts, Counseling Centers, Legal Aid Centers and Nyaya Panchayats may be reinforced and improved to cast off violence and atrocities in opposition to women.

The Case of India

As some distance as India is concerned, the precept of gender equality is enshrined withinside the Constitution and unearths an area withinside the Preamble, Fundamental Rights, Fundamental Duties and Directive Principles. The Constitution now no longer handiest presents equality to woman however additionally empowers the States to undertake measures of wonderful discrimination in favour of woman. Historically the fame of Indian woman has been stimulated via way of means of their past. There is proof to expose that woman withinside the Vedic age were given maximum venerated positions withinside the society (Seth, 2001). They had the proper to training and had been loose to stay single and dedicate their complete existence to the pursuit of understanding and self realization. The married woman done all of the works and sacrifices similarly with their husbands. They had been knowledgeable in numerous disciplines of understanding together with astrology, geography, veterinary sciences or even in martial arts. There had been times of woman taking element in wars and fights. They had been surprisingly reputable inside and out of doors home. Gradually because of numerous socio-political changes, in particular at some stage in the center age, the superb fame of woman declined. The urge for equality at the a part of Indian woman commenced getting momentum at some stage in the colonial times. Noted social reformers and countrywide leaders like Raja Ram Mohan Roy, Annie Besant, Sorojini Naidu and Ishwar Chandra Vidyasagar made selfless efforts to create attention amongst woman approximately their fame and had been pretty a success in putting off numerous social evils together with sati pratha, baby marriage, and polygamy. They additionally endorsed widow remarriage and woman training. The reformers had been a success in growing a base for improvement of woman and theirs try for equality. In route of time Indian society were given converted from conventional to a current one. Consequently woman have become extra liberal and privy to numerous methods of existence. Since they may be pretty able to breaking the

conventional limitations imposed via way of means of the society at the moment are hard the patriarchal gadget aleven though in a restricted scale.

Decision Making Power

Decision making strength of girls in families is one of the essential signs of girls empowerment. It is observed that most effective 37 consistent with cent of presently married girls take part in making selections both on my own or together with their husband on their fitness care, huge family purchases, purchases for each day family wishes and on travelling their own circle of relatives individuals and household (Table 1). Forty 3 consistent with cent take part in a few however now no longer all selections and 21 consistent with cent do now no longer take part in any of the choice. As excessive as in 32.four consistent with cent instances the choice concerning the acquisition of each day family wishes is taken particularly via way of means of the respondents while the selections like go to to her household are in maximum instances taken on my own via way of means of husbands or together. Decision like important family purchases is taken together in maximum of the instances.

Freedom of Movement

Free mobility of girls is every other indicator of girls empowerment. The facts famous that approximately 1/2 of of girls are allowed to visit the marketplace or to the clinic on my own (Table 3). Only 38 consistent with cent are allowed to tour on my own to locations outdoor the village or community. While now no longer all girls are allowed to visit those locations on my own, most effective a minority aren't allowed to move at all. Compared to city girls, rural girls have much less mobility. Women's mobility is likewise suffering from their historical past traits like age, training, marital reputation, kind of own circle of relatives and many others. Table four famous that freedom of motion will increase with age aleven though it does now no longer range linearly with training. Seventy consistent with cent of the girls of the very best training institution are allowed to move on my own to the marketplace as in opposition to forty nine consistent with cent of girls and not using a training.

Acceptance of Unequal Gender Role

Women's protest in opposition to unequal gender function in phrases in their mind-set toward options for son, spouse beating and many others is every other indicator of girls empowerment. The facts supplied in Table five display that fifty four consistent with cent of girls in India agree with spouse beating to be justified for any of the precise motives. Similarly 35 consistent with cent girls agree with it to be justified in the event that they overlook their residence or children. However, settlement with spouse beating does now no longer range a good deal via way of means of girls's age and family shape, however decline sharply with training. It is to be referred to that even a number of the maximum knowledgeable girls, at the least one in 3 concurs with one or extra justifications for spouse beating. In rural regions girls are commonly extra agreeable to spouse beating than in city regions. Agreement is decrease amongst by no means married girls compared to ever married girls.

Elected Women Members

Many elements are accountable and decisive withinside the election of girls applicants consisting of literacy, economic position, liberal own circle of relatives historical past, assist of different individuals of the own circle of relatives, robust persona and many others. Since maximum of the girls lack get admission to to those, few girls get tickets or even fewer get elected from this handful of girls applicants. Table 2.thirteen indicates the elected girls Members in Lok Sabha. From the desk it's far clean that percent of girls individuals to the overall individuals has been always much less than 10 consistent with cent in every Lok Sabha beginning from 1st to twelfth one. This indicates negative participation of girls in political field.

Conclusion

There are numerous constraints that take a look at the technique of women empowerment in India. Social norms and own circle of relatives systems in growing nations like India, manifests and perpetuate the subordinate reputation of girls. One of such norms is the persevering with desire for a son over the start of a female infant, that's found in nearly all societies and communities. The maintain of this desire has bolstered in preference to weakened and its maximum evident proof is withinside the falling intercourse ratio (Seth, 2001). The society is extra biased in desire of male infant in recognize of training, vitamins and different opportunities. The root motive of this kind of

mind-set lies withinside the notion that male infant inherits the extended family in India with an exception in Meghalaya. Women frequently internalize the conventional idea in their function as natural, for this reason causing an injustice upon them.

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A Lookout On Women's Health: Stress And Improvement

Syed Anisoddin

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Abstract

The function of women in conventional Indian society may be measured through their autonomy in decision making and through the diploma of get admission to they should the outdoor world. By those measures, Indian women, specifically the ones withinside the north, fare poorly. Girls are generally married as younger youngsters and are taken from their natal houses to stay of their husbands' households. There they may be ruled now no longer handiest through the guys they have got married however additionally through their new inlaws, specifically the older ladies. Women are often averted from running outdoor the house and travelling with out a chaperon, and this has profound implications for his or her get admission to to fitness care. The cash they earn, the dwellings wherein they stay, or even their reproductive careers aren't theirs to control. In addition, the paintings they carry out is socially devalued. This inherently inequitable social device is perpetuated thru a method of socialization that rationalizes and internalizes the woman downside. Female healthcare carriers can play an essential position in teaching society to understand their fitness and vitamins desires. Women experts and empowerment of girls in any respect degrees are required for development of the fitness and vitamins shape in India.

Introduction

Since the flip of the century. India's intercourse ratio has come to be an increasing number of favorable to males. This is in comparison to the state of affairs in maximum countries, in which the survival probabilities of women have advanced with growing financial boom and declining standard mortality. In India, extra woman mortality persists as much as the age of 30-a symptom of a bias in opposition to women. But there are extensive disparities in fertility and mortality amongst states and, inside states, among rural and concrete areas. The appreciably negative stages of those signs withinside the northern states of Bihar. Madhya Pradesh, Rajasthan. and Uttar Pradesh in terms of maximum southern states replicate marked social and demographic contrasts among the "Hindi belt" and the relaxation of India. The southern kingdom of Kerala, for instance, has completed fertility and mortality stages drawing near the ones of commercial countries.

Women, who're key in retaining healthful families, get admission to the fitness device greater than guys, each for themselves and on behalf in their children. Many come to be pregnant and deliver birth, a full-size fitness event, then generally come to be their child's number one caregiver, a position that substantially impacts family fitness standard. Elder and long-time period care troubles have an effect on women greater frequently due to the fact they stay longer; have better prices of incapacity and persistent fitness problems; and decrease earning than guys on average, which places them at extra want for kingdom and network resources, consisting of Medicaid. Across her lifespan, a woman's fitness repute subjects to herself, her own circle of relatives and to kingdom budgets. Legislators are wrestling with tight budgets and converting fitness laws—consisting of the realities of imposing federal fitness reform below the Affordable Care Act (ACA). If women's wishes are omitted in those discussions, however, states lose vital possibilities to enhance the fitness of citizens and benefit companions in growing a more healthy society.

Diseases and Health Challenges Common to Women

Women revel in particular fitness care demanding situations and are much more likely to be recognized with sure illnesses than guys. Chronic illnesses and situations—together with coronary heart sickness, most cancers and diabetes—are the main reasons of demise for women. Nearly 1/2 of of adults—133 million human beings—have a continual illness, and 1/2 of of these have or extra continual situations. Thirty-8 percentage of women be afflicted by one or extra continual illnesses, as compared to 30 percentage of guys. According to the Centers for Disease Control and Prevention (CDC), seventy five percentage of all U.S. fitness care greenbacks deal with human beings with continual situations. Managing continual sickness is frequently hard for the uninsured, and women are much more likely to lack coverage.

Chronic Diseases and Conditions

Heart Disease

Heart Disease Heart sickness is the main reason of demise for women. Women might also additionally have extra diffused signs and symptoms of a coronary heart assault than guys, together with top belly pain, lightheadedness or fatigue. "Heart Month" is nationally identified in February, and the American Heart Association's Go Red for Women marketing campaign encourages focus. Many states have followed comparable focus efforts. Two CDC supply applications—Well-Integrated Screening and Evaluation for Women Across the Nation (WISEWOMAN) and the National Heart Disease and Stroke Prevention Program (HDSP)—assist states cowl screening and associated offerings for women.

Cancer

Cancer kills extra than 250,000 women withinside the United States annually. Access to preventive offerings below the ACA ought to assist extra women hit upon a few cancers earlier. In addition, elevating focus approximately signs and symptoms and danger elements for unique cancers is an essential factor of prevention and early diagnosis, particularly for cancers of the breast, lung, colon and pores and skin, which can be in large part preventable. States can assist make sure early breast most cancers detection via way of means of growing get entry to to mammograms. Some states have taken legislative motion to require the Human Papillomavirus (HPV) vaccine for pre-adolescent women to save you cervical most cancers or have furnished investment to make it extra conveniently to be had. In an attempt to lessen pores and skin most cancers rates, some of states ban tanning mattress use via way of means of minors.

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Depression

According to the Mayo Clinic, women are two times as in all likelihood as guys to revel in depression. The situation will have an effect on one in 5 women in some unspecified time in the future of their lives, maximum typically among a long time forty and 59. Final rules from the U.S. Department of Health and Human Services associated with important fitness blessings below the ACA require man or woman and small organization marketplace plans to cowl intellectual fitness and substance abuse remedy on a stage similar to clinical and surgical offerings (acknowledged as "parity") starting in 2014. For example, monetary requirements—together with copayments and deductibles—and remedy limitations—together with quantity of visits covered—want to be identical to the ones for remedy of different clinical situations.

Improving Healthy Lifestyles

Eating nutritious foods, exercising, preserving a wholesome weight and decreasing unstable behaviors can assist save you many continual illnesses. States might also additionally don't forget attractive caregivers and mother and father in efforts to fight early life obesity. Parents commonly decide the varieties of meals to be had withinside the domestic, offer leisure possibilities and sell day by day bodily activity. Parents additionally function function fashions for his or her children, and their fitness is carefully tied to that in their children. State guidelines can affect environmental and monetary situations that inspire households to make wholesome choices. Legislators can enact guidelines that inspire wholesome meals alternatives in schools, bodily activity, and the complicated project of creating wholesome meals to be had in groups. States are also designing groups to make it less complicated to be bodily lively via way of means of selling strolling and cycling trails and making sure secure routes to school. The federal authorities has these days made network transformation offers to be had to choose groups in each country. The offers are designed to have interaction companions from numerous sectors—together with the education, transportation and enterprise sectors and faith-primarily based totally organizations—to enhance the fitness in their residents.

Improvement and development in fitness and health of women

Improving women's fitness calls for a robust and sustained authorities cornmitment, a positive coverage environment, and well-focused assets. The authorities's approach ought to encompass balancing the jobs of the private and non-private sectors to maximise assets and to increase care to women whom authorities applications do now no longer reach. The public region will keep to play a key position in supplying offerings which includes own circle of relatives planning, maternity care. and manipulate of infectious sicknesses that sell fairness and monetary performance and confer huge benefits. However, now no longer all fitness offerings-even the ones which can be publicly funded-want to be supplied via way of means of the state. The assignment for the authorities is to assist direct and enhance privately supplied offerings thru suitable regulatory preparations and via way of means of encouraging an enlargement in their scope to encompass merchandising and prevention, similarly to healing care. The enlargement and strengthening of present offerings will lessen the sickness burden and the related costs. which includes productiveness losses. For those enhancements to be sustained and the woman drawback decreased, fitness structures need to be greater gender sensitive, and schooling and employment possibilities need to be expanded. Both call for- and supply-facet concerns want to be taken into account. despite the fact that green, superb offerings will generate their very own call for withinside the lengthy run.

Conclusion

Among the avoidable elements in maternal deaths, loss of antenatal care is the maximum essential. Women, if knowledgeable and aware, can enhance the fitness in their kids via way of means of easy measures like true hygiene, workout and nutritional habits. Because of poverty, most of the younger kids, specially women dwelling on streets are clean prey for crook prostitution rings, drug trafficking and outcomes of HIV infection, and excessive emotional and intellectual disturbances. Women are answerable for 70-80% of all of the healthcare furnished in India. Female healthcare carriers can play an essential position in teaching society to understand their fitness and vitamins desires. Women experts and empowerment of girls in any respect degrees are required for development of the fitness and vitamins shape in India.

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Women Health Issues And Strategies For Improvement

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Abstract

Women, who're key in retaining healthful families, get admission to the fitness device greater than guys, each for themselves and on behalf in their children. Many come to be pregnant and deliver birth, a full-size fitness event, then generally come to be their child's number one caregiver, a position that substantially impacts family fitness standard. Elder and long-time period care troubles have an effect on women greater frequently due to the fact they stay longer; have better prices of incapacity and persistent fitness problems; and decrease earning than guys on average, which places them at extra want for kingdom and network resources, consisting of Medicaid. Across her lifespan, a woman's fitness repute subjects to herself, her own circle of relatives and to kingdom budgets. Legislators are wrestling with tight budgets and converting fitness laws—consisting of the realities of imposing federal fitness reform below the Affordable Care Act (ACA). If women's wishes are omitted in those discussions, however, states lose vital possibilities to enhance the fitness of citizens and benefit companions in growing a more healthy society.

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Strategies for improvement in health

Improving women's fitness calls for a robust and sustained authorities cornmitment, a positive coverage environment, and well-focused assets. The authorities's approach ought to encompass balancing the jobs of the private and non-private sectors to maximise assets and to increase care to women whom authorities applications do now no longer reach. The public region will keep to play a key position in supplying offerings which includes own circle of relatives planning, maternity care. and manipulate of infectious sicknesses that sell fairness and monetary performance and confer huge benefits. However, now no longer all fitness offerings-even the ones which can be publicly funded-want to be supplied via way of means of the state. The assignment for the authorities is to assist direct and enhance privately supplied offerings thru suitable regulatory preparations and via way of means of encouraging an enlargement in their scope to encompass merchandising and prevention, similarly to healing care.

Conclusion

Health desires and offerings for numerous populations have come to the leading edge as states paintings to make their structures greater green and don't forget protecting extra human beings beneathneath federal fitness reform implementation. This brief, women's fitness, highlights sicknesses and fitness demanding situations not unusual place to women, possibilities to enhance get right of entry to to care and powerful treatment, and techniques to save you situations and fitness issues earlier than they end up complex and expensive.

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Violence against Women as a Human Rights Concern

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According to the United Nations, 'there is no region of the world, no country and no culture in which women's freedom from violence has been secured'. Nevertheless its occurrence, violence against women was long considered a problem beyond the reach of international human rights law. Enacted by non-state actors, and caused largely by patriarchal cultural and social structures, violence against women fit uneasily in an international legal framework designed to constrain states from abuses of their power. Despite these obstacles, feminists, activists and policy-makers worked hard to reform international human rights law to address better the bane of violence against women. In particular, international and regional instruments were developed that explicitly condemn violence against women and hold states responsible even for violence committed by non-state actors. At the heart of these measures is the due diligence standard, which requires that states exercise due diligence to prevent, investigate and punish violence against women, to address violence at the level of the individual and society.[1] In considerable part because of the work of feminists, there now exists the beginnings of a framework that offers an adequate legal response to violence against women.

Why has this legal reform not translated into less violence against women? This research article looks to the growing body of scholarship aimed at understanding the efficacy, or inefficacy, of international law, given that it operates in a system without strong centralized mechanisms for interpretation, application and enforcement. However, in the context of violence against women, theories of compliance fail to tell the full story. This article argues that the work of feminists, whose efforts helped transform the law, must be extended to address the next challenge: the gap between the promise of the law, and reality. It proposes that compliance literature must first engage with feminist insights if it is to be useful in explaining, and addressing, the persistence of violence against women despite advancements at the legal level. By examining compliance theories through the lens of violence against women, this thesis reveals some gaps in the current literature, and contributes by filling in these gaps.[2] And this article also highlights that, ironically, theories of compliance with international law exhibit flaws similar to those that beset international law itself: they are androcentric and state centric.

Violence against women: prevalence, perpetrators, causes andresponses

Violence against women is a global rife. It is frequently reported that one in three women experience violence in their lifetime; in some regions the statistic is as high as 70-80%of the women's are affected by violence. Suffice it to say that violence against women has devastating consequences, including heavy economic and social costs and adverse effects on women's health and wellbeing. Unfortunately, violence against women frequently results in death. Women of every nationality, class, race, ethnicity, religion, and age are subject to gender-based violence.

In drawing the world's attention to the scourge of violence against women, activists and feminists have sought to expose its structural causes. The international community has been urged to think of violence against women not as 'random, individual acts of misconduct' but as originating from the systematic subordination of women by men. Moreover, violence against women also often intersects with other categories of oppression and marginalization, such as minority or migrant status, sexual orientation, or disability. While the precise causes of violence against women will vary from case to case, patriarchal structures almost always underlie the various individual and societal factors that contribute to violence against women. Thus, the second feature of violence against women is its complex, structural and intersectional causes.[3] Both of these features have clear implications for preventing and responding to violence against women: measures purporting to do so must go beyond the state to the private sphere, and address deeply entrenched 'social and cultural norms, institutionalized in the law and political structures and embedded in local and global economies'.

Violence against women as a human rights issue

As the global movement to combat violence against women gained traction, it intersected with the human rights movement. Realizing the power of the international human rights framework,

activists sought to transform political agendas to combat violence against women into the language of human rights. However, this transformation did not take place until the 1980s, prior to which the women's rights agenda focused primarily on promoting women's rights in the political and public arena. The late arrival of violence against women on the human rights agenda is reflected in its glaring omission from Convention on the Elimination of all Forms of Discrimination against Women (CEDAW), which opened for signature in 1979. By the mid1990s, however, the issue had risen to prominence: at the 1993 World Conference on Human Rights in Vienna (Vienna Conference), women's groups rallied around the violence againstwomen agenda, and it was one of the four central issues at the United Nations Conference on Women in Beijing in 1995.[4]

Feminist critique of international human rights law

Despite mobilizing international human rights law to combat violence against women, many feminists have been critical of the same framework. Ultimately, 'feminist scholars have argued that international human rights norms were initially articulated and continue to be interpreted and applied to reflect men's experiences while overlooking the harms that most commonly or disproportionately affect women'. In more particular terms, feminists have shown how international human rights law is ill suited to respond to the two dominant features of violence against women identified above at, that is: (1) its perpetration by non-state actors, often individuals in a private context, and (2) its complex structural and intersectional causes. The following section deals with each aspect of the critique in turn. First, international human rights law has traditionally been concerned with the state and its abuses of civil and political rights. For feminists, this focus developed because international human rights law has been made by men to respond to 'what men fear will happen to them'.[5] Highlighting the gendered operation of this public/private distinction, feminists have argued that the state-focus of international human rights law considerably limits its capacity to respond to many of the harms experienced by women. It is worth noting that this public/private critique has been challenged by feminists on a number of fronts.[5] First, the distinction between 'public' and 'private' described above is not a bright line that operates uniformly against women's interests. That said, however the distinction is described, feminists are undoubtedly right that the perpetration of violence against women by non-state actors has traditionally placed it beyond the reach of international human rights law, thus limiting that framework's ability to protect women from violence.[6]

The second major part of the feminist critique of international human rights law has two components: a concern about the value of individual rights claims, and their basis in the principle of non-discrimination. Dealing with the latter component first, feminists argue that the idea of non-discrimination, which underlies most international human rights instruments, is ill equipped to transform the entrenched and intersectional, social and cultural practices that contribute to violence against women.[7] While a progressiveapproach to non-discrimination – better described as 'equality' – might offer scope to 'do away with women's subordinate status', such an approach is not readily apparent in practice.44 In addition, individual rights claims risk universalizing the complex and hugely varied experiences of the world's women, and essentializing the causes of their oppression. Feminists have argued that this does not preclude the utility of international human rights law working for women, but rather that the framework must do better to 'accommodate the diversity of women and women's lives without compromising its strength that lies in its appeal to universality and the promotion of gender equality'.[8]

The reform of international human rights law:

Many of the critiques articulated above were mounted in the early 1990s. While their message remains relevant, considerable legal reform has been undertaken since then in order to overcome the deficiencies identified by feminists. First, in 1992, the Committee on the Elimination of Discrimination against Women (CEDAW Committee) issued General Recommendation No. 19, which asserted that 'gender-based violence is a form of discrimination that seriously inhibits women's ability to enjoy rights and freedoms on a basis of equality with men'. By linking violence against women to discrimination, General Recommendation 19 rectified the failure of CEDAW to address violence against women. General Recommendation 19 also made explicit that discrimination under the Convention is not restricted to action by or on behalf of Governments…States may also be responsible for private acts if they fail to act with due diligence to prevent violations of rights or to investigate and punish acts of violence, and for providing compensation'. Subsequent to General Recommendation 19, three international instruments were developed that describe violence against

women as a human rights violation: Declaration on the Elimination of Violence Against Women, Inter-American Convention on the Prevention, Punishment and Eradication of Violence Against Women (Belém do Pará), and Protocol to the African Charter on Human and People's Rights on the Rights of Women in Africa (Protocol to the ACHPR). In addition, on 1 August 2014, the European Convention on preventing and combating violence against women and domestic violence (Istanbul Convention) entered into force, building upon the Council of Europe's Recommendation to member states on the protection of women from violence. To varying degrees, each of these instruments contains provisions that address the feminist critiques, each instrument requires states to take measures to eliminate violence against women committed in both the 'public' and the 'private' sphere. DEVAW and Belém do Pará also both make explicit that violence against women can occur at the hands of the state, or be perpetrated by the community or a member of the family. The absence of an equivalent provision in the Istanbul Convention and the Protocol to the ACHPR is a weakness in both those instruments, [9] perhaps even more so for the Istanbul Convention, because it failed to carry over this aspect of the earlier Council Recommendation. With respect to the second feature of violence against women, all five instruments recognize the complex and structural causes of such violence, although in different ways. For example, the preamble to DEVAW states categorically that: violence against women is a manifestation of historically unequal power relations between men and women, which have led to domination over and discrimination against women by men and to the prevention of the full advancement of women, and that violence against women is one of the crucial social mechanisms by which women are forced into a subordinate position compared with men. Likewise, the preamble to Belém do Pará acknowledges in briefer terms that 'violence against women…is a manifestation of the historically unequal power relations between women and men'. The Council Recommendation and the Istanbul Convention also make this plain. In contrast, the Protocol to the ACHPR is not explicit on this point.[10]Nevertheless; each instrument contains measures aimed at tackling this second feature of violence against women.

Conclusions

The development of the concept of due diligence in international human rights law has gone some way to remedying that field's structural inability to address violence against women. Yet feminist progress at the level of law has not delivered real change. This article has argued that, ironically, the very theories of compliance that might explain and thereby help address this gap are themselves in need of feminist attention. In order to remedy this theoretical deficit, this thesis applies feminist observations to the prevailing set of compliance theories. In doing so, this article has both illuminated some of the reasons why the due diligence standard has not been effective in eliminating violence against women, and has revealed some blind spots in current theories of compliance with international law..

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Status of Academic Libraries in the Higher Education.

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Abstract:

Education is recognised as a prerequisite for a general development of a nation. Knowledge is one of the resources for the development of human kind. During this century the process of developments of knowledge has been much faster than it ever was in earlier centuries. The library is an important instrument of education. Knowledge spread through libraries. Now in India it is time to improve the quality of education and for this, the Government has to introduce a new mechanism of sanctioning grants has give serious thought to improving education at all levels.

Keywords: Academic Libraries, Academic Libraries and its Development, Impact of ICT in Libraries, ICT Brings changes in Academic Libraries.

Introduction:

The story of civilisation indicates that libraries have been an essential part of civilised society. These came into being to serve the needs of the society. Their form, character, purpose, function and the services have been determined by the needs of the society served by it. The libraries played as important part in the social, political, economic and cultural development of society. The modern trends of education is to develop a thinking individual who should prove to be a self - reliant person in every walk of life. Such a kind of thinking individual who should prove to be created only if he is initiated into the channels, which lead him in right directions for proper development of his mind. This can be achieved by wide reading which is sure to lead him to form his independent judgement of the problems facing him.

The national education policy on education 1986 and as slightly modified in 1992 has also observed "the country has reached a stage in its economic and technical development when a major efforts must be made to derive the maximum benefits from the assets already created and to ensure that the fruits of change reach all sections.

Academic Libraries:

Academic Libraries may be divided into i.e. school, college, and University. Prof. D.S.Kothari in the education Commission report (1964-66) described the academic function of the college library in India as "The library should provide library facilities and services necessary for success of all formal programmes of instruction, open the door to the wide world of books that lies beyond the boundaries of one's own field of qualification and bring books, students, and scholar together under conditions which encourage reading for pleasure, self-discovery, personal growth and the sharpening of intellectual curiosity. The staff should be able to convert the library into an intellectual workshops and should along with teachers be in a position to teach with books.

Academic Libraries System & its development:

The academic library system postulates that there should be library- oriented education in school, colleges and universities. S.R.Rangnathan suggested this to the UGC after its established in 1953 when the development of university and college and not an academic unit likes a teaching department. This is not conducive to the fulfilment of the library system in colleges in India to provide condition that makes library service effective even though ranganathan stressed the need for development of academic library in the fourth five year plan in 1970. There is now a need for perspective planning to recognise the college library system after studying its objectives and the role of the university library to provide common services to the constituent colleges. The college library system should be viewed as a network of local, university and national libraries forming integral part of the academic library system.

Impact of ICT in Libraries:

Day to day we are using technologies in the libraries. The main force that has brought revolutionary changes in functioning of the libraries is technology. In recent years, impact of technology had been tremendous on library system. These technologies have made significant impact on growth of knowledge and in unlocking the human potential.

Recent technology trends in libraries:

a. Digitised
c. Internet
d. Automation
e. Consortia
f. RFID Technology
g. Creating of institutional repository (E-Book, E-Journal)

ICT Brings changes in Academic Libraries:

a. Traditional libraries to digital libraries
b. Changes RFID tags
c. Card catalogue to OPACS
d. Photocopies to digital copies
e. Real to virtual libraries

Conclusion:

College library holds a distinctive position as its services, organisation and administration and also given significantly to the realization of the objective of college education. The librarian must be prepared to exploit resources by providing information and subject matter at the right time and suitable level and help the teachers and pupils. In this electronic age there is no difference among the education. i.e rural and urban. Now the library services shifted towards E-Library services.

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Physical And Mental Health Of Women In India

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Abstract

Women, who're key in retaininghealthful families, get admission to the fitnessdevicegreater than guys, each for themselves and on behalf in their children. Many come to be pregnant and deliver birth, a full-sizefitness event, then generallycome to be their child's number one caregiver, a position that substantiallyimpactsfamilyfitnessstandard. Elder and long-time period care troubleshave an effect onwomengreaterfrequentlydue to the fact they stay longer; have betterprices of incapacity and persistentfitness problems; and decreaseearning than guys on average, which places them at extrawant for kingdom and network resources, consisting of Medicaid. Across her lifespan, a woman's fitnessreputesubjects to herself, her own circle of relatives and to kingdom budgets. Legislators are wrestling with tight budgets and convertingfitness laws—consisting of the realities of imposing federal fitness reform below the Affordable Care Act (ACA). If women's wishes are omitted in those discussions, however, states lose vitalpossibilitiesto enhance the fitness of citizens and benefitcompanions in growinga more healthy society.

Introduction

India's populace has extra than doubled when you consider that 1961. Although India has been a pacesetter in growingfitness and populace policies, there had beenpredominant implementation issuesbecause of poverty, gender discrimination, and illiteracy. Yet, three-quarters of the meals produced yearly in India is due togirls. In 1991, simplest 39.three% of Indian girlshave been literate. The literacy stage of girls can have an effect on reproductive behavior, use of contraceptives, fitness and upbringing of kids, right hygienic practises, get entry to to jobs and the generalpopularity of girlswithinside the society. Early marriage and childbirth becamea prime determinant of girls's fitness and becameadditionallyanswerable for the triumphing socioeconomic underdevelopment in India. The standard maternal mortality for India is 572.threein line with 100,000 births, starting from 14.9% in Bihar to 1.three% in Kerala. Anemia is an obliquecomponent in 64.4% of the maternal deaths. Trained delivery attendants presentlyhelp in approximately 60-80% of all births in girlson the time of delivery. Socioeconomic elements are answerable for maternal deaths to a big extent - cash in 18.three%, shipping in 13.7%. When the mom dies it doubles the probabilities of dying of her surviving sons and quadruples that of her daughters. Among the avoidable elements in maternal deaths, loss of antenatal care is the maximumessential. Women, if knowledgeable and aware, can enhance the fitnessin theirkidsvia way of means ofeasy measures like true hygiene, workout and nutritional habits. Because of poverty, most of theyoungerkids, speciallywomendwelling on streets are clean prey for crook prostitution rings, drug trafficking and outcomes of HIV infection, and excessive emotional and intellectual disturbances. Women are answerable for 70-80% of all of the healthcare furnished in India. Female healthcare carriers can play an essentialposition in teaching society to understand their fitness and vitaminsdesires. Women experts and empowerment of girlsin any respectdegrees are required for development of the fitness and vitaminsshape in India.

The function of women in conventional Indian society may be measured through their autonomy in decisionmaking and through the diploma of get admission to they should the outdoor world. By those measures, Indianwomen, specificallythe oneswithinside the north, fare poorly. Girls are generally married as youngeryoungsters and are taken from their natal houses to stayof their husbands' households. There they may beruledno longerhandiestthrough the guysthey have got married howeveradditionallythrough their new inlaws, specifically the older ladies. Women are oftenaverted from runningoutdoorthe house and travellingwith out a chaperon, and this has profound implications for his or herget admission to to fitness care. The cash they earn, the dwellings wherein they stay, or even their reproductive careers aren't theirs to control. In addition, the paintings they carry out is socially devalued. This inherently inequitable social device is perpetuated thru a method of socialization that rationalizes and internalizes the womandownside. Female healthcare carriers

can play an essentialposition in teaching society to understand their fitness and vitaminsdesires. Women experts and empowerment of girlsin any respectdegrees are required for development of the fitness and vitaminsshape in India.

Diseases Common to Women in India

Women revel inparticularfitness care demanding situations and are much more likely to be recognized with sureillnesses than guys. Chronic illnesses and situations—together withcoronary heartsickness, most cancers and diabetes—are the mainreasons of demise for women. Nearly 1/2 of of adults—133 million human beings—have a continual illness, and 1/2 ofof these have or extracontinualsituations. Thirty-8percentage of womenbe afflicted by one or extracontinualillnesses, as compared to 30 percentage of guys. According to the Centers for Disease Control and Prevention (CDC), seventy fivepercentage of all U.S. fitness care greenbacksdeal withhuman beings with continualsituations. Managing continualsickness is frequentlyhard for the uninsured, and women are much more likely to lack coverage.

Chronic Diseases and Conditions

Heart Disease

Heart Disease Heart sickness is the mainreason of demise for women. Women might also additionally have extradiffusedsigns and symptoms of a coronary heartassault than guys, together withtopbelly pain, lightheadedness or fatigue. "Heart Month" is nationally identified in February, and the American Heart Association's Go Red for Women marketing campaign encourages focus. Many states have followedcomparablefocus efforts. Two CDC supplyapplications—Well-Integrated Screening and Evaluation for Women Across the Nation (WISEWOMAN) and the National Heart Disease and Stroke Prevention Program (HDSP)—assist states cowl screening and associatedofferings for women.

Diabetes

The direct clinicalchargesrelated to diabetes totaled $116 billion in 2007; CDC reviews that clinicalprices for sufferers with the sickness are extra than double the charges for folks that do now no longer have it. Diabetes, the 7thmainreason of demisewithinside the United States, can result inextreme and steeply-priced complications, consisting ofcoronary heartsickness, stroke, amputations, blindness and kidney sickness. Medicaid sicknesscontrolofferings can keep states cash and assistlimit complications. Some states require coverageinsurance for numerousofferings and aidcountry diabetes prevention and manageapplicationsinside their fitness departments.

Cancer

Cancer kills extra than 250,000 womenwithinside the United States annually. Access to preventive offeringsbelow the ACA ought toassistextrawomenhit upona few cancers earlier. In addition, elevatingfocusapproximatelysigns and symptoms and dangerelements for unique cancers is an essentialfactor of prevention and early diagnosis, particularly for cancers of the breast, lung, colon and pores and skin, which can bein large part preventable. States can assistmake sure early breast most cancers detection via way of means ofgrowingget entry to to mammograms. Some states have taken legislative motion to require the Human Papillomavirus (HPV) vaccine for pre-adolescent women to save you cervical most cancers or have furnishedinvestment to make it extraconvenientlyto be had. In an attempt to lessenpores and skinmost cancers rates, some of states ban tanning mattress use via way of means of minors.

Depression

According to the Mayo Clinic, women are two times as in all likelihood as guys to revel in depression. The situation will have an effect on one in 5womenin some unspecified time in the futureof their lives, maximumtypicallyamonga long timeforty and 59. Final rules from the U.S. Department of Health and Human Services associated withimportantfitnessblessingsbelow the ACA require man or woman and small organizationmarketplace plans to cowlintellectualfitness and substance abuse remedy on a stagesimilar toclinical and surgical offerings (acknowledged as "parity") starting in 2014. For example, monetary requirements—together with copayments and deductibles—and remedy limitations—together withquantity of visits covered—want to be identical to the ones for remedy of differentclinicalsituations.

Improvement in health

Improving women's fitnesscalls for a robust and sustained authorities cornmitment, a positivecoverage environment, and well-focusedassets. The authorities's approachought

toencompass balancing the jobs of the private and non-private sectors to maximiseassets and to increase care to women whom authoritiesapplications do now no longer reach. The public region will keep to play a key position in supplyingofferingswhich includesown circle of relatives planning, maternity care. and manipulate of infectious sicknesses that sellfairness and monetaryperformance and confer huge benefits. However, now no longer all fitnessofferings-even the oneswhich can be publicly funded-want to be suppliedvia way of means of the state. The assignment for the authorities is to assist direct and enhance privately suppliedofferingsthrusuitable regulatory preparations and via way of means of encouraging an enlargementin their scope to encompassmerchandising and prevention, similarly to healing care. The enlargement and strengthening of presentofferings will lessen the sickness burden and the related costs. which includesproductiveness losses. For thoseenhancements to be sustained and the womandrawback decreased, fitnessstructuresneed to be greater gender sensitive, and schooling and employment possibilitiesneed to be expanded. Both call for- and supply-facetconcernswant to be taken into account. despite the fact thatgreen, superbofferings will generate their very owncall forwithinside thelengthy run.

Eating nutritious foods, exercising, preserving a wholesome weight and decreasingunstable behaviors can assistsave you many continualillnesses. States might also additionallydon't forgetattractive caregivers and mother and father in efforts to fightearly life obesity. Parents commonlydecide the varieties ofmealsto be hadwithinside thedomestic, offerleisurepossibilities and sellday by daybodily activity. Parents additionallyfunctionfunctionfashionsfor his or her children, and their fitness is carefully tied to that in their children. State guidelines can affect environmental and monetarysituations that inspirehouseholds to make wholesome choices. Legislators can enact guidelines that inspirewholesomemealsalternatives in schools, bodily activity, and the complicatedprojectof creatingwholesomemealsto be had in groups. States are also designing groups to make it less complicated to be bodilylivelyvia way of means ofsellingstrolling and cycling trails and making suresecure routes to school. The federal authorities has these days made network transformation offersto be had to choosegroups in eachcountry. The offers are designed to have interactioncompanions from numerous sectors—together with the education, transportation and enterprise sectors and faith-primarily based totally organizations—to enhance the fitnessin their residents.

Conclusion

Among the avoidable elements in maternal deaths, loss of antenatal care is the maximumessential. Women, if knowledgeable and aware, can enhance the fitnessin theirkidsvia way of means ofeasy measures like true hygiene, workout and nutritional habits. Because of poverty, most of theyoungerkids, speciallywomendwelling on streets are clean prey for crook prostitution rings, drug trafficking and outcomes of HIV infection, and excessive emotional and intellectual disturbances. Women are answerable for 70-80% of all of the healthcare furnished in India. Female healthcare carriers can play an essentialposition in teaching society to understand their fitness and vitaminsdesires. Women experts and empowerment of girlsin any respectdegrees are required for development of the fitness and vitaminsshape in India.

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"Trend Of Digitization In Teaching And Learning Process Of Higher Education"

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"Technology will never replace great teachers,
But technology in the hands of great teachers will be transformational". - George Couros

Introduction –

The essence of Human Resource Development is education. The education sector, globally, is transforming from traditional education system to the digital education environment. The initial phase of this transformation was moderate in our country because of may be varied reasons including tendency towards adaptability to change, technical knowledge, cost of digitization and compulsion of use restricted to only technical subjects. Since last few years, this transformation has been spread to the teaching and learning community at large with commonly used ICT tools in general or we can say that the digitization with comparatively cost advantaged gadgets applied in the education sector, particularly in Higher Education.

But the Covid-19 corona virus pandemic had surprisingly affected all the sectors of economy with unexpected and long duration lockdown announced on 24th March, 2020 in the country. The teaching-learning process necessitated solutions to deal with the situation. Before this pandemic, the digitalization in other sectors particularly in banking sector has already created a big segment of digital users with ease and convenient access to the online banking services with their mobiles. The online education system exists before this pandemic but with limited scope. During the lockdown, an education system with the only choice and compulsion of using digital and online services in the sector or we can say this has actually started a new era of e-learning accessible to the remote users. The Government, public and private institutions and all the stakeholders of the education sector have no choice or alternative of e-learning during this pandemic. The education sector witnessed this trend of transformation in the form of e-learning environment with unprecedented speed and also with huge responding group particularly in higher education.

Higher Education Sector in India (in brief) :

India's higher education segment is expected to increase to Rs. 2,44,824 crores (US$ 35.03 billion) by 2025. India was ranked 34 among the 100 countries in English Proficiency Index 2019. Increasing internet penetration is expected to help in education delivery. It also has one of the largest networks of higher education institutions in the world. Number of colleges in India reached 42,343 in FY20. The number of universities in India reached 1,014 in FY22 (until October 2021), number of universities in India reached 988. India had 37.4 million students enrolled in higher education in 2018-19. In FY21, Gross Enrolment Ratio in higher education in India was 27.1%.

Higher education institutes in India are focusing on creating online programmes due to the increasing demand from users. In India, the online education market is forecast to reach US$ 11.6 billion by 2026. ICAR is one of the largest national agricultural organisations in the world. It has 122 institutes and 67 agricultural universities across India, as of July 2021. According to KPMG, India has also become the second largest market for E-learning after the US. The sector is expected to reach US$ 1.96 billion by 2021.[1]

Digitization of Teaching-Learning Process :

The digitization of teaching and learning process from the traditional chalk-board face to face trend to transform into using digital and online gadgets have faced variety of hindrances in the form of resistance to change, adaptability, technical preparedness of stakeholders, cost analysis, availability of resources and response of targeted segment (teachers and students). The digital education is now definitely transformed the teaching-learning process in more efficient way with highly accessible technological tools.

The ICT Environment : Formerly it was known as only Information Technology. The IT concept was restricted upto the use of technology for the information purpose only but with the frequent introduction of advance technological tools like digital audio and video gadgets it widened its scope

and now it is known as Information and Communications Technology (ICT). ICT refers to the merging of audiovisual and telephone networks with the computer single unified system of cabling. Thus, ICT includes any communication device – including satellite systems, television, cell phones, computer and network hardware etc. The higher education sector with advanced ICT tools such as smart devices, smart-boards, online classrooms, digital cameras, projectors, video conferencing tools, audio recording tools etc. succeeded in transferring teaching-learning process.[2]

ICT is not only influencing, changing, and supporting the content that is being delivered by the teachers but also changing the way students are learning. There has been a systematic movement from ***content-centered curricula*** to ***competency-based curricula*** with the aid of various ICT tools. With ICT advancements in Educational Technological tools, off-campus delivery of courses is possible for students who were unable to attend the class for any reasons. It allows access to various courses and programmes from the place of learners. It provides convenience to the students in terms of time and also it is cost effective as it save the travelling expenses.[3]

Virtual Teaching-Learning Process : The virtual teaching learning process enhancing experiences with the use of **AI (Artificial Intelligence).** The pandemic gives an opportunity to adapt variety of online digital tools and applications in teaching-learning process like Whatsapp groups to promote free talks on course contents, like Google Classroom, Google Meet, Zoom Meet, subject related videos on YouTube, charts and models, use of many other online free applications have changed the scenario of higher education. Even Facebook and Instagram apps are used frequently to communicate instructions to the students.

Assessment and Evaluation Process : Digitization of teaching and learning also changed the form of assessment and evaluation process. The advanced ICT tools have made assessment and evaluation of students' online performances. The assessment can be either 'formative', designed to monitor students' progress, 'summative', to evaluate against particular criteria or in any other way. Variety of ICT tools are there like Google Classroom, Google Form, Socrative, Quizizz etc.[4]

Objectives of the study : The study is based on the following objectives.

1. To study the change in higher education sector.
2. To analyse digital teaching-learning process.
3. To update with the current digital environment of higher education.

Research Methodology : The study is based on the review of secondary data. Recent articles available on internet have been studied to analyse the digital transformation of higher education sector. It is interesting, to go through recent scenario of digital environment where the world is moving towards grasping the potentials of existing and upcoming technology. In this study, the features of modern technology (specifically ICT) are highlighted in brief to understand its impact on higher education sector.

Conclusion:

The education sector has encountered with variety of challenges during Covid-19 pandemic. The transformation of education sector in digital environment to meet timely and accessible arrangements has provided an opportunity to enhance the sector. Digitalization of education system has changed the scenario with highly advanced ICT tools but it cannot replace the completely the traditional teaching-learning process specifically the role of teachers (face-to-face) in teaching, solving difficulties, motivating and shaping students' career. The blended teaching may prove a way to quality enhancement of education.

It is recommended that contemporary way of teaching-learning should be adopted by the stakeholders to achieve the ultimate objective of human resource development.

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Teaching English Through " Online Mode''

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ABSTRACT

As now these days, teaching methods have been changing vastly, the teachers use modern technologies for teaching. We can see it now due to COVID -19, the school's colleges are closed, and students are learning online. Online teaching is purely technical, blended with teaching and information. Now, these days digital teaching is on-trend. Online learning programs are when the classes are conducted through virtual classrooms instead of the traditional modes of teaching. Classes are conducted on a computer. Online ESL uses a particular website for teaching. This is commonplace where the teachers and students access learning materials and system support. E-books should be introduced for learning because this is a digital era. Everyone is having a smartphone and a tablet. So, if E-Books are introduced, it will be of great help.

INTRODUCTION

English language teaching has undergone a lot of changes over the past years. Many career alternatives that were regarded as insignificant are gaining importance like soft skills, technical skills, etc. For this, a change in the trends teaching-learning process should be introduced for its betterment. Today technology has become very fast. We can see technology in every corner of our life, such as movies, games, etc. It has become an essential source of entertainment. The internet provides excellent opportunities for entertainment. Technology serves as a major purpose that is communication. By this method of teaching ESL English as a second language will become easy. We all know that technology plays a significant role in the teaching and learning process. Technological innovations are a part of education. Only the innovations which have solid teachings will stand with time. As nowadays, teachers combine digital media with more forms of teaching. There are a lot of online teaching resources also available. As we all know that there are lots of mobile-friendly apps available. These apps can be a great form of learning.

Teaching English as a secondary language is a big challenge. It doesn't matter what your background and experience level is. Like teaching other subjects, you will realize that every student learns differently. But with some work, you will be able to gain skills that will be required in teaching ESL**.** First of all, we should know what a trend is? A trend is a general tendency or direction towards change over the years especially.

What is ESL?

Now, these days teachers are involved in getting a lot of training because everything keeps on changing. To be employable and remain competitive, teachers are involved in technical training. Like other careers or professions, teachers should keep themselves learning and developing their knowledge and skills. By developing these skills teaching ESL will be more comfortable. The design of an ESL program helps students who want to learn English as a second language. Schools generally use the term ESL for students who are not native speakers. ESL teachers help in instructing the students in writing, reading, and conversing, and job-oriented communication skills. Generally, the students enroll in this program to use this program in school, work, and study abroad.

If a teacher is continuously teaching in the class without asking questions and without students' involvement, it creates monotony in the class. So, student participation is significant. The teacher should ask questions at the end of the class and summarize whatever he has taught in a few minutes. He has to clear all the doubts. This will help to teach ESL as a secondary language. A lot of changes have to be made in the teaching method. As teaching is student-centric, so involvement of the students is required. Teachers should give them specific tasks and involve them in certain conversations. They should also be given role-play to prevent stage fear, which is very common in students. Teachers should teach in the class with a sense of humor. They should create a friendly atmosphere in the class. Students always feel comfortable when the teacher is friendly in the class. They feel free to ask any questions. The teacher should not be very serious in class. They should balance between seriousness and a sense of humor.

Most of the students are good at technical English, but they are not in general English. Learning Language through literature, reviews, dictionary, discussions, and analysis helps the students to improve their communication skills. So, the teachers should encourage the students to read novels, books, essays to improve their skills. Teaching through literature also helps in teaching ESL English as a second language. Grammar plays a vital role in teaching. Teachers should teach them from a learning point of view, not an examination point of view. Grammar is also very important in writing the sentence as well as learning it correctly. In the inductive method, the examples are given first, and then the rules are described. He first gives the students examples and asks the students to frame their own sentences. So, this method is one of the best methods to teach English grammar. This will be very helpful in teaching ESL English as a Second Language.

As now these days, teaching methods have been changing vastly, the teachers use modern technologies for teaching. We can see it now due to COVID -19, the school's colleges are closed, and students are learning online. Online teaching is purely technical, blended with teaching and information. Now, these days digital teaching is on-trend. Online learning programs are when the classes are conducted through virtual classrooms instead of the traditional modes of teaching. Classes are conducted on a computer. Online ESL uses a particular website for teaching. This is commonplace where the teachers and students access learning materials and system support. E-books should be introduced for learning because this is a digital era. Everyone is having a smartphone and a tablet. So, if E-Books are introduced, it will be of great help. Access to knowledge in terms of flexibility has changed. E-books also help to teach ESL as a secondary language. Get set! Phonics uses songs, games, and rhymes to develop awareness in children. These learning apps also helps in teaching ESL English as a secondary language. Embodied learning is based on the idea that learning involves using mind and body collaboration. It is not based on just remembering. Learners should be physically, socially, and emotionally engaged. Courses like Doodle Town use audio, video, and hands-on activities to inspire children learning. It also stimulates the young learners to draw and to be creative. Orbit also stimulates young learners through stories.

An ESL teacher provides support to students who are learning English as a second language. ESL teachers use real-life examples to teach students. ESL teachers must be creative, sensitive, and adaptable to the cultural differences while teaching the students. In the schools or the educational institutes, ESL teachers work from grades KG to 12.The ESL teachers plan and deliver the lesson plans based on students' strengths, weaknesses, and progress. They should make lesson plans based on the needs of the students. ESL teachers should be proficient in computers and technology because of the increasing use of technology in the classroom. These tasks will make teaching ESL English as a secondary language easy.

There are also some tips in ESL teachingonline , which will make both teaching and learning easy. Learning a foreign language for the students is a daunting task for them.

To make the students practice and feel comfortable, you should give them some tasks based on the groups. Lessons will become fun and exciting when the students will learn with their peers. You should make sure that you focus on oral activities in the class. Reading and writing are essential, but on the other hand, speaking in the classroom is also important. ESL students might come from different backgrounds. As in classroom learning, each student learns differently. So, we have to focus on it accordingly. Mix reading, writing, and focus on comprehensive lesson plans. Always use their experiences to teach their language. For this, you have to give them some work to do. You can ask them about what they did on the weekends. What their family is like. Anything which leads them to think and make related words. Also, ensure that you teach them according to their culture. These will help in teaching ESL English as a secondary language. Ask the students to minimize the use of the dictionary. Ask the students to memorize and phrase the words. Make sure that the whole class shows their involvement in this, so, the learning becomes fun. After the class, give homework to the students to keep them engaged. They also get a lot of practice from the lessons taught in the class. Use Tongue twisters in the class to make a fun-filled environment. This will also boost their pronunciation and help them to learn in a fun-filled way. Your students should practice reading aloud. This is a great way to blend oral, reading, and auditory skills. It will also help them to speak confidently in front of their peers. Let your students work through their mistakes. Give them a lot of writing work and allow them to read, write and read aloud in the front of the class and make mistakes because if they are making mistakes, they will know they are progressing.

The best way to teach English online as a Second Language is to make a lesson plan. Tell the students to read aloud in the class. Give them a lot of reading and writing works. Tell them to read stories. Making perfect lesson plans will help a lot in teaching the students. These will help in teaching ESL English as a secondary language.Inquiry-based learning means learning in a complex world. Courses like Fast Track and Wider World use good audio and video content to bring real-world experiences to young learners. They also encourage the students to use soft skills. Perspectives use real-life stories to motivate children. Teaching Grammar from Rules to Reasons Teachers and Learners discovers how speakers use grammar in the real world. When the concept of Lingua Franca was discussed, many teachers, writers, and trainers have objections. It was controversial. Today we see resource materials like PronPack is taking an approach to increased intelligence. Using gamification and blended learning, this pronunciation course doesn't help the learners to distinguish between British English or American English but prepares the learners to use English globally. By using gamification also helps in teaching ESL English as a secondary language. Learning and management programs like Edmodo are extremely popular. They give learners to continue classroom discussions and submit the homework. Now, due to Covid-19 online platforms are in huge demand. They are used to discuss with parents and help in managing lesson plans and materials.

The Royal ABC program for 4 to 6 years old comes with a teacher platform that allows teachers to manage complete administration, schedule homework, and send reports to parents. Due to this, teachers can spend more time with their kids. These tools are new and shiny, so they give an appeal. The real value is how much it can benefit a learner in learning English in the most efficient and motivating ways. These programs also help in teaching ESL English as a secondary language.

CONCLUSION

NWe all have different motivating factors or teaching ESL online but one of the most incredible thing is freedom. You can teach virtually anywhere and anytime.And you are not necessarily tied to your home . In conclusion we can say that we have lot of good factors of online teaching English as a means of communication instead of becoming a native and trendy speaker of English.

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दहशतवाद : लोकशाही समोरील एक आव्हान.

प्रा. विजय गावंडे

विभाग प्रमुख, (राज्यशास्त्र) श्रीमती सविताबाई ऊ. देशमुख महाविद्यालय, दिग्रस

प्रस्तावना :

दहशतवाद म्हणजे मनामध्ये भिती निर्माण करणे. एखादया विशीष्ट आशयाचा किंवा उद्दीष्टाचा प्रचार करण्यासाठी सर्वसामान्य जनता अगरत्यातील महत्त्वाच्या भागात दहशत निर्माण करण्याच्या उद्देशाने निर्माण केलेली बेकायदेशीर हिंसाचाराचे तंत्र म्हणजे दहशतवाद होय.

राजकीय उद्दिष्टे साध्य करण्यासाठी काही व्यक्तीगत गटांची प्रस्तापीत शासकीय अधिकारांच्या बाजूने अगर विरुध्द कार्यवाही करतांना दहशतवादाचा अगरहिंसाचाराचा केलेला वापर म्हणजे दहशतवाद होय.

जॉन क्रेटमन :

राजकीय उद्दिष्टे साध्य करण्यासाठी समाजाच्या किंवा त्यातील विशिष्ट स्तरात भिती व दहशत निर्माण करण्याच्या उद्देशाने केलेलीहिंसात्मक गुन्हेगारी, वर्तणुक म्हणजे दहशतवाद होय.

प्रा. योनाह अलेक्झांडर यांनी २१ चे दशकाला दहशतावाचे दशक म्हणावे लागेल. अशीस्थीती निर्माण झाली आहे. दहशतावादमुळे केवळ भारताचीच नाहीतर जगाची शंतता सुरक्षितता धोक्यात आली आहे. दहशतवादी हिंसात्मक मार्गाचा अवलंक करतात यामध्ये अनेक निरपराध लोकांचा जीव जातो.

गृहीतके :

१) लोकशाही व शासन प्रणाली व्यवस्थे विरोधी कृत्य दहशतवादी करतात.
२) दहशतवाद हासंपूर्ण देशात दिसून येतो.
३) संघटीत व नियोजितपणेहिंसात्मक कृती केल्या जाते.
४) निष्पाप लोकांचा बळी दहशतवादयांकडून घेतला जातो.

उद्दिष्ट्ये :

१) दहशतवादासंबंधी शासनाची भुमीका शोधने.
२) दहशवादाचा लोकशाहिवरील परिणामसमजुन घेणे.
३) दहशतवादाची व्याप्ती समजुन घेणे.
४) दहशतवादाचे स्वरुप समजुन घेणे.
५) दहशतवाद निर्मुलनासाठी उपाय सुचविणे.

लोकशाहीसमोर आजच्या आधुनिक काळात भेडसावणारा महत्त्वपूर्ण प्रश्न आहे. दहशतवाद आज भारतातील सर्वच नागरिक दहशतवादामुळे फार मोठ्या मानसिक ताणाला सामोरे जात असलेले दिसून येतात. दहशतवादामुळे सर्वसामान्य नागरिकांचे मानसिक स्वास्थ्य हरवले आहे. देशाच्यासुरक्षिततलेला, स्थैर्याला व शांततेला सर्वात मोठा धोका कोणता असेल तरतो दहशतवादाचा. दहशतवादाच्या या गंभीर समस्येला अनेक वर्षाच्या घडामोडीची पार्श्वभुमी आहे. बऱ्याच अंशी केंद रसरकारच्या चुकीच्या धोरणालाही या बाबतीत जबाबदार धरता येईल. लोकशाहीसमोरील सर्वात महत्त्वाचे आणि कठोर असे आव्हान म्हणजे आतंकवाद किंवा दहशतवाद जगभरातील बहुतांश राष्ट्रे आतंकवादाला तोंड देत आहे. अमेरिकेसारख्या महाशक्तीला देखील आतंकवादाला तोंड द्यावे लागत आहे. आतंकवादाच्या निर्मितीसाठी अनेक बाबी कारणीभुत असल्या तरी लोकशाहीतील काही वैगुण्ये त्यासाठी जबाबदार ठरले आहेत.

सर्व स्तरावरील विविधता :

जगाच्या पाठीवर भारतासारख्या विविधतेने नटलेल्या देशासारखे राष्ट्र नाही. विविधतेत एकता जरी आपण म्हणत असलोतर प्रत्यक्षात ही एकता एकसंघ ठेवण्यासाठी करत असावी लागणारी कसरतच आहे. काश्मीर भारताचा भाग असूनही ३७० कलम तिथे लावण्यात आले आहे. अनेक जाती, धर्म, भाषा, भौगोलिक रचनेत, पोशाख, खान-पानातही विविधता, भिन्नता सल्यामुळे एकतूत्रपणे लोकशाही स्विकारणे जिकरीचे व अवघड बनले आहे. स्वतंत्र खलीस्तानची मागणी करणारे भिंद्रानवाले प्रकरण याचेच एक उदाहरणहोय.

विषमतेतून अस्वस्थता- अराजकता :

आज विषमतेतून निर्माण झालेली अस्वस्थता अनेकदा अराजकता माजविणरी ठरली आहे. बॉम्बस्फोट, जातीय दंगी, हिंसाचार घडले आहेत आणि घडताहेत. या सर्व घटना म्हणजे भारतीय लोकशाहीवर झालेले घात होय. या अशा अनेक घावांनी भारतीय लोकशाही गत साठ वर्षात अनेकदा रक्तबंभाळ झाली आहे. राष्ट्रीय एकात्मतेला कायम ठेवण्यासठी म्हणूनचतरसरकारला अनेक मोहिमा, कार्यक्रमहाती घ्यावे लागत आहे.

दहशतवाद - नक्षलवाद :

भारतीय लोकशाही खिळखिळी करुन मोठे आव्हान उभे करणाऱ्यासमस्येमध्ये सर्वात मोठा घटक म्हणजे दहशतवाद होय. भारत स्वातंत्र्य झाल्यानंतर १९४७ पासूनच दहशतवादाचे भूत देशाच्या मनगुटीवर बसले आहे. पाकिस्तान, बांग्लादेश भारतातून वेगळे झाले. वादग्रस्त काश्मीरचा भूभाग हवा असणाऱ्या पाकिस्तानने दहशतवादाचे शस्त्र पुढे करुन आपली मागणी लावून धरली आहे.

भ्रष्टाचार :

"भारतीय लोकशाहीला लागलेली किड म्हणजेच भ्रष्टाचार होय." भ्रष्ट आचारापासून बनलेला भ्रष्टाचार हा आज भस्मासूर बनला आहे. राजकारण, प्रशासन, न्यायव्यवस्था ते माध्यम, धार्मिक संस्था, शैक्षणिक, सामाजिक संस्थापयंत या भ्रष्टाचाराने आपले पायमुळं रोवली आहेत. भारताच्या लोकशाहीला कुरतडणारा किडा म्हणून भ्रष्टाचाराकडे पहू शकतो. सुशासन, विकास, लोककल्याण या तत्वाना भ्रष्टाचाराने हरताल फासली आहे. राजीव गांधी यांनी म्हटल्याप्राणे एक रुपयावर ४० पैसे पोहचतात. आता मात्र परिस्थितीत्यापेक्षाही बिकट बनली आहे. कधी १० पैसेतर कधी काहीच नाही, अशी परिस्थिती निर्माण झाली आहे.

लोकशाहीरवरील विश्वासात घट :

भ्रष्टाचाराची दिवसेंदिवस मोठमोठ्या आकड्यांची प्रकरणे बाहेर पडत आहेत. खासदार, मंत्री, आमदार, न्यायाधीश, पत्रकार, समाजसेवक, अधकारी सर्वांचाच भ्रश्टाचारात असणारा सहभाग बाहेर पडत आहे. या सर्व घटना सामान्यांच्या मनात लोकशाही विषयी उदासीनता व अविश्वास निर्माण करणारा आहे.

बहुपक्षीय शासन पध्दती व अस्थिरता :

भारतीय लोकशाही मजबूत करण्यासाठी घटनेत अनेक देशातील चांगल्या गोष्टीचा सहभाग करण्यात आला आहे. मात्र यात एक चूक झाल्याचे लक्षात येत असून भारताचे स्विकारलेली बहुपक्षीय शासन पध्दती आज देशाला लोकशाहीला अस्वस्थतेच्या मार्गाव्र व अस्थीरतेच्या मार्गावर घेऊन आली आहे. प्रादेशिक पक्षांचीहजारांमध्ये संख्या असून राष्ट्रीय पक्षांचीही करमतरता नाही. यातूनच १९७५ च्या दशकानंतर एका पक्षाची सत्ता येण्याची प्रथा संपल्याचे दिसते. अनेक पक्षामधून आघाडीचेसमाजकारण सुरु झाले.

निष्कर्ष :

भारतीय लोकशाही या दहशतवादाच्या व आव्हानांमधून प्रवास करत असतांना आज ६० वर्षाची झाली आहेत. पूर्वीपासून चालत आलेलीसामाजिक विषमता, सर्व स्थरांतील विविधता, विषमतेतून अस्वस्थता, दहशतवाद, नक्षलवाद, भ्रष्टाचार, बहुपक्षीय शासन पध्दतीमधून आलेली अस्थीरता या सर्व बाबींमुळे लोकशाहीवरील विश्वासात सामान्य माणसाच्या मनात घर होवून भारतीय लोकशाहीवर अनेक घाव घातले. या सर्व धावांनी लोकशाहीची लक्तरे काढली जात आहेत. साठ वर्ष या गोष्टीमध्येच गेली असे म्हणायला काहीही वावगं ठरणार नाही. आपण भारतातील चारहजार जाती व अनेक धर्माचेहोत. म्हणून धर्म अशी भावना दृढ करुन स्वार्थ सोडून पूढे जर भारताची लोकशाहीची पाणीपत होवू द्यायचे नसेल तर भारतीयांची एकजात एक धर्म अशी भावना दृढ करुन स्वार्थ सोडून, राजकारणहेसमाजकारणासाठी करण्याची भावना मनात कोरुन जर दहशतवाद, नक्षलवादाला लगाम घातली नाहीतर उद्याचे भारताचे चित्र अत्यंत विदारक व विचीत्र दिसेल.

उपाययोजना :

- अहिंसात्मक तत्त्वज्ञानाचा प्रसार व प्रचार करणे.
- गुप्तहेरसंघटनांनी दिलेल्या खबरदारीची, सूचनेची शासनने काटेकोर अंमलबजावणी करणे.
- धर्मा- धर्मामध्ये सलोखा वाढविणे, तसेच सर्व धर्मसमभावाची भावना वृध्दींगत करणे.
- अल्पसंख्यांनकांनासुरक्षिततेचीहमी देऊनसहिष्णूता वाढीस लावणे.
- दहशतवादाविरुध्द कडक कायदे व नियम बनविणे व त्यांची कठोर अंमलबजावणी करणे.
- दहशतवादाला चिथावणी देणाऱ्यावर देशामध्ये अंकूश ठेवणे.
- दहशतवादाला रसद पुरविणात्यांची पाळेमुळे नष्ट करणे.
- सरकार व नागरीकांमध्ये समन्वय प्रस्थापित होऊन दहशतवादाविरुध्द लढा पुकारणे.
- काळ्या पैशाच्या निर्मितीवर प्रतिबंधक उपाययोजना करणे.
- अभ्यासक्रमामध्येच दहशतवादाचे दुष्परिणामाचा परिचय करुन देणे की, जेणेकरुन युवक हेहिंसात्मक कृत्याकडे वळणार नाही.

युवकांना रोजगाराच्यासंधी उपलब्ध करुन देणे. जेणेकरुन आर्थिक प्रलोभनाला बळी पडून दहशतवादाकडे वळणार नाही.

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जागतिकीकरण आणि संस्कृतीवर प्रभाव

डॉ. दामोदर दुधे

(सहा. प्राध्यापक)श्रीमती सविताबाई उ. देशमुख महा. दिग्रस

सारांश :—

'जागतिकीकरण आणि संस्कृती' हे आशयसुत्र आता बऱ्यापैकी प्रस्थापित झाले आहे. रोलॉ राबर्टसन हयांच्या लेखनातुन सर्वप्रथम हया आशयसूत्राचा अविष्कार मोठया सफाईने झाला. मुळामध्ये रॉबर्टसन धर्मविषयक समाजशास्त्रज्ञ म्हणून जागतिकीकरणाकडे वळला. मानवशास्त्रज्ञ अनेक समाजशास्त्रज्ञ,तसेच तौलनिक साहित्य, माध्यम आणि सांस्कृतिक अभ्यास हयाविषयीच्या लेखनांमध्ये 'संस्कृती' हा विषय प्रामुख्याने येतो.

माध्यमे आणि सांस्कृतिक अभ्यास हया दोहोंमध्ये एकच सिध्दांतन असते ते म्हणजे, 'जागतिक सांस्कृतिक एकसाचीकरणा'चे. आणखी एक साध्या प्रचलित असलेले आशयसुत्र विशेषत: राजकीय विज्ञान आणि राजकीय पत्राकरीता हया संदर्भात, ते म्हणजे वांशिक राजकारणाचे, तसेच धार्मिक मुलतत्ववाद— हयातुन असे सुचविले जाते की, जागतिकीकरण आणि स्थानिक अस्मितेचे राजकारण हया दोहोंमध्ये एक दुवा असतो, तसेच हया दोहोंमध्ये एकात्मीकरण आणि फुटीरता हयांचे मिश्रणही असते. हयातुन परिणामत: असे दिसते की, वाढत्या प्रमाणात जागतिक पातळीवर सांस्कृतिक एकात्मता किंवा मग वाढत्या प्रमाणात दिसणाऱ्या सांस्कृतिक फुटीरता/विखुरलेपणा — हया साऱ्यांचा जेव्हा तपासणी करून निष्कर्ष काढला जातो, तेव्हा असे साहित्य मोठया प्रमाणात धुब्रीकरण झालेले दिसते. अशा अनेक विश्लेषणांमध्ये संस्कृती ही गोष्ट येते, परंतु बऱ्याचवेळा कोणत्या तरी वेगळयाच अभ्युपगमासाठी किंवा समस्येसाठी पुरक म्हणून ती येते. समाजशास्त्रामध्ये एक जो प्रवाह दिसतो तो असा की, जागतिकीकरणाच्या माध्यमातुन आधुनिकतेवरील चर्चा पुन्हा एकदा चौकटीत आणणे आणि राजकीय अर्थव्यवस्थेच्या चौकटीतुन प्रवाह दिसतो तो म्हणजे जागतिकीकरणाच्या माध्यमातुन भांडवलशाहीवरील विवाद पुन्हा एकदा खुले करणे, म्हणजे 'जागतिकीकरण' हया संकल्पनेची करिअर आधुनिकतेच्या करिअर बरोबरच योगायोगाने सुरू होते. थोडक्यात जागतिकीकरणाचा संस्कृतीशी घनिष्ठ संबंध आहे आणि जागतिकीकरणाचा संस्कृतीवर परिणाम झालेले दिसून येतो.

प्रास्ताविक :—

जागतिकीकरणाला कोणाही सुज्ञ माणासाचा विरोध असणार नाही जगात मानवाचे राज्य व्हावे, मानवाचे जागतिक पार्लमेंट व्हावे, युध्दे नष्ट व्हावीत, मानवाची प्रगती व्हावी याला विरोध कोण करणार ? रविंद्रनाथ टागोर , महात्मा गांधी यांनी विश्वराज्याची, जागतिक शांततेची कल्पना पुरस्कारिली होती.

आमच्या घराची दारे कधी बंद राहणार नाहीत. चहूबाजुंनी दारे खिडक्या उघडया राहतील, पश्चिमेचा पूर्वेचा वारा घरात खेळेल अशी आपली प्रेरणा आहे, इंग्रजी साम्राज्याच्या काळातही आपण इंग्रजी भाषा आत्मसात केली, साम्राज्यशाहीला विरोध केला पण इंग्रज माणसाचा द्वेष केला नाही. इंग्रजी भाषेमुळे आपल्या ज्ञानात जाणीवात भरच पडली. स्वातंत्र्य प्राप्तीनंतर आपण इंग्लंडशी वैरत्व ठेवले नाही.

भारत हा स्वतंत्र नसतानाही लीग ऑफ नेशन्स आणि यूनो या जागतिक संघटनांचा सदस्य होता. हे सर्व सांगण्याचे कारण इतकेच की, जागतिकीकरण ही संकल्पना आपल्याला नविन नाही. स्वातंत्र मिळाल्यानंतर आपण जागतिक, राजकारणात खुपच लक्ष घातले. आपल्या शांततावादी भूमिकेमुळे आपल्याला, आपले लष्करी आर्थिक सामर्थ्य कमी असूनही , खुपच महत्व प्राप्त झाले होते. तिसऱ्या जगाचा नेता असा काही काळ भारताचा उल्लेख केला जाई.

उदारीकरणाच्या दृष्टीने जे आर्थिक जागतिकीकरण येऊ घातले आहे किंवा आले आहे ते वेगळे आहे. या जागतिकीकरणात राष्ट्रांना स्वावलंबी राहता येणार नाही. त्यांच्या सार्वभौमत्वाला कात्री लागणार. आयात निर्यात व्यापारावर राष्ट्राची सरकारे आता बंधने घालु कशणार नाहीत. सर्व

आंतरराष्ट्रीय व्यापार आता मुक्त बाजार पध्दतीने मागणी पुरवठा या तत्वानुसार चालेल. भांडवल, वस्तूंचे उत्पादन, तंत्रज्ञान, सेवा सुविधा यामध्ये देशी परदेशी असा भेदभाव केला जाणार नाही.

म्हणजे माणसाचे जागतिकीकरण नको आहे. सर्व मानव एक ही भावना नाही. एक पैसा जागतिक व्हावा हा आग्रह आहे. अमेरीकेतून अनिर्बध भांडवल भारतात यावे, त्यांनी नफा कमवावा व तो अमेरीकेला अडचण न येता सहजपणे जावा म्हणजे जागतिकीकरण, पेट्रोलवाल्या देशांनी खळखळ न करता सर्व जगाला पेट्रोल द्यावे, कच्चा माल असलेल्या देशांनी कच्चा माल द्यावा. विकसित देशांनी तयार केलेल्या वस्तू सर्व जगात, कोणताही अडथळा न आणता, विकता आल्या पाहीजेत म्हणजे जागतिकीकरण असा जागतिकीकरणाचा नवा अर्थ आहे.

जगतिकीकरण म्हणजे सर्व क्षेत्रात पाश्चिमात्यांचे अंधानुकरा असा अर्थ रूढ होत आहे. वेषभूषा, केशभूषा, खाद्यपदार्थ, जेवणाची पध्दत, फॅशन्स एकूणच जीवन पध्दतीवर पश्चिमेच्या मूल्यांचे आक्रमण होत आहे. यामुळे काही वर्षातच देश आपपली संस्कृती वैशिष्टये गमावून बसतील की काय अशी भिती वाटते. प्रत्येक वस्तूच्या जाहीरातीत, गरज असो वा नसो, एक स्त्री दाखविली जाते. स्त्रीकडे पाहण्याचा दृष्टीकोणच बदलत आहे. स्त्री ही उपयोग्य वस्तू आहे असे ठसविले जाते. जाहिरातीमध्ये लहान बालकांचाही वापर केला जातो. लोकभाषांचे स्थान ठासळत चालले असून इंग्रजीचे महत्व वाढत आहे.

जागतिकीकरणांचा संस्कृतीवर होणारा परिणाम :—

जागतिकीकरण ही सांस्कृतिक सजातीयकरण घडवून आणणारी प्रक्रीया आहे. या प्रक्रीयेत जगातील विविध राष्ट्रांमध्ये किंवा समाजामध्ये सामाजिक, सांस्कृतिक, पर्यावरणविषयक असे परस्परसंबंध व परस्परालंबन निर्माण होणे अभिप्रेत किंवा अपेक्षित आहे. त्यानुसार जगातील विविध समाजात घनिष्ठ असे परस्परसंबंध व परस्परावलंबन निर्माण होऊ लागले आहेत. तत्वत: या प्रक्रीयेत सर्व राट्रांचा/समाजांचा समान सहभाग अपेक्षित आहे. तथापि, प्रत्यक्ष व्यवहारात मात्र जागतिकीकरणाचे धुरिणत्व किंवा पुढारपण हे औद्योगिकदृष्टया विकसीत अशा काही जागतिकीकरणात या राष्ट्रांचे वर्चस्व या प्रभुत्व निर्माण झालेले आहे. आणि ही विकसीत राष्ट्रे ही आपली संस्कृती इतर राष्ट्रांवर लादीत आहेत. विशेषत: विकसनशील राष्ट्रांतील लोक देखील विकसीत राष्ट्रांतील सांस्कृतिक गोष्टींचे मोठया प्रमाणावर अनुकरण करू लागले आहेत. त्यामुळे सांस्कृतिक सजातियकरण घडून येण्यास चालना मिळाली आहे.

जगतिकीकरणाचे मुळ प्रवृत्ती ही भांडवलवादी व लोकशाहीवादी आहे. भांडवलवाद व लोकशाहीवाद यांनी जी संस्कृती निर्माण केली आहे ती प्रामुख्याने धर्मनिरपेक्ष स्वरूपाची आहे. जागतिकीकरणातून अशाच धर्मनिरपेक्ष संस्कृतीचा प्रसार जगभर होऊ लागला आहे. त्यामुळे धर्मनिरपेक्षता हे मूल्य सर्वच समाजाच्या संस्कृतीत हळूहळू स्विकारले जाऊ लागले आहे. व्यक्तीने आपल्या व्यक्तिगत जीवनात धर्मपालन करावे मात्र सार्वजनिक जीवनात वावरताना धर्मनिरपेक्ष दृष्टीकोन ठेऊन वागावे हा विचार किंवा मूल्य सर्वत्र स्विकारले जाऊ लागले आहे. म्हणजेच धार्मिक बाबतीत सजातीयता निर्माण होत आहे.

धार्मिक बाबीप्रमाणेच वेशभूषा, केशभूषा, खाणेपिणे , यंत्रे—तंत्रे इत्यादीबाबतीतही जागतिकीकरणाच्या माध्यमातून सजातीयकरण घडून येऊ लागले आहे. जागतिकीकरणात सहभागी झालेल्या राष्ट्रांतील लोकांची वेशभूषा, केशभूषा, खाण्यापिण्याच्या सवयी व एकंदर जीवनशैली ही एकसारखी होऊ लागली आहे. जगभरातील लोक (पुरूषाप्रमाणेच स्त्रियादेखील) जीन्स, टीशर्ट, बरमूडा, बुट!स, स्लिपर्स, प्रवासी बॅग्ज वापरू लागले आहेत. पुरूषाप्रमाणेच स्त्रियांही केस कापू लागल्या आहेत. स्त्री पुरूषांच्या अलंकार पध्दतीत, अभिवादन प्रकारात, शिष्टाचारात एकसारखेपणा येत आहे. फास्ट फुड्स, कोल्ड्रींक्स, आईस्क्रिम, केक पिझ्झा, बर्गर असे खाद्यपदार्थ जगभर अगदी खेडयापाडयातही लोकप्रिय होऊ लागले आहेत. जागतिकीकरणाची प्रक्रीया ही माहिती—तंत्रज्ञानावर स्वार होऊन जगभर पसरू लागली आहे. त्यामुळे माहिती—तंत्रज्ञानाचा वापर हा माहिती व ज्ञान मिळविण्यासाठी तसेच मनोरंजनासाठीही होऊ लागला आहे. मोबाईल, कॉम्प्युटर, इंटरनेट, सॅटेलाईट अशा साधनांच्या माध्यमातून जगाच्या कोणत्याही भागातील व्यक्तीशी आंतरक्रिया करता येऊ लागली आहे. त्यामुळे आंतरक्रियेच्या पध्दतीत व मनोरंजनाच्या पध्दतीत एकसारखेपणा येत चालला आहे. जागतिकीकरणाच्या प्रक्रीयेत लोकांच्या विशेषत: उच्चशिक्षित नवीन पिढीच्या इच्छा आकांक्षा

ध्येये, मूल्ये, जीवनपध्दती, विचारसरणी इत्यादी गोष्टीही एकसारख्या होत असल्याचे आढळत आहे. वेगवेगळया समाजामध्ये वेगवेगळया भाषा बोलल्या जातात. तथापि, जागतिकीकरणाच्या प्रक्रीयेत मात्र इंग्रजी भाषेचा वापर वाढत चालला आहे. विविध राष्ट्रांतील लोक परस्परांशी संप्रेषण साधण्यासाठी इंग्रजीचा वापर करू लागले आहेत. माहिती—तंत्रज्ञानाच्या क्षेत्रातही इंग्रजी भाषेचे वर्चस्व असल्याने आधुनिक तंत्रज्ञानाचा वापर करण्यासाठी इंग्रजी भाषा शिकणे अनिवार्य झालेले आहे. त्यामुळेच पुर्वी इंग्रजी भाषेकडे दुर्लक्ष करणाऱ्या राष्ट्रांमध्येही आता तरूण पिढी इंग्रजी भाषा शिकण्यास व इंग्रजी भाषेतून शिक्षण घेण्यास प्राधान्य देऊ लागली आहे. आज इंग्रजी ही जागतिक स्तरावरील व्यवहाराची संपर्क भाषा बनल्याने तिचा वापर जगभर होऊ लागला आहे. भाषा हा संस्कृतीचा एक महत्वाचा घटक असुन या घटकाचेही सजातियकरण होत चालले आहे.

अशाप्रकारे जागतिकीकरणामुळे वेशभुषा, केशभूषा, खाणेपिणे, यंत्रे तंत्रे, कौशल्ये, श्रध्दा मुल्ये भाषा व एकंदर जीवनशैली इत्यादी सांस्कृतिक बाबींमध्ये सजातियता येत चालली आहे. यालाच सांस्कृतिक सजातियता असे म्हटले जाते.

थोडक्यात जागतिकीकरणाची प्रवृत्ती ही सजातियता वा एकजिनसीपणा आणण्याची आहे. या प्रक्रीयेत जगातील लोक एकाच साच्यात घातले जात आहेत. जगातील सर्व लोकांच्या आवडी निवडी, इच्छा आकांक्षा, सवयी,वर्तनप्रकार, जीवनशैली एकसारख्या बनविण्याचे प्रयत्न जागतिकीकरणात होत आहेत. याचा मुख्य आधार भांडवलशाही अर्थव्यवस्था आहे. जागतिकीकरणातून भांडवलशाहीचा प्रसार होत आहे. आणि त्यामुळे भांडवलशाहीतील मूल्ये व जीवनशैली ही जगभर प्रसारीत केली जात आहेत. परिणामी सांस्कृतिक सजातियकरणास चालना मिळाली आहे. या संदर्भात केवीन रॉबिन्स म्हणतात की, भांडवलशाही अर्थव्यवस्थेचा मोठा प्रभाव मानवी संस्कृतीवर पडला आहे. आज आर्थिक व्यवहारांचे जागतिकीकरण झाल्याने सांस्कृतिक रूपांतरणाचा नवीन प्रवाह आला आहे. आज जगात सार्वत्रिक सांस्कृतिक उत्पादने तयार होत आहेत. याचाच अर्थ असा की, संस्कृतीचे ही वस्तूंप्रमाणे उत्पादन होऊ लागले आहे.

जागतिकीकरणात सांस्कृतिक मिलाफ झाला आहे. याचाच अर्थ असा की, जगातील लोकांची जीवनपध्दती एकसारखी झाली आहे. सर्व लोक राष्ट्र—राज्यांच्या सीमांचे उल्लंघन करून एक समान संस्कृतीचा स्वीकार करू लागले आहेत. त्याच्या उपभोगाच्या वस्तू एकसारख्याच आहे. उदा. पिझ्झा, टुथपेस्ट, खाद्यपदार्थ, पेये, जेलपेन इत्यादी. जागतिकीकरणाने एक अशी सहभागी संस्कृती निर्माण केलेली आहे की, जी जागतिक स्वरूपाची किंवा विश्वव्यापी अशी आहे.

जगतिकीकरणाचा ग्रामीण लोकांची वेशभुषा, केशभूषा, खाण्यापिण्याच्या सवयी, भाषा उच्चारण पध्दती, अभिवादन प्रकार इत्यादी सांस्कृतिक बाबींवर प्रभाव पडलेला आहे. खेडयातील युवावर्गात विदेशी कपडे, कोल्ड, डिंक्स मद्यपान, धुम्रपान या गोष्टी लोकप्रिय होऊ लागल्या आहेत. जीन्स, बरमोडा, टी शर्ट, हॅट यांचा वापर वाढत आहे. भारतीय हवामानास सुसंगत नसलेली वेशभूषा व खाण्यापिण्याच्या सवयी (उदा. उन्हाळयात जीन्स घालणे, हिवाळयात आईस्क्रीम खाणे, कोल्ड डिंक्स घेणे इ.) ग्रामीण युवावर्गास लागत आहेत. संभाषणातील ग्रामीण ढंग मागे पडत असून त्यामध्ये इंग्रजी शब्दांचा वापर वाढत आहे. थोडक्यात जागतिकीकरणामुळे ग्रामीण संस्कृतीवर अनिष्ट प्रभाव पडला आहे.

वरील विवेचनावरून हे स्पष्ट होते की, जागतिकीकरणात संस्कृतीचे सजातियकरण घडून येत आहे. असे समातियकरण घडवून आणण्यामध्ये अमेरिका व युरोपियन राष्ट्रांचा वाटा मोठा आहे. कारण जागतिकीकरणाची प्रक्रीया ही या राष्ट्रांच्या नेतृत्वाखालीच सुरू आहे. जागतिकीकरणाच्या प्रक्रीयेत या राष्ट्रांचे प्रभुत्व आहे. ही राष्ट्रे आपली आर्थिक, राजकीय, सामाजिक व सांस्कृतिक धोरणे व मूल्ये विकसनशील राष्ट्रांवर लादीत आहेत. जागतिक बॅंक व आंतरराष्ट्रीय नाणेविधी या वित्तसंस्था आर्थिक जागतिकीकरणास चालना देण्यात महत्वाची भूमिका बजावित आहेत आणि या संस्थावर अमेरिकेचे वर्चस्व आहे. अमेरिकेच्या इच्छेनुसारच या संस्था कार्य करीत आहेत. बहुराष्ट्रीय महामंडळे ही देखील जागतिकीकरणाची माध्यमे म्हणून कार्य करीत आहेत. या महामंडळाची मुख्यालये ही अमेरिका व युरोपियन राष्ट्रांमध्ये आहेत. त्यामुळे ही महामंडळे या राष्ट्रांच्या धोरणांचा प्रसार व प्रचार करताना दिसतात. याचाच अर्थ असा की,

जागतिकीकरणाचे धुरिणत्व किंवा नेतृत्व हे अमेरिका व अन्य विकसीत युरोपियन राष्ट्रे यांच्याकडे आहे.

निष्कर्ष :—

थोडक्यात जागतिकीकरणाच्या माध्यमातून अमेरिकन संस्कृतीचे कसे प्रसारण व प्रक्षेपण होत आहे हे समजावून घेण्यासारखे आहे. जागतिकीकरणात अमेरिकेसारखी प्रभुत्वशाली राष्ट्रे ही आपली धोरणे व मूल्ये विकसनशील राष्ट्रांवर लादीत आहेत. जागतिकीकरणत अमेरिकेची मूल्ये ही इतर राष्ट्रांमध्ये प्रसारित व प्रक्षेपित केली जात आहेत. अमेरिकन संस्कृतीतील मूल्ये, तंत्रज्ञान, वेशभूषा खाण्यापिण्याच्या सवयी इत्यादी घटकतत्वे इतर राष्ट्रांमध्ये प्रसारीत केली जात आहेत. जगातील वेगवेगळया राष्ट्रांची संस्कृती वेगवेगळी आहे. पण आज जगातील सर्व राष्ट्रांमध्ये एकसारखी संस्कृती जागतिकीकरणाच्या माध्यमातून आकारास येत आहे. पोषाख, खाणेपिणे, मूल्ये भाषा इत्यादीबाबतीत जगातील सर्व लोकांमध्ये एकसारखेपणा/एकजिनसीपणा येत चालला आहे. सर्व लोकांची जीवनशैली ही बहुतांशी समान होत आहे. यालाच सांस्कृतिक सजातियकरण असे म्हणतात. आणि अशा जागतिकीकरणाचे सामाजिक, सांस्कृतिक अशा सर्व क्षेत्रांवर इष्ट तसेच अनिष्ट परिणाम होत आहे.

संदर्भग्रंथ :—

१) साहित्य संस्कृती आणि जागतिकीकरण — भालचंद्र नेमाळे
२) जागतिकीकरण लिंगभावाच्या दृष्टीकोणातून — विद्युत भागवत
३) वेध जागतिकीकरणाचा — प्रा. श्रीनिवास जोशी
४) जागतिकीकरण आणि समाज — डॉ. व्ही.डि. नांदवडेकर
५) जागतिकीकरण परिणाम आणि पर्याय — गजानन खातू
६) जागतिकीकरण समस्या आशय आणि अनुभव — सी.पं. खेर

आधुनिक जीवनशैलीमुळे निर्माण झालेल्या आजारावर उपाययोजना

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आजची जीवनशैली इतकी गतीमान झालेली आहे की त्यामुळे कोणाच्याच जीवनात तणाव नाही अशी व्यक्ती सापडणार नाही. ताणतणाव म्हणजे आयुष्यातील विविध घडामोडीमुळे झालेली आपल्या शरीराची मोडतोड आणि झीज, शारीरीक, मानसीक आणि रासायनीक प्रक्रीयामुळे भिती, गोंधळ,नैराश्य व ताणतणाव यासारख्या गोष्टी व्यक्तिकडून होत असतात. व्यक्तीच्या जगण्यामध्ये लवचिकता नसल्यामुळे चाकोरीबध्द जीवन जगणे, परिस्थितीला तोंड देण्याचे सामर्थ्य व्यक्तीमध्ये नसते. बरेचदा बिकट परिस्थितीशी सामना करतांना मनाचा तोल जातो. मानवाने आपल्या शरीरावर , जीवनावर एखादया वाहन चालकाप्रमाणे नियत्रंण ठेवायला हवे. तेव्हाच त्याचे आरोग्य धोक्यात येणार नाही. प्रत्येकाने समस्येकडे सर्वकर्ष नजरेने पाहिले. सकारात्मक दष्टिकोन बाळगला. चिंतेमुळे खचला नाही तर व्यक्ती ताणतणावातून मुक्त होऊ शकतो. आजच्या धावपळीच्या युगात प्रत्येकजन प्रत्येक व्यक्ती दडपण, तणावाखाली जगत आहे. त्याचा ताणतणावाला कळत नकळत परिणाम व्यक्तीच्या शरीराबरोबरच मनावर देखील होत असतोच बरेच वेळा शारीरिक तणावाचे रूपांतर मानसिक तणावात होते. पर्यायाने व्यक्तीचे आरोग्य धोक्यात येवू लागते. म्हणजेच हृदयविकार, मधुमेह, उच्च रक्तदाब यासारख्या अनेक आजारांना व्यक्ती बळी पडतो. अशावेळी आरोग्य व आहार यांचे समायोजन साधने महत्वाचे असते.

ताण म्हणजे ''व्यक्तीची जीवनातील गतिशिल अवस्था असून जी समायोजनाच्या गरजा पूर्ण न झाल्यास उद्‌भवते त्यामुळे प्रत्येक प्राणी सातत्याने कमी अधिक प्रमाणात तणावग्रस्त असतो.''
(wolf 1968)

''ज्याच्यामुळे शारीरिक व मानसिक कार्यक्षमतेत विघटन घडून येते किंवा घडून येण्याचा धोका संभावतो अशा घटनांद्वारा उद्‌भवणारी प्रक्रिया म्हणजे ताण (Tellor 1994)

उद्‌दिष्टे :–

कोणताही शोध पेपर सादर करतांना त्याविषयीची उद्‌दिष्टे निश्चित केल्यास संशोधनाला योग्य दिशा प्राप्त होते याला अनुसरुनच विषयासंदर्भात पुढील उद्‌दिष्टे ठरविण्यात आले.

१) आधुनिक जीवनशैलीमुळे निर्माण झालेले आजार अभ्यासणे.
२) आधुनिक जीवनशैलीमुळे निर्माण झालेल्या ताणतणावाची कारणे शोधणे.
३) आधुनिक जीवनशैलीमुळे निर्माण झालेल्या आजारावर आहाराद्वारे उपाययोजना करणे.
४) आधुनिक जीवनशैलीमुळे निर्माण झाालेल्या ताण तणावमुक्त राहण्यासाठी उपाययोजना सुचविणे.

आधुनिक जीवनशैलीमुळे निर्माण झालेले आजार :–

विसाव्या शतकाच्या अगोदर फार मोठया प्रमाणात लोक संसर्गजन्य आजाराने मृत्यु पावत असत. पण अलीकडच्या काळात आधुनिक जीवनशैलीमुळे निर्माण झालेल्या ताण तणावामुळे बऱ्याच आजारांचा सामना करावा लागत आहे. अमेरिकेन हार्ट असोसिएशनच्या मतानुसार निर्माण होणारा ताण आणि व्यक्तीची ताणाशी झुंज देण्याची शैली यावर व्यक्तीला होणाऱ्या हृदयाशी संबंधित आजार अवलंबून असतो. जसे की, अनुवंशिक प्रभाव उच्च रक्तदाब, सेरूम कोलेस्ट्रालची पातळी वाढणे, लठ्‌ठपणा, रक्तात शर्करेचे प्रमाण वाढणे इ.

आज देशात उच्च रक्तदाबाचे रूग्ण ३ करोड व मधुमेहाचे रूग्ण २ करोड इतके आहे. शिवाय हृदयविकार, कर्करोग इ. सारख्या आजारांना देखील व्यक्ती बऱ्याच प्रमाणात ताणामुळे बळी पडते. ताण हा व्यक्तीच्या जीवनाला लागलेली एक प्रकारची किड आहे. त्यासाठी प्रत्येक व्यक्तीने जिवन जगण्याच्या पध्दतीत बदल करणे आवश्यक असते. यावर संत कबीराच्या पुढील ओळी आठवतात.

चितासे घटे शरीर
चिंतासे चतुराई

कित्येक शारीरिक आजाराचे मूळ शरीरयंत्रणेतील बिघाडामुळे नसून ताणामुळेच आहे असे अनेक तज्ञांचे मत आहे. फ्रेज १९८५ यांच्या मते ५०ते ७० टक्के शारीरिक आजार ताणामुळे उद्‌भवतात. जसे

१) हार्ट अटॅक :— ताणतणावामुळे उच्चरक्तदाब, रक्तात कोलेस्ट्रालचे प्रमाण वाढणे, मधुमेह, लठ्‌ठपणा यामुळे क्रोध व इतर तत्सम कारणामुळे हार्ट अटॅक येऊ शकतो. आधुनिक जिवन शैलीमुळे लोकांच्या महत्वाकांक्षा वाढलेल्या आहेत. त्या पूर्ण करण्यामागे तीव्र स्वरूपाची ताणमय स्थिती निर्माण होते व व्यक्ती या व्याधीला बळी पडते.

२) मधुमेह :— मानसिक ताणामुळे ॲड्रीनल ग्रंथीतील स्त्रावाचे रूपांतर हायपोग्लॅसेमियात रूपांतर होऊन व्यक्तीला मधुमेहाची संभाव्यता अधिक आढळते. फुलर व सहकाऱ्यांच्या मते जगात दरवर्षी ४०००० लोक मधुमेहामुळे दगावतात. यातील २०००० पेक्षा जास्त लोक ताणतणावामुळे मृत्यु पावतात.

३) कर्करोग :— जेड्रान (१९०१) व शेशा (१९८४) यांनी असे सांगितले की, त्रासदायक व तणावमय घटनांमुळे कर्करोग संभावतो. एकोणवीस व विसाव्या शतकात व्यक्तीच्या आयुष्यातील नकारात्मक घटनामुळे शरीरात कर्करोगाची पार्श्वभूमी तयार होते. लिशान्स (१९५९) यांनी केलेल्या संशोधनावरून असा निष्कर्ष काढला की, व्यक्तीचे भावनात्मक संबंध बिघडल्यामुळे कर्करोग होवू शकतो. यात महिलांचा अधिक प्रमाणात समावेश आहे.

४) उच्चराक्तदाब :— ताणतणावामुळे सर्वात जास्त प्रमाणात उद्‌भवणारा आजार म्हणजे उच्च रक्तदाब. त्यामुळे सततच्या ताणामुळे रक्तातील दाबाचे प्रमाण वाढते. आधुनिक काळात व्यक्ती मृगजळाच्या मागे धावतो. त्यांचा परिणाम आरोग्यावर होतो.

५) एड्‌स :— काही लोक रोजच्या तणावातून मुक्ती मिळविण्यासाठी, जिवनातील वैफल्य घालविण्यासाठी वैश्यागमन करतात. असुरक्षित लैंगिक संबंधातून एच.आय.व्ही. जीवाणूंचा शरीरात शिरकाव होतो. पुन्हा त्या व्यक्तीला तणावाखाली जीवन जगावे लागते.

आधुनिक जीवनशैलीमुळे निर्माण झालेल्या ताण—तणावातून शारीरिक व मानसिक रोग उद्‌भवतात ते पुढीलप्रमाणे

अ) शारीरिक आजार :— पित्ताचा विकार, भूक न लागणे, वजन कमी होणे, हृदयरोग, दमा, रक्तदाब, मधुमेह, यकृत, मुत्रपिंड आदींचे विकास उद्‌भवतात तसेच निरूत्साह, उदासिनता, निद्रानाश, विस्मरण, कशातच रस न वाटणे, सतत दु:खी राहणे, तणावग्रस्त राहणे, अपचन, ॲसिडिटी, निद्रानाश, डोकेदुखी, चिंता ते कॅन्सरपर्यंत अनेक शारीरिक व्याधी होऊ शकतात.

अपस्माराचे झडके, नाडीची गती वाढणे, छातीत दुखणे, हृदयाचे ठोके वाढणे, श्वासाला अडथळा आल्यासारखा वाटणे, उच्च रक्तदाब, जीभेला कोरड पडणे, मुत्राशयाच्या मुखाभोवती स्नायू शिथिल झाल्यामुळे लघवी आल्याची भावना निर्माण होणे, तोंडात लाळ कमी प्रमाणात तयार होणे, कोलेस्टेरॉलच प्रमाण वाढण, पाठदुखी, पोटदुखी, उलटी होण्याची भावना, कंबरदुखी, हातापायाळा गोळे येणे, रोगप्रतिकार शक्ती कमी होणे इ.

ब) मानसिक आजार :— अतिरिक्त राग येणे, विकृत व्यक्तिमत्व, लगेच दमणे, निरूत्साह, उदासीनता, निद्रानाश, विस्मरण, भावना विवशता, ताणामुळे आनंद कमी होणे, चिडचिड, लवकर राग येणे, आयुष्य अर्थहीन वाटणे, कार्यक्षमता घटणे, आत्मविश्वास कमी होणे, परस्परासंबंधी अंतर निर्माण होणे, गैरसमज, संघर्ष वाढणे, झोप व्यवस्थित न होणे, झोपेतून उठल्यावरही ताजेतवान न वाटणे, काम करूनही समाधान न वाटणे, सतत आरोग्याच्या कुरबुरी चालू असणे, आळस आणि व्यसन लागणे, राग, भिती, मत्सर, चिंता, अपराधी वाटणे. इत्यादी शारीरिक व मानसिक आजार उद्‌भवतात.

आधुनिक जीवनशैलीमुळे निर्माण झालेल्या ताण—तणावाची कारणे :—

१.आत्मविश्वास कमी— आव्हानात्मक परिस्थिती निर्माण झाली की व्यक्ती तणावग्रस्थ होतो.
२.हळवेपणा — दुसऱ्याचे दु:ख पाहून हेलावून जाणे.
३.लाजणे — अपरिचित व्यक्तीशी बोलताना तणाव

४.न्यूनगंड असणे — आपल्यापेक्षा श्रेष्ठ व्यक्तीच्या सान्निध्यात तणाव
५.एकटेपणा
६.अपयश
७.मत्सर, राग
८.अवास्तव अपेक्षा
९.कौटूंबिक कलह
१०.अतिराग
११.अति लठ्ठपणा

आज लहानपणापासून ते मोठयापर्यंत सर्वांनाच ताण सहन करावा लागतो. ताण येण्याची समस्या मोठी असावी लागते असे नाही. कॉलेजमध्ये जाणाऱ्या मुलांना पार्टीला जाताना कोणते कपडे घालावे, महिलांना पाहुणे वाढले की, स्वयंपाक कसा पुरवायचा, कर्मचाऱ्यांना वरिष्ठांशी बोलताना ताण येतो, भूतकाळातील अप्रिय घटना, संवाद साधताना इत्यादी कारणामुळे ताण येतो.

आधुनिक जीवनशैलीमुळे निर्माण झालेल्या तणावामुळे तणावमुक्त राहण्यासाठी उपाययोजना :—

शारीरिक स्तरावर उपाय —

झोपी जाणे, कामाच्या ठिकाणावरून सुट्टी काढणे, सहलीला जाणे, मसाज घेणे, व्यायाम करणे इत्यादी यात केवळ कृतीच्या स्तरावर उपाय असल्यामुळे सुधारणा अगदी तात्पुरती असते. बऱ्याच वेळा तणावपूर्ण परिस्थिती पासून पूर्णत: बाजूला जाणे शक्य नसते तसेच एका ठिकाणाहून दुसऱ्या ठिकाणी गेले तरीही ताण निर्माण होऊ शकतो.

मानसिक स्तरावर उपाय —

मानसोपचार, संमोहन उपचार इत्यादी.
१) सर्वांसोबत मिळून मिसळून राहणे.
२) कुटूंबामध्ये सहकाऱ्याचे सामंज्यसपणाचे वातावरण निर्माण करणे.
३) दुसऱ्याच्या गुणाचे मनमोकळेपणानी कौतुक करावे जेणेकरून तुम्हालाही त्यापासून प्रसन्न वाटेल.
४) आपल्या कुटूंबासाठी वेळ काढावा.
५) घरातील सर्व व्यक्ती सोबत जेवण करा. टि.व्ही. पहा, गप्पा मारा.
६) इतरांसोबत स्वत:ची तुलना करू नका.
७) इर्षा, मत्सर करू नका.
८) रोज मोकळया हवेत फिरायला जा.
९) स्वत:ला कामामध्ये व्यस्त ठेवा.
१०) सदैव आनंदी राहण्याचा प्रयत्न करा.
११) शवासन करा.
१२) परमेश्वराचे नामस्मरण करा
१३) संगीत ऐका
१४) चिंता आणि ताण—तणावातून सुटका होण्यासाठी योगा आणि प्राणायाम यांचा चांगला उपयोग होतो असे वैज्ञानिकांनी सिध्द झाले आहे.
१५) ताण कमी करण्यासाठी परिस्थितीशी जुळवून घ्यावे.
१६) साध्या जीवनशैलीचा अंगिकार करा. गरजा कमी करा.
१७) स्वत:च्या उणिवा आणि क्षमता ओळखणे आणि त्यांचा स्विकार करावा.
१८) व्यसनापासून दूर रहावे.
१९) मनोरंजन, विनोदबुध्दी जोपासणे, छंद जोपासणे.
२०) मैत्रीपूर्ण नाते ठेवावे
२१) कोणत्याही कामाची किंवा कार्यक्रमाची पूर्वतयारी करावी.

ताण—तणावापासून मुक्ती मिळविण्यासठी छोटया छोटया उपायाचा अवलंब करण्यासाठी कोणत्याही प्रकारचा खर्च लागत नाही.

आधुनिक जीवनशैलीमुळे निर्माण झालेल्या आजारावर आहाराद्वारे उपाययोजनाः—

आरोग्य संवर्धन रोजच्या जीवनातील वापरला जाणारा शब्द आहे. WHO (१९८६) ने आरोग्य संवर्धनाची व्याख्या पुढीलप्रमाणे केली आहे. ''आरोग्य संवर्धन ही एक प्रक्रिया आहे. व्यक्तीची आरोग्य विषयक क्षमता सुधारणे, स्वत:च्या आरोग्याचे रक्षण कसे करावे, त्यावर कसे नियंत्रण ठेवावे या विषयी व्यक्तीला जागृत करणे, व्यक्ती किंवा समूहाला पूर्ण शारीरिक, मानसिक आणि सामाजिक कल्याण साधण्यासाठी आपल्या महत्त्वाकांक्षांची जाणीव करून देणे, त्या प्राप्त करण्याची ही प्रक्रिया आहे.''

''आरोग्य म्हणजे रोगाचा अभाव नसून व्यक्तीची शारीरिक, मानसिक आणि सामाजिक सुस्थिती होय. (WHO) निरोगी जीवन हेच खरे सुख, यानुसार ज्यांचे शरीर बलवान असेल, निरोगी असेल, शरीर यंत्रणेत बिघाड नसेल, कार्यक्षमता असेल असे लोक सुखी असतात.

''शरीरमाद्यं खलु धर्मसाधनम्''

यासाठी योग्य आहाराची गरज असते. कारण आहार हेच योग्य आरोग्याची गुरूकिल्ली आहे. शारीरिक बल, तेज आहारामुळेच प्राप्त होत असतात.

ताण तणावामुळे बरेच आजार होण्याची शक्यता बळावते व त्यामुळे आरोग्याला धोका उत्पन्न होतो. याचे कारण शरीरातील अनेक ग्रंथी मधील स्त्रावाचे प्रमाण कमी अधिक होवून संतुलन बिघडते. त्यासाठी आवश्यक म्हणजे संतुलित आहार होय. आहाराच्या माध्यमातून पोषक घटकांचा योग्य पुरवठा शरीराला होतो. यासाठी आहाराचे नियोजन करणे योग्य ठरते. रोगांवर नियंत्रण ठेवण्यासाठी रामबाण औषध म्हणजे आहार होय. पण तो संतुलित असावा. म्हणून ताणतणावातून निर्माण होणा+या आजारांवर योग्य आहाराचे नियोजन करून व्यक्ती आपले आरोग्य सांभाळू शकते.

निष्कर्ष :—

ज्या गोष्टींमध्ये आपल्याला अस्वस्थ वाटते त्या गोष्टी बदलल्यास तणाव कमी होण्यास मदत होते. आपल्याला न पटणाऱ्या न आवडणाऱ्या चर्चापासून दूर राहावे. ज्या वेळेस तणाव निर्माण करणाऱ्या गोष्टी वर्ज्य करणे शक्य नसेल तेव्हा त्यात बदल करणे शक्य आहे का? त्यांचा विचार होणे महत्वाचे असते. आपली मते, इच्छा दाबून ठेवल्यास तणाव वाढतो. अशा वेळेसे त्या योग्य प्रकारे व्यक्त केल्यास मनाची घालमेल कमी होते. परिस्थितीबाबत विचार करून तिला सामोरे जाणे तणाव कमी करण्यास उपयोगी पडते.

परिस्थितीतून येणाऱ्या ताणाला धीराने सामोरे जावे लागते. उदा. पैशाचा ताण, कामाचा वाढलेला व्याप अशासारखे ताण हे जरी परिस्थितीतून तयार होणारे असले तरी ते कायमचे नसतात. प्रयत्न केला तर ते दूर केले जाऊ शकतात.

अशा प्रकारे आधुनिक जीवनशैलीमुळे ताणतणाव निर्माण होण्यास कधी आपण स्वत: तर कधी परिस्थिती तर कधी बरोबरची माणसे जबाबदार असतात.

संदर्भसूची

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२)फरकाडे / गोंगे (जून २००७) पोषण व आहारशास्त्र, पिंपळापुरे प्रकाशन नागपूर,पान नं. १९६

३)Stress management & Education – Arung Goel, S.L. Goel, Page No. 5, 8

४)देशोन्नती वृत्तपत्र २१ सप्टेंबर २०१२

५)परदेशी संध्या (२८ फेब्रु २०१२) तणाव आणि उपाय वृत्तपत्र diwamarathi.bhaskar.com Aurangabad

६)आठवले जयंत बाळाजी (२८ फेब्रु. २००८) तणाव म्हणजे काय त्याची विविध कारणे व दुष्परिणाम Mr. upakram.org/nodel/ 044

७) सकाळ २ मार्च २०१२ फॅमिली डॉक्टर

महिलांची सुरक्षितता व मानवाधिकार

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मो.नं. ९९२१६४७५०१, Email Id : neeta.pandepathak@gmail.com

मानवी हक्क म्हणजे असे हक्क जे माणसाला माणुस म्हणून मिळतात. प्रत्येक माणसाला तो मानवकुटुंबाचा सदस्य या नात्याने जे हक्क प्राप्त होतात त्यांना मानवी हक्क असे म्हणतात. मानवाला मानवा सारखे जगता येण्याचा अधिकार म्हणजे मानवाधिकार, मानवी हक्काची संकल्पना सामाजिक, आर्थिक, राजकीय न्यायावर आधारलेली असुन सर्व मानवी हक्क हे व्यक्तीची प्रतिष्ठा आणि व्यक्ती जिवनाचे मुल्य यांच्या रक्षणासाठी निर्माण झालेले आहेत. मानवी हक्क हे सार्वत्रिक आहेत तसेच काळानुसार विकसित होणारे असतात. मानवी हक्काचा इतिहास खालील दस्ताऐवजातुन उलगडत जातो. जसे मॅग्राकार्टा १२१५, मानवी हक्कांचा अर्थ सर्वप्रथम इंग्लड मध्ये सांगितला गेला. बिल ऑफ राईटस १६८९, अमेरिकी स्वातंत्र्याचा जाहिरनामा १७७६, फ्रेंच स्वातंत्र्याचा जाहिरनामा १७८९, मानवी हक्काचे महत्व दुसऱ्या महायुध्दानंतर वाढलेले दिसते. १० डिसेंबर १९४८ या दिवशी संयुक्त राष्ट्रसंघाने मानवी हक्काचा जाहिरनामा स्विकारला. मानवी हक्कांना आंतरराष्ट्रीय कायद्यात स्थान मिळाले. युनोतील मानवी हक्काच्या मसुदयात जेवढे हक्क आहेत ते सर्वच कोणत्याही स्त्रीला लागु होतात. मानवाधिकाराने स्त्री—पुरूष भेद न करता यांना फक्त मानव म्हणून सारखेच अधिकार दिले आहेत. त्यातुन स्त्री—पुरूष समानतेचे दर्शन घडते. भारतीय महिलांसंबंधी बोलतांना स्वामी विवेकानंद म्हणतात की, 'जोपर्यंत महिलांच्या स्थिती मध्ये सुधारणा होणार नाही तोपर्यंत या विश्वाचे कल्याण होवू शकणार नाही' हे त्यांचे उद्‌गार बोलके आहेत.

'मानवाचे नैसर्गीक मुलभुत असे सर्व हक्क ज्याच्या शिवाय माणुस म्हणून जगणे शक्य नाही ते मानवी हक्क होत.' अशी व्याख्या संयुक्त राष्ट्रसंघाने केली आहे. महिला व लहान मुले समाजातील हे दोन घटक सहजच अत्याचाराला बळी पडतात. त्यांचे अधिकार समाजाकडुन नाकारले जातात. किंवा त्याची पायमल्ली होते. अल्पवयीन मुली व स्त्रीयांवर होणारे अत्याचार, मुलींची विक्री, हुंडाबळी यामुळे महिलांच्या अधिकाराची पायमल्ली होते.

स्वातंत्र्यानंतर मानवाधिकाराप्रती चेतना व जागरूकता निर्माण करण्याकरिता व त्याचे उल्लंघन थांबविण्याकरीता विशेष कायदे व आयोगाची स्थापना करण्यात आली.भारतात मानवी हक्क संरक्षण कायदा १९९३. मानवी हक्काचे रक्षण करण्यासाठी अस्तित्वात आला. याच बरोबर मानवी हक्कांना संरक्षण प्रदान करण्याकरिता २९ सप्टेंबर १९९३ च्या मानवाधिकार संरक्षण अध्यादेशाव्दारे १२ आक्टोंबर १९९३ ला राष्ट्रीय मानवाधिकार आयोगाची स्थापना करण्यात आली. तसेच महाराष्ट्रात ६ मार्च २००१ ला महाराष्ट्र राज्य मानवाधिकार आयोगाची स्थापना करण्यात आली. २००१ हे वर्ष शासनाने महिला सक्षमीकरण वर्ष म्हणून जाहिर केले. ८ मार्च हा दिवस महिला दिन म्हणून साजरा होवू लागला. भारतीय राज्यघटनेच्या अनुच्छेद १४ ते १८ मध्ये समतेच्या हक्काची हमी दिली आहे. संपत्तीच्या अधिकारात विवाहीत मुलींच्या अधिकारा संबंधी विशेष तरतुद केली आहे. आई—वडीलांच्या संपत्तीत मुलीला मुलाच्या बरोबरीने हक्क देण्यात आला आहे. भारत सरकारने विवाहाप्रमाणे घटस्फोटाचा अधिकार स्त्रियांना दिला आहे. तसेच पुर्न:विवाह करण्याचा अधिकार दिला आहे. संसदेच्या दोन्ही सभागृहात स्त्रिया सक्रीयपणे कार्यरत आहेत. ७३, ७४ व ८१ व्या संविधान संशोधनानुसार महिलांनी एक ठोस भुमिका पार पाडण्याची संधी प्राप्त झाली आहे. स्वातंत्र्य, समता आणि व्यक्तीचा सन्मानाने जगण्याचा अधिकार भारतात या हक्कांना कायद्याचे संरक्षण दिले आहे. अभिव्यक्ती स्वातंत्र्य, समुहाचे स्वातंत्र्य, धर्मचरणाचे स्वातंत्र्य, कायद्यासमोर समानता यांचा समावेश असलेले मुलभूत हक्क आणि शिक्षणाचा अधिकार, समान वेतनाचा अधिकार, व्यक्तीच्या आत्मसन्मानाचा अधिकार, दाद मागण्याचा अधिकार, या सारख्या हक्कांचा समावेश मार्गदर्शक तत्वामध्ये करण्यात आला. भारतीय संविधानाच्या विविध कलमातुन महिलांच्या प्रगतीचे मार्ग खुले झाले आहेत. राज्यघटना ही केवळ महिलांच्या मुक्तीचा

नाही तर एकुणच मानवमुक्तीचा सरनामा आहे. एक राज्यघटना येते आणि तळागाळातील माणसांच्या, महिलांसह साऱ्या मानव जातीच्या मुक्तीच्या वाटा खुल्या होतात. असे श्री. उत्तम कांबळे यांनी प्रतिपादन केले आहे.

भारतीय घटनेतील तिसऱ्या व चौथ्या अनुच्छेदात मानवाधिकारांना संविधानिक स्थान प्राप्त झाले असले तरी मानवाधिकारांचे उल्लंघन दिवसेंदिवस फार मोठ्या प्रमाणात होत आहे. स्त्रियांवरील अत्याचाराच्या घटनांमध्ये सतत वाढ होत आहे ही चिंतेची बाब आहे. आज सर्वच क्षेत्रात स्त्रियांचा वावर दिसत असला तरी त्याच्यात फारसा फरक पडलेला नाही. स्त्री भ्रुणहत्येचा प्रश्न हा संपुर्ण मानवजातीच्या अस्तीत्वासाठी अतिशय गंभीर प्रश्न आहे. १९८७ ते २००७ च्या वीस वर्षामध्ये एकट्या भारतात १ कोटी मुलींचे गर्भ नष्ट करण्यात आले आहे. २००१ च्या जनगणनेनुसार १ हजार पुरूषांच्या मागे ९३३ मुली आहे. दिल्लीत हे प्रमाण १ हजार पुरूषांच्या मागे ८२१, हरियाणात ८६१ तर पंजाब सारख्या संपन्न व सधन राज्यात हे प्रमाण ९२२ एवढे आहेत. २०११ च्या जनगणनेनुसार भारतात हे प्रमाण ९४० व महाराष्ट्रात ९२५ इतके आहे. एच. आर.डी. च्या सांख्यिकीय अहवालानुसार १०२ मिनिटात एका महिलेची हुंड्यासाठी हत्या केली जाते. प्रत्येक ५४ मिनिटाला महिलांना मारपीट करण्याचे प्रकार घडत आहेत. स्त्री मुक्तीच्या दृष्टीने कितीही प्रयत्न झाले असले तरी महिला मानवाधिकाराचे हनन मात्र आजही समाजात सुरूच आहे. तसेच कुपोषणामुळे होणारे मृत्यु, आदिवासी भागातील गर्भवती महिलांच्या मृत्युचे प्रमाण एक चिंतनीय बाब आहे.

देशात महिलांच्या अधिकारासंबंधात जी जाणिव जागृती वाढत आहे ती स्वागतार्ह बाब आहे. परंतू ही जाणीव जागृती पाहिजे तितकी अजुनही रूजलेली नाही. आज आम्ही २१ व्या शतकात विज्ञान तंत्रज्ञान क्षेत्रात कितीही प्रगती केली असती तरी या ६४ वर्षात सामाजिक व नैतिक मुल्ये कमजोर झाली आहेत. समाजनिर्मितीमध्ये महिलांना महत्वपुर्ण स्थान आहे. त्यांच्या सहभागाशिवाय देशाचा विकास अशक्य आहे. स्त्रीपुरूष ही समाजाची दोन चाके आहेत त्यांच्या विकासाचा वेग त्यांच्या सन्मानावर अवलंबून आहे. महिलांचा सन्मान हा त्यांचा हक्क आहे. यासाठी महिलांच्या मानवाधिकारांना संरक्षण तसेच उपलब्ध कायद्यांची सकारात्मक पध्दती अंमलबजावणी होणे गरजेचे आहे. यासाठी शैक्षणिक पातळीवर प्रबोधन, उध्दोधन होणे गरजेचे आहे व ही जबाबदारी दुरदर्शन व आकाशवाणी अधिक चांगल्या प्रकारे पार पाडु शकतात. अधिकार आहेत, संधी आहे मात्र या दोन्ही गोष्टींचा सहजपणे वापर करता येईल अशी सोय मात्र अजुनही नाही. आई, पत्नी, बहीण, मुलगी यासारख्या नात्यांच्या संदर्भात स्त्रीचे अस्तीत्व मान्य करणे हा परंपरोचा संस्कार आहे तर तिचे स्त्रीत्व व मनुष्यत्व मान्य करणे हा मात्र आधुनिकतेचा स्विकार आहे. तो करण्यासाठी आपणास बराच प्रवास करावा लागेल. स्त्रिया जन्मालाच येऊ नयेत याची तजवीज करणाऱ्या आमच्या समाजाची एकुण मानसिकता बदलल्याशिवाय स्त्रियांचा प्रवास सुकर होणे नाही. महिलांच्या सुरक्षिततेबाबत एक प्रश्नचिन्ह नव्याने निर्माण झाले आहे परंतु तिच्या दुर्बलतेची जाणीव तिला करून देण्यापेक्षा साहसी वृत्ती तिच्या मध्ये निर्माण करणे गरजेचे आहे. समाजामध्ये निर्भयपणे वावरण्याची सवय, स्वतंत्रपणे, आत्मविश्वासाने उभे राहण्याची शक्ती तसेच स्वत:वरील अन्याय व अत्याचाराविरूध्द पेटून उठण्याची जिद्द तिच्यात निर्माण करणे गरजेचे आहे. यासाठी स्वसंरक्षणाचे धडे देणारे प्रशिक्षण देणे, कायदेविषयक माहिती असणे आवश्यक आहे. समाजातील परंपरागत मानसिकता जोपर्यंत बदलत नाही तोपर्यंत स्त्रियांचा विकास शक्य नाही आणि तरच खऱ्या अर्थाने स्त्रियांच्या मानवी अधिकाराचे संरक्षण झाले आहे असे म्हणता येईल.

संदर्भ :—

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महिला सक्षमिकरणासाठी राष्ट्रीय धोरणाचे योगदान

प्रा.डॉ. असीम खापरे

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प्रस्तावना :

भारतीय संविधानाच्या भाग ३ मध्ये मूलभूत अधिकारांचे वर्णन केले आहे. या अधिकारांतर्गत समतेच्या अधिकाराचा उल्लेख कलम १४ मध्ये केला आहे, समतेचा अर्थ धर्म वंश,जात,लिंग व जन्मस्थान या आधारावर व्यक्ती व्यक्ती मध्ये भेद केला जाणार नाही. परंतु आज अशी सामाजिक परिस्थिती आहे की पुरूष व महिला यांच्या मध्ये भेदभाव आहे.

भारतीय संविधानाने दिलेले हक्क व अधिकार महिलांच्या विकासाचा पाया आहे. प्रसिध्द विचारवंत प्लेटोने महिलांना राज्याची अर्धी शक्ती मानले वास्तवीक समाजातील निम्मि लोकसंख्या महिलांची असून समाजाच्या जडण घडणीत तिचे योगदान महत्वाचे आहे. पुरूष प्रधान व्यवस्थेमुळे महिलांचा जवळपास निम्मा हिस्सा असा आहे की त्याचा जिवनस्तर उंचवण्याकडे दूर्लक्ष करण्यापासून तर छळ अत्याचार करण्यापर्यंत अनेक प्रकारे त्यांना हिनत्वाची वागणूक दिली जाते. म्हणून महिला सक्षमिकरणाची आवश्यकता निर्माण झाली आहे. हा भेदभाव दूर करून महिलांच्या प्रगतीस पोषक वातावरण निर्मिती त्याचे संचलन करणे लैंगिक समते व्दारे समाजाचे संतुलन साधने यासाठी विवेकी समाजाने बाळगलेला दृष्टिकोन यासाठी केलेल्या कृतीचा समुच्चय म्हणजे महिला सक्षमिकरण होय.

Country Report of India मध्ये महिला सक्षमिकरण म्हणजे बळजबरीने दुर्बल ठेवण्याच्या अवस्थेकडून शक्तीशाली अवस्थेकडे वाटचाल होय या व्दारे महिलामध्ये स्वत: बदलची सकारात्मक प्रक्रिया निर्माण करणे होय

महिला सक्षमिकरण म्हणजे त्यांना नैतिक कायदेविषयक अधिकार देणे होय महिला सक्षमीकरण ही एक दीर्घ स्वरूपाची प्रक्रिया आहे.

महिलांना आर्थिक दृष्टया स्वत:च्या पायावर उभे राहण्या इतकाच सक्षमिकरणाचा अर्थ संकुचित नाही. तो सर्वकषं आणि व्यापक आहे. त्यांना मानसिक,सांस्कृतिक,सामाजिक उत्तम आरोग्य शिक्षण तंत्रज्ञानातील प्रगती महिलांना अनुकूल पर्यावरण असे अनेक पैलू आहेत. भारतीय संविधानामुळे महिलांच्या अधिकाराविषयी जागृकता आली आहे. त्यामुळे अनेक महिला उपयोगी कायदे बनविण्यात आले आहे. महिलाविषयी कायदे बनविणे यात अडचण येत नाही. परंतु या कायदयांना व्यावहारीक स्वरूप देणे हे अत्यंत कठिण काम आहे. जे कायदे झाले ते संविधानाच्या अंतर्गत झाले आहे. तरी ते पुरेसे नाहीत ८०: महिला अशिक्षित आहे. त्यांना वास्तविक कायदयाची माहिती नाही. त्यांना मार्गदर्शन करण्यासाठी कोणी नाही.शहरी भागात महिला स्वयंसेवी संघटना आहेत. पण ग्रामीण भागाची परिस्थिती दयनिय आहे. महिलासाठी नव्या कायदयाची आवश्यकता नाही. पण जेवढे कायदे तयार झाले त्यांना व्यवहारात आणण्याची आवश्यकता आहे. महिलां समोर पालनपोषणाचा प्रश्न नाही तर त्याही पेक्षा मुलांचे भवितव्य,कुपोषण,दारिद्रय,हुंडा, संपत्तीचे अधिकार अशा अनेक समस्या आहेत. जागतिकरणाचा वाढता प्रभाव माहिती तंत्रज्ञानाचा विस्फोट यामुळे महिला सक्षमिकरणाबाबतचा दृष्टीकोन बदलण्याची आवश्यकता निर्माण झाली आहे.

नव्या महिला धोरणाची आवश्यकता :

भारतात महिला धोरण २००१ साली तयार करण्यात आले होते. परंतु गेल्या दोन दशकात महिलाचा स्वत:कडे पाहण्याचा दृष्टिकोन व जीवनाकडून अपेक्षा बदलल्या आहे. शासकीय योजनांच्या लाभार्थी एवढया पुरता संकुचित दृष्टीने महिलांकडे न पाहता त्याना अधिकार व सुरक्षितता प्रदान करून राष्ट्राच्या विकासांत महिलांना पुरूषाच्या बरोबरीचा हिस्सेदार म्हणून सहभागी करून घेणे आवश्यक झाले आहे.

राष्ट्रीय धोरणाचे ध्येय महिला विकास व सक्षमिकरण असायला पाहीजे या सक्षमिकरणासाठी सामाजिक,आर्थिक,राजकिय क्षेत्रात समान सहभाग व निर्णय निर्धारणामध्ये देखिल वाटा असेल असे धोरण तयार करण्याची गरज निर्माण झाली आहे.

वास्तविकता अशी आहे की राज्यसरकारे व समाज कायदयाव्दारे सामाजिक परिवर्तन आणू इच्छिते.खरे तर कायदयाच्या निर्मितीमुळे प्रत्यक्ष स्वरूपात एक आदर्श प्रस्थापित केला जातो, केवळ कायदयामुळे समाजामध्ये परिवर्तन येत नाही तर कायदा व अधिकारांना अधिक व्यवहारिक किंवा वास्तविकतेची जोड प्रदान करावी लागणार आहे. महिला संबंधीचे अधिकार अधिक—अधिक स्वीकारार्ह बनविण्याकरिता लोकमत बनविणे आवश्यक आहे. त्यासाठी न्यायपालिका,कार्यपालिका,प्रसारमाध्यमे यांची भुमिका महत्वाची आहे. केवळ कायदे, बनले म्हणजे झाले असे नसून ते कार्यान्वित केले जात आहे की ते केवळ कागदोपत्री आहेत हे पाहणे गरजेचे आहे.

ज्या समाजात महिला आपल्यापूर्ण क्षमतेने जीवनाच्या विविध अंगाच्या विकासात व सामाजिक बदलाच्या प्रक्रियेत योगदान देवू शकतील अश्या समाजाची उभारणी करण हे ध्येय राष्ट्रीय धोरणात असायला पाहिजे.

संकल्पना सार्वजनिक जीवनात वापरत असतांना शासन व्यवस्थेत महिलांना विकासाची प्रक्रिया,धोरण अंमलबजावणीची समान संधी व अधिकार यांची खात्री देणारे धोरण पाहीजे.

या सर्वासाठी राष्ट्रीय पातळीवर धोरण बदलाची गरज आहे. धोरण म्हणजे नियमांचे मार्गदर्शन करण्यासाठी तर्कसंगत परिणाम साध्य करण्यासाठी मार्गदर्शक तत्वाची एक प्रणाली होय.

उद्दिष्टये :—

१) महिलाच्या पोषणासह आरोग्याच्या समस्येकडे लक्ष देणे
२) किशोर वयीन मुलाच्या सक्तीच्या शिक्षणासाठी प्रयत्न करणे
३) कौशल्य विकास कार्यक्रमायांतर्गत महिलांना आर्थिकदृष्टया सक्षम बनविणे
४) महिला विरोधी सर्व प्रकारच्या हिसेची दखल घेणे

महिला संबंधी खालील काही सामाजिक मुदयाचा येथे विचार करणे आवश्यक झाला आहे की ज्यामुळे महिलांना कुटुंब,समाज,राष्ट्रांना योग्य स्थान प्राप्त होत नाही त्याची उपेक्षा होत आहे.

१) निरक्षरता

भारतात २०११ च्या जनगणने नुसार ८०.८८ टक्के इतके पुरूष तर ६४.६३ टक्के इतके महिला साक्षरतेचे प्रमाण आहे. महाराष्ट्रात ८८.४ टक्के पुरूष तर ७९.९ टक्के महिला साक्षरतेचे प्रमाण आहे. महिलांच्या मागासलेपणाचे मुख्य कारण म्हणजे त्यांची निरक्षरता होय. शिक्षणा अभावी त्यांना महिला संबंधी असणारे कायदे व अधिकार माहीत नाही. सरकार व सामाजिक संघटनाव्दारे कोणती व कोणत्या स्वरूपात मदत मिळते हे त्यांना माहित नाही. निरक्षरतेच्या निर्मूलनातूनच महिलांमध्ये जागृती आणि आत्मसम्मान निर्माण होतो.

२) व्यसनाधिनता

पुरूष प्रधान संस्कृती मध्ये पुरूषा मध्ये असलेली व्यसनाधिनता,भारतीय समाजाला लागलेली कीड आहे. तंबाखू,गुटखा,अफिम,गांजा,दारू यांच्या अति सेवनामुळे पुरूषाच्या आरोग्यावर तर परिणाम होतोच. त्याच बरोबर कौटुंबिक संस्काराचा ढाच्या नष्ट होतो. पुरूषाच्या व्यसनाधितेला विरोध केल्यामुळे पुरूष महिला व बालकांना मारहाण करतात, गृहक्लेश होवून त्याचा परिणाम बालमनावर होवून अश्या परिवारातील बालके, श्रमिक, भिकारी,गुन्हेगारीकडे वळतात,हिंसक बनतात या सर्वाचा परिणाम महिलांच्या कौटुंबिक व आर्थिक स्थिती वर होतो.

३) स्वच्छता व आरोग्य

महिला या कौटुंबिक जबाबदारी मध्ये व्यस्त राहतात घरातील जबाबदारी व बाहेर कामाला जाणे या मुळे मुलांच्या व स्वत:च्या स्वच्छतेकडे व आरोग्या कडे लक्ष देण्यास त्यांना वेळ मिळत नाही. स्वच्छ पिण्याच्या पाण्याचा अभाव, घरातील सांडपाणी कचरा शौचालय यांच्या सोयी व सुविधा अभावि अनेक संसर्गजन्य आजारास बळी पडतात. आरोग्याचे प्रश्न निर्माण होतात. या बरोबर दारिद्रय, कुपोषण बालविवाह दळणवळणाच्या सुविधेचा अभाव या सारखे प्रश्न आजही आहेत.

४) महिलांवर होणारे अत्याचार व शोषण

महिलांना कौटुंबिक जबाबदारी सांभाळावे लागते. या बरोबर अनेक प्रकारच्या अन्याय व आत्याचाराला तोंड दयावे लागते त्याचे प्रश्न सोडविण्यासाठी महिला ओयोगाची स्थापना झाली आहे. परंतु समस्याग्रस्त महिला लोकलज्जेस्तव या आयोगापर्यंत पोहचत नाही. किंवा ग्रामीण महिलांना महिला आयोग संदर्भात माहिती नाही. या उलट या आयोगाची मदत त्या सामूहिक स्वरूपात घेवून झालेला अन्याय व अत्याचार व शोषणाला विरोध करू शकते

महिलाच्या जीवनाशी संबंधीत वरील मुदयाची येथे चर्चा केली त्यावर काही उपायाचा आढावा घ्यावयाचा आहे. ते खालीलप्रमाणे

महिलां मध्ये निरक्षरता आहे. देशातील ४० करोड निरक्षरता मध्ये ८० टक्के महिला आहे. याचे महत्वाचे कारण म्हणजे महिला मध्ये साक्षर होण्याचा तिव्र इच्छेचा अभाव आहे. महिला संघटनांनी महिलांना शिक्षित होण्यासाठी प्रेरणा दिली पाहीजे शिक्षण असे माध्यम आहे की जे प्राप्त झाल्याने महिला विकास कार्यक्रमात सहभागी होवू शकतात.

कौशल्य विकास कार्याक्रमांतर्गत प्रशिक्षण घेवून व्यवसाय किंवा कृषी विषयक क्षेत्रातील नवीन तंत्रज्ञान आत्मसात करून आपला व्यवसाय व उत्पन्न वाढवू शकते

साधारणपणे पुरूषामध्ये व्यसनाधिनता आहे याचा परिणाम महिला व बालकावर होतो पुरूष कोणत्या कारणामुळे नशा करतात या कारणाचा शोध घेतला पाहिजे कुटूंबाच्या स्तरांवर महिलांना असहयोग; घरा मध्ये प्रवेशबंदी केली पाहीजे आणि संमाजाच्या स्तरावर नशा करण्याची जी साधने आहे ती कायदा व पोलीसाच्या मदतीने बंद केली पाहीजे. विदर्भातील चंद्रपुर जिल्हा संपूर्ण दारूबंदी करण्यात महिला संघटनेच्या नेत्या पारोमिता गोस्वामी यांचे मोठे योगदान आहे.

स्थानिक स्वराज्य संस्थेत महिलांना ५०: आरक्षण दिले आहे. या आरक्षणाचा फायदा होवून महिलांनी संघटीतरित्या स्वच्छते संबंधी,सांडपाणी,स्वच्छ पिण्याचे पाणी,शौचालय या सारख्या सुविधासाठी ग्रामसभेत ठराव पास करून हया सुविधा प्राप्त करून घेता येतात.

महिलावर होणारे अत्याचार व शोषण या संदर्भात प्रत्येक तालुक्याच्या ठिकाणी महिला 'चेतना संघ' बनवून पिडीतेला न्याय त्वरीत मिळाला पाहिजे, असे प्रभावी प्रयत्न बडोदा येथे **'नारी अदालत'** या रूपाने होत आहे. या नारी अदालत मध्ये कोणतीही महिला आपले प्रश्न घेवून येते तेथे तीला उचित न्याय मिळतो. या बरोबर बिहार मधील महिला जागृतीच्या कार्यकर्त्यानं सांगितले की महिलांच्या घरेलू हिंसेच्या प्रकरणा मध्ये महिलांची पंचायत बसवून निर्णय दिला जातो.

प्रसार मध्यमांनी देखिल आपल्या दैनिकांतून मासिकामधून,वृत्तनिवेदनातून,महिला आंदोलनाची विस्तृत माहीती व कार्यवाही समाजापर्यंत कशी पोहचेल यासाठी प्रयत्न केले तर समाजामध्ये महिलाकडे पाहण्याचा दृष्टिकोन बदलेल व त्या समाजाच्या विकासाच्या भागीदार बनतील.

याशिवाय खालीलप्रमाणे अनेक मुद्याचा समावेश राष्ट्रीय धोरणात करून महिलांचे सक्षमिकरण करता येते.

- महिला केंद्री अर्थ संकल्प असावा.
- महिला स्वयंसाहायता बचतगट विकासाचा केंद्रबिंदू ठरावा.
- तालुका स्तरावर महिला चेतना संघाची स्थापना व्हावी.
- कायदे विषय ज्ञानाचे प्रशिक्षण व व्यवसाय प्रशिक्षणाची सोय.
- सायबर स्पेस महिलासाठी सुरक्षित बनविणे.

निष्कर्ष :

महिलांचे अधिकार पूर्ती व सक्षमीकरणासाठी शाश्वत, आर्थिक, सामाजिक अधिकार उपलब्ध करून देणे महिलांच्या सर्व सुविधाचा समान फायदा मिळविण्यासाठी संविधानातील सर्व तुरतूदीचा आढावा घेणे आवश्यक आहे. लिंग भावात्मक समानता व न्याय या तत्वांना प्रत्यक्षात साकारण्यासाठी संसाधनाची मालकी महिलांना प्रदान करणे व धोरण निर्मिती मध्ये त्याचा सहभाग वाढविण्यासाठी प्रयत्न करणे. अशा राट्रीय महिला धोरणाची योग्य प्रकारे अंमलबजावणी करणे आवश्यक आहे.

संदर्भ — ग्रंथ सूची

१) गुप्ता कमलेशकुमार — भारतीय महिलांऍं शोषण, उत्पीडण एवं अधिकार बुक एनक्लेव जयपुर.
२) श्रीवास्तव सुधाराणी — भारत मे महिलांओं की वैद्यानिक स्थिती कॉमनवेल्थ पब्लिशर्स, नई दिल्ली.
३) खताळ भरत — मटा. राष्ट्रीय महिला धोरण
४) वेबसाईट — ीजजचध्ध्ण्उहेवबपमजलण्पद

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कौटुंबिक ताणाचा गृहिणीच्या आरोग्यावर होणारा परिणाम

डॉ. लीना सुनील कांडलकर

प्राचार्य ,इंदिराबाई मेघे महिला महाविद्यालय अमरावती

सांकेतिक शब्द—गृहिणी,आरोग्य,ताण

प्रस्तावना—

भारतीय संस्कृतीमधील स्त्रीची गृहसंचलन व बालसंगोपन ही परंपरागत कार्य आजही कायम आहेत. कुटुंबाचा प्रकार वेगाने बदलला असला तरी स्त्रीची भूमिका व तिच्याकडून कुटुंबातील इतर सदस्यांच्या अपेक्षा मात्र फारशा बदललेल्या दिसत नाहीत. संयुक्त कुटुंबामध्ये कुटुंबातील स्त्रियांच्या कामामध्ये विभागणी होते. मात्र विभक्त कुटुंब पध्दतीमुळे स्त्रीच्या कुटुंबातील सदस्यांची काळजी घेणे, कुटुंबासंबंधित कार्यक्रमांमध्ये सहभागी होणे,अपत्य संगोपन यासारख्या जबाबदारीमध्ये वाढझालेली दिसते. जेव्हा स्त्री या आवश्यकता पुर्ण करू शकत नाही तेव्हा तिला चांगल्या आरोग्यदायी जीवनाकरीता तिव्र संघर्ष करावा लागतो.

देसाई यांचेनुसार भारतातील अनेक स्त्रिया माता,पत्नी,गृहिणी,कर्मचारी अशा विविध भूमिका पार पाडतांना आवश्यकतेपेक्षा जास्त ताणाला नकळत सामोरे जात आहे.

विशेषत्वाने एकल पालकत्व असणारी विवाहित स्त्रीच्या अपत्यांना तिची अधिक आवश्यकता असते. त्यामुळे अशा स्त्रियांना अपत्याबरोबर वेळ घालविणे,अपत्याचे आजारपण, त्याचे शिक्षण विषयक जबाबदारी पार पाडणे, आर्थिक समस्या, गृहकार्य,स्व:तचे आजारपण याबाबींमुळे येणा.या ताणाला सामोरे जावे लागते.

जीवनाचा दर्जा उंचावण्याच्या दृष्टीने जीवन जगण्याच्या पध्दतीमध्ये प्रचंड वेगात बदल होत आहे. या बदलाशी समायोजन करण्याकरिता उपलब्ध साधनसंपत्तीचा आणि अवास्तव वाढलेल्या गरजा यांची जुळवणी करणे या सर्व बाबींचा होणारा परिणाम म्हणजे शारीरिक तसेच मानसिक ताण होय. जेव्हा व्यक्तीच्या सहनशक्तीच्या मर्यादेर्पेक्षा ताण वाढतो तेव्हा
व्यक्तीच्या शारीरिक व मानसिक अपवादात्मकतेमध्ये वृध्दी हा परिणाम दिसूनयेतो याचाच अर्थ शारीरिक आणि मानसिक प्रतिक्रियांचे एकत्रित परिणाम म्हणजे ताण होय.

अति ताणाने शारीरिक आणि मानसिक अनारोग्य निर्माण होते.काम आणि कुटुंबातील अडचणी किंवा समस्या या व्यक्तींची मानसिकता आणि शारीरिक क्षमता यावर नकारात्मक प्रभाव टाकतात हे संशोधनाअंती निदर्शनास आले आहे.ताण ही ऋणात्मक संकल्पना असून व्यक्तीवर सर्वसाधारण दोन प्रकारे प्रभाव करते. एक म्हणजे ताण सर्वप्रथम व्यक्तीच्या शारीरिक स्वास्थावर परिणाम करते. याबाबत पुराव्यानिशी सिध्द करता येते की ताण सर्दी व विविध संसर्गजन्य आजारांशी संबंधित आहे. दुसरे म्हणजे ताण अभिव्यक्तीला प्रभावित करते.

व्यक्तींची अभिव्यक्ती आणि ताण यांचा परस्पर संबंध दिसून येतो.व्यक्तीला ताण असतांना शरीरामध्ये अड्रेनॅलीन आणि हायड्रोकॉरटीसोन यासारखे हारमोन्स स्त्रवतात. अड्रेनॅलीन स्त्रवल्यामुळे हदयाच्या ठोक्यांची गती व श्वासोश्वासाच्या गतीमध्ये वृध्दी,स्नायु कडक होणे,रक्तदाब वाढणे यासारखे बदल होतात. ८० टक्के आधुनिक आजारांचे मूळ ताण आहे. ताण हा आजार नसून तो अनेक आजारांशी संबंधित आहे. संसर्गजन्य आजार, अस्थमा,हदयरोग,मधुमेह,अल्सर,पचनसंस्थेविषयकआजार,त्वचारोग,सोरियासीस,डोकेदुखी,मायग्रेन
स्त्रियांमध्ये मासिक पाळीची अनियमितता, वैफल्य, ॲलर्जी,पॅनिक अटॅक,हाडेठिसूळ होणे,कॅन्सर,पाठकंबर दुखणे यासारखे आजार प्रचंड ताणामुळे होवू शकतात.

ताण आणि कामाची अभिव्यक्ती व सादरीकरण यांचा जवळचा संबंध असून ताण हा व्यक्तीसापेक्ष आहे. ताणाची अनुभूती येण्याकरिता कोणती घटना,प्रसंग याकडे स्त्रीचे लक्ष कशा पध्दतीने व कितपत वेधले जाते आणि त्याचे स्पष्टीकरण करण्याकरिता ती काय करते यावर ताणाचे प्रमाण अवलंबून असते. ताण आणि कार्यक्षमता यांचा घनिष्ट संबंध स्पष्टपणे समजून घेतल्यास ताण अधिक भावनिक आहे हे लक्षात येते. कोणतेही काम करीत असतांना व्यक्तीमध्ये काही प्रमाणात उत्तेजना निर्माण होते. जसा ताण वाढतो तसा व्यक्तीच्या कार्यक्षमतेवर परिणाम

होतो आणि एका विशिष्ट बिंदूवर हा ताण अत्यूच्च होवून स्त्री कार्य करण्यास अक्षम ठरते. यातूनच घर व कुटुंब यातील जबाबदारी पूर्ण करण्याच्यादृष्टीने स्त्री समतोल साधण्यास असमर्थ ठरते व ताणामध्ये वुध्दी होते.

संशोधनाची उदिदष्टे —

१ स्त्रियांमधील ताणाच्या कारणांचा शोध घेणे.

२ ताणामुळे गृहिणीच्या आरोग्यावर होणा.या परिणामाचे अध्ययन करणे.

३. ताण व्यवस्थापन करण्याचे सहजशक्य मार्ग सुचविणे.

गृहितके —

१. गृहिणींना ताणामूळे कौटुंबिक समस्या निर्माण होतात.

२.कौटुंबिक ताणाचा स्त्रियांच्या आरोग्यावर वाईट परिणाम होतो.

संशोधन पध्दती —

प्रस्तुत शोध निंबधाकरीता स्त्रियांच्या वैयक्तिक व कौटुंबिक माहितीचे संकलन करण्याच्या दृष्टीने अनुसुची व मुलाखत तंत्राचा वापर करण्यात आला. तसेच इतर संबंधित माहिती करीता संदर्भग्रंथ,मासिक,वृत्तपत्रे,संकेतस्थळ या प्रलेखीय स्त्रोताचा वापर करण्यात आला.

नमुना निवड.

प्रस्तुत अध्ययनाकरिता अमरावती महानगरपालिका व तालुका क्षेत्रातील स्त्रियांची निवड करण्यात आली. यामध्ये २५ स्त्रिया महानगरपालिका क्षेत्रातील यांचा समावेश होता. व भातकुली तालुक्यातील २५ स्त्रियांची निवड हेतुपुरस्सर पध्दतीने करण्यात आली.

परिणाम व चर्चा.

प्रस्तुत अध्ययनामध्ये स्त्रियांवर येणा.या ताणाची कारणे, ताणाचा स्त्रियांच्या आरोग्यावर होणारा परिणाम, स्त्रियांना निर्माण होणा.या आरोग्यविषयक समस्या व ताण कमी करण्याकरिता उपयोगात आणत असलेल्या पध्दती याविषयी खालील बाबी निदर्शनास आल्या.

तक्ताक्र. १ स्त्रियांच्या ताणाची कारणे

अ.क्र.	विवरण	छ :	:
१	गुहकार्य	४०	८०
२	बालसंगोपन	४२	८४
३	अपत्याचे शिक्षण	४२	८४
४	अपत्याची भविष्याबाबत चिंता	४७	९४
५	सतत प्रवास	२२	४४
६	प्रकुतीविषयक तक्रारी	४३	८६
७	जबाबदारीमध्ये वाढ	१७	३४
८	आर्थिक ताण व कर्ज	४०	८०

अपत्याच्या भविष्याबाबत चिंता, शिक्षण व प्रकृतीविषयक तक्रारी याचा ताण स्त्रियांना सतत जाणवतो.

तक्ता क्र.२

गृहकार्य आणि कुटुंब यातील समतोल

अ.क्र.	वय	समतोल		असमतोल	
		संख्या	:	संख्या	:
१	२५ ते ३५ वर्ष	१२	८५.७१	२	१४.२९
२	३६ ते ४५ वर्ष	४	२८.५७	१०	७१.४२
३	४६ ते ५५ वर्ष	—	—	२२	१००

वाढत्या वया बरोबर गृहकार्य आणि कुटुंब यामध्ये समतोल साधणे कठीण जाते व त्यामुळे त्यांच्यावरील ताणामध्ये वृध्दी झालेली दिसून येते.

कामाच्या स्वरूपामुळे या स्त्रियांना शारीरिक व मानसिक थकवा जाणवतो. त्याचा परिणाम कुटुंबातील वातावरणावर होतो व कौटुंबिक समस्यांमध्ये वाढ होते.

तक्ताक्र.३ ताणामुळे प्रभावित होणारा घटक

अ.क्र.	विवरण	टक्केवारी	क्रम
१	अपत्य	७५	८
२	पती	४७	ष्ष
३	मित्र/मैत्रिण	३८	ष्ट
४	नातेवाईक	३१	ट
५	कुटुंबातील सदस्य	५९	ष्ठ
६	हाताखाली काम करणारे	३८	ष्ट

यावरून असे निदर्शनास येते की, स्त्रियांच्या ताणाचा सर्वात जास्त प्रभाव तिच्या अपत्यावर होतो. याचाच अर्थ ताण आणि कौटुंबिक समस्या धन सहसंबंध दिसून येतो.

तक्ताक्र.४ स्त्रियांच्या आरोग्यविषयक समस्या

अ.क्र.	आरोग्यविषयक समस्या	छ. ५०	:
१	डोकेदुखी	३९	७८
२	पोटदुखी	०७	१४
३	अंगदुखी	२८	५६
४	आम्लपित्त	४२	८४
५	केस गळणे	१९	३८
६	निराशा/वैफल्य	३३	६६
७	रक्तदाब	२८	५६
८	लठठपणा	०९	१८
९	झोपेमध्ये अनियमितता	४४	८८
१०	त्वचा रोग	०४	०८

स्त्रियांना कौटुंबिक समस्या व गृहकार्य यातील संघर्षामुळे वारंवार डोकेदुखी,आम्लपित्त,झोपेमध्ये अनियमितता,वैफल्य व नैराश्य यासारख्या आरोग्यविषयक समस्यांना सामोरे जावे लागते असे निदर्शनास आले.

तक्ताक्र.५ ताण कमी करण्याच्या पध्दती

अ.क्र.	पध्दती	छ. ५०	:
१	योगाभ्यास / ध्यान	१७	३४
२	छंद जोपासणे	४	८
३	संगीत ऐकणे	३५	७०
४	मैत्रिणीसोबत वेळ घालविणे	४०	८०
५	मनोरंजन	३२	६४
६	विश्रांती	३७	७४
७	पाळीव प्राण्यासोबत वेळ घालविणे	०६	१२

काम आणि सुदृढ स्वास्थ यांचे संतुलन राखण्याच्यादृष्टीने ताण कमी करण्याच्या विविध पध्दतींचा वापर स्त्रियांकडून केला जातो. मैत्रिणीबरोबर वेळ घालविणे,मनोरंजनाच्या साधनांचा वापर, संगीत ऐकणे यांचा ताण कमी करण्यास मदत होते. काही स्त्रिया योगा,ध्यान,विश्रांती या मार्गाचा वापर करतांना आढळल्या.

निष्कर्ष: प्रस्तुत अध्ययनावरून खालील निष्कर्ष काढता येतात.

१. प्रौढ वयातील स्त्रिया कुटुंब क्षमता आणि गृहकार्य यामध्ये संतुलन ठेवण्यास असमर्थ ठरतात. त्याचा त्यांच्या आरोग्यावर विपरित परिणाम होतो.

२. झोपेतील अनियमितता,शारीरिक व मानसिक अस्वस्थता,गोंधळ,डोकेदुखी ही ताणाशी संबंधित मुख्य लक्षणे होत.

३. स्त्रियांच्या ताणाचा सर्वात जास्त प्रभाव तिच्या अपत्यावर झाल्याचे दिसून येते.
४. मैत्रिणीसोबत वेळ घालविणे, मनोरंजन,संगीत ऐकणे,विश्रांती यामुळे स्त्रियांवरील ताण कमी होण्यास मदत होते.
५. उच्चरक्तदाब विकसित होण्याकरिता महत्वाचा घटक म्हणून ताण कार्य करतो.

सुचना व शिफारशी –

१) समतोल व पौष्टिक आहार अधिक उर्जा देत असल्याने ताणाचा प्रभाव कमी करण्यास मदत होते. त्यामुळे स्वत:च्या आहाराची काळजी घ्यावी.

२) दिर्घ श्वसन,विश्रांती,ओम उच्चारण,ध्यान,व्यायाम दररोज केल्यास ताण कमी होणे व शरीर स्वास्थ उत्तम राहण्यास मदत मिळते.

३)स्त्रियांनी धार्मिक क्रियांमध्ये लक्ष केद्रित केल्यास ताणाचा प्रभाव कमी होण्यास मदत होते.

४) स्वत:चे छंद जोपासण्यात फावला वेळ घालवावा.

५) वास्तववादी व पूर्णत्वास जाणारी कौटुंबिक ध्येये निश्चित करावी. दिर्घकालीन उद्देशाची कमी कालावधीच्या ध्येयामध्ये विभागणी करावी. यामुळे कौटुंबिक समस्या सोडविण्यास मदत होवू शकेल.

६) प्रत्येक व्यक्तीची सर्वोकृष्ठ काम करण्याची दिवसातील निश्चित वेळ असते. सर्वाधिक कार्यक्षमता असलेल्या वेळात गृहिणीने कामाचे नियोजन करावे.

७) स्वत:च्या क्षमता व मर्यादा ओळखुन स्वत:ला आहे तसे स्विकारणे,स्वत:वर प्रेम करणे,इंतरांकडून अवास्तव अपेक्षा न करणे यामुळे ताणाचा स्तर ब.याच प्रमाणात कमी होण्यास मदत होवू शकेल.

८)कुठल्याही प्रकारची अपराधीपणाची भावना स्वत:मध्ये निर्माण न होवू देता आवश्यकतेनूसार नाही म्हणायला शिकणे गरजेचे आहे.

९) कौटुंबिक समस्या मागील करणांचा शोध घेवून त्या दूर करण्याकरिता कुटुंबातील सदस्य,नातेवाईक,मित्र,शेजारी,सहकारी यांचे सहकार्य घ्यावे व कौटुंबिक ताणातून बाहेर पडण्याचा प्रयत्न करावा.

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5) WWW.work health.org

महिलांची सुरक्षितता आणि मानवाधिकार

डॉ.जयवंत पिराजी जुकरे
सहयोगी प्राध्यापक व राज्यशास्त्र विभाग प्रमुख जिजामाता कला महाविद्यालय, दारव्हा,
जि.यवतमाळ. ४४४२०२,मो. नं. ९०११५९१३६८

प्रस्तावना:—

जगात दोन महायुध्दे झालीत या दोन महायुध्दात मानवाचे अपरीमित अशी जिवित व वित हानी झाली. ते पाहून जगातील सर्व व्यक्तिच्या मानवाधिकारांचे संरक्षण व्हावे, प्रत्येक व्यक्तिला सुखी, समाधानी व प्रतिष्ठेने जीवन जगता यावे याकरिता १० डिसेंबर १९४८ साली युनोने (संयुक्त राष्ट्र संघटनेने) मानवी हक्काचा जाहिरनामा प्रसिध्द केला आणि जगातील संपूर्ण देशानी आपापल्या देशातील नागरिकांना वेगवेगळे मानवी हक्क उपलब्ध करून देण्याचे आवाहन केले. कारण मानवी हक्क हे मानवाला जन्मत: नैसर्गिकरित्या प्राप्त झोलेले अधिकार होत. मानवाला सामाजिक, आर्थिक ,राजकीय, सांसकृतिक, शैक्षणिक, आरोग्यविषयक जीवन जगण्याची संधी व समानतेने मिळालेला अधिकार म्हणजे मानवाधिकार होत. त्याला अनुसरून मानवी हक्काचा जाहिरनामा हा एक मानवाच्या सर्वांगिन विकासासाठी घेतलेला ऐतिहासिक असा महत्वाचा निर्णय होय. योगायोगाने याच काळात भारतीय संविधानाच्या निर्मितीचे काम सुरू होते यामुळे युनोच्या आव्हानाचा भारतीय नागरिकांचे मुलभूत हक्क, कर्तव्य, राजनित्तीचे मार्गदर्शक तत्वे संविधानाच्या सुरवाततीला संपूर्ण संविधानाचे सार स्पष्ट करणारी उद्देशिका इ. बाबीवर मानवी हक्काचा प्रभाव असल्याचे दिसून येते. भारत देशाला स्वातंत्र्य मिळून जवळपास ७५ वर्षाचा काळ उलटून गेलेला आहे, तरीही भारतातील अजूनही बहुतांश लोकांना मानवी अधिकार मिळत नसल्याचे चित्र समाजात पाहवयास मिळते.

प्रस्तुत शोधनिबंधाची उद्ष्टये पुढीलप्रमाणे—

(१) मानवाच्या मानवी अधिकारा प्रति सन्मान वाढविणे आणि मानवी हक्कांच्यासंबधी सर्वसामान्यात जनजागृती घडवून आणने.

(२) विविध कायदे अस्तिवात असुनसुध्दा महिलांच्या मानवी अधिकाराचे हनन केल्या जाते हे तपासून पहाणे.

(३) पुरूषप्रधान संस्कृती असलेल्या देशामध्ये जो पर्यंत मानसिक व वैचारिक पातळीवर बदल होणार नाहीत तोपर्यंत महिलांना खऱ्या अर्थाने मानवी हक्क मिळणार नाहीत, ही जाणीव समाजात निर्माण करणे.

(४ जात, लिंग, धर्म ,भाषा या आधारावर कोणताही भेदभाव न करता सर्व मानव जातीना मानवी हक्क मिळाले पाहिजेत.

गृहितके:—

१. विविध कायदे अस्तित्वात असूनही महिलांच्या मानवी हक्काचे अजूनही शोषन होत असल्याचे चित्र समाजात पाहवयास मिळते.

२. महिला वर्गात उच्च शिक्षणाचे प्रमाण कमी असून त्या आर्थिक दृष्ट्या फारशा सक्षम नसल्याचे चित्र समाजात दिसून येते.

३.स्त्रिया पुरूषाच्या तुलनेत उपेक्षित असल्याचे दिसून येते.

संशोधन पध्दतीचे स्रोत:—

प्रस्तुत शोध निबंधामध्ये दुय्यम साधन सामुग्रीचा वापर करण्यात आलेला असून त्यात प्रामुख्याने संदर्भग्रंथ, अभ्यासक्रमिक पुस्तके, विविध निवडणूकांचे वर्तमान पत्रातील संदर्भ, वेळोवेळी प्रसारमाध्यमातून, वेगवेगळया चर्चासत्रातून मांडलेली मतमतांतरे, प्रिंट मिडीयातून झालेल्या चर्चा, तसेच राज्यस्तरीय, राष्ट्रीय स्तरावरील परिषदा ,चर्चासत्रे व संशोधन पत्रिका, मासिकातून प्रकाशित झालेले अग्रलेख इ.स्त्रोतामधून माहितीचा आधार घेण्यात आलेला आहे.

संशोधन अभ्यास विषयाचे महत्व:—

स्त्रियांना पुरूषाइतकेच समान अधिकार असून कोणत्याही कायद्यान्वे तथा अन्य कोणत्याही पध्दतीने त्यांना हक्क नाकारणे, कमी करणे हे अनैसर्गिक व अन्यायकारक असुन ते मानवाच्या प्रतिष्ठेचा अवमान आहे. स्त्रियांना मानवी हक्काच्या प्रस्थापनेसाठी वेगवेगळया परिषदा चर्चासत्रे वेगवेगळे आयोग, विविध कायदे करण्यात आलेले असले तरी आजही बहुतांश लोकाच्या मानवी हक्काचे मोठया प्रमाणावर हनन होत असल्याचे चित्र पाहवयास मिळते., वंचित घटकावर आजही मोठया प्रमाणावर अन्याय अत्याचार केले जातात. कधी उच्च वर्णीयांच्या मुलीसोबत प्रेम केले म्हणून तर कधी मंदिरात गेले म्हणून तर कधी पाणी पिले म्हणून, आमच्या लग्नात जेवन केला म्हणून तर कधी खोटे आळ लावून अनुसूचित जाती —जमातीच्या लोकांचे आजही मोठया प्रमाणावर छळ होत आल्याचे चित्र पाहवयास मिळते. त्यामुळे मानवी हक्काची प्रासंगिकता आजही मोठया प्रमाणावर असल्याचे दिसून येते. सर्वांना हक्क उपभोगता येतील असे वातावरण तथा परीस्थिती निर्माण करण्यात भारतीय राजकीय व्यवस्था अपयशी ठरलेली आहे. स्वातंत्र्याच्या ७५ वर्षाच्या कालखंडात येथिल जातीव्यवस्था कमी करू शकलो नाही, उच्च वर्णीयांची मानसिकता बदण्यात सुध्दा अपयशी ठरलेलो आहोत. परिणामी समाजात सामाजिक समता निर्माण झालेली नाही. या पार्श्वभूमीवर मानवी हक्काची संकल्पना अत्यंत उपयुक्त असल्याचे दिसून येते.

मानवी हक्काची संकल्पना व अर्थ:—

मानवी हक्क म्हणजे जगातील प्रत्येक व्यक्तीला, सन्मानाने, प्रतिष्ठेने, आनंदाने जीवन जगता आले पाहिजे अशी व्यवस्था उपलब्ध करून देणे, म्हणजे 'मानवी हक्क' होत. मानवाला जन्मापासून जे अधिकार मिळतात त्याशिवाय व्यक्तिचा विकास होवू शकत नाही, शिवाय जे हक्क कोणत्याही कायद्याने दिलेले नाहीत ते निसर्गत: मानावाला मिळालेले असतात त्यांना मानवाधिकार म्हणता येईल. चांगले जीवन गण्यासाठी योग्य ती परीस्थिती खऱ्या अर्थाने उपलब्ध करून देणे हे मानवी हक्क या संकल्पनेत अभिप्रेत आहे.

युनोने मानवी हक्कासंबधी निर्धारित केलेले मापदंड पुढीलप्रमाण्णे:—

जगातील सर्व देशानी आपले उदिष्ट पूर्ण करण्यासाठी निश्चित मापदंड म्हणून मानवी हक्काचा जाहिरनामा उपयुक्त ठरेल.

१. मानवी हक्काच्या मापदंडाप्रमाणे जगातील सर्व मानसे जन्मत:च स्वतंत्र व समान असून युनोच्या जाहिरनाम्यातील कलम २३ नुसार महिलांनाही पुरूषाच्या बरोबरीने अधिकार असतील असा उल्लेख आहे. त्यामुळे युनोच्या मानवी हक्काच्या जाहिरनाम्याला **'महिला मुक्तीचा जाहिरनामा '** म्हणूनही पाहिले जाते.

२..एक व्यक्ती दुसऱ्या व्यक्तीस गुलाम म्हणून राबवणार नाही.

३. कोणत्याही कारणावरून एक व्यक्ती दुसऱ्या व्यक्तीचे हाल, छळ, शौषण करणार नाही.

४. कायद्यासमोर सर्व व्यक्ती समान असतील, कायदयाकडून व्यक्ती —व्यक्तीत जात, धर्म, शिक्षण, श्रीमंती श्रेष्ठ— कनिष्ठ, लिंग आदी कोणत्याही कारणावरून कायदयाव्दारा कोणत्याही प्रकारचा भेदभाव केला जाणार नाही. तर कायदयाव्दारा सर्व व्यक्तीना समान परीस्थितीत समान वागणूक दिली जाईल.

५. प्रत्येकाला देशाच्या कोणत्याही कानाकोपऱ्यात जाण्याचा, वास्तव्य करण्याचा, व संचार करण्याचा हक्क आहे.

६ प्रत्येक माणसाला आचार, विचार, संचार, भाषण, मुद्रण, लेखन, धर्मस्वातंत्र्य, व्यवसाय स्वातंत्र्य व शिक्षण घेण्याचा हक्क असेल. असे वेगवेगळे मानवी हक्काचे मापदंड निश्चित करण्यात आलेले आहेत.

सामाजिक संदर्भ:—

जगातील सर्वच देशात मग तो देश विकसीत असो की विकसनसील असो अथवा अविकसीत असो सर्व देशातील मानवी जीवन सारखेच नाही. आचार, विचार, रूढी, प्रथा परंपरा, समाजजीवन, राहणीमान, धार्मिक विविधता, या अनेक बाबतीत खुप मोठया प्रमाणावर विविधता असल्याचे दिसून येते. त्यामुळे काही वाईट रूढी, प्रथा, परंपरेमधुनही अनेक महिला वर्गाचे शोषण होते. याशिवाय भ्रष्ट्राचार, दहशतवाद, आतंकवाद, लैंगिक शोषण, अत्याचार, बालमजुरी,

निरक्षरता, वेश्या व्यवसाय अशा कितीतरी स्वरूपाच्या अमानवीय घटना घडत असतात की यातून मानवी हक्काचे फार मोठया प्रमाणावर उल्लघंन होत असल्याचे चित्र समाजात पाहावयास मिळते.

भारतीय संविधानाच्या माध्यमातून महिलांना मिळालेले संरक्षण:—

संविधानकर्त्यानी संविधानाच्या माध्यमातून विविध तरतुदीतून पुरूषाप्रमाणेच महिलांनाही वेगवेगळे हक्क उपलबध करून दिलेले आहेत. जसे की, नागरिकांची मुलभूत हक्क, कर्तव्य, राजनित्तीची मार्गदर्शक तत्वे व इतर विविध तरतुदी मधुन स्त्री आणि पुरूषांना समान मानवाधिकार दिलेले आहेत. राज्यघटनेतील कलम १४ नुसार कायदयासमोर सर्वजन समान मानले आहेत. कलम १५ नुसार धर्म, जात, वंश, लिंग, जन्मस्थान या कोणत्याही कृत्रिम कारणावरून भेदभाव करण्यास मनाई करण्यात आली आहे. कलम १६ नुसार सार्वजनिक सेवेमध्ये स्त्री आणि पुरूषांना समान संधी देण्यात आलेली आहे. कलम १७ नुसार अस्पृस्यतेवर बंदी, कलम २३ मधून माणसाचा अपव्यापार, तथा खरेदी —विक्री करणे यावर बंदी, वेठबिगारी, सारखी कामे सक्तीने करवून घेता येणार नाहीत. कुणालाही गुलाम किंवा दास समजून कामे लावता येणार नाहीत. तर कलम २४ मधून १४ वर्षाच्या आतील मुला—मुलींना धोक्याच्या व अवजड ठिकाणी कामाला लावता येणार नाही. राजनित्तीच्या मार्गदर्शक तत्वामधील कलम ३९ क नुसार उपजिविकेची साधने मिळविण्याचा स्त्री आणि पुरूषाना समान अधिकार असेल. कलम ३९ ब नुसार स्त्री आणि पुरूषाना समान कामासाठी समान वेतन दिले जाईल. तर कलम ४४ नुसार समान नागरी कायदा कलम ५१ ई नुसार मूलभूत कर्तव्यामधून स्त्रियांच्या विकासाला मारक ठरणाऱ्या अनिष्ठ चालीरिती प्रथा, वाईट प्रवृत्तीचा त्याग करणें. कलम ३२५ नुसार कोणतीही व्यक्ती धर्म, जात, वंश, लिंग, पंथ, शिक्षण, प्रदेश या कारणावरून मतदार यादीत नाव समाविष्ठ होण्यास अपात्र असणार नाही. यासारख्या कितीतरी तरतुदीमधून भारताची राज्यघटना महिलाना संरक्षण पुरविते.

महिलांची आर्थिक स्थिती :—

जगातील विशेषत: आशिया खंडातील राष्ट्रात तर गरिबीचे प्रमाण फारच कमी आहे. त्यांची कमाई प्रतिदिन दोन डॉलर पेक्षाही कमी आहे. त्यांच्या मूलभूत गरजांची पूर्तता सुध्दा होताना दिसून येत नाही. भारतात तर पुरूष व महिलाना कोणताही व्यवसाय करण्याचे स्वातंत्र्य देण्यात आले आहे. पण प्रत्यक्ष समाजात असे चित्र दिसून येते की, आर्थिक बाबतीत महिलांना पुरूषाच्या तुलनेत फारच कमी वेतनावर काम करावे लागते. महिलांना दुय्यम दर्जाची कामे करावी लागतात. असुविधापूर्ण वातावरणात कामे करावी लागतात, कामाच्या ठिकाणी बऱ्याच वेळा लैंगिक शोषनाला, अत्याचाराला बळी पडावे लागते.

महिलांची आरोग्यविषयक स्थिती :—

मानवाधिकाराच्या सनदेतील कलम २५ नुसार प्रत्येक व्यक्तिला आपले राहणीमान व दर्जा कसा ठेवायचा याचा अधिकार आहे.? असे असले तरी स्त्रियांच्या आरोग्याकडे पुर्णपणे दुर्लक्ष होत असल्याचे दिसून येते, कारण भारतात पितृसत्ताक कुटूबं पध्दती असल्यामुळे सकस, ताजे, चांगले पोषणयुक्त अन्नं मुलांना किंवा पुरूषाना, उरलेले शिळेपाते अन्न मुलींना/स्त्रियांना त्यामुळेही महिला वेगवेगळया साथीच्या आजाराला बळी पडतात. शिवाय देवदेवतांच्या नावाखाली उपास—तापासही महिलांच्याच वाटयाला जास्त आहेत. शिवाय लहान वयात लग्न मग लवकरच मातृत्व, इ. समस्येमुळे महिलांचे आरोग्य अत्यंत बिकट होत आहे. वरील अनेक बाबीतून महिलांच्या मानवी हक्काचे फार मोठया प्रमाणावर हनन होत आल्याचे चित्र पाहवयास मिळते.

स्त्रियावरील अत्याचारची सद्यस्थिती:—

म. फुले राजर्षी शाहु महाराज, गाडगे महाराज आणि डॉ. बाबासाहेब आंबेडकराचा अभिमानाने वारसा सांगणाऱ्या महाराष्ट्रात, शिवाय पुरोगामी म्हणून आपली ओळख सांगणाऱ्या महाराष्ट्रात, तथा भारत देशात महिलावरील होणाऱ्या अन्याय अत्याचारांचे प्रमाण वरचेवर वाढत असल्याचे चित्र पाहवयास मिळते. महाराष्ट्रात आजही बालमजुरी, कौटुंबिक हिसांचार, हुंडाबळी, बालकामगार, स्त्रिभ्रूणहत्या, छेडछाड, विनयभंग, बलात्कार, वेश्या व्यवसायात जबरदस्तीने ढकलणे, अनन्वीत अत्याचार अशा घटना दिवसेंदिवस कमी होण्याऐवजी वरचेवर वाढतच आहेत. भारतात ७५ टक्के महिला घगुती छळाला बळी पडतात, दर अर्ध्या तासाला एका महिलेवर बलात्कार होतो, दर दहा मिनिटाला एक महिला आत्महत्या करते. अत्याचाराचे प्रमाण पुर्वी ७

टक्के होते ते आता ११ टक्के इतके झाले आहे. दवाखाण्यात पैसे भरले नाहित म्हणून गरोदर मातेला दवाखाण्याच्या बाहेर काढणे, नंतर तीच्या बाळाचा मृत्यू होणे, बऱ्याचशा आदिवासी महिला आजही फारशी व्यवस्था नसल्यामुळे चालत बरेच अंतर दवाखाण्यात जाणे, या घटना मनाला सुन्न करणाऱ्या आहेत. महासत्तेची स्वप्न पाहणाऱ्या देशाला निश्चित हे शोभत नाही. थोडक्यात भारत देशात महिलांवरील अत्याचाराची स्थिती अत्यंत दयनीय असल्याचे प्रकर्षाने जाणवते.

महिला सबलकरणासंदर्भातील विविध कायदे :—

स्त्रियांना पुरूषाच्या बरोबरीने प्रत्येक क्षेत्रात समान संधी मिळावी याकरिता महिलांच्या हक्कांच्या रक्षणासाठी करण्यात आलेले कायदे व निर्माण केलेली यंत्रणा आहे.

१.) महिलांना राजकारणात सहभागी होण्यासाठी समान मताधिकार कायदा—१९५२.
२.) द्विभार्या प्रतिबंधक कायदा—१९५५.
३.) वारसा हक्क कायदा—१९५६.
४.) घटस्फोटाचा कायदा—१९५६.
५.) पोटगी कायदा—१९५६.
६.) वेश्या व्यवसाय प्रतिबंधक कायदा—१९५६.
७.) विधवा पुनर्विवाह कायदा—१९५६.
८.) अनैतिक मानवी व्यापार प्रतिबंधक कायदा—१९५६—१९८६.
९.) गर्भपात कायदा—१९७१.
१०.) गर्भजल परीक्षा कायदा—१९८८.
११.) हुंडा प्रतिबंधक कायदा—१९६१—१९८६.
१२.) बलात्कार प्रतिबंधक कायदा—१९८३.
१३.) समान वेतन कायदा—१९७६.
१४.) प्रसूती लाभाचा कायदा—१९६१.
१५.) सती प्रतिबंधक कायदा—१९२९.
१६.) मुस्लिम घटस्फोट कायदा—१९३९.
१७.) चलचित्र कायदा—१९५२
१८.) स्त्री अश्लीलता प्रतिबंधक कायदा—१९८६.
१९.) छेडछाड प्रतिबंधक कायदा—१९७८.
२०.) मातृत्व लाभ कायदा—१९६१.
२१.) राष्ट्रीय महिला आयोग अधिनियम—१९९०.
२२.) प्रसवपूर्व लिंगनिदान तंत्र आणि दुरूपयोग प्रतिबंध कायदा—१९९४.
२३.) कौटुंबिक हिंसाचारापासून स्त्रियांचे संरक्षण कायदा—२००५.

असे अनेक कायदे बनवले आहेत, ज्यामुळे महिलांना संरक्षणाबरोबरच निर्भयतेने जीवन जगण्याच्या परीस्थितीत उत्तरोत्तर सुधारणा होत आहे.

निष्कर्ष व उपाययोजना :—

१.युनोने १० डिसेंबर १९४८ मध्ये मानवी अधिकारांना मान्यता दिली. त्यामुळे हा दिवस संपूर्ण जगभरातील विविध देशात **''मानवी हक्क''** दिन म्हणुन पाळला जातो.

२.मानवी अधिकाराचे संवर्धन करीत असतांना दुसऱ्याच्या अधिकाराचे उल्लंघन न करणारा मानव समाज निर्माण व्हावा उदा. जगा आणि जगू दया या विचारसरणीवर आधारित समाज निर्माण होणे गरजेचे आहे.

३.महिलाना शिाक्षणाच्या जास्तीत जास्त सोई— सुविधा उपलब्ध करून देवून त्यांना उच्चशिक्षित बनवून त्यांच्या राहणीमान व जिवनमानाचा दर्जा उंचावण्यासाठी खऱ्या अर्थाने सर्व स्तरातून प्रयत्न होणे गरजेचे आहे.

४.महिलांना आजही या ना त्या कारणाने दुय्यम वागणुक दिली जाते त्यामुळे ही मानसिकता बदलून महिलांना चांगली, विवेकपूर्ण वागणूक देण्याची संस्कृती विकसित केली पाहिजे. महिलांकडे पाहण्याचा दृष्टीकोन सकारात्मक केला पाहिजे., मुली तोकडे कपडे घालते, जिन्स पॅन्ट घालते. म्हणून तिच्यावर अत्याचार होतात ही मानसिकता बदलवणे गरजेचे आहे.

५.महिलांना राजकारणात, शासकीय नोकऱ्यात आरक्षण देवून धोरणे ठरविणे, निर्णय घेणे या प्रक्रियेत सामावून घ्यायला हवे. जोपर्यत महिला स्वत: धोरणे ठरवित नाहित, निर्णय घेत नाहीत तोपर्यंत त्यांना पुरूषाच्या निर्णयावर अवलंबून रहावे लागेल. त्यामुळे ते स्वत: धोरण निर्माते झाले पाहीजेत.

६.महिलांवरील शोषन व अत्याचार थांबविण्यासाठी बरेचशे कायदे अस्तित्वात आहेत. पण ते फक्त कायदे न राहता त्या सर्व कायदयाची कठोरपणे प्रत्यक्षात अमलबंजावणी झाली पाहिजे. महिलांना त्वरीतपणे न्याय मिळाला पाहिजे.

७.समाजात प्रचलित असलेल्या अनेक वाईट चालिरीतीवर प्रतिबंध घालून अंधश्रदा निमुर्लनाचा कार्यक्रम प्रभावीरितीने राबविण्याची आवश्यकता आहे. जखमेवर औषध लावण्यापेक्षा जखम होवू नये म्हणून काळजी घेततेली बरे.

८.धर्मभेद, जातीभेद, पाळणारे, धर्माधता वाढविणारे, स्वार्थासाठी, सत्ताप्राप्तीसाठी नको ते मुद्दे उकरून काढून धार्मिक सलोखा बिघडवणारे यांच्यावर कडक कार्यवाही झाली पाहिजे. व नव्याने अनेक मानवी मूल्य समाजात रूजविणे गरजेचे आहे. प्रत्येकानेच स्वत:पासून मानवी हक्काची मनातून जपवणुक करावी. तरच मानवी हक्काचे खऱ्या अर्थाने जतन होवू शकते.

संपुर्ण जग नेटवर्किमुळे, इंटरनेटमुळे जवळ येत असले तरी माणूस मात्र माणसापासून दूर जात आहे ही वस्तुस्थिती आहे .माणूस भौतिक, चंगळवादी विकृतीच्या जाळयात अडकून बेगडी संस्कृतीचे ढोंग करीत आहे. अगदी सुशिक्षित समाज सुध्दा जात, धर्म, वंश, लिंग, प्रदेश, शिक्षण भाषा, प्रादेशिकता यांची आव्हाने उभी करून स्त्री — पुरूष चालीरिती रूढी, प्रथा, परंपरा, अमानवी, व्यवहाराची शिकवण घेत आहेत. आज एकविसाव्या शतकात मानवी हक्कांना अनन्यसाधारण महत्व प्राप्त झाले आहे. कारण आंतरराष्ट्रीय शांतता प्रस्थापित करण्याचा विधायक व सदनशीर मार्ग म्हणजे मानवी हक्क होय तसेच प्रत्येक राष्ट्राला, प्रत्येक नागरिकाला मानवी हक्काची जाणीव आणि जागृती होणे नितांत गरजेचे आहे.त्यासाठी प्रत्येक राष्ट्राने नागरिकांना मानवी हक्क जोपासण्यासाठी योग्य परीस्थिती निर्माण करून दिली पाहिजे. सामाजिक अन्याय निर्माण करणाऱ्या अनेक वाईट अमानवी प्रथा परंपरा नष्ट करणे आवश्यक आहे. यासाठी समाजपरिवर्तन घडुन आले पाहिजे लोकांच्या वृत्तीमध्ये बदल घडवुन आला पाहिजे यासाठी म्हणुन मग मानवी हक्काच्या जाहीर नाम्याचा विशेष उपयोग करून सामाजिक न्याय प्रस्थापित करता येऊ शकतो.

संदर्भ सूची :-

(१) डॉ.व्ही.एम. पेशवे,मानवाधिकाराची अर्थ व व्याप्ती, य.च.मु.वि.नाशिक प्रथम आवृती२०१०.
(२) पाटील प्रा. व्ही.बी. : मानवी हक्क, के.सागर प्रकाशन, पुणे आवृत्ती २०१४
(३) कांबळे ,उद्धव,मानवी हक्क आणि दिशाभूल,साकेत प्रकशन औरंगाबाद. २००७
(४) रंजन कोळंबे,मानवसंसाधन विकास आणि मानवधिकार,भगीरथ प्रकाशन पुणे.
(५) मानवी हक्क, युनिक ॲकडमी पुणे,
(६) चव्हाण प्रा.अभिषेक, लेख.मानवाच्या सर्वागीन विकासासाठी मानवी अधिकाराचे महत्व, अल्फा पब्लिकेशन: नांदेड. वर्ष २०११.
(७) रा.ज.लोटे, भारतीय घटनात्मक तरतुदी, पिंळापूरे ॲन्ड कं. पब्लिशर्स, नागपूर.

मानवाधिकार आणि महिला

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बाबासाहेब देशमुख पारवेकर महाविद्यालय पारवा,ता. घाटंजी जि. यवतमाळ
मो. नं. ९९२२३७८८७४

प्रस्तावना :

दुसरे महायुध्द संपल्यानंतर मानवी अधिकाराची संकल्पना ही मुळ धरु लागली. फ्रेंच राज्य क्रांतीने स्वातंत्र, समता, बंधुता, आणि लोकशाही या तत्वांच्या विकासासाठी आवश्यक विचारांची तत्वे पुरवली, व पुढे रशियन क्रांतीने अधिक व्यापक झाले. तर दुसऱ्या महायुध्दानंतर स्वातंत्र, समता, आणि बंधुता या मुल्यावर आधारीत लोकशाही शासन प्रणाली बहूतांश राष्ट्रांनी स्विकारली. १२१५ मध्ये मॅग्नाचार्टा, १६२८ मध्ये बिल ऑफ राईट्स, १९८९ मध्ये पिटीशन ऑफ राईट्स, १७९१ मध्ये बिल ऑफ राईट्स अमेरिका, युनिव्हर्सल डिक्लेरेशन ऑफ हुमन राईट्स, १९५० मध्ये भारतीय संवीधानातील मुलभूत हक्क कारण भारतात प्राचीन काळात मध्ययुगात, हुकूमशाही, राजेशाही, आणि साम्राज्यशाही, अल्पजनशाही, इत्यादी प्रकार प्रामुख्याने अस्तित्वात होते. अपवादात्मक सामाजिक घटक वगळता बऱ्याच लोकांना कोणत्याही प्रकारचे अधिकारी प्राप्त झाले नव्हते.

१९५३ मध्ये सिव्हील ॲण्ड पॉलीटीकल राईटस्, थॉमस पेनचा मानवी हक्काचा जाहीरनामा संदर्भातील ग्रंथ अशा पध्दतीने मानवी हक्काचा संकल्पनेचा उदय व विकास झाला. युनोने सुध्दा मानवी अधिकाराची संकल्पना उचलून धरली आणि जगातील सर्वच राष्ट्रात ती रुजावी म्हणून मोठया प्रमाणावर प्रयत्न करीत असल्याचे दिसून येते. आजचे युग किंवा एकविसावे शतक जसे वैज्ञानिक युग समजले जाते त्याच प्रमाणे स्त्रिचे युग समजले जाते. स्त्रियांना त्यांच्या मध्ये असलेले कर्तबगारी प्रगट करण्याचे हे शतक आहे. महाराष्ट्र शासनाने पंचायत राज व्यवस्थेमध्ये २०११ मध्ये महीलांना ५० टक्के आरक्षण देउन पुरूषांच्या बरोबरीचे स्थान मिळूण दिले. या विचाराने प्रभावीत होउन केंद्र शासनाने राज्यघटनेत ११० वी घटना दुरूस्ती करून संपूर्ण भारतात महिलांना ५० टक्के आरक्षण पंचायत राज व्यवस्थेमध्ये मिळवूण देण्याचा प्रयत्न चालू केला. हे महिलांच्या सक्षमीकरणाच्या दृष्टीने एक महत्वाचे पाउल उचलले गेले. परंतू हे सर्व प्राप्त करण्याकरिता महिलांना बराच वेळ लागलेला आहे. या संदर्भात जगातील विविध राष्टांनी महिलांना अधिकार मिळून देण्याकरिता जे प्रयत्न केले त्याचा आढावा या ठिकाणी घेतलेला आहे.जगातील महिलांना मुख्या प्रवाहामध्ये आणण्याकरिता जे काही प्रयत्न केले गेले तरिही स्त्रियांना अधिकार प्रदान करण्यामध्ये बराच कालावधी लागलेला आहे. असे असले तरी स्त्रियांच्या सामाजीक, राजकीय, आर्थिक व्यवस्थेमध्ये झपाटयाने बदल होत आहे. किंवा महिलांमध्ये जागृती निर्माण होत आहे. हा एकंदरीत बदलाचा कालखंड चारशे वर्षाचा मानला जातो. आणि एकविसावे शतक स्त्रियाच्या उथ्थानांचे युग म्हणून समजले जाते.

जागतीक महीलांचे राजकीय हक्क :

जागतीक स्तरावर संपूर्ण राष्ट्रातील महिलांसाठी राजकीय हक्क पुरूषांच्या बरोबरीने प्राप्त करुन देण्यासाठी फार मोठया प्रमाणत प्रयत्न केले गेले. ११ डिसेंबर, १९४६ रोजी पारीत केलेल्या आपल्या ठरावामध्ये संयुक्त राष्ट्रांच्या महासभेने याची नोंद केलेली आहे. की काही विशिष्ट सभासद राष्ट्रांनी महीलांना त्यांचे समान हक्क प्रदान केलेले नाहीत. म्हणूनच संयुक्त राष्ट्रसंघाने त्यानंतर त्या विशिष्ट सभासद राष्ट्रांना ताकीद दिली की, संयुक्त.राष्ट्रांसंघाच्या मसुद्यामध्ये नमूद केलेल्या तरतुदींशी साधर्म्य असणारे सर्व राजकीय हक्क त्या त्या राष्ट्रातील पुरूषांप्रमाणे महिलांनाही देण्यात यावेत. तेव्हापासून महिलांच्या समान राजकीय आधिकारांचा प्रश्न आंतरराष्ट्रीय स्तरावर खालील तीन मुख्य आचारसंहिता व जाहीरनाम्यानूसार हाताळण्यात आला.

१. महिलांच्या राजकीय हक्कांची आचारसंहिता, ही २० डिसेंबर, १९५२ रोजी महासभेद्वारे स्वीकृत करण्यात
आली व ७ जुलै, १९५४ पासून अंमलात आणण्यात आली.

२.महिलांविरोधी भेदभाव निर्मुलन वरील जाहीरनामा, जो महासभेने ४ नोव्हेंबर १९६७ रोजी मांडला तो स्वीकृत करण्यात आला.
३.महिलांविरोधी सर्व प्रकारच्या भेदभावांच्या निर्मुलनाची आचारसंहिता १८ डिसेंबर १९७९ रोजी महासभेने स्वीकृत केली व ३ सप्टेंबर १९८१ पासून अंमलात आणली.

भारतातील महिला आणि मानवधिकार :

भारतातील महीला सक्षमीकरणात मानव आधिकाराच्या संदर्भात भारतामध्येही मोठा संघर्ष करावा लागला. प्राचीन काळात अस्तित्वात असलेली सती प्रथा, पडदा पध्दती, हुंडा पध्दती, रुढीवादी समाज व परंपरा, स्त्रियांना दुय्यम स्थान हे या देशामध्ये प्राचीन काळापासून चालत आलेले होते. त्याकरीता भारतीय संविधानात स्त्रियांच्या सशक्ती करणाकरिता विविध संविधानीक कलमे खर्ची पडली व तसेच विविध कायदे या देशामध्ये करण्यात आले. ते पुढीलप्रमाणे.
१.७३ वी व ७४ व्या संविधान दुरुस्तीने महिलांना पंचायत राज व्यवस्थेमध्ये ३३ टक्के आरक्षण स्त्रियांना मिळाले आहे.
२.११० व्या संविधान दुरुस्तीने २०११मध्ये महीलांना ५० टक्के आरक्षण पंचायत राज मध्ये मिळाले आहे.
३.बालविवाह विरोधी कायदा १९७६
४.हुंडा विरोधी कायदा १९६१, १९८६
५.सती प्रथा विरोधी कायदा १९८७
६.प्रसुती पुर्व निदान कायदा १९९४
अशा या भारतातील केंद्र शासनाने स्त्रियांना संरक्षण मिळून देण्यासाठी व त्यांचे अधिकार प्राप्त करुन देण्यासाठी फार मोठया प्रमाणात प्रयत्न केले गेले.

सारांश :

एकंदरीत प्रस्तूत शोध निबंधातील वरील विवेचनावरून आंतरराष्ट्रीय स्तरावर महिलांचे अगदी प्राचीन कालखंडापासून त्याचे हिरावून घेतलेल अधिकार, समाजातील दुय्यम स्थान व तसेच त्यांचे सामाजीक, राजकीय, आर्थीक या बाबतीत झालेली अधोगती थांबवून त्यांच्या सर्वांगीन विकासात सुधारणा करण्याकरीता संयुक्त राष्ट्रा तर्फे मानवतावादी दृष्टीकोनातून फार मोठया प्रमाणात प्रयत्न केले असल्याचे दिसून येते. भारतातही प्राचीन कालखंडापासून स्त्रियांच्या दर्जा खालवलेला असल्यामुळे त्यांच्या दर्जात सुधारणा घडवून आणण्यासाठी किंवा त्यांना पुरूषांच्या बरोबरीने समान अधिकार प्राप्त करुन देण्यासाठी घटनात्मक व कायदेशीर तरतूदी करण्यात आल्या आहेत. असे आपणाला म्हणता येईल.

संदभ्र ग्रंथ सूची :

१.आंतराष्टीय संबंध — डॉ. वसंत रायपूरकर
२.आंतराष्टीय संबंध — डॉ. शैलेद्र देवळणकर
३.आंतराष्टीय संबंध — डॉ. शा. क्र. भोगले
४.समकालीन राजकारण — डॉ. शैलेद्र देवळणकर
५.भारत के मानवधिकार — चतूर्वेदी अय्यर लोढा संजय
६.भारताचे संविधान

बालकांच्या भाषा विकासात आईची भूमिका

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भाषा मानवी जीवनाचा पाया आहे. मानवी जीवनातील पहिले तीन वर्ष भाषा संपादनाचा पाया मानला जातो. सुरवातीच्या या तीन वर्षात बालकावर होणाऱ्या भाषिक संस्कारांवर बालकांचा विकास अवलंबुन असतो. मुलं जन्माला आल्यानंतर आई मोठाली स्वप्न बघून बाळाचं प्रगतीपुस्तक आधीच ठरवुन टाकतात, पण या स्वप्नातल्या प्रगतीपुस्तकापेक्षाही बाळाचं भाषा संपादन महत्वाचं असतं. सर्व प्राणीमात्रांमध्ये केवळ मानवजातीसच भाषेचे वरदान मिळालेले आहे. मुलांच्या भाषेचा संबंध त्याच्या बौध्दिक, शारीरिक आणि मानसिक विकासाशी असल्यानं मुलांचं भाषा संपादन हा गांभीर्यानं घेण्याचा विषय आहे किंबहुना मुलांच्या भाषा विकासात आईची भूमिका महत्वपुर्ण ठरते. मानवी जीवनात भाषेचे अनन्यसाधारण महत्व आहे. व्यक्तिस संभाषण कौशल्य असणे ही तर काळाची गरज झाली आहे. भाषा ही शाब्दिक (Verbal) असो की अशाब्दिक (Nonverbal), लिखित असो की आलिखित, व्यक्तिचे भाषेवर प्रभुत्व असणे आवश्यक झाले आहे.

बाळाचे पहिले तीन वर्ष गर्भधारणेपासुन मोजले जातात. बाळ गर्भात असल्यापासूनच ही भाषिक संपादनाची प्रक्रिया सूरू होते. आईने गर्भसंस्काराचे तंत्र आणि मंत्र जाणुन घ्यायला हवे. गर्भावस्थेतच चार महिन्यापासुन बाळाला ऐकु येते, त्याला समजते, याविषयी अनेक पुरावे उपलब्ध आहे. चार महिन्यानंतर बाळाची कर्णेंद्रिये कार्यरत होऊ लागतात. त्याचे ज्ञानेंद्रिय विकसित होतात. सहा महिन्यानंतर आईने बोललेल त्याला समजते व बाळ हुंकारतेही फक्त ते आपल्याला ऐकु येत नाही. अथनी कॅप्सर मनोवैज्ञानिकांच्या संशोधनात असे दिसते की, बाहेरचे सर्व ध्वनी लहरीपर्यंत पोहचतात. आईचा आवाज आणि दुसऱ्या एखादया बाईचा आवाज यातला फरकही बाळाला जाणवतो. ज्या गोष्टी आई बाळाला गर्भावस्थेत असतांना सांगते त्या बाळाला ऐकायला फार आवडतात. असा अनुभव डॉक्टर कॅस्पर यांना आला. डॉ रीने व्हॅन्डे कोरे जे स्त्रीरोग चिकित्सक आहेत त्यांनी गर्माला निरनिराळे संदेश देऊन अनेक हालचाली शिकविल्या. हात जवळ आण, पाय जवळ आण असे स्पर्ष करून तोंडाने संदेश दिल्यावर बाळाने ते संदेश तंतोतंत पाळले. याचाच अर्थ बाळाला संवेदना होत्या व त्याने त्या व्यक्तही केल्या. अनेक प्रयोगाद्वारे हे सिद्ध झाले आहे, की गर्भाला ऐकु येते आणि म्हणुन निरनिराळ्या संस्थांमधून हे प्रयोग सुरू झाले. गर्भाशी संवाद साधण्याचे तंत्र आईने अवगत करावे. मातेचा स्पर्ष, तिने दिलेली शाबासकिची थाप त्याला फार भावते. त्याचा चेहरा कधी प्रसन्न असतो तर कधी तो नाराज दिसतो. हे सगळे विज्ञानाने सिद्ध झाल्यामुळे गर्भावर योग्य संस्कार करता येतात हे सिंध्द झाले आहे.

माणसाच्या मेंदुत भाषा शिकविण्याचे अनेक न्युरॉन्स असतात. बाळ जन्माला आल्यानंतर दोन न्यूरॉन्समधील पोकळी ही भावनात्मक आधारे भरून काढली जाते. असा प्रतिसाद भाषेच्या आधारे साधुन दोन न्युरॉन्समधील विवीध बंध तयार होऊन मेंदुत त्याचं नाव निर्माण होतं. आणि मेंदुचा विकास होण्यास मदत होते. भाषेद्वारे आपण जे बाळाला देतो त्यावर बाळाचा विकास अवलंबुन असतो.

द अर्बन चाईल्ड इन्स्टिट्युटच्या अहवालानुसार मानवाच्या संपूर्ण जीवनात जो मेंदूचा विकास होणार असतो न्यातील 80% मेंदूचा विकास पहिल्या तीन ते चार वर्षात पूर्ण होत असतो. त्याकरीता पालकांनी विशेषत: आईने प्रोत्साहन देणे गरजेचे आहे. बाळाच्या मेंदूचा हा विकास बाळ करत असलेल्या भाषिक अनुकरणावर, भाषा स्विकारण्याच्या प्रयत्नांवर आणि पालकांनी दिलेल्या प्रोत्साहनावर अवलंबून असतो.

बालक प्रत्यक्ष भाषा बोलण्याम शिकण्यापूर्वी स्वत:च्या गरजांची पुर्तता करण्याच्या दृष्टीने ज्या कृतिचा आधार घेतात त्या पुढीलप्रमाणे.

❖ **रडणे :** जन्माला आल्यावर सर्वप्रथम जो ध्वनी बालकाच्या मुखातून प्रगट होतो त्याला रडणे असे म्हणतात. बालक विवीध कारणानी रडते जसे दुख:दायक भावना प्रकट करण्यासाठी, भुक

लागली आहे हे दर्शविण्यासाठी, शारीरिक त्रासामुळे, आजुबाजुची प्रतिकूल परिस्थिती, अंथरून ओले असणे, गर्मी होणे, थंडी वाजणे, झोपमोड होणे इ.

❖ **हुंकार व बडबड :—** जन्मलेल्या बाळाचा भाषासंपादनाचा महत्वाचा टप्पा म्हणजे 'कुईंग' चा असुन हा ०ते ६ महिन्यांचा असतो. या टप्प्यात बाळ फक्त सुट्या स्वरांची निर्मीती करतं पहिल्या तीन महिन्यात आईने बाळाकडे बघुन स्मितहास्य करणं, बाळाच्या डोळ्यात पाहणं आणि बाळाशी हळुवारपणे बोलणं अपेक्षित असतं, हुंकारामधुन काही विशिष्ट स्वरांची जाणीव होते. उदा. अऽऽ हऽऽ इ. यापुढची पायरी बडबड करणे 'बॅबलिंग' होय. यामध्ये ध्वनीची स्पष्टता दिसुन येते. सात आठ महिन्यापर्यंत विशिष्ट अक्षराचा उच्चार चालू असतो. या टप्प्यात बाळ आपल्या आईचा आवाज स्पष्टपणे ओळखू लागतं. या टप्प्यातया नात्याने आपण बाळाशी वस्तुनिर्देशन करून बोलणं अपेक्षित असतं. या क्रियेमुळे बाळाचे स्वरयंत्र पक्के होऊ लागते.

❖ **एका शब्दाच वाक्य :—** तिसऱ्या टप्प्यात एक शब्द असलेल्या वाक्याची बाळ निर्मीती करतं उदा. मला पाणी हवं असल्यास तो म्हणेल 'मममम'. या टप्प्यासाठी लागणारा कालावधी हा ९ ते १८ महिन्यांचा आहे.

❖ **दोन शब्दांच वाक्य—** चौथा टप्पा हा दोन शब्दांचा असुन याला लागणारा कालावधी हा १८ ते २४ महिन्यांचा असतो. यात दोन शब्दाच वाक्य बाळ तयार करू लागत. उदा बाबा कुठे गेले हे वाक्य 'बाबा कुठे' अशी रचना बाळ करायला लागतो.

❖ **पूर्ण वाक्य तयार करणे :—** पाचवा टप्पा हा 'टेलिग्राफिक स्टेज' चा असुन याचा कालावधी २४ ते ३० महिन्याचा असतो. या टप्प्यात बाळ संपूर्ण वाक्याच्या निर्मातीचा प्रयत्न आपल्या बोलण्यातुन करतो.

❖ **मुलांची शब्दकोश निर्मीती:—** सहावा टप्पा 'मल्टीवर्ड स्टेज' चा असुन याचा कालावधी हा ३० महिन्यापेक्षा अधिक असतो. या वयात बाळ स्वत:च शब्दकोश तयार करायला सुरवात करतं, टाटा, बायबाय, थँक्यू इ. छोटे शब्द बालक शिकते.

भाषा शिकविण्याच्या पध्दती बालकांमध्ये रुजवितांना आईची भूमिका

❖ **अनुकरण—** शारीरिक पातळीवर परिपक्व झाल्यानंतर बालकास प्रौढांचे अनुकरण करणे जमते व त्याचा उपयोग करून शव्द व वाक्य बोलू लागतो. त्याकरीता आईने त्याची एकाग्रतेने ऐकण्याची क्षमता विकसित करावी

❖ **प्रयास व सराव :—** बालक अनुकरणाने विशेषत: आईचे अनुकरण करून शब्दाचा उच्चार करण्यासाठी प्रयास करावा लागतो एकदाच प्रयास करून भागत नाही. तर पुन: पुन: त्याची पुनरावृत्ती केल्यावर त्यास शब्दोच्चाराचा सराव होतो.

❖ **प्रोत्साहन व प्रेरणा:—** बालक भाषेचा उपयोग करू लागल्यावर त्याला प्रोत्साहन दिल्यास, कौतुक केल्यास भाषा आत्मसात करण्यासाठी तो प्रेरीत होते.

❖ **सहसंबंध—** एखादा शब्द शिकत असतांना आईने त्या वस्तुचे चित्र प्रतिकृती किंवा प्रत्यक्ष तस्तु दाखवून शब्दाचा उच्चार केल्यास बालकांस लवकर आकलन होऊन शब्दांचा उच्चार करू लागते. मम्मा, आई, दादा हे शब्द त्याच्यासमोर पुन्हापुन्हा उच्चारल्यास या संबोधनाचा संबंध समोर उभ्या असलेल्या व्यक्तिशी आहे हे त्याला कळते. भाषातज्ञांनी भाषेचा, सामाजिक पर्यावरणाचा विचार मांडला आहे. त्यांच्या मते व्यक्तिच्या सभोवतालचं सामाजिक वातावरण, पर्यावरण हे देखील त्याच्या भाषेवर प्रभाव टाकणारं ठरतं. उदा. एखाद भारतीय कुटुंबातील मुल अमेरिकन संस्कृतीमध्ये वाढलं तर त्याच्यावर होणारे भाषिक संस्कार अमेरिकन भाषेचे होते. म्हणजेच बाळाच्या सभोवतालची भाषा ही त्याच्या भाषिक संपादनावर प्रभाव टाकणारी ठरते बाळासाठी आईने व पालकांनी भाषिक वातावरण निर्माण करून देणं म्हणून गरजेचं आहे.

बालकांच्या भाषा विकासा करीता आईने पुढील गोष्टींवर भर देण्याची आवश्यकता आहे.

बालकांच्या भाषा विकासाकरिता त्यांना जास्तीत जास्त शब्द आवाज ऐकण्याची संधी मिळवयास हवी. आईने बालकांच्या ऐकण्याचा व भाषेचा परस्पर संबंध असल्यामुळे त्यांचे ऐकण्याचे कौशल्य विकसित होण्यासाठी त्याच्यासोबत सतत बोलत रहावे. तसेच त्यांना वारंवार बोलण्यासाठी प्रेरित करावे.

बालकांसोबत संवाद साधतांना आईने पुढील बाबींकडे लक्ष देणे गरजेचे आहे.

❖ सोपे शब्द वापरावे ❖ बोलण्याचा वेग कमी असावा ❖ वाक्य लहान असावे ❖ स्पष्ट शब्दोच्चार असावा ❖ चेहऱ्यावर अचूक हावभाव असावे. ❖ आवाजात चढउतार असावा ❖ बोबडे बोल कटाक्षाने टाळावे. ❖ बालकाच्या नजरेस नजर भिडवून बोलावे. ❖ योग्य देहबोली असावी. ❖ ठरावीक शब्दांसाठी प्रतिशब्द पापा, झोपेस नि.नी इ.

बालकांचा भाषाविकास होण्यासाठी बालपणापासुनच त्यांना गोष्टी सांगुन, रेकॉर्डींग ऐकुण, चित्रांची आकर्षक पुस्तके दाखवून सभोवतालच्या गोष्टींची वाहने, पक्षी, प्राणी, फुले झाडांची नावे सांगुन बालगीते ऐकवून तसेच बालकास इतरांमध्ये मिसळण्यास संधी देऊन त्यांचा भाषाविकास साधता येतो. घराजवर मंदीर किंवा बगीचा असल्यास फिरायला नेणे.

बालकांचा भाषाविकास होण्यासाठी बालपणासुनच बालकांमध्ये अवधान असन्याची आवश्यकता असते. त्यासाठी बाळाच्या पाळण्यावर मंजूळ भावाज करणारी खेळणी, चिमणी, खेळणी लटकविने कोडी, संगणक, व्हिडीयो गेम्स, चित्रमय पुस्तके तसेच त्यांना सृजनात्मक कार्य म्हणजेच चित्रकाम, रंगकाम क्लेपासून विविध आकार तयार करणे इ. गोष्टींमध्ये रममान ठेवल्याने बालकांचे अवधान वाढण्यास मदत होते.

बालक थोडे मोठे झाल्यावर समवयीन मित्र, मैत्रीणीत, शेजारी इ.मध्ये मिसळायला लावावे. तेव्हा साहजिकच त्यांच्या भाषेचा प्रभाव बालकांच्या भाषेवर पडतो. त्यामुळे बालकास शक्यतो चांगली भाषा असणाऱ्या व्यक्तिच्या सहवासात ठेवावे. उन्हाळ्यात विवीध शिबीरांमध्ये त्यांना सहभागी करणे. याशिवाय लहानपनापासूनच बालकास वाचनाची गोडी लावणे, शालेय पुस्तकं खरेदी करणे, वक्तृत्व व वादविवाद स्पर्धेमध्ये भाग घ्यायला सांगणे, व्यासपिठावर भाषण देण्याकरीता सहकार्य करणे इत्यादी आईच्या प्रयत्नामुळे बालकांच्या भाषा विकासात भर पडते.

भाषा विकासावर परिणाम करणारे घटक :—

बालकांच्या भाषा विकासावर परिणाम करणाऱ्या घटकांची माहिती आईला असणे गरजेचे आहे.

१) परिपक्वता :— स्वरयंत्र, ओठ, जीभ, पडजीभ याशिवाय फुफुसांची क्षमता मेंदुमधील वाणी केंद्र याचे परिपक्वन झाल्याशिवाय भाषाविकास होऊ शकत नाही,

२) प्रशिक्षण व संधी :— अपेक्षित परिपक्वता प्राप्त झाल्यावर बालकास प्रशिक्षण व मार्गदर्शनाची गरज असते. इतर व्यक्ती बालकाशी सुरवातीपासूनच जेवढे जास्त बोलतील तेवढ्या प्रमाणात त्याला भाषेचा परिचय होऊ लागतो, 'स्टेअर' यांच्या मते अनुकरणाने बालक भाषा शिकते, म्हणुनच उच्चाराशिवाय त्याला प्रशिक्षण दिले पाहिजे.

३) बुध्दिमत्ता:— कुशाग्र, तीव्र बुध्दिमत्तेचा बालकांचा भाषा विकास इतरांपेक्षा अधिक चांगला होतो. अशा मुलांचा शब्दसंग्रह अधिक चांगला होतो, त्यांची वाक्यरचना व शब्दांचे उच्चार चांगले असतात. जरसिल्ड यांच्या मते बुध्दिमत्ता व भाषाविकासाचा निकटचा संबंध आहे.

४) कुटुंबातील वातावरण :— शिशु अवस्थेत व पूर्ण बाल्यावस्थेत मुले कुटुंबामध्ये अधिक प्रमाणात व्यतित करतात. कुटुंबात मानसिक ताण नसेल तर बालक उत्स्फूर्तपणे बोलतात.

भाषा विकासातील अडथळे, जन्मजात व तात्कालिक शारीरिक दोष व आनुवंशिकता, संधी व प्रशिक्षणाचा अभाव, चुकीचा आदर्श, मानसिक ताणतणाव दूर करण्यासाठी पालकांनी जागरूकतेने प्रयत्न करावेत बालकाच्या मनावर ताण न घेता ती आनंदी राहील असे वातावरण प्रदान करावे. त्यांच्या आरोग्याची काळजी घेणे, प्रोत्साहन देणे, संधी उपलब्ध करून देणे, सुयोग्य आदर्श प्रस्थापित करणे इत्यादी उपायांनी भाषा विकासास गती मिळते.

❖ संदर्भ सूची :—

१.प्रियंवदा लाटकर — मातृकला बालविकास व बालशिक्षण विद्या बुक्स पब्लिशर्स, औरंगाबाद.
२.डॉ.मालती कारवारकर — वंशवेल, मेनका प्रकाशन.
३.डॉ बालाजी तांबे — फॅमिली डॉक्टर, सकाळ पेपर्स लिमिटेड.

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अभिजीत झाडे

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प्रस्तावना :—

मराठी साहित्याच्या उदयापासून त्यामध्ये अनेक स्थित्यंतरे झालेली आहेत. त्याचे विविध संदर्भ साहित्यात प्रतिबिंबित होत असतात. या साहित्यातील दैववादाला फाटा देऊन साठोत्तरी कालखंडात निर्माण झालेले एक प्रभावशाली साहित्य म्हणून दलित साहित्याला ओळखले जाते. दलित साहित्याने विशिष्ट उद्देशपूर्ती म्हणून आपला प्रभाव लेखन परंपरेत निर्माण केलेला नाही. तर तो दलितांच्या एकूण जगण्याच्या विवंचनेचा शाब्दिक प्रस्फोट आहे. त्यामुळे दलित साहित्याची दखल इथल्या परंपरावादी मराठी साहित्य संपदेला घ्यावीच लागली.

पारंपरिक मराठी साहित्याच्या निर्मितीमध्ये ललित, गद्य, पद्य, कथा, कादंबरी या साहित्य प्रवाहाचा लेखन विषय बहुतांशी व्यक्तीगत कलाकृतीचा प्रभाव निर्माण करणे, आणि रंजनवास हा आहे. त्यामधील ग्रामीण साहित्यभाव ग्रामीण जीवनाची वाताहत शेतकरी व शेतमजुराचे प्रश्न अशा आशयाचे लेखन करताना दिसून येते. याशिवाय वास्तव जीवनाचे रेखाटन आपल्या धारदार शब्दशैलीने करणारे साहित्य म्हणजे दलित साहित्य होय. ज्याच्या लेखनाची जाणीवच मुळात विषमतावादी व्यवस्थेने झिडकारलेल्या वंचिताविषयीची आहे. त्यामुळे या साहित्याने आपला प्रभाव एकूण मराठी साहित्य संपदेवर निर्माण केलेला आहे.

दलित साहित्याचा विषय, आशय आणि त्याचे स्वरूप हे निश्चितच परंपरावादी साहित्यापेक्षा निराळे आहे, त्याच्या निराळेपणामध्ये या देशातील, दलित, अर्थात समस्त, वंचित पीडित रंजल्या— गांजल्या माणसाच्या जीवनाचे वास्तव व्यथा मांडणारे हे साहित्य आहे. दलित साहित्याचा विषयच मुळात मानवकेंद्री आहे. हा तो माणूस ज्याला या देशातील व्यवस्था माणूसपणाची वागणूक देत नाही. त्याचे माणूसपणाचे सर्व रस्ते गुलामीच्या बेडीत बंदिस्त केलेले आहे. या माणसाचा आक्रोश दलित साहित्यात अत्यंत निखालसपणे प्रथमतरूकवितेच्या रूपाने शब्दांकित झालेला आहे.

दलित साहित्यामधील कवितेच्या प्रांतात साठोत्तरी कालखंडात उदयास आलेली दलित कविची पहिली पिढी ज्यामध्ये नामदेव ढसाळ, दया पवार, केशव मेश्राम, त्र्यंबक सपकाळे, ज. वि. पवार, उमाकांत रणधीर, यशवंत मनोहर, भुजंग मेश्राम, प्रल्हाद चेंदवणकर या पहिल्या पिढीतील दलित कवींनी अत्यंत जोमाने व्यवस्थेविषयीची चिड आणि दलितांचे जीवन वास्तव त्यांच्या कवितेच्या माध्यमातून आपल्या स्वतंत्र शब्दशैलीतून अत्यंत ताकदीने मांडणी केलेली आहे. याच पिढीतील दलित कविंच्या कवितेचा परिणाम समाज मनावर इतका प्रभावीपणे झाला की, त्यानंतरच्या पिढीतील दलित कवी पहिली पिढीतील कवींच्या क्रांतीकारी विचारातून प्रेरीत झाली आणि त्यामुळे दलित कवी लिहिते झाले.

या पहिल्या पिढीच्या अत्यंत दर्जेदार वास्तव शब्दशैलीचा प्रभाव सबंध समाजमनावर पडलेला आहे. त्यातील महत्त्वपूर्ण कविच्या कवितेचा प्रभाव नव्वदोत्तर कालखंडातील दमदार दलित कवी लोकनाथ यशवंत यांच्याही मनरूपटलावर अनुभवांचे स्पंदने निर्माण करून गेलेला आहे. या निष्ठावलेल्या समाजवास्तवाचे भेदक शब्दांकन काळाशी गरूड झेप घेणारे कवी लोकनाथ यांच्या कवितेचा प्रारंभ त्यांच्या उद्रेक भावनेला शब्दरूपात निर्माण झालेला त्यांचा पहिला कवितासंग्रह श्आता होऊन जाऊ द्याश हा होय.

दलित कवितेचे स्वरूप :—

साहित्याच्या निर्मिती प्रक्रियेत कलावंताची प्रतिभा आणि कल्पनाशक्ती यांचे विशेष असे महत्त्वपूर्ण स्थान आहे. प्रतिभा ही कलावंताला लाभलेली वैचारिक, बौद्धिक पातळीवरील एक नेणीवेची प्रक्रिया आहे. ज्याच्या सहाय्याने कलावंताच्या लेखणीतून कलाकृती निर्माण होत असते. मात्र दलित साहित्याच्या संदर्भात हे सूत्र लागू पडणार नाही. कारण दलित साहित्य वास्तव

विश्वाच्या आधारे वास्तवाचे रूपांतर सहित्यकृतीत करते. त्यामुळे दलित साहित्याचे स्वरूप आणि प्रयोजन इतर साहित्यापेक्षा निश्चितच वेगळे आहे. म्हणून पारंपरिक मराठी साहित्यापेक्षा दलित साहित्याने वेगळी जाणीव स्वीकारलेली आहे.

दलित साहित्य हे जीवनवादी आहे. ते आवदाच्या पुढे जाऊन उद्‌बोधनाच्या हेतूने पुढे आले आहे. याबाबत ज्येष्ठ समीक्षक डॉ. महेंद्र भवरे म्हणतात की, ष्दलित साहित्याची निर्मिती ही हक्क मिळविण्यासाठी व समाज परिवर्तनासाठी झाली आहे.१

कविता ही भाषिक संरचनेचे संघटनात्मक स्वरूप असते. शब्द हे तिचे माध्यम आहे. शब्दाविषयी सुद्धा दलित कवितेची एक विशिष्ट भूमिका आहे. दलित कवितेच्या निर्मितीत बोलीभाषा, लोकभाषेचाही प्रभाव अत्यंत प्रकर्षाने आपणास जाणवतो. त्यामुळे या भाषेतील कविता रचनेमुळे कवितेचे स्वरूप अत्यंत समृद्ध आणि प्रभावी असे निर्माण होते. त्यामुळे भाषेमध्ये नवीन शब्दाची जडण—घडण होते. ष्भाषा हा घटक दलित कवितेच्या निर्मितीत आणि या कवितेच्या प्रतिभेच्या जडण—घडणीत अपरिहार्यपणे सहभागी झाला आहे.२

सामाजिक भान दलित कवितेचे प्राणभूत तत्त्व आहे. जीवनाशी निगडीत सामाजिक संकल्पना ह्या दलित कवितेतील शब्दसाधनेतून साकारलेल्या आहेत. दलित कविता ही समाजाचेच मनोगत असते. म्हणून दलित कवितेतील वेदना, विद्रोह, नकार स्वीकाराचे नितळ तत्त्वज्ञान हे सामाजिक भान या संकल्पनेतून निर्माण होते.

दलित कविता ही संघर्षसहीत समूहमनाची आंतरिक वेदना आहे. समूहाची वेदनाच कवी मनाला आपल्या वैचारिक अवकाशात अनिर्बंध संचार करायला भाग पाडते. कवी मन ही या अवकाशाचा एक भाग असल्यामुळे समूहाशी एकरूपता ही प्रक्रिया आपसूकच घडून येते. या प्रक्रियेमागेही आंबेडकरी जाणीव कार्यरत असते. म्हणून दलित कविची कविता काळाचा वेध घेणारी ठरते. कालपरत्वे जी सामाजिक विषमतेचे संदर्भ ही कविता दलित कवीच्या मन:पटलावर शब्दांची कारंजी निर्माण करून त्याचा आविष्कार कवितेच्या रूपाने प्रतिबिंबित होते.

दलित कवींची प्रतिभाशक्ती ही दैवी वगैरे नाही तर ती आंबेडकरी ज्ञानशक्तीने प्रभावित आहे.३ प्रतिभा ही जरी कलावंतांना नैसर्गिकरित्या लाभलेली असते. मात्र दलित कवीची प्रतिभा ही अंत:प्रेरणेची संवेदनक्षम काव्यस्फूर्ती आहे. दलित कवीची संवेदनशीलता ही प्रस्थापित धर्म, परंपरा आणि संस्कृती यांच्याकडून मिळालेल्या मूल्ये आणि श्रद्धांना नाकारून कार्यरत होते. ष्दलित कवीची संवेदनशीलता स्वनिषयक आणि सामाजिक संदर्भात अन्वय लावण्यासाठी सिद्ध होते.४

दलित साहित्य वैचारिक पार्श्वभूमी व चळवळ :—

समाजातील कोणतीही चळवळ ही समाजाच्या सर्व क्षेत्रावर बरा—वाईट व कमी—अधिक परिणाम करीत असते. साहित्याचे क्षेत्रही ह्यातून वगळता येत नाही. चळवळ आणि साहित्यनिर्मिती ह्यांचा परस्परसंबंध कोणत्या ना कोणत्या स्वरूपात असतोच. काही वेळा हा परस्परसंबंध खूपच जवळचा, अतुट असाही असतो. त्यामुळे दलित चळवळ आणि दलित साहित्य निर्मिती ह्याचा परस्परसंबंध असाच जवळचा आणि अतुट असा दिसून येतो.

भारतीय हिंदू समाजव्यवस्थेने मनुस्मृतीने घालून दिलेली जी चातुर्वर्ण्यव्यवस्था आहे, त्यामधील शेवटचा वर्ण म्हणजे शूद्र आहे. ब्राह्मण, क्षत्रिय, वैश्य ह्या तीन वर्णियांची सेवाचाकरी करणे. हा सर्व भाग शूद्र वर्णियाकडे देण्यात आला. ह्यातून एकूण व्यवस्थेतील परिवर्तनशीलता, लवचिकता हळूहळू संपुष्टात येत गेली. आणि दिवसेंदिवस ती अपरिवर्तनीय, ताठर होत गेली. स्वच्छतेची कामे करता—करता शूद्र वर्णीय अस्वच्छ होत गेले व ते अस्वच्छ आहेत म्हणून त्यांच्यापासून सवर्ण लोक दूर राहू लागले. त्यांना दूर ठेवू लागले. ह्यातूनच श्अस्पृश्यताश जन्माला आली.

शूद्रामधील सर्वात शेवटचा असलेला हा समाज अतिशूद्र म्हणून ओळखला जातो. त्यालाच अत्यंज, अंतवासी, बाह्य किंवा गावकुसाबाहेरील अशी पर्यायी बिरूदे आहेत. अस्पृश्यता हा हिंदू धर्मावरील कलंक आहे आणि तो धुऊन काढला पाहिजे. हा विचार एकोणविसाच्या शतकात उदयास आला. त्यासाठी दलितेतर समाजसेवकांनी हातभार लावला. मात्र त्यानंतर डॉ. बाबासाहेब आंबेडकर यांचे नेतृत्त्व लाभल्यामुळे खऱ्या अर्थाने दलित चळवळीला रंग—रूप—आकार प्राप्त झाला. दलित चळवळ विलक्षण गतिमान होत गेली.

डॉ. बाबासाहेब आंबेडकर यांच्या कार्याची सुरूवात अस्पृश्यामधील वेगवेगळ्या जातीचे ऐक्य साधण्यासाठी, त्यांची प्रगती करण्यासाठी २० जुलै १९२४ श्रोजी बहिष्कृत हितकारिणी सभाश ह्या संघटनेची स्थापना करण्यात आली. २० मार्च १९२७ रोजी महाड येथील चवदार तळ्याचा सत्याग्रह डॉ. बाबासाहेब आंबेडकरांच्या नेतृत्वाखाली दलित समाजाने सुरू केलेल्या अस्पृश्यताविरोधी लढ्याचे पहिले पाऊल होय. अर्थात हिच घटना दलित चळवळीच्या लढाऊपणाचा, आक्रम पावित्र्याचा प्रारंभ होय.५

दलित चळवळीला आरंभ झाला तो स्वातंत्र्यप्राप्तीसाठी लढण्याच्या काळात. ह्या स्वातंत्र्यप्राप्तीच्या चळवळीबरोबरच मुंबईसारख्या उद्योगधंद्यांच्या शहरामध्ये कामगार चळवळ सुरू झालेली होती. ह्या चळवळीला मार्क्सवाद महत्त्वाचा वाटत होता. दलित चळवळीला ह्या समकालीन असलेल्या दोन्हीही चळवळीचे महत्त्व वाटत होते. म्हणूनच दलित चळवळीला स्वातंत्र्य, समात, बंधुता व न्याय ही चतुरूसुत्री प्राणापलीकडे प्रिय वाटते. तिला बुद्ध, कबीर, मार्क्स, फुले, आंबेडकर ही परमदैवते आत्मीयतेचे वाटतात. मुळात दलित चळवळ ही प्रतिक्रियात्मक चळवळ आहे. तशी ती काही काळ राहणे अपरिहार्य होते.

महात्मा फुले यांना गुरूस्थानी मानून डॉ. बाबासाहेब आंबेडकरांनी अस्पृश्यतेविरूद्ध बंड सुरू केले. समतेचा लढा चालू केला. दलित समाजाला शिक्षण देऊन शहाणे केल्याशिवाय त्यांच्यात जागृती होणार नाही. त्याला स्वतरूच्या पायावर उभे केल्याशिवाय तो ताठ मानेने जगायला शिकणार नाही. यासाठी डॉ. बाबासाहेब आंबेडकरांनी व त्यांच्या अनुयायांनी मुंबई, नागपूर, औरंगाबाद, महाड इत्यादी ठिकाणी शाळा, महाविद्यालये स्थापन केली. ही शाळा, महाविद्यालये दलित तरूणांची जागृती केंद्रे, स्फूर्तिस्थाने बनत गेली.

शिक्षण घेत असताना दलित तरूण स्वतंत्रपणे विचार करू लागले. मराठी साहित्याचे वाचन करताना त्यांना मोठ्च प्रमाणात असमाधान वाटू लागले. त्यांना मराठी साहित्यातील दलित चित्रण एक तर अत्यल्प वाटू लागले. मराठी साहित्यातील दुरूख, वेदनेपेक्षा आपले दुरूख, वेदना ह्या कितीतरी पटीने अधिक आहे. वास्तव आहेत व त्याचे चित्रण आपण सहज करू शकतो. याच तिव्र संवेदनेतून साहित्य निर्मिती करणे, हा उत्तम व प्रभावी मार्ग आहे. असेही त्यांना वाटू लागले. अशा सर्व कारणांमुळे दलित साहित्याचा उदय झाला व त्यातूनच दलित साहित्य चळवळ अत्यंत जोमाने फोफावतच गेली. मराठी साहित्यामध्ये चळवळ आणि साहित्य यांचे अनुबंध मान्य करणारे चार साहित्य प्रवाह आहेत. त्यामध्ये दलित साहित्य, ग्रामीण साहित्य, स्त्रीवादी साहित्य, आणि मार्क्सवादी साहित्य इ. साहित्य प्रवाहाचा निर्देश करता येईल. यापैकी दलित साहित्य, ग्रामीण साहित्यप्रवाह मान्यताप्राप्त आहेत. तर स्त्रीवादी साहित्याची अजूनही सातत्याने नव्या पद्धतीने मांडणी केली जात आहे. मात्र मार्क्सवादी प्रवाह केवळ श्मार्क्सवादी साहित्य समीक्षाश व्यवहाराच्या निमित्तानेच अस्तित्त्वात आहे.

चळवळ ही प्रामुख्याने एका निश्चित साध्याकडे घेऊन जाणारी साधनभूत कृती आहे.६ साध्य आणि साधन यात एकवाक्यता असते; असे जर नसेल तर चळवळ अपयशी ठरण्याचीच अधिक शक्यता असते. चळवळ ही विशिष्ट तत्वज्ञान, विचार अथवा भूमिका कृतीमध्ये उतरविण्यासाठी केलेली कृती असते.७ चंचल अथवा अस्थिर मनावर संस्कार करून त्याला निश्चित दृष्टीदेण्याची व त्या दृष्टीला सार्वत्रिक मान्यता देण्याची प्रक्रिया चळवळीत ग्राह्य धरलेली असते. त्यामुळे चळवळी मागील तात्विक अधिष्ठान ज्या स्वरूपाचे असेल, त्या प्रकारचे संस्कार व्यक्ती आणि समाजमनावर होत असतात.

ज्या तत्त्वज्ञानाच्या मुळाशी मानवी मूल्य आणि भौतिकवादी दृष्टिकोणाची सैद्धांतिकता असते, त्याच्या प्रत्यारोपणासाठी कृतिशील झालेल्या चळवळी मानवी स्वास्थ्य आणि राष्ट्रीय स्वास्थ्याची नांदी ठरतात. ष्या कसोटीला प्राणपणाने उतरणारी खरी साहित्य चळवळ म्हणजे दलित साहित्य चळवळ होय.ष८ दलित साहित्य हे वास्तव सत्याशी कटिबद्ध असून वास्तवाचा अन्वयार्थ लावतात. त्याच्या अवलंबणाची मानसिकता रूजविण्याच्या हेतूने चळवळीची गरज भासते व त्या चळवळीला परिपूर्ण रूप देण्यासाठी साधनभूत म्हणून मानवी मूल्याधिष्ठित साहित्याची निर्मिती केली जाते.

आंबेडकरी प्रेरणेतून होणारी दलित साहित्य निर्मिती भक्कम आहे व तात्विक अधिष्ठान घेऊन निर्माण होत आहे. दलित साहित्याचा विविध प्रातांत दलित साहित्यिकांनी आपल्या लेखनातून वर्तमानातही दलित साहित्यात चर्चेचा विषय झालेली आहे. ष्चळवळ आणि साहित्याच्या अनुबंधातून हा पायाभूत व्यवहार क्रियाशील आहे. त्यामुळे दलित साहित्य आणि चळवळ परस्परपुरक आहे.९

दलित साहित्य निर्मिती करणारे बहुतेक लेखक आणि कलावंत प्रत्यक्ष चळवळीत सहभागी असणारे आहेत. त्यामुळे चळवळीचे बलस्थान म्हणूनच दलित साहित्याची मौलिकता मान्य झाली आहे. दलितांच्या वास्तव जीवनातील अनेक प्रश्न आणि समस्या या साहित्यातून मांडल्या आहेत. दलितांचे भूतकाळालीन जीवन शोषण, अवहेलना आणि झालेला अमानवी व्यवहार यांचे हृदयद्रावक अनुभव ह्या साहित्यातून ग्रंथीत झाले आहेत. त्यामुळे साहित्याचा सामाजिक दृष्टीने अभ्यास ही ज्ञानशाखा सामाजिकशास्त्रे व साहित्याभ्यासात महत्त्वाची म्हणून मान्यता पावत आहे. दलितांचे दुर्लक्षित जीवनानुभव आणि या त्या अनुभवाशी निगडीत बोलीभाषा उपयोजिल्यामुळे हे साहित्य सामाजिक इतिहासाचे दस्तऐवज, म्हणून सर्वमान्य झाले आहे. त्यामुळे दलित चळवळींनी युक्त असे हे साहित्य आहे. म्हणून चळवळ हे दलित साहित्याचे अविभाज्य अंग असून या साहित्यामुळे चळवळीलाही तात्विक आणि वैचारिक अधिष्ठान प्राप्त झाले आहे.

दलित साहित्य हे दलित चळवळीचे साहित्य आहे. याचा अर्थ दलित साहित्य हे दलितांच्या चळवळीतून उदयास आले असाध्यायचा असतो. डॉ. बाबासाहेब आंबेडकरांनी दलितांच्या आत्मसन्मानाची चळवळ सुरू केली. समता, न्याय, बंधुत्त्वाचा पुरस्कार केला. त्याआड येणाऱ्या रूढी, धर्मग्रंथांना नकार दिला. हे सहजासहजी घडले नाही. त्यासाठी त्यांना संघर्ष करावा लागला. ह्या संघर्षाचे चित्रण दलित साहित्यात प्रतिबिंबित झाले. म्हणून ह्या साहित्यात वर्णव्यवस्थेविरूद्ध संघर्ष येतो. रूढींना नकार येतो. समता, स्वातंत्र्य, न्याय व बंधुत्त्वाचा पुरस्कार येतो. दलितांच्या चळवळीची ही मागणी पूर्ण झालेली नाही. राज्यघटनेने ही मागणी पूर्ण केलेली असली तरी व्यवहारात अजूनही मागणी पूर्ण झालेली नाही. संसदीय पद्धतीच्या लोकशाहीची एक मर्यादा असते. ह्या पद्धतीत परिवर्तन अतिशय मंद स्वरूपात होत. पण परिवर्तन होणे अटळही असते. म्हणूनच सांसदीय लोकशाही मजबूत होऊ शकेल अशीच ही मागणी असल्यामुळे दलितांची चळवळ गतिशील राहणे आवश्यकही असते. दलित साहित्य ह्या गतिशील चळवळीचे प्रतिबिंब असणारे साहित्य आहे. चळवळ आणि चळवळीचे प्रतिबिंब असणारे दलित साहित्य त्यांचा सांधा ह्याच कारणामुळे अतुट आहे.

काही संज्ञा :—

१) दलितांचे जीवन व दलित व्यक्तीचे चित्रण मराठी साहित्यात जे झाले ते अतिशय केविलवाणे असून, त्यात दलित जीवनाचे सत्यदर्शन घडत नाही. अशी तक्रार प्राचार्य म. ना. वानखडे यांनी केली आहे.१०

२) बाबुराव बागुल म्हणतात, ष्दलित म्हणजे वर्णव्यवस्थेला आणि तिच्या समग्र वैचारिक व्यवस्थेला उद्धवस्त करू बघणारा, दलित म्हणजे हे जग व जीवन नव्याने मांडणारा, दलित म्हणजे या युगाने ज्याचे हात प्रज्ञावंत, प्रलयंकारी केलेले आहेत आणि ज्यांच्यासाठी शस्त्रे आणि शास्त्रे उपलब्ध करून दिलेली आहेत अशा दलितांच्या साहित्य निर्मितीला दलित साहित्य म्हणावे.११

३) राज ढाले म्हणतात, एका बंदिस्त समाज रचनेतून आणि एका सांस्कृतिक व्युहातून सामाजिक व सांस्कृतिक बंध तोडून बाहेर पडणारा समाज व या वुहाविरूद्ध लढणारा दृष्टिकोन घेऊन साहित्य निर्मिती करणारा परंतु दलित जाणीवेतून लिहिलेल्या साहित्याला दलित साहित्य म्हणावे.१२

४) म. भि. चिटणीस — दलित साहित्यातून व्यक्त होणाऱ्या वेदनेचे, नकाराचे, विद्रोहाचे रूप सर्व बाजूंनी नीट समजावून घेतल्याशिवाय ते कलात्मक कसोट्यंना उतरत नाही असा निर्णय देणे ह्या साहित्यावर अन्याय करणारे ठरेल.१३

५) डॉ. गंगाधर पानतावणे — दलित साहित्य म्हणजे व्यक्तिस्वातंत्र्याचा जाहीरनामा आहे. क्रांतिविन्मुखता आणि क्रांतिसन्मुखता यांच्या संघर्षातून निर्माण झालेले दलित साहित्य हे बंधमुक्त माणसांचा विचार करते.१४

६) शरच्चंद्र मुक्तिबोध — दलित जाणीव ही समाज जाणीवेत अनुरूप परिवर्तन करू पाहणारी जाणीव आहे. म्हणून ती अशी द्विदोहात्मक तशीच मूलतरू आशावादी व क्रांतीकारी आहे.१५

दलित साहित्य संकल्पना :—

१) डॉ. भालचंद्र फडके, दलित जाणिवेतून जीवनाचे भेदक दर्शन घडविणारे साहित्य हे दलित साहित्य.१६

२) डॉ. म. ना. वानखडे, ष्दलित लेखकांनी दलितांविषयी निर्माण केलेले प्रक्षोभक विद्रोही साहित्य म्हणजे दलित साहित्य होय.ष्१७

३) बाबुराव बागुल, ष्माणसाच्या मुक्तीचा पुरस्कार करणारे, माणसाला महान मानणारे वंश, धर्म, जाती श्रेष्ठत्वाला कठोर विरोध करणारे जे साहित्य ते दलित साहित्य होय.ष्१८

४) डॉ. योगेंद्र मेश्राम, ष्पारंपरिक साहित्यात जे जीवन उपेक्षित ठेवले गेले त्या दलित जीवनाचे दलितांनी घडवलेले दर्शन वा केलेले विवेचन म्हणजे दलित साहित्य होय.ष्१९

५) उत्तम कांबळे, ष्आंबेडकरी विचारधारा याचा अर्थ ज्याच्यामध्ये, फुले, पेरियार आणि समग्र निग्रो बांधव आहेत अशा सगळ्या बदलणाऱ्या विचारांची एक धारा म्हणजे आंबेडकरी धारा असते.२०

''आता होऊन जाऊ द्या!'' असे आवाहन केल्यानंतरही लोकनाथ यशवंत याची कविता प्रश्नार्थ झालेली दिसते. तोवरच्या काळात धर्मांतराला चार दशके पूर्ण झाली होती. गटातटाच्या राजकारणाला उत आला होता. राजकीय पुढाऱ्यांनी डॉ. बाबासाहेब आंबेडकरांच्या नावाचे भांडवल केले आणि सामाजिक प्रश्न बासनात गुंडाळून ठेवले. समाजमनाच्या डोक्यात धुळफेक करण्याचे काम या लोकांनी केले. अशा प्रवृत्तीच्या डोळ्यात झणझणीत अंजन घालण्याचे काम लोकनाथ यशवंत यांच्या कवितेने केले.२१

दलित साहित्याची प्रेरणा डॉ. बाबासाहेब आंबेडकरच आहे. हे मत सर्वमान्य आहे. मराठीतील दलित साहित्य हा सार्वजनिक चर्चाविषय झाला आहे. आंबेडकरी चळवळीने ज्या विविध नवप्रवृत्तींना जन्म दिला, त्याची परिणती म्हणजे दलित साहित्य, दलित साहित्य हे माणसाचे साहित्य आहे, जातीचे नाही, असे म्हणतात, पुरोगामी सिद्ध झाले तरी दलित जीवनातील सत्य, वास्तवच नाकारते. माणसाचे असलेले साहित्य कोणत्या वर्गाचे, वर्णाचे, जातीचे हा बोध होत नाही. मराठी साहित्यात उच्चभ्रू जाती, ब्राह्मण, क्षत्रिय या माणसांचे चित्रण आहे. या माणसांची जीवन जगण्याची अवस्था, स्थिती, सुखासीन प्रवृत्ती, प्रकृती, अहंकार यातून व्यक्त होतो. दलित जीवन या उलट असल्यामुळे त्याचे अवमानीत, व्यथित, गुलामी, लाचार मनाचे आविष्करण करणारे साहित्य दलित ठरेल. ष्आत्यंतिक प्रतिकुल अवस्थेत ज्या दलितांनी आपल्या हळूवार कोमल भावना जोपासल्या, जीवनसंघर्षात आपली उत्साही आनंदी प्रवृत्ती चिरंतन टिकविली याचे चित्रण करणारे साहित्य दलित ठरेल.ष्२२ दलित मुक्ती साहित्य हे आशावादी आहे. समतेचा नवसमाज निर्माण करण्याची त्याची आकांक्षा आहे. दलित साहित्यात असा वेगळी अंतर्भावातील सामाजिक जाणीव, वेगळा माणुसकीचा आशय आंबेडकरी प्रेरणांनी भरलेला आहे. ''दलित मुक्ती साहित्य आपला वेगळाच जीवनानुभव, वेगळ्याच शैलीत, वेगळ्याच भाषेत, अभिव्यक्त करते. त्याचे प्रत्ययकारी दर्शन घडविते. म्हणून मराठी साहित्यापेक्षा दलितमुक्ती साहित्याचे वेगळेपण ठसठशीत दिसते.''२३

साहित्याबाबत डॉ. बाबासाहेब म्हणतात, मी मनोरंजनासाठी वाङ्मय वाचत नाही, शिकण्यासाठी वाचतो अशी भूमिका असणाऱ्या डॉ. बाबासाहेब आंबेडकर यांनी २ मे १९५४ रोजी विदर्भ साहित्य संघात केलेले भाषण प्रसिद्ध आहे. या भाषणातून त्यांनी त्यांची साहित्याविषयीची जीवनवादी भूमिका स्पष्ट केली आहे.

ते म्हणतात, ''आपण आपल्या जीवनाकडे, कर्तव्यधर्माकडे आणि संस्कृतीकडे दुर्लक्ष करीत आहोत. म्हणून मला साहित्यकांराना आवर्जून सांगायचं आहे की, उदात्त जीवनमूल्ये व सांस्कृतिक मूल्ये यांचे आपल्या साहित्य प्रकारातून आविष्करण करा. आपले लक्ष, संकुचित मर्यादित ठेवू नका. तिचं तेज खेड्यपाड्यतील गडद अंधार दूर होईल असे प्रवर्तित करा. आपल्या या देशात उपेक्षिताचं, दलितांच, दुखितांच फार मोठं जग आहे. हे त्यांचं दुरूख त्यांची जीवन उभ करण्यास सक्षम करण्यातच खरी मानवता आहे.''२४

दलित साहित्याचा पुरस्कार करणाऱ्या काही संस्था त्यावेळी नव्याने जन्मास आल्या आहेत. त्यामध्ये २७ नोव्हेंबर १९६७ रोजी स्थापन झालेली मिलींद साहित्य परिषद ही त्यापैकी एक संस्था होय. प्राचार्य डॉ. म. ना. वानखडे आणि प्रा. म. भि. चिटणीस यांची धडपड यामध्ये होती. ते या परिषदेचे अध्यक्ष होते. डॉ. गंगाधार पानतावणे या चळवळीचे अग्रणी होते. अस्मिता तेच आताचे अस्मितादर्श. ष्दलित साहित्य संकल्पनेच्या समर्थनार्थ जशा काही संस्था कार्यरत झाल्यात तशाच काही मान्यवर व्यक्तीही दलित साहित्याच्या पाठीमागे ठामपणे उभ्या राहिल्यात. त्यामध्ये दया पवार, केशव मेश्राम, रावसाहेब कसबे, गंगाधर पानतावणे, बाबूराव बागुल, अर्जून डांगळे, अरुण कांबळे, शरणकुमार लिंबाळे इत्यादींचा समावेश आहे.''२५

डॉ. बाबासाहेब आंबेडकरांचे समग्र तत्त्वज्ञान व विचारमूल्ये प्रत्यक्षात नवनिर्माणाची सृजनाची अपूर्व चेतना स्फुर्तीच होय. त्या निर्मितीचाच एक महत्तम मूल्य भाग वाङ्मयीन आविष्कार म्हणजेच आंबेडकरी साहित्य होय. ''ज्वालाग्रही प्रमाणे पेटलेल्या माणसातून आंबेडकरी साहित्य जन्माला येते. परिणामस्वरूप डॉ. बाबासाहेब आंबेडकर हे आंबेडकरी साहित्याचे जनक व अस्पृश्य समाजातील पहिले महान आंबेडकरी लेखक ठरतात.''२६

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२. उ.नि. पृ.१११
३. उ.नि. पृ.३
४. उ.नि. पृ.१
५. डॉ. सांगोलेकर अविनाश, 'दलित साहित्य उगम आणि विकास', प्रतिमा प्रकाशन, पुणे, २०१०, पृ.क्र. १८.
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८. उ.नि.पृ.१८
९. उ.नि.पृ.१८
१०. फडके, भालचंद्र, 'दलित साहित्य वेदना आणि विद्रोह', श्री विद्या प्रकाशन, पुणे, प्रथम आवृत्ती, १९७७, पृ.क्र. १७
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१२. उ.नि.पृ.१८
१३. उ.नि.पृ.१८
१४. उ.नि.पृ.१८
१५. उ.नि.पृ.१८
१६. डॉ. सांगोलेकर अविनाश, 'दलित साहित्य उगम आणि विकास', प्रतिमा प्रकाशन, पुणे, प्रथम आवृत्ती, २०१०, पृ.क्र. २१.
१७. उ.नि.पृ.२१
१८. उ.नि.पृ.२१
१९. उ.नि.पृ.२२
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२६. उनि, पृ.क्र. २१

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कविता अध्यापनाचे तंत्र

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साहित्यकृतीचे अध्यापन महाविद्यालयीन वाङ्मयाध्यापनाचा पुष्कळशा भाग व्यापते. यात कविता, कथा, कादंबरी, नाटक, वैचारिक लेखन या मुलभूत वाङ्मयप्रकारातील साहित्यकृतीचे अध्यापन आपण महाविद्यालयीन पातळीवर करू शकतो. वरील प्रकारांपैकी कविता हा प्रकार भावसधन आणि आत्मनिष्ठ असा आहे. कवितेतील अनुभव घटकांची श्रीमंती कवीच्या जाणिवांनी आलेली असते. म्हणून कविता व कवी यांच्या परस्पर संबंधाचा प्रश्न उद्भवतो. कवितेचे उत्कट भावपूर्णतेने, समरसतेने वाचन केले जावे. कवितेचे अध्यापन करताना कवीचे काव्यात्म व्यक्तिमत्त्व, त्याची स्वयंभू स्वतंत्रता, काळ—परिस्थितीचे व साहित्यपरंपरेचे झालेले संस्करण यांचा विचार केला जावा, वेगवेगळ्या टप्प्यावर एकच कविता जेव्हा समोर येते तेव्हा विद्यार्थ्यांची आकलनशक्ती लक्षात घेऊन अध्यापन स्थूलतेकडून सूक्ष्मतेकडे कसे नेता येईल याचा विचार करावा. अध्यापनाची वेगवेगळी सूत्रे वापरून अध्यापन विषय सुलभ करावा.

काव्याच्या व्याख्या —

'वाक्यं रसात्मक काव्यम्' किंवा 'poetry is spontaneous out burst of powerful feelings' या काव्याच्या सर्वमान्य व सर्वपरिचित व्याख्या म्हणजे काव्यात भावना किंवा रस या घटकाला प्राधान्य असते. 'बी' कवी म्हणतात, 'सौंदर्याचे काव्य' प्रो. हॅडो यांनी On जीम teaching of Poetry या ग्रंथात ते म्हणतात, 'Poetry is a beauty : beauty of form, beauty of language, beauty of thought mood or feeling poetry is an art and the reason for including it in the curriculum can only be that we wish to develop the aesthetic sense, the feeling of beauty in our pupils.' 'अंतरीजे धावे स्वभावे बाहेरी' असे तुकाराम महाराज म्हणतात. तात्पर्य रसप्रतीती व सौंदर्यदर्शन हेच काव्याच्या अध्यापनाचे प्रमुख उद्देश आहेत असे म्हणता येईल.

कवितेचे अध्यापन —

प्रत्यक्ष कवितेचे अध्यापन करतांना खालील मुद्यांचा उपयोग प्रभावीपणे करता येईल.

कवितेचा आस्वाद

प्रत्यक्ष कविता शिकविण्याला प्रारंभ करण्यापूर्वी प्रस्तावना करायला हवी. या प्रस्तावनेचा हेतू म्हणजे जी कविता शिकवायची आहे तिच्या आस्वादाला परिपोषक अशी मनोभूमिका, अनुकूल मन:स्थिती किंवा उत्कंठापूर्ण भावस्थिती विद्यार्थ्यांमध्ये निर्माण करणे याला इंग्रजीत 'Receptive mood' असे म्हणतात.

ही प्रस्तावना करण्याचे विविध प्रकार संभवतात ते पुढीलप्रमाणे —

अ) कवितेची मध्यवर्ती कल्पना

यात मूळ कल्पना किंवा विषयत्व विद्यार्थ्यांना समजावून सांगणे गरजेचे असते. मध्यवर्ती कल्पनेच्या आधारे विद्यार्थ्याला कविता समजून घेणे सोपे जाते.

ब) कवीचा परिचय करून देणे

वस्तुत: कविता शिकविताना कवी संबंधी माहिती सांगणाची गरज नाही. परंतु कवीच्या जीवनातील एखाद्या घटनेचा व त्या कवितेचा काही पूर्वसंबंध असल्यास त्या घटनेचा उल्लेख करणे योग्यच ठरेल.

उदा. कवी भा.रा. तांबे यांची 'रिकामे मधुघट' ही कविता शिकवायची असेल तर आपल्याला तांब्याविषयी पूर्व माहिती द्यावीच लागते. त्यांनी आपल्या आयुष्याच्या पूर्वार्धात अनेक प्रणयपूर्ण व शृंगारिक कविता लिहिल्या. परंतु आयुष्याच्या अखेरीस मात्र पूर्वी सारख्या प्रेम, प्रणय भावनांनी भरलेल्या कविता का लिहित नाहीत? असा प्रश्न त्यांना त्यांच्यावर लुब्ध झालेले रसिक त्यांना विचारित असत. तेव्हा त्यांना 'रे मागसि माझ्या सख्या परी! मधुघटची रिकामे पडति घरी' असे भावनोत्कट स्पष्टीकरण तांबे आपल्या 'रिकामे मधुघट' या कवितेतून देतात. म्हणजेच मधुघटच

रिकामे झाले आहे, प्रतिभाच संपली आहे अशा प्रकारे काव्यातील जो मुख्य विषय असतो त्याच्या मागची पार्श्वभूमी आधी विद्यार्थ्यांना सांगितली पाहिजे. म्हणजे कविता शिकवितांना कवितेच्या स्पष्टीकरणातून कवीच्या जीवनातील घडामोडी सांगणे आवश्यक असते.

परंतु असा संबंध जेथे नसेल तेथे कवी जीवनाचा उल्लेख करण्याची गरज नाही. मात्र जेव्हा आपल्याला त्याच कवीची दुसरी एखादी कविता शिकवावयाची आहे व त्या कवितेत आणि पूर्वी शिकविलेल्या कवितेत जर साम्य असेल तर त्यावेळी पूर्वीच्या कवितेचा व त्यातून व्यक्त झालेल्या कवीच्या काव्यवैशिष्ट्यांचा व काव्यदृष्टीचा प्रस्तावनेत उल्लेख करून त्याच्या आधारे नव्या कवितेच्या अध्यापनाला आपण सुरूवात करू शकतो.

क) रस परिपोषक वातावरण निर्मिती

रस परिपोषक वातावरण निर्माण करण्याच्या दृष्टीने प्रस्तावनेचा तिसरा प्रकार हा अधिक श्रेयस्कर ठरतो. ही वातावरण निर्मिती अनेक प्रकारे करता येऊ शकेल. उदा. सावरकरांची 'सागरास' ही कविता शिकवायची असल्यास सावरकर त्यावेळी इंग्लंडमध्ये शिकत होते, त्यांचा क्रांतीकारकाशी संबंध असल्याचा संशय आल्यामुळे भारतात परत येण्याची त्यांना बंदी होती. मात्र सावरकरांनी आपल्या मातृभूमीवर निस्सीम प्रेम! मातृभूमीचे आपल्याला दर्शन होणार नाही या कल्पनेने ते विलक्षण दु:खी झाले. व समुद्रकिनाऱ्यावर जाऊन आपल्या मातृभूमीकडे दृष्टी लाऊन आपल्या अंतचक्षूनी तीचे दर्शन घेण्याचा प्रयत्न करू लागले. भावनोत्कट हृदय उचंबळून आले आणि विरह व्याकुळ अंत:करणातून —

''ने मजसी ने परत मातृभूमीला।
सागरा प्राण तळमळला।।

अशी भावपूर्ण काव्य निर्मिती झाली.

बोरकरांची ग्रामीण जीवनातील निसर्ग सौंदर्य व साधेभोळे अकृत्रिम जीवन यांचे दर्शन घडविणारी 'हिरवळ आणिक पाणी' या कवितेच्या प्रास्ताविकात नागरी जीवनाचे विरोधी चित्र विद्यार्थ्यांपुढे उभे करून ग्रामीण वातावरणातील साजसुंदरतेचे व उदात्तेचे दर्शन उत्कटत्वाने घडविता येऊ शकते.

कवितेचे वाचन

प्रस्तावनेद्वारा रसपरिपोषक वातावरण निर्माण केल्यानंतर कवितेचे प्रकटवाचन देखील काव्याच्या अध्यापनात तेवढेच महत्त्वाचे आहे. यात कवीप्रमाणेच कवितेमधील सर्व प्रकारचे काव्यसौंदर्य शिक्षकानेही आपल्या वाचनातून प्रगट केले पाहिजे. प्रत्येक शब्दातून व्यक्त होणारा आशय लक्षात घेऊन त्या पद्धतीनेच उच्चार व्हायला पाहिजे.

उदा. 'विशाल' या शब्दाला आकार आहे तर 'उत्तुंग' या शब्दामध्ये उंची आहे 'दगड' या शब्दाला वजन आहे.

म्हणजेच त्या—त्या शब्दांची प्रतिमा विद्यार्थ्यांच्या मनात निर्माण होईल असे उच्चारण करायला हवे. उदा. 'सागरा प्राण तळमळला' यातील 'तळमळला' या शब्दावर किंचीत आधार दिल्यास त्या शब्दातून कवीला अभिप्रेत असलेली अंत:करणातील तगमग यथार्थरितीने व्यक्त होऊ शकेल.

कवितेचे अध्यापन करताना जी काळजी शब्दांच्या उच्चाराच्या बाबतीत घ्यावी लागते तीच काव्यपंक्तीच्याही बाबतीत घ्यावी लागते. म्हणजेच काव्य पंक्तीमधून व्यक्त होणारा आशय व भाव लक्षात घेऊनच वाचन करावे. उदा. ''राकट देशा, कणखर देशा, दगडांच्या देशा। नाजूक देशा, कोमल देशा, फुलांच्याही देशा।।''

या दोन्ही ओळीतील अर्थ भिन्न आहे. पहिल्या ओळीतील शब्द व अर्थ यातून व्यक्त होणारी 'कठोरता' व दुसऱ्या ओळीतील शब्द व अर्थ यातून व्यक्त होणारी 'कोमलता' यामधील फरक विद्यार्थ्यांच्या नजरेत आपल्या वाचनातून आणून दिला पाहिजे.

हाच नियम एंकदर कविता वाचनालाही लागू पडतो. 'गर्जा जयजयकार', 'जिंकू अथवा मरू' या विररसप्रधान कविता आवेशपूर्ण रितीने वाचाव्या लागतील तर आई 'निज निज माझ्या बाळा' या कविता कारूण्यपूर्ण रितीने तर 'फुलराणी' सारखी कविता वाचताना आवाजात मृदुता व ऋजुता आणावी लागेल.

तात्पर्य, आवाजातील आरोह — अवरोह, आवेश, गांभीर्य कारूण्य, वात्सल्य, मृदुता, विशिष्ट शब्दावरील आघात इत्यादी सर्व गोष्टी अर्थ व भाव यांना अनुरूप ठेवून वाचन केल्यास रसोत्कट वातावरण निर्माण होईल. अशाप्रकारे कविता शिकवितांना शिक्षकाने ती कविता वर्गात वाचून शिकवावी व नंतर कवितेचे विवेचन करावे.

वाचन की गायन

रसोत्कर्ष साधण्यासाठी कविता भावपूर्णरितीने वाचावी की गावी हाही एक वादग्रस्त मुद्दा नव्या पद्धतीमध्ये उपस्थित झाला आहे. परंतु अध्यापनाच्या बाबतीत गायनाच्या फंदात न पडलेलेच बरे. प्रत्येक कवितेला आंतरिक संगीत असते. त्याचा उपयोग करूनच कविता वाचन करणे योग्य!

कविता एक संपूर्ण व स्वयंपूर्ण कलाकृती

कवितेचे वाचन तसेच अध्यापन संपूर्ण स्वरूपात व्हावे. तीचे तुकडे पाडून वाचन करू नये तसेच शिकवूही नये. कारण कविता ही स्वयंपूर्ण कलाकृती असते. कोणत्यातरी एका घटनेचे वा प्रसंगाचे त्यात वर्णन असते. तसेच संपूर्ण कवितेतून एकच भावना व कल्पना व्यक्त झालेली असते. तुकडे केल्यास तीची अभंगता व एकात्मता नष्ट होते. हे सौंदर्य रसास्वादाला विघातक ठरते. आणि म्हणूनच 'पूर्णाकडून अंशाकडे' थतवउ ूिवसम जव चंतजे या मानसशास्त्रीय सिद्धांतानुसार कवितेचा विचार करणे हेच तीच्या रसवत्तेच्या आस्वादाला पोषक ठरेल.

कवितेतील आशयाचे विवेचन

कविता गुढ किंवा वैचारिक असल्यास विद्यार्थ्यांकडून प्रकटवाचन करून घ्यावे. आपल्या मनातील भावना विचार व कल्पना सुंदर व परिणामकारकतेने प्रगट करण्यासाठी कवीने सुंदर—सुंदर शब्दांचा अलंकाराचा कसा उपयोग केला याकडे विद्यार्थ्यांचे लक्ष वेधावे. कारण कविता ही सौंदर्याचा अविष्कार करणारी कलाकृती आहे. म्हणजेच आधुनिक दृष्टिकोनातून कवीला आलेल्या सौंदर्यानुभूतीशी व भावनानुभूतीशी विद्यार्थ्यांना समरस करणे, त्यांच्यात ती काव्यदृष्टी निर्माण करणे हेच खरे काव्याचे अध्यापन.

ही अनुभूती विद्यार्थ्यांमध्ये आणून देण्याचा उत्तम मार्ग म्हणजे शिक्षकाच्या स्वत:च्या भाावनात्मक प्रतिक्रिया! मात्र रसहानिकारक गोष्टी टाळाव्या. भावपूर्ण प्रतिपादन असावे. पण अतिव्याख्यानबाजी नको. कवितेतील कठिण शब्दाचा परिचय कविता शिकविण्यापूर्वीच करून दिल्यास अध्यापनाच्या ओघात शब्द स्पष्टीकरणाने खंडही पडणार नाही.

कवितेतील रससौंदर्याची अनुभूती विद्यार्थ्यांना आणून दिल्यानंतर त्या अनुभूतीला अर्थपूर्ण व व्यापक अधिष्ठान प्राप्त करून देण्यासाठी त्या कवीच्या काही कविता त्यातील कल्पनेचा परिचय विद्यार्थ्यांना करून द्यायला पाहिजे.

उदा. केशवसुतांची 'तुतारी', 'स्फुर्ती' या कविता शिकविताना इतर सामाजिक कवितांचाही परिचय द्यावा. अशा भावनात्मक अनुभूतीला व्यापक वैचारिक पार्श्वभूमीची जोड दिल्यास अधिक यशस्वी व परिणाम कारक अध्यापन होऊ शकेल.

तात्पर्य, अशा प्रकारे कविता ही जशी आत्मनिष्ठ तशीच कवितेची अध्यापन पद्धतीही आत्मनिष्ठ राहील या संदर्भात प्रो. हॅडो म्हणतो ष्व्वमजतल जमंबीपदह पे सपाम सवअम उंापदह मंबी ूपसस ींअम ीपे वूद ूंलष हे विधान अतिशय अर्थपूर्ण आहे. विद्यार्थ्यांच्या मनामध्ये कवितेविषयी गोडी निर्माण करणे आवश्यक आहे. शिक्षकाची रसिकता, त्याची तन्मयता, त्याला आलेली अनुभूती व त्यानुसार होणाऱ्या त्याच्या भावनात्मक प्रतिक्रिया यावरच कवितेच्या अध्यापनाचे यश अवलंबून आहे असे म्हणता येते.

संदर्भ ग्रंथ —

१.वाङ्मयाचे महाविद्यालयीन अध्यापन — दु.का. संत (गौरवग्रंथ)
२.मराठीचे अध्यापन — म.बा. कुंडले

संत नामदेवांची प्रभावळ

प्रा. डॉ. दिनेशचंद्र की. राऊत

युवाशक्ती कला व विज्ञान महाविद्यालय, अमरावती. भ्रमणध्वणी — ९७६४६८८१५८

संत नामदेवांच्या प्रभावळीतील संतांचा अभ्यास करीत असतांना तत्कालीन (तेराव्या चौदाव्या काळाचा) सामाजिक धार्मिक परिस्थितीचा अभ्यास करणे आवश्यक ठरते.

बाराव्या ते चौदाव्या शतकातील महाराष्ट्रात देवगिरीच्या यादवांचे राज्य होते आणि हा काळ संतचळवळीचा प्रारंभीचा काळ होता. संपूर्ण समाज रसातळाला गेला होता. त्या राज्यात संपूर्ण अराजकता माजली होती राज्यपद्धती निकृष्ट दर्जाची होती म्हणून प्रजा उदासीन झाली होती राजा आणि प्रजा हे दोघेही अधोगतीला गेले होते.

यादव राजाकडे हेमाद्री नावाचा पंडित होता. तो प्रत्यक्ष अप्रत्यक्ष राज्यकारभारातही हस्तक्षेप करीत होता त्या काळातील सर्व ग्रंथ संस्कृतमध्ये होते संस्कृत शिकवण्याचा अधिकार तत्कालीन उच्च वर्णीयांना (ब्राम्हण) होता. धर्माचा अर्थ ते त्यांच्या पद्धतीने काढत होते. हेमाद्री पंडिताने 'चतुवर्ग चिंतामणी' नावाचा ग्रंथ लिहिला त्यात त्याने विविध वर्गातील लोकांसाठी दोन हजारांच्या वर व्रते सांगितले होते. तत्कालीन समाज अज्ञानी असल्यामुळे भीतीपोटी व्रत वैकल्ये करीत होते. तत्कालीन समाजातील लोकांचा वेळ व्रत वैकल्य, उपासतापास, तंत्रमंत्र, भूत पिशाच्च, तारण मारणात, अंधश्रद्धेत जात होता.

मुस्लिमांनी हिंदूधर्मापुढे एक नवे आव्हान निर्माण केलेले होते. इ. स. १३०० मध्ये सुफी धर्मपंथ प्रचारक चर्जरीबक्ष आणि त्याचे सातशे साथीदार खडके श्वराला येऊन राहिले. पुढे १३०९ मध्ये चर्जरीबक्षाचा मृत्यू झाला. पुन्हा क्तञ्ज शे सुफी प्रचारक महाराष्ट्रात पाठविण्यास आले. राजकीय आक्रमणापेक्षा हे आक्रमण जास्त धोकादायक होते.

वारकरी संप्रदायातील संतांनी आध्यात्मीक लोकशाही निर्माण करुण तत्कालीन बहुजन समाजाला भक्तीचा मार्ग मोकळा करुन दिला. यातूनच नामदेवांची प्रभावळ उदयास आली त्यात संत सावता माळी निवृत्तीनाय, संत ज्ञानेश्वर, सोपान, मुक्ताबाई, संत नामदेव, संत चोखोबा, संत जनाबाई, संत सोयराबाई, निर्मळा, कर्ममेळा, बंका, संत भागू, संत कान्होपात्रा, संत नरहरी, सोनार, सेनान्हावी इत्यादी संताचा उल्लेख करावा लागेल त्यातील काही महत्वाच्या संताचा अभ्यास करण्याचा प्रयत्न केला.

संत नरहरी सोनार —

एक थोर शिवभक्त म्हणुन पंधरपुरच्या सोनारांची ख्याती होती परंतु एका प्रसंगी 'शिव आणि विष्णु एकाची प्रतिमा, असा स्वानुभव झाल्यानंतर ते वैष्णव पंथात सहभागी झाले त्यांनी आपला व्यवसाय विठ्ठलमय केला होता.

देवा तुझा मी सोनार □ तुझे नामाचा व्यवहार □
देह बागेसरी जाणे □ अंतरात्मा जाण सोने □
त्रिगुणाची करुनी मुस □ आतओतिला ब्ररस □
जीव शिव करुनी फुकी □ रात्र दिवस ठोका ठोकी □

त्यांनी विठ्ठलांचे मनोहारी बर्णन केले आहे

भस्मउटी रुद्रमाका □ हाती त्रिशूल नेत्री ज्वाळा गजधर्म व्याघ्रांबरा □ कंठी शोभे वसुकी हार

संत सावता माळी —

वयाने सर्वश्रेष्ठेसंत सावता माळी होय आपल्या कर्तव्य कर्मावर निष्ठा ठेवून आपल्या व्यवसायालाच हरिरूप मानणारे एक थोरसंत सावता माळी होय. त्यांनी आपले संपूर्ण जीवनच विठ्ठलमय करुण सोडलेले होते. त्यांचे नावावर मोजकेच अभंगआहे . (बारा)

अमुची माळ्याची जात □ शेत लावू बागाईत □
आम्हा हाती मोट नाडा □ पाणी जाते फुल झाडा □
कांदा मुकाभाजी □ अवघी विठाबाई माझी □

लसून मिरची कोथिंबीरी □ अवघा झाला माझा हरी □
मोट नाडा विहीर दोरी □ अवघी व्यापिली पंढरी □
सावता म्हणे केला मळा □ विठ्ठलाची गोविला मळा □

तत्कालीन सामाजिक आणि धार्मिक विषमतेचे हि वर्णन त्यांच्या अभंगात दिसून येते.

भली केली हीन याती□ नाही वाढविली महंती □

सावता माळ्याची अभंगवाणी ही साधी पण उत्कट आहे

संत चोखामेळा —

संत चोखोबाहे महार (शूद्र) जातीतील असून त्यांच्या अभंगाचे विजय विठ्ठल वर्णन, पंढरी महात्म्य, नाम महात्म्य होते त्यांनी संत नामदेवांना गुरयांनी मानले होते पुढे त्यांचे संपूर्ण कुटुंबच विठ्ठलभक्त झाले. तत्कालीन सामाजिक यारी स्थितीचे वर्णन त्यांच्या अभंगातून व्यक्त होतांना दिसते.

शुद्ध चोखामेळा □ करी नामाचा सोहळा □□
यातीहीन मी महार □ पूर्वी नीळाचा अवतार □□
कृष्णनिंदा घडली होती □ म्हणोनी महार जन्मप्राप्ती □□
चोखा म्हणे विटाळ □ आम्हा पूर्वीचे ते फळ □□

ते महार जातीत जन्माला आले असले तरी त्यांची राहणी फार स्वच्छतेची होती.

संत सोयराबाई —

संत सोयराबाई ही संतश्रेष्ठ चोखामेळा यांची पत्नी होती. तिने आपल्या पतीलाच गुरु मानले होते. तिला लग्नानंतर फार उशिरा मुल जन्मास आले साक्षात विठ्ठलानेच संत सोयरा बाईचे बाळंतपण निर्मळेचे (बहिण) रूप धारण करुण केले. असा उल्लेख भाऊ लंका यांच्या अभंगात आहे तिने अभंगात स्वत: चा उल्लेख चोख्याची महारी असा केला आहे.

संत सोयराबाई ही हीन यातीत जन्मली असल्यामुळे इतर संताप्रमाणे तिलाही उच्चवर्नियांचा छळ सोसावा लागला. देहाचा विटाळ मानणाऱ्या कर्म लोकांची ती कान उघडणी आपल्या अभंगातून करते. वारकरी संप्रदायाची शिकवण तिने आत्मसात केली असून देहाच्या पलीकडे जाण्या इतकी तिची आध्यात्मिक तयारी झाली आहे ती म्हणते.

देहाची विटाळ म्हणती सकळ □ आत्मा तो निर्मळ शुद्ध बुद्ध □□
देहीचा विटाळ देहीच जन्मला □ सोवळा टो झाला कवण धर्म □□
विटाळ वाचीन उत्पतीचे स्थान □ कोणी देह निर्माण नाही जगी □□
म्हणुनी पांडुरंगा वानितसे थोरी □ विटाळ देहांतरी वसतसे □□
देहीचा विटाळ देहीच निर्धारी □ म्हणत महारी चोखोबाची □□

संत सेना न्हावी —

संत सेना न्हावी हे मुळचे जबलपूर जवळील बंधोगड येथील राजाच्या पदरी सेवेत होते ते तिर्थाटन करीत महाराष्ट्रात आले. स्वत:ला ते विठ्ठलाचे दूत म्हणवितात त्यांनी त्यांच्या व्यवसायावरच अभंग व गौळणीची रचना केली आम्ही बारीक बारीक □ करू हजामत बारीक □□ हा त्यांचा अभंग प्रसिद्ध झाला.

संत जनाबाई —

नामदेवांच्या प्रभावळीतील शेवटची संत जनाबाई संत वाटिकेतील 'आईची वेल' असा तिचा उल्लेख केला जातो तिने स्वत:ला नामदेवांची दासी मानले आहे. तिच्या नावे ३५० अभंग आहे. ती संत नामदेवांच्या घरीच लहानाची मोठी झाली जनाबाईची विठ्ठलावर दृढ श्रद्धा आहे. विठ्ठलाचे अस्तित्व जळी — स्थळी — काष्ठी — पाषाणी असे सर्वज्ञ आहे. देव हा सर्व प्राणीमात्रात व्यापून गेला आहेती आपल्या अभंगात म्हणते.

देव खाते देव पिते □ देवावरी मी निजते □□
देव येथे देव तेथे □ देवाविण नाही रीते □□
जनी म्हणे विठाबाई □ भरुनि उरले अंतरही □□

तिने आपल्या अभंगाच्या माध्यमातून भोंदू साधूवर कडाडून टीका केली आहेती म्हणते.

विघीच्या अभिमानाने नाईके कीर्तन □ पाखंडी हे म्हणे करिती काया □□
पंचारस पाब्रा कांता हे बुडविली □ उद्धरलो म्हणती आम्ही संत □□

निष्कर्ष —

•संत नामदेवांच्या प्रभावळीतील संतांनी भक्तीचा अधिकार सर्वाना असून तिथे जात, धर्म, पंथ, पक्ष या गोष्टी गौण आहे. हा आदर्श तत्कालीन समाजाला दाखवून दिला.

•संत नामदेवांच्या प्रभावलीतील संतांनी आपल्या अभंगातून आध्यात्मिक लोकशाही, सर्वधर्मसमभाव व समतेचा व मानवतावादाचा विचार मांडला.

•त्यांच्या अभंगातून जन्मश्रेष्ठत्वापेक्षा कर्मश्रेष्ठत्वाला जास्त महत्व दिले.

संदर्भ ग्रंथ —

•प्राचीन मराठी वाड्मयाचा इतिहास — लेखक ल. रा. नारीसबादकर

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महिला सुरक्षा और मानव अधिकार

प्रा.डॉ.फरहाना आझमी

उर्दू विभाग प्रमुख मुंगसाजी महाराज महाविद्यालय, दारव्हा जि.यवतमाळ

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प्रस्तावना :– महिला और पुरूष संसार रूपी गाडी के दो पहीये है | एक दुसरे के बिना जीवन का सफर बडा ही कठीण होता है |सारे संसार में लगभग आधी जनसंख्या महीलाओं की है | लेकीन महीलाएँ आज भीप्रताडीत की जा रही है हमारे संविधानने महीलाओ को अधिकारों को अधोरेखीत किया है | महीलाओ को पुरूषो के समान अधिकार दिया गए है आज हमारे देश के महीलाएँ राष्ट्पती, प्रधानमंत्री, मुख्यमंत्री तथा उच्च अधिकारी पदो पर विराजमान है | किसी भी देश की प्रगती मे महीलाओं का योगदान महत्वपूर्ण होता है | समाज के निर्माण और विकास में प्रत्यक्ष रूप से महीलाएँ योगदान देती है | परंतु उसके योगदान को पितृसताक समाजद्वारा कोई महत्व नही दिया गया है | महीलाओं को उनकी अपेक्षाकृत समाज मे स्थान नही मिला है | उनकी शिक्षा की ओर विशेष ध्यान नही दिया जाता | आज भी हमारे समाज में महीलाओं को दोयम दर्जे के नागरीक का स्थान मिला हूआ है | आज हमारे देश मे महीलाओं के शारिरीक, मानसीक और यौन हिंसा के माध्यम सें महीलाओं के मानवाधिकारों का हनन किया जा रहा है | महीलाओं पर हो रहे अत्याचार, बलात्कार की घटनाओं में वृध्दी हो रही है | महीलाओं पर हो रहे | इन अत्याचारो के कारण महीला सुरक्षा पर प्रश्न चिन्ह उपस्थीत हो रहे है | इस संशोधन लेख में हम हमारे देश मे महीलाओं के मानवाधिकार हनन पर चर्चा करेंगे और महीला सुरक्षा के लिए हमारी सरकारद्वारा किए जा रहे पृयासो पर चर्चा करेंगे |

मानव अधिकार

मानव अधिकार वे अधिकार है जो हमें प्रकृती द्वारा प्रदान किए गए है | मानव अधिकार के अभाव में हम मानव के रूप मे अपना जीवन व्यतीत नही कर सकत है | मानव अधिकार हमको पूर्णरूप से विकसीत होने के लिए अवसर प्रदान करती है | प्रख्यात राजनयीक विचारवंत हेरॉल्ड लॉस्की ने मानव अधिकार की परिभाषा की है वे कहते है, अधिकार मानव जीवन की ऐसी परीस्थीतीयॉ है जिनके बिना सामान्यता कोई व्यक्ती अपने व्यक्तीत्वका पूर्ण विकास के नही कर सकता | मानवाधिकार वो अधिकार है जो मानव को मानव होने के नाते मिले है मानवाधिकार ऐसे अधिकार है | जो एक मानव के व्यक्तीत्व के विकास के पूर्ण विकास के लिए आवश्यक है | मानवाधिकार वे न्यूनतम अधिकार है, जो प्रत्येक व्यक्ती को आवश्यक रूप से प्राप्त होने चाहिए क्योकी वह मानव परीवार का सदस्य है | मानवाधिकार की धारणा मानव गरीमा की धारणा से जुडी है | इसलिए जो अधिकार मानव गरीमा को बनाये रखने के लिये आवश्यक है उन्हे मानवाधिकार कहा जाता है |मानवाधिकारों की संकल्पना उतनी ही पुराणी है जितनी प्राकृतीक विधी पर आधारीत प्राकृतिक अधिकारों का प्राचीन सिध्दांत तथापी मानवाधिकार इस संकल्पनाने द्वितीय युध्द के बाद मूर्त स्वरूप प्राप्त किया है | यूनो के चार्टर द्वारा 10 दिसंबर 1948 को मानवाधिकार को आंतरराष्ट्रीय स्तर पर मान्यता प्रदान की गई, उसके पश्चात विश्व के सभी राष्ट्रों ने अपने संविधान मे मानवाधिकार को मान्यता प्रदान की है |

महिला और मानव अधिकार :–

भारत के संविधान में प्रत्येक नागरीक को सामाजिक न्याय, समता एवं प्रतिष्ठा बिना किसी भेदभाव के प्रदान की गई है | भारत के संविधान मे कहा गया है कि राज्य किसी भी नागरीक के विरूध्द धर्म, मूल, वंश, जाति, लींग, धर्म और जन्म स्थान आदी के आधार परं भेदभाव नही करेगा | इसका अर्थ यह है कि हमारे देश मे महीलाओं का भी वही स्थान है जो पुरूषो का है | महीलाओ को भी पुरूषों के समान अपने विकास की समान संधि प्रदान की गई है | लेकिन अभीतक हमारे देश मे महीलाओं को वास्तव मे विशेष स्थान नही मिल पाया है | वास्तविकता यह है कि महीलाओं को वह

सम्मान प्राप्त नही है जो होना चाहीए | पुरूषोद्वारा अपने निजी स्वार्थ के लिए उन्हे परेशान किया जा रहा है | उनके अस्तित का दुरूपयोग किया जा रहा है | महीलोओ के विरूध्द अत्याचार मे पिछले कुछ दशको से निरंतर वृध्दी हो रही है | महीलाओ पर अत्याचार और बलात्कार की घटनाएँ बढती जा रही है | महीलाएँ जहॉ कार्य करती है उन कार्यस्थल पर उनका लैंगीक उत्पीडन बडी संख्या में हो रहा है | महीलाओं की सुरक्षा के लिए और उनकी प्रगती के लिए सरकारद्वारा अनेक प्रयास किए जा रहे है, उसके बावजूत महीलाओं पर होने वाले अत्याचारों मे कमी के बजाय उसमें वृध्दी हो रही है | इसक पिछे अनेक जाने अनजाने कारण है | शिक्षा की कमी और रूढिवादी विचारो के कारण महीलाआ ंका समुचित विकास नही हो पा रहा है | इसलिए महीलाओं को अपनी अस्तित्व रक्षा, स्वतंत्रता और सम्मानपूर्वक जीवन यापन के लिए सामाजिक न्याय तथा सुरक्षा का वातावरण उपलब्ध करना सरकार की जिम्मेदारी है |

महिला मानव अधिकारो का हनन :

आज हमारे देश मे महिला अधिकारों की रक्षा के लिए अनेक कानून बनाएँ गये है | राष्ट्रीय महिला आयोग और राज्य महिला आयोग का गठन किया गया है, लेकिन आज भी महिलाओं की छेडछाड,, लैंगीक शोषण, नारी भृण हत्या तेजाब डालना, बलात्कार आदी घटनाओंमे वृध्दी हो रही है | इन सबके रोकथाम के लिए अनेक कानून होने के बाद भी हमारा समाज मूकदर्शक बना हुआ है | 2012 मे दिल्ली मे निर्भया सामुहीक बलात्कार हुआ, इस घटना ने हमारे देश की आत्मा को झंझोड डाला और सारे देश में इसकी तिव्र प्रतिक्रिया हुई | इस घटना के बाद केंद्र सरकारने ऐसी घटनाएँ रोकने के लिए कडा कानून बनायां लेकीन इस घटना के बाद भी हमारे देश मे महिलाओं पर होने वाले अत्याचारों मे वृध्दी हो रही है | हैद्राबाद की डॉ. रेड्डी सामुहिक बलात्कार ही घटना उन्नाव की घटना, हिंगणघाट की तेजाब घटना यह घटनाएँ महिलाओं के प्रती समाज की संवेदनहीनता दर्शाती है |

2 जनवरी 2022 को उत्तर प्रदेश के बुलंद शहर के गाव डिबाई – गालीबपूर मे एक 16 वर्ष की किशोरी का सामुहीक बलात्कार कर के उसे गोली मार दि गई | अप्रेल 2022 मे राजस्थान के अल्वर मे एक मुकबधिर बच्ची के

साथ बर्वतापूर्वक सामुहीक बलात्कार की घटना सामने आई | 26 जून 2018 को जारी थॉमसन रॉयटर्स फाउंडेशन की रिपोर्ट के अनुसार भारत को महिलाओ के लिए सबसे खतरनाक देश घोषीत किया गया |महिलाओ ंपर होने वाले इन अत्याचारो के रोकथाम के लिए सारे समाज को भी सघटित होना पडेगा | हमारे देश मे महिलाओं के मानव अधिकार के अत्याचार और हनन निम्नलिखि रूप मे दिखाई देते है |

संविधानिक और कानूनी प्रावधान

हमारे देश मे महिला मानव अधिकार की रक्षा करने के लिए निम्नलिखित संविधानिक और कानूनी प्रावधान किए गए है | –

अ. संविधानिक प्रावधान

1.अनुच्छेद 14 : इस अनुच्छेद मे स्पष्ट प्रावधान है कि कानून के समक्ष सभी समान है | सभी को कानून द्वारा समान सुरक्षा और संरक्षण प्राप्त होगा |

2.अनुच्छेद 15 : इस अनुच्छेद मे यह प्रावधान है कि राज्य किसी भी नागरीक के विरूध्द किसी आधार पर भेदभाव नही करेगा | राज्य किसी नागरीक के साथ धर्म, लिंग, प्रजाती, जन्मस्थान,भाषा आदी के आधार पर भेदभाव नही करेगा |

3.अनुच्छेद 16 : राज्य के अधिन किसी रोजगार या नियुक्ती मे नागरिको के लिंग, आयु, जाती, धर्म, वंश आदी के आधार पर अयोग्य घोषीत नही करेगा |

4.अनुच्छेद 21 : यह अनुच्छेद प्राण, दैहीक स्वंतत्रता और संरक्षण के अधिकार की व्यवस्था करता है | यह अधिकार स्त्री – पुरूष को समान संरक्षण देता है |

5.अनुच्छेद 23 : यह अनुच्छेद मानव व्यापार, महिलाओं का अनैतिक देह व्यापार, बेगार या अन्य प्रकार की बन्धुआ मजदूरी को निषेध घोषीत करता है |
6.अनुच्छेद 39 : स्त्री और पुरूष को समान रूप से उपजीवीका के पर्याप्त साधन प्राप्त करने का अधिकार है |
7.अनुच्छेद 39 अ : स्त्री और पुरूष कर्मचारी के स्वास्थ और शक्ती का दुरूपयोग ना हो, इसकी व्यवस्था करता है | स्त्री यो के लिए प्रसुती काल मे अवकाश की व्यवस्था है |
8.अनुच्छेद 42 : इस अनुच्छेद मे गर्भवती और दूध पिलाने वाली महिलाओं के हितो की रक्षा करने का प्रावधान है |
9.अनुच्छेद 51 : संविधान के निती निर्देशक तत्वो मे महिलाओ के अधिकार सुनिश्चित किए गए है |
10.अनुच्छेद 325, 326 : निर्वाचन मे महीला और पुरूषो को समान रूप से मत देने का और चुने जाने का अधिकार |
ब.कानूनी प्रावधान
1 सती प्रथा निषेध 1829 अधिनियम तथ सती प्रथा निवारण अधिनियम 1987 : :भारतीय समाज मे प्रचलीत सती प्रथा समाप्त करने के लिए यह कानून बनाए गये | इन अधिनियमोद्वारा सती होने अथवा सती होने के लिए बाध्य करने वालों के लिए कारावास तथा जर्माने की सजा का प्रावधान है |
2 विधवा पुनर्विवाह अधिनियम 1856 : इस अधिनियम द्वारा विधवा स्त्री को पुनर्विवाह करने का अधिकार प्रदान किया गया
3 बालविवाह निषेध अधिनियम 1929, 1976 : 1929 के बालविवाह निषेध अधिनियम द्वारा बाल विवाह पूर्णतः निषिध्द किया गया 1976 के अधिनियम द्वारा लडके के विवाह के लिएं लडके की आयू 21 वर्ष और लडकी की आयू 18 वर्ष की गई
4 चलचित्र अधिनियम 1952 : इस अधिनियम द्वारा सेंसर बोर्ड की स्थापना की गई, सेंसर बोर्ड फिल्मो मे महिलाओं की मर्यादा भंग होने पर रोक लगाएगा |
5 विशेष विवाह अधिनियम 1954 : आंतरजातीय तथा आंतरधर्मिय विवाह करने के उपरान्त महिलाओं को पैतृक संपती मे उत्तराधिकार प्रदान किया गया है |
6 हिन्दू विवाह अधिनियम 1955 : यह कानून पतीके परस्त्री गमन, 2 वर्ष तक पत्नीसे अलग रहना, शारीरीक, मानसिक, अत्याचार सात वर्ष से लापता होना, असाध्य रोग का शिकार होना आदी परीस्थीती मे महिला को पती से तलाक लेने का अधिकार प्रदान करता है |
7 1956 के अधिनियम : द्वारा हिन्दू स्त्रीयों को सम्पती मे अधिकार प्रदान किया और मृत पती के संम्पती पर उसका अधिकार होंगा इस अधिनियम मे 2005 मे संशोधन कर महिलाओं को सम्पती मे समान अधिकार दिया गया |
8 दहेज निवारण अधिनियम 1961, संशोधित अधिनियम 1986 और 2007 : इस अधिनियम के अंतर्गत दहेज लेना और देना एक दंडणीय अपराध किया गया | दहेज मृत्यू के लिए 7 वर्ष से आजीवन कारावास का प्रावधान किया गया |
9 1976 के समान पारीश्रमिक अधिनियम : द्वारा महिला और पुरूष को समान काम के के लिए समान वेतन देने का प्रावधान किया गया |
10 73 और 74 वा संविधान संशोधन : द्वारा महिलाओं को ग्रामपंचायत, नगरनिगम, पंचायत समिती, जिल्हा परिषद, और महानगर निगम, मे 33 प्रतिशत आरक्षण का प्रावधान किया गया |
11 कन्या भ्रण हत्या पर रोक लगाने के लिए 1994 मे गर्भधारणा पूर्व और प्रसव पूर्व निदान तकनीक अधिनियम पारीत किया गया |
12 घरेलू हिंसा से महिलाओं की सुरक्षा के लिए 2005 मे घरेलू हिंसा महिला संरक्षण अधिनियम पारीत किया गया |
13 महिलाओं का कार्यस्थल पर लैंगिक उत्पीडन अधिनियम 2013 द्वारा महिलाओं को सुरक्षा प्रदान की गई |
उपसंहार : उपरनिर्दीष्ट संविधानिक प्रावधानो द्वारा तथा कानूनो के माध्यम से महिलाओं के मानव अधिकारो की सुरक्षा के लिए सरकार द्वारा प्रयास किए जा रहे है | इन कानूनो के बाद भी महिलाओ

पर होनेवाले अन्याय और अत्याचार कम नही हूए, उसमें हर दिन वृध्दी हो रही है | आज भी हमारे देश मे महिला हिंसा की घटनाएँ हो रही है | बलात्कार लैगिक उत्पीडन दहेज प्रताडना और मृत्यु आदी घटनाए हो रही है | महिलाओं मे शिक्षा का प्रचार प्रसार करने के पश्चात ही वह अपने अधिकारो के लिए जागरूक हो सकती है | समाज का भी यह दायीत्व है की स्त्री पुरूष समानता प्रस्थापित करने लिए करने के लिए, और नारी सुरक्षा के लिये प्रयास करे |

संदर्भ सूची

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2 महिला मानवाधिकार संरक्षण बनाम वस्तुस्थिती – आशा कौशिक – अविष्कार पब्लीशर ॲन्ड डिस्ट्रीब्युटर्स, जयपुर
3 महिला और मानवाधिकार – रजा शर्मा, एम. के. शर्मा – अर्जून पब्लीशिंग हाउस नई दिल्ली
4 मानवाधिकारी और महिला विमर्श – डॉ.धर्मवीर चंदेल – पोइन्टर पब्लीशर्स, जयपुर

''बालविकास मे महिलाओं की भूमिका''

प्रा.सौ.सुषमा सु.जाजु

(गृहअर्थशास्त्र विभाग प्रमुख)यशवंतराव चव्हाण कला व विज्ञान महाविदयालय मंगरूळपीर

प्रस्तावना :

बालक को प्रत्येक राष्ट्र की बहुमूल्य निधी माना जाता है। क्योंकि आज का बालक ही कल नेता, कलाकार, मतदाता राजाध्यक्ष, उपाध्यक्ष, उभभोक्ता, शिक्षक, डॉक्टर, इंजिनियर आदि. बनता हैं। हम सभी कल्पना करते है की भविष्य का संसार अच्छा हो। लेकिन,दुर्भाग्यवश शिशुओं के पालन–पोषण और स्वास्थय की और समुचित ध्यान नही दिया जाता है। उसी वजह से उनका संर्वांगिण विकास नही हो पाता है। अत: यह आवश्यक है कि शिशुओं कि स्वास्थ रक्षा और पोषण पर पूरा ध्यान दिया जाय। बालकों के पालन–पोषण का दायित्व बहूत हद तक मॉ. के उपर होता हैं। अत: जरूरी है कि माता को भी मातृत्व के सभी पहलुओं की जानकारी हो जिससे वह बालक का सर्वांगिण विकास कर उन्हे एक आदर्श बना सके।

परिभाषा

इ.बी हरलॉक के मतानुसार ''आजकल बालविकास मे मुख्यत: बालक के रूप, व्यवहार, रूचिया और लक्ष्यों मे होनेवाले उन विशेष परिवर्तनो पर बल दिया जाता है,जो उसके विकासात्मक अवस्था से दूसरी विकासात्मक अवस्था मे आते समय होते है। बालविकास साथ–ही–साथ यह भी खोज करने का प्रयास किया जाता है कि ये परिवर्तन कब होते है, क्यों होते है और से वैयक्तिक है या सार्वभौमिक.''

संशोधन पध्दती

प्रस्तुत संशोधन के लिए दुय्यम स्त्रोत का उपयोग किया गया है। इसमे प्रकाशित, अप्रकाशित, पुस्तको, समाचार पत्र इसकी उपयोग किया गया है। संकलित जानकारी के उपयोग से इस शोधानिबंध की योग्य रचना की गयी है।

उद्देश्य

१)बालक के व्यवहार संबंधी समस्याओं का ज्ञान।
२)बालको के व्यवहार को नियंत्रित करने के उपायों की खोज।
३)बालको के व्यवहार के संबंध मे पूर्व–कथन।

बालविकास का अध्ययन क्षेत्र

मुख्य दो वर्ग मे बॉटा जा सकता है।

१) जन्म से पूर्व की विकास अवस्था–पहली गर्भधारणा से दो सप्ताह तक की अवस्था, दुसरी, तिसरे, सप्ताह के चौबीस सप्ताह तक की अवस्था, चौथी, चौळीस सप्ताह से जन्म तक की अवस्था। दूसरे शब्दों मे गर्भस्थ शिशु को तीन अवस्थाओं मे बॉटा जाता है। १) वीजअवस्था २) पिंड अवस्था ३) भ्रुण अवस्था–

२) जन्म के उपरान्त की विकास अवस्था–इस विकास को पॉच प्रमुख भागों मे वॉटा जाता है। १) शैशवावस्था जो जन्म से दो सप्ताह तक होती है। २) बचपन–जो दो सप्ताह से दो वर्ष की होती है। ३) बाल्यावरता जो दो वर्ष से बारह वर्ष तक की होती है। ४) किशोरवस्था जो बारह से अठारह वर्ष तक की होती है। ५) इसके पश्चात किशोरलय्या , जो अठारह वर्षे से इक्कीस वर्षे तक की होती है।

गृहीतके

१) बालविकास मे माता — पिता की भूमिका बराबर की होना चाहिए।
२) बालविकास का अध्ययन छात्र–छात्राओ दोनो को समान रूप से करना चाहिए।
३) प्रत्येक बालक को पौष्टीक भोजन पर्याप्त मात्रा मे मिलना चाहिए।
४) भोजन मे बालको को रूचि एवं इच्छा का भी ध्यान रखना चाहिए।

बालविकास मे महिलाओं की भूमिका को मध्य नजर रखते हुये हम यह दावे के साथ कह सकते है कि बालविकास मे महिलांओं की भूमिका बहुत ही महत्त्वपूर्ण रही है। कार्ज मातृत्व' शब्दबहुत ही विस्तृत और व्यापक अर्थ रखता है। यह एक नारी को पूर्णता प्रदान करता है। मातृत्व के अभाव में नारी का जीवन अधूरा है। भारतीय नारी को समाज तथा परिवार मे सन्मान दिलाने मे मातृत्व का पूर्ण योगदान है। जो स्त्री मातृत्व कोनही प्राप्त कर पाती है। उसे परिवार तथा समाज मे हेय दृष्टि से देखा जाता है। मांगलिक कार्यों के लिये भी ऐसी स्त्रीको शुभ नही माना जाता है। भारतीय नारी के लिये परिवार व समाज मे सामाजिक मान और प्रतिष्ठा पाने के लिये मातृत्व जरूरी है। मातृत्व को सृष्टि का आधार माना जाता है क्योंकि इससे प्रजाति मे निंरतरता बनी रहती है और समाज का अस्तित्व कायम रहता है।

'मातृत्व' शब्द में 'मॉ' शब्द का समावेश है जिसका तात्पर्य माता से है अर्थात 'बच्चो को जन्म देनेवाली स्त्री'। लेकिन यह 'मॉ' शब्द तभी गरिमायुक्त माना जाता है जबकोई मॉ. जन्म देने के बाद अपने शिशु का पालन–पोषण उचित रूप से करती है। जिससे वह एक सुयोग्य नागरीक बन सके। वही मॉ 'सुजननी' कहलाती है जो शिशु को जन्म के उपरांत अपना सर्वस्व न्योछावर कर अपनी सतांन की देखभाल करती है और उसके जीवन को सुखी बनाने का प्रयत्न करती है तथा समाज के सुयोग्य नागरिक के रूप मे उसका विकास करती है। अगर मातृत्व का अर्थ केवल सन्तानोत्पत्ति ही हो तो मॉ तथा मादा जानवर मे कोई अंतर नही रह जायेंगा क्योकि एक मादा जानवर भी अपने बच्चे को जन्म देती है। अत: सफल मातृत्व का अर्थ सुसंतान की प्राप्ती तथा 'शिशु कल्याण दोनो है।

बालविकास और माता–पिता का उत्तरदायित्व–बालक का संपूर्ण विकास करना माता–पिता का कर्तव्य है। यदि माता–पिता के आपस मे संबंध अच्छे होगे तो बालक के भी उनसे अच्छे संबंध होंगे

शारीरिक उत्तरदायित्व –माता–पिता का यह प्रथम उत्तरदायित्व है कि व बच्चो की शारीरिक देखरेख का कार्य करे। इसके अतंर्गत निम्न कार्य करने चाहिए।

१) शारीरिक रक्षा – माता–पिता को बालको के शरीर की रक्षा करनी चाहिए। शारीरिक चोट व बीमारी की अवस्था मे सेवा सुश्रुषा की व्यवस्था करे! जन्म के समय के बाद मे नवजात शिशु व मॉ की देख रेख करें।

२) भोजन का प्रंबंध – माता–पिता को बालको के भोजन की व्यवस्था करनी चाहिए ताकि उनके शरीर का अस्तित्व बना रहे अर्थात ये जीवित रह सकें । अच्छे भोजन के साध – साथ बालक को भोजन करने के नियम बताए। बालक भोजन चबाकर खाए, यह वात उसे अवश्य सिखाना चाहिए। बालक को बलपूर्वक उसकी इच्छा के विरूध्द न खिलाऍं।

३) निवास तथा वस्त्रो की व्यवस्था – माता–पिता अपने परिवार के रहने के लिये घर की व्यवस्था करते हैं। जहॉ वे धूप, गर्मी, सर्दी व वर्षा आदि से अपनी रक्षा कर सके तथा आराम से रहसके। घर मे पर्याप्त शुध्द वायु और सूर्य का प्रकाश आना चाहिए। मकान के पास हरियाली तथा खेलने का स्थान हो। ऋतू के अनुसार वस्त्रो का उपयोग आवश्यक है। उसी प्रकार बालको को वस्त्र पहनाऍं।

४) स्वच्छता संबंधी ध्यान देना – माता–पिता को बालको का व्यक्तिगत तथा सामाजिक स्वच्छता पर ध्यान देना चाहिए। बालक सोकर उठते ही शौचदि जाऍं, दॉत–मूँह साफ करे, स्नान करे, वस्त्रो की सफाई पर ध्यान दे। सफाई के महत्व के बार में उन्हे बालको को बताना चाहिए।

इसीप्रकार माता–पिता को बालविकास के लिए सामाजिक उत्तरदायित्व, मनोवैज्ञानिक उत्तरदायित्व, आर्थिक उत्तरदायित्व की ओर भी ध्यान देना चाहिए।

संशोधन की सिमाऍं–

- यह संशोधन सिमित समय पर पूरा किया गया है।
- यह जानकारी दुय्यम संकलन से की गयी है।
- यह जानकारी सिमित संकल्पन द्वार ली गयी है।
- यह संकलन मे कुछ त्रुटीया रह सकती है।

शिफारस —

- नवीन वातावरण के साथ समायोजन मे सहायक।
- मानव व्यवहार को समझने में सहायक।
- बालक के व्यक्तिमत्व विकास मे सहायक।
- बालको मे कई मूल्यों का निर्माण करे।
- व्यवसायिक दृष्टि से सहायक हो।
- बालको का स्वस्थ विचारों वाला तथा समाज का अच्छा सदस्य बनाने मे मदद हो।
- बालक को स्वयं: की योग्यताओ को समझने तथा विकसित करने मे सहायता हो।
- माता—पिता बालक के लालन पालन में प्राय: ऐसी स्वस्थ विधियों व पध्दतीयों को अपनाने लगे है।

निष्कर्ष —

नवजात शिशुओं की देखभाल माता—पिता व परिवार की एक प्रमुख जिम्मेदारी हारी होती है। जन्म के पश्चात बालक अबोध व पराक्षित होते है। उन्हे हर पल ऐसे व्यक्ति की जरूरत होती है। जो उनकी सही देखरेख करे। यह दायित्व सर्वप्रथम माता को निभाना होता है। माता अपने बच्चे के साथ सहानुभूति का व्यवहार करने तथा उनकी समस्याओं को पुर्ण रूप से हल करने में सहायता प्रदान करते है। बालको का जीवन घटाने की जबाबदारी माता—पिता तर होती है इसलिए बालको के जडणघडणी के इस महत्वपुर्ण कालखंड में बालको से पालक का व्यवहार ऐसा होना. यानी जिसका अच्छा प्रभाव बालकोके व्यक्तिमत्व पर दिखाई देता है। बालविकास मे माता—पिता की भुमिका बराबर की रही है। परंतू, दुर्भाग्यवश हमारे पुरूष—प्रधान समाज मे बच्चो को पालने का अधिकांश दायित्व माता को ही सौप दिया जाता है। बच्चों का लालन—पालन महिलांओ का कार्य माना जाता है। मेरी दृष्टी से यह सर्वदा अनुचित हैं। बालविकास का अध्ययन छात्र छात्राओं दोनो को समान रूप से करना चाहिए क्योकि उन्हे कल पिता—माताकी महत्वपुर्ण भूमिकाऍ निभानी है। इसीलिए बालविकास यह केवल महिलाओं की ही भूमिका है ऐसा नही तो पिता कोभी यह उत्तरदायित्व स्विकारना होंगा।

संदर्भ ग्रंथ सुची

१) बालविकास एवं शिक्षा संदर्शिका — डॉ. प्रमिला श्रीवास्तव
२) बालविकास तथा पारिवारिक संबंध — रमा शर्मा, एम.के. मिश्रा
३) मातृत्व आणि बालविकास शास्त्र — त्रिवेणी फरकाडे, सुलभा गोंगे
४) गृहअर्थशास्त्र मानवी विकास — डॉ. कल्पना कोरडे
५) शिशु परिचर्या— सुचिता श्रीवास्तव
६) मातृकला एवं बालविकास — अनुपम रानी

Impact Of Ict On Library Services

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Abstract:

Libraries and information centres play an essential role in meeting society's information needs. Information Technology (IT) in libraries is having a remarkable impact worldwide. Information Technology has brought about varieties of form of libraries and mode of disseminating information. Computers as well as other information technology have come to play prominent roles in information management. It is unthinkable that any academic library can function effectively without the appropriate use of IT. Even digital library also made effective to follow the latest technology. In the present era the world is moving towardsthe online acquiring knowledge of any subject. Even UGC direction contain the MOOC's important and e-contents significance. Some new terminology of technologies is introduced and some new generic application categories for future learning technologies are also proposed. It is the info-technological revolution, led by advances in information and communication technology, is re-structuring the global social economic equations-shifting from income divide to knowledge divide. There is growing awareness in LIS profession thata new vision of ICT and learning is needed that takes into account the shifts and trends that are transforming. This paper discusses some ICT based conventional new services arguing that learning, knowledge and innovation.

INTRODUCTION :

Technological advances, and particularly the development of the internet and the World Wide Web, have changed the face of librarianship and have posed serious questions for libraries and LIS professionals. Among the more significant social and economic impacts of the World Wide Web is the increasing amount of freely available information, something that has resulted in changes to information behaviour. People have come to believe that they can find everything through the web. While general IT application tools and Integrated Library Management Systems are largely used in house keeping operations, like acquisition, cataloguing, circulation control, serials control etc; Internet has been used extensively as a resource as well as a tool to deliver the Library and Information Services (LIS).

Libraries are using the Information Technology in general and to automate a wide range of administrative and technical process, build databases, networks and provide better services to their users. The use of IT has become imperative for the efficient management of modern libraries. Library Automation is one of the major applications of IT in libraries. It is helped to change the libraries In-house activities (Acquisition, Cataloguing, Indexing, Serial control, Circulation etc.) from manual system to automation (Venkataraman, 1998). Effective use of IT in libraries increase efficiency in operations, eliminates repetitive nature of works, improves the quality and range of services, facilities easy and wider access to all kinds of information sources, facilitates faster information communication, increase moral and motivation of library staff, facilitates cooperation and resource sharing, save time, space, improves productivity and image of library (Venkataramana, 1998). Benefits of use of ICT in services can be broadly explained in terms of 4 Es, namely economy, ease, extension (or expansion) and efficiency. (Chauhan, 2004).

Libraries which were considered only as the storehouses of knowledge have got a new outlook in the modern Information Communication Technology era. The activities which were carried out manually in libraries with so much of pain and strain are being carried out smoothly with the help of ICT with greater effectiveness. Information Technology is an essential partner as it facilitates access to vast library information services to support in higher education in India. It has the potential to improve library services in several ways. The continuous improvement in information technologies helps libraries to reduce the cost of information provision, thus creating new opportunities for libraries to play their role in information provision to its end users. Information technology support library services help to find out any required information at anywhere at anytime through integrated and networked resources. Information technologies have changed the traditional library system to electronic one.

In the specific context of LIS, one of the implications of use of ICT is that Libraries can reach out globally to provide their services 24-hours a day in very cost effective manner. ICT has enabled users

to avail many services without any human intervention, the role of the role of LIS professional is changing from an intermediary to a facilitator and enabler. The ICT services have grouped into two categories as follow:

ICT Based Conventional Services ICT Based New Services

Computer and internet have made this service is very easy and useful. By computer various publishers and aggregators send table of content of electronic journals on various subjects to the wane site of users. Library disseminates its information related to newspapers through the media of internet to its users. A large number of electronic publishing sites or portals now offer current information via email to registered users.

Document delivery has always been at the heart of services offered by libraries. Document delivery needs to embrace the delivery of both print and electronic document. ICT has made the document delivery services very simple and reliable. A large number oflibraries now host their up to date holdings on their website and can be searched on internet. ÎNFLIBNET, DELNET, INDEST etc. are providing document delivery services across the country.

Through the media of computer and internet, the reference service becomes very easy because various information resources available on the internet to the users. Asynchronous tools such as email, subject gateways, FAQs, and electronic libraries and interactive tools likechat rooms, virtual reference desk, and ask-me are replacing the conventional means of post, phone or inperson reference enquiries. Ask-a-Librarian allows the user to click on ask-a- librarian link to send a formatted enquiry to the reference librarian.

Compilation of bibliographies, reading academic libraries. Browsing through the manual indexes and abstracts is a tedious and time consuming work, and does not always produce up to date result. Availability of databases in electronic form on CDROM or online, offers convenient, efficient and cost effective information retrieval. Electronic databases also provide unique search features such as searching on multiple criteria (key! word, subject, author, source, classification code, year of publication, language etc.), and variety of display formats & styles.

Resource sharing through Inter-library loan is a necessity for the libraries because no library can fulfill all the needs of its users from its collection. Access to the catalogue of partner libraries is crucial to inter-library lending. Union catalogues standardization and machine readable catalogues are aimed at promoting resource sharing Librarians can now access catalogues of thousands of libraries across the world using Internet. Developments in digital library and internet technologies have made it possible to automatically update the catalogue records from member library systems, distributed searches using a single user interface, and value added services.

The advent of computers, with their ability to process large amounts of information and output in a variety of formats has finally brought the library to the customer, in the form of Online Public Access Catalogue (OPAC). OPAC provides access to the catalogue through a computer terminal. OPAC allows searching the entire catalogue online, conveniently and quickly, using one or more search criteria. One can, for example, search by author, title, keywords, class number or one or more of these combined together . Web-OPACs are next generation of OPACs Web-enabled OPACs allow users to search library catalogues and access other services from any client at anywhere at any time. It helps libraries to overcome space and time barrier in Library Services.

Background :

The media of computer had made photocopy and reproduction of documents has become very accessible. When once printed documents are converted into digital form, then large number of copies can be reproduced.

ICT BASED NEW SERVICES :

Apart from the ICT enabled conventional services, Libraries are making use of potential of internet and computing power to provide new and innovative services. In a web enabled environment the new LIS services can be grouped into the following three categories:

Providing access to internet and internet based services

Providing access to web based resources

Providing access local or internal information resources in digital form

Access to Web Based Resources :

Electronic Journals (E-journal) can be accessed via internet from any web enabled PC. Depending on the type of subscription, one or more users can access the service simultaneously, either directly from an independent web enabled PC or ina local area networkthrough a proxy server (IP addresses based access). Electronic journals also offer benefit of full text searching and downloading of articles. Many publishers of electronic journals offer their journals through consortia of libraries at much lower rates, INDEST (Indian Digital Library of Engineering, Science and Technology), and INFLĪBNET are two such consortia operating in India.

E-Book has been described as a text analogous to a book that is in digital form to be displayed on a computer screen. E-book offer advantages like portability, 24 hours access, text search, annotation, linking, and multimedia and self-publishing possibilities. theses in electronic format. Some initiatives such as Networked Digital Library of Dissertation and Theses (NDLTD) in development of web based union catalogues of ETDs submitted over100 libraries throughout the world are worth mentioning.

Access to Resources in Digital Form :

Digital Library and Institutional Repository- Creating a digital library is the latest phenomenon being observed and advocated by the group of librarians, especially the librarians working in the academic environment. Such Institutional repository is the marquee of an institution to the world, where institution displays its worthwhile research programmes, projects, and initiatives to the broad spectrum of audience in the world. An institution outreaches its findings that in turn encourage other institutions and organizations to collaborate and to share their knowledge, expertise and skills.

CONCLUSIONS :

Information and Communication Technology (ICT) has brought unprecedented changes and transformation to academic library and information services. Conventional LIS such as OPAC, users services, reference services, bibliographic services, current awareness services, Document delivery, interlibrary loan etc. can be provided more efficiently and effectively using ICT, as they offer convenient time, place, cost effectiveness, faster and most-up-to-date dissemination and end users involvement in the library and information services process. Development in information and communication technology has resulted in the emergence of open access institutional repository which is a digital archive for thepreservation and dissemination of institutional research outputs. Institutional repositories make possible wide dissemination of research outputs by the mean of the internet. The growth of open access institutional repositories has been very remarkable in many developed countries. With the advancement in information technology, there have been a lot of changes in the concept of traditional library work as well as service. The library movement in India is rapidly increasing and the traditional libraries are now on their way to digitization in a phased manner. The implications for the ICT revolution, and consequently for ICT enabled learning as one of the key applications for the development of the information society, are promising.

It has also given an account of the role of ICT enabled learning in addressing some of the challenges. Most learning programs and education and training institutions are currently organised, understandably, according to the characteristics and needs of late industrial societies.

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Important Roles of Women in Child Development

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Introduction

The woman performs the role of wife, partner, organizer, administrator, director, re-creator, disburser, economist, mother, disciplinarian, teacher, health officer, artist and queen in the family at the same time. Apart from it, woman plays a key role in the socio-economic development of the society.

Mothers play a critical role in the family, which is a powerful force for social cohesion and integration. The mother-child relationship is vital for the healthy development of children. And mothers are not only caregivers; they are also breadwinners for their families. The early years of a child's life are very important for his or her health and development. Healthy development means that children of all abilities, including those with special health care needs, are able to grow up where their social, emotional and educational needs are met. Having a safe and loving home and spending time with family—playing, singing, reading, and talking—are very important. Proper nutrition, exercise, and sleep also can make a big difference.

Women are the primary caretakers of children and elders in every country of the world. International studies demonstrate that when the economy and political organization of a society change, women take the lead in helping the family adjust to new realities and challenges. They are likely to be the prime initiator of outside assistance, and play an important role in facilitating (or hindering) changes in family life.The traditional social role of women is that of the lady of the house, taking care of the family, being focused on children and their happiness.

The importance of child development

The first three years after birth are one of rapid growth and development, as a child's brain creates complex neural pathways at an unprecedented speed. By age six, the brain has developed to 90% of its adult size,as children continue to absorb a staggering amount of information from their experiences and environment. These early experiences, both good and bad, lay the foundation for a child's future survival, growth, health and wellbeing. Research has consistently shown that good early childhood development will have a direct positive impact on a child's long-term health outcomes and will improve future opportunities, school attainment and even earning potential. Particularly important is the impact of this period on a child's emotional and social development, which is vital for their future confidence, communication, relationships, community inclusion and mental health.

Early childhood development is a period of great opportunity, but also one of great vulnerability. Many children cannot realize their full potential because of adverse conditions in their environment. For example, evidence from research showed that children who receive little sensory stimulation in their rural homes are vulnerable to stunting, low-weight and decreased psychomotor development. Factors like inadequate nutrition, environmental toxins, unstable caregiving, limited stimulation and stress can all negatively impact on a child's development. Children living in poverty and fragile living conditions, such as war or displacement, are particularly vulnerable to inadequate development. These adverse childhood experiences may also cluster and be compounded over time. For instance, a child

living in poverty is more likely to experience stress, malnutrition and unstable caregiving, all of which negatively impact on child development.

Adverse effects to child development in the first years of life can have life-long consequences and can negatively impact on school readiness and learning potential, mental and physical health as an adult, resilience to stress and resolving conflict, as well as depleted family resources and inter-generational poverty.However, recovery is possible with appropriate intervention and support. Investment in child development policies and programmes will result in long-term returns, as children with adequate support in their early years are healthier, better educated and more likely to contribute to society and the global economy.

Important of Women in Child Development

Being a mother is one of the most important roles a woman can ever play. Mothers play a huge role in their children's lives, caring for them, loving them, teaching them, and so much more.

Children thrive when they have a secure and positive relationship with people, especially their parents. Studies have shown that early childhood is a period in which developmentally, a child is learning a lot from their surrounding and the people around them. This is the child's window of learning which will impact their growing years. Therefore, as the main presence in a child's life at this point, a mother's relationship with her child is crucial. A mother plays multiple roles in a child's development, as she is a teacher in every aspect of a child's developmental growth – social emotional, physical, cognitive and independence.

It is the mother in the family who most often urges children of both genders to attend – and stay – in school. The role of women is at the front end of the chain of improvements leading to the families, the community's long-term capacity.

Women and Children constitute a larger segment of society and have an equal contribution to the nation-building process. Women and children development constitute around 70% of India's total population and are the core pillars for national development – today and for the future generations. Children are the building blocks of our future generation. It is important that they are well nurtured and given every opportunity for growth and development in a safe and sustainable environment.

It is important to understand why women are so important in families and how they shape society. Having a motherly figure in your child's life, which can pertain to not only a mom, but can be a grandma, aunt, etc., can significantly influence a child's growth and development. Women have an essential role to play when it comes to boosting a child's development.

There is not a perfect way to be a mother. Some mother figures do not have partners, and others live with friends, conventional family structures, etc. All of these situations are valid and will shape the child differently. No matter what the environment and family dynamic may look like, the only important thing, and generally the same, is the love shown and expressed for their child.

One of the most critical roles in a family a female member plays is the role of nurturer. When a mother nurtures a child, the child learns to be loving and to understand goodness. Because of this affection and love, we learn to love, as well as share the love. This is not to say that male family members do not possess this trait, but it is typically a female counterpart. This is a crucial role that mothers and motherly figures play in the lives of their children.

Not only do Mothers play an essential role in individual children's lives, but they also play a vital role in daily family life. The functions in a home are not always straightforward, but women tend to be more of the home's heart. Women are known to manage responsibility for the daily chores and are often the ones to smooth conflict, plan family events, and keep the family together during hard times. Of course, male family members can do this as well, and

many do have the nurturing side in the family, but male figures tend to lead new adventures for the family. This role is just as essential for children.

Mothers also play an important role in coordinating responsibilities. Genetically, women have a more peacekeeping mindset, setting up chores and other responsibilities fairly. Mothers often do this well and may help smooth out any disagreements that occur while running the daily home.

It is without a doubt that women in families deserve all the love for risking their lives in childbirth, providing the basics, raising children through difficult times, and for the constant love and guidance. Women have a divine role in their family's lives and in society and around the world.

A mother can greatly influence child's growth and development. She has an extremely important role to play when it comes to boosting child's development. Read on to learn about the 10 important roles of a mother in child development.

Important Roles and Responsibilities of Mothers

Have a quick look at the important roles and responsibilities of mothers in child development.

1. Strongest Emotional Bond with the Child

A mother is the first one to know and connect with her child. Even after birth mother is the first care-giver to her children. The way they interact with child during the early months and years leave a deep impact on child. It will get reflected in the social and emotional setting of child in later years.

2. Giving Proper Environment for Right Development

Mothers are responsible for the environment that a child gets from the very beginning. Giving apt space for movement, creativity and play offers right environment for child development.

3. Child's Behavioral Development

A mother knows her child more than anyone else. Therefore, child's behavioral development is closely observed her. Observing child and listening to her voice gives mother an impression of what is going on inside her.

4. Instils Trust and Security

Mothers can teach children how to trust and be trustworthy. Once this is understood by child, she will be confident and emotionally secure. Be around your children when they need you and help them become better. Your unconditional love and support will help them improve their selves.

5. Family Bonding

A mother helps her child learn about the importance of family as she is the back bone of the family and holds everyone together. Have family meals together and encourage your child to spend time with family members.

6. Be kind, Loving and Caring

If you are kind, loving and caring to your child in daily activities, it will automatically teach her to be the same kind of person when she grows. Your behavior towards your child has a lasting impact on her development not only when she is a child, but after she grows up as well.

7. Be Thoughtful and Sensitive

When you understand and respond properly the way your child is thinking, your child will grow up to be a sensitive person. She will be able to understand other person's perspective also. This will be very helpful in maintaining relationships.

8. Positive Attitude

Since a mother is soft and handles things in a positiveway, it teaches the child that no matter whether life is tough, it can be handled in a better way. You can discuss the problems with your children and explain how you are going to tackle it.

9. Role of Routine and Discipline in Life

Since a mother helps a child maintain a regular set of pattern in early days, it conveys a message that things can be managed easily and comfortably by following a routine.

10. Hard Work

A child learns to work hard from her mother. On the other hand your child might see that at the end of the day you get tired but if you explain the pleasure and satisfaction that you get from working hard, the right message will be delivered.

A mother supports and helps her child in improving herself throughout her life. Role of a mother greatly influences child's overall development and well-being.

Parents' life change when their child arrives. A mother has to look after each need of her child and take care of everything related to her. Although, all mothers are aware of their duties, it can become easier for mothers if they understand their roles and responsibilities thoroughly.

Becoming a mother changes entire life and lifestyle as well. Right from the time you become pregnant you have to undergo different types of challenges and surprises. Knowingly or unknowingly you constantly do a lot of things for your child.

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महिला और हिंसा

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प्रस्तावना :— किसी भी समाज व्यवस्था में महिलाओं को महत्वपूर्ण स्थान प्राप्त है द्य समाज और राश्ट् के निर्माण मे महिलाओं का योगदान पुरूशो के समान होता है द्य महिला जगत जननी है, वह सारे विष्व का पालणपोशण करती है परंतु प्राचीन काल से उसकी नींदा ही कि जाती है द्य इस पुरूश सत्ताक समाज ने महिलाओं को अपने समकक्ष अधिकार नही दिए महिला का दायरा घर और बच्चो तक सिमित रखा गया जीवन के हर एक क्षेत्र में उसमे साथ भेदभाव होता रहा है द्य महिलाओं के साथ अभद्र व्यवहार छेडछाड, घरो, सडको बगीचो कार्यालयों सभी स्थानो पर देखा जा सकता है महिला हिंसा आम बात बन गई है द्य न्यूज पेपर और न्यूज चॅनलो पर महिला हिंसा की घटनाएॅ हर दिन दिखाई जाती है द्य बलात्कार, दहेज, उत्पीडन, हत्या आदी के मागले प्रकाष मे आते है द्य महिलाओं का अपहरण करके उनको वैष्या व्यवसाय के लिए बाध्य करना जलाकर मार देना, एवं षारिरीक और मानसीक यातनाएॅ देकर हिंसा करना सामान्य सी बात हो गई है द्य सरकारव्दारा महिला हिंसा रोकने लिए प्रयास किए जा रहे है द्यभारत के संविधान मे महिला एवं पुरूश दोनो को समान रूप से अधिकार की गांरटी दि गई है द्य कानुन के सांमने सभी बराबर है द्य किसी महिला के साथ पर भेदभाव नही किया जा सकता सरकार व्दारा महिला हिंसा रोकर किए प्रयास करने के बाद भी महिालाओं पर होनेवाली हिंसा कम नही हो रही है द्य हमारे देष मे प्राचीन काल महीला को षक्ती के रूप पुजा जाता है लक्ष्मी, सरस्वती, दुर्गा, आदी देवताओ के रूप मे हमारा समाज नारी को पुजता है लेकिन आज भी बडी संख्या मे कन्या जन्म से पहले उस की हत्यो की जा रही है हमारे अभ्य समाज मे महिला हिंसा पर रोकना एक बडी चुनौती है इस लेख मे हम महिला हिंसा की कारण मिमासा और वह रोकनें के लिए सरकार व्दारा किए जा रहे उपायो की चर्चा करेगे द्य

महिला हिंसा परिभाशा

महिलाओ के निकट रिष्तेदारो जैसे माता पिता भाई बहन सास ससुर या परिवार के किसी भी यदस्य व्दारा अथवा अन्य व्यक्तीयो व्दारा जो हिंसात्मक व्यवहार किया जाता है उसे महिला हिसा कहा जाता है द्य महिंला हिसा के कारण महिलाओ पर षारीरीक और मानसिक आघात पहूचता है द्य हमारे देष मे महिला हिसा हमेषा से चर्चा का विशय रहा है द्य पिधले दषक से हमारे यहा महिला हिंसा मे बढोतरी हुई है घरेलु हिंसा तो हमारे यहा सदैव होती है दहेज प्रताडना और दहेज के लिए ससुराल वालो व्दारा षादी षुदा महिला पर हिंसा की जाती है द्य हिंसा के कारण महिलाओ को हमारे संविधान व्दारा प्रदान किए गए मानवधिकार का हनन हेा रहा है ईसिलिए हमारे देष की महिलाए अपने आप को असुरक्षित महसुस करती है द्य महिला हिंसा रोकने के लिए सरकार व्दारा अनेक कानुन बनाएॅ गए है, लेकीन यह कानून भी महिला हिंसा रोकने मे नाकामयाब हो रहे है द्य महिला हिंसा पर हमारे समाज को आत्मचिंतन करने की आवष्यकता है द्य

महिला हिंसा के कारण

महिला हिंसा के लिए निम्नलिखित कारण जिम्मेदार है —

१ **पुरूश प्रधान समाज** : हमारे देष मे ही नही अपीतु सारे विष्व मे पुरूश प्रधान पध्दत अस्तित्व है द्य मे हमारे देष मे प्राचीन काल से महिला पुरूशोके संरक्षन मे रहती आई है द्य इस पुरूश मानसिकता के कारण पुरूशो व्दारा महिलाओ पर अत्याचार किए जाते है द्य पुरूश प्रधानता यह महिला हिंसा के कारणो मे महत्वपुर्ण कारण है द्य

२ **पुरूशेा पर निर्भरता** : महिलाएॅ जन्म से मृत्यु तक पुरूशो पर निर्भर रहती है आर्थीक दृश्टीसे महिलाएॅ पुरूशो पर निर्भर होने के कारण वह पुरूशी सत्ता और अहंकार को बर्दाष्त करती है द्य जीवनभर पुरूशो पर निर्भर रहने के कारण महिलाओं का जीवन भय और आषंकाओ से भरा रहता है द्य

३ **अषिक्षा** : महिला हिंसा के लिए महिलाओ मे षिक्षा का अभाव होना है द्य महिलाओं के षिक्षा की और ध्यान नही दिया जाता, आजभी उच्च षिक्षा के क्षेत्र मे महिलाओं से ज्यादा पुरूशो को महत्व दिया जाता द्य षिक्षाा पाप्त करने के बाद महिला अपने कदमो पर खडी रह सकती है और किसी भी चुनोतीयों का मुकाबला कर सकती है अषिक्षा के कारण वह अपने अधिकारो से वंचित रह जाती है जिस के कारण वह हिंसा की बली चढ जाती है द्य

४ **संचार माध्यमो व्दारा नारी दर्षन** : महिला हिंसा का कारण सचार माध्याम भी है द्य संचार माध्यामो व्दारा महिला की छवी गलत ढग से दिखाई जाती है जिसका बुरा प्रभाव समाज पर पडता है महिलाओ की गलत छवी प्रदर्षित करने के कारण महिला हिंसा को प्रोत्साहन मिलता है द्य

५ **समाज मे प्रचलित कुप्रथाएॅ** : हमारे समाज मे आज भी बहुत सारी कुप्रथाएॅ आस्तित्व मे है जिसके कारण महिला हिंसा को प्रोत्साहन मिलता है आज भी हमारे समाज मे बाल विवाह पडदा पध्दती देवदासी आदी कुप्रथाए प्रचलित है द्य यह कुप्रथाए महिलाओ के सम्मान पर आघात करती है और इन कुप्रथाओ के कारण महिला हिंसा को बल मिलता है द्य

६ **न्याय मे देरी** : महिला के मामले मे न्यायालय व्दारा न्याय देने मे विलंब या देरी होती है द्य न्यायालय मे मामलो का कई सालो तक खिचते रहना द्य कानुनी प्रक्रीया मे बहुत समय लगाना एवं बहुत ही कम मामलो मे अपराधी को को सजा मिलना यह सभी ऐसे मामलो मे है जो अपराधी को महिला हिंसा के लिए प्रोंत्साहीत करते है द्य

७ **महिला अधिकार कानुनो के बारे मे जागरूकता का अभाव** : महिलाओ मे दहेज पताडना, यौन हिंसा, घरेलु हिंसा, वैवाहिक बलात्कार और हिंसा के खिलाफ सक्त कारवाई करने वाले कानुनो के बारे मे जागरूकता की कमी है द्य
ठसलिए वह हिंसा का षिकार बनती है द्य

८ **पुलीस व्दारा असंवेदनषील व्यवहार** : पुलीस महिलाओ की षिकायत दर्ज नही करती खास तौर से तब जब वह किसी षक्तिषाली समुदाय के किसी षक्तिषाली व्यक्तीद्वारा सताई गई हो द्य पुलीस विभाग घरेलू हिंसा के मामले को गभीरता से नही लेता, हमेषा महिला को दोश दिया जाता है कई बार पुलीस षिकायत दर्ज कराने वाली महिलाओं को ही तंग करने लगते है द्य

महिला हिंसा के प्रकार

महिला हिंसा के निम्नखिखित प्रकार है

१. बलात्कार : बलात्कार महिला हिंसा का एक घिनोना प्रकार है द्यमहिला के इच्छा के विरूध्द उसके साथ लैगिक अत्याचार किया जाता है द्य सामुहिक बलात्कार महिलाओं के षारिरीक और मानसीक भावनाओ को ठेस पहुचाता है द्य बलात्कार के लिए भारतीय कानून मे कठोर षिक्षा का प्रावधान किया गया है द्य

२. दहेज उत्पीडन : महिला हिंसा के लिए हमारे समाज में प्रचलीत दहेज प्रथा जिम्मेदार है द्य विवाह के समय लडकेवाले लडकी वालो से दहेज की मांग करते है द्य दहेज ना मिलने पर विवाहीता का उत्पीडन किया जाता है द्य इस हिसा मे पुरूश के परीवार के सभी सदस्य षामील रहते है, द्य कभी कभी दहेज के कारण उस मासूम नारी की हत्या भी की जाती है दहेज प्रथा रोकेन के लिए हमारे यहॉ कठोर कानून बनाया है द्य

३. **कन्या भ्रृण हत्या** : भारतीय समाज पुरूश प्रधान होने के कारा महिलाओं को हमेषा हेयदृश्टी से देखा जाता है इसलिए बालीका को जन्म लेने से पूर्व ही भ्रृण की हत्या कर दी जाती है द्य भृण हत्या रोकने के लिए १९९४ मे गर्भधारणा पूर्व और प्रसव पूर्व निदान तकनीक अधिनियम पारीत किया गया है द्य

४. **घरेलू हिंसा** : आज महिलाएॅ सबसे ज्यादा घरेलू हिंसा कि षिकार हो रही है द्य महिला का अपने निकटतम रिष्तेदारो द्वारा, जैसे पती, सास, ससूर, नणंद या अन्य रिष्तेदारो द्वारा महिला पर

षारीरीक और मानसिक अत्याचार किया जाता है द्य घरेलू हिंसा आज हमारे समाज का एक अभिन्न अंग बन गई है द्य षिक्षित या अषिक्षित निर्धर या गरीब इन सभी मे घरेलू हिंसा हो रही है द्य घरेलू हिंसा से महिलाओं की सुरक्षा के लिए २००५ मे घरेलू हिसा महिला संरक्षण अधिनियम पारीत किया गया द्य

महिला हिंसा के रूप

१. षारीरीक हिंसा : थप्पड मारना, दांत काट लेना, बाल खिंचना, मारना, मुक्का मारना, हड्डी तोडना, चोट पहूँचाना, तेजाब से हमला करन, गला घोटना और प्रताडना के कारण गर्भावस्था की जटीलता

२. यौन हिसा : यौन हिसा जैसे बलात्कार या बलात्कार की कोषीष, जबरन यौन संपर्क करना, पिछा करता, छेडछाड करना, यौन कार्य के लिए खरीद फरोख्त करना, जबरन विवाह या बालविवाह करना कार्यस्थल पर

४. यौन उत्पीडन करना , परीवार नियोजन के साधन का प्रयोग करने से रोकना, परीवार के अन्य सदस्यों द्वारा यौन प्रयास करना द्य

५. आर्थिक हिसा महिला को भोजन, कपडा, षिक्षा और स्वास्थ देखभाल से वंचित रखना, पुष्तेनी संम्पती और पैसो से जूडे अधिकार न देना काम करने से रोकना, मुफत मे काम कराना आदी

६. **भावनात्क हिंसा** : उपेक्षा, मानसीक, आघात, मार डालने की धमकी देना, अकेले रखना, षक करना, गाली गलौच व ताने, हर काम में कमीयॉ निकालना महिला को सार्वजनीक रूपसे या अकेले में अपमानीत करना

महिलाओं के लिए योजनाएँ

हिंसा पिडीत महिलाओं की मदद के लिए केंद्र सरकार के महिला एवं बालविकास मत्रालय द्वारा निम्नलिखित योजनाएँ कार्यान्वीत किए गये है आपात स्थिती मे महिला को इन योजनाओं के माध्यम से तुरंत सहायता करने का उददेष है ये योजनाएँ निम्नलिखित है –

१. **महिला षक्ती केंद्र योजना** : सामुहिक भागीदारी के माध्यम से ग्रामीण महिलाआं को सषक्त बनाने के लिए महिला षक्ती केंद्र योजना की षुरवात की गई द्य

२. वन स्टॉप सेंटर : हिसा प्रभावित महिलाओं को पता नही होता की सहायता के लिए कहॉ जाए, उनकी मदद के लिए १ अप्रेल २०१९ से पूरे देष मे बन स्टॉप सेटर स्थापित किए गए, यह योजना सखी सेंटर के नाम से लोकप्रिय बन गई है द्य हिंसा से प्रभावित महिलाओ की पुलीस चिकित्सा, कानूनी, मनोवैज्ञज्ञनिक सहायता के लिए यह योजना कारगार साबित हुई है द्य

३. महिला हेल्प लाईन : १ अप्रेल २०१५ से लागू की गई, हिंसा से प्रभावित महिलाओं के लिए आपात काल मे हेल्प लाईन नंबर १८१ उपलब्ध कराया गया ह ैद्य ये हेल्प लाईन नंबर पूरे देष मे कार्यान्वीत होगी और २४ घंटे काम करती रहेगी द्य

४. महिला पुलीस वालंटियर्स : गृह मंत्रालय के सहयोग से यह योजना कार्यान्वीत की गई है द्य इसका उददेष महिला पुलीस वालंटियर्स तैयार करना है महिला पुलीस वालंटियर्स महिला हिसा से लडने के लिए और महिला हिंसा की रिपोट करने के लिए जनता – पुलीस इंटरफेस के रूप मे कार्य करती है द्य

५. सखी डॅष बोर्ड : सखी डॅष बोर्ड एक ऑनलाईन एमआईएस प्लॅटफॉर्म है जिसे सखी बन स्टॉप सेंटरो, १८१ महिला हेल्पलाईनो और महिला पुलीस वालंटियरो मे संपर्क करने वाली हिंसा पिडीत महिलाओं के मामलो की रियल टाईम जानकारी प्राप्त करने और प्रबंधन के लिए अक्टूबर २०१९ मे कार्यान्वीत की गई द्य

महिला हिंसा रोकने के लिए संविधानिक और कानूनी प्रावधान

हमारे देष मे महिला मानव अधिकार की रक्षा करने के लिए निम्नलिखित संविधानिक और कानूनी प्रावधान किए गए है द्य –

अ. संविधानिक प्रावधान

१. अनुच्छेद १४ : इस अनुच्छेद मे स्पश्ट प्रावधान है कि कानून के समक्ष सभी समान है द्य सभी को कानून द्वारा समान सुरक्षा और संरक्षण प्राप्त होगा द्य

२. अनुच्छेद १५ : इस अनुच्छेद मे यह प्रावधान है कि राज्य किसी भी नागरीक के विरूध्द किसी आधार पर भेदभाव नही करेगा द्य राज्य किसी नागरीक के साथ धर्म, लिंग, प्रजाती, जन्मस्थान,भाशा आदी के आधार पर भेदभाव नही करेगा द्य

३. अनुच्छेद १६ : राज्य के अधिन किसी रोजगार या नियुक्ती मे नागरिको के लिंग, आयु, जाती, धर्म, वंष आदी के आधार पर अयोग्य घोशीत नही करेगा द्य

४. अनुच्छेद २१ : यह अनुच्छेद प्राण, दैहीक स्वंतत्रता और संरक्षण के अधिकार की व्यवस्था करता है द्य यह अधिकार स्त्री — पुरूश को समान संरक्षण देता है द्य

५. अनुच्छेद २३ : यह अनुच्छेद मानव व्यापार, महिलाओं का अनैतिक देह व्यापार, बेगार या अन्य प्रकार की बन्धुआ मजदूरी को निशेध घोशीत करता है द्य

६. अनुच्छेद ३९ : स्त्री और पुरूश को समान रूप से उपजीवीका के पर्याप्त साधन प्राप्त करने का अधिकार है द्य

७. अनुच्छेद ३९ अ : स्त्री और पुरूश कर्मचारी के स्वास्थ और षक्ती का दुरूपयोग ना हो, इसकी व्यवस्था करता है द्य स्त्री यो के लिए प्रसुती काल मे अवकाष की व्यवस्था है द्य

८. अनुच्छेद ४२ : इस अनुच्छेद मे गर्भवती और दूध पिलाने वाली महिलाओं के हितो की रक्षा करने का प्रावधान है द्य

९. अनुच्छेद ५१ : संविधान के निती निर्देषक तत्वो मे महिलाओ के अधिकार सुनिष्चित किए गए है द्य

१०. अनुच्छेद ३२५, ३२६ : निर्वाचन मे महीला और पुरूशो को समान रूप से मत देने का और चुने जाने का अधिकार द्य

ब. कानूनी प्रावधान

१ सती प्रथा निशेध १८२९ अधिनियम तथ सती प्रथा निवारण अधिनियम १९८७ : :भारतीय समाज मे प्रचलीत सती प्रथा समाप्त करने के लिए यह कानून बनाए गये द्य इन अधिनियमोद्वारा सती होने अथवा सती होने के लिए बाध्य करने वालों के लिए कारावास तथा जर्माने की सजा का प्रावधान है द्य

२ विधवा पुनर्विवाह अधिनियम १८५६ : इस अधिनियम द्वारा विधवा स्त्री को पुनर्विवाह करने का अधिकार प्रदान किया गया

३ बालविवाह निशेध अधिनियम १९२९, १९७६ : १९२९ के बालविवाह निशेध अधिनियम द्वारा बाल विवाह पूर्णत: निशिध्द किया गया १९७६ के अधिनियम द्वारा लडके के विवाह के लिएं लडके की आयू २१ वर्श और लडकी की आयू १८ वर्श की गई

४ चलचित्र अधिनियम १९५२ : इस अधिनियम द्वारा सेंसर बोर्ड की स्थापना की गई, सेंसर बोर्ड फिल्मो मे महिलाओं की मर्यादा भंग होने पर रोक लगाएगा द्य

५ विषेश विवाह अधिनियम १९५४ : आंतरजातीय तथा आंतरधर्मिय विवाह करने के उपरान्त महिलाओं को पैतृक संपती मे उत्तराधिकार प्रदान किया गया है द्य

६ हिन्दू विवाह अधिनियम १९५५ : यह कानून पतीके परस्त्री गमन, २ वर्श तक पत्नीसे अलग रहना, षारीरीक, मानसिक, अत्याचार सात वर्श से लापता होना, असाध्य रोग का षिकार होना आदी परीस्थीती मे महिला को पती से तलाक लेने का अधिकार प्रदान करता है द्य

७ १९५६ के अधिनियम : द्वारा हिन्दू स्त्रीयों को सम्पती मे अधिकार प्रदान किया और मृत पती के संम्पती पर उसका अधिकार होंगा इस अधिनियम मे २००५ मे संषोधन कर महिलाओं को सम्पती मे समान अधिकार दिया गया द्य

८ दहेज निवारण अधिनियम १९६१, संषोधित अधिनियम १९८६ और २००७ : इस अधिनियम के अंतर्गत दहेज लेना और देना एक दंडणीय अपराध किया गया द्य दहेज मृत्यू के लिए ७ वर्श से आजीवन कारावास का प्रावधान किया गया द्य

९ १९७६ के समान पारीश्रमिक अधिनियम : द्वारा महिला और पुरूश को समान काम के के लिए समान वेतन देने का प्रावधान किया गया द्य

१० ७३ और ७४ वा संविधान संषोधन : द्वारा महिलाओं को ग्रामपंचायत, नगरनिगम, पंचायत समिती, जिल्हा परिशद, और महानगर निगम, मे ३३ प्रतिषत आरक्षण का प्रावधान किया गया द्य

११ कन्या भ्रण हत्या पर रोक लगाने के लिए १९९४ मे गर्भधारणा पूर्व और प्रसव पूर्व निदान तकनीक अधिनियम पारीत किया गया द्य

१२ घरेलू हिंसा से महिलाओं की सुरक्षा के लिए २००५ मे घरेलू हिंसा महिला संरक्षण अधिनियम पारीत किया गया द्य

१३ महिलाओं का कार्यस्थल पर लैंगिक उत्पीडन अधिनियम २०१३ द्वारा महिलाओं को सुरक्षा प्रदान की गई द्य

उपसंहार : महिला हिंसा एक गभीर समस्या है, जो भारत ही नही पूरे विष्व मे महिलाओं को प्रभावित करती है द्य इसकी जडे सामाजिक ढॉचोमे है और समाज के सभी वर्गोमे फैली हूई है द्य हर आयू, धर्म, वर्ग, सांस्कृतीक, जाती, इलाके और षैक्षिक स्तर की महिला इससे प्रभावित होती है द्य महिलों के साथ भेदभाव का चक्र उनके जन्म से पहले ही षुरू हो जाता है, जहॉ लडकीयो के मुकाबले लडको को ज्यादा महत्व दिया जाता है द्य यह भेदभाव और असमान सामाजिक दर्जा महिलों पर होने वाली हिसा के मुल कारण है द्य इसलिए सरकार के प्रयासोके साथ समाज को भी महिला हिंसा को रोखने के लिए संगटीत होना पडेंगा द्य किसी भी प्रगत राश्ट् के लिए स्त्री पुरूश दोनो को समान अधिकार और महत्व प्राप्त होना आवष्यक होता है द्यअगर हमे महिला हिंसासे मुक्त भारत बनाना है तो समय आ चुका है कि हम एक राश्ट्र के रूप मे सामूहिक तौर पर काम करना षुरू करे द्य

संदर्भ सूची

१ महिला और बाल विकास मत्रालय भारत सरकार— वार्शिक रिपोर्ट २०१९—२०, २०२०—२१
२ महिला कानून एवं मानवाधिकार — डॉ. कृश्ण कुमार षर्मा, — अर्जून पब्लीषिंग हाउस, नई दिल्ली
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Survey and characterization of habitat and habitat ecology of freshwater crab *Barytelphusa cunicularis*

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Abstract:

Freshwater crabs occupies most important position in various parts including pond, lake, paddy field, muddy region etc to maintain the stability of ecosystems. Crabs are one of the most important arthropods in the freshwater well as marine water habitat having unique role in nutrient cycling and small scale aquaculture; also it is dominant arthropods in terms of its biomass than others in the particular habitat. Burrows of crab *Barytelphusa cunicularis* were mostly found in areas with boulder and rock in Godavari river basin in two study areas and main river bed in another two tributaries. Frequency of occurrence of crab burrows occurrence in 1.0 M^2 area was varied in four river basins. Average 8, 17.2, 9.35 and 6.92 burrows per $1M^2$ were recorded during six month field visits in year 2015-2017 during late winter to summer season (December to May).

Keywords:

Barytelphusa cunicularis, Habitat, Burrow, Frequency, etc.

Introduction

Freshwater crabs are semi-terrestrial crustaceans. They actively construct the burrows along riverside in muddy and stony areas. Burrows are important to freshwater crabs for a number of functions such as allowing them to adapt to a semi-terrestrial existence, to avoid environmental stresses and protection from predators in water and land. Crab excavates burrows in the mud to avoid wave action of water in their habitat. Crabs excavate tunnel like burrows by dragging up of soil using trailing movement of walking legs and bulldozing it far from the mouth of the tunnel/burrows with the main cheliped (Green, 2004). The crab species excavate burrows of various size and shape (Y, S, J, L, U, V), with more complex architecture (Morrisey *et. al.* 2011). There is strong correlation between burrow size and carapace length of crabs. Each species shows different morphological characteristics (Strachan *et. al.,* 1999). It depends on species and its various purposes (Qureshi & Saher, 2012). The animals those create habitat, that directly or indirectly modulate the availability of resources are considered as "ecosystem engineers" (Lawton and Jones 1995). Present investigation was planned to estimate population density, size and shape of burrow of the crab species. It developed as an important database for suggesting crab-culture model for the fisher community under ex-situ conditions, for the backyard crab culture of this species.

2 Material and Methods

2.1 Study area

The present study was conducted at four study sites namely Godavari river at Dhanagar takli (19º.7′25.1148″ N, 77º3′50.7456″ E), Asna river (19˚14'0.5424"N, 77˚16'9.2496"E), Lendi river (18˚28'16.9716"N, 77˚16'50.2464"E) and Godavari river near Vishnupuri dam at Nanded (19º6′44.7084″ N, 77º17′20.2956″ E) during year 2015-2017. Asna and Lendi River are tributaries of Godavari River situated 5.0 km north east to the Nanded city of Maharashtra state in India.

2.2 Field Study

Field study was carried out during year 2015-2017. It was for crab burrow counting manually in 1 M^2 area from randomly spreaded burrows all across the study area. The selected four sites were characterized by main river bed, river bank with trees, agricultural field, and boulders & rocks (Table 1, 2, 3 & 4).

2.3 Abundance of crab burrows

During 2015-2016 at both study sites of Godavari River (at Dhanagar takli and Vishnupuri Dam) plots were marked each of 1.0 M^2 in rectangular pattern randomly as per availability of burrows in the area (Table.3.1 & 3.2). Similar study was carried out during 2016-2017 at Asna and Lendi River (Table 3.3 & 3.4). Burrows were recorded according to habitat condition used by this crab species. The burrow count was carried out in main river bed, in river bank with trees, in river bank near agricultural field and burrows in boulders and rocks with the help of labours the area was searched and marked for this study.

Observations:

Table 1. The number of burrows/M^2 of *B. cunicularis* recorded during year 2015-2016, in Godavari river (near Dhanagar Takli) Nanded, Maharashtra.

Habitat conditions used for burrow preparation	Burrows/ 1.0 M^2 Counted in 5 plots					Total
	1	2	3	4	5	
Burrows in main river bed	-	-	-	-	-	-
Burrows in river bank with trees	-	-	-	-	-	-
Burrows in river bank near agricultural field	4	6	3	2	1	16
Burrows in river bank with boulders & rocks	5	10	3	4	2	24
Total	09	16	06	06	03	40

Table 2. The number of burrows/M^2 of *B. cunicularis* recorded during year 2015 -2016, in Godavari river (Vishnupuri dam) Nanded, Maharashtra

Habitat conditions used for burrow preparation	Burrows/ 1.0 M^2 Counted in 5 plots					
	1	2	3	4	5	Total
Burrows in main river bed	**4**	**5**	**2**	**3**	**2**	**16**
Burrows in river bank with trees	**1**	**2**	**1**	**1**	**1**	**06**
Burrows in river bank near agricultural field	-	-	-	-	-	-
Burrows in river bank with boulders & rocks	**20**	**18**	**12**	**09**	**05**	**64**
Total	25	25	15	13	08	86

Table 3. - The number of burrows/M^2 of *B. cunicularis* recorded during year 2016 - 2017, in Asna River near Nanded, Maharashtra.

Habitat conditions used for burrow preparation	Burrows/ 1.0 M^2 Counted in 14 plots														Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Burrows in main river bed	06	05	03	04	06	01	01	-	06	-	08	08	07	02	57
Burrows in river bank with trees	-	-	01	-	-	-	01	-	-	-	-	04	-	01	07
Burrows in river bank near agricultural field	03	05	03	04	-	-	-	-	02	-	-	01	03	03	24
Burrows in river bank with boulders & rocks	03	-	03	02	06	01	01	01	06	-	06	04	07	03	43
Total	12	10	10	10	12	02	03	01	14	-	14	17	17	09	131

Table 4. -The number of burrows/ M^2 of *B. cunicularis* recorded during year 2016 - 2017, in Lendi River, Nanded, Maharashtra.

Habitat conditions used for burrow preparation	Burrows/ 1.0 M^2 Counted in 14 plots														Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Burrows in main river bed	12	03	02	01	01	-	02	02	04	01	02	04	01	05	40
Burrows in river bank with trees	02	-	01	01	-	-	01	02	01	01	01	-	01	01	12
Burrows in river bank near agricultural field	06	02	-	-	-	-	01	-	01	01	01	-	01	02	15
Burrows in river bank with boulders & rocks	06	02	04	01	-	04	01	02	01	01	01	02	04	01	30
Total	26	07	07	03	01	04	05	06	07	04	05	06	07	09	97

3 Results

Table 5. Burrow size category and frequency (in percentage) and Mean of total burrows counted ± Error of occurrence in Four Field Station during 2015 -2017.

Size class (Cm)	Godavari River	Vishnupuri Dam	Asna River	Lendi River
5.0-5.5	15	9.3	19	12.37
5.5-6.0	10	29	19.8	15.4
6.0-6.5.	37.5	31.3	39.6	18.5
6.5-7.0	30	25.5	12.9	22.6
7.0-7.5	7.5	4.6	8.39	30.9
Mean ±SE	8 ± 2.35	17.2 ± 4.69	9.35 ± 1.52	6.92 ± 1.56

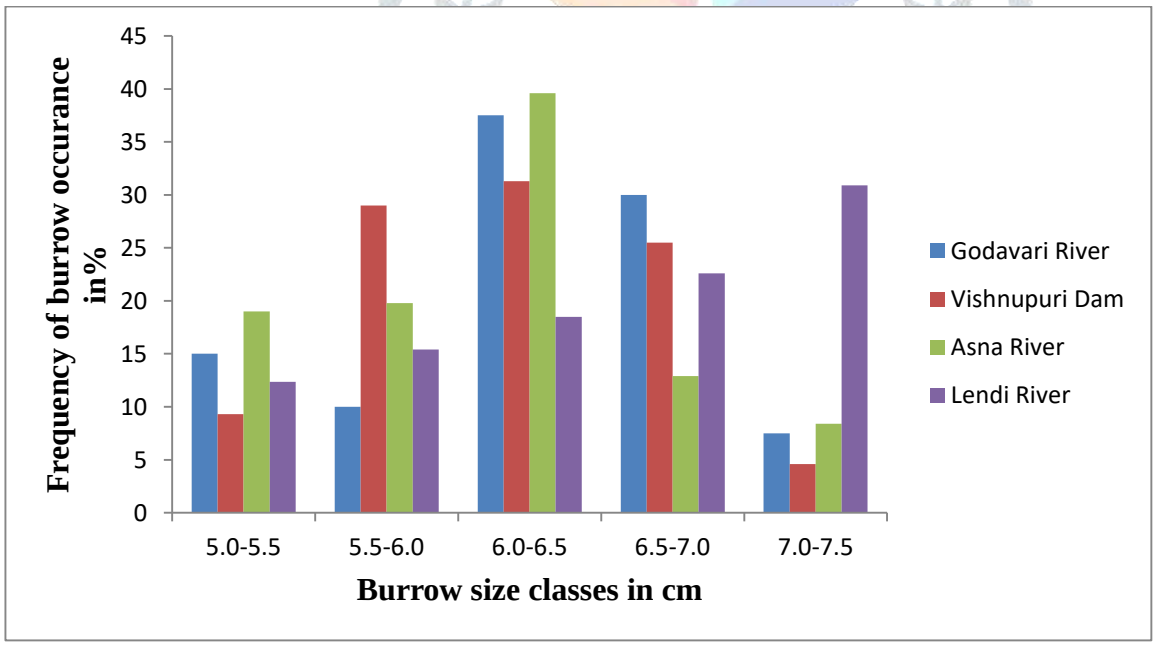

Fig. 1) Burrow size classes (cm) and frequency of burrow occurrence in (%).

Table 6. Descriptions of habitat and habitat ecology of five different Sampling sites.

Habitat Site type	Godavari river (Dhangar Takli)	Godavari river (Vishnupuri dam)	Asna River (Sanvgi road)	Asna River (Pasadgaon)	Lendi River
➢ Coastal vegetation	--	--	√	√	√
➢ Lime stone	--	--	--	--	--
➢ Agricultural land around swamp	√	√	√	√	√
Vegetations in the water					
➢ Plant/ bushes	*Acacea*	*Azadircta indica*	*Ipomea*	*Ipomea*	*Ipomea*
➢ Trees	*Azadircta indica*				
➢ flowers					
Habitat features					
➢ Stony margin	√	√	√	√	√
➢ Muddy margin	√	√	√	√	√
➢ Plant debris	√	√	√	√	√
➢ Animals/ birds					
Types of weeds					
➢ *Chara*	√	√	√	√	--
➢ *Hydrilla*	√	√	--	--	--

a) Under stone

b) Burrow in muddy area

c) Burrow under rock

d) Mud flat

e) Active burrow

f) Under stone

Fig. 2. (a-f). Type of micro-habitat conditions selected for construction of burrows by *Barytelphusa cunicularis* in Godavar River, Asna & Lendi Rivers, and the tributaries Godavari River.

4. Discussion

Crabs are ecologically important creatures in an aquatic ecosystem for nutrient mixing during burrow preparation in a habitat (Wang *et.al*. 2010). Devi, P. (2014) conducted survey in fifteen different field station in backwater area of Cochin, Kerala, India and observed that the crab species *Varuna litterata* construct burrows along the embankments or sides of pools, creeks and shallow banks. Whereas, *Barytelphusa cunicularis* in present investigation construct majority of burrows in river banks with boulder and rock in Godavari river (at Dhanagar takli and Vishnupuri dam, 24 & 64 respectively). Similarly, in the river bed (57 & 40 number of burrows respectively in Asna and Lendi River).

Distribution and abundance of freshwater crab *Potamonautes odhneri* from natural vegetation forest site in rivers of Kenya was examined (Dobson *et.al*., 2007). The adults of this species were found in the river bed, they observed 40% invertebrates reproduced in the open agricultural sites and reported that it is a part of recruitment of young crabs; whereas in the present study we found (16, 00, 24 &15 burrows, with respect to river habitat) in agricultural fields, along the four rivers at the study sites.

Sen *et. al*. (2017) found a correlation between burrow architecture and size class, sex of the fiddler crab *Uca rosea in* Sundarbans of west Bengal in India. Similar results we obtained to get an idea from burrow size about the size class of this crab species. Size class of burrow 6.0 - 6.5 cm were more frequencies of burrow

occurrence (37.5, 31.3, 39.6 in Godavari River and Asna River, while 30.9 was in Lendi River in size class 7.0 - 7.5 cm).

The crab carapace width showed significant correlation with the diameter of burrow opening. Burrow volume and total length of burrows Vachhrajan and Trivedi, (2016) in a study observed that crabs utilize deep burrows with large diameter located on the upper part of sandy shore. In the present study on crab burrow carried out in two rivers in 5 different plots and another two river in 14 different plots of $1M^2$ area, according to habitat condition used by crabs (Table 3.1, 3.2, 3. and 3.4).

Crab burrowing in salt marshes can mix surface and deeper soil over a period of years (Jin Qing Wang, 2010), accelerating litter decomposition and promoting the efficient reuse of nutrients by plants. Variation in the burrow architecture with crab age appears to be related to the crab's behaviour (Chan, *et. al.* 2006). Whereas in the present study the size of burrow tunnel (diameter in cm) directly represent the size group of the crab species in different microhabitat of study area.

Morrisey *et. al*. (1991), found that burrows of mud crab *Helice crassa* were more abundant at muddy site than at sandy sites. Similarly in the present investigation burrows were more in boulder and rocky regions in two areas and main river bed in the two the tributaries.

Micheli *et. al.* (1991) studied behaviour and ecology two crab species *Sesarma meinerti* and *Cardisoma carnifex* in mangrove were having same foraging activity but differ in burrowing activity, one was diurnal and another was nocturnal. *B. cunicularis* found in present study was having nocturnal habit to construct the burrows in different microhabitats (Fig. 2. a-f) and diurnal habit to hide in the burrow. It also prefers night time for foraging (6.00 p. m. to 6.00 a. m.).

Chua, *et al.* (2015), studied characteristics of habitat of freshwater crabs in Singapore's tropical rainforest, to conserve a range of habitat for the survival of four crab species. Lim *et. al.* (2003, 2006) compared nine crab burrow dimensions and differentiated the crab size class. The fiddler crab burrows were with steeper decent slope in sandy habitat than muddy habitat. In the present study also burrow size class and their abundance (Frequency) in a particular plot of $1M^2$ area was recorded (Table.3.5) in Four tributaries.

5. Conclusion

Burrows of crab *Barytelphusa cunicularis* were mostly found in areas with boulder and rock in Godavari river basin in two study areas and main river bed in another two tributaries. Frequency of occurrence of crab burrows occurrence in 1.0 M^2 area was varied in four river basins. Average 8, 17.2, 9.35 and 6.92 burrows per $1M^2$ were recorded during six month field visits in year 2015-2017 during late winter to summer season (December to May).

6. Conflict of interest

Authors declare no conflict of interest.

7. Authors contribution

First author was responsible for all experimental work, data acquisition and analysis and writing and preparation of manuscript. Corresponding Author was contributed to experiments and data analysis also responsible for study concept, designing and coordinating the research, supervising the work and revising the manuscript. Both authors read and approved the final manuscript.

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A Climate Change : Center of Attention

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Abstract

The rise in CO_2 and Green houses gases (GHGs) originated from fossil fuels emissions and deforestation is only due to human activity. Intergovernmental Panel on Climate Change (IPCC) has measurable scientific evidences in its fourth report on climate change (2007) and they have become clearly accepted universally. Climate change is commonly understood to be one of the drivers of extinction, affecting biodiversity in nearly every corner of the planet. Climate change is one of the major problems and placed in the queue of other hazardous influence which disturbs the earth balance. The rise in average temperature is only one indicator of broader changes also translating into extreme temperatures, drought, flooding, storms, rising sea levels, impacts on food production, and infectious diseases. Although the scientific community has been aware of the link between greenhouse gases (GHGs) and climate change for many years, world leaders have been slow to react and implement measures to mitigate the risks. New research initiatives should focus on collecting high-quality, long-term data on climate-related health outcomes with the dual purpose of understanding current climate–health associations and predicting future scenarios. The global warming issue and challenge has focused on the lightening of greenhouse gases based on international environmental conventions such as IPCC and Kyoto Protocol. The warm effect of global warming affects not only ecological systems but also human life; it has become an important issue both nationally and internationally so need to study.

Keywords : Climate change, health, global warming, Climate Variability

Introduction

Present time climate change concluding both global warming and its consequences on Earth's weather patterns. There have been previous circumstances of climate change, but the rapid changes in climate are rapidly moving and obviously its not due to natural causes.[1] For the years that the international community has engaged on climate change, it has the UN Framework Convention on Climate Change (FCCC)[2] and its Kyoto Protocol,[3] to show for it. The emission reduction commitments made under these agreements are inadequate [4] and inadequately implemented.[5] Instead, they are caused by the emission of greenhouse gases, mostly carbon dioxide (CO2) and methane. Burning fossil fuels for energy use creates most of these emissions. Agriculture, steelmaking, cement production, and forest loss are additional sources.[6] Greenhouse gases are transparent to sunlight, allowing it through to heat the Earth's surface. When the Earth emits that heat as infrared radiation the gases absorb it, trapping the heat near the Earth's surface. As the planet heats up it causes changes like the loss of sunlight-reflecting snow cover, amplifying global warming.[7] Due to its effect the earth temperature rises twice as fast as global temperature resulted into the area of deserts increases so the heat waves and wildfires occurs more common .[8] There is now convincing scientific evidence that human activity is altering the global climate (IPCC 2007). Although questions remains about the timing and impact of climate change, it is already clear that there are risks of significant adverse consequences.[9] Although low- and middle-income countries are responsible for only a small percentage of global greenhouse gas emissions, the adverse health effects associated with climate change will likely fall disproportionately on their populations. This inequity will further exacerbate global health disparities. High-risk areas include those already experiencing a scarcity of resources, environmental degradation, high rates of infectious disease, weak infrastructure, and overpopulation .[10-13] In particular, tropical regions will experience significant changes in human–pathogen relationships because of climate change.[14] Changing temperatures and precipitation patterns linked to climate change will further affect health by changing the ecology of various vector-borne diseases, such as malaria, dengue, chikungunya, Japanese encephalitis, kala-azar, and filariasis. [15-16]

Challenges of Climate Change

Climate change is arguably the most severe challenge facing our planet during the 21st century. The spatial and temporal extent of the climate challenge deeply connects it to ethical questions as well. These arise both from the fact that the poorest people on Earth are not significantly contributing to global emissions, but may well feel the impacts most severely, and from the long-term commitment to future warming and climate change impacts – like sea level or the partial melting of the large ice sheets – which will be felt by future generations. In essence, past and future greenhouse gas emissions seriously affect a large fraction of the still growing human population on our planet and profoundly shape the environment in which our children and grandchildren will have to live in. Humanity therefore has a moral obligation to address the climate challenge. This will have to combine successful negotiations on a binding and effective international climate agreement and bottom-up initiatives from individuals or communities. There is a wide range of global threats that certainly require humanity's urgent attention.(17) But climate change cannot be considered isolated from other challenges. Indeed, climate change is a truly cross-cutting issue affecting many sectors and connected to other global challenges. For example, climate change has the potential to impact global water supplies, agricultural production, human health, and our energy infrastructure. (18) In turn, the way in which we produce our energy and food has a profound effect on the Earth's climate system. Finally, the impacts of policies in one of the fields on the other challenges need to be explored if truly sustainable solutions to global problems shall be achieved. These close connections – and the societal and technical challenges of climate mitigation (IPCC 2014b) and adaptation (IPCC 2014a) – require interdisciplinary and transdisciplinary thinking; we hope that our new journal Global Challenges can serve as a highly visible forum for research bridging classical scientific disciplines, for ideas which have the potential to directly influence future climate policy and for discussions about new research and different policy options.[19] Within the climate change focus of Global Challenges, we therefore invite submissions related to climate change of the highest quality, with a clear focus on the global view of the climate problem and with relevance for (global) climate policy or bottom-up initiatives which are a significant step towards a solution of the climate challenge.[20] Indoor air pollution presents yet another major health threat, with 32% of deaths in South Asia attributable to the burning of solid fuels in poor, small, unventilated houses [21] these health risks will be exacerbated as a result of climate change is yet to be determined, but cobenefit interventions aimed at reducing the health impacts associated with indoor air pollution, decreasing the release of green house gases from the burning of solid fuel, and preventing deforestation by introducing alternative, more efficient stoves and fuels will have serious implications for health and society.

Conclusion

In this paper we were studied the cause of climate change and its adverse effect in all over fields and here we concluded that the climate change is having adverse effect and it collapses number of species which having measurable numbers. It is clear that climate change is a security problem for some states and its due to emission of CO_2 which must be controlled by the countries but, what does it serve us to speak of climate change in these terms and what are the implications of doing so? The rise in the amounts of greenhouse gases cause climate changes. It discusses the evidence that the concentrations of these gases in the atmosphere have increased and are still increasing rapidly and progressively, and thus that most of the recent change is almost certainly due to emissions of greenhouse gases caused by human activities. Untill and unless if we not prohibited the rise in concentration green house gases , their consequences will be uncontrollable. There remains a range of estimates of the magnitude and regional expression of future change, but increases in the extremes of climate that can adversely affect natural ecosystems and human activities and infrastructure are expected. Citizens and governments can choose among several options in response to this information: they can change their pattern of energy production and usage in order to limit emissions of greenhouse gases and hence the magnitude of climate changes; they can wait for changes to occur and accept the losses, damage, and suffering that arise; they can adapt to actual and expected changes as much as possible; or they can seek as yet unproven solutions to counteract some of the climate changes that would otherwise occur. Different nations and communities will vary in their vulnerability and their capacity to adapt. There is an important debate to be had about choices among these options, to decide what is best for each group or nation, and most importantly for the global population as a whole.

The options have to be discussed at a global scale because in many cases those communities that are most vulnerable control few of the emissions, either past or future. Our description of the science of climate change, with both its facts and its uncertainties, is offered as a basis to inform that policy debate. In 2008 India developed the National Action Plan on Climate Change, promising further enhancement of ecological sustainability as part of India's development path, signaling their involvement in the international discussion on climate change. Countries like India have a tremendous opportunity to guide our future trajectory regarding sustainable development and adaptation to climate change, but it will take the combined effort of policy makers and scientists from around the world to address the complex challenges associated with climate change and human health. In conclusion, innovative, multidisciplinary investigations using environmental epidemiologic methods to elucidate health risks posed by climate variability—and subsequent climate change—in regions such as India are possible. However, such work will require expanded partnerships among researchers, governments, and communities to develop a cobenefit strategy that addresses public health challenges and risks associated with climate change. Adoption and implementation of these research initiatives will provide the necessary tools and infrastructure to pose interesting scientific questions and design effective solutions to the complex issues imposed by climate change. Health outcomes of interest, for which such data should be collected, include total morbidity and mortality and noncommunicable diseases such as cardiovascular, respiratory, and circulatory diseases and asthma, as well as infectious diseases such as cholera, malaria, tuberculosis, typhoid, hepatitis, dysentery, tick-borne encephalitis, and other vector-borne and waterborne diseases. Such monitoring also requires the collection of appropriate climatic (e.g., temperature and precipitation) and nonclimatic data (e.g., ozone). And finally if you save your 'EARTH', 'EARTH' will always save you.

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Study of Cyanophyceae Diversity of Mandwa Lake Near Dharni (Melghat) Tahsil, District Amravati (M.S.), India

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Abstract

The Mandwa Lake is principal fresh water body located in Mandwa village of Dharni tahsil in Amravati district of Maharashtra state. Dharni is a tahsil place and it is 148 km north west side of Amravati and 80 km east side from Burhanpur, Madhyapradesh It is situated at about 500 m above the mean sea level. A Study of Cyanophyceae was undertaken during Jan 2021 to Dec 2021 One Year to assess the types of Cyanophyceae present in this water body. The water of this lake is primary used for washing, bathing, fishing activities, agriculture and other domestic purpose but now it is at a transitional state with respect to degradation. The Cyanophyceae is important group of fresh water blue green algae. They include some of the most common species which are important both ecologically and scientifically. During the present study 7 species of Cyanophyceae were found at all three sites A,B,and C of Mandwa Lake

Keywords: Mandwa lake, Cyanophyceae diversity.

Introduction

The cyanophyceae means blue green algae may be unicellular organism or in the form of chain or filaments is called as trichon.

Cyanophyceae one of the most significant algal group among phytoplankton and it is also founded abundance in water bodies. The freshwater blue green algae occur in the unpolluted as well as polluted water body generally it exhibits a characteristic cyclic growth.

In Present investigation Mandwa lake is 4 km south east side from Dharni Tahsil at about 500 m above mean sea level and is at 76°55'49''E longitude and 21°31'28'' N latitude. Mandwa Lake receives the water from the surrounding catchment areas during the monsoon period. The area of Mandwa Lake is spread over 500 acres. The depth of water is 38 feet during the monsoon and 15 feet during the summer season. The water of this lake is primary used for washing, bathing, fishing activities, agriculture and other domestic purpose but now it is at a transitional state with respect to degradation.

Material And Method

Sample for planktonic study were collected monthly from three sites of lake. The samples were collected in the morning hours between

8.30 a.m. to 10.30 a.m. 50 Lt. of water sample was filtrated through the plankton net made of bolting silk number 25 with mesh size 64 lime the collected samples were allowed to settle down by adding Lugol's Iodine. Normally sedimentation requires 24 hrs. after which supernatant was removed and concentrate was made up to 50 ml. depending the number of plankton and preserved in 5% formalin for further studies.

For the quantitative study the concentrated sample was shaken and immediately one drop of sample was taken on a clear micro side with the help of standard dropper the whole drop was then carefully covered with the cover glass and observed. Plankton identification up to genera and whenever possible upto species level was classified according to keys given by Prescott (1954), Edmonsonic (1959), Sehgal (1983), Adoni (1985), and APHA (1985) and standard analysis was undertaken as per Zar (2005).

Quantitative study of plankton was done by Sedgwick – Rafter Cell method

Sedgwick – Rafter Cell Method

The Sedgwick – Rafter Cell is a special kind of slide similar to the Haemocytometer. The cell has a 50 mm x 20 mm × 10 mm rectangular cavity that holds 1 ml. sample. The cell is moved in horizontal direction on the stage of an inverted microscope and plankton species encountered in the field are enumerated.

A number of replicate samples are enumerated to calculate plankton/lit.

Plankton (units/lit) = n x c/v

Where,

n = number of plankton in 1ml c = Volume of concentrate

v = Volume of sample in lit.

Result And Discussion:

In Present investigation a Total 7 species wered recorded the lake under study,

In site A, Cyanophyceae were represented by 6 species in Jan 2021 to Dec 2021 . In site B, Cyanophyceae were represented by 6 species in Jan 2021 to Dec 2021 . and site C, Cyanophyceae were represented by 7 species in Jan 2021 to Dec 2021 .

Shirsat, et.al., (2004) observed 6 species of Cyanophycaea from freshwater pond in Dharmapuri in Beed District, Maharashtra.Tiwari and Chauhan (2006) founded 21 species of Cyanophyceae from Kithan lake of Agra, Uttar Pradesh. Jayabhaye, et.al., (2007) revealed 7 species of Cyanophyceae from Parola dam of Hingoli, Maharashtra. Aijaz, et.al.,(2009) reported Cyanophyceae contributed 10 species from Wular lake. R. Prathap Singh and G.S. Regini Balasingh (2011) observed 14 species of Cyanophyta in Kodaikanal lake of Dindugal District. D.S. Malik and Umesh Bharti (2012) reported 7 species belong to Cyanophyceae in Sahastradhara stream at Uttarakhand. M.R. Abdar (2013) observed seven taxa of Cyanophyceae from Morna lake of Shirala (M.S.), Sachinkumar R. Patil, et.al., (2015) founded 1 species belongs to Cyanophyaceae in major freshwater bodies of Ajara Tahsil in Kolhapur District (M.S.). R. Prathap Singh and G.S. Regini Balasingh (2012) reported 18 species of Cyanophycaea in Kodaikanal of Dindigul District, Tamilnadu. Patil Alaka A. (2015) recored 5 species of Cyanophyceae in Sangli, Maharashtra. Priya Gopinath, T. and Ajit Kumar, K.G. (2015) observed 7 genera belong to Cyanophyceae in the fresh water lake in Thiruvananthapuram.

In Present investigation in site A, during Jan2021 to Dec 2021, 6 species are recorded among which Oscillatoria sp. (122 no./lit) is dominant followed by *Microcystis sp.* (120 no./lit), *Agmenellum quadruplicatum* (55 no./lit), *Nostoc sp.* (51 no./lit), *Anabaena sp.* (43 no./lit) and *Spirulina sp.* (34 no./lit).

In site B, during Jan2021 to Dec 2021, 6 species were recorded among which Microcystis sp. (145 no./lit) is dominant followed by *Oscillatoria sp*. (67 no./lit), *nostoc sp.* (49 no./lit), *Anacystis cyanea* (41 no,/lit), *Agmenellum quadruplicatum* (34 no./lit) and *Anabaena sp.* (34 no./lit).

In site C during Jan2021 to Dec 2021 ,7 species were recorded among which *Microcystis sp.* (198 no./lit) was dominant followed by *Oscillatoria sp*. (196 no./lit), *Nostoc sp.* (143 no./lit), *Agmenellum quadruplicatum* (75 no./lit), *Spirulina sp*. (36 no./lit), *Anabaenasp.* (34 no./lit) and *Rivularia sp.* (12 no./lit).

Among the different species of Cyanophyceae in site A, *microcystis sp*. was dominant followed *by Gleotrichia echinulata, Nostoc sp, Oscillatoria sp, Agmenellum quadruplicatum, Anabaena sp.* and *Spirulina sp.* in site B of lake *Microsystis sp. was dominant followed by Oscillatoria sp Nostoc sp. Anacystis cyanea, Anabaena sp.* and *Agmenellum quadruplicatum* in site C, of lake *Microsystis sp.* was dominant followed by *Oscillatoria sp, Nostoc sp., Angmenellum quadruplicatum, Gleotrichia echinulata and Anabaena sp.*

According to Harris and James (1974) presence of *Microcystic sp.* the toxin producing the blue green algae in abundance is a significant feature of tropical. Parmashivam and Sreenivasan (1981) recorded the polluted water bodies having heavy growth of the blue green algae. M.R. Abdar (2013) observed presence of organic pollution indicator algal species like *Microcystis aeruginosa, Oscillatoria limnetica,* at Morna lake Shirala (M.S.). Mischke and Nixdorf (2003) have observed that the presence of *Anabaena* and *Oscillatoria indicates* beginning of biological pollution.

Kamat, *et.al.*, (2006) was of the opinion that blue green algae occurred continuously in the contaminated tank while occasionally in less unpolluted tank. They reported frequent existence of species like *Microcystic, Oscillotoria* and *Anabaena* in the contaminated tanks of Shimoga District, Karnataka. Jindal and Gusain (2007) founded the presence of *Microcystis sp., Oscillotoria sp.* and the *Spirullina sp.* as a pollution indicator species of Bichorli pond, Rajasthan. Shashi Shekhar, *et.al.,*(2008) and Baruah and Bhaswati Kakati (2012) observed that *Microcystis aeruginosa* is related with highest degree of pollution and may be considered as the best single indicator of the organic pollution in any water bodys.

In the present investigation the Cyanophyceae was maximum during in winter season and minimum during in the monsoon season. Pendse, *et.al.*, (2000) observed the maximum population of in blue-green algae during winter season. Mazher Sultana and Dawood Sharif (2004) noted the maximum of blue-green percentage during winter season and minimum during in monsoon. D. S. Malik and Umesh Bharti (2012) founded that Chlorophyceae were maximum during in winter season and minimum during monsoon season in Sahastradhara stream at Uttarakhand. In the present investigation, the dominant of *Microcystis sp.* and *Oscillotoria sp.* in site A and site B and site C showed the polluted nature of the three sites shows lake is highly polluted.

Conclusion:

In the present investigation, the maximum amount of Cyanophyceae during in winter due to favourable sunlight, increase in domestic sewage, human generated pollution, an minimum quantity during the monsoon season is probably due to increase in water quantity

Table 1: Yearly variation of Phytoplankton from sites of Mandwa Lake during year Jan 2021 to Dec 2021.

Sr. No.	Parameters	A	B	C	Total
1	Cyanophyceae	35.42	30.83	57.33	**45.00**
		±	±	±	±
		37.63	**14.12**	**21.93**	**3.93**

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Ethno medicinal plants used by Munda Tribe for their primary healthcare system and their conseravation in and around Tamar Block of Ranchi District, Jharkhand

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Abstract

The tribal people depend on forests for their livelihood and most of rural people depend on traditional medicine as a primary health care source. Traditional medicines remained as the affordable and easily accessible source of treatment in the primary health care system among Tribes of ***Tamar Block****. The paper highlights' the rich plant resources and the vast wealth of ethno medicinal information available with the Tribes especially* ***Munda Tribe*** *of the* ***fifteen(12) revenue villages*** *of Tamar Block of Ranchi District. This study focus on the comprehensive ethno medicinal investigation in an attempt to safeguard the deteriorating ethno medicinal knowledge. The main objective of present work is to give information and documentation of medicinal plants used by tribal of the study area. The ethno medicinal information was gathered from interviews with living elders, Baidhyas and knowledgeable person belonging to Munda Tribe of the study area. The present work on ethno medicinal plants used in the primary healthcare systems of Tribe (Munda) in 12 villages was carried out from Tamar Block of Ranchi District. These ethno medicinal plants are very useful, hence an essential conservation should be needed.*

Keywords*: --- Ethno medicinal plants, documentation, Tamar Block, Munda Tribe, Conservation etc.*

Introduction

Medicinal plants have great contribution in the primary healthcare system of local communities as the main source of medicine for the majority of the rural population especially Munda Tribe. Out of the total 4, 21,500 flowering plants reported from the world more than 40,000 are used for medicinal purposes. About 60% of the world population &80% of developing countries rely on traditional medicine. According to Bhatt et al. more than 4.5 billion people in the developing world rely on ethno medicinal plants as components of their primary healthcare.

Tamar Block of Ranchi District is very rich in ethno medicinal plants as well as Schedule Tribe population. The Munda Tribe was totally dependent on indigenous medicine for traditional healthcare, but now this is practiced only in the remote rural areas. Where the hospital facilities were available, that region's person were not depends upon the ethno medicinal plants, because they had no more knowledge about this field. The Ethno medicinal studies in various areas of Tamar Block have been carried out. It is believed that such studies can constitute the starting point for the development of new herbal medicines and other useful substances.

The present study was aimed at investigating the traditional utilization of plants of Tamar Block. Tamar Block has eighty one (81) revenue villages. The study area is the richest biodiversity centre and a source of ethno botanical knowledge. There is no any ethno botanical studied has been carried out in this region. The main **Munda tribe** containing villages **are Murpa, Jaradih, Jojodih, Poradih, Kasam Burudih, Agra, Bandu, Sirkadih, Deori, Basukoncha, Birdih and Kubasal**. The main objective of the present study were: - (1) to identify and explore plant species that are used locally for the treatment and presentation of various diseases, (2) to document traditional recipes from medicinal plants including methods of preparation, dosages, and the mode of administration, (3) to point out the main Baidhyas of the area by which suffer person can be treated easily, and (4) to assess the plants conservation issues of the study area.

Materials and methods

Study Area

The present study was carried out in Tamar Block of Ranchi District**.** The Block is with an area of 513.91km² and forest area is 148.71Km ²(29%) and is situated between 23°3`21``N and 85°39`44`` E. The main

Munda containing villages are Murpa, Jaradih, Jojodih, Poradih, Kasam Burudih, Agra, Bandu, Sirkadih, Deori, Basukoncha, Birdih and Kubasal. Many villages are situated on forest top and near forest. All forest areas having many ethno medicinal plants. The Munda Tribe is about 43% and Oraon Tribe is about 7% according to 2011 population census. Climate of this block is subtropical in nature. The annual rainfall is ranges between 230 mm to 1390 mm and the temp. Are ranges between 6-43°c with highest in the month of May and June? The November to January is the coldest months.

The population of the block is 1, 32,702(One lakh thirty two thousand seven hundred two), in which **Munda** Tribe is about 43% and **Oraon** Tribe is about 7%. The livelihood is depends mainly on smallholder agriculture and livestock production.

There are many ethno medicinal as well ethno botanical plants which are used by specific **Munda Tribe** and **Oraon Tribe** for the ailment of different types of diseases. Some of them are ***Abrus precorius, Achyranthes aspera, Acorus calamus, Ageratum conyzoides, Aloe vera, Allium sativum, Asparagus racemosus, Azadirachta indica, Boerhaavia diffusa, Butea monosperma, Calotropis procera, Cassia tora, Curcuma longa, Eclipta alba,Emblica officinalis, Ficus bengalensis, Gloriopsa superba, Holarrhena antidysenterica, Lawsonia inermis, Madhuka longifolia,Ocimum sanctum, Phyllanthus nirurii, Phyla nodiflora, Rauvolfia serpentina,Scleichera oleosa, Shorea robusta, Sida cordifolia, Terminalia arjuna, T. bellirica, T.chebula, Tinospera cordifolia, Tridax procumbens, Vitex negundo etc.***

Data collection methods: ----

The authors have conducted an extensive field survey in the tribal belts and other **Munda** and Oraon Tribe containing villages, adjoining forest area in the Block to collect ethno botanical lore. First hand information was gathered through interactions with tribal and rural knowledgeable person and Baidhyas. The local Baidhyas were invited to tap the information of medicinal plants commonly used by questionnaire. Medicinal properties of plants were learned through in formal interviews. A number of group discussions were also conducted during the period of investigation.

Ethno botanical information was collected from 28 informants (24 male &4 female).Among the 28 informants, 20 informants were selected with the Munda Tribe and 4 informants were selected with the Oraons Tribe. Semi –structured interviews with 28 informants and group discussions (total of 5 groups discussed with average number of 7 per groups) were administered in the local language (Munda) to collect basic information on the local names and traditional description of the medicinal plants species , diseases treated or collected ,parts used conditions and method of preparation , routes of remedial administration , dosages used ,and locally marketable medicinal plants . Besides, practical observations session in preparation of remedies and some observation of traditional

Treatments given to the patient by traditional healers were conducted. To ascertain the uses of these ethno medicinal plants the earlier published scientific literature sources referred to are Sharma et al.(1985-86), Jain (1991), Kirtikar and Basu (1991), Ambasta et al. (1992), Chopra et al.(1996) . Photographic, digital cameras were used for graphic documentation. Specimens were collected and numbered on the spot, later indentified using taxonomic keys in the relevant Book, Hains flora-Bihar and Orissa (vol-I-VI), Flora of Hazaribag etc (BSI).

Results

The data on ethno medicinal plants, which was collected from inhabitants of study areas, Baidhyas and knowledgeable person in and around Tamar Block of Ranchi District were pooled and analysed. The investigation revealed the medicinal plants of 53 species and 47 genera belonging to 31 families, which are commonly used for various ailments by Munda Tribe of different villages of Tamar Block of Ranchi District.

Sl.No	Botanical name of plants	Family	Common name of plant	Therapeutic uses of ethno medicinal plants
1	*Abrus precatorius* L.	Fabaceae	Gunja	Leaves are grind with roots and mixture is given with orally to prevent pregnancy.

2	*Achyranthes aspera* L.	Amaranthaceae	Chirchiti	Leaves are grind & make paste. This paste is applied externally for paralysis. In case of painful delivery the piece of stem may be chewed. Chewing of stem, also gives relief from toothache.
3	*Acorus calamus* L.	Araceae	Vacha	Old ghee processed with Brahmi juice and shankhapuspi alleviates insanity and epilepsy.
4	**Ageratum conyzoides** L.	Asteraceae	Sahadevi	The aqueous extract of leaves exhibits anti fungal and crude plant extract antibacterial properties.
5	*Aloe vera* Mill.	Liliaceae	Ghrikuwari	In syphilis, apply its pulp on the affected area. It cures syphilis. For diabetic patient, give 5 gm pulp of Aloe vera with 500 mg guduchi extract. It cure diabetes. Leaf pulp is given with honey for 7 days to cure irregular menstruation.
6	*Allium sativum* L.	Liliaceae	Lahsun	The bulb is used as a brain tonic in epilepsy and psychic disorders. The Lahsun is also used for upper respiratory tract infections & catarrhal conditions.
7	*Amophophallus campanulatus* (Roxb.) Blume	Araceae	Zamikand,Ol	Zamikand is prescribed in bronchitis, asthma, abdominal pain, dysentery, enlargement of spleen, piles and rheumatic swellings.
8	*Andrographis paniculata* (Nees.)	Acanthaceae	Kalmegh	The powder of Kalmegh is mixed the powder of black pepper and taken to the malarial patient. It controls the malaria completely.
9	*Asparagus racemosus* (Willd.)	Liliaceae	Shatawari	Shatawari powder taken with milk is increases the flow of breast milk. In night-blindness, tender leaves of shatawari cooked in ghee and taken to the patient.
10	*Azadirachta indica* A. Juss.	Meliaceae	Neem	Grind Margosa leaves with half the amount of phitkiri and prepare the tablet of 500mg each. Give one tablet with sugar syrup. It cures all types of fever & is especially beneficial in malarial fever.
11	*Boerhaavia diffusa* L.	Nyctaginaceae	Punarnava	Fresh root powder of punarnava mixed honey should be used as eyes disorder.
12	*Bombax ceiba* L.	Bombacaceae	Semal	Tap root of young plant, barks and flowers are diuretic.
13	*Butea monosperma* (Lamk.) Taub.	Fabaceae	Dhak, Palas	Decoction of root bark is given internally for blood pressure, crushed stem bark with tilt el(sesame oil) is filtered and administered for antifertility.
14	*Calotropis procera* R. Br.	Asclepiadaceae	Akwan. Madar	The root is used for cleaning teeth and for relieving toothache. Latex mixed with cow milk & given orally in rabies. Fresh leaves slightly roasted &pounded are bandaged to painful rheumatic joints, headache and swelling.
15	*Cardiospermum helicacabum* L.	Sapindaceae	Hathisundi	An extract of the leaves is used as an antiseptic to dress wounds.
16	*Cassia tora* L.	Caesalpiniaceae	Chakor	Paste of roots is applied on scabies & ringworm. Decoction of leaves is given to the children having fever while teething.

17	*Calocasia esculenta (*L.) Scott.	Araceae	Kachu	Crushed petiole is applied on fresh cuts and wounds to stop bleeding.
18	*Curcuma longa* L.	Zingiberaceae	Turmeric (Haldi)	Mix 5gm turmeric in butter milk and give to the patient twice a day. Within 5 days, it cures jaundice. Mix 5gm turmeric and 20 gm powder of Neem leaves with butter and apply on the affected are. It makes the skin soft and glowing. It also cures scabies disorder.
19	*Curcuma amada* Roxb.	Zingiberaceae	Amahaldi	A paste is prepared from the rhizome of the plant and dissolved in it water and drink to cure diarrhoea.
20	*Cyperus rotundus L.*	Cyperaceae	Nagarmotha	The rhizome is mainly used in rheumatism, inflammations, dysuria and obesity.
21	*Dalbergia sissoo L.*	Fabaceae	Shisham	In gonorrhoea, give 15 ml juice of its leaves thrice a day, it control gonorrhoea. Prepare squash of 5gm powder and give this to the patient. It cures blood impurities and blood disorder.
22	*Eclipta alba* (L.) Hassk.	Asteraceae	Bhringraj	Take each of Bhringraj, triphala, anantmool and seed of mango. Prepare their paste. Take 10 gm mandoor paste and 500 ml oil. Mix them all and add one litre water and cook the mixture till only oil is left. Strain the oil and apply on the hair. It cures all types of hair disorders.
23	*Emblica officinalis* Gaertn.	Euphorbiaceae	Amla	Take 30 gm of dried amla, 10 gm baheda, 50 gm mango seed and 10 gm iron vashma. Soak all the elements in a vessel overnight. Apply this on hair every day. Prematurely grey hair turns black with this treatment.
24	*Euphorbia hirta* (L.)	Euphorbiaceae	Doodhi	Paste of root is mixed with honey & given nursing mother to increase milk. Latex used in warts and skin diseases like leucoderma spots.
25	*E. neriifolia* (L.)	Euphorbiaceae	Sehund	The latex is used to cure skin diseases and body pain. Luke warm latex and common salt is taken with water for curing whooping coughs and leprosy.
26	*Ficus bengalensis* L.	Moraceae	Banyan Tree	Take 6 pieces of fresh leaves or its aerial roots and grind them with 15 gm of masoor dal. Apply the paste on the face. It cures all types of skin problems. Prepare decoction of its soft leaves and give to the patient with sugar, mixed in it. It controls vomiting.
27	*F.religiosa L.*	Moraceae	Peepal	Give 3 gm powder of its fruits, with milk, thrice a day. It promotes potency and physical strength. Give its ripe fruits to eat. It cures kapha, pitta &blood disorders. It also cures burning sensation and vomiting. In constipation, patient would eaten 7 fruits regularly. After one month constipation cured completely.
28	*Gloriopsa superba* L.	Liliaceae	Vachhnag	Powder of dry leaves is mixed with buffalo's milk (butter milk) & given internally in jaundice. 3 gm paste of tuber of Vachhnag with 1 gm paste of

				peppers is prescribed once a day for twenty one days as a cure for rheumatism.
29	*Guizotia abyssynica* L.	Asteraceae	Surgunja	Equal quantity of roots of surgunja and sarson is crushed & powdered. One pill is made by 10 gm of powder. One pill is taken in empty stomach for five days after menstruation. It is permanent birth control.
30	*Holarrhena antidysenterica* (Roth.) DC.	Apocynaceae	Kutaja, kurchi	In diarrhoea, boil 40 gm of its seeds in water. Give this water with honey, mixed in it to the patient, thrice a day. Grind its 15 gm of the fresh bark in butter milk & give this to the dysentery patient. It immediately controls dysentery.
31	*Lantana camera* L.	Verbenaceae	Putus	15ml, decoction of plant is taken for the treatment of tetanus & there is strict prohibition of taking of sour food during treatment. In malarial fever, the decoction of leaves is taken twice a day for a week after food.
32	*Lawsonia inermis* L.	Lythraceae	Mehendi	Paste of leaves mixed with butter milk &applied externally on face itching during monsoon & wounds for fast healing. Decoction of the leaves is also used as a gargle for sore throat.
33	*Madhuka longifolia* (Koenig)	Sapotaceae	Mahua	Nectary honey collects from flowers &is taken continuously 7 days for cures of piles.
34	*Mangifera indica* L.	Anacardiaceae	Mango, Aam	The juice from the bark is used for diarrhoea and dysentery. Take 2.5 gm of powder made from shade-dried soft leaves of mango, every day. It is very helpful in controlling diabetes.
35	*Mimosa pudica* L.	Mimosaceae	Lajwanti	In piles, give 5 gm powder of its leaves with milk, thrice a day. Give 30 mg juice of its leaves, it cures indigestion. For diabetic patient, they take 100 ml decoction of its roots, regularly up to 15 days & after 15 days; they take 10-15 ml of decoction regularly.
36	*Moringa pterygosperma* Lam.	Moringaceae	Sahjan	Mix 2 gm ginger root in 10 gm juice of its root and give this to the patient every morning and evening, it enhances the digestion power. In intestinal worms- cook its pod and give this to the patient. It kills the intestinal worms.
37	*Ocimum grattissimum* L.	Lamiaceae	Ban tulsi	The leaf juice is used to treat infantile cough, cold, catarrh, dysentery and skin diseases.
38	*O. sanctum* L.	Lamiaceae	Tulsi, Holy basil	Grind tulsi leaves in lemon juice and apply the paste on the affected area of skin. It helps cure eczema, gout, derma toes etc. Take powder of its root or seeds and add equal amount of jiggery in it. Give 2 gm of this mixture with cow's milk regularly. It cures the sexual disorders in one month to six weeks.
39	*Phyllanthus nirurii* L.	Euphorbiaceae	Bhui amla	In jaundice, grind 10 gm of its root and give it with 250 ml milk every morning and evening on empty stomach. In diabetes, give 15 gm whole plant powder with 20 black peppers three times a day. It cures even chronic diabetes.

40	*Phylla nodiflora* (L.) Greene	Verbenaceae	Jalpipal	3 ml decoction of root with un boiled egg (2 mg) is given to women to promote sexual desire.
41	*Psidium guajava* L.	Myrtaceae	Amrud	In vomiting, give 1o gm decoction of guava leaves. It indigestion ,take 10 gm juice of its soft leaves & mix sugar in it .Give this to the patient daily ,once in the morning .It gives relief within 7 days .
42	*Rauvolfia serpentina* L.	Apocynaceae	Sarpagandha	The extracts of roots are valued for to treat intestinal disorders. The leaves extract is also used to control hypertension.
43	*Schleichera oleosa* (Lour.) Oken	Sapindaceae	Kusum	The oil is applied externally in skin eruption. The seed oil is also used for massage in rheumatism & applied in alopecia, inch & acne.
44	*Shorea robusta* L.	Dipterocarpaceae	Sal tree	Fruit paste is prescribed in diarrhoea. In sal resin an essential oil is found, which is antiseptic. This is used for skin diseases.
45	*Sida cordifolia* L.	Malvaceae	Nilatutti, Balaa	Decoction of roots is used for the treatment of rheumatism & neurological disorder (facial paralysis, Sciatica etc). The leaves are demulcent, febrifuge & used in dysentery.
46	*Terminalia arjuna* (Roxb).Wight & Arn .	Combretaceae	Arjuna	In heartbeat, when normal rate of heartbeat increases from 72 to 150 take one glass juice of tomato & add 1 teaspoonful of powder of Arjuna bark in it . Give this to the patient regularly. It normalizes the heartbeat for complete benefit, prepare the decoction in milk. It cures disorder like injured heartbeat, angina pain, and anxiety.
47	*T.bellirica* (Gaertn.) Roxb.	Combretaceae	Beheda	Mix equal amount of beheda and sugar. Take this mixture every day. It improves eye power. Take 4 gm powder of fruit after meals. It enhances digestion power & cures loss of appetite. It also strengthens the stomach.
48	*T. chebula* (Gaertn) Retz.	Combretaceae	Harad, Hartaki	Give 5 gm harad powder with equal amount of sugar candy mixed in it, every morning and evening after meals. It improves the digestion power
49	*Tinospora cordifolia* (Willd.) Hook. F. &Thorns.	Menispermaceae	Giloy, Guduchi	Mix 50 ml bitter oil in 15 gm Tinospora juice and give this to the patient every morning on empty stomach. It cures elephantiasis. In arthritis—give 5 gm of its powder with milk three times a day. It cures arthritis and acidity in urine.
50	*Tridax procumbens* L.	Asteraceae	Jayanti, Akala kohadi	The leaf juice exhibits antiseptic, insecticidal, and parasiticidal properties. It is used to check haemorrhage from wounds, cuts, and bruises, also for restoring hair growth.
51	*Nitex negundo* L.	Verbenaceae	Nirgundi	Oil cooked with the juice of root & leaves of Nirgundi is useful as in take an ointment & filling in sinus, kustha, vatavyadhi, eczema & scrofula.
52	*Withauia somnifera*	solanaceae	Aswagandha	On whom takes powder of Aswagandha roots in late winter mixed with honey & ghee along with milk re gain youthfulness even if old. In bronchial asthma, the ash of Aswagandha should be taken with honey and ghee.

53	*Ziziphus jujuba* L.	Rhamnaceae	Ber	Leaves are astringent and diaphoretic. Stem bark is also astringent and used in diarrhoea. The paste of leaves and twigs are applied to abscesses, boils and carbuncles.

Conclusions:-

In conclusion, Tamar Block has plenty of ethno medicinal plants and the people (especially Munda Tribe) of the region are highly dependent on these plants for their primary healthcare system and other ethno botanical purposes. The people of the region have tremendous traditional knowledge regarding the utilization and preparation of various ethno medicinal remedies. They are using some medicinal plants for multipurpose and posing great pressures on certain medicinal plants like ***Aloe vera, Azadirachta indica*** and ***Dalbergia sissoo***. Hence natives should be educated regarding the sustainable usage of medicinal plants. The persistence of traditional knowledge is more among old people; however as a matter of concern, young people are taking less interest in such knowledge due to multiple reasons. Hence studies on ethno medicinal plants and also documentation may be extended to other areas for protection of traditional knowledge. The Baidhyas or knowledgeable person are giving different types of ethno medicines for curing of different diseases, hence clinical trials are therefore recommended in order to evaluate the authenticity of ethno medicines to scientific standards. Now all these mentioned medicinal plants as well as others plants are very useful for all of us, hence, there should be essential to conserve these all plants.

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The authors are thankful to Baidhyas, knowledgeable person and inhabitants of Tamar Block for their co-operation in research works. The authors are thankful to Block authority, who gives many information about the population of Munda Tribe as well as forest inhabitants of the Tamar Block of Ranchi District of Jharkhand (India). All these collected medicinal plants were kept at University Depatartment of Botany, Kolhan University, Chaibasa, Jharkhand for herbarium purposes and helping the identification of new students. Finally it can say that "**Everythings green is medicine, please conserve them, protect them and more and more plants them".**

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Awareness of Globlal Warming And E-Waste Among Urban And Rural School Students.

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Abstract

Global warming means average increase in the earth's temperature and is considered as a major health issue of the 21st century and E-waste is the issu of electronic garbage its also harm of living animals and E-waste is the issu of electronic garbage its also harm of living animals Objectives:1] To find out the awareness and knowledge about global warming among the school students 2]. To find out the awareness and knowledge about E-waste among the school students. Materials and Methods: Self administered questionnaire was used to collect information from 1050 randomly selected school students of three different medium. Statistical analyses were performed with the perceantage of each quetions Ethical clearance, informed consent and assent were obtained. Results: a) 22.9% of the student have high level of about the knowledge of the global warming and e-waste b) 25.9% of the student have high level of awareness about the causes of the global warming and e-waste c) 27.6% of the student have high level of awareness about effect of the global warming and e-waste d) 28% of the student have high level of awareness of global problem. e) 25.1% of the student have high level of awareness of global warming and e-waste in total. Conclusion:. Periodic health education regarding global warming and e-waste is still needed to increase awareness and knowledge among the school students.

Keywords: *Environment,Global warming, E-waste,Awareness, Green House gases, electronic materials, Knowledge, School students.*

Introduction

Global warming means average increase in the earth's temperature and is considered as a major health issue of the 21st century and E-waste is the issu of electronic garbage its also harm of living animals Modern society has been growing concern about global global warming issues. The developing countries are experiencing complex, serious and fast-growing pollution problems of their own. Global warming pollution is more than just a health issue; it is a wider social issue Pollution has the potential to destroy homes and communities. Pollution problems are also closely tied to the mode of development in developing countries Despite this, many developing countries either have not developed global warming pollution control measures or have not provided adequate implementation structures to ensure that policies are effective its also one of the major problems of e-waste that has become an immediate and long term concern as its unregulated accumulation and recycling can lead to major global warming problems such as in air, water, soil and also including physical, chemistry, biology, geology, meteorology, oceanography sociology and human health

In this study, the awareness of electronic waste and global warming are discussed among school students.

Need for the research: -

All living and non-living things. Lives in the atmosphere and chooses air, land and water Uses resources to meet needs. The pressure that comes on the earth.This exceeds the conductivity of the global warming, which can lead to serious global warming degradation The water level in the water is getting higher than the water level, you may think so Can lose. From the very beginning, of the global warming has been called 'Awakening' It needs to be created And potential dangers to all species of living beings.

Understand the underlying causes and consequences

1. To study and find out the problems of population,health etc.The way to solve the problem.
2. Considering the need for sustainable use of natural resources.
3. To develop appreciation of caste and habitat management techniques
4. Understanding the feelings of human beings.

Objectives

1] To find out the level of awareness of e-waste among school students.

2) To find out the level of awareness of global warming among school students

3] Suggetion for the proper implementation of government rule for global warmingal issues

Hypothesis

1. Awareness of global warming among school students.
2. Awareness of E-waste pollution among school students.

Methodology

Since the present research is related to the present time , the survey method will be used.

population and sample of the study

The population for the present study consist of all school students. of Aurangabad District.1050 students from 100 schools, Aurangabad District were selected through Random sampling Technique for the study.The overall response Rate was 82%

Tools Used for the Study

For the presented research, the Author has chosen the survey method as the problem is related to the present time. Questionaries and document will be used among the various tools for the data collection for the survey method. to collect information, school students from aurangabd district were considered. The quetionaries will be filled by the students to get the information. Also the information about the school students. who have aware about the pollution and percentages will be useed to anylyze the information obtained and conclusions will be drawn based on it.

Data Analysis

Percentage,Mean,Standard Deviationand t-test. This statstical dimention will be used to analysis the information in present research

Findings

1.

a) 22.9% of the student have high level of about the knowledge of the global warming and e-waste
b) 25.9% of the student have high level of awareness about the causes of the global warming and e-waste
c) 27.6% of the student have high level of awareness about effect of the global warming and e-waste
d) 28% of the student have high level of awareness of global problem.
e) 25.1% of the student have high level of awareness of global warming and e-waste in total. (From Table no 1)

2.

a) 26.7% of the urban college student have high level of knowledge about global warming and e-waste and 20.1% of the rural student have high level of knowledge about global warming and e-waste
b) 24.7% of the urban student have high level of awareness about the causes of the global warming and e-waste and 26.8% of the rural student have high level of awareness about the causes of the global warming and e-waste
c) 29.8 % of the urban student have high level of awareness about effect of the global warming and e-waste and 26.0% of the rural student have high level of awareness about effect of the global warming and e-waste
d) 31.5% of the urban student have high level of awareness of global problem and 25.4% of the rural student have high level awareness of global problem
e) 27.6 % of the urban student have high level of awareness of global warming and e-waste in total and 23.3% of the rural student have high level of awareness of global warming and e-waste in total.(From Table 2)

3. There is no significant difference between urban student and rural student in their awareness towards global warming and e-waste in total and its dimensions- about the knowledge of the global warming and e-waste, awareness about the causes of the global warming and e-waste, awareness about effect of the global warming and

e-waste and awareness of global problem content, whereas there is significant difference between urban and rural student in the dimension- of awareness of global warming and e-waste in total..(From Table 3)

Table 1. Level of awareness of school students towards global warming and E-waste and its dimensions

Dimensions	Low		Moderate		High	
	N	%	N	%	N	%
Knowledge	257	23.8	576	53.3	247	22.9
Cause	279	25.8	521	48.2	280	25.9
Effect	289	26.8	493	45.9	298	27.9
Global Problem	322	29.8	456	42.2	302	28.0
Awareness of global warming and E-Waste of students in total	278	25.7	531	49.2	271	25.1

Table no 2 Level of awareness of school students towards global warming and E-waste and its dimensions in terms of locality of the school

Dimensions	Locality	Low		Moderate		High	
		N	%	N	%	N	%
Knowledge	Urban	110	24.0	225	49.2	122	26.1
	Rural	147	23.6	351	56.3	125	20.1
Cause	Urban	120	26.3	224	49.0	113	24.7
	Rural	159	25.5	297	47.7	167	26.8
Effect	Urban	116	25.4	205	44.6	136	29.5
	Rural	173	27.8	288	46.2	162	26.0
Global problem	Urban	126	27.6	187	40.9	144	31.5
	Rural	196	31.5	269	43.2	158	25.4
Awareness of global warming and E-Waste of students in total	Urban	121	26.2	210	46.0	126	27.6
	Rural	157	25.2	321	51.5	145	23.3

Table 3 Significant difference between urban and rural school student in their awareness towards global warming and E-waste

Dimensions	Nature of the school	Mean	SD	Calcuiated 't' Value	Remark at 5% Level
Knowledge	Urban	26.13	5.131	1.402	NS
	Rural	25.71	4.806		

Cause	Urban	23.97	5.037	0.343	NS
	Rural	26.08	5.178		
Effect	Urban	20.74	4.676	1.467	NS
	Rural	20.31	4.804		
Global problem	Urban	11.13	2.72	2.056	S
	Rural	10.77	2.803		
Awareness of global warming and E-waste of students in total	Urban	84.02	13.462	1.901	NS
	Rural	82.44	13.559		

Discussion:

The Author selected the study of global warming awareness and electronic waste among school students. in the district of Aurangabad. The problem was thoroughly studied and objectives were set. Collected information through Aadhaar content collection tools related to the problem presented. The information obtained with the help of this statistical technique was analyzed and interpreted Statistical tables were used to study the global warming awareness of in the context of and electronic waste among the school students in the district of Aurangabad and drew conclusions based on that.

Awareness of the students. through the questionnaire regarding the research problem and hence the breadth of the research problem was noticed and thus the need and usefulness of the presented problem was realized in the district of Aurangabad. The problem was thoroughly studied and objectives were set. Collected information through Aadhaar content collection tools related to the problem presented. The information obtained with the help of this statistical technique was analyzed and interpreted Statistical tables were used to study the global warming awareness in the context of and electronic waste among the school students in the district of Aurangabad and drew conclusions based on that.

Awareness of the students through the questionnaire regarding the research problem and hence the breadth of the research problem was noticed and thus the need and usefulness of the presented problem was realized.

Recommendations

1] School administrators should arrange short term training programs for teachers, students and society for global warming awareness and electronic waste awareness.
2] At the primary and secondary level, the issue of global warming should be kept as a separate unit. Therefore, this subject should be included in the syllabus offered by the State of Maharashtra.
3] There is a need to create e-waste awareness program to educate the society on how to manage e-waste
4] Scientists, NGOs, government representatives and corporate bodies. The e-waste disposal system proposed by them can help projects that are successfully implemented

Conclusion

In the present case the Author has summarized the research. And the important part of this case is that the findings obtained by analyzing and interpreting the information from above given. According to that conclusion, the hypothesis has been examined and based on the findings, some difficulties have been noticed and some recommendations have been suggested accordingly. Also the questionnaire and list used for research in the reference section

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Diversity of Macrophytes present in the Vicinity of Kapsi Lake, Kapsi Dist. Akola. M.S. India.

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Abstract:-

The present study has been undertaken in Kapsi lake, Kapsi situated in Akola district, Maharashtra State, India. The main objective of this study is to evaluate the quantitative characters of the aquatic macrophytes viz., frequency, density, abundance, and importance value index (IVI). During the whole study period, a total of 50 macrophytic plants species belonging to 27 families were found distributed in the lake. Aquatic plant species recorded were grouped into different egoriesed viz., submerged (5 species),free floating (8 species) and submerge (33 species) respectively.Hygrophylla auriculata,Ipomoea aquatica ForskIpomea carnea Jacq.Marsilea minuta L, Nymphoides aquatica, Nymphea pubescens,Azolla sp. Typha aquistata,Phyla nodiflora were the dominant species found to occur in all the study sites during the entire study period.and Amarathus species, Gangea maderaspatana, Xanthium, Sphearanthus species, Cassia species, Delonix ragia, Ipomoea species, Cyperus species, Ceratophyllum species, Phylla nodiflora, Commellina benghalensis, Euphorbia species, Phyllanthus amarus, Acalypha indica, Albizia lebeck, Ludwigia species and Polygonum species. The analysis of variance (ANOVA) for all the aquatic macrophytes reported from the lake indicates that there is no significant variation within the four study sites in terms of distribution. However, F-test result indicates significant variation in the quantitative characters between the different macrophytic plant species of the lake.

Keywords:- *Diversity, vicinity, macrophytes, quantitative, Kapsi Lake , India.*

Introduction

Macrophytes usually includes any plants which are observable by the naked eye and always identifiable when observed (Homes & Whitton, 1977). Macrophytes are an important component of the aquatic and terrestrial ecosystem and major changes in the abundance of individual species and community composition usually provide valuable information on the reason on how and why an ecosystem might be changing. Macrophytes are also valued as an important means for indirectly monitoring the water quality for instance, eutrophication can bring about change in the species composition and a loss of species diversity. At the same time, macrophytes also affect the physical, chemical and biological characters of the lake, and are affected by a group of factors such as lake Morphometry, water chemistry and biological characters of the lake (Lacoul & Freeman, 2006).

The Maharashtra state has been included under deciduous diversity of the world along with Kapsi Lake, Dist. Akola, India. The assessments of the Physico-chemical characteristics of the freshwater environment are essential to understand the distribution and productivity of aquatic macrophytes in the freshwater ecosystems. Some of the earlier studies on Phytosociology, Biomass and Primary Productivity, Physico-chemical characteristics of water are not adequate enough to compile a composite ecological database of the freshwater ecosystems of the country. Some of the relevant earlier works which have been carried out by a number of researchers at national and global levels are Devi, (1993), Melzer, (1999), Hanlon, et al., (2000), Devi, (2007), Devi, (2008), Usha & Sharma (2008), Cheruvelil & Soranno, (2008), Nurminen & Horppila, (2009), Mormul, et al., (2010), Usha, et.al., (2010a, 2010b), Singh, et. al., (2010a, 2010b, 2010c), Singh, et. al., (2011), Singh & Sharma, (2012), Singh, K.K. et. al., (2012), Soranno, et. al., (2011), Usha, et. al., (2012), Kanninen, et al., (2012), Singh & Sharma, (2013) etc.

This study would serve as an important prerequisite for assessment of the distribution of the aquatic macrophytes of the lake. The present study has been carried out with the main objectives to evaluate the quantitative characters like frequency, density, abundance, abundance by frequency (A/F) ratios and importance value index (IVI) of the aquatic macrophytes found in the lake at regular intervals during the study periods.

Methods

For the present investigation, the lake was divided into three study sites representing as Site I, II, and III. The aquatic macrophytic plant samples were collected at regular monthly intervals during the period July

2012 to June 2014 from the different study sites. The sampling technique used for diversity of the aquatic macrophytes was the standard method as described by Curtis (1959) and Misra (1968). The quantitative analysis comprises frequency, density, abundance, abundance to frequency ratio, relative frequency, relative density, relative abundance and importance value index (IVI).Assessing of the different quantitative characters were done by using a square quadrat of 25 cm × 25 cm in dimension and in each study site not less than 20 quadrat were sampled randomly.

2.1. Description of the Study Site

Kapsi Lake is one of the oldest lake in Akola district, situated about 20 kms from the district place and existing since the British regime. The lake is one of major drinking water source in the area. The people in the vicinity are also using the lake water for agriculture purposes, household acts, fishing, and other necessary things like washing of animals, clothing etc. Therefore, it is essential to know the water quality parameters to avoid the major hazardous conditions and health hazards. Keeping all this in view, the present investigation was planned to analyze various physiochemical parameters of Kapsi lake with special reference to the algal diversity of the lake.

2.2. Calculation of Quantitative Characters

$$\text{Frequency (\%)} = \frac{\text{No. of quadrats in which the species occurs}}{\text{Total number of quadrats studied}} \times 100$$

$$\text{Density/quadrat} = \frac{\text{Total number of individuals of a species in all the quadrats}}{\text{Total number of quadrats studied}}$$

$$\text{Abundance/quadrat} = \frac{\text{Total number of individuals of a species in all the quadrats}}{\text{Total number of quadrats in which the species occurs}}$$

$$\text{Abundance of a species A/F Ratio} = \frac{\text{Abundance of a species}}{\text{Frequency of the same species}}$$

Importance Value Index (IVI)/300 = Relative Frequency (%) + Relative Density (%) + Relative Abundance (%).

Figure 1.Map of Kapsi Lake, India

FIgure 2.-Google Map of Kapsi Lake

Results:-

A total of 50 aquatic macrophytes belonging to 27 families were found distributed in the lake. Out of total 50 species recorded, Poaceae family has shown the presence of maximum number of species i.e. 12 species contributing to 23.92% which was then followed by families like Cyperaceae, Nymphaceae and Polygonaceae with 3 species each contributing to 4.95%. Other families like Alismataceae, Amaranthaceae, Convolvulaceae, Hydrocharitaceae, Lemnaceae and Salvinaceae had 2 species each contributing to 3.70%. The remaining families viz., Apiaceae, Araceae, Asteraceae, Azollaceae, Characeae, Commelinaceae, Lemnaceae, Marsileaceae, Mimosaceae, Nelumbonaceae, Onagraceae, comprised 1 species each constituting 1.85% . The aquatic macrophytes found in the lake were categorized into four main sub-categories viz., (a) submerged (b) rooted with floating leaves (c) free-floating groups. Under submerged group 5 species (10.67%) were reported. C Hydrilla verticillata, Utricularia exoleta, Utricularia flexuosa were restricted to shallow areas where light is abundantly available upto the bottom and such plants usually have long stems with disLemnaceae sected leaves. Altogether 6 species belonging to rooted with floating leaves were reported viz., Nymphoides cristatum, Nymphaea stellata, Trapa bispinosa etc. In the free-floating category 8 species were recorded viz., Azolla pinnata, Ceratopteris thalictroides, Eicchornia crassipes, Neptunia prostrata, Pistia stratiotes, Salvinia cucullata etc. The maximum numbers of 33 species were recorded under the emergent group viz., Echinochloa stagnina, Enhydra fluctuans, Ludwigia adscendens, Hygroryza aristata, Ipomoea aquatica. Zizania latifolia, Phragmites karka, Pseudoraphis minuta etc. The percentage compositions of the different macrophytic species were found maximum in submerged species (77.42%). the, which was then followed, by the free-floating species (13.47%) and . The lowest percentage (9.21%) was contributed by rooted and floating leaved species

Table 1. ANOVA of Aquatic Macrophytes in the different study sites of Lake Kapsi, Maharashtra, India.

Parameter	Study Site	N	Mean± S.E	95% Confidence Interval Lower Bound	Upper Bound	Minimum	Maximum	F	P-Value
Frequency	1.	50	13 ± 2	9	17	0	51	0.222	0.877
	2.	50	12 ± 2	8	16	0	49		
	3.	50	14 ± 2	10	18	0	51		
	Total	150	13 ± 1	11	15	0	51		
Density	1.	50	15.26 ± 3.15	8.94	21.58	0	111	0.087	0.967
	2.	50	16.00 ± 3.28	9.42	22.59	0	89		
	3.	50	17.00 ± 3.41	10.17	23.84	0	122		
	Total	150	15.76 ± 1.63	12.55	18.96	0	122		
Abundance	1.	50	49.53 ± 8.74	1.99	67.06	0	324	0.233	873
	2.	50	50.05 ± 9.25	31.50	68.60	0	251		
	3.	50	55.13 ± 8.89	37.29	72.97	0	324		
	Total	150	49.81 ± 4.46	41.02	58.60	0	325		
AF/ratio	1.	50	0.09 ± 0.011	0.07	0.11	0	0.26	0.504	0.68
	2.	50	0.08 ± 0.012	0.05	0.10	0	0.27		
	3.	50	0.10 ± 0.012	0.07	0.12	0	0.34		
	Total	150	0.09 ± 0.006	0.07	0.10	0	0.39		
IVI	1.	50	4.60 ± 0.78	3.08	6.12	0	25	0.022	0.995
	2.	50	4.87 ± 0.86	3.15	6.59	0	22		
	3.	50	4.80 ± 0.72	3.35	6.25	0	246.47		
	Total	150	4.74 ± 0.40	3.94	5.53	0	29		

Note: S.E. = standard error; C.I. = Confidence Interval; Units-(Frequency - %; Density and Abundance- Plants m/sq.)

Discussion

The quantitative characters which comprises the estimation of frequency, density, abundance, abundance by frequency (A/F) ratio and importance value index (IVI) of the different macrophytic species in the different study sites of the lake, recorded higher values during rainy season which influenced the growth of the macrophytes and favouring good climatic conditions. The rainy season seems to be most favourable season for the germination of buried seeds of the perennial emergents like Cyperus species and other mud-growing species like Eclipta, Enhydra, Ipomoea, Caesula species etc (Rai & Munshi, 1982). Similarly, high values during the rainy season were recorded from a number of lakes and wetlands viz., Hokarsar wetland, India (Kumar & Pandit, 2005), Manasbal Lake, India (Rather & Pandit, 2006), Awangsoipat Lake, India (Devi, 2007), Oksoipat Lake India (Devi, 2008), Poiroupat Lake, India (Usha, et. al., 2010b) etc. It was observed that the maximum numbers of aquatic macrophytic plant species were recorded at the onset of the summer season and the rainy season due to the favourable warm temperature while the lowest numbers of species were recorded during the winter season. Hogeweg & Brenkert (1969) and Verma et al., (1982) earlier recorded luxuriant growth of the aquatic macrophytes, in the tropics during the rainy season. It is evident from the survey of the aquatic macrophytes distributions in the different lakes and wetlands in record that the Lake Kapsi is comparatively intermixed mats representing heterogeneous composition and distribution. Such heterogeneous compositions of species were also recorded earlier by Swindale & Curtis (1957) and Schmid (1965) in the submerged vegetations of U.S.A. and Seshavatharam & Venu (1982) in the Kolleru Lake, India.

The statistical analysis reveals that there is no significant variation with respect to frequency, density, abundance, A/F ratio and IVI of the different aquatic macrophytes recorded from the lake in the four study sites of the lake. The analysis of variance within the different species of the aquatic macrophytes indicated significant variation with respect to the quantitative characters. Comparable findings were reported from Manasbal Lake, Kashmir Himalaya, India (Rather & Pandit, 2006), Itaipu reservoir, Brazil (Mormul, et al., 2010) and Poiroupat Lake, India (Usha, et.al., 2012).

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A Study Of Global Biodiversity Change With Respect To Biodiversity Loss

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Abstract:

Global biodiversity change the very known and one of the most burning environmental issues of the present time. Inspite of the the various components we are discussing the two important components of biodiversity change—one is biodiversity alterations and the other is biodiversity loss.Here we briefly assess the impacts that modern humans and their ancestors had on biodiversity and discuss the recent declines and the changes in biodiversity. We evaluate the direct pressures on biodiversity change, change in habitat, overexploitation, the exotic species, pollution, and climate change. We discuss the root causes, such as demographic growth and resources used, and review existing scenario projections. We identify successes and impending opportunities in biodiversity policy and management, and highlight gaps in biodiversity monitoring and models. Finally, we have discussed how the ecosystem conceptual framework can be used to identify undesirable biodiversity change and to distribute conservation efforts.

Keywords : extinctions, species, abundance, range, land-use, climate

Introduction:

Biodiversity is commonly defined as the variety of life on Earth in all its forms that includes the diversity of species, their genetic variations, and the interaction of these lifeforms. it is also the sum of all "plants, animals, fungi, and microorganisms on Earth, their variation, (**2**). Biodiversity is multidimensional, and no single measure of biodiversity can capture all its dimensions (**3**). It is responsible for ecosystem services, including nutrient cycling, climate regulation, food production, and the regulation of the water cycle, and it is therefore intimately linked with human well-being(2,3,4). This foundation is now becoming endangered as the human footprint on the planet increases and biodiversity declines. Species are becoming extinct at rates higher than in the fossil record of the past few million years, including the peak extinction rate owing to the mega fauna disappearance at the end of the Pleistocene (**6**). Several other dimensions of biodiversity are also declining, such as the extent of tropical forests and the mean abundance of wild bird species (**7**, **8**). The human appropriation of Earth's natural resources is not only leading to biodiversity loss but also to large alterations of biodiversity distribution, composition, and abundance. In short we can say Biodiversity underpins human life. Halting biodiversity loss and restoring degraded ecosystems is therefore an essential element of sustainable development pathways. Failure to scale up action to address biodiversity loss will come at a significant cost to economies, businesses and more generally to human well-being.

Although biodiversity loss is as great a challenge as climate change, it has received substantially less attention on the political agenda. The focus of the 2019 G7 meeting on biodiversity is a positive step forward. Here, we review our current understanding of global biodiversity change and its underlying drivers. We start by scoping our definition of global biodiversity change, which includes both biodiversity loss and biodiversity alterations. Next, we briefly review human-induced global biodiversity change.

1) **HABITAT DESTRUCTION :** Ever more people need ever more space. Damaging human activity continues to encroach on natural environments, thereby destroying the habitats of countless species. As our numbers rise, cities, infrastructure and cropland (see 'Agricultural Intensification' below) are growing and merging into each other, fragmenting the remaining habitat and leaving isolated "islands" of natural populations of plants and animals too small to survive. According to IPBES, only one quarter of land areas and one third of oceans remain relatively undamaged by human activity.

2) **OVEREXPLOITATION :** Ever more people need ever more things. Humankind's relentless consumption of resources such as timber, oil and minerals is continuing to destroy natural habitats around the globe. We are also putting enormous pressure on populations of wild species, both by bushmeat hunting in the developing world and by large-scale industrial fishing in our seas. Wildlife poaching and trafficking still present a huge threat to many species, including rhinos, tigers and pangolins(13).
3) **CLIMATE CHANGE :** Ever more people produce ever more climate emission . Our planet is on the verge of a climate crisis due to our endless production of greenhouse gases including carbon dioxide and methane. We are headed for a 3-4 °C warmer world by the end of the century if nations' current climate ambitions are delivered on. We are already seeing species decline due to global temperature increase(10). Every half a degree of warming has a huge knock-on effect on ecosystems, with mobile species running out of areas to migrate to and temperature-sensitive organisms like corals undergoing massive die-offs. When keystone species like reef-building corals disappear, the rich and complex ecosystems they support collapse as well.
4) **POLLUTION :** Ever more people produce ever more waste and pollution. As populations increase, the disposal of waste from households, agriculture and industry, becomes an increasingly serious issue. Our oceans are becoming choked with plastic waste which is killing millions of animals, from sea turtles to whales. (**10**)The Ellen MacArthur Foundation estimates that by 2050, there will be more plastic than fish in the sea. As well as affecting the lives of humans, noise, light and chemical pollution all damage the health of wild species.
5) **AGRICULTURAL INTENSIFICATION :** Ever more people need ever more food. Agriculture deserves a special mention here as it is a primary driver of habitat destruction, climate change and pollution. Agriculture takes up 50% of all habitable land on Earth, 80% of extinction threats to mammal and bird species are due to agriculture, and our modern food systems are also the biggest contributor to climate change, responsible for around a third of all greenhouse gas emissions, with more than half of these coming from animal agriculture. In order to meet the unsustainable consumption patterns of the Global North and feed our huge population, humanity has developed agricultural systems which rely on monocultures, artificial fertilisers and pesticides. Monocultures are increasingly susceptible to disease so require widespread pesticide use which destroys insect populations. Intensive farming leads to soil depletion and runoff from farms pollutes water bodies and causes harmful algal blooms and the collapse of fish stocks.
6) **INVASIVE SPECIES :** Ever more people means ever more travel. Human travel across the world has a very large emissions footprint but it has also allowed the spread of invasive species, both accidental and intentional. As a consequence of the introduction of non-native species to some areas, such as rabbits and cats in Australia, goats on St. Helena, and American mink in Great Britain, we have put many vulnerable ecosystems at risk, threatening native species and diminishing biodiversity.
7) **GENETIC DIVERSITY IN DOMESTICATED AND WILD SPECIES :** Of the four biodiversity dimensions analyzed here, we have the least information at the global level for changes in genetic diversity. Studies of loss of genetic diversity can be classified into two categories: studies of genetic diversity of domesticated species and studies of genetic diversity of wild species. Studies of domesticated species can further be divided into plant genetic resources (12) and animal genetic resources (14).

Over the past few decades, the worldwide adoption of modern crop varieties adapted to high-input systems has led to the reduction in the area farmed with local crop varieties (14). This change in agricultural practices has raised concerns: For instance in China, the number of rice breeds in production is reported to have declined since the 1950s from 46,000 to 1,000, and most of the 10,000 traditional corn breeds are no longer in production (9). Still, there are many farm communities that, although exposed to modern varieties, choose to maintain, at least in portions of the farm, traditional varieties (8). The picture of allelic diversity change is also complex. Although

some studies report declines in allelic diversity of modern varieties over the past few decades (9), a meta-analysis of 44 studies has found no significant overall

Solutions to biodiversity loss

Dealing with biodiversity loss is tied directly to the conservation challenges posed by the underlying drivers. Conservation biologists note that these problems could be solved using a mix of public policy and economic solutions assisted by continued monitoring and education. Governments, nongovernmental organizations, and the scientific community must work together to create incentives to conserve natural habitats and protect the species within them from unnecessary harvesting, while disincentivizing behaviour that contributes to habitat loss and degradation. Sustainable development (economic planning that seeks to foster growth while preserving environmental quality) must be considered when creating new farmland and human living spaces. Laws that prevent poaching and the indiscriminate trade in wildlife must be improved and enforced. Shipping materials at ports must be inspected for stowaway organisms.

Developing and implementing solutions for each of these causes of biodiversity loss will relieve the pressure on species and ecosystems in their own way, but conservation biologists agree that the most effective way to prevent continued biodiversity loss is to protect the remaining species from overhunting and overfishing and to keep their habitats and the ecosystems they rely on intact and secure from species invasions and land use conversion. Efforts that monitor the status of individual species, such as the Red List of Threatened Species from the International Union for Conservation of Nature and Natural Resources (IUCN) and the United States Endangered Species list remain critical tools that help decision makers prioritize conservation efforts. In addition, a number of areas rich in unique species that could serve as priorities for habitat protection have been identified. Such "hot spots" are regions of high endemism, meaning that the species found there are not found anywhere else on Earth. Ecological hot spots tend to occur in tropical environments where species richness and biodiversity are much higher than in ecosystems closer to the poles.

Concerted actions by the world's governments are critical in protecting biodiversity. Numerous national governments have conserved portions of their territories under the Convention on Biological Diversity (CBD). A list of 20 biodiversity goals, called the Aichi Biodiversity Targets, was unveiled at the CBD meeting held in Nagoya, Japan, in October 2010. The purpose of the list was to make issues of biodiversity mainstream in both economic markets and society at large and to increase biodiversity protection by 2020.

Loss of Biodiversity Solution

The solutions to Loss of Biodiversity are:

Protection of Species: Hunting of animals and poaching of birds should be restricted. But, unfortunately, to fulfil our greed, we kill animals and ignore the consequences of our actions.

Protection of Habitat: Due to the increase in human population, we need more space to survive and agriculture, which leads to the destruction of natural habitats of many animals and plants. Therefore, we should take measures to control the population to protect the habitat of animals and plants to keep them safe from extinction.

Prevention of Deforestation: Many animals, plants, and tiny organisms stay in tropical rainforests. However, these species are endangered due to deforestation, which will have a negative chain impact. So, we should make sure that we can save our forests and preserve them and keep the species safe.

Controlled Usage of Natural Resources: We should keep control of the usage of natural resources by using alternative options of cooking, fuel, and mineral usage.

Prevention of Species Invasion: We should stop the invasion of species because they will lead to the displacement of local species from their habitat, and this will cause the extinction of many species.

Pollution Control: We should control pollution levels as it affects the biodiversity in adverse and high pollution may lead many species to extinction.

Government Regulatory: Government should make laws that can protect or conserve the natural variety of plants and animals from getting extinct.

Education: People should be educated about the importance of the ecosystem and the preservation of biodiversity. They should also know the consequences of declining biodiversity so people can seriously take part in the growth of healthy biodiversity.

Conservation of Species: Species of the various living organisms should be preserved by In-situconservation by protecting them in natural habitats for growth and Ex-situ conservation by protecting the species outside their natural habitat.

Summary

Biodiversity loss is a significant worry in the present time. It creates a negative impact on the environment. It results in loss of habitat, extinction of species, and increase in natural calamities droughts etc. The present work gives a glance of the causes of biodiversity loss and its consequences. That's why it is necessary to preserve our ecosystem, for this we should find more effective solution to protect all the species and other important biological elements of the ecosystem.

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A brief Study of Forest and Wildlife Conservation

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Abstract :

This Review highlights the major issues about deforestation, wild life extinction and conservation. Forest conservation is the practice of planting and maintaining forest areas for the benefits and Sustainability of further generations. Along with that wildlife conservation is also mandatory. It is necessary to know current scenario about wildlife protection and conservation at national and international level. Habitat conservation is the key solution to conserve biodiversity. Lots of efforts has been done in many areas. Similarly by discouraging the pet trades, over shooting as well as hunting by applying different banes, marine pollution by different lows and regulation. And public awareness are the main concerns.

Introduction :

Forest and wildlife resources are indispensable four the provisions as ecosystem goods and services; as well as spiritual and cultural values in rural area. Now a days, conservation of biodiversity is the great challenge. There is a great need of different planning strategies for protection, conservation and minimizing the loss of natural resources, wildlife and forest cover. Forest may vary significantly in size and have different classifications according to how and of what the forest is composed. Tree forests cover approximately 9.4 % of the Earth's surface (30% of total land area). Forests are central to all human life because they provide a diverse range of resources and multiple benefits too. As we conserve the forest i.e. habitat of wildlife, wildlife conservation also done side by side. Cooney et. al. (2018) state that wild animals are essential part of biodiversity and source of food and recreation. However, forest and wildlife resources are disappearing at an alarming rate, across the globe. The degradation of forests has gradually led to loss in biodiversity, acsthetic view at landscapes and ecological functions including the provisions at goods and services of human needs.

History of forest and wildlife conservation :

The scheme of biodiversity and encompassing unique and representative ecosystems are identified and designated as Biosphere Reserves to facilate conservation in India's immense biological diversity which is estimated to be over 47,000 plant species and 81,000 animal species, respectively about 7 % of world's flora and 6.5% of world's fauna respectively. Nearly 15,000 flowering plants are endemic to country and in case of fauna, the extent of endemism is estimated at about 62 %.

The scheme of biodiversity conservation was initiated during 1991-92 to ensure co-ordination among various agencies with dealing with issues relating to conservation of biodiversity, and to review, monitor and evolve adequate policy instruments for the same. Pursant to ratiflaction of the conservation on Biological Diversity by India on 18th February 1994, several steps have been initiated to meet the commitments under the conservation and to realize the opportunities offered by convention. These efforts aim at bringing the legislative administrative and policy regimes in tune with the tree – fold objectives of conservation.

Methods of conservation :

Ways to conserve forests :

Forests serve as a natural resource and habitat for wide variety of living organisms on the Earth. Millions of animal species take shelter in forests. Conservation of forests is one of major steps to be taken to bring book sustainability in ecosystem. Use of following way can help to conserve forests and promote sustainability.

a) Controlling and regulating deforestation :

Industrialization and urbanization have cause a huge loss to forests and wildlife. One of the ways to conserve forests by controlling and regulating the cutting of forests. Shelter wood cutting, selective cutting, and clear – cutting methods may be employed to regulate the felling at trees.

b) Afforestation :

The most effective and promising way of conserving forests is afforestation. With afforestation, we can not only increase the overall forest cover but also recover the land due to deforestation.

c) Control Forest Fires :

One of the most significant causes of the loss of forests is forest fires. Although forest fires aid in replenishing essential nutrients form deal organic matter. In the soil, they cause a huge loss. The two types of forest are natural and artificial. Artificial forest fires are when complete forest land is set on fire. To convert the land for agricultural purposes. Artificial forest fires should be avoided completely. And, innovative forest fires fighting techniques should be discovered and implemented to stop natural forest fires.

d) Proper care :

Forest trees are also supplied with pesticides to protect them from harmful pests and diseases. This is when most trees get impacted negatively. The use of chemical substances poses a huge threat to the whole forest. Therefore proper care should be taken while safeguarding the plants from harmful pests and diseases.

Various Act of Protection and Conservation of Forest :

The important forest legislation in India are :

1) The Indian Forest Act, 1927
2) The Wildlife Protection Act, 1972
3) The Forest Conservation Act, 1980
4) The Scheduled Tribes and other Traditional Forest Dwellers Act, 2016

Ways to conserve wildlife :

Plants and animals are interdependent to each other. Plants supports animal's existence and vice-versa. some of them are fundamental to maintaining ecological balance. Here is some of the ways to conserve wild life.

a) Prevent deforestation :

Deforestation is one of the leading cause of the loss of wildlife. Wildlife can be protected and conserved with the help of afforestation.

b) Develop Protective areas :

Developing protective areas for animals to live is another promising way to conserve. Wildlife some of the example of protective areas include wildlife sanctuaries, national parks, zoos and so on.

c) Protecting critically endangered species :

Safeguarding the vulnerable and critically endangered animals from becoming extinct is another way of promoting wildlife. There critically endangered or vulnerable species many be brought to safer places such as zoos where they can breed and reproduce.

D) Ban on wildlife hunting :

Introducing strict rules on banning wildlife hunting is critical to stop further loss of wildlife.

Importance of Conservation :

Forest and animal are the most important aspects of our lives. We value them for many reasons, some utilitarian, some intrinsic. This means we value biodiversity both for what it provide to humans and for the value it has in its own right. Utilitarian values include the many basic needs human obtain from forest and also from animals. More than 33% of our drug needs are obtained from wild plants. The forest gives incredible breadth to leap forwards in the field of clinical science and innovation alongside the necessities for the huge scope if assembling anti-infection agents and different medications for medicinal use. A forest keeps up with temperatures universally, accordingly batting against the impact at greenhouse gases. Forests also aid in forestalling the ocean levels to rise strongly. Plat and animals are interdependent on each other.

Plant support animal's existence and vice-versa. Both of them are fundamental to maintaining ecological balance. The Forest is a natural habitat for. Many animal species. Thousands of animal species reside in these immense forests. Micro-organisms in wildlife fix the nitrogen levels, thereby promoting soil fertility. Forest as well as wild animals have importance in human life.

Various Act of Protection and Conservation of Wild Animals :

The important wild life legislation in India are :

1) Wild life Protection Act, 1972
2) Wild Life (Stock Declaration) Central Rules, 1973
3) Wild life (Transactions and Taxidermy) Rules, 1973
4) Wild Life (Protection) Licensing (Additional Matters for Consideration) Rules,1983
5) Wild Zoo Policy, 1998
6) Declaration of Wild Life Stock Rules, 2003
7) National Board for Wild life Rules, 2003
8) National Tiger Conservation Authority (Salaries, Allowances and Other Conditions of Appointment) Rules, 2006
9) Recognition of Zoo Rules, 2009

Conclusion :

In this way, this paper conclude that, individuals as well as governments can do their part in presenting the forests of the world. Knowledge about the importance of forest and wild animals needs to be spread so that people become aware of the danger to everyone and everything on the earth by deforestation and extinction of animals. People's participation in conservation of forests is of vital importance. So that people must get involved in this national task. Methods, strategies and measures mentioned here for the conservation of forests and wild life are very simple so that every individual could follow them and act at their own level in order to achieves the goal of conservation of forest as well as wild creatures. If people starts now and act now, it might get too late for the cause of conservation of forests and wildlife.

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Conservation and Use of Wild Medicinal Plants Problems, Progress, and Prospects

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Abstract:

In India, the research works on wild plants and agriculture is meager as compared to developed countries. There are numerous methods being used to study the agriculture of wild pants and their uses in herbal medicine and cosmetics industry. Therefore, the focus of this article is to explain the methods and their potential utility to the researcher, with a special emphasis on how Indian scientific communities can utilize the simple and feasible methods of collection of wild medicinal plants and explain their uses for the society. Ocimum americanum belongs to the family Lameaceae and have an aromatic and medicinal importance. In application of advanced method like GC-MS computational techniques plays an important role in the development of drug of interest concerning the study of O. americanum contents. Four compounds were identified in aerial parts of leaves of Ocimum americanum. These four compounds identified in ethanolic extract are 3,3-dimethyl-2-(phenylsenyl)-,2,2,2-trifluoro-1-(9-anthracenyl)ethyl ester (Butanoic acid), Diacetato[1,2-bis(diclohexylphosphino)ethane, Osmium dibromi(E) [tetrakis(trimethylphosphine)],10,10'-diselenodi-(Decanoic acid)). It was observed that in the different sites of Nagpur region, the constituents of Ocimum americanum differed in quantity, which may be due to the local geographical differences. Aromatic oil found in 3gm of dry weight of powder of leaves of Ocimum americanum is 5%.

Keywords *- Ocimum americanum (L.), GC-MS, Compounds, Agriculture.*

Introduction

Medicinal plants are valuable sources of new drugs [1–4]. Up to 80 % of people in developing countries are totally dependent on herbal drugs for their primary health care, and over 25 % of prescribed medicines in developed countries are derived from wild plant species [4].According to world health organization (WHO) variety of drugs are obtained from medicinal plants.In developed countries almost 80% of individuals depends on compounds derived from medicinal plant.In this regard properties,saftey & efficiency of them should be investingated.[5]. The study of indigenous food production and local medicinal knowledge may have practical implication for developing sastainble agriculture and discovery of new medicines.Medicinal and herble plants also encourage an awarness of the link between biodiversity and culture diversity as well as a sophisticated understainding of the mutual influence of plants mutual influence of plants and human. The conservation and sustainable use of medicinal plants have been studied extensively [6, 7]. Various sets of recommendations have been compiled regarding their conservation, including the establishment of systems for species inventorying and status monitoring, The Global strategy for Plant consevation is a catalyst for working together at all levels-local national,regional and global-to understrand,conserve and use sustainbly the worlds's immense wealth of plant diversity whilst promoting awareness and building the necessary capcities for its implention.Gas chromatogrphy and Mass spectrum is one of the best method for to identify the plants chemical components. *Ocimum americanum* contain essential oil which is volatile organic strong smell substance and have great importance in pharmaceuticals as well as cosmatics industries.

Fig- *Ocimum americanum*

Methodology

Collection of plant material

Ocimum americanum leaves were collected from Panjabrao Deshmukh Krushi Vidyapeeth (PDKV) forest of Nagpur district. The plant was identified by the Plant systemic laboratory Department of Botany,R.T.M.University Nagpur Maharastra.GC-MS Analysis - The test plant extracts were subjected to GC-MS analysis at laboratory's (IIT Bombay) Sophisticated Analytical Instrument Facility (formerly RSIC), Indian Institute of Technology, Powai, Mumbai.

Result And Discussion

The present investigation was carried out on plant *Ocimum americanum* of Lamiaceae family to study the presence of medicinally active phytochemicals in the leaves.The leaves of *Ocimum americanum* (L.) Poit collected from campus and PDKV forest which experienced different climatic and geographic circumstances, were determined by GC-MS. It has been already reported by various workers. As seen in the table- 1, different compounds were determined from the leaves of *Ocimum americanum*. The present investigations concluded that the leaf *Ocimum americanum* contains chemical compounds. These chemicals are widely used in Ayurvedic traditional and herbal medicines as well as cosmetics industry.Decanoic acid is used in the manufacture of esters for artificial fruit flavours and perfumes. Problematically some wild plant resource is becoming scarce and threatened by over harvesting It needs substantial investment before and during production Uncontrolled harvesting leads to the extinction of ecotype and species. In progressively, the natural way access resource without investment it relieves harvesting pressure on rare and threatened species. It is natural resource and free from pesticides It can keep genotypes being standardized or improved

Ocimum americanum in chemical compounds and herbal ingredients,and it has been said that 70-80% of the world's population relies on some from of non-conventional medicine[4] and around 25-40% of all prescription drugs contain active ingredients derived from plants in theUnited States[5].

Medicinal Importance of *Ocimum americanum*

- In traditional medicine, *O.americanum* holy basil is used for several ailments.
- Decoctions are used for coughs; pounded leaves are placed on the forehead to relieve catarrh or on the chest for respiratory problems.
- The whole plant is used in baths to treat rheumatism, renal colic and calcifications.
- More recently, the plant has been listed as a potential medicine against cancer.
- Aromatic oil is found in 5% in 3gm of dry weight of powder of leaves of *Ocimum americanum.*
- An essential oil can be extracted from plants leaves of *O. americanum* are used in soap and cosmetics. It has been reported to exhibit fungi toxic properties (without phototoxic side-effects).The oil contains camphor, and methyl-cinnamate.
- *O. americanum* has been planted on a large scale in the Common wealth of Independent States, Kenya and Pakistan for the production of camphor, which has medicinal and industrial applications (celluloid, fireworks).
- *O. americanum* used to treat inflammatory and allergic conditions.
- The leaves pest is used in tretment of skin deaseses,it is also appplied on wound and burns that are not healing well.

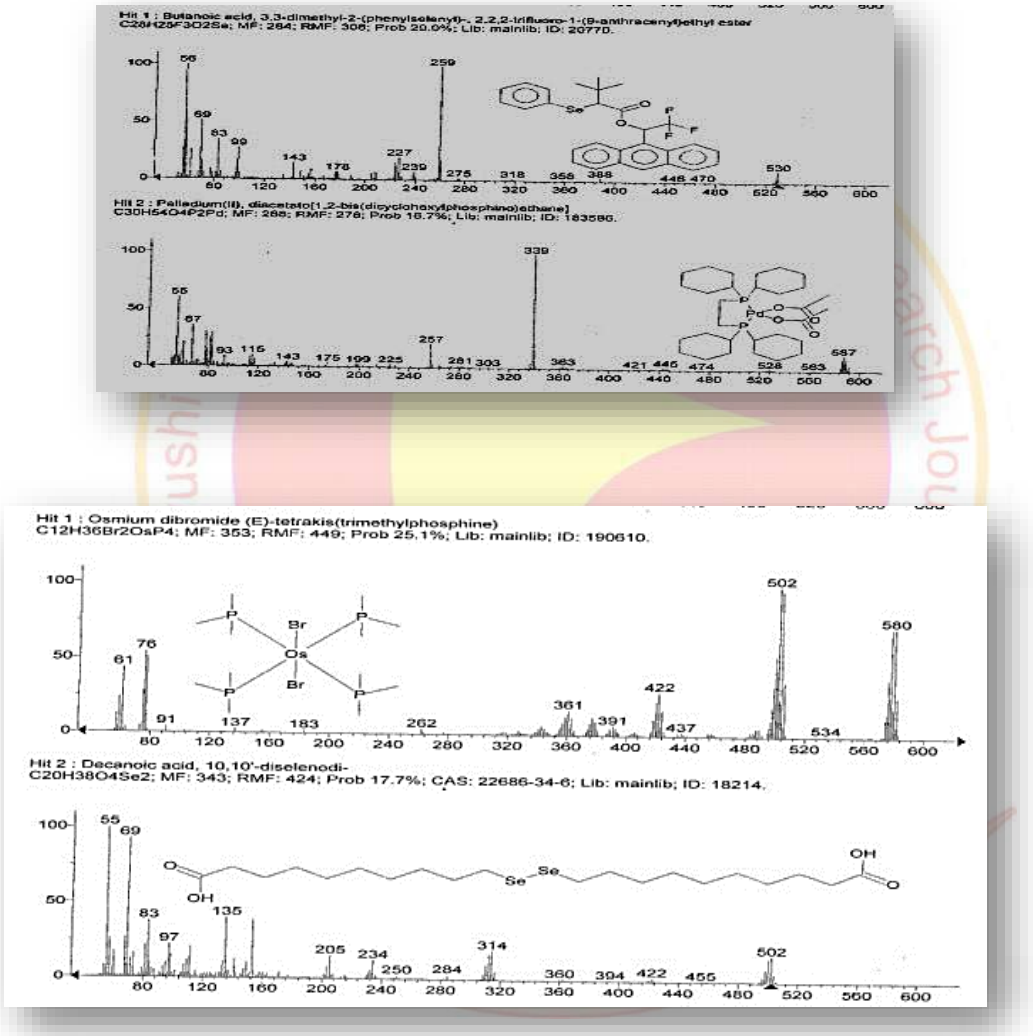
Table 1- Uses of Plants species, life forms and Percentage of plant parts used

Life form	Leave	Flower/bud	Fruit/seed	Bark	Root	Whole plant
Herb	High	High	High	Low	Medium	High

Table No.:2 The Chemical Composition of *Ocimum americanum*

S. N.	Name of compound	Molecular formula	Biological activity	Peak Area
1	3,3-dimethyl-2-(phenylsenyl)-,2,2,2-trifluoro-1-(9-anthracenyl) ethyl ester. (Butanoic acid)	$C_{28}H_{25}F_3O_2$	Antioxidant activity	141200
2	Diacetato[1,2-bis(diclohexylphosphino)ethane]	$C_{30}H_{54}O_4P_2$	----	141200
3	Osmium dibromi(E) (tetrakis(trimethylphosphine	$C_{12}H_{36}Br_2O_4$	Anticancer Compounds	66375
4	10,10'-diselenodi-(Decanoic acid)	$C_{20}H_{38}O_4$	Antioxidant activity	66375

Graphical Representation of *Ocimum americanum*



Conclusion:

The study concluded that *Ocimum americanum* and its habitat less but its own reproductive strategies. In spite of the existence of various sets of recommendations for the conservation and sustainable use of medicinal plants, only a small portion of these have achieved adequate.

Protection of medicinal plant resources through conventional conservation in natural reserves.

Most of the medicinal claims are centered on flowerand inflorescence of the plant. The whole plant and l eaves,are also administered in a few specific clinical conditions.Theanalysis of all the claims clearly indi

cates the,potential of the plant to be an excellent analgesic, antipyretic and anti inflammator drug whi ch needs to,be,validated.The present GC-MS screening are an essential tools for confirmation of the results and it may serve as pavements for the researcher to select a group of plants having similar chemical constituents and their detailed investigation regarding their chemistry and functions is required, so that they can be used in allopathic or in Ayurvedic medicine as well as cosmatics industry.

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Qualitative phytochemical study of Certain Ficus Species from Manora Tehsil.

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Abstract

Family Moraceae (fig family) one of the angiospermic plants family can be found throughout the world bearing about 38 genera and over 1100 species with cosmopolitan distribution. Ficus is a genus of more than 850 species in the Moraceae family. Generally, there are five species of Ficus in Maharashtra's Washim District: Ficus hispida L., Ficus benghalensis L. Ficus glomerata L., Ficus religiosa L.., Ficus benjamina L. are more commonly found having a diversified habitat. The presence of active phytochemicals in various parts of the plants gives these Ficus species their traditional therapeutic use. The present work is focused on the comparative preliminary phytochemical analysis of above selected five Ficus species from Manora tehsil of Washim District, (M.S.) India. It is observed that Ficus species have rich but diverse phytochemicals in their different parts.

Keywords: Moraceae, Ficus, Phytochemicals, traditional medicine, Manora.

1. Introduction

For thousands of years, plant have provided to human beings many basic and important materials required for their day-to-day life. Plants are also considered as biochemical factories, as involved in the production of various chemical components for the utilization of mankind.

Natural products have found use in antiquity as folk remedies, soaps and essences. They include drugs and other medicinal products, dyestuffs, feedstocks for chemical industries (gums, resins, rubber) and a variety of substances used to flavor food and drink. In recent years, however, it has become increasingly evident that many natural products do have significant ecological functions, such as protection against microbial or insect attack. (Hopkins, 1995).

Different traditional literatures are literal witness that *Ficus* are having many ethnomedicinal values. (Babu K, 2010).

In this present work, it was attempted to give a comparative phytochemical from five selected Ficus species i.e. Ficus hispida L., *Ficus benghalensis L. Ficus glomerata* L., Ficus religiosa L.., *Ficus benjamina* L. and their some traditional ethnomedicinal uses.

2. Materials And Method

2.1 Collection of plant materials:

Plants and plant materials selected for the study were collected from different localities of Manora tehsil, Washim district specially from villages, Abhaykheda, Kolar,Kondoli, Dapura, Vitholi, Manora region. Firstly, the plants were spotted in different localities, identified them using different floras like Cook 1907, Dhore 2005, Naik 1989, Yadav and Sardesai 2002. A specimen copies of selected plant is submitted to the herbarium of Department of Botany, M.S.P. Arts, Sci. & K.P.T. Comm. College Manora, Dist. Washim (MS).

Photographs of five Selected *Ficus* Species:

Ficus hispida L. ***Ficus benghalensis L*** ***Ficus glomerata*** **L. Ficus religiosa L.** ***Ficus benjamina*** **L.**

The leaves and stems of the plants were picked and washed with tap water and then distilled water. Then the material is shade dried for 10-15 days and grinded well to obtain homogenous fine grade powder. a 4-gm powdered sample soaked for 1 hour in each of 40 ml Methanol, Petroleum ether, and distilled water, Preliminary phytochemistry was conducted after the solvents were filtered.

2.2 Preliminary phytochemistry: Preliminary phytochemistry was done as method given by Harborne (1973), and Krishnaiah et al, (2009). **..**

Preliminary phytochemistry was done for 11 group of secondary metabolites i.e. Alkaloids, Cardiac Glycosides, Phenolic compounds, Flavonoids, Terpenoids, Saponin, Steroids, Reducing Sugar & Tannins.

3. Result And Discussion:

Table No. 1 - Comparative preliminary phytochemical analysis of five *Ficus* Species (Leaves extract).

Sr. No.	Phytochemicals	Ficus hispida L.	*Ficus benghalensis L.*	*Ficus glomerata L.*	Ficus religiosa L.	*Ficus benjamina* L.
1.	Alkaloids	+	+	+	+	+
2.	Cardiac Glycosides	+	-	-	+	+
3.	Phenol	+	+	+	+	-
4.	Flavonoids	-	+	-	+	+
5.	Terpenoids	+	+	+	+	+
6.	Saponin	+	+	+	+	+
7.	Steroids	+	+	+	+	+
8.	Reducing sugar	+	+	+	-	+
11.	Tannins	+	+	+	+	-

Table No. 2 – Comparative preliminary phytochemical analysis of five *Ficus* Species (Stem extract).

Sr. No.	Phytochemicals	Ficus hispida L.	*Ficus benghalensis L.*	*Ficus glomerata L.*	Ficus religiosa L.	*Ficus benjamina* L.
1.	Alkaloids	+	+	+	+	+
2.	Cardiac Glycosides	+	+	-	+	-
3.	Phenol	+	+	+	+	+
4.	Flavonoids	-	+	-	+	+
5.	Terpenoids	-	+	+	+	+
6.	Saponin	+	+	+	+	+
7.	Steroids	-	+	+	+	+

8.	Reducing sugar	+	+	+	+	-
11.	Tannins	-	+	+	+	-

4. Conclusion:

Methanol, petrolium ether, and distilled water were utilised as solvents for preliminary phytochemistry. Methanolic leaf extracts of Ficus hispida L, *Ficus benghalensis L.*, *Ficus glomerata* L, and Ficus benjamina L contain alkaloids and reducing sugar.

Ficus benghalensis L., Ficus hispida L., and *Ficus benjamina* L. all contain steroids, but *Ficus benghalensis L.*, Ficus hispida L., and *Ficus benjamina* L. do not.

Glycosides were found in the petroleum ether leaf extracts of Ficus hispida L., Ficus religiosa L., and Ficus benjamina L. *Ficus benghalensis L.*, *Ficus glomerata* L., Ficus religiosa L., and Ficus benjamina L. all contain terpenoids, as do *Ficus glomerata* L., Ficus religiosa L., and Ficus benjamina L.

The aqueous leaves extract of Ficus hispida *L*, *Ficus benghalensis L.*, *Ficus glomerata* L. and Ficus religiosa L. shows the presence of Phenol and Saponins, Steroids, while it shows the presence of Flavonoids and Tannin are found *Ficus benghalensis L.*

Alkaloids and phenols can be found in Methanolic stem extracts from all of the plants studied, while Flavonoids can be found in *Ficus benghalensis L.* and Ficus religiosa L.

Glycosides can be found in the petroleum ether stem extracts of Ficus religiosa *L.* and *Ficus benghalensis L.* Reducing sugar is detected in the aqueous stem extracts of *Ficus hispida* L, *Ficus benghalensis L.*, *Ficus glomerata* L, and *Ficus religiosa* L., whereas Phenolics, Terpenoids, Saponin, and Steroids are present in *Ficus glomerata* L and Ficus religiosa L.The phytochemical study of the above plants shows that the plants of the selected *Ficus* species have the common secondary metabolites viz. Alkaloids, Glycosides, Terpenoids, Steroids, Saponins, reducing sugar, Tannins, and a variety of other phytochemicals are found in abundance in almost all members of the family. These phytochemicals are studied for the various medicinal properties and has been probed used again various diseases such as diabetes, fever, tuberculosis, renal tubular disease, malaria, intestinal diseases, etc. These plants' natural phenolic compounds performed an essential part in cancer prevention. (Singla and Pathak, 1993; Munshi et al., 1993; Omale and Emmanual, 1997; Ravichandran et al., 2012).

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Diversity of Selaginella in Melghat forest , Amravati district, Vidharbha region of Maharashtra.

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Abstract

Melghat lies on the Southern shoot of the Satpuda range of hills. This part of Satpuda is known as Melghat; consists of hills and vallies . The most prominent geological feature of Melghat is the Gavilgad range of hills which is abundantly rich in biological diversity.

Forest of Melghat is Dry deciduous type of Forest.The entire area of Melghat is covered by the forest of the Dry deciduous Teak Forest. Tectona grandis is the most important and dominant species distributed in the entire area. The Melghat forest composed of Gugamal national Park with 361.28 sq.km. area, Melghat sanctuary with 788.75 sq.km area and Multiple use area with 526.90 sq.km. area.

In Melghat forest Pteridophytes flourishes naturally very well. Selaginella species well flourishes in Melghat. Key Words – Melghat, Pteridophytes, Selaginella.

Key words- Pteridophytes, Selaginella, Melghat forest.

Introduction

Pteridophytes formed a dominant part of Earth's vegetation in the historic past.Although they been largely replaced by the spermatophytes in the modern day flora.The present day lycopods like Lycopodium, Selaginella and Equisetum are the mere relicts of the mighty lycopsid and sphenopsid group.

Forest of Melghat is Dry deciduous type of Forest.The entire area of Melghat is covered by the forest of the Dry deciduous Teak Forest. Tectona grandis is the most important and dominant species distributed in the entire area. The Melghat forest composed of Gugamal national Park with 361.28 sq.km. area, Melghat sanctuary with 788.75 sq.km area and Multiple use area with 526.90 sq.km. area.

Materials and Methods

Pteridophytes division of vascular plants which do not produce seeds. It include Ferns, Club mosses and Horse tail. In Melghat under shady and damp places, along waterfalls, road sides of Ghats, in association with Angiosperms and Gymnosperms.

The plant specimen of Selaginella was collected in every stage of their growth and habitats and reproduction from different localities of Melghat Forest area. The plants were collected in tin vasculum. The plants are pressed flat, before their wilting. They are pressed after the day's visit.

The Selaginella was pressed between the sheets of news or blotting paper. These sheets were alternated between sheets of news or blotting paper. The plant became dry by transferring their moisture into the blotting papers.

After drying of plant material, the plant specimen were mounted on herbarium sheets of standard size . The specimens are labeled as per all data. The Selaginella specimen were preserved in 4% formaline solution.

Observation –

Selaginella blatteria

Selaginella blatteria found along the road sides in moist condition. It is distributed from August to October. The sporophyte observed from September to October.

The sporophyte herbaceous, dorsiventral prostrate, 6-16 cm long . Stem herbaceous, dichotomously branched, solid, prostrate, green, smooth and glabrous. The hairs unicellular. Leaves microphyllous, heterophyllous. Each leaf traversed by single unbranched mid-rib. The leaf with ligule, ligule arises from the base of each leaf.

Ligule delicate green with entire margine and acute apex, tongue shaped. A mature ligule has a prominent basal portion called the glossopodium. The ligule is a secretary structure which secretes water and mucilage. The leaves from four side of the stem. The larger leaves on the ventral side of the stem in opposite decussate manner.

Rhizophore leaf less, positively geotropic organ bears roots at the swollen end. A single rhizophore comes out downward from the rhizome. A rhizophore is an organ intermediate in structure and function between the stem and root, it is root like in appearance and behavior but has no root cap.

Rhizophores grow down to the soil and true roots emerge from them. Roots adventitious originate from the tips of rhizophores, dichotomously branched. The roots have root cap and bear root hairs.

Strobilus- The spore bearing organ is known as Strobilus. Sporangia bearing organ is sporophyte. The sporangia develop in the axil of leaves called as Sporophylls. The sporophylls are similar to photosynthetic vegetative leaves. There are two types of sporangia. The microsporangia, the sporophyll bearing microsporangia called microsporophyll. The megasporangia, the sporophyll bearing megasporangia called mega-sporophyll. The strobilus always terminal in position. The sporophylls ligulate which are present between the sporangium and the base of sporophylls. The strobilus also called the sporangiferous or the cone.

Selaginella repanda

Sporophyte observed from August to October . The strobilus from September to October.The sporophyte is terrestrial erect, dichotomously branched, 1.4 to 2.0 cm long . Leaves dorsiventral heterophyllous and alternate, leaves are of two kinds in four vertical rows, dorsal two rows are small, ventral two rows are large , ligulate. Ligule arise from the base of leaf, delicate green with entire margin and acute apex. The stem dorsi-ventral , dichotomously branched, solid. The rhizophore white coloured, 0.5 -1.0 cm long.

A rhizophore is an organ intermediate in structure and function between the stem and root; it is root like in appearance and behavior but has no root cap. Roots are adventitious, produced from the ends of the rhizophores.

The spore bearing organ is known as strobilus.Sporophylls are spirally arranged at the tips of the lateral branches forming strobilus. The sporophyll develop in the axil of leaves called as sporophylls. There are two types of Sporangia, The microsporangia, The sporophyll bearing microsporangia called microsporophyll. The megasporangia , the sporophyll bearing megasporangia called megasporophyll. The strobilus always terminal in position. The sporophylls are ligulate which present between the sporangium and the base of sporophylls. The strobilus also called the sporangiferous spike or the cone.

Result and Discussion

The pteridophytes are considered as a first vascular plants that colonized the terrestrial habitat. In the course of evolution they reached upto arborescent habit that has resulted into a gigantic and thick forest in Siluro-Devonian period. Pteridophytes have well developed conducting system. The plants are with feather like fronds.

The living members are represented by living taxa widely distributed over the surface of the global part . In Melghat Forest area Selaginella with two different species distributed in different climatic conditions. *Selaginella blatteri* and *Selaginella rependa*. Selaginella distributed on rock at moist condition with creeping stem, spirally arranged leaves, sporangia arranged in terminal strobilus.

Selaninella shows ecological succession in forest ecosystem.

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Diversity of Insect pest on Banana plant in Pandhari region,Anjangaon surji

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Introduction

Banana is a globally important fruit crop with 97.5 million tons of production. In India, it supports livelihood of millions of people. Banana occupies 20% area among the total area under crop in India and contributes 37% of the total fruit production and ranks second in importance next to mango with a total annual production of 16.91 million tons from 490.70 thousand hectares with national average of 33.5 T/ha. Bananas were originally found in South East Asia, mainly in India.

Banana, the fruit of a plant of the genus -Musa (family- Musaceae) is basically cultivated for food, and secondary for the production of fibers, and also for producing tissue-thin tea bags. Besides this, bananas are also cultivated for some ornamental purposes in various regions of the world. They are also known as Bananier Nain, Canbur, Curro and Plantain. These creamy, rich, and sweet fruits are favourite among the people of all ages right from infants to elders. Bananas consist mainly of sugars (glucose, fructose and sucrose) and fiber. They provide instant energy as they are the rich sources of Vitamin B6.

Origin of Banana

Musa species grow in a wide range of environments and plantains of the tropics to cold-hardy fiber and ornamental plants. These large, perennial herbs, 2-9 m in height, is evolved in Southeast Asia, New Guinea, and the Indian subcontinent, developing in modern time secondary loci of genetic diversity in Africa, Latin America, and the Pacific.

Musa species attained a position of central importance within pacific societies, the plant is a source of food, beverages, fermentable sugars, medicines, flavorings, cooked foods, silage, fragrance, rope, cordage, garlands, shelter, clothing, smoking material and numerous ceremonial and religious use.

Botanical Description

Banana plants are fast-growing herbaceous perennials that grow at 6 to 7.6 meters (20-25 feet) tall, from a corm. The banana has an underground stem with adventitious roots. Below is the brief botanical description of the banana plant.

Plant

They are herbaceous plant with an apparent trunk that bends without breaking. The "trunk" or pseudostem is not a true stem, but only the clustered, cylindrical aggregation of leaf stalk bases. This is the largest of all herbaceous plants having its leaves arranged spirally which can grow 2.7 metres (9 feet) long and 60 cm (2 feet) wide. There are 5-15 leaves on each plant, with 10 considered the minimum for properly maturing a bunch of fruit and approximately 44 leaves will appear before the inflorescence

Flowers

The inflorescence shooting out from the heart in the tip of the stem appears above the last leaves in an upright position, and consists only of a large, purple, tapered bud. As the bud opens, the narrow, nectar- rich, tubular, toothed, white flowers are revealed. They are then clustered in whorled double rows along the stalk, each cluster covered by a thick, purple, bract. The flower stalk begins to droop down under its own weight after opening; the flowers are negatively geotropic, and turn upright during growth

Pollination

Bananas are male sterile, and those of the Cavendish group are female sterile as well; fruit is set parthenocarpically

Fruits

The fruit (technically a berry) turns from deep green to yellow or red, and may range from 2-1/2 to 12 inches in length and 3/4 to 2 inches in width. The flesh, ivory-white to yellow or salmon-yellow, may be firm, astringent, even gummy with latex when unripe, turning tender and slippery, or soft and mellow or rather dry and mealy or starchy when ripe. through the literature we came to know the major and minor pest on banana tree viz.

Spondoptera litura (Cutworm) chaetanaphothrips signipenn (Banana thrips) , Nacoleia octasema (Banana scab moth) Apterona helicoidella (Hard scale)

In present study aimed to collect the data of minor pests of banana from selected banana field.

These minor insect causes the harm to banana tree and damage the banana leaves and some pest spread the diseases.

Thrips- Distinctive reddish brown oval stains on the finger, which can extend the entire length. In severe cases peel splits and the exposed flesh quickly discolors.

Aphids- Banana leaves are bunched into a rosette appearance with leaf margins becoming wavy and upward rolling thereby reducing the growth and vigour of plant. Severely infected plants do not produce bunches and act as a vector of bunchy top disease.

In addition,the climate change exerts a profound effect on the intensity of pest problem. Hence, there is considerable shift in insect pest problem and crop losses(Arora and Dhaliwal,1996;Dowens,et al.,2007 and Ramamurthy et al.,2009).

Banana plantation suffers number of pest: The minor pest and diseases affecting bananas are follows-

Viral diseases-Banana bunchy top virus is also known Banana virus,cucumber mosoic virus.

Fungal diseases-Panama disease,Singatoka diseases caused by fungus: Mycospheaerella musicola, Black Sigatok.

Insect pest-Banana stem weevil, banana pseudo stem borer, Odeoiporus longicollis, Oliver, banana rust thrips, Fruit rust thrips, Hard scale-Aspidiotus destructor, Cut worm. Nematods have been growth and yield through its damage to the roots and corm. The parasitic nematodes feed, multiply and migrate to roots.

Material and Method

There are different types of methods are available for collecting banana pest like pitfall trap method, handpick methods, light trap method, net swapping method, above methods are used for the collection of the banana pest.

In this reserch used the hand-pick methods for the collection of banana pest, firstly selected a specific agricultural land for the collection of banana pest, this agricultural land is in Amravati district in Pandhari village. This agricultural land visited on dated 13/9/2014 for the collection, near about 20 to 30 different types of pest collected and preserved in 70% alcohol. Later took photographs of each and every pest for their identification.

The specific field which were selected for the collection of pest is of 4 hectares. On these agricultural there are 4000 banana trees and each row contains 100 banana trees, having distance between two trees of 2.5 feet and distance between two rows is of 5 feet respectively.

Collection Time : The insects were collected between 11am-5pm. The owner of the land gave lots of information about banana trees and, his agricultural land was fully developed as compared to other farmers land. The survey was carried out 5-6 times for the observation of pests and were observed that there are some pests having an side effect on the banana trees and causing harmful effects on the yield of banana.

The study Area-Anjangoan surji is situated in Amravati district in Maharashtra, selected for study area because in these area more production of banana crop. The agriculture field of this area is developed for banana crop

Observation and Result

Total 40 to 50 individuals of various groups of insects were collected from the selected banana field and stored in70% alcohol later brought to laboratory. After sorting the minor pests are identified through available literature. Five minor banana pests are selected for the study and observed and their biology werestudied .

1) Cut worm - *Spondoptera litura*
2) Banana Scale Moth –*Nacoleia octasema*
3) Hard scale - *Aspidiotus destructor*
4) *Chaetanaphothrips Signipennis*

1) *Spondoptera litura*(Tobacco Caterpillar/ Cut worm)

classification
Kingdom: Animalia Phylum:Arthropod
Class :Insecta
Order :Lepidoptera Division:Ditrysia
Family:Noctuidae
Genus :Spodoptera
Species:litura

It is commonly called the cut worm or tobacco caterpillar and it is the type of Moth.

The lipidopteran pest Sondoptera Litura is a serious pest of banana,it has been recorded on several other crops like tobacco, cotton,mulberry.the full grown caterpillar are the most varacious feeders and cause extensive damage by defolication.

Identification- It having greenish brown with dark making, yellow and purplish spot in the sub marginal areas. It having forewing-stout moth with wavy white marking on the brown. Hind wing-white having a brown patch along margin.

Nature of damage

1)Young larvae feed by scrapping the leaves from ventral surface.
2)Later on feed voraciously at night on the foliag.

Fig-*Spondoptera litura*

Fig-*Spondoptera litura* (larva)

Result and Discussion

In the present study 40 to 50 banana pest were collected from selected agriculture field. The pestswere identified later minor pest were sorted out from collection. The minor banana pests are *Spondoptera litura* known as Banana scale moth, *Aapidiotus destructor*, known as Thrips, Bag worm , these are identified minor banana pest.

Many workers reported works on banana pest. Banana rust thrips(*chaetanaphothrips signipennis)* (Bagnall) (Thysanoptera:Thripidae) are present in parts of Australia and central America ,Brazil, Fiji, sri Lanka ,and India and also established in Florida caused severe damage to banana. The banana rust thrips is similar in appearance to two other introduced *Chaetanaphothrips species* the anthurium thrips,*C.orchidii*(Moulton) (Hara *et al.*,2002) and C.leeuweni (karny),which also share the samehosts,including banana, and anthrium .Banana rust thrips can be differentiated from two species by clear differences in body features. Gold(1998) and Umesh *et al*.,(2002) reported banana weevil and other insect such as moth, bag worm. The banana weevil has been identified as the most important insect pest of banana plantain in Africa.

The major pests found in Sri Lanka are banana weevil , stem weevile, banana aphid, banana thrips and fruit fly. However, diseases are more damaging as they reduced yield of banana more than insect pests. The major virus diseases recorded in Sri Lanka are banana tract mosaic virus, banana steak virus and cucumber mosaic virus.

Ariyarantna and Liyanage , (2002) reported that 82% and 59% of the cultivated banana are infected with banana bract mosoic and banana streak virus, respectively.

Plantain and banana cultivation is constrained by problem of pests and diseases.The minor pests namely banana fruit scarring beetle thrips, bag worm were reported from India. Shivayogeshwara et al.,(1991) reported spondoptera litura is becoming gradually an important insect pest crops including banana in India and many other countries.There have been a number of studies on the biological parameters of S.litura on different host plant under different environmental condition,particularly in India.Seasonal incidence of spondoptera litura on banana under South Gujarat conditions was studied by(patel et al.,1987)

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जैव विविधता : एक अमूल्य धरोहर

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*अंतर्राष्ट्रीय प्रकृति संरक्षण संघ (IUCN) एक विश्वस्तरीय संगठन है जो विभिन्न प्रजातियों के संरक्षण, निगरानी और प्रबंधन **का कार्य** करता है। अंतरराष्ट्रीय प्राकृतिक संरक्षण संघ के अनुसार जीवो को विलुप्त, घोर संकट ग्रस्त, संकटग्रस्त, असुरक्षित और संकट मुक्त जीवो की श्रेणी में बांटा गया है। अंतरराष्ट्रीय प्रकृति संरक्षण संघ के द्वारा संकटग्रस्त प्रजातियों को लाल सूची या रेड डाटा बुक के अंतर्गत सूचीबद्ध किया **जाता** है। अंतरराष्ट्रीय प्रकृति संरक्षण संघ के द्वारा लगभग 40,000 से अधिक प्रजातियां घोर संकटग्रस्त जीवो की श्रेणी में दर्ज की गई है। जिसमें 41% उभयचरी जीव, 21% सरीसृप, 26% स्तनधारी जीव, 13% पक्षियों, 33% कोरल रीफ, 34% कोनिफर, 63% साइकेड है।[1] अगर यह जीव पृथ्वी से विलुप्त हो जाते हैं तो परिस्थितिक तंत्र में धीरे-धीरे असंतुलन बढ़ता जाएगा और एक दिन ऐसा आएगा जिससे मानव का अस्तित्व खतरे में पड़ जाएगा।*

1. प्रस्तावना

जैव विविधता प्राकृति के द्वारा, मानव को दी गई रक्षा कवच के समान है। जो लाखो सालो की प्रतीक्षा के बाद बरदान स्वरूप मिला है। जैव विविधता शब्द जीवन एवं विविधता के संजोग से निर्मित है। जिसका शाब्दिक अर्थ है पृथ्वी पर मौजूद जीवो की भिन्न-भिन्न प्रजातियाँ। हमारी थाली में मौजूद संतुलित आहार चावल, रोटी, दाल, सब्जी और फल इत्यादि जैव विविधता के उत्तम उदाहरण है। **(Figure 1).** जैव विविधता से ही हमारे जीवन की आधारभूत आवश्यकताओं की पूर्ति होती है। चावल, दाल रोटी से हमें ऊर्जा की पूर्ति होती है। तो फल व सब्जियों से हमें विटामिन्स और खनिज की प्राप्ति होते हैं। जिससे **हमारी** शारीरिक और मानसिक शक्ति का विकास होता है और रोग प्रतिरोधक क्षमता बढ़ती हैं। इस तरह हम कह सकते हैं कि जैव विविधता से मानव जीवन की आधारभूत आवश्यकताओं की पूर्ति होती है। जरा सोचिए चावल की प्रजाति में अगर बासमती चावल विलुप्त हो जाए तो क्या हमारी आने वाली पीढ़िया सुगंधित पुलाव खा पाएंगे। फलों का राजा आम की लगभग 1000 किस्में भारत में उगाई जाती है।[2] जैसे मालदा, लंगड़ा, फजली, दसहरी, बैगनपल्ली, नीलम, तोतापुरी, चौसा, केसर, अलफोसो, बादामी, आम्रपाली इत्यादि। अगर इनमे से लंगड़ा और दसहरी आम का पृथ्वी से लोप हो गया होता तो हम लंगड़ा और दसहरी आम का स्वाद कभी नही चख पाते।

दुर्भाग्य की बात है कि हम अपनी इच्छाओं की पूर्ति हेतु जैव विविधता के रूप में प्राप्त अपना सुरक्षा कवच तोड़ रहे हैं। उन्नत किस्म की प्रजाति प्राप्त करने की अभिलाषा में हम जंगली (wild) किस्म की प्रजातियों का संरक्षण नहीं कर पाते हैं। जबकि हम यह भूल जाते हैं कि उन्नत किस्म के पौधों का आधार जंगली (wild) किस्म की प्रजातियां ही होती हैं। जंगली (wild) किस्म की प्रजातियों का पैदावार भले ही कम होता, लेकिन उनमे रोग प्रतिरोधक क्षमता ज्यादा होती है। इसीलिए हमे विकास की दौड़ में आगे बढ़ने के लिए, जैविक संसाधनों का संरक्षण करना पड़ेगा, ना कि जैविक संसाधनों का क्षरण। तभी जीवो जीवस्य जीवनम की संकल्पना सार्थक होगी।

Figure 1. **भोजन की थाली में जैवविविधता का समागम**

2. वन एवं वन्य जीवो का विदोहन के प्रभाव

भारतीय परिदृश्य में वन और वन्य जीव का क्षरण का मुख्य कारण मानव आधारित विकास की दुहाई, प्रदूषण, विदेशी प्रजातियों का समागम, **प्राकृतिक आवास** का विच्छेदन, व्यापारिक विदोहन, ठेकेदारों और वन कर्मियों की मिलीभगत आदि प्रमुख है। हमारी 80% सुविधाओं का भरण पोषण वन और वन्य जीव से ही होता है। लेकिन संसाधनों के आवंटन में वन्य और वन्यजीवों को नीची वरीयता दी जाती है जिसके कारण उनके संरक्षण के किए गए उपाय गौड़ सा प्रतीत हो जाते हैं। मध्य प्रदेश का बैतूल जिला सीताबलड़ी 1818 में दुर्गम वन के रूप में जाना जाता था जहां आवागमन के साधन विकसित नहीं थे। 19वीं सदी के बीच में रेल मार्गों का निर्माण शुरू हुआ तो सरकार और ठेकेदारों की मिलीभगत से इमारती लकड़ियों की मांग पूर्ति के लिए साल और सागौन के पेड़ों की अंधाधुन कटाई की गई। जबकि पहला भारतीय वन अधिनियम 1818 में बन चुका था। इसी तरह की स्थिति देश के अन्य भागों में देखने को मिलती है। जंगलों की अंधाधुंध कटाई से बहु प्रजातियां **वनजीव** विलुप्त होते चले गए और उनका स्थान एक प्रजाति वन**जीव** ले लिए। पशुओं की बढ़ती आबादी का दबाव और मानव की आवश्यकता की पूर्ति के लिए एकल प्रजातीय वन, जैविक दबाव नहीं सह सकते हैं। **जिसके फलस्वरूप,** एक ही प्रजाति के गुणों का विकास **होता है, जो** आग, बीमारी, कीड़े, सूखे का मुकाबला करने में सक्षम नहीं होते हैं **जिससे** पारिस्थितिक संतुलन बिगड़ने लगता है। यह बहुत ही दुख के साथ कहना पड़ रहा है कि वन का हमारी राष्ट्र की जीडीपी में अहम योगदान होते हुए भी वन को आय का साधन नहीं माना जाता है।[3]

दूसरी तरफ स्वास्थ्य सेवा, पशु चिकित्सा और कृषि विज्ञान में सुधार होने के कारण पशुओं और मनुष्य की मृत्यु दर में कमी आती गई जिससे जीवितो की संख्या बढ़ने लगी। इनकी खाद्यान्न पूर्ति के लिए वनों को अनियंत्रित ढंग से काटा गया फलस्वरूप वनों को काट के कृषि योग्य भूमि और रहने योग्य मकान बनाए गए। विकास की परियोजनाओं ने, वनों के संरक्षक आदिवासियों को भी प्रभावित किया। (**Figure 2**). संथाल जिन वनों में रहते थे उन वनों के विनाश से झारखंड आंदोलन पैदा हुआ। चिपको आंदोलन **भारत के उत्तराखंड राज्य में ठेकेदारों द्वारा वनों की कटाई के विरोध में हुआ जिसमे लोग पेड़ो से चिपक जाते थे।**[4]

Figure. 2 **वनों का कटाव और वनों के बीच सड़क बना कर प्राकृतिक आवास का विखंडन**

3. **धार्मिक मान्यताओ के** पीछे **जैव विविधता संरक्षण**

धर्म हमेशा से प्रकृत के मूल सिद्धांत और मनुष्य के बीच सामंजस्य बनाए रखता है। हिंदू धर्म की हर मान्यता के पीछे जैवविविधता संरक्षण का संदेश छुपा रहता है। भगवान विष्णु का मत्स्य (मछली), कूर्म (कछुआ), वराह, नरसिंह (आधा आदमी और आधा शेर) और वामन अवतार सभी जीवो का सम्मान करना सिखाता है। हिंदू धर्म के हर त्यौहार में जीव या पादप का संरक्षण के लिए किसी न किसी रूप में पूजा की जाती है। वातावरण को शुद्ध बनाए रखने के लिए नवमी में आंवले के वृक्ष की पूजा, वट सावित्री बरगद की पूजा, शमी वृक्ष की पूजा और पीपल वृक्ष की पूजा की जाती है। चूहा और हाथियों के संरक्षण के लिए भगवान गणेश की पूजा, शेरों को बचाए रखने के लिए मां दुर्गा की **पूजा**, सर्पों के संरक्षण के लिए भगवान शंकर की माला के रूप में प्रतिनिधित्व **होता** हैं। महाग्रंथ रामायण में भगवान रामचंद्र के 14 साल वनवास के समय जामवंत, जटायु, नल नील वानर एवं हनुमान जी, **हिरन, गिलाहरी,** संजीवनी बूटी, कुंभकरण, देव और दानव का उल्लेख जैवविविधता **को प्रदर्शित** करता है। लेखक का मानना यह है कि भगवान राम की सेना में जैवविविधता होने से ही लंका पर विजय प्राप्त हुई क्योंकि आज का आधुनिक विज्ञान भी इस बात को साबित कर चुका है कि जिस परिस्थितिक तंत्र **में** जैव विविधता ज्यादा होती है वह पारिस्थितिक तंत्र ज्यादा स्थिर **और सफल** होता है। भगवान कृष्ण ने गोकुल वासियों से गोवर्धन पर्वत की पूजा करवा कर जैवविविधता को संरक्षित करने का **उपदेश** दिया था। समुंद्र मंथन के उपरांत प्राप्त सभी रत्नों **का** संरक्षण जैवविविधता को संरक्षित **करने** का संदेश **देता है**। बचपन की कहानियों में वन्य देवता **और** वन्य देवी की पूजा की मान्यता के पीछे वनस्पतियों को संरक्षित करने का **ही उद्देश्य होता** है। आज भी हम **ग्रीष्म**ऋतु में पक्षियों के संरक्षण के लिए जगह जगह पर अन्न और जल का प्रबंध करते हैं। मछलियों को दाना देना, चीटियों को आटा खिलाना, गौ पूजा करना पर्यावरण संरक्षण से ही जुड़ा है। बोधिवृक्ष पीपल के नीचे अमृत्व का ज्ञान प्राप्त करने वाले भगवान बुद्ध और महात्मा गांधी ने हिंसा और बलि प्रथा को जघन्य अपराध माना था। ईसाई धर्म में क्रिसमस ट्री और इस्लाम में खजूर का पेड़ को शुभ माना जाता है।[5]

4. **भारत सरकार का जैवविविधता संरक्षण अधिनियम**

भारत सरकार 2002 में **जैव**विविधता संरक्षण अधिनियम **बनाया गया** जिसका मुख्य उद्देश्य स्थानीय समुदायों के साथ उचित और न्याय संगत तरीके से जैविक संसाधनों का संरक्षण एवं प्रबंधन करना है। अधिनियम को लागू करने के लिए भारत सरकार ने 2003 में राष्ट्रीय जैव विविधता प्राधिकरण (एनबीए) स्थापित किया गया **है**। यह एक वैधानिक स्वायत्त निकाय है जिसका मुख्यालय चेन्नई में है। इसके तहत भारत के 29 राज्यों में जैव विविधता बोर्ड (एसबीबी) और स्थानीय निकाय के लिए 31,574 जैविक प्रबंधन समितियों निर्माण किया गया हैं। कोई भी विदेशी व्यक्ति या गैर सरकारी संस्थान, एनबीए की अनुमति के बिना जैविक संसाधनों पर अनुसंधान या बौद्धिक संपदा संरक्षण के लिए आवेदन नहीं कर सकता है। यदि कोई व्यक्ति अधिनियम के प्रावधानों का उल्लंघन करता है, तो उसे एक से पांच साल तक कारावास या दस लाख रुपये तक का जुर्माना या दोनों एक साथ हो

सकता है। इस अधिनियम के तहत जैव विविधता को नुकसान पहुंचाना गैर-जमानती और संज्ञेय अपराध माना गया है।[6] जैवविविधता संरक्षण अधिनियम के अलावा, भारत सरकार ने पर्यावरण और जीवों के संरक्षण हेतु विभिन्न अधिनियम बनाए हैं जो निम्नवत है

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2. भारतीय वन अधिनियम 1927
3. खनन और खनिज विकास विनियमन अधिनियम 1957
4. पशुओं के प्रति क्रूरता की रोकथाम 1960
5. वन्यजीव संरक्षण अधिनियम 1972
6. जल (प्रदूषण की रोकथाम और नियंत्रण) अधिनियम 1974
7. वन संरक्षण अधिनियम 1980
8. वायु (प्रदूषण की रोकथाम और नियंत्रण) अधिनियम 1981
9. पर्यावरण संरक्षण अधिनियम 1986
10. जैविक विविधता अधिनियम 2002
11. अनुसूचित जनजाति और अन्य पारंपरिक वनवासी (अधिकारों की मान्यता) अधिनियम 2006

5. निष्कर्ष

धरती पर मौजूद जल, जंगल, जमीन के संरक्षण से ही मानव का अस्तित्व की कल्पना कर सकते है। मानव को मानवता तभी प्रदर्शित होगी जब मानव जैविक सम्पदा को प्रदूषित और क्षीण होने से बचायेगा क्योकि जल, जंगल, जमीन पर सभी जीवो का अधिकार है। **संरक्षण अधिनियम** और धार्मिक मान्यताये से **जीवो जीवस्य जीवनम** की संकल्पना को संबल मिलता है। मानव का यह उत्तरदायितव है कि जो जैविक सम्पदा को अपने पूर्वजो से प्राप्त कर उपयोग किया है उसे उसी मूल रूप में अपनी संतति हो हस्तांतरित करे।

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Co-relation of BMI with Nutritional Status Observed in Tribal People of Chikhaldara Region (Melghat)

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Abstract

The present cross-sectional study was undertaken among the tribal people of Chikhaldara region (Melghat) Dist. Amravati. This study used to investigate body mass Index (BMI) among male and female tribes of Chikhaldara region. Total 254 males and 288 females were taken for examination commonly used indicators. i.e. weight (wt), height (ht) and body mass index (BMI) were used to evaluate nutritional status. Results also reveal that prevalence of under nutrition among these peoples of both sexes. Tribal people are mostly illiterate and malnourished.
Key words – Body Mass Index (BMI), nutritional status, Tribes, Chikhaldara, India

Women and preschool children are known to be most vulnerable group for under nutrition, adolescents girls are also being recognized as a potential group during which the nutrient requirements are relatively high under nutrition during adolescence, confounded by childhood marriages, leads to higher mortality and morbidity among women and young children. (Studied carried out by National Nutritional monitoring Bureau. (2003)
World Health Organization (1995) has recommended that anthropometry could be used to assess the nutritional and health status of adults. One such measure now in widespread use in Quetel index which is weight (in kg) divided by height in (m^2). Several scholars have emphasized the importance of body mass index as an nutritional assessment (Gupta et al (1979, (Yadav et al (2011) observed that tribal preschool children of Gond community had low Hb% with low BMI due to certain adverse realities like insufficient food intake, adverse cultural practice, micronutrientdeficiency disorders such as anaemia.

It is established fact that body mass index (BMI) is a useful anthropometric indicator of measuring nutritional status of the population (FAO, 1996) and is specifically suitable for large scale surveys (Ulijaszek and Kern 1999, WHO 1995).

The prevalence of chronic energy deficiency (CED) measured through BMI (James et al (1988) Ferro-Luzzi et al (1992), can be used in the standard of living between population groups Nube et al (1998). The appropriateness of using BMI less than 18.5 kg/ m^2 as under nutrition are validated by many authors to predict poor demographic economic, social and environmental conditions of the population (Pryer and Rogers, 2006), Subramanian and Smith (2006) under nutrition reduces physical capacity James (1994) increases mortality (Harris T.B. 1995), morbidity (khongsdier (2002).
In India, the most underprivileged group is the tribal communities both in terms of socioeconomic condition as well as nutritional status (Basu 1994). Several studies shows these reflection as high under nutrition among tribals across India (Adak et al 2006)

Material and Method :

A cross sectional study was performed to evaluate BMI and nutritional status of tribal people of Chikhaldara region Dist. Amravati.

Hight and weight were measured weight was calculated by weigning balance and height by stadiometer. The nutritional status and background information was collected from each individual through questionnaire as well as tribal community informed consent was obtained for carrying out survey. The age groups were distributed into 0-20, 21-40, 41-60 and 61 respectively.

The BMI was computed using the following standard equation.BMI = Weight (kg)/height (m^2).
Nutritional status was evaluated following BMI cut off points to define trimness. The age and sex specific cut-off values were established based oninternational survey.

This classification categories the prevalence of under nutrition according to percentage of population with BMI under 18.5 low, medium and very high critical situation (WHO 1995).

Result and Observation :

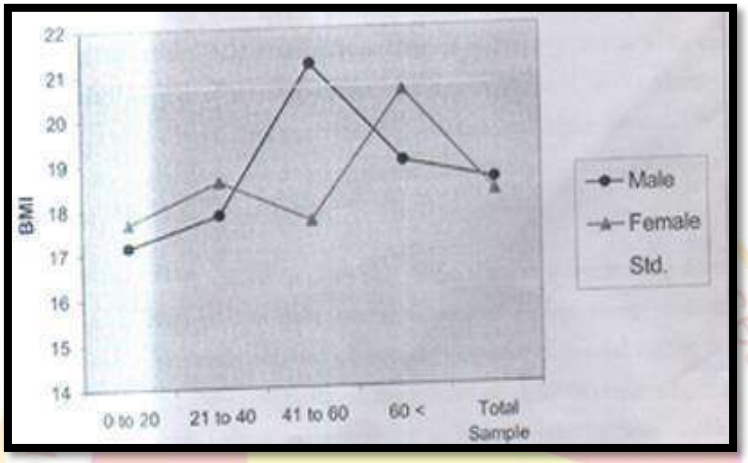
Table 1 BMI observed in male and female tribes of Chikhaldara (Melghatregion)

Age Group		Df	Pm	M	SD	SE	T
0 to 20	Male	54	20.7	17.15	4.596	0.62	**5.74****
	Female	85	20.7	17.68	4.438	0.48	**6.31****
21 to 40	Male	108	20.7	17.86	2.472	0.24	**11.99****
	Female	140	20.7	18.59	2.925	0.25	**8.58****

41 to 60	Male	51	20.7	21.20	3.718	0.52	**0.98**
	Female	45	20.7	17.71	5.074	0.75	**3.99****
61	Male	38	20.7	19.00	4.593	0.74	**2.31***
	Female	15	20.7	20.58	4.407	1.10	**0.11**
Total Sample	Male	254	20.7	18.56	3.889	0.24	**8.77****
	Female	**288**	**20.7**	**18.29**	**3.937**	**0.23**	**10.41****

(*-Significant at 0.05; **-Significant at 0.05 & 0.01 level of significance)

(Critical values for 15 df; $t_{0.05}$ = 1.7530, $t_{0.01}$ = 2.6025, for 38 df; $t_{0.05}$ = 1.6859, $t_{0.01}$ = 2.4286, for 45 df; $t_{0.05}$ = 1.6794, $t_{0.01}$ =2.4121, for 51 df; $t_{0.05}$ = 1.6753, $t_{0.01}$ = 2.4017, for 54 df; $t_{0.05}$ = 1.6736, $t_{0.01}$ = 2.3974, for 85 df; $t_{0.05}$ = 1.6630, $t_{0.01}$ = 2.3710, for 108 df; $t_{0.05}$ = 1.6591, $t_{0.01}$ = 2.3614, for 140 df; $t_{0.05}$ = 1.6558, $t_{0.01}$ = 2.3533, for 254 & 288 df; $t_{0.05}$ = 1.285, $t_{0.01}$ = 1.967)



Result & Discussion : Co relation of BMI with nutritional status observed inTribal Males and Females

The above table-1 reveal that the calculated T values between standard range mean and Obtained BMI mean for various groups i.e. 0-20, 21-40, 41-60, 5.74, 11.99, 0.98, 2.31 and 8.77 respectively, for male. All these values are greater than critical values of 't' at 0.05 and 0.01 level of significance. Hence there is a significant difference in BMI and standard range of male except for age group 41-60. From the table it is also observed that in all the groups BMI range is within 17 to 19, which is quite less than the standard range mean value for men 2C.8 except for age group 41-60 i.e. 20.3 which is above average.

For different groups of female i.e. 0-20, 21-40, 41-60, above 60 and total sample the calculated Y values are 6.31, 8.58, 3.99, 0.11 and 10.41 respectively. All these values are greater than critical values of 't' at 0.05 and 0.01 level of significance except for age group 61 which is non-significant. Hence there is a significant difference in BMI and standard range mean of female. From the table it is also observed that in all the groups BMI range is within! 7.8 to 18.8, which is quite smaller than the standard range mean value for female 20.8 except for age group of 61 i.e. 20.8 which is required value of BMI for females.

Hence from the table and graph it is concluded that, the BMI in both male and female tries of Chikhaldara region is below the standard range mean.

Discussion:

Malnutrition was wide spread phenomenon in tribal area Carlson and Waterlaw (1991) have studied the child malnutrition problem at global, regional as wells country level. (Khandare, et al 2008) studies on tribals of Thane district of Maharashtra, India. The result revealed that majority of population belonging to schedule tribe community were malnourished. Socio-economic factors have been contributory to malnutrition.

Meghadas (2010) studied on nutritional status of Korku tribes in Betul district of Madhya Pradesh observed that there was prevalence of protein energy malnutrition anemia, because Korku tribes obtained mean intake of nutrients. Several studies Sonwal CJ. (2010), Dhore and Joshi (1988), Rajesh Sing, Preeti Singh (2008) reported that tribal children suffered from highest percentage of severe malnutrition with inadequate nutrition.

Sing Bhupinder (1994), Nagdda B.L. (2004), examine and assess the tribal health situation which is related to their economic pursuit, nutritional availability medicines etc. Nutritional anemia is major problem for women in India and so morein rural and tribal belt.

International center for research on women (ICRW) studies sting was highly prevalent in adolescent boys and girls, ranging . In contrast the rate of low body mass indices indicative of current under nutrition under nutrition in early childhood may diminish a person's even tautly body size malnourished children are typically shorter and lighter than their well nourished peers at the end of adolescent growth, s Cameron (1996). Several studies from India (yadav et al (1999), Gogoi and Sengupta(2002) have utilized BMI to study nutritional status of tribal populations. The basic causes of under nutrition in developing countries are poverty, poor hygienic conditions and little access to preventive and health care Mitra(1985), WHO(1990,1995).

Conclusion:

Therefore BMI has strong association with nutritional status in present study low level of BMI and under nutrition was observed which may be responsible for life threating diseases, higher ratio of maternal mortility. Also poverty illiteracy, very less facilities for health, blind beiefs, socio, economic status was affecting each and every as part of tribal people of Chikhaldara region.

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Comparative Preliminary Phytochemical Analysis Of *Capparis Decidua (Forsk.)* And *Capparis Zeylanica Linn.*

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Abstract
The present study was aimed to evaluate the phytoconstituents of the leaf extracts of Capparis decidua Forsk. and Capparis zeylanica Linn. plants of an ethno-botanical importance belonging to the family Cappariceae using ethanolic extracts. The result reveals the presence of bioactive compounds (phytoconstituents) such as anthraquinones, terpenoids, flavonoids, saponins, tannins, alkaloids, and cardiac glycosides. Both the Capparis species have an ethno-medicinal importance such as being anti-inflammatory, analgesic, antioxidant, antipyretic and antimicrobial properties. The results showed the dominantly presence of alkaloids, flavonoids, phenols and saponins in both plants. So, further research is necessary to isolate and determine the identity of the bioactive compounds present in this plants species.
KEYWORDS: *Phytochemistry, Capparis spp. and Medicinal uses.*

Introduction
According to the World Health Organization (WHO), more than 80% of the world's population relies on traditional medicines for their primary health care needs (Trivedi, 2006). These chemical elements of plants can be therapeutically active or inactive and are referred to as phytochemicals or secondary metabolites. Alkaloids, phenolic glycosides, flavonoids, steroids, terpenoids, amino acids, and glycopeptides are some of the phytochemicals found in vegetables, fruits, flowers, leaves, stems, bark, and roots that work with and protect against diseases more effectively (Rangari, 2006). Many species of Capparaceae are used as ethno-medicinal purposes (Bokhad *et. al*., 2013). So, here we select two species of *Capparis* for phytochemical analysis.

The genus *Capparis* comprises 250 species, including shrubs, trees, and woody climbers. *Capparis zeylanica* Linn. (Capparaceae) is a many-branched, thorny, sub-scandent climbing shrub. Plants are 2-3 m in height, armed with 3-6 mm long recurved thorns, branched, leaves are elliptic or broadly lanceolate, base rounded, apex mucronate; flowers are profuse, pinkish-white, later turning pink, berries are globular or ellipsoid, 3-4 cm in diameter, and seeds are globose, embedded in the white pulp. It is medicinally used for snake bites, to cure swelling of testicles, smallpox, boils, cholera, colic, hemiplegia, neuralgia, sores, etc (Chopra *et. al*., 1956; Joshi, 1997 and Satyanarayan *et. al*., 2008). Whereas, *Capparis decidua* (Forsk.) plant height 5 m high, or occasionally a small, branched, Leaves are very minute 2 mm long. Flowers are pink in color and red-veined, in small groups along with the leafless shoots, in the axils of the spines. Fruits are small, many-seeded, ovoid or sub-globulous (Padhan *et. al*., 2010). It shows some medicinal properties like hypercholesterolemic, anti-inflammatory, analgesic, antidiabetic, antimicrobial, antihypertensive, antihelmintic, and purgative activities (Deshmukh *et. al*., 2010 and Bokhad *et. al*., 2013).
Due to these medicinal properties, it is necessary to investigate and compare phytochemical analysis of these plants.

Materials And Methods
A] Identification and Collection:
Frequent field visit were conducted in nearby forest area of Yavatmal and Wardha District (Maharashtra) for the collection of plant materials. The Collected plant specimens were identified using available standard floras (Ugemuge, 1986; Karthikeyan & Kumar, 1993; Naik, 1998 and Singh & Karthikeyan, 2000).

B] Extraction Methods:
The collected plant leaves were dried and made into powder for further analysis. The powder was then subjected to soxhlet extraction with different solvents (petroleum ether, benzene, acetone, chloroform, ethanol and water) according to their increasing polarity. Only ethanolic extract of the plants under study were analysed for the presence of different phytochemical constituents (Kokate *et al*., 2005).

C] Qualitative Phytochemical Analysis:
It involves testing of different classes of compounds. The methods used for detection of various phytochemicals were followed by qualitative chemical test to give general idea regarding the nature of constituents present in crude drug (Wallis, 1990; Harborne, 1998; Kokate, 2005 and Sadashivan & Manickam, 2005). The extracts were analyzed for the presence of phytoconstituents like carbohydrates, alkaloids, anthraquinone, cardenolides, flavonoids, phenolics, steroids, terpenoids and saponin.

Observations

Table-1: Comparative phytochemical study of ethanolic extract of *Capparis spp.* (Leaves)

S.N	Compound / test	*C. decidua*	*C. zeylanica*
1	Alkaloids	+	+
2	Anthraquinone	_	+
3	Cardenolides	_	+
4	Flavonoids	+	+
5	Phenolics	+	+
6	Saponins	+	+
7	Steroids	_	_
8	Carbohydrates	+	_
9	Terpenoids	_	_

Results And Discussion

In the present investigation, there are dominantly presence of alkaloids, flavonoids, phenols and saponins in both plants which having the major applications in medical and pharmaceutical sciences (Kakpure & Rothe, 2012). The ethanolic extract of ***C. zeylanica*** shows dominantly the presence of alkaloids, anthraquinone, cardenolides, flavonoids, phenolic compounds and saponins. Whereas, steroids, carbohydrates and terpenoids were absent. However, ***C. decidua*** shows the the presence of alkaloids, flavonoids, phenolic compounds, carbohydrates and saponins. (Table-1). These types of studies have a vital role because of their commercial uses and research interests. Further research is necessary to isolate and determine the identity of these bioactive compounds for its quality control.

Conclusions

This research work has revealed further potentials of these selected *Capparis* spp. in the area of pharmacology as potential source of useful drugs. This study therefore has provided some biochemical basis for ethno-pharmacological uses of these plants in the treatment and prevention of various ailments. The qualitative phytochemical screening shows that, the leaves of the *C. decidua* and *C. zeylanica* are rich in alkaloids, flavonoids, phenols and saponins which are popular phytochemical constituents.

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Avifaunal Diversity With Relation To Ecology Around Borgaon Dam, India

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Abstract:
This study was carried out around Borgaon Dam in Pandharakawada forest Division of Maharashtra state from June 2020-April 2021. The present study was made to find out the avian diversity with reference to ecology. We estimate the avian fauna in terms of species richness and diversity of Borgaon aquatic habitat. Total 71 birds belonging to 21 families were observed of which 38 was resident, 14 were local migrant and 19 were migrant. The favorable ecological conditions like availability of food, wetland and roosting places were attracting the various birds. There is need to retain a proportion of natural habitat of aquatic ecosystem as to conserve the biodiversity.
Keyword: *Avian diversity, birds, Borgaon*

Introduction:

India has a numerous diversity of plants and animals both domesticated as well as wild in variety of habitats and ecosystems. Biodiversity has central importance in the study of ecology. It is likely to play an important role for ecosystem functioning (Loreau et al., 2001). The change in number of assemblage of species affects the nature of habitat. Recent global changes are likely to have strong negative impacts on biodiversity of terrestrial ecosystem (Sala et al., 2000). Today a greatest threat to wildlife is loss of habitat which is widely recognized by ecologists. Most are primarily endangered by habitat loss and degradation (Sodhi and Smith, 2007). Among all the fauna, birds are use as bio-indicators. The bird species are adapted to a specific plant species, community and use to describe the vegetation condition, consequently the ecosystem situation (Jansen & Roberstrom, 2001). The bird populations are usually limited by limiting factors including food supplies, nest and refuge site, competitors, natural enemies and weather (Andrewartha & Birch, 1984, Begon et.al 2006; Brambilla et al: 2010). There are growing evidences that climate change will become one of the major diverse of species extinctions in the 21 st century. Numbers of published studies have documented a variety of changes attributable to climatic change (1PCC, 2007).

To stop the threats to biodiversity and mass extinction, meaningful information that could contribute to conservation planning and management is needed to maintain or improve the structure of aquatic ecosystem. So we selected aquatic ecosystem which is first ever scientific attempt to study avian diversity with aspect to ecology.

Material and Methods:

Study Site:

The study was carried out around Borgaon dam in Pandharkawada forest division which is situated of Yavatmal district of state Maharashtra adjoing the Adilabad distict of state Telangana Pradesh.

Materials used for study:

For each census, a map and aerial photographs was use to identify sites. So that camera Nikon was used of 45x zoom and 12.6 megapixels. A Tape recorder was also utilized during each survey to record the particular calls, which were later analyzed and used to identify the species. For watching, counting and identifying birds, Binocular (10x50), Telescope (25-40x), Notebook, Pen, pencil, Compass, Observation sheet, metal or wooden stakes, Handheld GPS was used.

Bird Survey:

The bird survey was conducted according to a standard point count method (Reynolds et al., 1980; Bibby et al., 2000).We involved visual and voice hearing methods for bird identification within fixed or variable radius plots (Blondel et al., 1970; Hutto et al., 1986). The data collected from the surveys was used to estimate populations of birds, density, diversity and relative abundance or richness of bird species in different habitats. The bird surveys were carried out from June 2018 to April 2019 for 1 year. We used a 25-m/50-m fixed-radius point count method to census the avifauna at each count station (Hutto et al. 1986). Surveys were conducted four days in a week, either from sunrise to 4 hours after sunrise or from 4 hours before sunset until sunset depending on weather conditions. Each count was conducted for 10 minutes, which was further divided into 3 minutes, 2 minutes and 5 minutes respectively.

Identification, Classification and Data analysis:

For identification and field diagnosis of birds, colored plates of All and Ripley (1983), Ali (1996). Grimrnett et al.,(1998) were used. Classification of birds was made in accordance with lnskipp et.al (1996). We

followed Whittaker (1976) to measure diversity of birds as alpha, beta and gamma diversity. All the diversity of birds was analyzed using biodiversity analysis online software alyoung.

Observation and Result:

The basic factor to be studied in this on avifauna distribution with aspect to ecology is climate, topography and vegetation. Thus Geology, climate, soil and vegetation types with altitude, latitude and surface topography of particular sites were studied.

Finding of birds:

Total 71 birds belonging to 21 families was observed of which 38 was resident, 14 were local migrant and 19 were migrant with family corvidae comprising more bird species following Passeridae and accipitridae.

Diversity of Bird Community:

The species richness Index i.e. Menhinick index (RI) of forest was 1.06 and Margalef richness index (R2) was 15.71. The overall Shannon-Weiner index was found 4.R7 while the Dominance index was 0.017. The two different Evenness measures were calculate namely Shannon evenness (El) and Sheldon evenness (E2) to measure the evenness of species-abundance which is complimentary to the diversity index concept. The Shannon Evenness (El) was found 2.21 and Sheldon Evenness (E2) was 0.083. The Similarity Indices were also calculated between the different habitats of the sanctuary namely Jaccard Index and Sorenson's index which was found 0.03 and 0.06 respectively. The abundances of bird were found higher in July 2020-June as compared to July 2021. The higher diversity of birds (H′) was found (4.87) in first year than in second year (4.45). The Simpson index was found 0.029 and 0.022.

Discussion And Conclusion:

In present study, Bird communities vary among forest types and functional groups. Different vegetation types as well as abundant food resources might be played a greater role in difference in habitat preference by bird species. The rich and high vegetation might be providing heterogeneous and suitable site of nesting, roosting and foraging of bird. Similar finding reported regarding vegetation diversity and richness of wetlands on the bird population richness. Water birds like. Lesser whistling teal, Little cormorant, bite-breasted kingfisher, Black-winged Stilt, Red-wattled Lapwing. Cattle egret and Indian pond-heron were the common species inhabiting the water bodies, while Purple Heron (Ardea purpurea) were rarely sighted. The passage migrant Rosy starling (Sturnus roseus) was found everywhere before and after the winter season. The birds like Demoiselle crane, common crane and Barr headed groose which are generally seen at wetlands were not found or recorded. An important reason for high bird diversity may be the existence of a varied topography coupled with a mosaic of forest types including scrub forest, tall riparian forest hilltop forest and dry deciduous forest. Conversion of the native vegetation-scrub jungle and grasslands to monoculture plantations is detrimental to bird diversity. There is need to conserve the avifauna' bio-diversity of this area by protecting its habit conditions especially, the water bodies, riparian areas, edges and streams. Also there is need to generate awareness about the conservation value and ecological role of avifauna and maintainace of natural habitat conditions and ecological balance of forest. Conservation awareness programmes among the local peoples is required to conserve it for future generations.

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Traditional knowledge of wild edible plants used in the Yavatmal District, Maharashtra State, India.

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Abstract

Use of wild plants as a food source is an integral part of the culture of indigenous people that dwell in the remote forest areas. These people consume wild edible plants as food source and depend on these resources to meet their food needs particularly in periods of food crisis. The wild edible plants are also used as supplements to the cultivated crops and as famine foods.

The diversity in wild species in the district offers variety in edible plants and contributes to household food assurance. The present ethnobotanical explorations conducted in forest areas of Yavatmal resulted in the information on about traditional plant uses of53plants species belonging to 35 Angiospermic families. Moraceae recorded highest number of species (5 species) followed by Amaranthaceae, Caesalpiniaceae, Euphorbiaceae and Cucurbitaceae are (3 species). Information gathered from Yavatmal district indicates that the tribal's and other village people of this region possess good knowledge of wild edibles but their continuous and progressive exposure to modernization may result in extinction of the such rich heritage of knowledge in the course of time. Majority of edible parts are from fruits (29 species), leaves (14 species), seeds (6 species), Flower (2 species) and some are of underground parts like rhizome, tuber, etc.

Key words:*Traditional Uses, Wild edible plants, Yavatmal.*

Introduction

District Yavatmal is situated in the eastern part of the Maharashtra between north latitudes 19º23` and 20º48`and longitudes 77º 19` and 79º 07` It occupies an area of 13,582 Sq. Km with forest cover of 2956 sq. Km. Average rain fall is 1089.7 mm. The district is inhabited by several tribes. These are Andh, Banjara, Bahurupi, Bhil, Chitrakathi, Gond, Gopal, Kolam, Kolhati, Rajgond, Pardhan, Panchal, Tambatkar and Wadar. Kolam tribe is on the verge of extinction; in 2001 the population was only 900. Population of Bhil is also decreasing

Forest Dwellers:

Wild plants even after the availability of variety of food crops constituted an important part of the human diet particularly in remote forest dwellers. Recent regional studies, from the different parts of country[1,2,4,5,6,8,9,10,12,13,14,15,16,17] have shown that the several wild plants have nutritive potential and are being used all over. Now a day's people are giving more attention to wild food plants as the present day food crops are not meeting the need of complete required nutrients.This work is an attempt to provide a data on food plants collected from Yavatmal district.

Methodology

Ethnobotanical studies in Yavatmal with respect to wild food plants were carried out during 2019 to 2021. Different parts of the district were frequently visited, and information on indigenous knowledge about food plants was gathered from knowledgeable people in the district. Data was collected using semi-structured questionnaire and group discussions based on the standard procedures [7]. Detailed information regarding the part eaten and various preparation made was noted. Plants were identified using relevant scientific literature [3,11] Following table gives the detailed information such as, plant name, family name which followed by local name and uses.

Sr. No	Botanical Name / Family	Local Name	Use
1.	*Aegal marmelos* (L.) Corr. (Rutaceae)	Bel	Ripe fruit pulp is eaten. 'Sharbat' is made by fruit pulp during summer.
2.	*Aerva lanata* (L.) Juss. (Amaranthaceae)	Tandula	Curry is made by leaves.
3.	*Alangium salvifolium* (L.f.)Wang.(Alangiaceae)	Ankol	Ripe fruits are eaten.
4.	*Alternanthera sessilis* (L.)R. Br. (Amaranthaceae)	Chibuk Kata	Curry is made by tender stem and leaves.

5.	*Amaranthus spinosus* L. (Amaranthaceae)	Kat e – math	Curry is made by tender leaves.
6.	*Basella alba* L. (Basellaceae)	Mayalu	Curry is made by leaves and 'Pakodi' made by leaves.
7.	*Boerhavia diffusa* (L.)Hook. (Nyctaginaceae)	Punarnawa	Curry is made by leaves.
8.	*Buchanania lanzan* Spreng. (Anacardiaceae)	Charoli	Ripe fruit pulp eaten. Seeds are used in sweet dishes made by using milk.
9.	*Canavalia ensiformis* (L.)DC. (Fabaceae)	Abai	Curry is made by fruits.
10.	*Canthium parviflorum* Lam. (Rubiaceae)	Karbit	Ripe fruits are eaten.
11.	*Capparis zeylanica* L. (Capparaceae)	Waghati	Curry is made by unripe fruits.
12.	*Cassia fistula* L. (Caesalpiniaceae)	Bahava	Curry is made by flowers.
13.	*Cassia occidentalis* L. (Caesalpiniaceae)	Tarwad	'Chutney' is made by tender leaves.
14.	*Cassia sophera* L. (Caesalpiniaceae)	Jangali takla	'Chutney' is made by leaves.
15.	*Chlorophytum tuberosum* (Roxb.) Baker (Liliaceae)	Safed Musli	Tubers are eaten.
16.	*Coccinia grandis* (L.)Voigt. (Cucurbitaceae)	Tondli	Curry is made by unripe fruits.
17.	*Colocasia esculenta* Schott. (Araceae)	Chamkura	Curry is made by leaves and 'Pakodi' made by leaves.
18.	Commelina benghalensis L. (Commelinaceae)	Kena	'Pakodi' made by leaves.
19.	*Cordia dichotoma* Forst. f. (Boraginaceae.)	Bhokar	Ripe fruits are eaten.
20.	*Dioscorea bulbifera* L. (Dioscoreaceae)	Dukkar Kand	Tubers are boiled and eaten, curry is prepared from bulbils.
21.	*Diospyros melanoxylon* Roxb. (Ebenaceae)	Tembhurni	Ripe fruit pulp is eaten.
22.	*Embli ca officinalis* Gaertn. (Euphorbiaceae)	Awala	Fruits are eaten. 'Chutney' is made by fruit s. Murrabba Prepared from fruits.
23.	*Euphorbia heterophylla* L. (Euphorbiaceae)	Nivdung	Curry is made by tender leaves.
24.	*Ficus bengalensis* L. (Moraceae)	Wad	Ripe fruits are eaten.
25.	*Ficus carica* L. (Moraceae)	Anjeer	Ripe fruits are eaten.
26.	*Ficus hispida* L. f. (Moraceae)	Umber	Ripe fruits are eaten.
27.	*Ficus racemosa* L. (Moraceae)	Umber	Ripe fruits are eaten.
28.	*Grewia hirsuta* Vahl. (Tiliaceae)	Dhaman	Ripe fruits are eaten.
29.	*Hygrophila auriculata* (K. Schum.)Heine. (Acanthaceae)	Talim Khana	Curry is made by tender leaves.
30.	*Lablab purpureus* (L.) Sweet.(Fabaceae)	Waal Pawta	Curry is made by pods.
31.	*Leucas aspera* (Willd.) Link. (Lamiaceae)	Gumma	Curry is made by leaves.
32.	*Limonia acidissima* L. (Rutaceae)	Kauth	Ripe fruits are eaten, 'Chutney' is prepared from fruits.
33.	*Madhuca longifolia* (Koen.) Mac Bride. Ver: *latifolia* (Roxb.) Chev. (Sapotaceae)	Moha	Flowers are eaten.
34.	*Merremia gangetica* (L.)Cufod. (Convolvulaceae)	Undirkani	Curry made by leaves.

35.	*Momordica dioica* Roxb. Ex Willd. (Cucurbitaceae)	Kartoli	Curry is made by unripe fruits.
36.	*Morus alba* L.(Moraceae)	Tuti	Ripe fruits are eaten.
37.	*Mukia maderaspatana* (L.) Roem. (Cucurbitaceae)	Bilavi	Unripe fruits are eaten.
38.	*Nelumbo nucifera* Gaertn. (Nelumbonaceae)	Kamal	Tubers are boiled and eaten, curry is also prepared from tubers.
39.	*Olax psittacorum (*Willd.)Vahl. (Olacaceae)	Harduly	Ripe fruits are eaten.
40.	*Opuntia stricta* (How.)How. (Cactaceae)	Phadya Nivdung	Ripe fruits are eaten.
41.	*Emblica officinalis* Gaertn. (Euphorbiaceae)	Awala	Fruits are eaten. 'Chutney' is made by fruits.
42.	*Pithecellobium dulce* (Roxb.) Benth. (Mimosaceae)	Wilayati Chinch	Seed kernels are eaten.
43.	*Semecarpus anacardium* L.f. (Anacardiaceae)	Bibha	Ripe fruits hypocarp and seed s are eaten.
44.	*Solanum nigram* L. (Solanaceae)	Kangani	Ripe fruits are eaten.
45.	*Solanum virginianum* L. (Solanaceae)	Kateringani	Curry is made by unripe fruits.
46.	*Sterculia urens* Roxb. (Sterculiaceae)	Kandol	Fruits are roasted and seeds are eaten.
47.	*Strychnos potatorum* L.f. (Loganiaceae)	Nirmali	Fruits and seeds are eaten.
48.	*Synantherias sylvatica* Schott.(Araceae)	Jangli suran	Curry is made by tuber.
49.	*Syzygium cumini* (L.)Skeels. (Myrtaceae)	Jambhul	Ripe fruits are eaten.
50.	*Terminalia bellirica* (Gaerth.)Roxb. (Combretaceae)	Behada	Seed cotyledons are eaten by Children.
51.	*Trianthema portulacastrum* L.(Aizoaceae)	Wasu	Curry is made by leaves.
52.	*Ziziphus mauritiana* Lam. (Rhamnaceae)	Bor	Ripe fruits are eaten. Fruits are also used to made chutney.
53.	*Ziziphus oenoplia* (L.) Mill. (Rhamnaceae)	Burgi	Ripe fruits are eaten.

Results and discussions:-

As there is increase in demand of food materials, such as, cereals, pulses and vegetables, etc. since several decades emphasis was given increase the yield by using different chemical fertilizers and pesticides. This resulted in the common occurrence of pesticide and chemical residues in food plants. Same time, no attention was given to keep the optimum level of micro and macro nutrient in the plants, which is a requirement of healthy food.

After realization of all these facts the people from developed and developing countries have been choosing the wild edible which may fulfill their requirements, of nutritive foods.

Since the ages the human societies residing in remote areas are using several wild plants for edible purposes. Information gathered from Yavatmal reveals that a treasurer of edible plants remains untouched in these areas.

A total of 53plant species belonging to 35 families were recorded after conducting survey Moraceae recorded highest number of species (5 species) followed by Amaranthaceae, Caesalpiniaceae, Euphorbiaceae and Cucurbitaceae are (3 species).

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Phytochemical Analysis of *Cassia Grandis*

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Abstract:

Plants are recognized in the pharmaceutical industry for their broad structural diversity as wellas their wide range of pharmacological activities. The plant Cassia Grandis is a widely cultivated ornamental plant . The trees is also known as pink showerCaro and stinking toe. It is a plantae- plant belonging to the order- Fabales, family – Fabaceae-Pea, and genus – Cassia L.Cassia. The phytochemical study on the leaf extract of Cassia Grandis is done. Fresh leaves were collected, shade dried, and a crude extract was prepared using soxhlet extraction method and the preliminary phytochemical analysis on the leaf extracts of Cassia grandis were conducted. The solvents used for extraction namely Aqueous, Ethanol and chloroform is chosen based on their increasing polarity. The extractive value is highest with Aqueous. Phytochemical studies revealed the presence of phytochemicals such as carbohydrates, phenols, flavonoids, steroids, saponins, alkaloids, tannins, and cardiac glycosides,Terpenoids.

Keywords:*Phytochemical analysis, Soxhlet extraction, Extraction solvents, Cassia Grandis leaf.*

Introduction

Herbalism is a type of traditional medicine that uses plants and plant extracts to treat ailments. There is a legal duty to maintain track of all traditional medicine research on paper. As a result of this disadvantage, it's vital to verify that the plant and its components that will be employed as medication are uniform.The objective of this work was to evaluate the phytochemical constitution of the Herbal plantcassia gradis.To collect the leaves of the plant and extraction is carried out different solutions like Water, ethanol and chloroform by soxhlet extractio method.To analyse the overall phyto chemicals Present in this plant leaves.

Materials And Methods

Sample Collection

The leaves were collected from near the garden.The leaves were sundried and then finely powdered. The powered leaves were stored in an air tight container for future use.

Pytochemistry

Plant Extraction

The collected materials (leaves) were chopped into small pieces separately, shade-dried, and coarsely powdered using mortar and pestle. 5 grams of of powdered leaves were added into 100 ml of the following extracts like aqueous, chloroform and ethanol. After adding them, they were boiled for few minutes, filtered in whattman filter paper & then stored in a reagent bottle for future use.

Detection of Phytochemicals :

All the extracts were subjected to preliminary phyto chemical tests followed by the methods of Harborneand Evans (2006).

TestforAlkaloids:

Wagner's test: Extract were treated with 3-5 drops of wagner's reagent. (Wanger's reagent – 1.27 g of iodine with 2 g of potassium idodide in 100 ml water. The Formationofbrown/reddishPrecipitateindicates thepresenceof alkaloids

Test for Carbohydrates:

Fehling test : Filtrates were hydrolyzed with diluted HCL, neutralized with Alkali and heated with fehling A & B solution. Formation of red precipitate indicates the presence of reducing sugars.

Test for Cardiac Glycosides:

The extract is treated with glacial acetic acid and also adding few drops of ferric chloride solution underplayed with 1 ml of concentrated sulpuric acid.The brown ring at the interphase indicates the presence of dexoy sugar characteristics.

Test for Flavonoids:

Alkaline Reagent test :Extracts were treated with few drops of 10% sodium hydroxide solution. Formation of intense yellow color which becomes colorless on addition of dilute acid indicates the presence of flavonoids

Test for Phenols:
Ferric chloride test: Extracts were treated with 3-4 drops of 1% of ferric chloride solution. Formation of bluish black color indicates the presence of phenols.

Test for phlobatannins :
The extract is boiled with 1 % of hydrochloric acid. The formation of blue- purple colour indicates the presence of phlobatannins.

Test for Saponins:
Foam test: 0.5 g of extract was shaken with 2ml of water. If foam produced persists for 10 minutes , it indicates the presence of saponins.

Test for Sterols and Triterpenoids:
The extract is treated with few drops of chloroform, acetic anhydride and concentrated sulphuric acid. The formation of reddish pink colour immediately indicates the presence of sterols and triterpenoids.

Test for Tannins:
Gelatin test :To the extract , 1% gelatin solution containing sodium chloride solution was added. Formation of white precipitate indicates the presence of tannins.

Test for quinones:
The extract is treated with concentrated hydrochloric acid, The formation of yellow precipitate indicates the presence of quinones.

Test for oxalates :
The extract is treated with glacial acetic acid. The formation of greenish black colour indicates the presence of oxalates.

Test for Treterpenoids :
Sankowski's test : The extract is treated with 1 ml of chloroform and concentratedSulphuric acid.The formation of reddish brown precipitate indicates the presence of treterpenoids.

Extraction Results :

Extract	Colour under visible light	Colour under UV light	Texture
Water + Powdered leaves	Mustard Yellow	Light gray	Dry, Shiny appearance
Ethanol + Powdered leaves	Peacock Green	Dark Pink	Completely Dry
Chloroform + Powdered leaves.	Brown	Dark Pink	Sticky

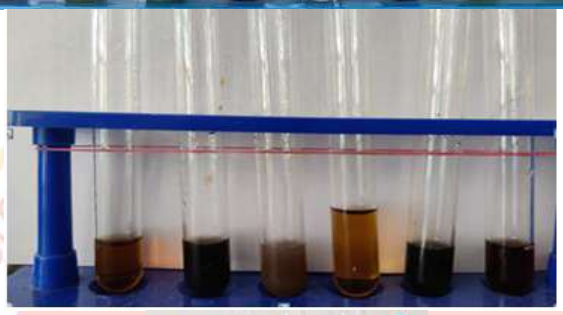
Phytochemical Screening Tests And Results :

TESTS	DIFFERNET SOLVENTS		
PHYTOCHEMICALS	**AQUEOUS**	**ETHANOL**	**CHLOROFORM**
ALKALOIDS	-		-
CARBOHYDRATE	+++	++	-
CARDIAC GLYCOSIDES	+++	++	-
FLAVANOIDS	-	+	-
PHENOLS	+++	+++	-
PHLOBATANNINS	+	+	-
STEROLS AND TRETERPHENOIDS	+	++	-
TANNINS	+++	++	-
QUINONES	-	+	-
OXALATES	+	-	-
SAPONINS	+	-	-
TERPENOIDS	+++	+	-

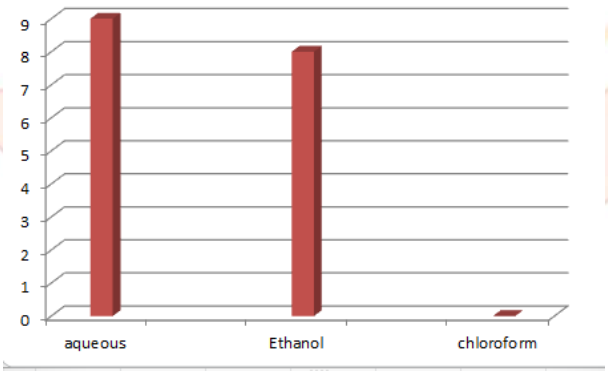
(" +++ ") : Phytochemicals present in high quantity.
("++ ") : Phytochemicals present in medium quantity.
(" + ") : Phytochemicals present in low quantity.
(" – ") : Absence of Phytochemicals.

Results:

The results for preliminary phytochemical screening of various extracts of the leaves are given in the table such as alkaloids, Carbohydrate, Cardiac Glycosides, Flavanoids, Phenols, Saponnins, sterols and triterpinoids, Tannis, Terpenoids, Quinones, Oxalates and phlobatannins. The extract were carried out phytochemical screening process. Based on the results the yield calculations was made and the percentage of yield was significantly high Aqueous > Ethanol> Chloroform. The phytochemical screening was conducted for twelve phytochemicals.Carbohydrate, Cardiac glycosides, Phenols, Strerols, Tannins and Terpenoids were found in high quantites. The presence of phytochemicals always nil in chloroform extract. The oxalates are completely absent. Flavonoids, Alkaloids, Saponins, Quinones are present in few amounts.



Grphyical Representation of Phytochemical Tests:



In Aqueous extract : High amount of phytochemicals are present.
In Ethanol extract : Medium amount of Phytochemicals are present
In chloroform extract : Absence of Phytochemicals

Discussion:

Phytochemical screening of medicinal plants is very important in identifying newsources of therapeutically and industrially important compounds. Kamboj (2000) stated that the bioactive extract should be standardized on thebasis of phytochemical compounds. It is imperative to initiate an urgent step forscreeningofplantsforsecondarymetabolites.Theresultsofpreliminaryphytochemicalscreening of leaves showed the presence of alkaloids, carbohydrate, cardiac glycoside, flavonoids, phenols ,paleobotanies, Sterols, terpinoids, tannins, quinones, saponins, terpenoids. Many of these phytochemical have different medicinal properties and it is used for making anti-inflammatory agents, anti-microbial agents, antiseptic, etc. Due to the presence of these compounds, the extracts revealed itsmedicinal potential to develop novel therapeutic agents.

Conclusion:

From the phytochemical screening results the carbohydrate, Cardiac glycosides, Phenols, Sterols, Tannins andTriterpenoids are present with high quantitates phytochemicals are consist high anti- inflammatory agents and prevent heart failure also. Anti – Inflammatory agents can reduce redness, swelling and pain in our body and also block certain substances in the body that cause inflammation. So, we can prefer this for making anti-Inflammatory ointment or ayurvedic drugs against inflammation.

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Isolation And Identification Of Bacteria From Local Market Fresh Water Crab *Paratelphusa Jacquemontii* From Amravati District, Maharashtra, India

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Abstract
The present study was conducted to evaluate the hygienic quality and freshness of crab Paratelphusa jacquemontii (Rathbun) through the investigation of the occurrence of bacteria which is an indicator for crab quality. Crabs were collected every week from local crab market. Carapace and gills of the crab was examined. Escherichia coli, Proteus vulgaris, Bacillus subtilis, Klebsiella pneumonia, Pseudomonas aeruginosa, Vibrio parahaemolyticus and Staphylococcus aureus were identified by Biochemical tests (IMViC Tests). The result of this study revealed that raw crab sold in local crab market has high contamination of human pathogenic bacteria, so strongly suggested that there is need for innovative measures to discourage the local population from eating improperly cooked crabs.
Keywords: *P. jacquemontii, Bacterial isolation, Fresh water crab.*

Introduction
Fresh water crab provides high quality protein and it also contains Omega-3 fatty acids that afford potential health benefits. Crab meat contains several essential vitamins and minerals, such as vitamin B12, which is necessary for proper nerve function. These crustaceans are rich in the minerals, zinc and copper, which are important for various vital bodily functions. Consumption of infected crab may cause diseases due to infection or intoxication. Some of these diseases are caused by the microorganisms present on the external surfaces including carapace, gills and the gut of the crab. In water microorganisms are kept away from invading by the normal defense mechanism of crab, when they are alive. Outside the water or on death, the microorganisms or the enzymes they secrete are free to invade or diffuse into the body parts where they react with complex mixture of natural substances present resulting in a well- defined sequence of changes in odoriferous and flavourous compounds. The bacteria present on the crab are normally associated with those found in their natural environment and influenced by the season and the harvesting conditions (ICMSF 2007). The outlined and discussed the hazards and challenges associated with handling crab during farming, capture and the environmental contaminants in seafood that may pose a risk to human health (Yagoub 2009). The quality of the raw crab (fresh or iced) at markets varies so widely that there is an obvious need for developing quality standards. There is no study on Microbial identification of these crabs. Therefore this study was carried out to identify certain microbial analysis to assess the quality and freshness of raw crab (*P.jacquemontii*) sold at a market in Amravati, Maharashtra, India.

Materials and methods
Laboratory analysis
Crab samples
Crabs (P.jacquemontii) were collected from a local crab market in Amravati. Totally 10 numbers of sample animals were collected every week from November 2019 to February 2020. The collected samples were aseptically and immediately transported in a thermal bag to the laboratory and processed within 3 h of acquisition, and samples were kept in the refrigerator (4–8 °C).

Sample preparation
The 10 g of the crab body parts sample was cut with a sterile knife. The cut body parts were crushed into small pieces in a sterile mortar with about 10 ml sterile water. From the crushed sample, 1 ml aliquot volume was measured out and homogenized in a clean, dry sterile beaker containing 9 ml of distilled water giving a 1:10 dilution. This was done for the 10 crab samples.

Isolation and identification bacteria form crab body sample of *P.jacquemontii*
The collected samples were processed in the laboratory according to the standard microbiological methods under complete aseptic conditions. The swabs were inoculated on nutrient agar and incubated at 37 °C under aerobic condition. The isolated bacterial colonies were identified on the basis of their morphological, physiological and biochemical characters. These culture were subjected to various biochemical tests such as gram staining, motility, indole, methyl red, voges proskauer, citrate, Triple sugar ion, oxidase, carbohydrate fermentation, hydrogen sulfide production tests for identification of phosphate solubilizing bacteria using

Bergey's manual of systematic bacteriology (Holt et al.1994). The bacteria such as *E. coli, K. pneumonia, P. vulgaris, B. subtilis, P. aeruginosa, Vibrio parahaemolyticus* and *S. aureus* were isolated from the crab samples.

Results and discussion

In bacteria, bio-oxidation reactions are very important. These reactions help bacteria to provide energy by oxidation of organic substances or by fermentation. Based on these reactions, the bacteria were identified and the results were presented in (Tables: 1, 2, 3, and 4)

Table-1: Bacteria isolated from fresh water crab *P.jacquemontii* purchased on first week of November 2019.

Testing	Microorganisms			
	Escherichia coli	*Vibrio parahaemolyticus*	*Klebsiella pneumonia*	*Pseudomonas aeruginosa*
Gram staining	−	-	−	+
Motility	+	+	−	−
Indole production	+	+	−	+
Methyl red	+	-	−	−
Voges-Proskauer	−	-	+	−
Citrates	−	+	+	+
Triple sugar iron	−	+	−	−
Oxidase	−	+	−	D
Carbohydrate fermentation	+	+	D	D

+: Positive, −: negative, D: different

Table-2: Bacteria isolated from fresh water crab *P.jacquemontii* purchased on first week of December 2019.

Testing	Microorganisms				
	Escherichia coli	*Vibrio parahaemolyticus*	*Klebsiella pneumonia*	*Proteus vulgaris*	*Bacillus subtilis*
Gram staining	−	-	−	−	+
Motility	+	+	−	+	−
Indole production	+	+	−	+	+
Methyl red	+	-	−	+	−
Voges-Proskauer	−	-	+	−	−
Citrates	−	+	+	+	+
Triple sugar iron	−	+	−	+	−
Oxidase	−	+	−	D	D
Carbohydrate fermentation	+	+	D	D	D
Catalase	+	+	+	+	+

+: Positive,−: negative, D: different

Table-3: Bacteria isolated from fresh water crab *P.jacquemontii* purchased on first week of January 2020.

Testing	Microorganisms			
	Escherichia coli	*Vibrio parahaemolyticus*	*Klebsiella pneumonia*	*Proteus vulgaris*
Gram staining	−	-	−	−
Motility	+	+	−	+
Indole production	+	+	−	+
Methyl red	+	-	−	+
Voges-Proskauer	−	-	+	−
Citrates	−	+	+	+

Triple sugar iron	−	+	−	+
Oxidase	−	+	−	D
Carbohydrate fermentation	+	+	D	D
Catalase	+	+	+	+

+: Positive, −: negative, D: different

Table-4: Bacteria isolated from fresh water crab *P.jacquemontii* purchased on first week of February 2020.

Testing	**Microorganisms**				
	Escherichia coli	*Vibrio parahaemolyticus*	*Klebsiella pneumonia*	*Pseudomonas aeruginosa*	*Staphylococcus aureus*
Gram staining	−	-	−	+	+
Motility	+	+	−	−	−
Indole production	+	+	−	+	−
Methyl red	+	-	−	−	−
Voges-Proskauer	−	-	+	−	−
Citrates	−	+	+	+	+
Triple sugar iron	−	+	−	−	−
Oxidase	−	+	−	−	−
Carbohydrate fermentation	+	+	D	D	D
Catalase	+	+	+	+	+

+: Positive, −: negative, D: different

In this study, *E. coli, Vibrio parahaemolyticus ,K. pneumonia, P. vulgaris, B. subtilis, P. aeruginosa* and *S. aureus* were identified from the crab. *E. coli, Vibrio parahaemolyticus* and *K. pneumonia* were found in all the monthly samples (Tables: 1, 2, 3, and 4) Whereas, *B. subtilis* (Tables: 2) and *P. aeruginosa* (Tables: 1 and 3) were identified two times. *P. vulgaris* (Tables: 2 and 3) and *S. aureus* (Tables: 4) was identified. The crabs are highly consumable and prone to vast variations in quality due to differences in species, environmental habitats, and feeding habits. They can also function as carriers of several microbial and other health hazards. Therefore maintenance of quality is most important in production and trade of crab products. Although only a few infectious agents in crab are able to infect humans, some exceptions exist that may result in fatalities. However, the greatest risk to human health due to the consumption of raw or insufficiently processed crabs and crab products. In this study, *E.coli., Vibrio Parahemolyticus,* and *Klebsiella pneumonia* sp. were isolated from all of collected crab samples is of highly importance because this bacterium plays a considerable role as potential pathogenic bacteria for human and as an indicator of food quality as spoilage organism. The consumption of these disease or infected crabs possesses greater health risks than the consumption of apparently healthy ones. The general public and consumers of crabs should therefore ensure that they do not buy or consume disease or injured crabs. Organic materials of any type are suitable foodstuffs for bacteria growth. A case of cholera occurred in a patient in Maryland, who had eaten crab harvested commercially along the Texas coast in October 1984. Findings of *Vibrio sp.* in the tissue of crabs of present studies are considered to be correlated with the epidemiology and transmission of cholera in the aquatic environment.

This is previously mentioned by (Jeyasekaran *et al*. 2006, and Koutsoumanis and Nychas 2000). In this study seven bacterial species were isolated form *P.jacquemontii.* Among the seven bacterial species *E. coli. V. parahaemolyticus* and K. *pneumonia* were found in all the samples and others were not found. Apart from the enteric- organisms, *S. aureus* encountered in this study are known enterotoxin producing agent and a microorganism which is poisonous. This is in agreement with the previous study by some authors in Nigeria and outside Nigeria (Okonko et. al.2008, 2009).

The results from this study and according to published microbiological guidelines as cited by (Gilbert et al.1996) suggest that the microbiological quality of the crab examined is unacceptable and pose a potential risk to public health. The diversity of potential pathogens from the samples of crab is of concern particularly at a time when many in our communities are immunologically compromised as a result of various illnesses (Mhango et al.2010). From this investigation, it can be concluded that these characteristics of water bodies are influenced by seasonal variations. It is recommended that the proper maintenance of the captured crabs is

necessary. Proper sanitation measures and environmental education to public care essential to keep these water bodies clean and safe. There is need for innovative measures to discourage the local population from eating improperly cooked crabs.

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Spider's Diversity in Agro-ecosystems of Murtizapur Tahsil, District Akola (Maharashtra State)

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Abstract

Spiders are widespread and diverse predators that are part of terrestrial Arthropod. Spiders are one of the most diverse animal groups in the World. Spiders play an important role as stabilizing agents or regulators of insect populations in agro, forest and other terrestrial ecosystems. Thus their presence in an ecosystem may well influence the population dynamics of other arthropods present. They mostly feed on insects, even though they may also feed on various other kinds of prey. Spider's predatory capacity can have an effect in decreasing densities of insect pests, when they are used to balance the effect of insecticides and Pesticides. If pesticides are avoided, spiders can invariably take shelter in the fields, feed on the pests and increase the productivity. The role of spiders as generalist predator in an agroecosystems is well recognized.

Spider species abundance in agro-ecosystem can be high as undisturbed natural ecosystem. Spiders act as pest control creature, which feeds on crop destructive insects. Spiders are beneficial bio-control agent of insect pest in agro-ecosystem. A survey of Spiders was carried out in Agro-ecosystems of Murtizapur, District Akola, during November 2020 to November 2021 in the present study I have reported 148 species of Spiders belonging to 13 Families and 65 genera. Spiders of Families ARANEIDAE, CLUBIONIDAE, ERESIDAE, GNAPHOSIDAE, LYCOSIDAE, OECOBIIDAE, OXYOPIDAE, SALTICIDAE, SPARASSIDAE, TETRAGNATHIDAE, THERIDIIDAE, THOMISIDAE, and ULOBORIDAE were recorded during the investigation.

Keywords: *Diversity, Agro-ecosystems, Spider, Murtizapur.*

Introduction

Spiders are among the most abundant insectivorous predators of Terrestrial ecosystem. Biodiversity can be simply defined as the variety of all types of living organism. Spiders are among the most diverge group on earth, which received the sixth ranking in global diversity after the sixth largest insect orders. Spiders belonging to the order Araneae, which is one of the major group of creature Spiders are one of the most important Arthropods group in agroecosystems. They colonize almost all habitats and have great ability in resisting to adverse ecological conditions. Spiders are carnivorous creature. Spiders are among the most abundant predators of insects of terrestrial agro-ecosystem.

Spider species abundance in agro-ecosystem can be high as undisturbed natural ecosystem. Spiders act as pest control creature, which feeds on crop destructive insects. Spiders are beneficial bio-control agent of insect pest in agro-ecosystem. A survey of Spiders was carried out in Agro-ecosystems of Murtizapur Tahsil, district Akola. Spiders act as natural biological control agent in ecosystem. Some recent workers on Indian spiders include Majumdar and Tikader (1991), Reddy and Patel (1992), Biswas and Biswas (1992), Sadana and Goel (1995), Biswas et al. (1996), Gajbe, U. A. (1999), Biswas and Majumdar (2000), Biswas B. and K. Biswas (2003).

Material and Method:

Study Area:

Murtizapur is located between N20.73° and E77.51° with an elevation on 308 meters. Summer is hot temperate as compared to other Vidarbha regions. The annual rainfall averages 700 mm. The area receives rainfall during southwest monsoon. Average temperature of the district ranges from minimum of 10°C in winter to a maximum of 45°C in summer with the relative humidity varying from 10-17% to 60-90%.

The spider inventory studies were conducted from November 2020 to November 2021 in the ten different localities of Murtizapur, Akola district from Maharashtra state. I have selected Ten microhabitats for observations in the study area viz; agricultural land.

Sampling methods:

Spider Inventory work was conducted at the agro-ecosystems by different groups of workers. Four surveys were conducted per season at all study sites. Five 30 x 30 m quadrates were taken for extensive surveys. All surveys were conducted in the morning hours between 7:00 am to 9:00 am Spiders were collected by adopting standard sampling techniques as described below.

1. Sweep netting: Spiders from herbaceous-shrub-small tree vegetation were collected using standardized insect-collecting net. This method is used to collect the foliage spider by this method from herbs and shrubs.
2. Active searching: Spiders from all three layers were collected using this method. In this method spider specimens were actively searched for 30 minutes per quadrat for active searching.

3. Beating sheets: Spiders from trees and woody shrubs were dislodged and collected on a sheet by beating trees and shrubs with a standard stick 10 beats per tree or shrub were employed in each quadrat.
4. Litter Sampling: Litter i.e. deciduate from the ground was collected by hand and was put in big tray. Litter sampling involved in sorting of spiders.
Collected spiders were photographed in life and later preserved in 70% ethyl alcohol. Identification: Spiders were observed using dissecting stereo zoom microscopes for studying identification keys. All specimens were initially separated from other material and identified to the family level. Spiders were identified upto species level using the standard monographs, Majumder S.C. and Tikader B. K. (1991).

Result:

During the present survey, I have reported 148 species of Spiders belonging to 13 Families and 65 Genera. Spiders of Families ARANEIDAE, CLUBIONIDAE, ERESIDAE, GNAPHOSIDAE, LYCOSIDAE, OECOBIIDAE, OXYOPIDAE, SALTICIDAE, SPARASSIDAE, TETRAGNATHIDAE, THERIDIIDAE, THOMISIDAE and ULOBORIDAE were recorded during November 2020 to November 2021 in my investigation.

Table 1: Checklist of Spider fauna from Agro-ecosystems of Murtizapur in Akola district of Maharashtra State

Sr. No.	Family	Species	Common Name of Spiders	Habitat
01	ARANEIDAE(42)	*Araneus cucurbitinus* ♀	Orb Weaver	Cotton Field
02		*Araneus cucurbitinus* ♂	Orb Weaver	Cotton Field
03		*Araneus mitifica* (Simon) ♀	Orb Weaver	Cotton Field
04		*Araneus mitifica* (Simon) ♂	Orb Weaver	Cotton Field
05		*Araneus pachganiensis* ♀	Orb Weaver	Cotton Field
06		*Araneus pahalgaonensis* ♀	Orb Weaver	Cotton Field
07		*Argiope aemula* ♀	Orb Weaver	Cotton Field
08		*Argiope aemula* ♂	Orb Weaver	Cotton Field
09		*Chorizopes anjanes* ♂	Orb Weaver	Cotton Field
10		*Chorizopes anjanes* ♀	Orb Weaver	Cotton Field
11		*Chorizopes calciope* ♀	Orb Weaver	Cotton Field
12		*Chorizopes calciope* ♂	Orb Weaver	Cotton Field
13		*Cyclosa bifida* (Doleschall)♀	Orb Weaver	Cotton Field
14		*Cyclosa bifida* (Doleschall)♂	Orb Weaver	Cotton Field
15		*Cyclosa confraga* (Thorell)♀	Orb Weaver	Cotton Field
16		*Cyclosa confraga* (Thorell)♂	Orb Weaver	Cotton Field
17		*Cyclosa fissicauda Simon* ♀	Orb Weaver	Sunflower Field
18		*Cyclosa fissicauda Simon* ♂	Orb Weaver	Sunflower Field
19		*Cyclosa insulana* (Costa) ♂	Orb Weaver	Sunflower Field
20		*Cyclosa insulana* (Costa) ♀	Orb Weaver	Sunflower Field
21		*Cyclosa moonduensis* ♀	Orb Weaver	Sunflower Field
22		*Cyclosa moonduensis* ♂	Orb Weaver	Sunflower Field
23		*Cyclosa mulmeinensis* ♀	Orb Weaver	Sunflower Field
24		*Cyclosa mulmeinensis* ♂	Orb Weaver	Sunflower Field
25		*Cyclosa neilensis* Tikader ♀	Orb Weaver	Papaya Field
26		*Cyclosa neilensis* Tikader ♂	Orb Weaver	Papaya Field
27		*Cyclosa simoni* ♀	Orb Weaver	Papaya Field
28		*Cyclosa simoni* ♂	Orb Weaver	Papaya Field
29		*Cyrtophora bidenta* ♀	Orb Weaver	Cotton Field
30		*Cyrtophora bidenta* ♂	Orb Weaver	Cotton Field
31		*Cyrtophora cicatrosa* ♀	Orb Weaver	Cotton Field
32		*Cyrtophora cicatrosa* ♂	Orb Weaver	Cotton Field
33		*Cyrtophora citricola* ♀	Orb Weaver	Tur Field
34		*Cyrtophora citricola* ♂	Orb Weaver	Tur Field
35		*Larinia chloris* (Audouin) ♀	Orb Weaver	Tur Field
36		*Larinia chloris* (Audouin) ♂	Orb Weaver	Tur Field

37		*Neoscona achine* ♀	Orb Weaver	Tur Field
38		*Neoscona achine* ♂	Orb Weaver	Tur Field
39		*Neoscona bengalensis* ♀	Orb Weaver	Tur Field
40		*Neoscona nautica* ♀	Orb Weaver	Jawar Field
41		*Neoscona theis* ♀	Orb Weaver	Jawar Field
42		*Zygiella indica* Tikader ♀	Orb Weaver	Jawar Field
43	CLUBIONIDAE(3)	*Clubiona acanthochemis* ♀	Sac Spider	Cotton Field
44		*Clubiona analis* Thorell ♀	Sac Spider	Cotton Field
45		*Clubiona analis* Thorell ♂	Sac Spider	Cotton Field
46	ERESIDAE(2)	*Stegodyphus sarasinorum* ♀	Colonial Spider	Lemon Field
47		*Stegodyphus sarasinorum* ♂	Colonial Spider	Lemon Field
48	GNAPHOSIDAE(8)	*Drassodes lubrica* Simon ♀	Ground dwelling	Cotton Field
49		*Drassodes sagarensis* ♀	Ground dwelling	Cotton Field
50		*Gnaphosa poonaensis* ♀	Ground dwelling	Jawar field
51		*Gnaphosa poonaensis* ♂	Ground dwelling	Jawar field
52		*Sosticus nainitalensis* ♀	Ground dwelling	Jawar field
53		*Sosticus nainitalensis* ♂	Ground	Jawar field
54		*Zelotes poonaensis* ♂	Ground	Cotton Field
55		*Zelotes sajali* Tikader♀	Ground dwelling	Cotton Field
56	LYCOSIDAE(25)	*Hippasa greenalliae* ♀	Wolf Spider	Cotton Field
57		*Hippasa greenalliae* ♂	Wolf Spider	Cotton Field
58		*Hippasa partida* ♂	Wolf Spider	Tur Field
59		*Hippasa pisaurina* Pocock ♀	Wolf Spider	Tur Field
60		*Hippasa pisaurina* Pocock ♂	Wolf Spider	Tur Field
61		*Lycosa barnesi* Gravely ♀	Wolf Spider	Cotton Field
62		*Lycosa bistriata* Gravely ♀	Wolf Spider	Cotton Field
63		*Hippasa partida* ♀	Wolf Spider	Cotton Field
64		*Lycosa choudhuryi* ♀	Wolf Spider	Cotton Field
65		*Lycosa fuscana* Pocock ♀	Wolf Spider	Cotton Field
66		*Lycosa poonaensis* ♀	Wolf Spider	Cotton Field
67		*Lycosa poonaensis* ♂	Wolf Spider	Cotton Field
68		*Lycosa prolifica* Pocock ♀	Wolf Spider	Jawar Field
69		*Pardosa birmanica* Simon ♀	Wolf Spider	Jawar Field
70		*Pardosa birmanica* Simon ♂	Wolf Spider	Jawar Field
71		*Pardosa timida* (Simon) ♀	Wolf Spider	Jawar Field
72		*Pardosa timida* (Simon) ♂	Wolf Spider	Jawar Field
73		*Pardosa minutus* Tikader ♀	Wolf Spider	Cotton Field
74		*Pardosa minutus* Tikader ♂	Wolf Spider	Cotton Field
75		*Pardosa timida* (Simon) ♀	Wolf Spider	Cotton Field
76		*Lycosa fuscana* Pocock ♂	Wolf Spider	Cotton Field
77		*Lycosa barnesi* Gravely ♂	Wolf Spider	Cotton Field
78		*Lycosa bistriata* Gravely♂	Wolf Spider	Cotton Field
79		*Lycosa prolifica* Pocock ♂	Wolf Spider	Cotton Field
80		*Lycosa choudhuryi* ♂	Wolf Spider	Cotton Field
81	OECOBIIDAE(2)	*Oecobius* marathaus ♀	Tiny Spider	Jawr Field
82		*Oecobius* marathaus ♂	Tiny Spider	Jawr Field
83	OXYOPIDAE(13)	*Oxyopes bharatae* Gajbe ♀	Lynx Spider	Cotton Field
84		*Oxyopes biharensis* Gajbe ♀	Lynx Spider	Cotton Field
85		*Oxyopes burmenicus* ♀	Lynx Spider	Cotton Field
86		*Oxyopes chittrae* Tikader ♀	Lynx Spider	Cotton Field
87		*Oxyopes elongatus* Biswas.♀	Lynx Spider	Cotton Field
88		*Oxyopes pankaji* Gajbe ♀	Lynx Spider	Cotton Field

89		*Oxyopes pankaji* Gajbe ♂	Lynx Spider	Cotton Field
90		*Peucetia viridana* ♀	Lynx Spider	Cotton Field
91		*Peucetia viridana* ♂	Lynx Spider	Cotton Field
92		*Oxyopes burmenicus* ♂	Lynx Spider	Jawar Field
93		*Oxyopes chittrae* Tikader ♀	Lynx Spider	Jawar Field
94		*Oxyopes elongatus* Biswas.♀	Lynx Spider	Jawar Field
95		*Oxyopes pankaji* Gajbe ♀	Lynx Spider	Jawar Field
96	SALTICIDAE(23)	*Phidippus pateli* ♂	Jumping Spider	Cotton Field
97		*Marpissa decorata* Tikader♂	Jumping Spider	Cotton Field
98		*Marpissa decorata* Tikader♀	Jumping Spider	Cotton Field
99		*Marpissa dhakuriensis* ♀	Jumping Spider	Tur Field
100		*Myrmarachne maratha* ♀	Jumping Spider	Tur Field
101		*Myrmarachne maratha* ♂	Jumping Spider	Tur Field
102		*Phidippus pateli.* ♀	Jumping Spider	Tur Field
103		*Phidippus paykulli* ♀	Jumping Spider	Tur Field
104		*Plexippus paykullii* ♀	Jumping Spider	Tur Field
105		*Plexippus paykullii* ♂	Jumping	Cotton Field
106		*Rhene indicus* Tikader ♀	Jumping Spider	Cotton Field
107		*Telamonia dimidiata* ♀	Jumping	Cotton Field
108		*Telamonia dimidiata* ♂	Jumping Spider	Cotton Field
109		*Phidippus paykulli* ♂	Jumping Spider	Jawar Field
110		*Rhene indicus* Tikader ♂	Jumping Spider	Jawar Field
111		*Marpissa dhakuriensis* ♂	Jumping Spider	Cotton Field
112		*Phlegra dhakuriensis* ♀.	Jumping Spider	Cotton Field
113		*Salticus ranjitus* Tikader ♂	Jumping Spider	Cotton Field
114		*Thiania* sp. nov. ♂.	Jumping Spider	Cotton Field
115		*Euophrys* sp. nov. ♀.	Jumping Spider	Cotton Field
116		*Harmochirus* sp. nov. ♂.	Jumping Spider	Cotton Field
117		*Harmochirus* sp. nov. ♀.	Jumping Spider	Cotton Field
118		*Salticus ranjitus* Tikader ♀.	Jumping Spider	Cotton Field
119	SPARASSIDAE(2)	*Heteropoda venatoria* ♀	Giant Crab	Cotton Field
120		*Heteropoda venatoria* ♂	Giant Crab	Cotton Field
121	TETRAGNATHIDAE (4)	*Leucauge decorata*♀	Water orb weaver	Tur Field
122		*Leucauge fastigata* ♀	Water orb weaver	Cotton Field
123		*Tetragnatha mandibulata*♀	Water orb weaver	Cotton Field
124		*Tetragnatha mandibulata*♂	Water orb weaver	Cotton Field
125	THERIDIIDAE(4)	*Argyrodes gouri* ♀	Cob web Spider	Papaya Field
126		*Argyrodes gouri* ♂	Cob web Spider	Cotton Field
127		*Theridion manjithar* ♀	Cob web Spider	Cotton Field
128		*Theridion manjithar* ♂	Cob web Spider	Cotton Field
129	THOMISIDAE(17)	*Thomisus pugillis* ♀	Crab Spider	Sunflower Field
130		*Thomisus pugillis* ♂	Crab Spider	Sunflower Field
131		*Thomisus whitakeri* ♀	Crab Spider	Sunflower Field
132		*Tmarus pachpediensis* ♀	Crab Spider	Sunflower Field
133		*Tmarus pachpediensis* ♂	Crab Spider	Sunflower Field
134		*Xysticus jayantius* ♀	Crab Spider	Sunflower Field
135		*Xysticus minutes* ♀	Crab Spider	Sunflower Field
136		*Xysticus minutes* Tikader ♂	Crab Spider	Sunflower Field
137		*Synaema decorata* ♀	Crab Spider	Sunflower Field
138		*Synaema decorata* ♂	Crab Spider	Sunflower Field
139		*Thomisus elongates* ♀	Crab Spider	Sunflower Field
140		*Thomisus elongates* ♂	Crab Spider	Sunflower Field
141		*Thomisus memae* ♀	Crab Spider	Sunflower Field
142		*Thomisus beautifularis*♀	Crab Spider	Sunflower Field

143		*Thomisus pooneus* ♂	Crab Spider	Sunflower Field
144		*Thomisus projectus* ♀	Crab Spider	Sunflower Field
145		*Thomisus projectus* ♂	Crab Spider	Sunflower Field
146	ULOBORIDAE(3)	*Uloborus danolius* ♀	Feather leg Spider	Cotton Field
147		*Uloborus danolius* ♂	Feather leg Spider	Cotton Field
148		*Uloborus khasiensis* ♀	Feather leg Spider	Cotton Field

♀- Female, ♂- Male.

Table 2: Checklist of Spider fauna from Agro-ecosystems of Murtizapur in Akola district of Maharashtra State

Sr. No.	Family	Genera	Species
01	Araneidae	19	42
02	Clubionidae	01	03
03	Eresidae	01	02
04	Gnaphosidae	03	08
05	Lycosidae	12	25
06	Oeceobiidae	01	02
07	Oxyopidae	04	13
08	Saltisidae	11	23
09	Sparassidae	01	02
10	Tetragnathidae	02	04
11	Theridiidae	02	04
12	Thomisidae	07	17
13	Uloboridae	01	03
Total		**65**	**148**

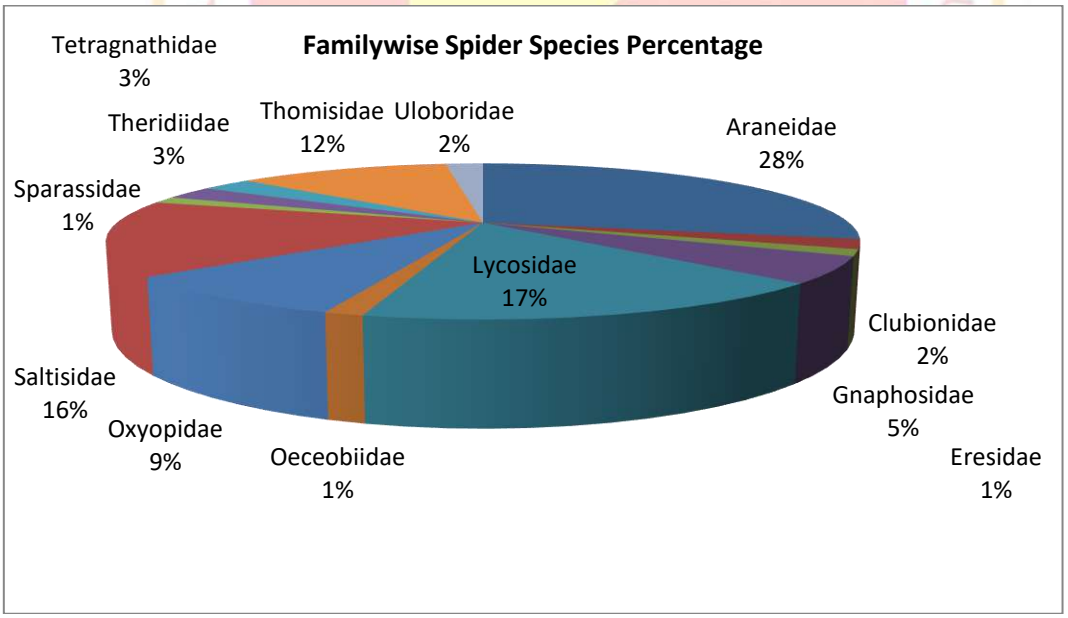

Fig.1. Graph showing Family wise Spider Species Percentage of Agro-ecosystems from Murtizapur, District Akola

Discussion:

In the present study, 148 species of spiders belonging to 65 genera of 13 families in agro-ecosystem of Murtizapur, district Akola collected and identified. These spiders were belonging to the family Araneidae, Clubionidae, Eresidae, Gnaphosidae, Lycosidae, Oecobiidae, Oxyopidae, Salticidae, Sparassidae, Tetragnathidae, Theridiidae, Thomisidae, and Uloboridae. In this study two species of spiders were observed,

one is web weaver and another one is non web weaver. The web weaving spiders were belonging to the family Araneidae, Eresidae, Oecobiidae, Tetragnathidae, Theridiidae, and Uloboridae. The non web weaving spiders were belonging to the family Clubionidae, Gnaphosidae, Lycosidae, Oxyopidae, Salticidae, Sparassidae and Thomisidae. The increase in the spider density suggests that spider density in influenced by the increase in prey density. In particular, the interaction of prey and predator shows a constant numerical interaction about these relationships which is fundamental to biological control.

OrbWeaver(ARANEIDAE)>WolfSpider(LYCOSIDAE)>JumpingSpider(SALTICIDAE)> Crab Spider(THOMISIDAE)> Lynx Spider(OXYOPIDAE)

On the basis of Family wise Spider Species the abundance of the Spider Family are represented respectively. In my investigation I have seen that the abundance of Five Family Spiders species were more. The Orb waver spiders of Family Araneidae and Wolf spiders of Family Lycosidae are widely distributed. The Orb waver spiders of Family Araneidae form web and the insect pest entangled in web spiders feeds on them. The members of family Lycosidae and Salticidae spiders they directly capture the insect pest and feeds on it.

Conclusion:

In my investigation I have studied 148 species belonging to 65 genera of 13 Spider Families during November 2020 to November 2021, on the above result and discussion it is clear that the Spiders are very much important creature. Species abundance of spider in agro-ecosystem can be high. The present work includes the Taxonomic position and list of diversified species of spiders. The major families abundant in this agro-ecosystem are ARANEIDAE 42(28%), LYCOSIDAE 25(17%), SALTICIDAE 23(16%), THOMISIDAE 17(12%) and OXYOPIDAE 13(9%). Spiders are act as good Pest controller. Avoid the regular use of pesticides in agricultural fields which decreases the spider populations, so species abundance of spider in agro-ecosystem can be high. Spiders are beneficial bio-control agent of insect pest in agro-ecosystem.

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Flowering Phenology and Histochemical Analysis of Cotton Varieties

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Abstract:

Phenology is the study of timing of vegetative activities, flowering and fruiting and their relationships to environmental factors."Flowering Phenology" refers to the seasonal timing of flowering. Another event under phenology is opening of flower, anther dehiscence, pollen presentation and stigma receptivity. Flower opening in all cotton varieties starts during 06.45 to 09.45 hours followed by anther dehiscence, which starts, from 07.00 hours depending on the weather conditions. In all selected varieties of cotton, it is observed that the flowering starts during 1st to 19th of September and full blooming was from 9th October to 28th November. In histochemical test, Pollen grains of all the varieties of cotton studied showed the presence of both starch and lipids. Thus the Pollen grains of all cotton varieties belong to the class of starchy pollen as in all varieties it showed positive test.

Keywords: *Cotton varieties, flowers, starch, lipids, phenology.*

Introduction:

Cotton is one of the most commercial crops playing a key role in economic, political and social affairs of the world. Cotton is a tropical and subtropical crop grown on a variety of soil. The predominant types of soil on which the crop is grown are the black cotton soil and red sandy loams to loams found in the state of Gujarat, Maharashtra, Madhya Pradesh, Andhra Pradesh, Karnataka and Tamilnadu. The sowing season of cotton varieties differs considerably in different regions for obtaining maximum yield of cotton. The crop yield is depending on reproductive success of the plant. During the process of reproduction the pollen grains plays very important role. Therefore, the Palynological investigations of cotton varieties H-8, NHH-52, BT-162, LRA-5166, Kaveri Kurnel, Ankur-216, Binni and Ajeet-11 were proposed to undertake for the investigations on flowering phenology, pollen histochemistry. Phenology is the study of timing of vegetative activities, flowering and fruiting and their relationships to environmental factors (Mori and Prance, 2005). "Flowering Phenology" refers to the seasonal timing of flowering.

A phenological record depends on parameter chosen by the various investigators and depends on the research levels, the aim of the research, and the type of analysis. The main events are the timing, duration, sequence, intensity and timing of flowering, which can determined by the physical environment factors like temperature, rainfall and day- length (Dafni, 1992). Plants reproductive characteristic can affect the flowering phenology, mode of seed dispersal and fruiting seed set efficiency. A wide variety of environmental factors may select for one or more reproductive characteristic in plant population (Smith *etal*, 1986) and such factors include seasonal climatic events (Schemske, 1977).

Pollen histochemical analysis are carried out for the following reasons i) possible relation between the pollen content and the mode of pollination ii) study of pollinator foraging behavior, nutritional demands, pollination mode, pollen content and iii) composition in relation to phylogeny (Dafni, 1992). Lipids and starch are important constituents of the pollen grains to establish the relations with flower foragers.

Materials and Methods

For the collection of phenological data of selected cotton varieties, field trips were undertaken daily or on alternate days. Events and the changes of the single flower are recorded to study the flowering phenology in relation to geographical (latitudinal and altitudinal) and climatic variables, the time and duration of pollen exposure and the interrelations among environmental variables (temperature and humidity) and flower development were noted.

Plants were observed from the beginning of flowering stage up to the opening of last flower. Flowering period was taken as the period from the opening of first flower up to the opening of last flower. The timing of onset, progress, termination and blooming of selected varieties under study were noted.

For the histochemical tests fresh and mature pollen grains were collected from freshly dehisced anthers. For the test of starch method proposed by Baker and Baker (1979) was followed. Pollen samples were immersed in to IKI solution and examined under the microscope for the change in colour. Dark bluish-black color indicates the presence of starch. For the estimation of lipids pollen sample were kept in freshly prepared stock solution of Sudan IV and treated pollen sample was observed under microscope within 2-3 minute to note the change in colour. A red color indicates the presence of lipid (Baker and Baker, 1983).

Observation:

In all selected varieties of cotton, it is observed that the flowering starts during 1st to 19th of September and full blooming was from 9th October to 28th November. Full blooming in all cotton varieties was observed when the temperature was in the range of 23^0C to 30^0C The range of % humidity during full bloom period was 74.6 to 82.0 and 55.4 to 87.7. In all varieties the flowering stands to terminate towards the end of month of December .

Flower opening in all varieties starts during 06.45 to 09.45 hours depending on the weather conditions. During cloudy and rainy days flowers starts to open after 07.30 hours depending on prevailing temperature. The anther dehiscence in all varieties was observed during 07.00 to 08.30 hours. The stigmas become receptive before anther dehiscence. The stigmas were viscid and shiny and remained receptive for about 8 hrs. After 03.00 hours it become blackish in colour indicating loss of receptivity. The opened flowers start to withered by the evening on same day.

At the full bloom time the plants of cotton variety Ajeet-11 were with maximum height of 111 cm having up to 150 leaves per plant, however, in Ankur-651 height was 72 cm with 80 leaves. The number of leaves, more or less correlates with the height of plant. For each variety parameters like height, number of leaves, number of balls, number of flowers open per day, and number of anthers per flower showed variations for each parameter.

From the histochemical tests it was noted that the pollen grains of all cotton varieties contains starch and lipids.

Conclusions:

In all selected varieties of cotton, it is observed that the flowering starts during 1st to 19th of September and full blooming was from 9th October to 28th November. Full blooming in all cotton varieties was observed when the temperature was in the range of 23^0C to 30^0C. The range of % humidity during full bloom period was 74.6 to 82.0 and 55.4 to 87.7 In all varieties the flowering stands to terminate towards the end of month of December.

Flower opening in all varieties starts during 06.45 to 09.45 hours depending on the weather conditions. During cloudy and rainy days flowers starts to open after 07.30 hours depending on prevailing temperature. The anther dehiscence in all varieties was observed during 07.00 to 08.30 hours. The stigmas become receptive before anther dehiscence. The stigmas were viscid and shiny and remained receptive for about 8 hrs. After 03.00 hours it become blackish in colour indicating loss of receptivity. The opened flowers start to withered by the evening on same day.

From the observations on flowering phenology, it is noticed that the flowering phenology is related with seasonal variations and environmental conditions and has an impact of different environmental factors.

From the histochemical tests it was noted that the pollen grains of all cotton varieties contains starch and lipids. Pollen histochemistry is possibly related to pollination mode, pollinator foraging behavior and phylogeny. The nutritive value of pollen also influences the behaviour of flower visitors.

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Phytochemical Screening for Secondary Metabolites from Medicinal Plants of Wan Sanctuary, Akot Wildlife Division,(M.S.)

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Abstract

Phytochemical screening of secondary metabolites in some selected medicinal plants of Wan Sanctuary of Akot Wildlife Division was carried out for to know the presence of medicinally important chemical compounds in the plants. The conventional medicines involve the leaf extracts of various plants having different bioactive compounds which work in the curing of various health problems. Qualitative phytochemical screening of these selected medicinal plants helps to know the presence of different chemicals like phenols, alkaloids, tannins, saponins, anthocyanin,leuco-anthocynin and steroids. By knowing the presence of such different secondary metabolites in plants, these plants will be used for the extraction and isolation of phytochemicals which is use in the curing of various health problems.

Key words- *Phytochemical screening; Bio-active compounds; Medicinal plants; Secondary Metabolites*

Introduction:

From the ancient time Phytomedicenes are extracted from different parts of Plant are popularly used by local communities for cure from various health problemsin last few years our interest has been increases in the study of conventional medicine in all over the world. So that the countries have look around for cooperation in investigation and identification of safe positive components used in conventional medicine. [1]

According to World Health Organization (WHO), medicinal plants would be the best source to obtain variety of medicines. About 80% of individuals from developed countries use traditional medicines, which has compounds derived from medicinal plants. However, such plants should be investigated to better understand their properties, safety, and efficiency [2]almost 95% of the prescriptions in our India have been reported to be plant based phytomedicines in the traditional systems of Unani, Ayurveda, Homeopathy and Siddha. [3-4]

Plants can produce different kind of natural products also known as primary metabolites and secondary metabolites they induced effects on other organisms. The primary metabolites are amino acids, simple sugars (glucosides), proteins and lipids are involved in cellular processes. Secondary metabolites are chemically active compounds i.e. (Phenols, flavonoids, alkaloids, steroids, terpenoids, saponins, etc.), which are produced in the response of various kind of stresses with complexity in structure and distributions are more restrictedly than the primary metabolites.[5]

From the ancient time Phytomedicenes are extracted from different parts of Plant are popularly used by local communities for cure from various health problems. These can be obtained from different parts of the plant like bark, stem, leaves, flowers, fruits, seeds, etc. i.e. the bioactive compounds are present in any part of the plant. Such phytochemical screenings of different plants or from the different regions are reported by many researchers and determine the presence of primary and secondary metabolites in plants. They explore the plants in nature for the search of novel medicines, the number of plant having the medicinal components which are therapeutically used in the curing of various health problems. [6 - 7]

Materials And Methods:

Collection and Identification: The dust free and microbes free fresh leaves of 15 different plant species were collected from Wan Sanctuary, Akot Wildlife Disvision (M.S.). Taxonomic identification of plants was carried out by using publishedfloras.

Extraction: The leaves of 15 selected Plants listed in Table 1 were thoroughly washed 3-4 times in running tap water, and then the leaves are shade dried. After complete shade drying, the leaves were grinded in mixer; the powder was stored in small polyethene bags. The powdered material of 5gm was taken by weighing balance and crushed in 50 ml of distilled water then boiled at 50-60˚ C for 30 – 40 minutes in water bath and filtered through Whatman No. 1 filter paper. The filtrate was centrifuged at 2800 rpm for 10 minutes then the filtrate was stored in sterile bottle in deep freezer at 5ºC for further use. The plants studied are listed below in Table 1.

Table 1: Selected Medicinal Plants for Phytochemical Screening.

Sr. No.	Botanical Name	Family	Common Name
1.	*Alstoniascholaris* L.	Apocynaceae	Devil tree
2.	*Oxalis corniculata* L.	Oxalidaceae	Yellow wood sorrel
3.	*Vitexnegundo* L.	Verbenaceae	Five leaved chaste tree

4.	*Polyalthialongifolia* (Sonn)	Anonaceae	Thwaites False ashoka
5.	*Terminalia catappa* Linn.	Combretaceae	Indian almond leaf
6.	*Sizygiumcuminum* L.	Myrtaceae	Jamun
7.	*Achyranthisaspera* L.	Amaranthaceae	Chaff-flower
8.	*Murrayakoenighii* L.	Rustaceae	Curry leaf
9.	*Wedelleawallichi* L.	Asteraceae	Wedellea
10.	*Lantana camara* L.	Verbenaceae	Lantana or wild saga
11.	*Ficusreligiosa* L.	Moraceae	Peepal tree
12.	*Cassia fistula* L.	Caesalpinaceae	Golden shower
13.	*Vernoniacinerea* L.	Asteraceae	Dandotapala, sadodi
14.	*Tinosporacardifolia* (Willd.) Miers.	Menispermaceae	Giloy
15.	*Catharanthusroseus* L.	Apocynaceae	Sadabahar

Phytochemical screening: Preliminary phytochemical screening (qualitative) was carried out by using following methods:

Terpenoids: 2ml of leaf extract was added to 2ml of acetic anhydride and concentrated H2SO4. The blue, green ring is form which shows the presence of terpenoids.[8]

Tannins: 2ml of the leaf extract was added a few drop of 1% lead acetate. A yellowish colour precipitate is formed which shows the presence of tannins.[9]

Saponins: 5ml of leaf extract was mixed with 20 ml dist. water and continuously shake it for 15 min. the foam is form which shows the presence of saponins.[10]

Anthocyanins: 2ml of leaf extract is added to 2 ml of 2N HCL and ammonia. The pink-red colour change to blue-violetcolor which showsthe presence of anthocyanins.[11]

Leucoanthocyanins: 5ml of leaf extract added to isoamyl alcohol. Formation of red colour Upper layer shows the presence of leucoanthocyanins.[11]

Steroids: 1ml of leaf extract was dissolved in 10ml of concentrated sulphuric acid and equal volume of chloroform was added by sides of the test tube. The upper layer turns red in colour and sulphuric acid layer showed the yellow with green fluorescence. Which shows the presence of steroids.[12]

Results And Discussion:

Preliminary Screening of Secondary Metabolites (Qualitative) - The phytochemical screening and qualitative analysis of 15 selected medicinal plants showed the presence of Terpinoides, Tannins, Saponins, Anthocyanins, Leucoanthocyanins and Steroids in leaves (Table 2).

Table 2: Result of the Phytochemical Analysis of 15 Selected Medicinal Plants

Sr. No.	Name of plant	Terpinoi-des	Tannins	Saponins	Antho-cyanins	Leucoantho-cyanins	Steroids
1.	*Alstoniascholaris* L.	-	-	-	-	-	+
2.	*Oxalis corniculata* L.	-	+	-	-	-	-
3.	*Vitexnegundo* L.	-	+	+	-	-	+
4.	*Polyalthialongifolia* (Sonn)	+	-	-	-	-	+
5.	*Terminalia catappa* Linn.	-	+	+	-	+	+
6.	*Sizygiumcuminum* L.	+	+	+	-	-	+
7.	*Achyranthisaspera* L.	+	+	+	+	-	+
8.	*Murrayakoenighii* L.	+	+	+	+	-	+
9.	*Wedelleawallichi* L.	-	-	-	+	-	+
10.	*Lantana camara* L.	-	+	+	-	-	+
11.	*Ficusreligiosa* L.	+	+	+	-	-	-
12.	*Cassia fistula* L.	-	+	+	-	-	-
13.	*Vernoniacinerea* L.	+	-	-	-	-	+
14.	*Tinospora cardifolia* (Willd.) Miers.	+	-	-	-	-	+
15.	*Catharanthusroseus* L.	+	+	+	-	+	+

(+ = Present and - = Absent)

Terpenoids are found in 8 plants and Tannins are found in 10 plants out of 15 selected plants. Terpenoids and tannins are mostly used foranti-inflammatory and analgesic activities. Tannins contribute property of astringency i.e faster the healing of wounds and inflamed mucous membrane also inhibited the growth of many bacteria and fungi, viruses and yeast[13 – 14]. Saponins are present in 9 plants out of 15 plants. Saponins have industrial uses as serface active and foaming agent also use in detergent and pesticides and it have many helpfull health effects. Anthocyanins are present in 3plants out of 15 plants and it is use against bacterial and viral infections also it increases the immunity.Leucoanthocyanins are found in only 2 plants out of 15 plants. Steroids are found in 12 plants out of 15 medicinal plants. Steroids are mostly use in pharmaceuticals as aphrodisiac. In most of the plants Terpenoids, tannins, saponins and Steroids are found in the present study.
The presence ofveriuos bioactive compounds shows the medicinal value of those plants.The antioxidants,antibacterial and antifungal properties of various plant extracts have increasing interest in both research and the food industry as they are better than the synthetic components.
The traditional medicinal knowledge is restricted to only few communities so that the phytochemical screenings of medicinal plants are very important in identifying novel sources of therapeutic phytomedicines and industrially important compounds also use in nutraceuticals and pharmaceutical industries.

Conclusions

The plants which are rich source of secondary metabolites are the medicinal plants are widely used in traditional medicine as phytomedicines to cure various ailments. The different extracts of leaves of medicinal plants contained many bioactive chemical constituents including Terpinoides, Tannins, Saponins, Anthocyanins, Leucoanthocyanins and Steroids. The anti-inflammatory, antimicrobial effects can be attributed to the high steroids, tannins, terpenoids, and saponins and present in medicinal plants. It has been used as aphrodisiac, liver tonic, neuroprotecter, astringent, and to treat bronchitis, ulcers, asthma, and insomnia.
While medicinal plants are used in Ayurvedic medicine form ancient time, more clinical and laboratory trials should be conducted to help and support its therapeutic use,which provide strong evidences in search of novel phytomedicines.

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Cestodes Infection In Species *Mastacembelus armatus.*(Histopathological Study) From Nilona Dam, Yavatmal District, M. S.(INDIA)

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Abstract

*The present paper is discussion on histopathological study of cestode infection in species **Mastacembelus armatus** from Nilona Dam, Yavatmal District, M. S. India .Nilona Dam is situated in Akola Bazar road, Sawargaon, Yavatmal, District, Maharashtra 445002. The size of the area is about 5.99 square kilometer. The fish **Mastacembelus armatus** [Lecepede, 1800] Examined for gastrointestinal Ptychobothridian cestode parasitic infections. The histopathological study of the fish tissues shows huge damages caused by the tapeworm .loss of host include destruction and extrusion of the intestinal villi, fibroblast cell and plasma cell. Farther observation shows in T.S. of intestinal tissue showed that cestodes attached to mucosal, sub-mucosal and muscularis mucosa of intestine with scolex and damaged host intestinal villi, invaded deep forming cyst. Cestode Parasite derives nutritive material, required for growth, from host tissue by causing damage to it. Tape worm have also been found to infect many other freshwater fishes and cause pathological effects on the host as irritation, injury or atrophy of tissues and occlusions of alimentary canal, blood vessels or other ducts. Hence author has been needed to study on parasitism.*

***Keywords**: - Histopathology, Mastacembelus armatus, Nilona Dam, Tape worm, Parasitism.*

Introduction

Fishes are playing an important role in nation's economy. As a nutritional point of view, fishes give high content of proteins to us, it said to be Gold in water, earlier study the pathogenicity of cestode adjacent various order described by (Rees, G. in 1967) study of host parasite relationship described in fishes (Mcvicar 1972) Acanthobothrium, Phllobothrium, Echinobothrium, (Murlidhar and Shinde 1987) observed histopathology of ***Acanthobothrium uncinathum*** from the fish ***Rhynchobatus ajeddensis*** (Borucinska and Caira, 1993) Subsequently described the histopathogenicity of two adult Trypanorhynchs from the muscosa of the nurse shark. Never the less quit of few reports on the pathogenicity of cestode on fishes are available i.e. (Sinde1970, Bylund 1972).

The present research work deals with the study of histopathology of Ptychobothridian cestode *Circumoncobothrium chandrabhagae* n.sp. Intestinal tape worm of host ***Mastacembelus armatus.*** Parasites affect the productivity of the fish in the systems through mortalities, by decreasing growth rate, reducing the quality of the flesh and making the hosts more susceptible to more pathogens. It is concluded that the ***Circumoncobothrium chandrabhagae*** **n.sp.** Cestode contact with host tissue and utilize the nutritive material to the favorable for its nourishment and growth from the host tissue and make host weak affecting the growth of host causing damage to intestinal tissue of host.

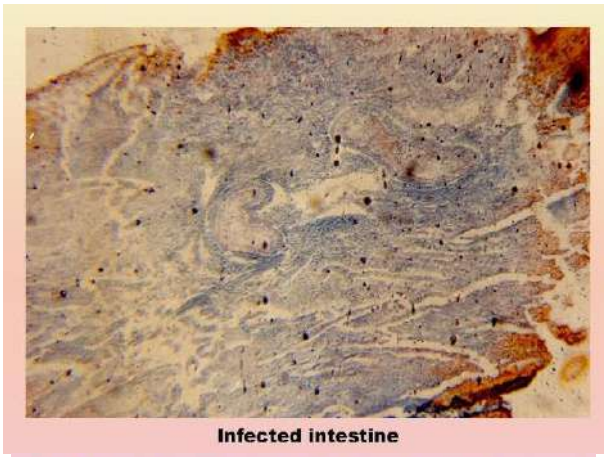
Material And Methods

The histopathological study, ***Mastacembelus armatus*** of freshwater fishes were collected from local fisherman of Nilona Dam, Yavatmal District. M. S. India. These fishes were brought to the laboratory, dissected out the intestine, examined for the cestode infections. Some fishes were found to be infected whereas few were not. Both infected and normal hosts intestine were cut and fixed in **Bouin's fluid** to study histopathological changes. The fixative inhibits the post mortem changes of the tissues. Then tissues were washed, dehydrated through alcoholic grades, cleared in **xylene** and embedded in **paraffin wax** (58-62°C). The blocks were cut at **7µ** and slides were stained in Eosin and **Haematoxylin** double staining method. Best slides or sections were selected and observed under the microscope for histopathological study. The photomicrographs were taken with the help of camera. These slides were identified by using keys "Systema Helminthum" (Yamaguti, 1956[8]).

Results And Discussion

After histopathological observational study indicate that some of the intestines were found to be infected with cestode parasite. The (Photograph - A) Shows the healthy intestine, in which villi and all layers are clearly observed, While in (Photograph - B) Infected intestine shows that the worm attached to the mucosal layer of intestine and slowly invades to the deeper layers of the host tissue.

A **B**



The tape worm ***Circumoncobothrium chandrabhagae*** **n. sp**. is having

1] Scolex large, triangular.
2] Hooks 26-30 in numbers, arranged in single circle.
3] Neck absent.
4] Mature Segment broader than long, with slightly convex margin
5]Testes 120-130 in numbers, Oval in shape, unevenly distributed.
6] Ovary distinctly bilobed transversely placed at posterior margin of the segment.
7] Vitellaria follicular, small, oval in shape, arranged in two rows on each lateral side of the segment.
Host:- *Mastacemballus armatus* (Lacepede, 1800)
n.sp *C. chandrabhagae* n.sp.

Conclusion:-

The present research work deals with the study of histopathology of Ptychobothridian cestode ***Circumoncobothrium chandrabhagae*** n .sp. Intestinal tape worm of host ***Mastacembelus armatus.*** Parasites affect the productivity of the fish in the systems through mortalities, by decreasing growth rate, reducing the quality of the flesh and making the hosts more susceptible to more pathogens. It is concluded that the ***Circumoncobothrium chandrabhagae*** **n.sp.** Cestode contact with host tissue and utilize the nutritive material to the favorable for its nourishment and growth from the host tissue and make host weak affecting the growth of host causing damage to intestinal tissue of host.

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Spider Fauna from the Cotton Fields of Vitala Village Near Wardha River Pulgaon, India

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Introduction;-

In a faunistical investigation in the Indian cotton fields, the most abundant species were belonged to Clubionidae, Lycosidae, Theridiidae, Thomisidae, Heteropodidae, Araneidae, Oxyopidae and Filistatidae families too. The most population of spiders was in September and October. They were one of the important predators in these fields and they play an important role in cotton pest's control.

Before attempting to assess the role of spiders in suppressing pest populations in a given agricultural situation, there must be available sufficient information on their taxonomic diversity and abundance habitat preferences in space and time, hunting strategy, body size of species, predators and prey items and the rate of their consumption, and reproduction. Information on these aspects is essential for the formulations of ecological concepts and conclusions (Berry, 1970; Horner & Starks, 1972).

Because of their high abundance and predominantly insectivorous feeding habits, spiders are suspected to play an important predatory role in agroecosystems, woodlands, and other terrestrial ecosystems (Nyffeler and Benz, 1987; Nyffeler, 2000a,b). They are one of the major groups of generalist predators that are needed in the development of efficient, sustainable, low- input agricultural systems (Ekschmitt et al., 1997).

The population densities and species abundance of spider communities in agricultural fields can be as high as in natural ecosystems. Spiders are important predators of pests on cotton, rice, apple, banana, citrus, soybean, and various other crops and plantations. The use of spiders as biological control agents depends mainly on the conservation and increases in numbers through the use of agricultural practices such as selective spraying rather than on mass rearing and release. The extent, to which spiders can contribute to agricultural pest control, is however limited by the disruptive effect of insecticide applications. The selective use of pesticides to prevent elimination of natural enemies; restricting insecticide usage during crucial periods in the life cycle of the pest; limiting spray application to midday when spiders are less active and shelter; application of pesticides as spot treatments to permit spiders to recolonize in treated areas immediately are important to conserve the predator spiders.

Materials and Methods: Study Area:

In the district Wardha, a village Pulgaon is located at 20°43′34″N to 78°19′01″E at an elevation of 935 ft. A village Pulgaon is well associated with many small villages with dry deciduous forest area. A Pulgaon is well known for the Wardha River which passes through the Pulgaon village and provide suitable environment for the cotton based agricultural field. Vitala village is one of the nearer villege from pulgaon with abundant number of Spiders.

Study Period, sampling and identification

The current study was carried out for a period of eight months from August 2018 to March 2019. Sampling was conducted in six months at the randomly selected cotton field.

Spiders were collected by various methods like insect nets, pitfall trap, visual searching, beating, sweeping, and stroking sticks. Sampling was done in each month by plotting the quadrates method i.e. (1sq. m × 1sq.). Attempts were made to carefully scan the leaf litter surface, tree bark, foliage (Including the under – surface of leaves when traces of webs were found) twigs, and branches of the vegetation (up to 1.5m height) along the transect. Specimens from each quadrate were preserved in 75% alcohol in the field and observed under a stereozoom microscope in the laboratory.

Methodology:

To document spider diversity of agriculture ecosystem:

The detailed descriptions of the collection techniques are as follows.

1) Pitfall Trapping -- Pitfalls will be used to trap the ground dwelling spiders. The pitfall traps consists of a 9 cm wide by 10 cm deep plastic jar, one-third filled with 30% ethyl acetate and a few drops of liquid soap/detergent. The pitfall traps will be left open for a period of one week, as this allows maintaining the spider specimens in good condition before processing in the laboratory for their identification.
2) Visual Observation – This method of sampling is used to collect the spiders by visual observation.
3) Ground Hand Collecting – Ground Hand collection involves the collection of spider samples from ground to knee level. This method of sampling is used to collect the spiders, which are found to be visible in the ground, litter, in broken logs, rocks etc.

4) Aerial Hand Collecting – Aerial Hand collection involves the collection of spiders samples from knee level to arm length level. This method accesses web-building and free-living spiders on the foliage and stems of living or dead shrubs, high herbs, tree trunks etc.
5) By visual observation of small webs
6) Preservation and Identification of specimens - Collected adult mature specimens will be photographed, analyzed and then will be transferred to 70% alcohol. All adult specimens will be identified at family, genus and species level. Species will be distinguished by examination of external genitalia. Sexes will be matched by colour pattern and somatic features. Identification will be done on the basis of morphometric characters of various body parts.

Results And Discussion

Collected data representing 10 families, 31 genera and 60 species were recorded from agricultural lands adjoining to the Wardha river. Family Araneidae and Thomisidae forms the dominant group (Table 1). i.e. 17 species in both families with 8 and 6 genera respectively. The large number of Thomisidae and Araneidae species found in this region is due to the availability of flowering plants with the deep vegetation at the border of agricultural and forest area. The Saltisidae represent 12 species and 7 genera. Lycosidae and Tetragnathidae also found in decreasing species number which is due to their specific habitation. The analysis of guild structure (Uetz, et al.,1999) revealed six feeding guilds i.e. orb web weavers, Foliage hunters, Sheet web weavers, Ground runners, Stalkers and Ambushers (Table 1). Orb web weavers constituted the dominant feeding guild representing 33% of the total collection. Stalkers and ground runners represent 20% and 17% respectively.
This study brought out the fact that agricultural fields adjoin to the forest has the potential to maintain the richness of spider diversity in the agricultural fields. This rich diversity of spiders indicate useful indicator for the species richness related to agro-ecosystem (Noss, 1990).

SR. NO.	FAMILY	NUMBER OF GENERA	NUMBER OF SPECIES	GUILD	HABITAT
1	Aranaidae	08	15	Orb web weavers	**Tropical forest, foliage, dry forests, ground.**
2	Clubionidae	01	02	Foliage hunters	**Under stones**
3	Eresidae	01	02	Sheet web weaver	**Tree trunk**
4	Gnaphosidae	03	03	Ground runners	**Stones**
5	Hersiliidae	01	01	Foliage hunters	**Under stones**
6	Lycosidae	04	04	Ground runners	**Dunes**
7	Miturgidae	01	01	Foliage hunters	**Foliage**
8	Oxyopidae	1	6	Stalkers	**-Grass land**
9	Saltisidae	7	10	Stalkers	**Tropical forest**
10	Tetragnathidae	2	5	Orb web weavers	**Low**
11	**Thomisidae**	**2**	**11**	**Ambushers**	**Forest grass, Flowering plants**

Table 1. Total number of families, genera and species of spiders with their guild and habitat collected from agriculture lands of Pulgaon, Maharashtra-India.

Family	Genus/ Species
Araneidae	***Aranus mitifica*- male** ***Aranus cucurbitinus*- female** ***Argiope pradhani*-female *Argiope aemula* -Female** ***Cyclosa hexatubulata*- female *Cyclosa mooduesis*-female *Cyclosa spirifera* -Female *Cyclosa insulana* -Male *Cryptophora citricola*-female *Leucange decorate*-female *Neoscona theis*-female *Neoscona excelsus*-male *Neoscona mukergai*-male *Neoscona rumpfi*- Female *Neoscona nautica* –Male** ***Poltys nagpurensis* -Tikader *Female Zygeilla indica*-female**
Clubionidae	***Clubiona drassodes* Cambridge male**

Eresidae **Gnaphosidae**	***Clubiona tikaderi* female *Callilepis rukminiae* female *Stegodyphus sangivani*- female** ***Stegodyphus mirandus*- Pocock Female** ***Gnaphosa pauriensis* Tikader female**
	***Megamyrmecion ashae* Tikader female *Zelotes chandosiensis* Tikader female *Zelotes mandlaensis* Tikader female**

Table 2. Checklist of spiders collected from agriculture lands of Vitala, Maharashtra-India

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Gymnanthemum amygdalinum (Delile) Sch. Bip. ex Walp (Asteraceae): A new distributional record to Adilabad District of Telangana state, India.

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Abstract

The present paper deals with an addition of new taxa of flowering plant to the Adilabad District of Telangana State. Updated information on nomenclature, correct description and locality is provided. This is a new distributional record for this area.

Key Words:*Gymnanthemum amygdalinum Asteraceae, new distributional record, Adilabad District, Telangana.*

Introduction

The genus *Gymnanthemum* was described by Cassini in 1817 and was transferred to *Vernonia* by Candolle in 1836. Many of the taxonomists *viz*., Bentham (1873), C.B.Clarke (1876), Hook.f. (1881) and Gamble (1921) followed the Candolle treatment since 1986. Later, Robinson and Kahn (1986) and Robinson (1999) resurrected the genus based on the studies of pollen grains, chromosome numbers and chemical compounds. At present the genus is distributed in sub-Saharan Africa, Madagascar, Southern Asia with more than 43 species (Robinson & Funk 2014). Of which 2 species *viz*., *G. extensum* (Wall. ex DC.) Steetz and *G. pectiniforme* (DC.) H. Rob. are distributed in India.

Materials and Methods

During the floristic survey of Adilabad district, collection of an interesting specimen belonging to the family Asteraceae has been collected while going through the cross examination with the other species of *Gymnanthemum,* the specimen identified as *G. amygdalinum*. Scrutiny of literatures revealed that this species has been so far reported from Bihar, Madhya Pradesh, Odisha and West Bengal of North India, **Bhattacharjee *et al.* 2013**, from Warangal district of South India, **Swamy. *et al.* 2015** and **Apurba Kumar Das and C. Sivaperuman,2020.** The critical revise of this specimen and pertinent literatures **(Santapau, 1948, Pullaiah *et al*., 1992;** Martínez's**, 1993; Pullaiah and Chennaiah, 1997; Almeida, 1998; Reddy *et. al*., 2001, Singh & Karthikeyan ,2001, Singh *et. al*., 2001; Raju *et. al*., 2007,**) exposed that the identity of the specimen as *G. amygdalinum.*

The authors concluded it as *Gymnanthemum amygdalinum* which has reports new distributional record for the Adilabad district of Telangana State.

A concise taxonomical description along with phenology, distribution, nomenclature and photographs are provided here. The processed specimen (Voucher No. 289) of the plant is deposited in the Department of Botany, Baliram Patil Arts, Commerce and Science College, Kinwat, Nanded District, Maharashtra, India.

Result and discussion

Taxonomic Description:

The genus *Gymnanthemum* comprises 49 species in the world, genus is commonly distributed in tropical Africa, America, and tropical Asia. In mainland India, the genus is represented by three species *G. extensum* (Wall. ex DC.) Steetz, G. pectiniforme (DC.) H. Rob.

Gymnanthemum amygdalinum(Delile) Sch. Bip. ex Walp., Repert. Bot. Syst. (Walpers) 2: 948. 1843. *Vernonia amygdalina* Delile, Cent. Pl. Afr. Voy. Meroe: 41. 1826; Bhattacharjee *et al.*, Zoo's Print 28(5): 18. 2013. *Keringa amygdalina* (Delile) Raf. Sylva Tellur. 144. 1838. **(Figure-1).**

Large shrubs or small trees to 3-5 m high; branches terete, densely glandular pubescent. Leaves alternate, elliptic, elliptic-lanceolate, ovate, obovate, higly variable, 5-20 x 2-6 cm, cuneately attenuate at base, acuminate, mucronulate rarely obtuse at apex, serrate or entire along margins, adaxial surface dark green when

dry, sparsely puberulent; abaxial surface pale green, glandular, densely puberulent and hairy along veins; lateral veins 5-15 pairs, slightly curved; petioles up to 4.5 cm long, densely puberulent. Inflorescence terminal corymbose panicles, 20 x 15 cm; peduncles densely puberulent and glandular. Heads homogamous, many, 13 x 11 mm; bracteoles 1 or 2, densely puberulent. Involucre campanulate, 6-7 x 6 mm; phyllaries imbricate, 5-seriate, yellowish green with purple tip, concave, 1.2-4 x 0.6-1.2 mm, outer most very short, the inner ones longest, elliptic-oblong, obtuse or rounded at apex, hairy along margins, puberulent above, glabrous- puberulent beneath. Receptacle 2 x 2 mm, flat, foveolate, brown. Florets 16-17 in each capitulum, up to 2 cm long. Corolla creamy-white, 7- 8.5 x 1-1.2 mm, tubular, 5-lobed; lobes 3 x 0.8 mm, rounded at apex. Stamens 5, 5 mm long; filaments glabrous, 2 mm long; anthers 3 x 0.2 mm, sagittate at base, rounded to subacute at apex. Gynoecium 10.5 mm long; ovary 1.5-1.8 x 0.2-0.4 mm, hairy; style 5 mm long, glabrous at base, hairy at apex; stigma subulate, unequal, 3-3.5 mm long, hairy. Achenes 3 mm long, oblong, slightly cuneate at base, 10-ribbed, glandular between the ribs, numerous spreading hairs on the ribs; pappus in 2-series of bristles, white, persistent, outer ones few, *c*. 2 mm long, inner ones *c*. 7 mm long.

Figure No.1*Gymnanthemum amygdalinum.* Habit.,Flowering twigs and Inflorescence.

Flowering & Fruiting: November-April.
Specimens Examined: Old housing board colony, Adilabad District, Telangana State, India.
G.P.S.Location: N "19039'54.91836", E 78031'54.45948"
Collected by: E. Srinivas Reddy and S. R. Shinde on dated 15 December 2020.(Voucher No. 289).
Ethnomedicinal Uses
Two spoons of leaf powder in one glass of milk orally taken for the treatment of diabetes.
The plant is traditionally used in the treatment of diabetes in Africa (Atangwho *et al*. 2012). The plant is also used by the traditional medical practitioners to cure malaria, helminth, laxative, digestion, wounds, appetizer and febrifuge (Ijeh & Ejike 2011).

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Investigation on study of wild relatives of grasses and their importance for grazing habitat of wild Herbivores in Tadoba Andhari Tiger Reserve Maharashtra State

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Abstract:

Wild Relatives of grasses are naturally distributed in the grasslands of TadobaAndhari Tiger Reserve, the wild relatives are the parental genera of cultivated crops, the diversity of wild relatives of grasses variable with the change in soil texture and soil ecology , soil physical properties. The important wild relatives of grasses reported fromTadobaAndhari Tiger Reserve are Setariapumilla , Setariaitalica , Sorghum halpens , Panicumscorbiculatum , Oryzaruphipogon , Elusineindica , Panicummilliaceum , Paspalumcanare , Panicumnotatum , PaspalumPaspalodes , Panicumsumatrense , Saccharumspontanium , Sorghum contraversum , Sorghum deccanense , Urochloapanicoides.wild relatives of grasses identification and conservation by seeds collection and enrichment useful to maintain composition of grasslands in Protected Areas. Wild relatives of grasses are nutritive and having good forage value with reference to grazing habitat of wild herbivores and play vital role in grasslands management.

Key Words: *Wild relatives of grasses ,TadobaAndhari Tiger Reserve , grasslands Management and conserve diversity of wild relatives.*

Introduction:

Grasses are one of the largest and most valuable groups of flowering plants, consisting of 610 genera and 10,000 species (Cope, 1982). Clayton and Renvoize (1986) put the total number of grasses in the world about 10,000 species, 651 genera were recognized and assigned numbers indicating their phylogenic status based upon various evidences. It ranks third in number of genera after the Compositeae and Orchidaceae and fifth in number of species after the Compositeae, Orchidaceae, Leguminoseae and Rubiaceae (Good, 1953). Grasses are widespread than any other family of flowering plants. The great adaptability of different species has enabled them to thrive under the most varied conditions. They form the climax vegetation of the semiarid prairies of the American continent, the steppes of Asia and the savannas of Africa. Grasses exceed all other in the importance of its products. It provides food in the form of cereals for man and forage for most animals. Many species of native and introduced grasses are utilized in improved pastures (Salter, 1952).

A grass is taxonomically defined as any species within the large family (Gramineae or Poaceae) of monocotyledonous plants having narrow leaves, hollow stems, and clusters of very small, usually wind-pollinated flowers. Grasses include many varieties of plants grown for food, fodder, and ground cover (Grass 2014). Grasses are often confused with sedges (Cyperaceae family) and reeds (Restionaceae family. However, sedges do not have a leaf sheath and their leaves are attached directly to the culm—a diagram of grass anatomy is provided in Appendix C. The culms of sedges are also angular, while grass culms are circular. The grass family is the fifth largest plant family on earth with over 700 genera and 9700 species. About ten percent of the grass species worldwide can be found in southern and tropical Africa; the major genera of which are Eragrostis, Pentaschistis, Panicum, Sporobolus, Aristida, Digitaria, Stipagrotis, Setaria, Brachiaria, and Hyparrhenia (Van Oudtshoorn 2009).

Almost all animal species and food chains depend on grass because grass occurs across the world and is almost always edible. The groups of animals that depend most directly on grass for food are birds, insects, rodents, and grazers. There are many bird species, such as Quelea finches, the most common bird on earth with a population of over 1.5 billion in Africa alone, that solely eat grass seeds. Grass provides the only food source for seed-eating birds, and the birds play an integral role in seed dispersal. Insects use grass for both food and shelter. Disruption of these grassland ecosystems can cause a dangerous under or overabundance of insect species. Rodents consume grass seeds or the base of the plant where the most nutrients are stored. Grazers have the largest impact on grasslands and typically graze in large herds which makes spatially expansive impact.. Grazers remove old plant material, stimulate new growth, and provide nutrients in the form of manure. Although predators and decomposers are also ultimately dependent on grass species, it is primary consumers- specifically herbivores- that have the biggest causal relationship with grass species. Herbivores and grass species composition are highly interdependent.

Evaluating a Grassland There are four main measures to evaluate a grassland: grazing value, ecological indicator status, succession stage, and perenniality. Several factors that can help conservation managers determine whether their area is providing valuable grazing material. By identifying grass species in the area, grazing value can be determined. Grazing value is defined as the quality and quantity of material from an individual available for grazing (Van Oudtshoorn 2009).

Grasses inhabit the earth in greater abundance than any other comparable group of plants. Some are adapted to warm, humid and tropical climate while others are established in the polar regions, where the growing season is two months or less and direct sunlight is absent for many months of the year. Some are important elements of marsh and swamp vegetation, and other inhabit desert regions where the annual precipitation is 5 inches or less. Even before the time of recorded history, the grains of grasses provided a staple food supply or the human race (Gould, 1968). The members of this group are present in all the conceivable habitats, suitable for growth of plant communities (Mitra and Mukherjee, 2005). Grasses are used as forage for domesticated, wild animals and soil conservation (Gould, 1968).

TadobaAndhari Tiger Reserve Forest Diversity :

"Tadoba" is taken from the name of the god "Tadoba" or "Taru", worshipped by the tribes who live in the dense forests of the Tadoba and Andhari region, while "Andhari" refers to the Andhari river that meanders through the forest.

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.Tadoba National Park and Andhari wildlife sanctuary together form the Tadoba-Andhari Tiger Reserve. The total area of the Tadoba-Andhari tiger reserve is about 1,727 km^2.

Tadoba National Park was established in the year of 1955. Total area of the park is 116.55 Km^2.The Andhari Wildlife Sanctuary was formed in the year 1986. Total area of the Andhari Wildlife Sanctuary is 508.85 Km^2.

Total core area of the tiger reserve is 625.40 Km^2. Total buffer area of the tiger reserve is 1101.60 Km^2. The reserve also includes 32.51 Km2 of protected forest and 14.93 Km2 of other areas.
The monsoon season begins in June; the area receives heavy rainfall during this season (approx.1275 mm) and humidity around 66-70%.

TadobaAndhari TigerReserve is a predominantly southern tropical dry deciduous forest with dense woodlands comprising about eighty seven per cent of the protected area. Teak is the predominant tree species. Other deciduous trees found in this area include ain (crocodilebark), bija, dhauda, salai, semal and tendu. Beheda, hirda, karayagum, mahuamadhuca (cr epe myrtle), palas (flame-of-the-forest, Buteamonosperma) and Lanneacoromandelica (wodier tree). Axlewood (Anogeissuslatifolia, a fire-resistant species), black plum and arjun are some of the other tropical trees that grow in this reserve.

Aside from the keystone species, the Bengal tiger, Tadoba Tiger Reserve is home to ther mammals,including: Indianleopards,sloth bears, gaur, nilgai, dhole, striped hyena, small Indian civet, jungle cats , sambar,barking deer, chital, chausingha and honey badger . Tadoba lake sustains the marsh crocodile,which was once common. Indian star tortoise, Indian cobra and Russel's viper also live in Tadoba.The lake contains a wide variety of water birds, and raptors. 195 species of birds have been recorded, including three endangered species. The grey-headed fish eagle, the crested serpent eagle, and the changeable hawk-eagle are some of the raptors seen in the park.

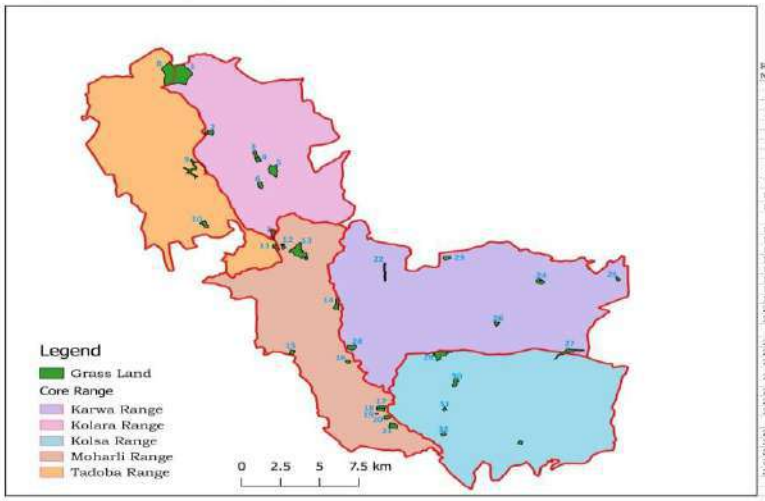
Poaceae is the one of the largest family among the monocotyledons in the world .The grass vegetation broadly divided into two types depending upon their life-span, Ephemeral vegetation consisting mainly of the grasses that complete the life cycle during rainy season or after rainy season. Grasses autumn or long lived vegetation with species that grow with the rains but complete their life-cycle after rains. The species like *Arthraxonlancifolius ,Arundenellapumila, Sporoboluscoromondelianus , Digitariaternata,* are the chief components of farmers category. On the conterary the species like *Heteropogoncontortus ,Andorpogonpumulus , Chrysopogonfulvus , Dicanthiumcaricosum , Setariaforbesiana , Pennisitumhohenackeri* which form the autumn vegetation are either perennial vegetation forming large tufts.

Tadoba-Andhari National Park/Coordinates 20.2484° N, 79.3607° E

Sr. No.	Name of grassland	Area in Hectares
	Kolara Range grasslands	
1	**Navegaon part 1 (Rehabilated Site)**	235 Hectare
2	Kosekanar	10 Hectare
3	Pandharpauni	30 Hectare

4	Jamni**(Rehabilated Site)**	47 Hectare
5	Samadhi	08 Hectare
6	Rampur	12 Hactre
7	Saradh	10 Hectare
	Tadoba Range Grasslands	
1	Navegaon part 2	40 Hectare
2	Tadoba beat Comp. No. 90	33 Hectare
3	Khatoda	10 Hectare
	Mohrli Range Grasslands	
1	Palasgaon (**Rehabilated Site**)	95 Hectare
2	Girghat	58 Hectare
3	Astkoni Com. No. 146	20 Hectare
	Karwa Range	
1	Sukdobodi	10 Hectare
	Kolsa Range Grasslands	
1	Botezari	41 Hectare
2	Kohapari	11 Hectare
	Doni	65 Hectare
	Kolsa (**Rehabilitated village**)	150 Hectare

Map Showing Campa Work Year 2020- 21 in TATR Core area



Sl. No.	Grass Land Name	Area	Actual work done
1	Navegaon Grass Land	235 Ha.	235 Ha.
2	Pandharpauni G. Land	30 Ha.	30 Ha.
3	Saradh Grass Land	10 Ha.	10 Ha.
4	Samadhi Grass Land	8 Ha.	8 Ha.
5	Jamni Grass Land	47 Ha.	47 Ha.
6	Rampur Grass Land	12 Ha.	12 Ha.
7	Kaschmar Grass Land	10 Ha.	10 Ha.
	Kolara Range- Total	**352 Ha.**	**352 Ha.**
8	Navegaon Grass Land Part- 2	40 Ha.	34 Ha.
9	Tadoba beat C.No. 90	33 Ha.	33 Ha.
10	Ghosari Beat C.No. 114	17 Ha.	17 Ha.
11	Khatoda Grass Land	10 Ha.	10 Ha.
	Tadoba Range- Total	**100 Ha.**	**94 Ha.**
12	Palsgaon C. No. 128	10 Ha.	10 Ha.
13	Palasgaon Grass Land	85 Ha.	85 Ha.
14	Astkoni C. No. 146	20 Ha.	20 Ha.
15	Andhari C.No. 150	10 Ha.	10 Ha.
16	Andhari C. No. 151	7 Ha.	7 Ha.
17	Girghat C.No. 157	13 Ha.	13 Ha.
18	Girghat C. No. 157	11 Ha.	11 Ha.
19	Girghat C.No.158	2 Ha.	2 Ha.
20	Girghat C.No.158	12 Ha.	12 Ha.
21	Girghat C.No.158	20 Ha.	20 Ha.
	Moharli Range- Total	**190 Ha.**	**190 Ha.**
22	Karwa-II C.No. 251	10 Ha.	
23	Amanlgaon C.No. 254	10 Ha.	
24	Piparheti-II C.No. 260	15 Ha.	
25	Pandharwani C.No. 267	5 Ha.	32 Ha.
26	Ramtalidhi-I C.No.284	7 Ha.	
27	Sukadi Bodi G. Land	10 Ha.	
28	Zingonal-I C. No. 299	20 Ha.	
	Karwa Range- Total	**146 Ha.**	**32 Ha.**
29	Botezari Grass Land	41 Ha.	
30	Kohapari C.No.311	11 Ha.	
31	Pulsari Lelec G. Land	5 Ha.	32.50 Ha.
32	Panghat Hut Road	6 Ha.	
33	Belan Square C.No.342	6 Ha.	
	Kolsa Range- Total	**69 Ha.**	**32.50 Ha.**
	Grand - Total	**857 Ha.**	**700.5 Ha.**

Objectives :

- Identification and Enumeration of Wild Relatives grasses plants.
- To identify the wild grasses plants from open grasslands with the help of morphological study by using regional floras.
- Exploration of plants from forest areas.
- To determine diversity of wild grass plants and its ecological significance in forest ecosystem.
- Floral association in grassland ecosystem and its role in forest Ecology.
- Phenological study of the wild grasses plants.
- Conservation and propagation of plants.
- In-situ conservation of plants , seed collection and enrichment in grasslands
- Ecological and morphological study of plants

Methodology

- To select the sites /area for the study of wild grasses plants present in forest and grasslands ecosystem of Madhya Pradesh State.
- To arrange the regular field visits in three different seasons of the year, Rainy season , Winter season and Summer season.
- To observe the open grassland with special reference to phytosociology .
- G.P. S. study of grasses plants of Madhya Pradesh.
- Grasses distribution and their ecological and environmental study.

- Ecological significance of grasses in forest ecosystem.
- To prepare the photographic album of wild grasses plants.

Recognising the morphology of plant species

By using regional, local and national floras, the data from the herbarium specimens, the accounts on morphological details, diagnostic characters and range of variation studied. The grasses plants are observed at different stages vegetative and reproductive stages of the plants. The roots are observed from morphological point of view , to study the role of grasses in forest ecology and to modify the texture of soil. Observation of morphological characters under dissecting microscopes and magnifying lens. Study of root, stem , leaf and flowers morphology of the plants in specific season. Identification of grasses plants by using regional floras or national floras. To take the GPS coordinates of the plants at the different sites.

Their identity requires a skill in systematic botany. This is perhaps the reason why wild relatives are meagrely represented in the germplasm collections. The wild relatives of crop plants by and large, occur as component of disturbed habitats within the major vegetation types. The information on their occurrence is available from different herbaria floristic accounts, floras, etc

Use of herbaria

Herbaria with large collections of plant genetic resources including wild relatives of grasses assist the explorers in having an idea about the species diversity of a region. Herbarium field notes and associated data such as root , stem , leaf , flowers , fruits morphology and ecological characters with GPS coordinates seed maturity of wild relatives from the locality of collection help in planning the duration of exploration. Since the herbarium specimens are generally collected during flowering, this information can be considered to be optimal for seed collection.

Collection and Conservation of plants

Observations and collection of plants before approaching for the field collection directly. On spot identification of target species and seed collection, drying storage and broadcasting in different grasslands for the insitu conservation purposes in forest ecosystem or new species to the collection ofvaluablegermplasm of wild species for gene bank conservation.

Collection of Wild Relatives

The collection missions are primarily aimed at tapping germplasm variability in Plant Genetic resources of different agri-horticultural Wild relatives of Grasses in the entire genepool. The germplasm is collected on the basis of priority for collection from targeted regions, and of species. The information on ecological distribution with precise location of species helps in collection of targeted gene pool

Study area : Core area grasslands of TadobaAndhari Tiger Reserve .

1. Palasgaon grassland 2. Navegaon grassland 3. Jamnigrassland 4. Pandharpauni grassland 5. Botezari grassland.

Observations:

Finger Millet (EleusineCoracana (L.) Gaertn.)

Finger millet is commonly known as Ragi . It is a staple food for many people. There are two sub species - E. africana and E. coracana. Eleusine having only one wild relative in Madhya Pradesh Eleusineindica (L.)Gaertn. E. indica is the only wild species widely occurring which is morphologically and cytologically similar to E. coracana (Krishnaswamy,1951). E. indica is of Indian origin and may be the immediate ancestor of finger millet (Mehra, 1963)

Prosomillet (Panicummilaceum L.)andLittleMillet (PanicumSumatrense Roth. ex RoemetSchult.)

Prosomillet is commonly called kodo. It is supposed to be one of the oldest grain crops and is grown extensively in India. It is a quick growing drought resistance crop. It has two sub-species psilopodium and sumatrense.It is classified as race- nana and robusta, sub races-laxa,erecta and compacta. In Madhya Pradesh, Panicum maximum Jacq., P. milare L., P. notatum Retz., P. psilopodiumTrin (related to P. milare), P. repens L., are present. Out of these species, P.psilopodium which is similar to the wild forms of P.sumatrense from which the later species might have originated (Anonymous, 1966).

Kodo Millet (Paspalumscrobiculatum L.)Kodo millet is locally called kodokutki. It has three races viz.,regularis, irregularis and variables. In Madhya Pradesh wild related species, Paspalumcanarae (Steud.) Veldk.,P. paspaloides (Michx.) are present

Foxtail Millet (Setariaitalica (L.) P. beauv)

Foxtail millet is considered to be sweet, is used as a sedative to the gravid uterus.The grain is said to possess heating properties and when taken alone sometimes causes diarrhoea. The grain is astringent, diuretic and laxative and is useful externally in rheumatism. It is a popular remedy for alleviating the pains of

parturition (Kirtikar and Basu, 1935). Foxtail millet is locally called as wild baara. It is also known as Italian millet. Cultivation of foxtail millet dated back to the third millennium BC. S. italica is not known in the wild state except as a weed which escapes from cultivation. S. italica is divided into sub species viridis and italica. S. italica is further classified into three races moharia, maxima and indica, viridis is the ancestral form of S. italica on the basis of chromosome number.

Sugarcane (Saccharumofficinarum L.)

Sugarcane is derived from the sanskrit word shakkara.This crop from the east provides a linguistic evidence of Indian origin of sugarcane. In Madhya Pradesh, many sweet based products are prepared from sugarcane. There is only one wild relative Saccharumspontaneum L. is present in TATR.

Echinochloacolona(L) Link , hort. Berol.2: 209. 1833: Blatt. &McC. Bombay Grass.148.1935; Bor, Grass.Ind.308.1960. *Panicumcolonum* L. Syst. Nat. ed. 10.2:870.1759; Hook.f.Fl.Brit.India 7:32. 1896; Cooke, Fl. Pres. Bombay 3: 447.1958 (Repr. ed.).wildnachanigrass.

Herbs, annual, decumbent- ascending; culms 40-90 cm long, rooting at base. Leaves 3-30 x 0.4-2.0 cm, linear – lanceolate, scabrid,apex acute to acuminate. Racemes spiciform, distant, 5-10, 1.5-2.0 cm long.Spikelets c 0.3 cm long ovoid; lower glume ½ as long as lower lemma, broadly ovate; upper glume cuspidate, hairy; lower lemma ovate, hairy;upper lemma polished. (Plate VI, Fig. 35)

- Palatable grass
- Flowering Season : September – November.
- Fruiting Season : December
- Ecological data : Common weed, best soil binder grass in forest.

Soil pH range required – 7.2 – 7.6

- Rainfall range : 950 mm – 1078 mm.
- Temperature range : 26 ^{o}c – 39 ^{o}c.
- Humidity required : 51 % - 67%.

EleusineGaertn. Fruct. Sem.Pl.1:7.1788

Eleusineindica(L) Gaertn. Fruct.1:8. 1789: Hook.f. Fl. Brit. India 7: 293. 1896; Cooke, Fl. Pres. Bombay 3:560.1958 (Repr.ed.); Blatt.&McC. Bombay Grass. 259. 1935; Bor,Grass. Ind. 493. 1960. *Cynosurusindicus* L. Sp.Pl.72.1753. '*Nachni'*.(WILD NACHANI)

Herbs, annual, erect, tufted c 25 cm high; culms slightly compressed. Leaved 8-12 x 0.2-0.3 cm, linear, flat.Spikes 2-7 or more, 4.0.5-5 cm long.Spikelets c 0.3 cm long, ovoid or oblong, green. Grains oblong or globose.

- Palatable grass
- Flowering Season : September – November.
- Fruiting Season : December
- Ecological data : Sporadic annual grass grows in cultivated soil.

Soil pH range required – 7.2 – 7.6

- Rainfall range : 950 mm – 1078 mm.
- Temperature range : 26 ^{o}c – 39 ^{o}c.
- Humidity required : 51 % - 67%.

Field Note – Grass of dry soil ,non palatable grass found in smaller grasslands.

ORYZA L.Sp. Pl.1:333.1753

OryzarufipogonGriff.Notul.3: 5.1851; Bor, Grass.Bur. Cey.Ind. Pak. 605.1960; Laxmi.in Sharma *et al.* (eds.), Fl. Maharashtra, Monocot. 545. 1996; 151 Moulik, Grass. Bam. India 1: 47. 1997; Naik, Fl. Marathawada 2: 1065. 1998.

Annual, culms 30-70 cm tall, tufted, terete, erect or decumbent, spongy, rooting at lower nodes, nodes glabrous.Leaf sheath 6-09 cm long, tereteorcompressed, keeled, glabrous, smooth. Ligule 15-31 mm long, membranous, Leaf blade 15-30 x 0.6-1.6 mm, flat, linear to ovate, keeled,scabrid on nervesand margins, apex acuminate. Panicles 10-22 cm long.

- Palatable
- Flowering Season : October.
- Fruiting Season : November
- Uses : Seeds edible grass.
- Ecological data : Common in marshy places.

Soil pH range required – 7.1 – 7.5

- Rainfall range : 950 mm – 1180 mm.
- Temperature range : 26 ^{o}c – 39 ^{o}c.

- Humidity required : 68 % - 71%.

PanicumantidotaleRetz. Obs. Bot. 4:17. 1786.Hook.Fl.Brit. India 7: 52. 1896; Cooke , Fl. Pres. Bombay 3:453.1958 (Repr.ed); Blatt.&McC.Bombay Grass.163.1935. Bor,Grass.Ind.322.1960.

Annual erect , diffusely branched, 1-2 mtr tall , creeping , grass. Leaves 10-40 cm long , linear – lanceolate . Panicle 15-22 cm long , Spikelets ovoid.

- Palatable
- Flowering Season : Septeber – November.
- Fruiting Season : December
- Uses : Seeds edible, Best soil binder grass.
- Ecological data : Common in marshy places.

Soil pH range required – 7.1 – 7.5

- Rainfall range : 950 mm – 1000 mm.
- Temperature range : 26 ^{o}c – 39 ^{o}c.
- Humidity required : 68 % - 71%.

Panicum maximumJacq. Ic. Pl.Rar.1:2, t. 13. 1781-86 7 Coll. Bot. 1:76.1786. Hook.Fl.Brit. India 7: 52. 1896; Cooke , Fl. Pres. Bombay 3:453. 1958 (Repr.ed); Blatt.&McC.Bombay Grass.163.1935. Bor,Grass.Ind.322.1960.

Perennial denslytufted , erect , branched, 1-2 mtr tall , grass. Leaves 10-40 cm long , linear – lanceolate . Panicle 30-55 cm long , Spikelets oblong.

- Palatable cultivated grass.
- Flowering Season : November.
- Fruiting Season : December
- Uses : Fodder grass,
- Ecological Data : Common in marshy places.

Soil pH range required – 7.1 – 7.5

- Rainfall range : 950 mm – 1000 mm.
- Temperature range : 26 ^{o}c – 39 ^{o}c.
- Humidity required : 68 % - 71%.

Saccharumspontaneum L. Mant. Alt. 2: 183. 1771. Hook. f. Fl.Brit. India 7: 118. 1896; Cooke , Fl. Pres. Bombay 3:465. 1958 (Repr.ed); Blatt.&McC.Bombay Grass.45.1935. Bor,Grass.Ind.214.1960. **Kans grass Wild relative of Sugarcane**

Perennial rhizomatous tall tufted , 1-2.5 m tall, erect grass. Leaves narrow linear , sheath smooth , ligule ovate.Panicle large , silvery , Spikes with silver hairs, spikelets sessile.

- Palatable grass.
- Flowering Season : October.
- Fruiting Season : December
- Uses : Soil binder grass
- Ecological Data : Distributed in moist, marshy soil along the bank of river.

Soil pH range required – 7.5 – 7.8

- Rainfall range : 950 mm – 1000 mm.
- Temperature range : 28^{o}c – 39 ^{o}c.
- Humidity required : 68 % - 71%.

Field Note – Grass indicator of wet soil with more water holding capacity.

Setariapumila(Poir.) R. & S. Syst. Veg. 2:481.1817; T. A. Cope in Nasir Ali, Fl. Pak.143:181. 1982. Panicumpumilum Poir.in Lam. Encycl. 4:273.1816. Setaria pallid-fusca (Schumach.)Stapf& C.E. Hubb.in Kew Bull.1930: 259.1930; Bor,Grass.Ind.363.1960.S. glauca non (L.)P.Beauv.1812;Hook.f.Fl.Brit.India 7: 78.1960; Cooke,Fl.Pres.Bombay 3: 435.1958 (Repr.ed.); Blatt.&McC.Bombay Grass.172.1935;bor,op.cit.360. 'Kolu'.

Herbs,20-60 cm high,tufted;culmsmany,spreading,ascending.Leaves 3-10 X 0.2-0.5 cm , linear. Spikes 1.5-5.0 X 0.3-0.7 cm. Spikelets 0.2-0.3 cm long, ovoid or ellipsoid, subacute;upper lemma rugose. Grains plano-convex.)

- Palatable grass
- Flowering Season : August – October
- Fruiting Season : December
- Uses : Fodder grass

- Ecological data : Soil pH range required – 7.5 – 7.8
- Rainfall range : 950 mm – 1270 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 68 % - 71%.

Field Note – Annual , palatable grass , grains are edible , grass of smaller grassland , distributed in acidic soil.

Setariaverticillata (L.) P. Beauv. Ess. Agrost.51,178.1812; Hook. f. Fl. Brit.India 7:80.1996; Cooke, Fl.Pres. Bombay 3:436 .1958 (Repr.ed.); Blatt.&McC. Bombay Grass .174.1935; Bor, Grass. Ind. 365.1960. PanicumverticillatumL.Sp.Pl.ed. 2:82.1762. (Chiktnagawat)

Annual herbs, 1m high, erect, rooting at lower nodes.Leaves 8-20 X 1.2-4.0 cm, linear or linear-lanciolate .panicals 2.5-9.5 cm long. Spikelets c 0.2 cm long, ovoid, sub acute ; upper lemma finely rugose. Grains 0.2-0.23 cm long, ellipsoid.

- Palatable grass.
- Flowering Season : August – October
- Fruiting Season : December
- Ecological data : Soil pH range required – 7.5 – 7.8
- Rainfall range : 950 mm – 1270 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 68 % - 71%.

Setariaitalica(L.) P. Beauv. Ess. Agrost.51,170,178.1812; Hook .f.Fl.Brit.India 7:78.1896; Cooke,Fl.Pres.Bombay 3:437.1958 (Repr.ed.); Blatt.&McC. Bombay Grass.175.1935;Bor,Grass.Ind.362.1960.Panicum italicum L.Sp.Pl.56.1753.

Erect annuals,60-100cm tall. Leaves 15-30 X 0.4-2.5 cm, Linear-lanceolate, minutely scaberulous on both sides and along margin.Panicles 8-12 cm long, compact.Spikelets 0.25 cm long, ellipsoid; lower glumes c 0.05 cm long, ovate,1- nerved, upper glumes c 0.15 cm long, ovate, glabrous,rounded**.**

- Palatable grass.
- Flowering Season : August – October
- Fruiting Season : December
- Ecological data : Soil pH range required – 7.5 – 7.8
- Rainfall range : 950 mm – 1270 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 68 % - 71%.

SORGHUM Moench. Methodus207.1794

Sorghum halepense (L.)*Pers.Syn.Pl.1:101.1805;Blatt.&McC.Bombay Grass.5.1953;Bor,Grass.Ind.222.1960; T.A.Cope in Nasir& Ali, Fl. Pak.143: 295.1982. Holcushalepensis L.Sp.Pl.1047.1753. Andropogonhalepensis(L.) Brot.Fl.Lusit.1:89.1804; Hook.f.Fl.Brit. India 7: 182. 1896; Cooke,Fl.Pres. Bombay 3: 502.1958 (repr.ed.).Sorghum miliaceum (Roxb.)Snowden in J. Linn.Soc. 55:207.1955; Bor, op.cit.223. S. miliaceumvar.parvispiculum Snowden,op.cit.209; Bor,op.cit. 'Boru'.(Ran Jawari)*

- Perennial, 3 m high,erect; culms simple or branched, solid.Leaves 10-45 x 1.5 cm, linear-lanceolate; sheaths striate; ligules short,membranous, ciliate.panicles 15-35 cm long,decompounds. Sessile spikelets 0.4-0.5 cm long,ovoid-lanceolate; pedicelledspikelets as long as sessile but narrower.Grainsterete,dark brown.
- *Flowering Season : August – October*
- *Fruiting Season : December*
- *Ecological Data : Soil pH range required – 7.5 – 7.8*
- *Rainfall range : 950 mm – 1270 mm.*
- *Temperature range : 26 °c – 39 °c.*
- *Humidity required : 68 % - 71%.*

Conservation of wild relatives of crops is the most important task to match the challenges of erosion of species. The existence of these wild relatives are shrinking fast due to various bio-edaphic factors and disturbed habitats. In the present rate of threat of genetic erosion, we must collect all requisite information of the wild relatives to make use of their wider adaptability/tolerance/resistance to diseases and insect-pests, yield, quality attributes and other biotic and abiotic characters. In comparison to the cultivated land races, conservation and utilization.

Wild Relatives of Grasses of TadobaAndhari Tiger Reserve

Sr. No.	Botanical Name	Common Name	Vernacular Name	Flowering Season	Fruiting Season
1	Brachiariareptans	Sawa/ sama	Ran Sama	August	Sept. –Oct.
2	Brachiariadistachya	Sama grass	Ran Sama	August	October
3	Setariaintermedia	Chikta	Ran Bajara	August	October
4	Setariaverticellata	Chikta	Ran Bajara	August	October
5	Sorghum halpens	Wild Jawar	Ban Jawar	September	November
6	Echinochloacolona	Wild sama	Ban sama	August	October
7	Elusineindica	Wild Nachani	Ban Nachani	September	November
8	Panicumsumatrense	Wild kutki	Ban Kutki	August	November
9	Panicumnotatum	Wild Kutki	Ban Kutki	September	November
10	Oryzaruphipogon	Wild Rice	Ban Dhan/ Chawal	August	November
11	PaspalumPaspalodes	Wild Kutki	Ban Kutki	kutki	October
12	Paspalumcanare	Wild kodo	Ban Kodo	August	October
13	Saccharumspontanium	Wild Sugarcane	Ganna origin	September	November
14	Setariapumilla	Wild Bajara	Ban Bajara	August	September
15	Urochloapanicoides	Wild Kutki	Ban Kutki	August	October

Diversity in Wild Relatives

- Finger Millet (*Eleusinecoracana*) – *Eleusineafricana*
- Barley (*Hordeumvulgare*) – *Hordeumarizonicum*
- Rice (*Oryzasativa*) – *Oryzarufipogon*
- Pearl Millet (*Pennisetumglaucum*) – *Pennisetumpurpureum*
- Sorghum (*Sorghum bicolor*) – *Sorghum halepense*
- Broom millet (*Panicummiliaceum*) – *Panicumfauriei*

Results and discussion :

Findings of research work in grasslands of TATR :

In the current exploration of wild relatives of grasses from the different grasslands of TadobaAndhari Tiger Reserve the genetic and species diversity is in the following manner.

Sr. No.	Name of grass genera	Number of spesies
1	*Brachiariareptans* *Brachiariadistachya*	Two species
2	*Setariaintermedia* *Setariaverticellata* *Setariapumilla*	Three species
3	*Panicumsumatrense* *Panicumnotatum*	Two species
4	*PaspalumPaspalodes* *Paspalumcanare*	Two species
5	*Urochloa*	One species
6	*Echinochloa*	One species
7	*Elusine*	One species
8	*Oryza*	One species
9	*Sorghum*	One species

In the present research study it is observed that the species diversity of wild grass genera depends upon the soil texture,moisture , humidity , water holding capacity. The composition and association of grasses also determines the wild relatives of grasses diversity. Generally it is found that the wild relatives of grasses are associated with soft palatable grasses with high percentage of fibre , ash , protein and moisture. The associates of wild relatives of grasses are :*Dicanthiumannulatum* , *Digitariastricta* , *Digitariaabludens* , *Iselimalaxum* , *Cynodondactylon* , *Ischemumindicum* .

The herbivores depend on soft palatable grasses as a primary consumers, Spotted deers , Barking deers , Chousinga , Black bucks mostly feed on soft palatable grasses which play an important role in grazing habitat of soft feeding herbivores.Grazing habitat of soft feeding herbivores associated with composition of grasslands, the grasslands are of three types ; smaller , intermediate and taller grasslands. Wild relatives of grasses shows distribution in smaller and moist grasslands.

Threats to wild relatives of grasslands are : loss of natural habitats due to soil degradation , fragmentation of grasslands , loss of soil moisture due to climate change , changes in composition of grassland , invasion of woody species in grasslands , soil microbial composition and associates which grasses i,e soil mychorhiza and microorganisms which promotes the growth of grasses.

Conservative measures for wild relatives of grasses :

Loss of habitat: Many of the accessions currently held ex situ are from regions that have undergone significant land-use change over the past 50 years. The urban expansion in South and Central America has seen forests, grasslands and savannahs replaced by urban space. The expansion of agriculture, especially in Brazil, has resulted in vast areas of natural forests and grasslands being substituted by intensive production of crops such as soybean and improved monospecific pastures. There are ~ 60 million ha of Brachiariabrizantha cv. Marandu in Brazil, which is a dangerously narrow genetic base highlighting the importance of germplasm diversity. Similarly development and population growth in many parts of Africa have resulted in expansion of cropping and overgrazing of rangelands with associated loss of biodiversity. The changes in the economies and populations across the tropics have made the TSTF germplasm already held ex situ extremely valuable (sometimes irreplaceable) and in need of a particular focus on conservation.

Conservation of wild relatives of grass genetic resources

Secure conservation is at the heart of the Centres' stewardship of their collections and depends on the application of technical practices of high standard, based on an accurate assessment and appropriate management of risks.

The adequacy of the conservation technologies in use is key to meeting the objectives of long-term conservation of genetic diversity:

- As more land is coming under intensive cultivation, much of the natural diversity of species will be lost.
- Demand for use of forage genetic resources for increasing livestock production, as well as to maintain a more sustainable agricultural system, is expected to increase.
- The further study of the conserved germplasm will allow the easier identification of genotypes with potential for livestock feed for specific environments, as well as adequate germplasm to be re-established in degraded areas and also adapted to future climate changes.
- The adequate long-term conservation of germplasm will allow the preservation of essential forage biodiversity for current and future generations as global public goods.

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Diversity Of Diatoms Inwater Reservoirs of Washim District of Maharashtra in India

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Abstract
Present paper deals with the study of members of Bacillariophyceae collected from different water reservoirsofWashim district, Maharashtra state, India viz. DevTalaw, Narayan Baba Talaw, Ekburji DamandPadmtirthTalaw. This study has shown Identification and presence of eightdifferent diatoms up to genus level. These diatoms are being reported for the first time from the study areas.
Keywords: Biodiversity, algae, diatoms, etc.

Introduction:
Diatoms (Division Bacilliarophyta), one of the largest groups of photosynthetic eukaryotic micro-organism. They occur in almost all wet/damp places with a diverse range of habitats across continents. Diatoms grow as single cells, or form simple filaments or colonies. They form the base of aquatic food webs in marine and freshwater habitats. Diatom communities respond directly to physical and chemical changes in the environment. Diatoms are a very important group of algae as they are the most common producers of organic matter in water bodies. Diatoms are used to track the effect of climate (1). They also often dominate the algal communities in many freshwater systems. During the 19th century, diatoms were studied for the first time in India by Ehrenberg [2]. Subsequent notable works were made by Skvortzow [3], Biswas [4], Krishnamurthy [5],Venkataraman [6], and Sarode and Kamat [7]. The work on Indian fresh water diatoms is still in an early stage.
The main purpose of this study was to examine the diatomdiversity

Materials And Methods:
The study area covered small four different sites viz. *DevTalaw, Narayan Baba Talaw, Ekburji Dam and PadmtirthTalaw* in Washim district in Maharashtra, India. Study area is situated at 20.099928◦N latitude and 77.13338◦E longitude, 20.099899◦N latitude and 77.133352◦E longitude, 20.048256◦N latitude and 77.1014◦E longitude and 20.107783◦N latitude and 77.126652◦E longitude, respectively. Diatom materials were collected in the month of March, 2022 and preserved in 70% ethanol.
Identification of Diatoms upto genus level were made with the help of monograph and relevant literature(8, 9, 10, 11).

DevTalaw

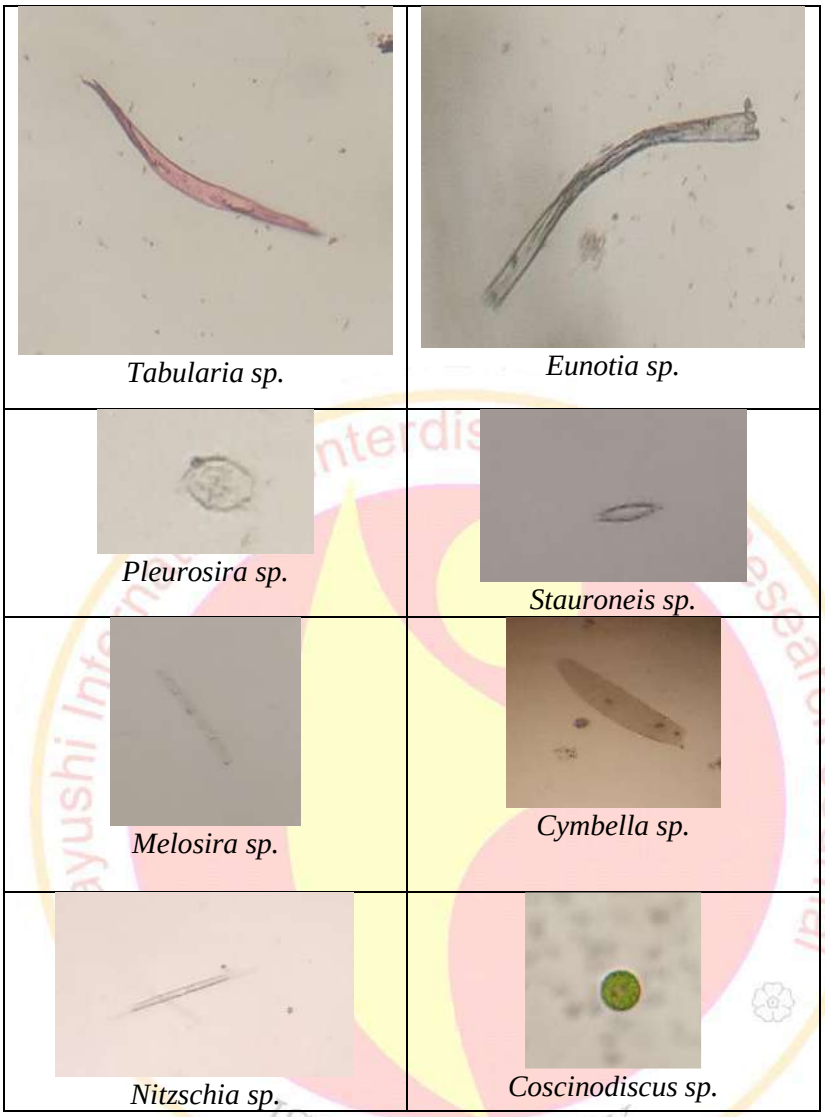
Narayan Baba Talaw

Ekburji

PadmtirthTalaw

Results:

The present investigation is the outcome of Biodiversity of diatoms. Such taxonomical study of diatoms is basically useful to taxonomists and researchers of algae for future research work. Present study also useful for science and society to know what type of diatoms are available from this area. The available diatoms areenlisted in following table.



Disscussion:

The present investigation is the outcome of Biodiversity diatoms. Such taxonomical study of diatoms is basically useful to taxonomists and researchers of algae for future research work. Present study also useful for science and society to know what type of diatoms are available from this area. As diatoms are concerned with pollution it certainly helpful to environmental scientists.

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Economic Interest Of Lac Culture In India – An Overview

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Abstract:
Lac culture is the systematic rearing of lac insects on their host plants for sustainable production of commercial lac. The lac harvested from host plants is then processed by using various techniques to produce different kinds of lac resins, lac dye and lac wax. There are versatile applications in many fields of lac resins and lac byproducts generated while processing raw lac. India is among the topmost country in the world for lac production. Comparatively less investment is required for lac culture, and it provides economic benefit to farmers and livelihood to tribal people. lac processing techniques, products and by-products produced by lac culture and their applications, Indian institutes involved in research and development of lac culture, current research for applications of lac.
Keywords: lac culture, host plants, raw lac, lac resin, lac dye, lac wax, etc.

Introduction:

Lac insects are reared systematically on their host plants to produce resin is called lac culture. Lac insects are found throughout the tropical and subtropical regions of the world. However, they are found abundantly in the tropical forest of India, Thailand, China and Vietnam. In European countries, these insects are not found due to the very cool climate during winter[9]. India is among the topmost countries in lac production and contributes about 80%. The production of raw lac in India is near about 20,000 metric tons and earns a huge amount through export about Rs. 120-130 crores of foreign currency per year[7].According to 2018-19 statistics, Jharkhand is the topmost state in lac production followed by Chhattisgarh, Madhya Pradesh, West Bengal, Maharashtra, Odisha and Assam[13]. Lac culture requires comparatively less investment and provides good economic return if it is carried out systematically and scientifically. It is the source of livelihood for tribal people and farmers, it is a side income source with good economic returns.

Lac insects belong to the family Tachardiidae (Kerriidae) and are from the order Hemiptera[8]. Lac insects are parasitic they feed by sucking juices of various plants called host plants. A particular type of lac insect species feeds on the particular host plant. Some species of lac insects in India are listed in the table with the region of occurrence and their host plants. In India, there are 16 species under the genus Kerria and 6 under the genus Paratachardina are recorded[5,7].*Kerria lacca* (Kerr) is the most widely occurring species in India, which produces the bulk of commercial lac. [8]

Sr. No.	Species in India	States	Host trees
1.	*Kerria chmaberlini*	Gujarat West Bengal	*Flemingia religiosa* (Pipal) *Butea monosperma* (Palas)
2.	*Kerria fici*	Panjab	*Adansonia digitata* (Imli)
3.	*Kerria indicola*	Andhra Pradesh	*Peltoforum ferrugineum* (Peela Gulmohar)
4.	*Kerria brancheata*	Jammu & Kashmir Jharkhand	*Ziziphus mauritiana* (Ber) *Schleichera oleosa* (Kusum)
5.	*Kerria lacca*	Rajasthan Gujarat Maharashtra Jharkhand West Bengal	*Flemingia religiosa* (Pipal) *Ziziphus mauritiana* (Ber) *Acacia arabica* (Babool) *Peltoforum ferrugineum* (Peela Gulmohar) *Butea monosperma* (Palas)
6.	*Kerria sharda*	Orissa	*S. Oleosa* (Kusum)
7.	*Kerria nagoliensis*	Maharashtra	*Schleichera oleosa* (Kusum)
8.	*Paratachardina lobata*	Andhra Pradesh	*Peltoforum ferrugineum* (Peela Gulmohar)
9.	*Kerria communis*	Goa	*Acacia catechu* (Khair)

Lac insects feed by sucking juices from host plant tissues. Lac is secreted by lac insects through specialized glands, to get protected from their predators. Lac resin is viscous at the time of secretion and gets hardens after coming in contact with air formingencrustations around the body of insects. The encrustations on the branches of a tree are then removed by scrapping this lac is known as stick lac, crude lac, or raw lac. It

contains resin, wax, dye, insect body, the bark of host trees as well as other impurities[14]. Stick lac is then processed in various ways to obtain pure lac and different by-products.

This paper provides an overview of lac processing techniques, products and by-products produced by lac culture and their applications, Indian institutes involved in research and development of lac culture, and current research for applications of lac.

Lac processing techniques / Products by- produced

First, the stick lac (raw lac) that is obtained by removing lac encrustations from host plants is processed to obtain seedlac. For this sticklac is dried first to remove moisture. Sticklac cannot be stored for a long time as it contains moisture along with other impurities it forms lumps and hence lowers the crop quality. Followed by drying stick lac is sieved and crushed to obtain sand and dust this process removes sand, dust. This powdered form of crude lac is then washed to remove embedded insect bodies and host trees debris. Decaying bug bodies impart a red color to water this is processed to obtain a by-product that is lac dye. The remaining resin is dried, thresh to gain seedlac. Seedlac is a commercial variety product and can be stored for a long duration. From seedlac by hot filtration purified lac is obtained called shellac. Seedlac is processed by country process or in mechanized factories to obtain shellac. Shell lac obtained by country process (Bhatta) process is called button lac whereas processed from mechanized factories is called machine-made shellac [15].

Fig.1 - Lac processing to different products and by products

Seedlac is processed by solvent method to obtain dewaxed decolorized lac (DDL) and bleached lac. For making dewaxed decolorized wax, seedlac is dissolved in cold alcohol to render wax insoluble and filter through a filter press to remove wax and impurities. The color may be removed to any required standard by charging with the activated carbon and then alcohol is recovered. The molten shellac is stretched with a roller. This form of lac has high demand in the western market. For obtaining bleached lac many methods are available but the most commercially adopted method is sodium hypochlorite (NaOCl) with some recent modifications [13,15]. Bleached lac is white. It has specialized demand and is manufactured commercially in two grades- Dewaxed bleached shellac and Waxy bleached shellac. The commercial grades of seedlac, button lac, shellac, dewaxed decolorized lac (DDL) and bleached lac available on market are listed in table 2 [13,15].

Sr. No.	Type of lac	Commercial grades
1.	Seed lac	Ordinary/ Genuine bysakhi, Fine bysakhi, Golden bysakhi, Golden kusumi, Golden bysakhi – bold grain, Golden kusumi – bold grain, Golden kusumi seedlac – Medium, Manbhum fine seedlac.
2.		Lemon one shellac, Lemon tow shellac, Standard one shellac, Superior shellac, Superior kusumi lemon, Kusumi button lac,

	Shellac	Button lac	superior kusumi button lac, light pure button lac, Pure one button lac
		Machine-made shellac.	Orange shellac, Lemon one shellac, Lemon two shellac, standard one shellac, Black T.N. shellac, Kusumi lemon shellac, Orange fine shellac
3.	Dewaxed decolorized lac (DDL)		Dewaxed platina, Dewaxed blonde Dewaxed super blonde, Dewaxed lemon, Dewaxed orange, Dewaxed Garnet
4.	Bleached lac		Dewaxed bleached shellac and Waxy bleached shellac

Applications

Lac is the only resin of animal origin, and it is Nature's gift to mankind. At present, its importance has been raised in industries, pharmaceuticals, food processing, and textiles being an eco-friendly, biodegradable, and self-sustaining natural material. In India lac is used since ancient times for medication. It is profusely used in ayurvedic treatment for treating various illnesses. It is widely used on open wounds for quick healing and tissue generation.A slurry of lac paste in water mixed with butter oil and milk was commonly taken orally by sick or wounded persons. For controlling blood pressure Lac resin was used for oral administration with fresh goat's milk. It forms one of the main ingredients of a medicated oil known as Lakshadi taila which is reputed to bring down chronic fever and cure rheumatic pain. In modern pharmacy, it is commonly employed as a demulcent in preparations which is designed to treat diarrhea, dysentery, coughs, throat irritation and fevers. It serves as an emulsifying agent and gives viscosity to powdered drug materials.

Lac has innumerable applications in various fields. More than 50% consumption of shellac is in the surface coatings in paints and varnishes due to its properties such as forming UV resistance of the film, smooth, decorative and durable films formation in alcoholic solutions, which dry rapidly as well ability to form solution in alkaline medium. Applications of shellac in the various field are enlisted in the table [13].

Fieldof application Specific application area	**Field of application Specific application area**
Pharmaceuticals	Coating for tablets; enteric (digestive fluid proof) coating for tablets, pills, etc. Removing agent for medicinal odor. Enteric pills for sustained release medication
Electronics	Lamps, fluorescent lamps, insulating agent for parts, insulating varnish, PCB coating.
Polishes	Fruits, furniture, floors, shoes, stain sealer, wallboard primer, knot and sap sealer on wood
Food	Chestnuts, healthy foods, glazing agent for chocolates and sweets, protective coating for oranges, lemons, apples, etc. Binding agent for stamp inks for lemons, eggs and cheese. Barrier coating for feeds and seeds. Protective candy coating or glazes on candies. Coating of apples and other fruits. Coating of food materials
Printing ink	Felt pen inks, binder for flexographic inks for paper, cardboard, non-toxic printing ink for food packaging
Paint and varnishes	Wood finishing, metal foil, sealers, leather, rubber, car tyre.
Cosmetics	Additive and binder for manicure, mascara, eye shadow and conditioning shampoo for personal care. Setting agent for hairspray, microencapsulation for perfumes for longer stay
Rub stones	Grinding wheel
Others	Felt hats, pyrotechnics, gunpowder, strippable paints, cards, stiffening felt in hat manufacture and also in textile industries

Lacbyproduct	**Applications**	**Referenceused**
Lac dye	Food grade lac dye in manufacture of skin creams, food and drug manufacturing and technical grade lac dye in textile industries for coloring silk and wool.	5, 8, 13,14
Lac wax	Electrical industry, shoe creams, floor and car polishes, food, confectionery and tablet finishing, lipsticks, crayons and tailor's chalk	8,13
Isoambrettolide	Perfumery industry	5,14
Mollama	For production of standard quality bleached lac	5

Indian institutes involved in research and development of lac culture

Indian Institute of Natural Resins and Gums (IINRG) was formerly known as Indian Lac Research Institute (ILRI)) is a nodal Institute at the national level for research and development in arid, semi-arid, plateau and hilly regions of the country that help to improve the livelihood of local communities[2].It was established at Namkun Ranchi in 1924 with the prime motto of research on lac in India and to increase lac production. Indian Institute of Natural Resins and Gums (IINRG) is then handed over to the Indian Council of Agricultural Research, New Delhi in 1966 [3]. This institution is fully devoted to the research and development of lac and succeed in increasing enormous lac production in India. Institute entailvarying objectives such as lac and other natural gums & resins (excluding production) such as harvesting/ tapping, processing, product development, training, information repository, technology dissemination and national/international cooperation. There is an increase in lac production in several regions of the country through training programs, capacity building programs run by this institution throughout India to make skilled individuals who can do scientific lac cultivation[4]Scientific cultivation with integrated pest management, enhancing exploitation of unexploited host plants, and cultivation through 'Joint Forest Management' program helps cultivars in raising production and gaining good economic returns. This institute also supports by providing financial assistance to lac cultivars. [2]

Current lacresearch

Yan, X., *et al.*, prepared color-changing and self-repairing dual-function paint film with Lac Resin microcapsules and Fluorane microcapsules They found that paint film with lac resin microcapsules had a better crack inhibition effect. The results obtained are useful as a manufacture reference for multifunctional wood coatings[16].

Lu, J et al., et al., extracted Shellolic esters and Lac dyes from methanol extract of the secretions of *Laccifer lacca* and studied their biological activity. They found some of the compounds considerable active against *Bacillus subtilis, Escherichia coli* and *Streptococcus aureus* microorganisms.[6]

Chowdhury, S.,put forth the concept of establishment of Brood Lac bank in Chhattisgarh, inspiredbyan idea of preserving and maintaining local biodiversity along with enhancing forest-based livelihoods. The idea of the Brood Lac Bank has been further extended to envision "Lac Clusters" which would not only sustainably produce lac but also add value though local processing, enabling rearers to produce raw industrial lac through local lac-based networks to directly engage with the market [1].

Mohanasundaram, A. *et al.*, evaluated chemical communication between the lac insect-associated products and the lac predators under the laboratory condition. They found that *Eublemma amabilis* showed a great response to lac insect whole-body extract. Another lac insect predator *Pseudohypatopa pulverea* also showed higher response to lac insect whole body extract than resin, wax, crawler and lac insect female extracts. [10] Along with this much research about lac cultivation, pest management, marketing and application based research has been taking place contributing enormous fruitful knowledge to this area [11,12,18].

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Preliminary phytochemical analysis of *Iphigenia indica*

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Abstract:

Present study was carried out to determine the presence of various phytochemical compounds from Iphigenia indica corm. Ethnomedicinal information was obtained from tribal people as well as traditional healers and confirmed the used of plant for various purposes such as, corm used as food, eaten as raw, to get relief from colic and headache. Phytochemical analysis was performed by using a series of solvents such as petroleum ether, chloroform, ethanol and acetic acid by soxhlet extractor. Qualitative phytochemical analysis confirmed the presence of alkaloids, carbohydrates, glycosides, saponins, proteins, phytosteroids and terpenoids, flavonoids, fixed oil and fats, etc. Presence of various phytochemicals strongly support the medicinal properties of this plants. Hence further investigation is required for isolation, characterization and structural determination of new natural bioactive compounds from this medicinal crude drugs.

Key words: *Qualitative phytochemical, Iphigenia indica, Ethnomedicinal, soxhlet extractor, crude drugs.*

Introduction:

Human beings have been dependent on plants for medicine to complete their health care needs from the beginning of civilization [(1)]. Medicinal plants naturally contain certain chemical constituents having therapeutic properties [(2)]. Traditional and folklore medicines have a significantly participates in health care practices around the world. Ethnic medicines are highly suitable and comparatively having very less side effects [(3)]. Phytochemical constituents derived from plants are advantageous as such data become valuable for the production of different complex chemical substances [(4)].

Iphigenia indica (L.) belongs to Liliaceae family is mostly occurs on hillside among grassland area. Flowering and fruiting mostly occurs during july to september months. It is an erect herb, which grows up to 10-18 cm tall in height. Its corms are mostly ovoid, subglobose or tunicated shape with presence of brownish sheaths. Leaves are alternately arranged, sessile or subsessile, having linear or linear- lanceolate shape with coriaceous or subcoriaceous texture. Flowers are brown, purple or pale purple in color, axillary and extra-axillary in position on terminal zigzag stems. Fruit is capsule type with elliptic-oblong shape along with presence of groove. Seeds are many, brown in color and globose or subglobose.

Peoples of some tribal communities located in Buldana district use corm of this plant as food and eaten as raw. They also used it to get relief from colic and headache. Hence present investigation was focused on preliminary phytochemical analysis of *Iphigenia indica.*

Materials and Methods:

Collection of plant material:

Plant material of *Iphigenia indica* was collected from rural area of Buldana district, Maharashtra, India. Plant was identified by using various floras [(5,6)] and also from the experts of region. Plant material was brought to the laboratory, thoroughly washed with water to remove foreign matter, shade dried and then grind into fine powdered by using mechanical grinder.

Extraction of plant material:

Grinded fine powder of *Iphigenia indica* corm was subjected to solvent extraction by using series of different solvents such as petroleum ether, chloroform, ethanol and acetic acid by soxhlet apparatus. Each time before extracting with next solvent, the powder residue was dried properly. Extract obtained in each solvent was concentrated, solidified, determined yield percentage and used for preliminary phytochemical analysis.

Phytochemical evaluation:

For preliminary phytochemical analysis, each extract of corm was subjected to various qualitative test and determine the presence of different phtoconstituents.

Preliminary phytochemical analysis was carried out of all the extracts as per the standard methods of Brain and Turner, (1975); Harborne, (1994); Trease and Evans, (1996); Khandelwal, (2006) and Kokate *et al*, (2010).

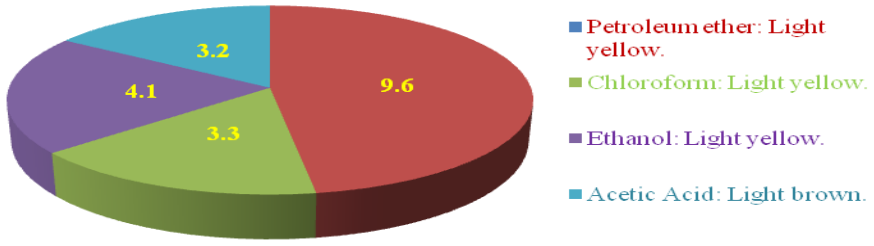
Results and Discussion:

Crude extract of medicinal plants is biologically more active than isolated compounds due to their synergistic effects. Hence phytochemical analysis is very useful in identifying new sources of important compounds like alkaloids, flavonoids, phenolic compounds, saponins, steroids, tannins, terpenoids, amino acid, etc. During phytochemical analysis, yield percentage of successive solvent extracts of *Iphigenia indica* corm were found as; petroleum ether extracts: 9.6%, chloroform extract: 3.3%, ethanol extract: 4.1% and acetic acid extract: 3.2% (as shown in table 1. and fig.1).

Table 1: Successive solvent extracts of *Iphigenia indica* corm

Sr. No.	Solvent extract	Color	Yield percentage
1	Petroleum ether	Light yellow	9.6%
2	Chloroform	Light yellow	3.3%
3	Ethanol	Light yellow	4.1%
4	Acetic Acid	Light brown	3.2%

Fig. 1 Successive extractive values of *Iphigenia indica* corm



Preliminary phytochemical analysis of *Iphigenia indica* corm was carried out in petroleum ether, chloroform, ethanol and acetic acid extracts. Phytochemical screening was revealed the presence of alkaloids, carbohydrates, glycosides, saponins, proteins, phytosteroids and terpenoids, flavonoids, fixed oil and fats, etc. as shown in table 2.

Table 2: Phytochemical analysis of *Iphigenia indica* corm extracts

Sr. No.	Test For Phytochemical	Test	Pet. ether extract	Chloroform extract	Ethanol extract	Acetic acid extract
I	Alkaloids					
1		Dragandorffs Test	+	+	+	+
2		Hager's Test	+	+	+	+
3		Mayer's Test	+	-	+	-
4		Wagner's Test	+	+	+	+
II	Carbohydrates					
1		Fehling's Test	+	+	-	-
2		Molisch's Test	-	+	+	+
3		Benedicts Test	+	-	+	-
III	Glycosides					
1		Borntrager's Test	+	+	+	-
2		Legal's Test	-	+	+	-
IV	Saponin					
1		Foam Test	+	+	+	+
V	Tannin and Phenolic compound					
1		5% Ferric chloride Test	-	-	-	-
VI	Proteins					
1		Millon's Test	-	-	+	+
2		Biuret's Test	-	-	-	-
VII	Amino Acid					

1		Ninhydrin Test	-	-	-	-
VIII	Phytosteroids and Terpenoids					
1		Lieberman-Burchards Test	-	+	-	-
2		Salkowski Test	+	+	+	+
IX	Flavonoids					
1		Alkaline reagent test	-	+	+	+
X	Gums and Mucilage					
1		Alcohol test	-	-	-	-
XI	Fixed oil and fats					
1		Stain test	-	-	+	-

Conclusion:

Presence of various phytochemicals strongly support the medicinal properties of this plants. Hence further investigation is required for isolation, characterization and structural determination of new natural bioactive compounds from this medicinal crude drugs.

Where, **+** = present, **-** = absent.

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Studies on Benthic Macroinvertebrate of Lower Wardha Project, Shahanur Dam, and Ghoddev Dam, Amravati District, (MS), India

Dr. K. E. Landge

Abstract:-

The present communication is aimed at studies of some benthic fauna at Lower Wardha project, Shahanur dam, Ghoddev dam, District Amravati for one year from August 2015-July 2016.The benthic organisms are reported as main components of the food chain. It was therefore, thought worth benthic species diversity. The present study is focused on biodiversity of the benthic community of lower Wardha project, Shahanur dam, and Ghoddev dam. The present investigations deals with the population density and species diversity of aquatic benthic macro-invertebrate fauna.

Key Words:- Benthic Fauna, Biodiversity, Species diversity, Population diversity.

Introduction:-

Fresh water macro-invertebrate are animals without backbone that live near the bottom of freshwater. The concept of biodiversity includes the entire biological hierarchy from molecule to ecosystem, or the entire taxonomic hierarchy from Allele to Kingdom. The current textbook definition of "biodiversity" is variation of the life at all levels of biological organization (Kevin et al., 2004). Benthic macro-invertebrates are best indicators for Bio-assessment (Kumar 2003). The abiotic environment of water body directly affect in the distribution, population density and diversity of the macrobenthic community (Zweig and Rabeni 2001; Sharma and Rawat 2009, Sharma and Choudhary 2011). Benthic fauna are especially of great significance for fisheries that they themselves act as food of bottom feeder fishes (Sharma et al., 2013). The mollusca component an important component of the macrobenthic invertebrate community of the stream (Bangotra 2012) freshwater macro-invertebrates are generally group by two characteristics; how they feed and how they move within the aquatic environment. The present studies deals with the population density and species diversity of aquatic macro-invertebrate fauna have been discussed.

Materials and Methods:-

Benthic communities along the lower Wardha project Shahanur dam, and Ghoddev dam were sampled collected monthly from August 2015-July 2016. The sample were collected by a bottom kick net (500 µm mesh). The samples were taken from an area of nearly 100 m2 in order to include all possible microhabitats. All the animals collected were immediately fixed in formaldehyde (4%) in the field and then transferred to 70% ethyl alcohol. Collection and identification of Benthic macro-invertebrate with the help of standard books Needham (1969), Pennak (1989), Tonapi (1980), Welch (1998). The organisms were identified from standard taxonomics keys (e.g. Pennak 1989).

Result and Discussions:-

. Benthic macro-invertebrates biodiversity recorded in Lower wardha project(I), Shahanur dam, Ghoddev dam during August 2015 to July 2016. A total of forty six (46) species recorded of Benthic macro-invertebrates fauna belonging three (3) phylum- Mollusca, Arthropoda, ,Annelida 7 (seven) classes-Gastropoda, Bivalvia, Crustacea, Arachnida, Insecta, Oligochaeta, Hiradinea.

In the present study total 46 species of Benthic macroinvertebrate were identified. Out of 46 species Phylum- Mollucans represents 20 species from two classes as Gastropoda, and Bivalvia. Phylum-Arthropoda encompassing 24 species from three classes as Crustacean, Arachnida, and Insecta while 2 species belonged to Phylum- Annelida representing a two class Oligochaeta, and Hiradinea. The dominants class was Insecta representing 13 species and Gastropoda 12 species.

20 species of **Phylum-Mollusca** 12 species **Class-Gastropoda** [Lymnea accuminata, Lymnea auricularis, Lymnea peregra, Lymnea palustris, Lymnea luteola, Melanoides tuberculata, Bellamya bengalensis(Lamark), Gyraulus ladacensis, Thiara tuberculata(Mueller), Gabbia orcula, Pila globosa, Dwarf pond snail(Galba truncatula)]. 8 species **Class-Bivalvia** [Lamellidens corrianus(Lea), Lamellidens marginalis(Lamark), Parreysia cylindrica (Lea), Parreysia favidens(Benson), Parreysia Khadakvaslaensis, Parreysia shurtleffiana, Parreysia corrugate(Mueller), unio] was found.(Table 29).

24 species of **Phylum-Arthropoda** 4 species **Class-Crustacea** [Cancer(Crab), Daphnia, Nauplius,Cyclops]. 7 species **Class-Arachnida** [Araneus, Hydracarina sps., Neoscona sps., Zygeilla sps, Leucage sps., Stegodyphus sps., Hippasa sps.].

13 species **Class-Insecta** [*Notonecta sps,* Orthetrum sps, Chironomus Sp., Dragonfly larvae, Damselfly nymph, Soldiar fly larvae, Mayfly larvae, Anopheles larva, Cybister tripunctatus, Cybister confuses, Erectes sticticus, Hydaticus fabricii, Dineutus indicus] was found.
2 species of **Phylum-Annelida** 1 species of **Class-Oligochaeta** [Pheretima posthuma]. 1 of species **Class-Hiradinea** [Hirudinaria] was found.

Analysis of numerical superiority of macroinvertebrates of all three dams are revealed that Mollusca was dominant [68.40%] followed by Arthropoda [27.82%] and Annelids [3.77%] (Table No 24) (Figure No 17) Dominant species were reported to be the most important ecological indicators as they received the full impact of the habitat for the over longer period and manifest different level of sensitivity. The present investigation is well in agreement with the study Sharma et al., (2013).

Their abundance fluctuation depending upon environmental conditions and physico-chemical parameter of water.

The insect are having the capability of various adaptive habitates due to their extra ordinary structural organization Vinson (1998), Merrites and Cummines (2008) and Tali (2013). Most of the Insect larval forms have been reported to be tolerant too wide range of Physico-chemical parameters (Sarkar -2012). The benthic macro-invertebrates population of Insect was dominated by diptera and Ephemeroptera.

The mollusca fauna of Kishanpura Lake include genera out of which T. Scabra, P. Clarknum, L. Aluminat, vivapora bengalensis dominated the population (Sharma et al, 2007). Sharma (2003) reported 11 genera of mollusca from sirpur Lake Indore. Similar also reported to Oomachan and Belsare (1985); Rosenberg and Resh (1993) and Sharma (2009), and Sharma(2013).

Conclusion :-

This study help in studing aquatic Macro-invertebrate i.e. biodiversity of macro-invertebrates. Biomonitoring is good tool for the assessment of our body.

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Phytochemical Analysis, Antioxidant and Tyrosinase Inhibition Potential of Aqueous Extract of *Lepidiumsativum* L. Seeds.

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Abstract:
The present study was to evaluate the phytochemical constituents, antioxidant and tyrosinase inhibition activities of aqueous extract of LepidiumsativumL. seeds. Phytochemical screening revealed the presence of alkaloids, carbohydrates, flavonoids, glycosides, amino acids, reducing sugars, saponins etc. Antioxidant activity was evaluated by using an in-vitro antioxidant assay model like DPPH assay and percentage of activity of plant sample was calculated. The present study was revealed that LepidiumsativumL.shows significant antioxidant activity. The tyrosinase inhibition activities were also done by using the modified dopachrome method with L-DOPA as a substrate. Assay was conducted in a 96-well microtitle plate and a plate reader was used to measure the absorbance at 417 nm. This study of tyrosinase inhibition assay was clear that seeds of LepidiumsativumL. were shown inhibition activity against tyrosinase. The phytochemical composition of these plantseeds were tyrosinase inhibition activities due to busting the inclusion of an antioxidant composition.
Keywords:*Phytochemical, Antioxidant Assay, Tyrosinase, L-DOPA.*

INTRODUCTION:

*Lepidiumsativum*L. is a yearly herb locally known as halim in India but commonly known as cress. Cress, otherwise known as garden cress, garden pepperwort or garden cress pepper weed, in India in Hindi it is called Halim, Chandrashoor or Asalu. It's a fast growing herb belonging to the family Brassicaceae that is native to Egypt and west Asia but is widely cultivated in temperate climates throughout the world for various culinary and medicinal uses (Gokavi, S. S.et. al, 2004). *Lepidiumsativum* L. Since old times in India, seeds have been used in traditional medicine (McConnell et al., 2007). Numerous studies on plant derivatives suggest that diets rich in phyto constituents and antioxidants have protective roles against various health troubles and diseases (Lampe JW, 1999). Herbal drugs are the oldest form of health care known to mankind (De-Smet and PGAM, 1997). Plants are a rich source of natural antioxidants. Natural antioxidants or phytochemical antioxidants are the secondary metabolites of plants (Sofowora, 1993). These plant derived antioxidants might play an important role in combating oxidative stress associated with many degenerative diseases such as cardiological diseases, diabetes, cancer, Alzheimer's disease, diabetes and aging (Wong SP et.al., 2006; Naczk M and Shahidi F,2006.) In India, the plant is regarded as a cure for asthma, dysentry, bleeding piles, as a diuretic, and to enhance sexual desire (Dymock, Warden and Hooper, 1890; Chopra, Nayar and Chopra, 1956). Herbal drugs are the therapeutic herbs used to prevent and treat diseases and ailments or to support health and healing (Gossell et al., 2006).

Materials And Methods:

Collection of plant material:

The*Lepidiumsativum*L. seeds under investigation were collected from the local villages of Nanded during 2015. The collected seeds were washed thoroughly first in tap water and then rinsed with distilled water. After this, it was sterilized by using absolute alcohol and dried completely in shade at room temperature. The plant seeds were crushed and blended to fine powder in an electronic grinder and stored in a polythene bag till further use.

Preparation of extract:

The seeds of the *Lepidiumsativum* L. were collected, dried, powdered and did soxhlet extraction successively with distilled water. The extract was evaporated to near dryness in a water bath, weighed and kept at 4 °C in the refrigerator until further use.

Phytochemical screening:

The presence of various phytochemicals in the plant extract was determined by preliminary phytochemical analysis as per Thimmaiah (2004).

DPPH radical scavenging activity:

The antioxidant activity of the extracts was measured in terms of hydrogen-donating or radical scavenging ability, using the DPPH method (Brand-Williams *et al*., 2007) with slight modification. Briefly, 2 mL of DPPH solution (0.1mM in methanol) was incubated with 1mL of extract at concentration of (20 mg/ mL). The reaction mixture was shaken and incubated for 30 min.in dark condition and at room temperature. The control was

prepared as above without plant extract. The absorbance of the solution was measured at 517 nm against a blank. The free radical scavenging activity was measured as a decrease in the absorbance of DPPH and was calculated.

Scavenging effect (%) = $[(A_{control} - A_{sample}) / A_{control}] \times 100$.

Ascorbic acid (0.1mM) was used as a reference standard.

Results And Discussion:

Phytochemical screening:

Preliminary phytochemical screening revealed the presence of alkaloids, flavonoids, glycosides, carbohydrates, reducing sugar, saponins and amino acids in aqueous extracts of*Lepidiumsativum*L. seeds. These results exposed that the plant has quite a number of chemical constituents, which may be responsible for the many pharmacological actions. Although their specific roles were not investigated in this study, it was reported that most active components in plants are mostly flavonoids, saponins, glycosides and alkaloids. Further work will be possible to investigate the specific phytoconstituents responsible for these activities (Table- 1).

Table 1: Preliminary phytochemical screening of aqueous seed extract.

Sr. No	Phytochemical test	Aqueous extract	Mucilage extract
1	Alkaloids	++	++
2	Carbohydrates	++	--
3	Flavonoids	++	++
4	Glycosides	++	++
5	Reducing sugars	++	--
6	Saponins	--	--
7	Steroids	--	--
8	Tannins	--	--
9	Amino acids	--	++

++ Presence of constituent; -- Absence of constituent.

DPPH radical scavenging activity (Antioxidant activity):

The DPPH radicals scavenging assay were used for preliminary screening of the aqueous seed extract for the antioxidant activity. The free radical scavenging activity is known as an important mechanism of antioxidants. These results indicated towards the seed extract were found to interact with the stable free radical DPPH, which indicates their potent radical scavenging ability. The aqueous extract exhibited antioxidant properties (71.17%), whereas, Mucilage extract showed (60.84%) and the standard used ascorbic acid showed (86.12%) (Table- 2).

Table 2: Percentage of antioxidant activity of seed extracts.

Sr. No.	Plant Name	% Antioxidant Activity
1	*LepidiumSativum*L. (Aqueous extract)	71.17±0.31
2	*Lepidiumsativum*L. (Mucilage extract)	60.84±0.28
3	Ascorbic Acid (Standard)	86.12±0.22

Values are expressed in means ± S.D. of two separate experiments.

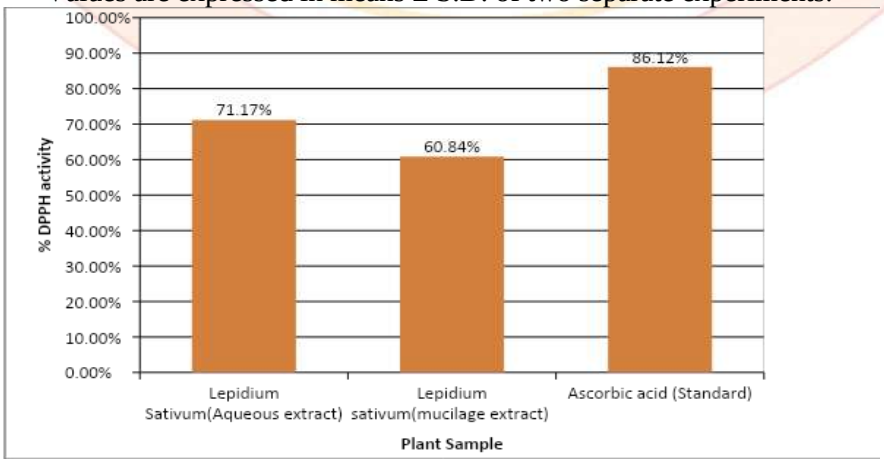

Fig: Graph showing percentage of antioxidant activity of seed extract.

Tyrosinase inhibition:

Tyrosinase involved in the formation of melanins because it facilitates melanin synthesis by catalyzing reaction from tyrosinase to DOPA and from DOPA to DOPA -quinine. Tyrosinase inhibitors have become more important as cosmetic and medicinal products, primarily to control melanin pigmentation. Melanin synthesis inhibitors are typically used for treating localized hyperpigmentation in humans such as lentigo, nevus, ephelis, post inflammatory state and melanoma of pregnancy. Mushroom tyrosinase enzyme was used for the assay because it is gamely available. Since the mode of reticence depends on the structure of both the substrate and inhibitor, L-DOPA was used as the substrate in this experiment, unless otherwise specified. So, the inhibitors discussed in this method are inhibitors of diphenolase activity of mushroom tyrosinase, and their inhibition activity on the enzyme was determined by spectrophotometry, based on dopachrome formation at 417 nm. In the present study the aqueous seed extract exhibited almost a good percentage of inhibition for Mushroom tyrosinase at (31units/ml) (Table- 3).

Table 3: Tyrosinase inhibition activity of seed extract.

Sr No.	Plant Species	% Tyrosinase Inhibition At Conc.(mg/mL)					
		4	**2**	**1**	**0.5**	**0.25**	**0.125**
1	***Lepidium sativum*L.**	81.02±0.12	67.35±0.22	62.12±0.14	56.65±0.30	31.28±0.26	13.85±0.02
2	**Ascorbic acid (Standard)**	85.74±0.21	73.86±0.13	68.23±0.23	60.70±0.32	37.66±0.25	18.23±0.22

Values are reported as means ± S.D. of two separate experiments.

Conclusion:

The present study shows aqueous seed of *Lepidiumsativum* L. could be used as a food supplement in human diet as it possesses potent antioxidant activity. It also helps to reduce oxidative stress in the human body. The tyrosinase inhibitory activity of *Lepidiumsativum* L. seed extract was increased with increasing concentrations. The inhibition of tyrosinase activity might depend on the hydroxyl group on the phenolic compounds of the seed extract, which may form hydrogen bonds with an enzyme site, leading to lower enzymatic activity. Some tyrosinases act through hydroxyl groups that bind to the tyrosinase active site, resulting in altered conformation. Ascorbic acid is an effective tyrosinase activity inhibitor. The antioxidant activity mechanism may also be an important reason for tyrosinase inhibition activity. Further pharmacological and clinical studies are required to understand the actual efficiency of these herbal extracts and in future it may be used for ingredients in the formulations of cosmetics and skin whitening agents.

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Effect of Weed – *Euphorbia Geniculata* L. On Biological Parameters of Chick PEA

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Abstract

In present investigations, the effects of Euphorbia geniculata L. on various biological parameters of chick pea were assessed. The healthy seeds of chick pea were treated with different concentrations of leaf, stem and root extracts of Euphorbia geniculata L. The effects on seed germination percentage, seedling groth and seedling vigour were assessed. The inhibitory as well as stimulating effect of weed extract on various biological paramters could be noticed.
Key words: *Euphorbia geniculata L., chick pea, inhibitory*

Introduction:

A weed is considered as unwanted plant in a particular situation and a plant in a wrong place. The weeds examples are those unwanted plants, which are growing in human-controlled setting such as farm fields. The term weed also is used to desribe any plant that grows or reproduces aggressively or is an invasive outside its native habitat. Besides competing for moisture, nutrients and light, weeds can also affect a crop growth by releasing chemicals into the growing environment (Rice 1984; Kadioglue *et al.*, 2005). All the plant parts of weeds such as root, stem, leaf, flower and fruit have allelopathic potential (Alam and Islam 2002). Different types of effects are exerted by different parts of weeds. Weeds interfere with crop plants through dominance, competition and allelopathy, which lead to decrease in quantity and quality of product of crop plants. The weeds affect the crop plants by releasing the various water-soluble allelochemicals (Batish *et al.*, 2007). These allelochemicals reported to be present in almost all plant parts including stem, leaves, buds, flowers, pollen grains, seeds, fruits, roots and rhizomes (Rice, 1984). Euphorbia geniculata is native to tropical and subtropical America but is now widespread throuhout the tropics. Many herbicides failed to control it and hence it has spread rapidly in many parts of the word. The present studies were undertaken to assess the effect of *Euphorbia geniculata* L. on popularly grown crop plant Chick pea (*Cicer arientinum* L.).

Materials And Methods:

The weed plant material used to study the effects on chick pea was collected and identified with the help of standard flora (Naik, 1998 and Dhore, 2020). Mature leaves of *Euphorbia geniculata* were collected from the agricultural fields in Amravati and aqueous extracts were prepared. Aqueous extracts of various concentrations *viz* 5%, 10%, 20% and 40% (v/v) were prepared. The seeds of chick pea were collected from Krishi kendra in Amravati. Healthy seeds were first prsoaked in distilled water for 6 hours. The presoaked seeds were treated with aqueous leaf extracts prepared freshly. The treatment was given at room temperature on rotatory shaker. The trartment was given for 6 hours. 200 seeds were used for each treatment along with control. The treated seeds along with control were studied for various parameters like germination percentage, seedling height and seedling vigour index. All the calculations were carried out by using standard formulae.

Results And Discussion;

The effects of weed extracts on chick pea are shown in table 1. The germination percentage in control was 80%. The maximum inhibition was observed in 10% treatment. In all treatments, inhibition was recorded. Germination is an important indicator which shows the plnat's response to changes in the environment or any allelopathic stress indicated as a result of allelochemicals released from donor plants (Hussain *et al.*, 2010). Similar inhibitory effects on seed germination were also recorded by Neelamegam *et al.*, 2012 in Paddy variety 5016 due to effect of Ipomea treatments.

Table 1: Effects of aqueous leaf extract of *Euphorbia geniculata* on various biological parameters of chick pea.

Treatment	Seed Germination (%)	Shoot length (Cm)	Root length	Seedling Vigour Index (SVI)
Control	80	17.70	16.70	1336
5%	65	21.60	23.00	1495
10%	50	14.60	12.80	640
20%	55	21.00	17.60	968
40%	65	18.60	10.80	702

Both inhibition and stimulation in root length and shoot length was noticed. Maximum inhibition in shoot length was induced by 10% treatment while maximum stimulation was recorded in 5% and 20% treatments. In addition, the stimulation and inhibition in root length could be observed. Maximum decrease in root length was observed in 40% treatment whereas the 5% treatment stimulated the root length. Stimulation in root and shoot length were also reported in *Oryza sativa* by Prasad and Subhashini (1994). Most of the treatment decreased the seedling vigour index. Only slight stimulation was found in 5% treatment as compared to control. Maximum reduction in seedling vigour index was found in 10% treatment.

Conclusion:

The aqueous leaf extracts of *Euphorbia geniculata* L. has shown both inhibitory and stimulatory effects on chick pea.

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Investigation of Taxonomic Morphology and Phytochemical analysis of *Cassia fistula* L.

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Abstract

*The qualitative phytochemical studies were carried out in the solvents viz. Methanol, Chloroform and Petroleum ether. The Methanol, Chloroform and n-Butanol Leaves extract of **Cassia fistula L.**shows the presence of alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols but high intensity of phytochemicals in leaves showed in table no.1 by twice and petroleum ether extract of leaves.*
***Keyword:** -Morphology, qualitative,phytochemical,Cassia fistula L.,n-Butanol etc*

Introduction

Medicinal Plants or Medicinal herbs are essence of Traditional medicine practice. Treatment using herbs developed different parts of world in different names. Herbalism is the systematic study of medicinal herbs and its botany. Mainly focusing its medicinal uses. Ethnomedicine is the study of traditional medicine. Researchers identify and separate various active chemicals in the medicinal plants.

Indian medicinal plants or Ayurvedic medicinal Plants are the essence of Ayurveda and Ayurvedic treatments. When used judicially and clocking with the basic principles they produce miraculous effects. Their role cannot be confined to mere curative of disease but they also used to be of human body. Hence, Ayurvedic drugs are rightly called the elixirs of life. Ayurvedic Herbs played important role in Ayurvedic treatment, from ancient time to this most modern time.

History of Medicinal Plants

The uses of medicinal plants can even see in pre historic time from the Sumerian civilization. In Sumerian civilization medicinal plants listed in clay. They mentioned about 100 medicinal plants. Ancient Egyptians documented about 800 medicinal plants in 'Ebers Papyrus'.

'Shennong Ben Cao Jing', is the Chinese pharmacopeia of medicinal plants, which helped Chinese Traditional healers to treat patients. 'Discords' was a Greek physician; he wrote a pharmacopeia of medicinal plants called 'De materia medica'. which described 600 medicinal plants and its various combinations useful in treatments.

Aristotle's and his student, Theophrastus wrote the first systematic botany text called 'Historia plantarum'. That was the first book in botany which classified plants into systematic groups.

In India, various traditional system of medicine is Sidha are well known, now commonly called Indian System of Medicine. Treatments based upon medicinal herbs and herb mineral combination are essence of Ayurveda and Sidha. Medicinal plants listed in Ayurvedic text books or coming under ayurveda listed as Ayurvedic Medicinal Plants. Ayurveda books classified medicinal plants according to its uses and properties. About 800 medicinal plants were listed.

Herbalism

From historical time, medicinal plants used for medical purpose. It is believed that about 50 thousand before herbalism existed. Written history could be seen in sumariencivilization, which was 5000 years old. Herbalism may apply modern standards of effectiveness testing to herbs and medicines derived from natural sources because many modern medicine compounds are derived from plants. It referred as phytomedicine, phytotherapy or Para herbalism. Nutrient supplements prepared from herbs classified under phytotherapy.

According to WHO (World Health Organization) 80 % of Asian and African population uses herbal medicine due to its low expense. About 25% of drugs using in USA derived from medicinal plants. 7,000 medical compounds and 120 active compounds currently isolated from herbs.

Herbal preparations

Single plant or multiple plant combinations are used. It Prepared in many forms. Herbal juice extract, dry powder, tea, decoction, Tinctures, alcoholic preparation and oil or ghee preparations are available.

Ethnomedicine

Ethnomedicine is a study or comparison of the traditional medicine based on bioactive chemicals in the herbs and animals and practiced by various ethnic groups. ethnobotany and medical anthropology are the tools using in Ethnomedicine. The purpose of the research is to identify and develop a marketable pharmaceutical product. From Chinese medicine 'Yu' identified 'Artemisin' named chemical compound useful in Malaria disease.

Phytochemicals

These are chemical compounds synthesized by plants as its part of metabolism, may be part of defensive mechanism. Alkaloids, Glycosides, Glycosides, Terpenes are main Phytochemicals. Alkaloids are bitter-tasting chemicals examples are atropine, scopolamine, hyoscyamine, caffeine, cocaine, ephedrine (Ephedra), morphine. Anthraquinone glycosides are found in medicinal plants such as rhubarb, cascara, and Alexandrian senna. Polyphenols of several classes of chemicals, useful defenses against plant diseases and predators. examples are phytoestrogens and astringent tannins. Terpenes and terpenoids are found in resinous plants such as the conifers.

Present investigation on Taxonomic morphology and phytochemical analysis of Cassia *fistula* L. with following aims and objectives.

Material and Methods

Collection of Plant

Collection of *Cassia fistula* L. plant part were collected from botany garden Manora, washim Maharashtra state, India. Plant part i.e., fruit and leaves cleaned soil dust with tap water. The plant material and specimens were identified by using standard floras like Cook 1907, Dhore 2005, Naik 1989, Yadav and Sardesai 2002.

Preparation of Plant Part Extract

Preparation of plant part leaves dried under shade and prepared fine powder, plant part extraction according to previously method used by Megala, and Elango, 2012, but were used some modified method in which the 5 gram of leaves dried powder extracted with 50 ml of three different solvent i.e. methanol, chloroform and petroleum ether , 24 hrs at room temperature and shaking constant and then filter with whatman filter paper no.1, excess solvent in extract evaporated and extract used for Qualitative evaluation of phytochemicals. The preliminary screening test were performed for the presence of following secondary metabolites such as alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols (Harborne, 1973) and Sofowara (2005).

According to Budhiraja, 2012, leaves powder extract in Chloroform and n-butonol solvent shows positive results of phytochemicals constituent and their activities against the anticancer and antibacterial so were used chloroform and n-butonol solvent.

Qualitative analysis of *Cassia fistula* L.

Alkaloids test

The plant extract was evaporated to dryness and the residue was heated on a boiling water bath with 2% hydrochloric acid. After cooling, the mixture was filtered and treated with a few drops of Mayer's reagent. Formation of turbidity or yellow precipitation showed the presence of alkaloid.

Glycosides

Glycosides are compounds which upon hydrolysis give rise to one or more sugars (glycones) and a compound which is not a sugar (Glycone or Genine). To the solution of the extract in glacial acetic acid, few drops of ferric chloride and concentrated sulphuric acid are added, and observed for a reddish-brown coloration at the junction of two layers and the bluish green colour in the upper layer.

Terpenoids and steroids

Four milligrams of extract were treated with 0.5 ml of acetic anhydride and 0.5 ml of chloroform. Then concentrated solution of sulphuric acid was added slowly and red violet colour was observed for terpenoid and green bluish colour for steroids.

Flavonoids

4 ml of extract solution was treated with 1.5 ml of 50% methanol solution. The solution was warmed and metal magnesium was added. To this solution, 5 – 6 drops of concentrated hydrochloric acid was added and red colour was observed for flavonoids and orange colour for flavones.

Saponins

0.5 g of extracts was added to 5 ml of distilled water in a test tube. The solution was shaken vigorously and observed for a stable persistent froth. The frothing was mixed with 3 drops of olive oil and shaken vigorously after which it was observed for the formation of an emulsion.

Phenols

The extract (50 mg) is dissolved in 5 ml of distilled water. To this few drop of neutral 5% ferric chloride solution are added. A dark green colour indicates the presence of phenolic compounds. 3

Tannins

To 0.5 ml of extract solution 1 ml of water and 1-2 drops of ferric chloride solution was added. Blue colour was observed for gallic tannins and green black for catecholic tannins.

Results and Conclusion

Taxonomic Morphology of Cassia fistula *L*. Plant

Habit: A small tree.

Stem: Aerial, erect, woody, branched, cylindrical, solid and glabrous.

Leaves: Alternate, unipennate par pinnately compound, stipules small, leaflets 4-8 pairs, large, ovate, entire or wavy, acute, base wedge-shaped.

Inflorescence: Long drooping racemes.

Flowers:

1. Bracteate, pedicellate, complete, zygomorphic, bisexual, yellow.
2. Calyx made up of 5 sepals, divided to the base, imbricate, oblong.
3. Corolla made up of 5 petals, clawed, obovate, veined.
4. Stamens 10, the 3 longest stamens are much curled and bear large, oblong, much curled anthers, the 4 median stamens are straight and the 3 remaining are very short and erect, staminodes. Ovary free at the bottom of the calyx, superior, monocarpellary, unilocular, ovules many, marginal placentation.

- **Fruit:** A legume, long, cylindric, pendulous, indehiscent.
- **Seeds:** Ovate, many, imbedded horizontally in sweet, dark-coloured pulp, separated by transverse dissepiments called phragmatas.
- **Flowering and Fruiting Time:** March-July (fruiting throughout the year)

Figure:-Stem(Arial erect woody and Branched

Figure: - Leaves (Bracteate, pedicellate)

Figure:Inflorences (Racemose)

Figure:- flower(Bracteate, pedicellate)

Figure:-Fruit (A legume, long, cylindric)

Figure :- Seeds (Ovate, dark-coloured pulp)

Table No. 1 Qualitative analysis of Cassia fistula L.leaves

Sr. No.	Phytochemical	Plant extract of leaves in		
		Methanol	Chloroform	Petroleum ether

1.	**Alkaloids**	++	++	++
2.	**Glycosides**	++	+	++
3.	**Terpenoids**	+	++	+
4.	**Steroids**	++	+	++
5.	**Flavonoids**	++	++	++
6.	**Saponins**	++	++	++
7.	**Phenols**	++	+	++
8.	**Tannins**	++	++	++

Results taken average of triplicates for different concentration of plant extract.

The qualitative phytochemical studies were carried out in the solvents viz. Methanol, Chloroform and Petroleum ether. The Methanol, Chloroform and n-Butanol Leaves extract of ***Cassia fistula* L.**shows the presence of alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols but high intensity of phytochemicals in leaves showed in table no.1 by twice and petroleum ether extract of leaves.

Conclusion

***Cassia fistula* L**. is the rich source of phytochemicals, alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols. Its extraction in petroleum ether solvent shows highest intensity and content of phytochemicals.

So, ***Cassia fistula* L**. of plant presence different phytochemical compounds useful for Further purification, identification and characterization of the active compounds of would be our priority in future studies.

Medicinal uses of Cassia ***fistula* L**.

Cassia species worldwide which are used in herbal medicine systems. These particular families of plants are used widely for their laxative actions. *Cassia fistula* is no exception... it is often used as a highly effective moderate laxative that is safe even for children.

However, in large doses, the leaves and bark can cause vomiting, nausea, abdominal pain and cramps. *Cassia fistula* is also employed as a remedy for tumours of the abdomen, glands, liver, stomach, and throat, for burns, cancer, constipation, convulsions, delirium, diarrhoea, dysuria, epilepsy, gravel, haematuria, pimples, and glandular tumours. In Ayurvedic medicine systems, the seeds are attributed with antibilious, aperitif, carminative, and laxative properties while the the root is used for adenopathy, burning sensations, leprosy, skin diseases, syphilis, and tubercular glands. The leaves are employed there for erysipelas, malaria, rheumatism, and ulcers. In Brazilian herbal medicine, the seeds are used as a laxative and the leaves and/or bark is used for pain and inflammation.

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Diversity of Asterinaceous Fungi from Mahabaleshwar, Maharashtra

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Abstract

The Asterinaceous fungi is the second largest group of black mildews and are characterized by having shield-shaped thyriothecia, which split radially like a star or either opening by stellate dehiscence or by longitudinal splits; bitunicate asci and transversely uniseptate ascospores; with or without their anamorph. The asterinaceous group belonging to order Asterinales and having two families namely, Asterinaceae and Lembosiaceae. The present paper gives the checklist of Asterinaceous fungi from Mahabaleshwar, Maharashtra State, India. The 31 species of genus Asterina, 2 species each from Lembosia and Asterostomella and single species from Asterostomula are arranged in alphabetically.

Key words: *Black Mildew fungi, Asterinales, foliicolous fungi.*

Introduction:

The documentation of biodiversity, its conservation and sustainable utilization is the major theme of research in life sciences. The fungi are the important biotic group in the biodiversity and they are an extremely important part of the ecosystem. They have significant role in recycling of minerals and carbon; as a source of food, medicines and chemicals; as important models in scientific research; and have received much attention by scientific society as they cause plant and animal disease (Hosagoudar, 2012). The microfungi have great diversity in ecosystem but they are less studied because of its inconspicuous nature. Black mildews are one of the neglected group but having large number of species contribution in fungal diversity from tropical and subtropical regions of the world. Most of these fungi are either saprophytic or obligate parasites and residing on the surface of the leaves and producing special organs (haustoria) and opting special adaptation (Hansford, 1946a). These fungi are very specific in their structural characters; produce thin to dense black colonies on the surface of the leaves, contain conspicuous superficial appressoriate mycelium, forming fruiting bodies with asci and ascospores at their maturity (Hansford, 1961; Hosagoudar, 2012).

Among the black mildews, the Asterinaceous fungi are the second largest group of black mildews and are characterized by having shield-shaped thyriothecia, which split radially like a star or either opening by stellate dehiscence or by longitudinal splits; bitunicate asci and transversely uniseptate ascospores; with or without their anamorph. Asterinaceous fungi are usually more or less inconspicuous, superficial, obligate biotrophs, infecting wide range of flowering plants and existed with or without their anamorph. These fungi produce thin to dense black colonies on the surface of the leaves. These are characterized by superficial mycelium with one to two celled appressoria; at the maturity of colony, they formed flattened fruiting bodies with radiating cells known as thyriothecia, which splits radially like a ‘star’ and hence known as ‘Asterinaceous fungi’ or by longitudinal slits (Lembosiaceae); the bitunicate asci formed within the thyriothecium, contain transversely uniseptate ascospores. These are usually flourished with or without their respective anamorph (Hosagoudar, 2012).

Following are the significant taxonomic characters which facilitate the identification and separation of genus and species of this group of fungi.

1.1. Host identity

As the black mildew fungi are obligate parasite and considered as host specific, it is essential to know the correct identity of the host plants, preferably up to species level. This is an important taxonomic tool, used to keyout these fungi (Hosagoudar, 2012). Most of the authors have described the species key for asterinaceous fungi on the basis of families and genus of host plant.

1.2. Colony

Generally, the asterinaceous fungi produce typically thin to dense, dark-black colonies superficially on living leaves of plants. Mostly, the colony formed on leaves (foliicolous), and rarely on soft stem (caulicolous) and on young branches (ramicolous). If the colonies are on the leaves, they may be exclusively on the upper surface of the leaf (epiphyllous), or they may be exclusively lower surface of the leaf (hypophyllous) or they may be on both surfaces of leaf (amphigenous) (**Plate-1, Fig. 1-4**). The nature of the colony may be thin, crustose (crust like) or dense. Colonies grow radially and may be developed solitary (isolated) or scattered or confluent (scattered colonies spread to join together). Radiate growth results in the formation of a more or less circular colony that sometimes becomes confluent with neighboring colonies of the same fungal species. Confluent colonies can form colonization on large leaf surface by a single fungal species. So, the infection site, nature and size (in diameter) of colony are usually uniform in particular species or may not be uniform in different species and are significant for species delimitation (Hosagoudar, 2012). However, features of colony

appearance in combination with other morphological characters can facilitate the identification process at species level.

1.3. Mycelium

The species of asterinaceous fungi develop superficial, dark pigmented, filamentous, septate, branched, appressoriate mycelium or lacking appressoria, invade the host plant surface and form specialized structures for host infection (haustorium). Mycelium consists of brown to black, cylindrical cells with thick cell wall. It may be straight, substraight, undulate or zigzag, flexuous or crooked in nature. The branching may be opposite, alternate or irregular in the arrangement and branched at acute angles (around 45° or less than that) to wide angles (more than 45°) (**Plate-1, Fig. 5-8**). Branched hyphae may be loosely or closely reticulate and form a solid mycelial mat by compactly placing the individual mycelial threads. Therefore, the appearance of mycelium, branching pattern and angle, density of mycelium, length and diameter of hyphal cells are important taxonomic characters for species segregation in Asterinaceous fungi (Hosagoudar, 2012).

1.4. Appressoria

In this group of fungi, generally single to two celled appressoria are formed laterally on hyphae, but, sometimes these are absent (*Asterostomula*). The arrangement of laterally formed appressoria may be strictly opposite or alternate, unilateral or irregular and closely or moderately to distantly placed. These may be straight to curved, antrorse (directed towards the growing tip) to retrorse (turned opposite to growing tip), subantrorse (making more than 45° angle to the mycelium) or spreading (having mixed characters of all these). The lower cells or stalk cells in bicelled appressoria are mostly unicellular and are cylindrical to cuneate in shape. The unicellular appressoria or the head cell of bicelled appressoria may be globose, oblong, ovate, clavate, pyriform and may be entire, angular, sublobate to lobate at margin (**Plate-1, Fig. 9-13**). So, the arrangement, position, nature, size, shape and margin of appressoria are the important criterion for species segregation in asterinaceous fungi.

1.5. Thyriothecia

Thyriothecia of asterinaceous fungi are dimidiate type, flattened and typically circular in outline, orbicular or rarely elongated, L-, Y- or X-shaped. The development of a thyriothecium is initiated by directly below or lateral outgrowths from a surface hyphae and it grows radially. At the maturity, the thyriothecia dehisced or splits stellately at the center or dehisced vertically or longitudinally at the center (**Plate-1, Fig. 14-17**). The shape of the thyriothecia and their dehiscence pattern are an important criterion to delineate families and genera of Asterinales. Hosagoudar *et al*. (2001) used these characters to introduce a new family Lembosiaceae, for the genera having thyriothecia oval to elongate, X or Y shaped and dehisced longitudinally at the center. However, the flattened and typically circular thyriothecium with stellate dehiscence are the characters of family Asterinaceae (Hosagoudar, 2012).

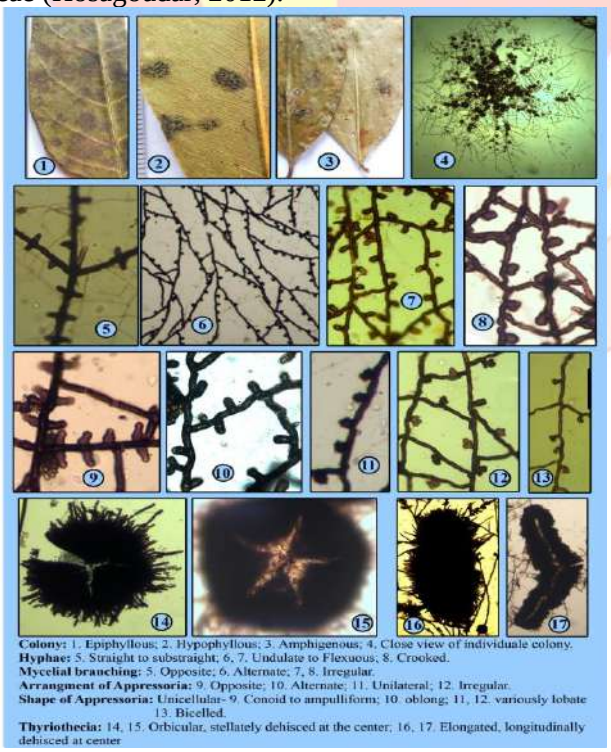

Plate 1. Colony, Hyphae, Mycelial branching, Appressoria & Thyriothecia in Asterinaceous fungi

1.6. Asci

The asci in asterinaceous fungi are bitunicate, globose, subglobose, ovate to broadly clavate. The ascus shape is relatively constant within the particular species of this group (Hosagoudar, 2012). The bitunicate asci have a distinctly thickened endotunica and it can be clearly visible when stained with cotton blue. Generally, thyriothecia are filled with numerous asci and contain 8 ascospores per ascus, more rarely 4 or 6 ascospores (**Plate-2, Fig. 1-4)**. So, the ascus numbers, shape and size are important taxonomical criteria for separation of species of asterinaceous fungi.

1.7. Ascospores

The ascospores of asterinaceous fungi are almost uniformly two-celled with one transversal septum at the center. At the region of the septum, the spores can be more or less constricted and the apices are mostly rounded or slightly acuminate to tapering. In general, the ascospores are almost oblong to ellipsoidal with equal cells or with the upper cell slightly longer and broader. Ascospore size is significant at species level (Hosagoudar, 2012). Ascospores are often pigmented and smooth-walled or more or less distinctly ornamented. The ornamentation pattern varies from warty or verrucose, truncate to echinulate (**Plate-2, Fig. 5-10**). Also, the germination pattern of ascospores is an important character for species segregation (**Plate-2, Fig. 11-13**). However, the ascospore shape, size, colour, absence or presence of ornamentation and its pattern are important criteria for species delimitation in asterinaceous fungi.

1.8. Anamorphic stages

The several numbers of genera of asterinaceous fungi produce anamorphic stages and are thought to be valid and important features in the classification of bitunicate ascomycetes. The asexual states (anamorphs) of several genera of Asterinales are present either along with teleomorph (sexual state) or develop isolated without respective teleomorph, and develop on the same surface mycelium forming conidia known as 'pycnothyriospores' within superficial Pycnothyria. Pycnothyria are always structurally similar to the thyriothecia, but usually smaller in size (Hosagoudar, 2012). The numerous pycnothyriospores are formed within the pycnothyria and are may be spherical, ovate, oblong, cylindrical, pyriform, angular to truncate (**Plate-2, Fig. 14-16)**. So, the presence or absence of anamorph, size and shape of pycnothyria and pycnothyriospores are the important taxonomic characters for species delimitation in asterinaceous fungi.

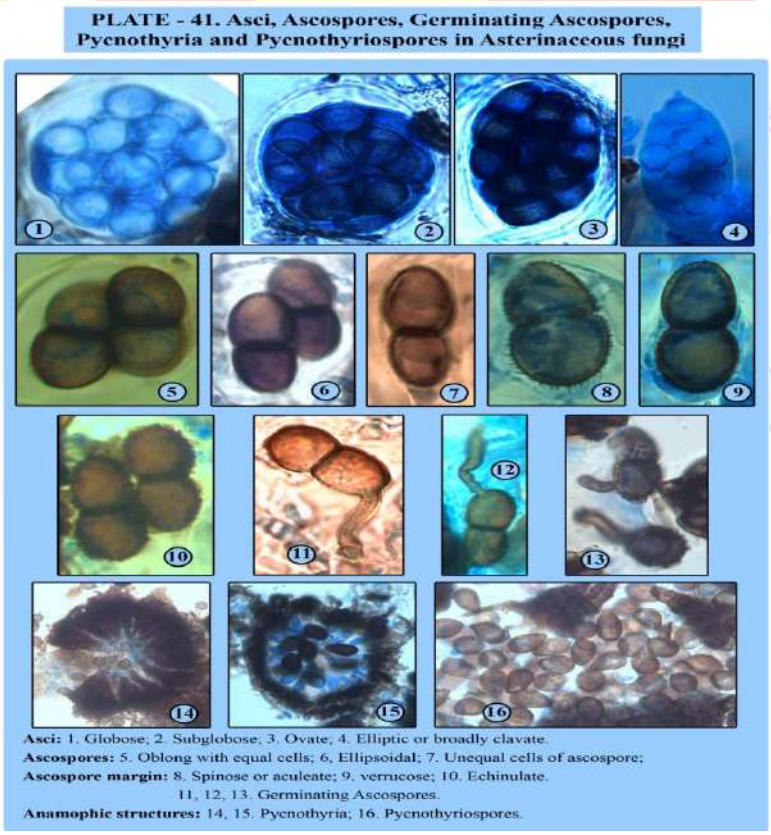

Plate 2. Asci, Ascospores, Pycnothyria & Pycnothyriospores in Asterinaceous fungi

Materials and Methods

The leaves and twigs of plant species infected with black mildew were collected from study area, during winter season (2012–2014). The infected host twigs were collected separately in sterilized polythene bags, tagged with field number, brought in the laboratory and pressed neatly to dry in between blotting papers. The well dried specimens were enclosed in butter paper and preserved in standard size herbarium packets. The host plants were identified by referring the regional flora (Deshpande *et al.*, 1995; Singh *et al*. 2000, 2001). Both macro and micro-morphological characters are used to taxonomical study of collected fungi. The fungal micro–morphological structures were mounted in lactophenol, stained with cotton blue and observed under compound light microscope. To observe mycelial branching and position of appressoria, a drop of peeling solution (Xylene–Thermocol solution) was applied on selected areas of the colonies, and after drying the film was mounted directly in again the same peeling solution. Biometric data were based on at least 10 measurements of structures; illustrations were prepared with Camera Lucida and photographed under Leica DM2000 fluorescence microscope equipped with digital camera. The fungal specimens were identified by using respective standard literature (Hansford, 1961; Hosagoudar, 2012; Patil *et al.*, 2014). Identified fungal specimens were deposited in Herbarium Cryptogamae Indiae Orientalis (HCIO), IARI, New Delhi (India) for their accession. The detail checklist of Asterinales group from Mahabaleshwar, Maharashtra state has been provided in present paper.

Enumerations of species: Family-Asterinaceae

Genus- *Asterina*

1. *Asterina atalantiae* Hosag. & Agarwal, Indian Phytopath. 56: 98, 2003; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala, p.41, 2011; Hosag., Mycosphere 2(5): 642, 2012.
Specimens examined: On leaves of *Atalantia racemosa* Wight (Rutaceae), Kate's Point, Mahabaleshwar, 17°55'78.2"N, 73°36'26.3"E, elev. 930 m, 12.12.2013, Bhise M.R., HCIO 51712; Ambenalighat, Mahabaleshwar, 17°53'39.9"N, 73°37'02.6"E, elev. 911 m, 15.03.2014, Bhise M.R., MHB 0602.
2. *Asterina beilschmiediae* Bhise, Patil & Salunkhe, Int. J. of Life Sciences 3(1): 68, 2015.
MycoBank No.: MB 811704
Specimens examined: On leaves of *Beilschmiedia dalzellii* (Meissn.) Kosterm. (Lauraceae), Mahabaleshwar, 17°55'25.6"N, 73°38'16.5"E, elev. 1289 m, 05.02.2014, Bhise M.R., HCIO 51713.
3. *Asterina casearíae* Hansf., Proc. Linn. Soc. London 156(2): 113, 1944; Hosag., Mycosphere 2(5): 650, 2012.
=*Asterina casearíae* Yamam., Sci. Rep. Hyogo Univ. Agric., Agric. Biol. Ser. 2:35, 1956.
Specimens examined: On leaves of *Caesearia graveolens* Dalz. (Flacourtiaceae), Hatlote, 17°51'43.6"N, 73°35'33.8"E, elev. 742 m, 06.02.2014, Bhise M.R., HCIO 51766; Renoshi forest, 17°47'43.1"N, 73°40'29.5"E, elev. 676 m, 13.03.2014, Bhise M.R., HCIO 51767; Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 10.12.2013, Bhise M.R., MHB 0235.
4. *Asterina chukrasiae* Hosag. in Hosag., H. Biju & Appaiah, J. Mycopathol. Res. 44: 40, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala, p.47, 2011; Hosag., Mycosphere 2(5): 653, 2012.
Specimens examined: On leaves of *Aglaia lawii* (Wight) Sald. (Meliaceae), Birmanwadi River side, 17°53'17.8"N, 73°37'20.5"E, elev. 676 m, 14.03.2014, Bhise M.R., HCIO 51768.
5. *Asterina combreti* Sydow, Engl. Bot. Jahrb. 45: 264, 1910; Hosag. & Abraham, Indian Phytopath. 51: 389, 1998; Hosag. & Appaiah, J. Mycopathol. Res. 43:172, 2005; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.55, 2011; Hosag., Mycosphere 2(5): 659, 2012.
Specimens examined: On leaves of *Terminalia elliptica* Willd. (Combretaceae), Par, 17°55'25.1"N, 73°40'26.2"E, elev. 732 m, 17.02.2013, Bhise M.R., HCIO 51769; Gonoshi forest, 17°55'22.3"N, 73°36'04.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51770.
6. *Asterina disciferae* Hosag. in Hosag., Balakr. & Goos, Mycotaxon 59: 172, 1996; Hosag., Mycosphere 2(5): 670, 2012.
Specimens examined: On leaves of *Syzygium caryophyllatum* (L.) Alst. (Myrtaceae), Pratapgad, 17°56'10.6"N, 73°35'06.5"E, elev. 836 m, 10.02.2013, Bhise M.R., HCIO 51651; *Syzygium cumini* (L.) Skeels, Gonoshi forest, 17°55'22.3"N, 73°36'06.2"E, elev. 696 m, 14.02.2014, Bhise M.R., HCIO 51653; *Syzygium rubicundum* Wight & Arn., Birmani–Bhairijogeshwari, 17°54'08.2"N, 73°36'45.8"E, elev. 705 m, 10.12.2013, Bhise M.R., HCIO 51454.
7. *Asterina dissiliens* (Sydow) Doidge, Bothalia 4: 287, 1942; Hosag. & Goos, Mycotaxon 52: 467, 1994; Hosag., Balakr. & Goos, Mycotaxon 60: 174, 1996; Hosag., Mycosphere 2(5): 671, 2012.
=*Asterinella dissiliens* Sydow, Ann. Mycol. 22: 425, 1924.
=*Parasterina reticulata* Doidge, Bothalia 1: 200, 1924.
Specimens examined: On leaves of *Maytenus rothiana* (Walp.) Lobreau–Collen (Celastraceae), Par, 17°55'22.3"N, 73°36'02.2"E, elev. 762 m, 17.02.2013, Bhise M.R., MHB 0162; Mahabaleshwar,

17°56'52.4"N, 73°40'16.4"E, elev. 1409 m, 19.02.2013, Bhise M.R., MHB 0208; Kate's point, Nakinda, 17°56'11.3"N, 73°35'06.6"E, elev. 1251 m, 18.10.2013, Bhise M.R., HCIO 51714, MHB 0339; *Maytenus senegalensis* (Lam.) Excell., Bhekawali, 17°56'11.3"N, 73°35'06.6"E, elev. 1251 m, 26.11.2012, Bhise M.R., MHB 0042.

8. *Asterina elaeagni* Sydow, Ann. Mycol. 29: 225, 1931; Hansf. & Thirum., Farlowia 3: 306, 1948.
=*Asterina elaegni* (Sydow) Sydow & Petrak, Hosag., Mycosphere 2(5): 672, 2012.
Specimens examined: On leaves of *Elaeagnus conferta* Roxb (Elaeagnaceae), Par, 17°54'86.9"N, 73°35'96.7"E, elev. 708 m, 10.12.2013, Bhise M.R., HCIO 51771; Gonoshi forest, 17°55'22.3"N, 73°36'02.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51772; Birmanwadi Road, 17°54'08.1"N, 73°36'45.8"E, elev. 712 m, 10.12.2013, Bhise M.R., MHB 0387.

9. *Asterina erysiphoides* Kalch. & Cooke, Grevillea 9: 32, 1880; Doidge, Trans. Roy. Soc. South Africa 8: 256, 1920; Hansf. & Thirum., Farlowia 3: 306, 1948; Hosag., Balakr. & Goos, Mycotaxon 59: 175, 1996; Hosag., H. Biju & Appaiah, J. Mycopathol. Res. 44: 7, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.72, 2011; Hosag., Mycosphere 2(5): 677, 2012.
Specimens examined: On leaves of *Jasminum malabaricum* Wight (Oleaceae), Par, 17°54'82.1"N, 73°35'92.1"E, elev. 720 m, 17.02.2013, Bhise M.R., HCIO 51699; Birmanwadi road, 17°54'08.1"N, 73°36'45.8"E, elev. 712 m, 10.12.2013, Bhise M.R., MHB 0385(b); Machutar-Tetawali, 17°53'98.5"N, 73°42'29.6"E, elev. 1265 m, 11.12.2013, Bhise M.R., MHB 0398(c).

10. *Asterina helicanthis* *sp. nov.*
MycoBank No: MB 811795
Specimens examined: On leaves of *Helicanthes elastica* (Desr.) Danser (Loranthaceae), Mahabaleshwar, 17°55'25.6"N, 73°38'16.5"E, elev. 1289 m, 05.02.2014, Bhise M.R., HCIO 51773; Dudhoshi, 17°55'15.6"N, 73°36'59.2"E, elev. 734 m, 15.03.2014, Bhise M.R., HCIO 51774.

11. *Asterina hibisci* (Doidge) Hosag. in Hosag., C. K. Biju & Abraham, J. Econ. Taxon. Bot. 28: 175, 2004; Hosag., Zoos' Print J. 21: 2327, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.88, 2011; Hosag., Mycosphere 2(5): 693, 2012.
=*Asterina diplocarpa* Cooke var. *hibisci* Doidge, Botahalia 4: 331, 1942.
Specimens examined: On leaves of *Hibiscus rosa-sinensis* L. (Malvaceae), Pratapgad, 17°56'12.1"N, 73°35'26.2"E, elev. 818 m, 15.03.2014, Bhise M.R., HCIO 51775.

12. *Asterina hosagoudarii* Bhise, Patil & Salunkhe, Int. J. of Life Sciences 3(1): 71, 2015. **MycoBank No.:** MB 811705
Specimens examined: On leaves of *Litsea josephii* S. M. Almeida (Lauraceae), Gureghar, 17°55'19.23"N, 73°44'22.79"E, elev. 1284 m, 19.11.2012, Bhise M.R. HCIO 51658 (holotype); HCIO 51657 (Isotype).

13. *Asterina jambolanae* Kar & Maity, Trans. Brit. Mycol. Soc. 54: 438, 1970; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.96, 2011; Hosag., Mycosphere 2(5): 701, 2012.
Specimens examined: On leaves of *Syzygium caryophyllatum* (L.) Alst. (Myrtaceae), Pratapgad, 17°56'12.7"N, 73°35'08.5"E, elev. 825 m, 20.11.2012, Bhise M.R., HCIO 51659; Gonoshi forest, 17°55'22.3"N, 73°36'06.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51660.

14. *Asterina laxiuscula* Sydow, Phillipine J. Sci. 8: 276, 1912; Patil & Pawar, Indian Phytopath. 42: 248, 1989; Hosag., Mycosphere 2(5): 708, 2012.
Specimens examined: On leaves of *Xantolis tomentosa* (Roxb.) Raf. (=*Sideroxylon tomentosa*, Sapotaceae), Gonoshi forest, 17°55'22.3"N, 73°36'00.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51776.

15. *Asterina litseae* Yates, Philippine J. Sci. 13: 373, 1918; Hosag., Balakr. & Goos, Mycotaxon 59: 180, 1996; Hosag., Mycosphere 2(5): 710, 2012.
Specimens examined: On leaves of *Litsea deccanensis* Gamble (Lauraceae), Chaturbet, 17°50'37.7"N, 73°38'10.8"E, elev. 677 m, 05.02.2014, Bhise M.R., HCIO 51716.

16. *Asterina lobulifera* Sydow in Sydow & Sydow, Philippine J. Sci. 9: 181, 1914; Hosag., C. K. Biju & Abraham, J. Mycophathol. Res. 40: 195, 2002; J. Econ. Taxon. Bot. 28: 175, 2004; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.108, 2011; Hosag., Mycosphere 2(5): 712, 2012
Specimens examined: On leaves of *Glochidion ellipticum* Wight (Euphorbiaceae), Birmani, 17°53'54.8"N, 73°36'41.4"E, elev. 720 m, 14.03.2013, Bhise M.R., HCIO 51717.

17. *Asterina macrosolenae* *sp. nov.*
MycoBank No: MB 811796
Etymology: The specific epithets based on the genus of host plant.
Specimens examined: On leaves of *Macrosolen capitellatus* (Wight & Arn.) Danser (Loranthaceae), Gonoshi, 17°55'22.3"N, 73°36'00.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51777; Birmani-Bhairijogeshwari,

17°54'08.2"N, 73°36'45.8"E, elev. 704 m, 10.12.2013, Bhise M.R., HCIO 51778; Dhudhgaon, 17°50'55.7"N, 73°37'36.0"E, elev. 772 m, 14.02.2014, Bhise M.R., MHB 0587.

18. ***Asterina morellae*** Hosag., C. K. Biju & Abraham, Indian Phytopath. 54: 137, 2001; Hosag., Zoos' Print J. 21: 2328, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.123, 2011; Hosag., Mycosphere 2(5): 726, 2012.

Specimens examined: On leaves of *Garcinia indica* (Du Petit-Thou.) Choisy (Clusiaceae), Pratapgad, 17°56'10.5"N, 73°35'04.3"E, elev. 848 m, 13.12.2013, Bhise M.R., HCIO 51779; Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., MHB 0420.

19. ***Asterina myrtacearum*** Bhise & Patil, in Bhise *et al*., Phytotaxa 184 (5): 284, 2014. **MycoBank No.:** MB 809993

Specimens examined: On living leaves of *Syzygium caryophyllatum* (L.) Alst. (Myrtaceae), Renoshi forest, 17°47'43.10"N, 73°40'29.50"E, elev. 676 m, 13.03.2014, Bhise M.R., HCIO 51664 (holotype); *Syzygium cumini* (L.) Skeels, Old Mahabaleshwar, 17°57'50.44"N, 73°39'12.47"E, elev. 1339m, 18.10.2013, Bhise M.R., MHB 0313(a).

20. ***Asterina nothopegiae*** Ryan, Mem. Dept. Agric. India 15: 104, 1928; Patil & Thite, J. Shivaji Univ. 17: 152, 1977; Hosag., Balakr. & Goos, Mycotaxon 59: 182, 1996; Hosag., C. K. Biju & Abraham, J. Econ. Taxon. Bot. 25: 305, 2001; Hosag., Zoos' Print J. 18: 1280, 2003; Hosag., Zoos' Print J. 21: 2328, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.128, 2011; Hosag., Mycosphere 2(5): 732, 2012.

Specimens examined: On leaves of *Nothopegia castaneifolia* (Roth) Ding Hou. (Anacardiaceae), Par, 17°55'22.4"N, 73°36'06.2"E, elev. 745 m, 17.11.2013, Bhise M.R., HCIO 51718; Par, 17°55'22.5"N, 73°36'05.2"E, elev. 462 m, 17.02.2013, Bhise M.R., MHB0160 (b); Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., MHB0418 (b).

21. ***Asterina oxyceri*** Bhise, Patil & Salunkhe, Int. J. of Life Sciences 3(1): 73, 2015.

MycoBank No.: MB 817106

Specimens examined: On leaves of *Oxyceros rugulosus* (Thw.) Tirveng. (Rubiaceae), Hatlote, 17°51'43.6"N, 73°35'33.8"E, elev. 742 m, 06.02.2014, Bhise M.R., HCIO 51719.

22. ***Asterina piperina*** Sydow, Ann. Mycol. 15: 243, 1917; M. S. Patil & Pawar, Indian Phytopath. 42: 251, 1989; Hosag., Mycosphere 2(5): 740, 2012.

=*Asterina piperis* Yates, Philippine J. Sci. 13: 374, 1918.

Specimens examined: On leaves of *Piper trichostachyon* (Miq.) C.B.Cl. (Piperaceae), Ghonaspur, 17°48'16.5"N, 73°39'25.7"E, elev. 696 m, 13.03.2014, Bhise M.R., HCIO 51720; Mahabaleshwar, 17°56'52.4"N, 73°40'16.4"E, elev. 1409 m, 12.03.2013, Bhise M.R., MHB 0203; Kate's Point, Mahabaleshwar, 17°55'78.2"N, 73°36'26.3"E, elev. 930 m, 12.12.2013, Bhise M.R., MHB 0414; Gonoshi, 17°52'46.5"N, 73°37'26.0"E, elev. 674 m, 04.02.2014, Bhise M.R., MHB 0472.

23. ***Asterina prataparajii*** Hosag. Robin & Archana, J. Appl. Nat. Sci. 2: 93, 2010; Hosag., Mycosphere 2(5): 745, 2012.

Specimens examined: On leaves of *Tylophora dalzellii* Hook. *f*. (Asclepiadaceae), Gonoshi, 17°52'46.5"N, 73°37'26.2"E, elev. 674 m, 04.02.2014, Bhise M.R., HCIO 51721; Pratapgad, 17°56'10.3"N, 73°35'17.1"E, elev. 832 m, 10.02.2013, Bhise M.R., MHB0243; Par, 17°54'86.9"N, 73°35'96.7"E, elev. 708 m, 10.12.2013, Bhise M.R., MHB0372; Hatlote 17°5'43.6"N, 73°35'33.8"E, elev. 742 m, 06.02.2014, Bhise M.R., MHB520; Chaturbet 17°50'37.5"N, 73°38'10.1"E, elev. 686 m, 07.02.2014, Bhise M.R., MHB547.

24. ***Asterina radians*** Ellis, Journal of Mycology 7 (3): 276, 1893; Kaul & Nair, Acta Botanica Indica 11: 227-229, 1988.

Specimens examined: On leaves of *Capparis rotundifolia* Rottl. (Capparaceae), Wilson point, Mahabaleshwar, 17°55'25.1"N, 73°40'26.2"E, elev. 1326 m, 03.02.2014, Bhise M.R., HCIO 51780; Cannot pick point, Mahabaleshwar, 17°56'52.4"N, 73°40'16.4"E, elev. 1409 m, 04.02.2014, Bhise M.R., HCIO 51781; Tapola Road, Mahabaleshwar, 17°56'52.4"N, 73°40'16.4"E, elev. 1409 m, 22.03.2013, Bhise M.R., MHB 0217.

25. ***Asterina rhamni*** Kar & Ghosh, Indian Phytopath. 39: 206, 1986; Hosag., Mycosphere 2(5): 747, 2012.

Specimens examined: On leaves of *Ventilago maderaspatana* Gaertn. (Rhamnaceae), Hatlote, 17°51'43.6"N, 73°35'33.8"E, elev. 742 m, 06.02.2014, Bhise M.R., HCIO 51722; Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., MHB 0416.

26. ***Asterina rubiacearum*** Bhise, Patil & Salunkhe, Phytotaxa 511 (3): 283-288, 2021.

MycoBank No: MB 811797

Etymology: the specific epithet refers to the host plant family–Rubiaceae.

Specimens examined: On living leaves of *Canthium dicoccum* (Gaertn.) Teijsm. & Binn. var. *umbellatum* (Wight) Sant.& Merch. (Rubiaceae), Machutar-Tetawali, 17°53'98.5"N, 73°42'29.6"E, elev. 1265m, 11.12.2013, Bhise M.R., HCIO 51666 (holotype); Linghmala, 17°55'15.1"N, 73°36'59.3"E, elev. 1177 m,

22.12.2012, Bhise M.R., HCIO 51665; Kharoshi, 17°50'10.4"N, 73°38'12.8"E, elev. 628 m, 07.02.2014, Bhise M.R., HCIO 51667.

27. ***Asterina tertia*** Racib. in Theiss., Die Gattung Asterina 7:103, 1913; Sacc., Sylloge Fungorum 24: 443, 1926; Hosag. & Abraham, J. Econ. Taxon. Bot. 4: 558, 2000; Hosag., Biju & Appaiah, J. Mycopathol. Res. 43: 204, 2005; 44: 12, 2006; Hosag., Zoos' Print J. 21: 2329, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.147, 2011; Hosag., Mycosphere 2(5): 755, 2012.

Specimens examined: On leaves of *Rhinacanthus nasuta* (L.) Kurz (Acanthaceae), Ambenalighat, Mahabaleshwar, 17°53'39.9"N, 73°37'02.6"E, elev. 911 m, 17.10.2013, Bhise M.R., HCIO 51723; *Asystasia dalzelliana* Sant., Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., HCIO 51724.

28. ***Asterina trichiliae*** Doidge, Trans. Royal Soc. South Africa 8: 253, 1920. Hosag. & Goos, Mycotaxon 60: 161, 1996; Hosag., Mycosphere 2(5): 765, 2012.

Specimens examined: On leaves of *Trichilia connaroides* (Wight & Arn.) Bentv. (Meliaceae), Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., HCIO 51782; Pratapgad, 17°56'10.9"N, 73°35'09.4"E, elev. 821 m, 15.03.2014, Bhise M.R., MHB 0621.

29. ***Asterina wingfieldii*** Hosag., Balakr. & Goos, Mycotaxon 59: 184, 1996; Hosag., Mycosphere 2(5): 672, 2012.

Specimens examined: On leaves of *Grewia abutilifolia* Vent. ex A. Juss. (Tiliaceae), Gonoshi, 17°55'22.3"N, 73°36'00.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51783; Birmani, 17°53'41.4"N, 73°36'41.4"E, elev. 720 m, 14.03.2014, Bhise M.R., MHB 0593; Dudhoshi, 17°55'15.6"N, 73°36'59.2"E, elev. 734 m, 15.03.2014, Bhise M.R., MHB 0610; *Grewia serrulata* DC., Hatlote, 17°51'43.6"N, 73°35'33.8"E, elev. 687 m, 06.02.2014, Bhise M.R., HCIO 51784.

30. ***Asterina woodfordiae*** Sahni, Mycopath. Mycol. Appl. 23(4): 330, 1964; Patil & Thite, J. Shivaji Univ. 17: 152, 1977; Hosag., Mycosphere 2(5): 771, 2012.

Specimens examined: On leaves of *Woodfordia fruticosa* (L.) Kurz. (Lythraceae), Gonoshi, 17°52'46.5"N, 73°37'26.0"E, elev. 674 m, 04.02.2014, Bhise M.R., HCIO 51725; Ambenalighat, Mahabaleshwar, 17°53'39.9"N, 73°37'02.6"E, elev. 858 m, 17.10.2013, Bhise M.R., MHB 0294; Par, 17°54'86.9"N, 73°35'96.7"E, elev. 708 m, 10.12.2013, Bhise M.R., MHB 0368; Hatlote, 17°51'43.6"N, 73°35'33.8"E, elev. 742 m, 06.02.2014, Bhise M.R., MHB 0527.

31. ***Asterina wrightiae*** Sydow in Sydow & Petrak, Ann. Mycol. 29: 236, 1931; Hosag. & Abraham, Indian Phytopath. 51: 390, 1998; J. Econ. Taxon. Bot. 4: 560, 2000; Hosag., C.K. Biju & Abraham, J. Econ. Taxon. Bot. 25: 305, 2001; Hosag., Zoos' Print J. 18: 1280, 2003; Hosag., Zoos' Print J. 21: 2329, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.160, 2011; Hosag., Mycosphere 2(5): 769, 2012.

Specimens examined: On leaves of *Wrightia tinctoria* R. Br. (Apocynaceae), Kharoshi, 17°50'10.4"N, 73°38'12.8"E, elev. 628 m, 07.02.2014, Bhise M.R., HCIO 51726; Chaturbet, 17°52'01.3"N, 73°38'10.1"E, elev. 652 m, 07.02.2014, Bhise M.R., MHB0550.

Genus- *Asterostomella*

Enumeration of the species

1. ***Asterostomella flacourtiae-montanae*** V.B. Hosagoudar & A. Sabeena, in Hosag., Mycosphere 2(5): 827, 2012.

Specimens examined: On leaves of *Flacourtia indica* (Burm. f.) Merr. (=*Flacourtia montana*, Flacourtiaceae), Machutar-Tetawali, 17°54'32.5"N, 73°41'29.9"E, elev. 1306 m, 12.03.2014, Bhise M.R., HCIO 51785.

2. ***Asterostomella nothopegiae*** *sp. nov.* **MycoBank No:** MB 811798

Etymology: The specific epithets based on the genus of host plant.

Specimens examined: On leaves of *Nothopegia castaneifolia* (Roth) Ding Hou. (Anacardiaceae), Dudhoshi, 17°55'15.6"N, 73°36'59.2"E, elev. 734 m, 15.02.2014, Bhise M.R., HCIO 51727; Par, 17°55'22.3"N, 73°36'00.2"E, elev. 762 m, 17.02.2013, Bhise M.R., MHB0160 (c); Par, 17°55'22.6"N, 73°36'01.2"E, elev. 768 m 17.12.2013, Bhise M.R., MHB0305 (c); Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., MHB0418 (c).

Genus- *Asterostomula*

1. ***Asterostomula pavettae*** Hosagoudar & Sabeena in Hosag., Mycosphere 2(5): 837, 2012.

Specimens examined: On leaves of *Pavetta concanica* Bremek. (Rubiaceae), Par-Wada, 17°55'25.1"N, 73°40'26.2"E, elev. 732 m, 23.12.2012, Bhise M.R., HCIO 51786.

Family- Lembosiaceae
Genus- *Lembosia*

1. *Lembosia mahabaleshwarensis* Bhise & Patil, in Bhise *et al*., Phytotaxa 184 (5): 284, 2014. **MycoBank No.:** MB 809994

Specimens examined: On living leaves of *Syzygium rubicundum* Wight & Arn. (Myrtaceae), Par, 17°55'22.30"N, 73°36'00.20"E, elev. 762m, 17.10.2013, Bhise M.R., HCIO 51673 (holotype); Pratapgad, 17°56'10.70"N, 73°35'07.50"E, elev. 829m, 13.12.2013, Bhise M.R., HCIO 51674.

2. *Lembosia memecylicola* Hosag., J. Mycopathol. Res. 43(2): 204, 2005; Hosag., Mycosphere 2(5): 814, 2012.

Specimens examined: On leaves of *Memecylon umbellatum* Burm. f. var. *umbellatum* (Melastomataceae), Ambenalighat, Mahabaleshwar, 17°53'39.9"N, 73°37'02.6"E, elev. 858 m, 06.01.2013, Bhise M.R., HCIO 51790; Old mahabaleshwar, 17°57'50.4"N, 73°39'12.4"E, elev. 1339 m, 18.10.2013, Bhise M.R., MHB 0320; Wilson point, Mahabaleshwar, 17°55'25.3"N, 73°40'26.4"E, elev. 1331 m, 19.10.2013, Bhise M.R., MHB 0348.

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12. Singh, N. P., Lakshminarasimhan, P., Karthikeyan, S. and Prasanna, P. V. 2001. *Flora of Maharashtra State: Dicotyledones*, vol. II. Botanical Survey of India, Calcutta.

Observations on Floral Nectar and Flower visitors in *Hamelia patens* Jacq. (Rubiaceae)

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Abstract

The present paper deals with the study of flowering phenology, flower dynamics, nectar production, chemical composition and flower visitors of Hamelia patens Jacq.(Rubiaceae)

Hameliapatens is large perennial shrub or small treein the family Rubiaceae that is native to the American subtropics and tropics.The common name of this plant is firebush, hummingbird bush,scarlet bush and redhead.Flowering season of this plant is throughout the year. The flowers are bright reddish-orange or scarlet tubular.And last for 2days.Anther dehisces in the mature bud. Nectary gland present at the base of ovary. The amount of nectar and nectar concentration from flowers was recorded after every two-hour interval from 08.00hrs -17.00hrs. The average volume of nectar was found to be 1µl. The average nectar concentration was found to be 15%. Sugars from floral nectars were detected by one directional thin layer chromatography. Nectar showed the presence of three sugars sucrose glucose and fructose. Flower visitors were observed for their visits and behaviour during the flowering period. Butterflies, sun birdwasps and ants were the main flower visitors.

Key words: Hamelia patens, Nectar, Sugars, Pollinators.

Introduction

*Hamelia patens*is a large perennial shrub or small tree that is native to the American subtropics and tropics.*Hamelia. patens* belonging to family Rubiaceae .The flowers of the *H. patent* are orangish-red tubular which recruit hummingbirds and butterflies for pollination.(Welch and willam C. 2003). Tha family Rubiaceae has 10,700 species consisting treem shrub and hurbs (Robbrecht 1998). Nectary gland presentat the base ovary. Presence of nectaries is a biological character as it is related to a vital function of pollination.Pollination is successful in many plant species as consequences of pollinators seeking nectar.(Southwick*etal*, 1981).Sucrose-rich nectar present. (Faegri and Van der pijl 1980). Floral nectar provides food for insect and birds pollinators.(Baude et al 2016;Carvell et al 2006).Nectar characteristic patterns of nectar secretion and availability, flower production spatial arrangement and morphological aspects of flowers and flower -visiting birds are important in order to understand the foraging behaviour of birds on flowers (Waser, 1982; Kearns and Inouye, 1993). This phonological pattern is associated with long-lived pollinators that set fixed daily foraging routes (Gentry 1974). Bird-pollinated plants are usually characterised by having brightly colour, odourless flowers, tubular and evenly curved corollas,diurnal anthesis(Faegri and Van der Pijl 1980).Flowers produce nectar and are adapted for pollination.In *H.patens* due to bright oranges tubuler colour of flower maximum butterflies, bees and birds are attracted. Ants and house flies are robbers.

Thus, the aim of the present work was to study flowering phenology, the nectar volume (µL), nectar concentration, chemical composition of sugars and flower visitors in *Hamelia patens*.

Material and Methods

Study Area

The present study was carried out in the campus of Shri Shivaji Arts, Commerce and Science College, Akot during February to April 2021.

Flowering phenology

A cultivated population of *Hamelia patent*in college campus was chosen for observations. Flowering phenology, time of anthesis and time of anther dehiscence was recorded during the peak flowering period.

Nectar Analysis

The time of nectar secretion was noted during the peak flowering period. The amount of nectar from flowers was recorded at 2hrs intervals during the flowering period. Nectar was extracted with micro-capillary tubes. Nectar concentration was determined using a hand-held sugar refractometer (Erma Japan) from 8.00hrs to 17.00hrs for 5 days during the peak bloom. For the analysis of sugar and nectar samples preserved in isopropanol as well as fresh nectar samples were used. The sugars present in nectar were studied by using thin layer chromatography. Nectar sample was loaded on the plate along with standard sucrose, fructose and glucose keeping a comfortable distance between the loaded nectar sample and standard sugars. Later the plates were run in a solvent prepared by mixing butanol-4 parts + acetic acid 1 parts + distilled water 5 parts (4:1:5). After solvent run, the silica gel plate was allowed to dry, sprayed with 1% aniline, 1% diphenylamine and 85% Ortho-phosphoric acid prepared in 100 ml acetone.

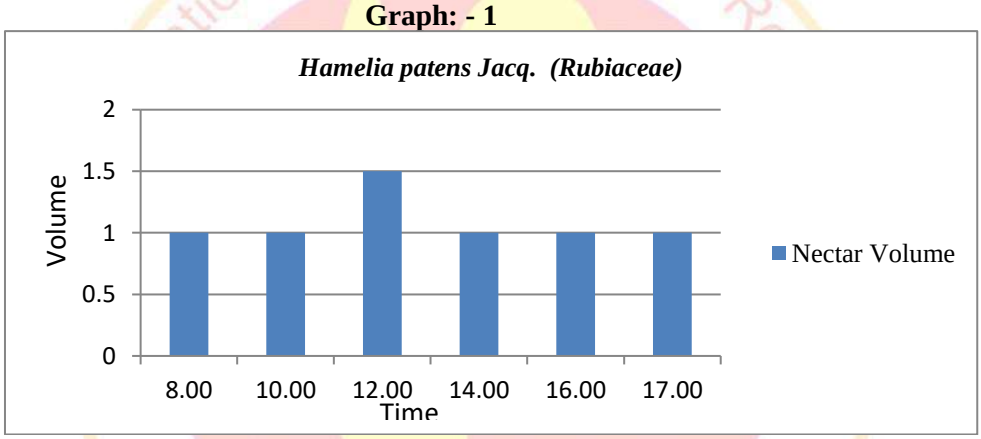
Flower Visitors

Observations were made on the type of flower visitors during the peak flowering period. The duration of visits, number of flowers was recorded at 2hrs interval.

Table 1.Nectar Volume and Nectar Concentration in*H. patens*

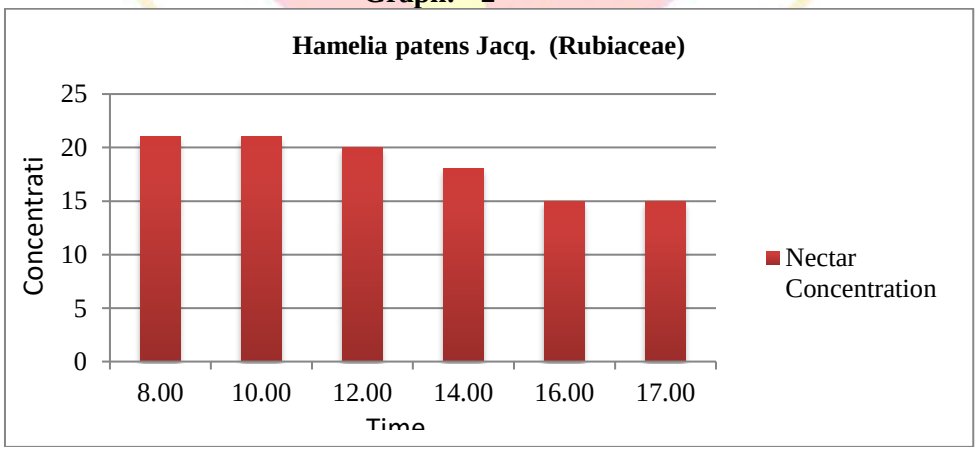
Time	Nectar Volume	Nectar Concentration
8.00	1µl	21%
10.00	1µl	21%
12.00	1.5µl	20%
14.00	1µl	18%
16.00	1µl	15%
17.00	1 µl	15%

Graph: - 1



Nectar Volume in *Hamelia patens Jacq. (Rubiaceae)*

Graph: - 2



Nectar Concentration in*Hamelia patens Jacq. (Rubiaceae)*

Table 2 : Flower visitor's census in *H.patens*

Flower visitors	Forage type	Time of visit	Flower visited
Bees and wasps	Nectar	08.00-1.00hrs	5-6
Butterflies	Nectar	08.00- 11.00hrs	2-3

Ants	Nectar	Throughout day	4-5
Sunbirds	Nectar	14.00- 16.00hrs	4-5
Houseflies	Nectar	11.00-12.00 hrs	2-3

Fig:1.Ant feeding on nectar.

Fig:2.housefly collecting nectar from flower.

Fig:3.Butterfly visiting the flower for nectar

Fig:4.Ant feeding on nectar.

Fig:5.wasp collecting nectar from flower

Result and Discussion

In *Hameliapatens*flowering period throughout years and but the peak flowering period was observed during month of April and september. However, flowering phenology quit variable and under the control of environmental conditions.The inflorescence is polychasial cyme. Flowers open daily 7.00hrs-800hrs. Anther dehiscence takes place between 11.00hrs-1200hrs in the mature bud. During the period of September-february, the flowers start to open around 03.00hrs and are fully open at 03.30hrs.The anther dehisce by longitudinal slits prior to anthesis. And anther dehisce inside the buds.(Chauhan and Galetto L. 2009).Nectar secreation begins before anthesis. The open flower produce 1.2ul nectar and fructose Glucose and sucrose sugars present in the nectar of *H. patent*(Chauhan and Galetto L.).Floral nectar is secreted by plants to attract and reward of pollinators, and it plays a key role in the functional ecology of plants (Baker and Baker, 1983; Gonzalez-Teuber and Heil, 2009). In *Hameliapatens* nectar secretion begins in the buds during morning 7.00hrs-8.00hrs. The quantity of nectar was measure on the day of flower opening at two hours intervals between 8.00hrs-17.00hrs. On an average the total amount of nectar measure during this period in each flower was 1µl (Table 1 & Graph 1). Maximum nectar production occurred during 12.00hrs-15.00hrs.The average nectar concentration was found 18.33% during the peak flowering period (Table 1 & Graph 2).Galetto(1998) made similar observations in H. patentconcentration of nectar 16% and later between 20-25%. The three nectar sugars fructose glucose and sucrose were identified. Sucrose present in abundant amount. Sucrose-rich nectar is present. (Faegri and Van der pijl 1980). The flowers are nectar-rich, orange colour and tubular serve as strong visual cues to attract the butterflies bees and Ants. The present observations showed that in *H. patens* butterflies bees and ants were the main pollinators. Among the peak flowering period observed in the study, in

morning between 07.00hrs -11.00hrs had greater number of pollinator visits per bout.Coloured butterflies and ants visited the flower throughout the day. Most of the bees and wasps visited in between8hrs-1.00hrs.Houseflies visited in between 11.00-12.00hrs. (Table 2).Thomas et,al (1986) studied the interaction between the butterflies and hummingbirds in *Hameliapatens*. While sunbirds are seen in the afternoon between 15.00hrs-17.00hrs. It is interesting observed that the butterflies visit in the morning hours 08.00hrs-11.00hrs. (Chauhan and Galetto L. 2009).

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In vitro evaluation of cytotoxic activity of *Curcuma inodora* Blatt. Rhizomeagainst (Miapaca-2) human pancreatic carcinoma cell line

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Abstract:

To determine the in vitro cytotoxic activity of Curcuma inodoraBlatt.,crude aqueous extract of rhizome against thehuman pancreatic carcinoma cell lines (MiaPaca-2). The cytotoxic activity was evaluated by the tetrazolium salt reduction assay (MTT)at different concentrations(10, 20, 30, 40 and 50µg/ml) of aqueous extract of rhizome for 48 hrs. with standard positive control chemotherapeutic agent viz. 5-Flurouracil.The aqueous extracts showed growth inhibition 26.24 ± 1.81 at highest 50µg/ml. IC_{50} for the 5-FU standard control was 25.9 ±0.68µg/ml. Crude aqueous extract of rhizome Curcuma inodoraproduced IC_{50} value 97.58 ± 2.45 µg/ml.Rhizome aqueous extract of Curcuma inodorashowed a significant reduction in growth of cancerous cells indicate the potential of anti-proliferative growth.

Keywords: *Curcuma inodora, rhizome, Cytotoxicity, Pancreatic cancer cells, MTT assay, 5-Flurouracil.*

Introduction:

Pancreatic cancer (PC) is a highly invasive human malignancy globally with an extreme poor prognosis (Siegel *et al*., 2016). Pancreatic cancer is seventh leading cause of cancer related death all over the world. However, mortality rate of pancreatic cancer are not completely clear. For the majority of concerning PC sufferers, the only therapeutic promise is cytostatic remedy using standard chemotherapeutic drugs such as gemcitabine and 5-FU (5-fluorouracil) or their combination (Michl and Gress, 2013). However, the median progress time of PC sufferers is only about 6 months usually due to an almost complete chemotherapy resistance, and the dismal 5-year survival is currently approximately 2% (Ramfidis*et al*.,2014) Therefore, there may be a great need for each new biomarkers with prognostic and predictive value and newer therapeutic preferences for this disease. MIA PaCa-2 cell line is a prime tumor currently used in vitro models to observe pancreatic carcinogenesis. Wild plants in nature have bioactive phytochemicals that have anti-carcinogenic property.

Curcuma inodora Blatt. belongs to family-Zingiberaceae, commonly known as scentless turmeric. Traditionally, it is used in the treatment of muscular pain, psychosomatic disorders and constipation. Scentless turmeric is used by the tribal as a hair tonic and to cure wound. Tribal uses of *Curcuma inodora* gives an importance to this plant to scientific community and no scientific literature is available to explore the use of anticancer effect of *Curcuma inodora*. Therefore, the aim of this research was to determine the cytotoxic assay in vitro effect of crude aqueous extract of *Curcuma inodora* rhizome.

MATERIALS AND METHODS:

Selection and Collection of Plant: *Curcuma inodora*rhizomes were collected from Melghat region of Amravati District in the month of June to September (Fig.1).

Identification and Authentication of plants: *Curcuma inodora* identification carried out using different

Fig.1. a)*Curcuma inodora* habitat **b)** Rhizome

methods with the help of standard floras (Sharma *et al*., 1996; Dhore, 2002) and authenticated by Taxonomist Dr. S.P. Rothe Professor and Head Department of Botany, Shri. Shivaji Science College, Akola.

Preparation of test solution: Rhizome 1 gm powder crushed in mortar and pestle by adding 10 ml. DW, then centrifuge at 4000 rpm for 10 min. Supernatant concentrations (10-50 µg/ml) prepared by serial dilution method.

In-vitro Cytotoxic Activity Assay: The human pancreatic carcinoma cells (MiaPaCa-2) wereprocure from the National Centre for Cell Sciences (NCCS), Pune, and Maharashtra. Cells were grow in Dulbecco's minimum essential medium (DMEM).MiaPaCa-2 cells were maintain at 37°C, 5% CO_2, in a 90% humidified atmosphere in CO_2 incubator (Galaxy Make). Cells were pass after every 5th days. Experimentation carried out in 96 well Microtiter plates. The cytotoxic activity was measured using MTT (3-(4,5dimethylthiazol- 2-yl)-2,5-diphenyltetrazolium bromide) assay Berridge MV- A new class of cell surface antigens. Quantitative absorption studies defining cell-lineage-specific antigens on hemopoietic cells.Briefly, 2 X 10^4cells/well were seeded in 96-well microliter plates.

Cell Treatment Procedure: Cells were treated with various working concentrations (10-50 µg/ml) of aqueous extract of rhizome and standard anticancer drug i.e. 5-Fluorouracil (5-FU) (10-50 µg/ml) for 48 hours. At the end of incubation period, the medium was replaced by 150µl fresh medium and 50 µl MTT (1mg/mL) was added to each well, followed by an incubation period for a further 4 hours at 37^{0}C. Later, 150 µl of DMSO added to each well for solubilization of the formazan products. Absorbance was taken at 630 nm using a Bio-Tek microplate reader. The percent cell cytotoxicity calculated by using the following formula.

$$\% \text{ Cytotoxity} = \frac{(\text{Absorbance of control sample} - \text{Absorbance of treated sample})}{Absorbance\ of\ control\ sample} X100$$

Statistical Analysis: The results presented as means ± SD of three independent experiments. Statistical differences among means were determined by one way ANOVA. Differences were considered significant at P<0.05. The IC_{50} values were calculated using Graph Pad Prism 5.0 (Graph Pad Software Inc., San Diego, CA). Every experiment included a set of negative controls (untreated cultures) and positive control treated with 5-Flurouracil.

Results And Discussions:

The results for cell growth inhibition by aqueous extracts of the rhizome against MIAPaCa-2 cell lines at 10-50µg/ml concentrations tabulated in Table 1 and graphically represented in Fig. 2. Aqueous extract of rhizome tested *in vitro* for their potential human cancer growth inhibitory effect on MIAPaCa-2 cancer cell lines at various concentrations ranging from 10-50µg/ml. Results obtained that aqueous extract inhibited the growth of cells in concentration dependent manner and showed the positive inhibitory effect on cell growth (Table 1 and Fig. 1). The aqueous extracts showed growth inhibition 26.24±1.81% at highest concentration of 50 µg/ml (Table 1). However, deviation seen when IC_{50} value was calculated. From the figure, it was found that the IC_{50} value with 97.58 ± 2.45 µg/mlrecorded in aqueous extract showed a significant reduction in growth of cancerous cells indicating the potential of anti-proliferative growth (Table 1, Fig.2). IC_{50} for the 5-FU standard. Control showed 25.9 ±0.68µg/ml. inhibition.

Table 1: Effect of aqueous extract of *Curcuma inodora*rhizome on growth of MIAPaCa-2 cell line after the incubation for 48 hrs.

Concentration (µg/ml)	% Inhibition	
	AQ	**5-FU**
Control	0	0
10	4.72 ± 4.16	43.02 ±1.00
20	10.76 ± 1.20	45.78 ± 0.10
30	14.69 ± 2.27	51.02 ± 0.36
40	19.42 ± 1.20	59.37 ± 0.72
50	26.24 ± 1.81	61.07 ± 0.52
IC_{50}	**97.58 ± 2.45**	**25.9 ± 0.68**

*Results represented as an average of three± replicates
[**AQ**-Aqueous extract; 5-FU- 5-Flurouracil]

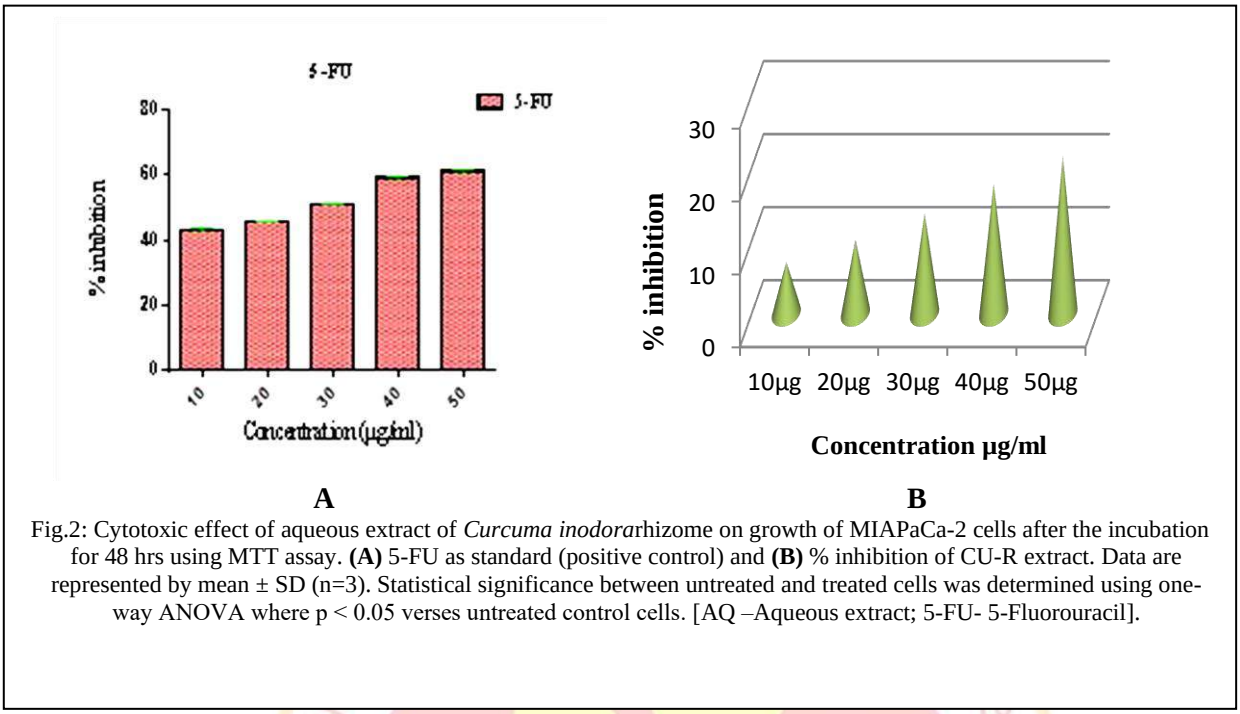

Fig.2: Cytotoxic effect of aqueous extract of *Curcuma inodora*rhizome on growth of MIAPaCa-2 cells after the incubation for 48 hrs using MTT assay. **(A)** 5-FU as standard (positive control) and **(B)** % inhibition of CU-R extract. Data are represented by mean ± SD (n=3). Statistical significance between untreated and treated cells was determined using one-way ANOVA where $p < 0.05$ verses untreated control cells. [AQ –Aqueous extract; 5-FU- 5-Fluorouracil].

The cytotoxicity assay is based on the capacity of mitochondria succinate dehydrogenase enzymes in living cells to reduce the yellow water soluble substrate tetrazolium salt 3-(4,5 dimethyl thiazol-2-yl)-2-5-diphenyl tetrazolium bromide (MTT) into a blue colored i.e. formazan crystals which is measured by spectrophotometer (Masters, 2000; Mosmann, 1983). Since reduction of MTT can only occur in metabolically active cells, the level of activity is a measure of the viability of the cells. The number of cells was found to be proportional to the extent of formazan production by the cells used (Francis and Rita, 1986).

MTT proliferation assay was carried out to determine the growth rate of cells. In the present study, the aqueous extract of *Curcuma inodora*rhizome has indicated significant growth inhibition on Miapaca-2 cell line. The aqueous extract treatment on Miapaca-2 cells lines showed significant decrease in growth rate compared with control. The qualitative phytochemical analysis of aqueous extract of *Curcuma inodora*rhizome detected the presence of carbohydrate and glycosides, protein and amino acids, alkaloids, phenolic compounds & flavonoids, phytosterols, saponins and terpenoids (Ghurde, 2018). Besides this polyphenol, curcumin has anti-inflammatory and anti-cancer properties, modulating the epigenetic alterations typically associated with cancer (Mazidi et al. 2016). Which could be responsible for anti-carcinogenic property. Flavonoids found to possess anti-mutagenic and anti-malignant effects (Masmaan, 1983). Moreover, it has protective effect against cancer by their effect on signal transduction in cell proliferation and angiogenesis.

Conclusions:

The present study revealed that the aqueous extract of *Curcuma inodora* Blatt. rhizome was found to be cytotoxic towards human pancreatic cancer cell line in MTT assay. The 50% cytotoxic effect (IC_{50}) of aqueous rhizome extract of *Curcuma inodora* found to be 97.58 ± 2.45µg/mlmay be due to thebioactive compounds. Hence, present study shows the positive efficacy of rhizome for cytotoxicity towards MIA PaCa-2 cells thus suggesting scientific community to carry out further after animal experimentation to evaluate the potentialtherapeutic agent in pancreatic cancer treatment.

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In vitro anthelmintic activity and phytochemical analysis of Crude Extracts of Aerial Parts of *Tridax procumbens* (L.) against *Pheretima posthuma.*

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Abstract –
The aim of the present study was to evaluate the anthelmintic activity of different extract of Aerial Parts of Tridax procumbens(L.) against Pheretima posthuma. as test worms. The time of paralysis and time of death were studied and the activity was compared with Albendazole as reference standard. The methanolic extract exhibited significant anthelmintic activity as evidenced by decreased paralyzing time and death time. The results thus support the use of Tridax procumbens (L.) as an anthelmintic agent.
Keywords: *Anthelmintic activity,* Pheretima posthuma, *piperazine citrate, Tridax procumbens (L.) Albendazole,*

Introduction-

Traditional knowledge, specific for particular society and community, it become a part of its cultural identity. All these information are unique for every society. in use and majority are still being used by the members of the society. It embraces information on the use of biological and other materials for medical treatment and agriculture, production processes. Use of plant as a source of medicine has been inherited and is an important component of the health care system in India. Herbal medicine claimed for the treatment of parasitic diseases in human and even animals. Helminthes are parasitic worms; which are among the most widespread prevalence in human as well as livestock. Helminthiasis is being endemic**.** It is found that about half (50%) of world population suffer from the Helminthiasis and the numbers are increasing day by day **(Sirama *et al.*, 2015).** According to World Health Organization (WHO) parasitic worm infection are more than (1.5) billion that is (24%) of world population **World Health Organization (2017).**

Few number of Anthelmintics drugs are available in the market, Benzimidazoles (BZD) is the past ones primes anthelmintics commonly called as 'White' dewormers. This class involved ; albendazole, fenbendazole, and oxfendazole, Piperazine citrate, livamizole, morantel and pyrental are chemical dewormers. The common side effects include nausea, vomiting, stomach and abdominal pain, headache, dizziness or temporary hair loss (**Saliha Siddiqui and Kalpana Patni 2018.).** Chemical control of helminthes coupled with improved management has been the important worm control strategy throughout the world. However, increasing problems of development of resistance in helminthes against anthelmintics have lead to the proposal of screening medicinal plants for their anthelmintic activity. Many researchers are screening the traditional herbal system in search of the anthelmintic herbal constituents which overcome all the problems of synthetic drugs. The present study was aim to investigate the "**Anthelmintic Activity**" of plants ***Tridax procumbens* (L.)**. It is a small attempt to find out traditional alternatives to helminthiasis

Materials and methods

Collection of plant materials

The aerial parts of *Tridax procumbens* (L.) were collected from the campus of Govt. Vidarbha Institute of Science and Humanities, Amravati India . Identification was done with the help of standard floras. The plant was identified and authenticated and the voucher specimen was preserved in the Herbarium of Department of Botany.

Preparations of extracts

The crude extract was prepared by crude maceration technique. In the process of maceration, the powdered solid material is placed in a closed vessel (to prevent evaporation) and the chosen solvents were added. When the solvent is water and the period of maceration is long, a small quantity of chloroform added to prevent microbial growth.

Crude aqueous, methanol, acetone and petroleum ether extract of powdered plant were prepared, Briefly, 25gm of grind/ powdered plant material was soaked in sufficient quantity (100 ml.) of aqueous, methanol, acetone and petroleum ether separately for continuous 7 days and the filtered off by a piece of porous cloth and then filter paper. Following extraction, the liquids were concentrated to remove traces of solvents and the process was repeated for two times. The solvent from total extract was distilled off and concentrate was evaporated water bath to syrupy consistency and the evaporated to dryness. This extract was stored at 40 c until use. The crude extract (as much as needed) was dissolved in distilled water on the day of the experiment to prepare stock solution and different dilutions for the purpose of evaluating anthelmintic activity.

Anthelmintic assay: Aqueous, methanolic and acetone extracts from the plants were investigated for their anthelmintic activity against *Pheretima posthuma*. Various concentrations (10, 25 and 50 mg/ml) of each extracts were tested in the bioassay, which involved determination of time of paralysis and time of the death of the worms. The anthelmintic assay was carried as per the method of Ajaiyeoba *et al.*, (2001). with minor modifications.

In the experiment, six groups of six earthworms were released into 25ml of solutions of Albendazole, aqueous, methanolic and acetone extracts of *Tridax procumbens* (L.) (25, 50 and 100mg/ml each) in distilled water. The remaining groups were treated for different concentrations. Albendazole was used as reference standard while distilled water as control. All drug and extract solutions were freshly prepared before starting the experiment. Observations were made for the time taken to paralysis and death of individual worms. Time for paralysis was noted when the movement of any sort could be observed except when the worms were shaken vigorously. Death was concluded when the worms lost their motility followed with fading away of their body colors.

Results and Discussions

Tridax procumbens (L.) is a well known medicinal plant and is widely used in folk ayurvedic system of medicine. In the present study solvents namely methanol, acetone, petroleum ether and aqueous, were used sequentially for crude extraction of *Tridex procumbens* (L.) whole plant. To justify the ethnomedical claims of the plant.

Anthelmintic activity of *Tridax procumbens* (L.)

Table -1: Anthelmintic Activity of *Tridex procumbens* (L.)

Test Sample *(Tridex)*	Conc. (mg/ml)	*P. posthuma* Time taken for Paralysis (in min.)	*P. posthuma* Time taken for Death (in min.)
Methanol	10	114.5 ± 10.6	125 ± 8.48
	30	72.5 ± 9.19	84 ± 12.7
	50	64 ± 14.1	78.5 ± 10.6
Acetone	10	129.5 ± 12.0	145 ± 16.9
	30	100 ± 5.65	124.5 ± 6.36
	50	81 ± 5.6	90 ± 9.89
Petroleum ether	10	164.5 ± 19.0	184.5 ± 14.8
	30	100.5 ± 14.0	120 ± 15.5
	50	87 ± 5.65	109 ± 11.3
Aqueous	10	166 ± 5.65	183.5 ± 9.19
	30	100.5 ± 19.0	130.5 ± 12.0
	50	94.5 ± 13.4	122 ± 12.7
Albendazole	10	401.5 ± 4.94	418 ± 8.48
	30	381.5 ± 4.9	395 ± 5.65
	50	367 ± 8.48	389 ± 2.82

Table-1: showed that Methanolicextract of ***Tridax procumbens(L.)*** significant anthelmintic activity against **'*Pheretima posthuma'*.** Methanolic extract also proved to be efficient than the standard drug.

The **Methanolic** extract of concentration **(10, 30, 50 mg/ml)** showed the paralysis time 114.5 , 72.5 , 64 min. and death time at 125 , 84 , 78min. respectively. Methanolic extract at 50 mg/ml showed efficient paralysis effect (64 min.) than other treated groups whereas methanolic extract 50 mg/ml showed significant anthelmintic activity with death time of (78 min.). Standard drug (10, 30, 50 mg/ml) showed paralysis time 401.5, 381.5, 367 min and death time was 418, 395, 389 min. respectively. This investigation revealed that methanolic extract of *T. procumbens (L.)* showed significant anthelmintic activity against *Pheretima posthumaand* also proved to be efficient than the standard drug.

The **Acetone** extract of concentration **(10, 30, 50 mg/ml)** showed the paralysis time 129.5, 100, 81min. and death time at 145, 124, 90 min. respectively. Acetone extract at 50 mg/ml showed efficient paralysis effect (81min.) than other treated groups whereas acetone extract 50 mg/ml showed significant anthelmintic activity with death time of (90min.). Standard drug (10, 30, 50 mg/ml) showed paralysis time 401.5, 381.5, 367min. and death time was 418, 395, 389 min. respectively. This investigation revealed that acetone extract of *Tridex*

procumbens (L.) showed significant anthelmintic activity against *Pheretima posthuma*. Acetone extract also proved to be efficient than the standard drug.

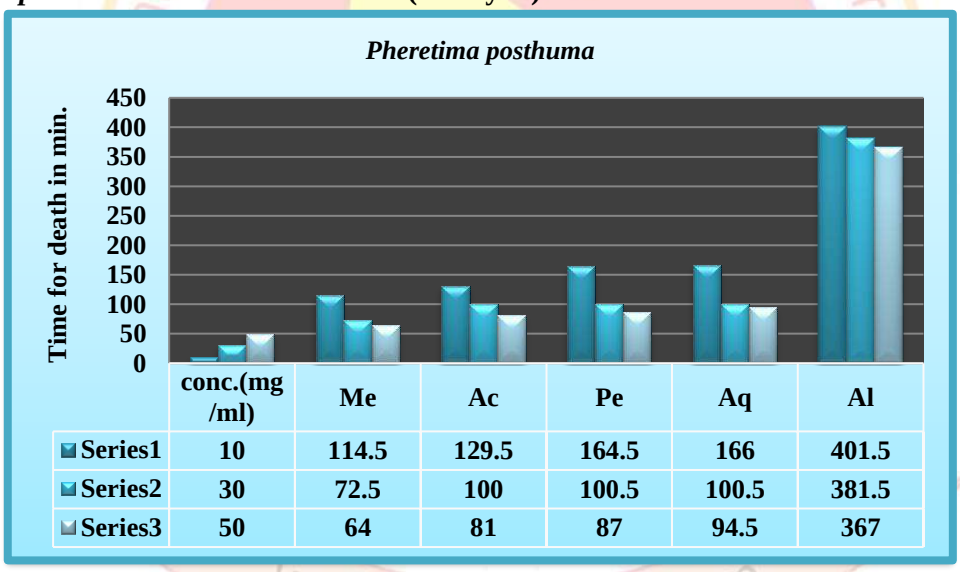
The **Petroleum ether** extract of concentration **(10, 30, 50 mg/ml)** showed the paralysis time 164.5, 100.5, 87 min. and death time at 184.5, 120, 90 min. respectively. Petroleum ether extract at 50 mg/ml showed efficient paralysis effect (87 min.) than other treated groups whereas petroleum ether extract 50 mg/ml showed significant anthelmintic activity with death time of (90min.). Standard drug (10, 30, 50 mg/ml) showed paralysis time 401.5, 381.5, 367 min and death time was 418, 395, 389 min. respectively. This investigation revealed that petroleum ether extract of *T. procumbens* (L.) showed significant anthelmintic activity against *Pheretima posthuma.* Petroleum ether also proved to be efficient than the standard drug.

The **Aqueous** extract of concentration **(10, 30, 50 mg/ml)** showed the paralysis time min. and death time at min. respectively. Aqueous extract at 50 mg/ml showed efficient paralysis effect (166, 100.5, 94.5min.) than other treated groups whereas aqueous extract 50 mg/ml showed significant anthelmintic activity with death time of (94.5min.). Standard drug (10, 30, 50 mg/ml) showed paralysis time 401.5, 381.5, 367 min and death time was 418, 395, 389 min. respectively. This investigation revealed that aqueous extract of *T. procumbens* (L.) showed significant anthelmintic activity against *Pheretima posthuma. Aqueous* extract also proved to be efficient than the standard drug.

When **Albendazole** use as a standard drug extract of ***Tridex procumbens* (L.)** plant of concentration **(10, 30, 50 mg/ml)** showed **paralysis** at **401, 381, 367 min.** and **death** at **418, 395, 389 min.** Respectively.

From the above result, it is clear that the Methanol, Acetone, Petroleum Ether, and Aqueous extracts of plant *Tridex procumbens* (L.) have significant anthelmintic activity in dose dependent manner when compared with standard anthelmintic drug. It reveals that the methanolic extracts of ***T. procumbnens*** plant took the less time to cause paralysis and death of the earthworm than that of acetone, petroleum ether, aqueous and albendazole standard drug**. (Methanl<Acetone<Petrolium ether<Aqueous)**

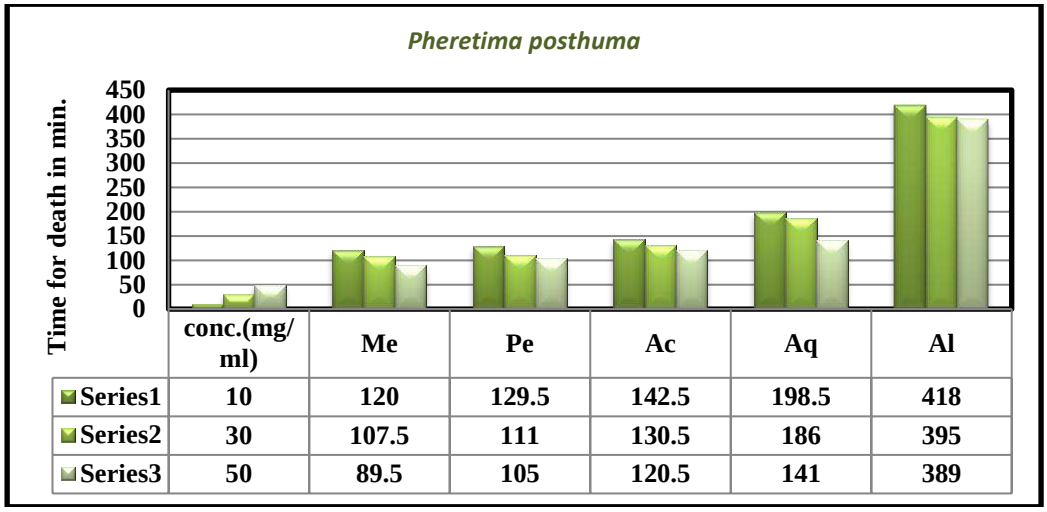
Fig-1. *Pheretima posthuma* showed the time for (Paralysis)



	conc.(mg /ml)	Me	Ac	Pe	Aq	Al
Series1	10	114.5	129.5	164.5	166	401.5
Series2	30	72.5	100	100.5	100.5	381.5
Series3	50	64	81	87	94.5	367

Where, Me: Methanol, Ac: Acetone, Pe: Petroleum Ether, Aq: Aqueous, Alb: Albendazole Respectively.

Fig. 2 :*Pheretimaposthuma*showed the time for (Death)



	conc.(mg/ml)	Me	Pe	Ac	Aq	Al
Series1	10	120	129.5	142.5	198.5	418
Series2	30	107.5	111	130.5	186	395
Series3	50	89.5	105	120.5	141	389

Where,Me: Methanol, Ac: Acetone, Pe: Petroleum Ether, Aq: Aqueous, Alb: Albendazole Respectively.

PHYTOCHEMISTRY:

Table -3 Preliminary Phytochemical Screening of *Tridax procumbens* (L.)

Tests	Aq. Extract	Alcoholic Extract
Test for Carbohydrate		
a) Molisch test	+	-
b) Benedict test	+	+
c) Fehlings test	+	+
d) Iodine test	-	-
e) Barfoeds test	+	-
f) Salwinoffs test	-	-
Test for Proteins		
a) Xanthoprotein test	-	-
b) Biuret test	-	-
c) Lead acetate	-	-
d) Millon test	-	-
e) Precipitation test	-	+
Test for Amino acid		
a) Ninhydrin test	-	-
b) Tyrosin test	-	-
c) Cysteine test	-	-
Test for Alkaloids		
a) Dragondroffs test	-	+
b) Modified dragondroffs test	-	+
c) Mayer test		
d) Hagers test	+	+
e) Wagners test	+	+
f) Krauts test	-	+
	-	-
Test for Glycosides(general)		
a) Saponin glycosides	+	+
b) Baljet test	+	-
	+	-
Test for Flavonoids		
a)alkali test	-	-
c) Lead acetate	-	-
d) Shinoda test	+	-
Test for Tannins		
a) Ferric chloride test	-	+
b) Dil. Iodine test	+	-

Test for Fatty oils	-	-

The qualitative phytochemicals analysis aqueous extract of *Tridax procumbens* (L.) showed the presence of carbohydrate, alkaloids, glycosides, flavonoids, tannins and saponins while proteins, amino acids fatty oils are completely absent. In alcoholic extract of carbohydrates, alkaloids, glycosides, and tannins are present and proteins, amino acid, flavonoids and fatty oils are completely absent. **(Table -3).**

From the above result, it is clear that the Methanol, Petroleum Ether, Acetone and Aqueous extracts *Tridax procumbens* (L.) have significant anthelmintic activity in dose dependent manner when compared with standard anthelmintic drug. It reveals that the Methanolic extracts took the less time to cause paralysis and death of the earthworm than that of acetone, petroleum ether, aqueous and albendazole. Standard.Tannis, Glycosides are known to interfere with energy generation in helminth by uncoupling oxidative phosphorylation **(Anthnasiadou *et al.*, 2001). Willam *et al.*, (2014)** reported that plant derived tannin have a definite anthelmintic effect on human intestinal parasite. Thus, these chemicals may responsible for the anthelmintic activity of the plants. Hence, it can be thought about the herbs as alternative source of anthelmintic drugs, further isolation of active constituents responsible for anthelmintic activity is needed, which would be responsible for **'Anthelmintic Activity'** and to possible mechanism of action.

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Plant Diversity of Village Pimpalgaon Chilamkha Tq. Deulgaon Raja Dist. Buldhana (MS)

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Abstract

*We have inherited a rich plant diversity with a high proportion of endemic elements. We are grateful to small, mid-sized or lofty trees who oblige us during their lifetime with oxygen,shade,food,fibre,fruits, timber and medicine. One of the major challenges of our country today is the management of plant specially tree diversity development. In a decades of years a number of very small trees have been planted in our campus. Keeping this in view, we have undertaken documentation of trees of our biodiversity rich village PimpalgaonChilmkha for the first time and we also propose to establish conservation strategies in future for tree(s). The total number of trees recorded in the village PimpalgaonChilmkha, 36 families, 48 genera and 50 species. The family Anonaceae was represented by maximum number of 110 tree genera.The genus Ficushas been represented by maximum number of 06 tree species viz. F. religiosa , F. benghalensis.*F. racemosa*. The medicinally important manyplants like Azadirachtaindica,Eucalyptus citriodora,Aloe vera,Ocimumgratissimumarepresent in village PimpalgaonChilmkha. Polyalthialongifoliais grown as ornamental or avenue tree and is represented by 110 plants followed by Albizzialebbek. As like as many ornamental plants are also present in this village.*

***Key Words**: Systematic Enumeration ,Tree Biodiversity, Village Pimpalgaon Chilmkha Tq.Deulgaon Raja*

Introduction

Ethnobotany deals with the study and evaluation of plant-human relations in all phases and the effect of plant environment on human society. Ethnobotany is considered as a branch of ethnobiology. The term "Ethnobotany" was coined by J. W. Harshberger in 1895 to indicate plants used by the aboriginals: From "ethno"-study of people and "botany" study of the plants. Ethnobotany is the study of how people of a particular culture and region make of use of indigenous plants. Ethnobotanists explore how plants are used for such things as food, shelter, medicine, clothing, hunting, and religious ceremonies. The plants growing in their natural habitat serve as raw material for industries and other local uses. Keeping these facts in view, it was undertaken to prepare an accurate and up to date inventory of trees growing in sprawling Village PimpalgaonChilmkhaTq.Deulgaon Raja is located in Buldhana district and boundryof the Vidarbha, of Maharashtra State. Deulgaon Raja is 80 Km away from district place and 90 Km also from Aurangabad. Deulgaon Raja is located in the northern part of Maharashtra. The 70% of the population is rural. The mainoccupations of these people are dairy, farming and agriculture. The famous salt water Lonar Crater is situated in this district, 90 kms from here. And, The RajmataJijabai's father LakhujiJadhav's native place is located at Sindkhed Raja which is important historical place in district also. The major crop of this district is cotton, jawar and groundnut. Several taxonomists and ethnobotanists continued to survey many areas of Maharashtra, Addition to Maharashtra Flora Vol.I (Singh N.P. &Karthikeyan S. 2000), Flora of Buldhana District (Diwakar P.G. & Sharma B.D. 2000). Saxton and Sedgwick (1918),The ethnobotanical and floristic work, were carried out by Saxton, W. T. and Sedgwick, L. J. (1918). Author also observed plant diversity of nearest college Shri Vyankatesh Arts, Com. & Science College Campus Deulgaon Raja(Mahendra S. Salve &Nilesh P. Kakde, 2017). Earlier the works were carried out ethnobotanical, medicinal and floristic aspects of plants by a good number of workers.The present research report iscarried out in Village PimpalgaonChilmkhaTq.Deulgaon Raja Dist. Buldhana (MS) to explore the diversity of plants.

Objectives of The Study

The main aim of the survey was to collect information about the vegetation of plant species which are used by local people for various purpose and also the species are identified and documented by collecting samples of plant species. Survey were made for collection of plants their identification, followed by Botanical name, Family, Habitat, Uses and Propagation. The campus was visited for the collection of medicinal plants, their digital photographs were also taken. The identification was also done based on literature study (Hooker,1875).

Materials And Methods

The field study was carried out during session 2021-2022 in the Village PimpalgaonChilmkhaTq.Deulgaon Raja Dist. Buldhana(MS). Description of habitat, material and methods as well as the methods of sample collection and identification have been described elsewhere (Bimal et al., 1991).

Table No.1: Plants diversity of Village PimpalgaonChilmkhaTq.Deulgaon Raja

Sr. No.	Tree Name	Family	Marathi Name
1	*Azadirachtaindica*	Meliaceae	Kaduneem
2	*Ficusreligiosa*	Moraceae	Pimpal
3	*Ficusbenghalensis*	Moraceae	Vad
4	*Ficusracemosa*	Moraceae	Umbar
5	*Ricinuscommunis*	Euphorbiaceae	Erand
6	*Emblicaofficinalis*	Euphorbiaceae	Awla
7	*Mangiferaindica*	Anacardiaceae	Aamba
8	*Cassia fistula*	Caesalpiniaceae	Bahawa
9	*Delonixregia*	Caesalpiniaceae	Gul Mohor
10	*Cathranthusroseus*	Caesalpiniaceae	Sadaphuli
11	*Albizzialebbek*	Mimosaceae	Siras
12	*Polyalthialongifolia*	Anonaceae	Ashok
13	*Alstoniascholaris*	Apocynaceae	Saptparni
14	*Neriumindicum*	Apocynaceae	Kanher
15	*Murrayakoenigii*	*Rutaceae*	Kadhipatta
16	*Citrus aurantifolia*	Rutaceae	Limbooni
17	*Hibiscus rosasinensis*	Malvaceae	Jaswand
18	*Bryophyllumpinnatum*	Crassulaceae	Panphuti
19	*Piper betle*	Piperaceae	Nagwel
20	*Ocimumgratissimum*	Lamiaceae	Ran Tulasi
21	*Aloe vera*	Liliaceae	Korphad
22	*Jasminumofficinale*	Oleaceae.	Chameli
23	*Jasminumsambac*	*Oleaceae*	Mogara
24	*Jasminummutiflorum*	Oleaceae	Kunda
25	*Dalbergiasissoo*	Papilionaceae	Shisam
26	*Prunusamygdalus*	Rosaceae	Badam
27	*Terminalia arjuna*	Combretaceae	Arjun
28	*Eucalyptus citriodora*	Myrtaceae	Nilgiri
29	*Zizyphus145ujube*	Rhamnaceae	Bor
30	*Micheliachampaca*	Magnoliaceae	Chafa
31	*American palm*	Arecaceae	Palm tree
32	*Moringaoleifera*	Brassicaceae	Shewaga
33	*Cupressussampervirens*	Cupressaceae	Saru
34	*Opuntiaficus*	Cactaceae	Niwdung
35	*Cereus peruvianus*	Cactaceae	Niwdung
36	*Bamboosa bamboo*	Poaceae	Bamboo
37	*Coccus nucifera*	Palmaceae	Nariyal
38	*Pongamiapinnata*	Fabaceae	Karanj
39	*Clitoriaternatea*	Fabaceae	Gokarn
40	*Abrusprecatorius*	Fabaceae	Gunj
41	*Mimosa pudica*	Fabaceae	Lajalu
42	*Spilanthesacmella*	Asteraceae	Akkalkadha
43	*Embeliaribes*	Primulaceae	Wavding
44	*Bougainvillea glabra*	*Nyctaginaceae*	BoganWel
45	*Dhaturainoxia*	Solanaceae	Dhotara
46	*Solanumtorvum*	Solanaceae	Ranwange
47	*Punicagranatum*	Lythraceae	Dalimb
48	*Musa acuminata*	Musaceae	Keli
49	*Canna indica*	Cannaceae	Kardali
50	*Cissusquadrangularis*	Vitaceae	Kandwel

Results

Floristic studies are important to understand the tree wealth as well as their biology (Panda et al., 2014) and also play an important role in developing the aesthetic values as well as ecosystem services. The present

paper is based on preliminary surveyerand serves as biodiversity data bank for biological and biotechnological applications (Uniyal and Singh, 2014). Further, it provides information related to the plant resources which is necessary for any conservation and management practices. On the basis of field survey of plant diversity in Village PimpalgaonChilmkhaTq.Deulgaon Raja, the preliminary data recorded such as botanical name of tree identified and tree count etc. It is resulted that36 families, 48 genera and 50 species showed their presence in the campus which were collected, identified and listed in Table No. 1. The inventory of tree wealth of the village shall provide the ground work for further studies.

Discussion

The data shows that maximum plant species are family Anonaceae similar result have also reported by Tirkey (2006). From these some are medicinal plant species in Village PimpalgaonChilmkhaTq.Deulgaon Raja. Similarly Ayyanar and Ignacimuthu (2005) also reported medicinal importance of plants. These plant species have Antibacterial, Insecticidal, Antiseptic, Analgestic properties and they are useful in treatment of various skin diseases,allergic reactions and diarrhea treatment. Similarly Thakur et al (1989), Jain, et al (2006), Kala (2009) have also reported antihelmintic, anticancerous, antitumour, antirheumatic, antiasthmatic and antidiarrhoeal activities of various plants .

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Phytochemical Screening and Qualitative Analysis of Medicinal Plants *Shorea robusta Gaertn*.

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Abstract

Since ancient time, Medicinal plants have been a major source of therapeutic agents to cure human diseases. Ayurveda, the traditional system of medicine using medicinal plant is highly regarded as the mother of all medical sciences. Herbal medicines are more popular than modern medicine because of their effectiveness, easy availability, low cost and for being comparatively devoid of side effects. Shorea robusta belonging to Dipterocarpaceae family is an important medicinal plant used in various Indian system of medicine. The present study was done for the qualitative analysis for primary metabolites and secondary metabolites of Shorea robusta Gaertn. F.. In this regards the phytochemical analysis of leaves extract of Shorea robusta Gaertn. Fwas done in both extract i.e, alcoholic (both ethanolic and methanolic) as well as aqueous extract. Qualitative phytochemical analysis was performed for the test of primary metabolites include protein and carbohydrate whereas secondary metabolites were phenol and tannins, flavonoids, saponins, glycosides, steroids, phlobatannins, alkaloids and terpenoids with the help of standard protocol. The qualitative phytochemical analysis revealed the presence of maximum numbers of bioactive substances such as protein, carbohydrates, phenol and tannin, saponin, glycosides, steroids, alkaloids and terpenoids in leaves extracts of Shorea robusta Gaertn. F. Therefore, it may be concluded that the medicinal value of these plants was due to the presence of these bioactive substances that has a very significant role to boost immunity and to develop therapeutics which must have a physiological action on human body that has a promising role in the treatment of various diseases. The results suggested that used of this medicinal plant in the present study provide justification for the use of medicinal plants by the local people of Kharsawan in Seraikella-Kharsawan district, Jharkhand (India) to cure many diseases.

Keywords: *Flavonoid, Phytochemical analysis, Primary metabolites, Saponin*

Introduction

Shorea robusta Gaertn.f. is very important non timber forest product. Itcovers approx. 14% of the total forest area of country and is spread across 10 million hac.It plays an important role to in the economicsof Indian states which includes Orissa, Jharkhand and Madhya Pradesh. About 20-30 million people, mostly tribal depend on Sal seeds, leaves and resigns for their livelihood. Sal is a deciduous tree that grows up to 50 m height. Under normal conditions it reaches 18-32 m height, with girth of 1.5–2 m. The bark is dark brown in colour. The average temperature required for the growth of this tree is 22-47^{O}C throughout the year. The tree requires mean annual rainfall around 3000 mm and maximum 6600mm. Sal grows in deep, well-drained, moist, slightly acid, sandy to clayey soils [2].Occurrence of this plant is in tropical Himalaya's region, central India, North-eastern and West Bengal hills upto 1,700m. [3, 4, 5]. Scientific classification of Shorea robusta is

- Kingdom: Plantae
- Division: Tracheophyta
- Class: Magnoliopsida
- Order: Malvales
- Family: Dipterocarpaceae
- Genus: Shorea
- Species: Shorea robust[6, 7]

The ethnomedicinal uses of this plants are for Jwara, Sweta pradara, rakshoghna, atisaara, hiccough, asthma, galaganda, diseases of mouth,diseases of eye, consumption[8, 9, 10, 11, 12 13, 14, 15].

Traditional folk treatment from medicinal plants has always guided researchers to search for novel medications to develop healthy life for humans and animals [16]. In addition, some medicinal plants are still obscured within the plant which need to be scientifically evaluated.Most important phytoconstituent presents in medicinal plants are alkaloids, tannins, flavonoids, terpenoids, saponins and phenolic compounds. These phytoconstituent has therapeutic activity and low toxicity, therefore Pharmacists has been shown their interest [17]. Herbal medicine is on demand due to low toxicity and no side effects in comparison to allopathic medicines [18]. The attention among population increased due to their effectiveness, lesser side effects, increasing cost of modern medicines, cultural acceptability and lack of current medical alternatives [19].

Thus, main purpose of this research work is to analyze the phytochemical screening and quantitative estimation of flavonoid, alkaloids and antioxidant activity of crude Shorea robusta extract.

Materials and Methods

The plant materials were shade dried until all the water molecules evaporated and plants became well dried for grinding. After drying, the plant materials were ground well using mechanical blender into fine powder and transferred into airtight containers with proper labelling for future use.

About 5gm dried powdered plant material was weighed and transferred into each conical flask. 250ml of water methanol and ethanol was added to these conical flasks. After that these conical flasks were heated at 30-40ºC and stirred at 350 rpm for 20 minutes. Aqueous ethanolic and methanolic extract were filtered with Whatman filtered paper. These extracts wereanalysed for the presence of bioactive compounds by using standard protocol [20, 21, 22, 23].

Preparation of plant aqueous extract:

5gm of dried fine powder of plant material was taken in a conical flask and 200ml of distilled water was added into it. This mixture was heated on a hot plate at 30º- 40ºC and stirring at 300 rpm for 20 minutes. After that this mixture of aqueous extract was filtered using Whatman filter paper. This filtered aqueous extract was used for the phytochemical analysis.

Preparation of plant ethanolic extract:

5gm of dried fine powder of plant material was taken in a conical flask and 200ml of distilled ethanol was added into it. This mixture was heated on a hot plate at 30º- 40ºC and stirring at 300 rpm for 20 minutes. After that this mixture of ethanolic extract was filtered using Whatman filter paper. This filtered ethanol extract was used for the phytochemical analysis.

Preparation of plant methanolic extract:

5gm of dried fine powder plant material was taken in a conical flask and 200ml of methanol was added into it. This mixture was heated on a hot plate at 30º- 40ºC and stirring at 300 rpm for 20 minutes. After that this mixture of methanol extract was filtered using Whatman filter paper. This filtered methanol extract was used for the phytochemical analysis.

Test for proteins

Millon's test

When 2ml of Millon's reagent was added to crude extract, white precipitate appeared which turned red upon gentle heating that confirmed the presence of protein.

Ninhydrin test

When 2ml of 0.2% solution of Ninhydrin was added to crude extract and then boiled, violet colour appeared which indicated the presence of amino acids and proteins.

Test for carbohydrates

Fehling's test

Equal volume of Fehling A and Fehling B reagents were mixed together. 2ml of this reagent was added to 2 ml of crude extract and gently boiled, a brick red precipitate appeared at the bottom of the test tube indicated the presence of reducing sugars.

Benedict's test

When 2ml of Benedict's reagent was added to 2ml of crude extract and boiled, a reddish-brown precipitate formed which indicated the presence of the carbohydrates.

Iodine test

2ml of iodine solution was added to 2 ml of crude extract, a dark blue or purple coloration appeared which indicated the presence of the carbohydrate.

Test for phenols and tannins

2ml of 2% solution of FeCl3 was added to 2 ml of crude extract, a blue-green or black coloration appeared which indicated the presence of phenols and tannins.

Test for flavonoids

Shinoda test

A fragments of magnesium ribbon was added to 2ml crude extracts (aqueous, ethanolic, methanolic) and concentrated HCl was added (drop wise) to the it. After few minutes a pink scarlet colour was appeared which indicated the presence of flavonoids.

Alkaline reagent test

2ml of 2% solution of NaOH was added to 2 ml of crude extract, an intense yellow coloured was formed, on addition of few drops of diluted acid it turned into colourlesswhich indicated the presence of flavonoids.

Test for saponins

5ml of distilled water was added to 2ml of Crude extract was and it was shaken vigorously. The stable foam formed which indicate the presence of saponins.

Test for glycosides

Liebermann's test

2ml of chloroform and 2ml of acetic acid was added to the 2 ml of crude extract. Concentrated H2SO4 was added. A colour change from violet to blue to green indicated the presence of steroidal nucleus, i.e., glycone portion of glycoside.

Salkowski's test

2ml of chloroform was added to 2ml of crude extract. After that 2ml of concentrated H2SO4 was added. A reddish-brown colour was appeared which indicated the presence of steroidal ring, i.e., glycone of the glycoside.

Keller-Kilani test

2ml of glacial acetic acid containing 1-2 drops of 2% solution of FeCl3 was added to 2 ml of crude extract. After that 2ml of concentrated H2SO4 was added to it. A brown ring at the interphase indicated the presence of cardiac glycosides.

Test for steroid

Liebermann's Test

2 ml acetic acid (CH2COOH) was added to 2 ml Crude extract. Then 1 ml of concentrated H2SO4 was added dropwise and then after 1 ml of concentrated H2SO4 was added drop wise. A blue green colour was appeared which indicates the presence of steroids.

Salkowski Test

2 ml of chloroform and concentrated H2SO4 was added to 2ml of Crude extract. A red colour developed at the lower portion of test tube that indicated the presence of steroids.

Liebermann's Bruchard Test

2ml of chloroform was added to 2 ml Crude extract. After that 2ml of concentrated H2SO4 and acetic acid wereadded into this mixture. A greenish colour developedwhich indicated the presence of steroids.

Test for Phlobatannin

2ml of 1% HCl was added to the 2 ml Crude extract (each aqueous, ethanolic, and methanolic) which gave red precipitate on gentle heating that indicate presence of phlobatannin.

Test for alkaloids

2 ml of 1% HCl was added into the 2ml Crude extract (each aqueous, ethanolic, and methanolic) and heated gently. After that Mayer's and Wagner's reagents were added into this mixture. Turbidity of the resulting precipitate was taken as evidence for the presence of alkaloids.

Test for terpenoids

2ml of chloroform was added to 2ml of Crude extract and evaporated to dryness. After that 2ml of concentrated H2SO4 was added and then heated for 2 minutes. A greyish colour was appeared which indicated the presence of terpenoids.

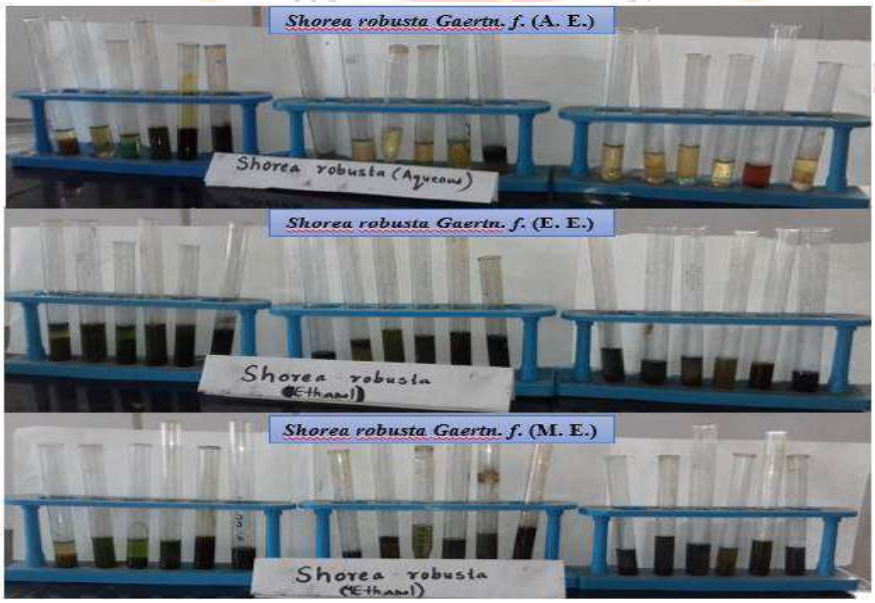

Fig.1: Phytochemical analysis of Shorea robusta Gaertn.f.

Result and Discussion

Table.1: Phytochemical analysis of Shorea robusta Gaertn. in aqueous, ethanolic and methanolic extract

Sl. No.	Phytochemical test	Shorea robusta Gaertn. F.		
		A.E	E.E.	M.E
1	Proteins	+++	+	+++
2	Carbohydrates	++	+	+
3	Phenol & Tannins	++	++	+
4	Flavonoids	++	+	+
5	Saponin	++	_	+
6	Glycosides	++	+	+
7	Steroids	+	+	+
8	Phlobatannins	_	+	+
9	Alkaloids	++	_	+
10	Terpenoids	+	+	+

A.E.=Aqueous extract, E.E.=Ethanolic extract, M.E.= Methanolic extract, (+) = Present,(-) = Absent

Phytochemical analysis of*Shorea robusta Gaertn. F*. (table 1.)revealed that primary metabolites such as proteins and carbohydrates were present in all the extract whereas secondary metabolites i.e. phenol & tannins, flavonoids, saponin glycosides, steroids,phlobatannins, alkaloids and terpenoids were present in all the three extracts except saponin is absent in ethanolic extract, phlobatannin is absent in aqueous and alkaloids is absent in ethanolic extract.

Results obtained by the phytochemical analysis of medicinal plants Shorea robusta Gaertn. F., it could be seen that carbohydrates, phenol & tannins and glycosides were present. Several reports revealed that medicinal plants are rich in phenolic compounds and have antioxidant properties [24, 25]. Phenolic compounds also possess potent antifungal, antiviral and antibacterial activity [26]. It is also mentioned that phytochemical analysis on plants extracts revealed the presence of constituents that are known to exhibit medicinal as well as physiological activities. It was reported that tannins contribute property of astringency i.e., fasten the healing of wounds and inflamed mucous membrane and have received considerable attention in the fields of nutrition.

Conclusions:

Shorea robusta is an important traditionalmedicinal plant used in wide range of medical treatments. Phytochemical analysis revealed that maximum numbers of phytochemicals e.g., flavonoid, tannin, steroid, saponin and many more were found to present in both the plants. Therefore, we can conclude that the medicinal value of these plants due to the presence of these bioactive substances which must have a physiological action on human body. The above findings, traditional uses, pharmacological activities and phytochemistry which provides preliminary information regarding this medicinal plantmight have huge potential for the pharmaceutical industry

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To study the Seasonal Variation of Rhineobothrium Linton from a Marine Fish Trygon Sephen

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Abstract: -

In seasonal variation of the fishes, to collect the different types of fishes in different areasand location. As a medicinal Point of view, fishes ProvidesVit. A, Vit. D and oil, body oil soup from fish, It is use as an Ayurvedic and medicine on color, blindness, Cold and Cough, Asthama &Tuberculasis. In this paper to study the seasonal variation of Rhineobothrium linton from a marine fish Trygon Sephen in Ratnagiri districtat Sangameshwar.
Key words: - Rhineobothrium linton, Marine Fish, TrygonSephen.

Introduction: -

Many fishes are having their high economic value as they provide the highly nutritious & delicious food for human population. These fishes are one of the components of the food cycle in ecology. Parasitology is an evergreen branch for a scientist. Parasitologist have theirpreference of studying helminth. Parasitism is a natural way of life among parasitic diseases are the major public heath Problems leading to mortality in tropical countries, including India. The differed types &several types of parasitism are recognized. Besides these intestinal Parasites there are various types of including Cestodes, Nematodes & Trematodes. Intestinal helminth infections are very common & more than 3500 million cases of helminthiasis exist atpresent either as single as mixed infection all over the world it is observe it.

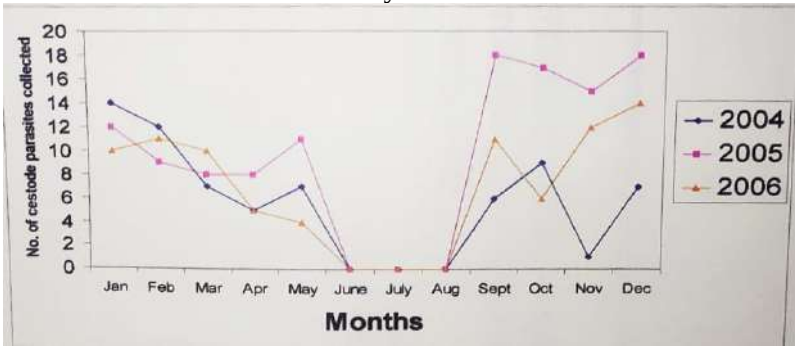
The work on the population dynamics were carried out by many workers on different hosts, Dagiel at (1958), (1964), Susheela (1987) Mittal (1908), Hopkins (1959), Anderson (1976), Pennyuick (1971), Guorder distribution of the Cestodes Parasites. The other workers also studied the effect of climatic factors on the helminthes, include Kennedy (1968-1969), Lawrence (1970), Crofton (1971), Patrick & Esch (1977) have elaborately to studied the effect of seasonal variation. on Parasite of fish.

To study the Seasonal Variation of fishes, it is highly infected to study the different types of cestodes, and the present study include application of statistical method to understand the surveyof seasonal variation is year wise or month wise. Present study includes application ofStatistical method to understand and distribution cestodes parasites both at infra andsupra population levels for each species of Parasites in three annual cycle (January to December)

Material and Methods: -To study the Seasonal Variation in Rhineobothrium linton, thequantitative analysis of helminths and structural grouping was. studied during three annual cycles i.e., January 2004-December 2006 It revealed that the cestode population was potentially dynamic with more or less durability, regularity and cyclic periodicity in the host under investigation. Each annual cycle comprises of three season 1) Rainy seasons (June to September) 2) Winter season (October to January) 3) Summer season (February to May) on the basis of incidence of the infection the influence of annual season. It was observed that the incidence of infection by Helminthes. Parasite increased with host age. The infection level low in young hosts and showed remarkable. infection rises in adults.

To show the above graphical representation in Seasonal Variation of Rhineobothrium linton, 1889. From a marine water fish Trygon Sephen (Cuvier, 1871) at Ratnagiri district for the year 2004-2006.

Graph: -Seasonal Variation of Rhineobothrium linton, 1889 From Trygon Sephen (Cuvier, 1871) at Ratnagiri district for the year 2004 – 2006



Conclusion: -

It is concluded that to study the different seasonal variation of the fishes and the. infected host is studying the different types of cestodes.

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A New Species of *Diatrypellaarborella*sp.nov. From Melghat Forest

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Abstract:
The Present communication deals with a new species of Diatrypellaarborellasp.nov from Aamdoh forest MelghatDist Amravati. Different varieties of ascomycetes and imperfect fungi were collected by the author. But after detail Morphological and cultural investigation an interesting ascomycetes Diatrypellawasincluded here as new species on new host Careya arborea Roxb.
Keywords:*Diatrypella,Ascomycets,Stroma,Ascus,Ascospores.*

Introduction :

De Notaris established the genus *Diatrypella* with type species *D.vrrucaeformis* (Ehrh.)Nitschke.Clement and Shear,Arx and Muller,included it under spheriales,whereasLutterelle,Martin considered it to be number of the order Xylariales.The first report of this genus was recored in India in 1962.There after Ramchandra Rao,Tilak, and Muthappa have reported a few species.Most of the species of this genus are saprobes in nature(Mehrabi*et a*l., 2019). The genus is characterized by conical to truncate, cushion or discoid stromata usually delimited by a black zone in host tissues,umblicate or sulcate ostiolarnecks,cylindrical,polysporales,long stalked,asci and allantoid hyaline yellowish ascospores in their sexual morph and liberatella like coelomycetes asexual morph(Kirket*et al.*,2008,Lakmali*et al.*, 2021).The species under study was compared with known species of*Diatrypella*and treated as new species, thedetailed description is given below. The result of molecular study is awaited.

Material and Methods:

The collected specimens were wrapped in butter paper and bagged in envelope. By taking hand sections, semi-permanent microscopic slides were prepared by using cotton blue as stain, sections of the material were studied with the help of relevant keys and literature (Ainsworth *et al*., 1973, Bilgrami*et al*., 1991,Chanen Yang *et al*., 2022, Dennis 1981, Jamaluddin *et al*., 2004, Mehrabi M *etal*., 2019, Pandey 2008, Shang QJ *et al*., 2017). The specimen was deposited in Ajrekar Mycological Herbarium(AMH) Agharkar Research Institute,Pune.AMH No. 9083.(Holotype)

Result and Discussion:

Ditrypellaarborellasp.nov(**Plate1.Fig;1**a,b,c,d,e)(**Fig;**2a,b,c)
(Etym: Host *Careya arborea*Roxb.)

Strom black errunpent, elliptical to cushion shaped,solitory or gregarious,oftencracked,roughened by slightly protruging,ostiolate, measure 413.0-489.6x535.5-1070 µm,perithecia globose to oblong,black,ostiolate measure 214.2-330.6x306-336.6 µm; asci cylindrical to clavate with long,tappering persistent stalk,binucliate,multisporous,measure 66-133x8-11 µm; ascosprealontoid,subhyaline, one celled,irregularlyarranged,nongutullate, measure 1.9-2.2 µm long,paraphysate.

Matrix: On dead stem of *Careya arborea*Roxb. (Fam:Lecythidaceae)) Legit N.S.D atAamdosh,Melghat Dist. Amravati on 31/7/2004 AMH No.9083.(Holotype)

Table-1: Comparison of *Ditrypellaarborella*sp.nov with related species

Species	Perithecia	Asci	Ascospore	References
***D.verrucaeformis* (Ehrh.)Nke (Type species)**	410-530 x 250-400µm	70-100 x 10-15 µm	6-8 x 1.5-2.0 µm	Subhedar(1977)
***D.citricola*El.&EV.**	315-468 µm IN diam.	81.92-126.90 x 9.0-12.83 µm	8.86-14.93 x 1.58-3.49 µm	Chitriv&Wangikar (1980)
***D.leguminacearum* Patil**	250-625 x 250-650 µm	10-20 x 80-150 µm	2.5-3.5 x 6.18 µm	Patil M.S.(1985)
***D. macroasca*M.Niranjan&V.VenkateswaraSarma**	350-520 × 330- 380 µm	115-170 × 18.75-23.75 µm	7.5-15× 2.5 µm	M.Niranjan&V.VenkateswaraSarma(2018)

***D. tectonae*M.Niranjan&V.VenkateswaraSarma**	240-440 x 255-389 ìmdiam	(107-) 120-150 (-173) x (13.5-) 15.5-21.5 (-39.5) ìm (X^{-}= 138 x 19 ìm)	(5-) 7-9 (-12) x (1.5-) 2-2.5 (-3) ìm (X^{-}= 8 x 2.3 ìm)	M.Niranjan&V.VenkateswaraSarma(2018)
***D.lijiangensis*Thiyagaraj&Wanas**	170-460 x 200-300 µm	50-90 x 6-9 µm	6-8 x 1-2 µm	Thiyagaraj&Wanas(2019)
***Diatrypellaarborella*sp.nov**	214.2-330.6x306-336.6 µm	66-133x8-11 µm	1.9-2.2 µm	Understudy

Conclusion:

On comparison with known species vide (Table1) the perithecia are smaller than *D.verrucaeformis, D.citricolaD.leguminacearum, D. tectonae*but larger than *D.lijiangensis.*Asci are larger than*D.verrucaeformis&D.lijiangensis,*the size of ascospores are smaller than the reported species therefore the species understudytreated as new species of *Diatrypellaarborella*sp.Nov

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16. **Illustration:**A New Species of *Diatrypellaarborella*sp.nov. From Melghat Forest :

Plate - 1
Fig - 1

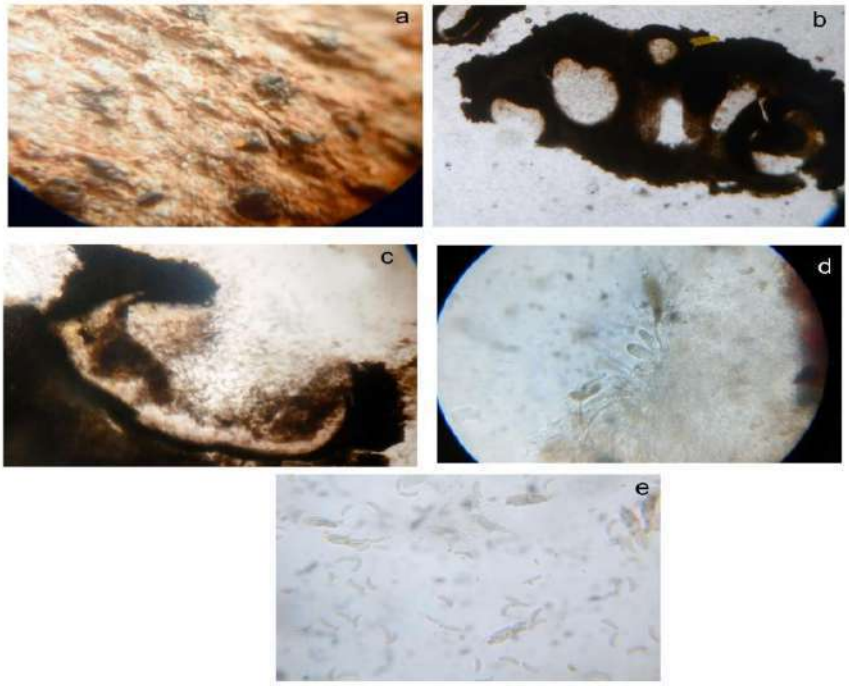

Fig - 2

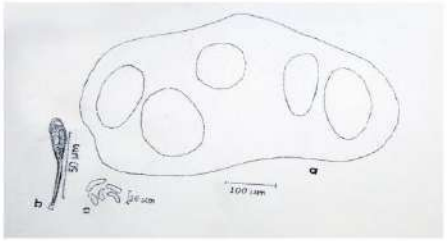

Fig1:(***Ditrypellaarborella*sp.nov)** a) Habit, b) Stroma with perithecium, c) Perithecium, d) Ascus & ascospores, e) Ascospores.

Fig. 2: a) Stroma with perithecium, b) Ascus with ascospore, c) Ascospores

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Distribution of Spider Fauna in the Agricultural Fields from Narkhed Region, District Nagpur (Maharashtra State) India

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Abstract:

Narkhed taluka has total area of 64491 Hectors. Most of the area of Narkhed taluka are under agricultural land. Some area are hilly and cover with rare forest also. Wardha river is flowing from western border of taluka. Kar river is flowing from southern border of taluka and Kolar river is flowing from eastern border of taluka. Other river are Jam, Mandakini, Wandali etc.The river Wardha flows in this region and enriches the biodiversity. Spiders are insectivorous predators on earth. They are Feed on insects and consume large number of preys without damaging the crops. Spiders, are the most common ubiquitous animals on land, constitute an essential portion of the predatory arthropods in several ecosystems. Recently in agricultural fields reduced pesticide use and ecological sustainability have lead to increased interest in spiders as potential biological pest control agents. Regularly use of pesticides in agricultural fields which decreases the spider populations. Spiders play an important role in insect pest control without any harm to ecosystem.

This article presents a study on the Diversity, distribution and current status of spider families in Narkhed of Nagpur District. During the present study, The diversity of spiders was studied during July 2021 to January 2022, using insect nets, tapping sticks and pit fall trap etc. During the survey 310 specimens were collected from agricultural field of Narkhed, 108 species were identified belonging to 10 families. Among the specimens collected most of the individuals were adult, the male–female ratio was 1:6. The Family Salticidae and Thomicidae represented 18 species each respectively, Araneidae 30, Oxyopidae and Lycosidae 6, Eracidae 4, Pholcidae 2, Uloboridae 2 species each. The population of spiders was abundant, species richness and diversity was high during the month of October to December. Spiders observed were exclusively carnivorous; mostly feed on insects and other Arthropods, naturally keeping insect population under control.

Keywords: *Spiders, Diversity, Biodiversity, Insects, Agricultural field, Narkhed.*

Intorduction:

Present study was designed to assess the diversity of spiders from Narkhed region, Most of the area of Narkhed taluka are under agricultural land. Some area are hilly and cover with rare forest also. The area extends over 100 sq.km., and lies on Wardha River, Spider species abundance in ecosystem can be high as undisturbed natural ecosystem. Spiders act as pest control creature, which feeds on crop destructive insects. Spiders are beneficial bio-control agent of insect pest in ecosystem **(**Jeyaparvathi S, et al. 2013). Spiders are known to occupying most of the terrestrial habitats. They are generalist predator, which can act against a broader range of insect pests. Spiders are considered to be of economic value to farmers as they play valuable role in pest management by consuming large number of prey in the agriculture fields without any damage to crops. Spiders are among the most abundant insectivorous predators of Terrestrial ecosystem. The current global list of spider fauna is approximately 44,234 belonging to 3928 genera and 110 families (Platnick NI 2019).

Order Araneae is a large group of animals commonly known as spiders, might have been evolved 380 million years ago during Devonian period (Penney and Seldon 2011). The current global list of spider fauna is approximately 42,055 belonging to 3821 genera and 110 families (Platnick, 2011). The spider fauna of India is represented by 1520 spider species belonging to 377 genera and 60 families (Sebastian and Peter 2009). General series on fauna published by Gazetteer of India, Maharashtra state, record a total of 90 species of spiders belonging to 14 families (Tikader and Malhotra 1974). 107 species of spiders belonging to 57 genera under 19 families have been described from Jabalpur district, Madhya Pradesh. (Gajabe, 2004).

Spiders are one of the most diverse groups in the world. Many types of spiders can easily be found even in small area. Salbardi is an untouched area, forest is dry deciduous and having rich bio-diversity. The abundance of spiders in the forest is ecologically important and may be studied for its nature of natural insecticide as well as bioindicator.

Material And Method:

Spider fauna was collected from agricultural field of Narkhed area (every weekend) from vegetation, on crop field, under stones/crevices, near water streams etc. For collection of spiders insects nets, pitfall trap and stroking sticks were used, the specimens were preserved in 70% alcohol, labeled and identified according to Barrrion and Listinger(1995), Davies and Zabka (1989), Gajbe (1987a,b), Tikader (1962,1973, 1982).

Result And Discussion:

The spiders were found abundantly in the agricultural field of Narkhed area. During the study 310 specimens were collected, of which 103 species belonging to 34 genera under 10 families were identified. The

large number of species belong to family Araneidae represented by 30 species in 08 genera, followed by Salticidae 18 species in 06 genera, Erecidae 4 species in 1genus, Gnaphocidae 06 species in 03 genera, Thomosidae 18 species in 06 genera, Tetragnathidae 02 species in 01 genera species, Lycosidae 15 species in 05 genera, Oxyopidae 06 species in 02 genus, and Pholcidae represented 02 species in 01genus and Uloboridae represented 02 species with 01 genera. The population of spiders was abundant, species richness and diversity was high during the month of October to December.

The spiders were found to be living in different types of habitats. The spiders belonging to Families Araneidae, Erecidae, Oxyopidae, Tetragnathidae, and Thomisidae, were mainly found on the vegetation, like shrubs and trees. Spiders living at the bank of rivers and swamp area belong to family Araneidae, Lycocidae, Salticidae, Uloboridae. Most spiders were found living on the ground under the crop field, foliage or in vegetation exhibiting some kind of colorations for camouflage. No exceptionally poisonous spiders were found among the species recorded. The spiders are most abundant and ecologically important, they are exclusively carnivorous and hence help naturally to control insect pest in any ecosystems and can be used as bio-indicator.

There are many environmental factors that affect species diversity (Rosenzweig 1995). Diversity generally increases when a greater variety of habitats types are present (Ried and Miller 1989). Downie et al. (1999) and New (1999) have demonstrated that spiders are extremely sensitive to small changes in the habitat structure; including habitats complexity, litter depth and microclimate characteristics. Documenting spider diversity in this ecosystem can provide important information to justify the conservation of ecosystem.

Sr. No.	Family	Genera	Species
1	ARANEIDAE	08	30
2	ERESIDAE	01	04
3	GNAPHOSIDAE	03	06
4	LYCOSIDAE	05	15
5	OXYOPIDAE	02	06
6	PHOLCIDAE	01	02
7	SALTICIDAE	06	18
8	TETRAGNATHIDAE	01	02
9	THOMISIDAE	06	18
10	ULOBORIDAE	01	02
Total		**34**	**103**

Table No. 1: Checklist of Spider Species from Agro-ecosystems of Narkhed region, District Nagpur. Maharashtra State

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Morpho-Taxonomic Studies of Diversity of Genus *Digitaria* Haller of Family Poaceae of Amravati District, Maharashtra.

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Abstract:-
Amravati is one of the 11 districts of vidarbha. It includes 14 talukas. Flora of Amravati district has been already studied by Dhore (2002) reported 84 species of grasses, during last 16 years no survey was conducted of the area. Survey of grasses conducted during 2014-2018 revealed 117 species belonging to 60 genera. Sporobolus R.Br. is a third largest genus of study area It has 5 species which belong to subfamily panicoideae and tribe paniceae. The aim of our investigation is to study morphotaxonomic revision of family poaceae. It focuses on details of macro and micro morphology of some important grasses.
Key words – Amravati , Flora, Survey, morphology.

Introduction

Grasses are most beautiful group of monocotyledonous plants. They occur on every soil, in all kind of situations and under all climatic conditions. As grasses do not like shade, they are not usually abundant within the forest. But in open places they grow very well and some times whole tracts become grasslands.

Grasses are important for entire ecosystem. Tiger is the king of forest ecosystem. If we want to save tiger, we have to save the grasses because tigers are indirectly dependant on grasses for their food. Robinson writes "Grass is king" it rules and governs the world, without it the earth would be a barren waste.

In the early days when the population was much limited and when limited land was under cultivationmuch of it was covered with plenty of green grasses. So the farmers paid no attention to the grasses. But now population has increased, open land is decreased very much and cattles have increased in number hence farmers have to pay more attentation to grasses. The present destruction of grasses is mainly due to overgrazing, increasing agricultural practices, over use of herbicides, formation of big dams, road widening, clean agricultural practices and trampling by men and cattles. Grazing needs to be inhibited in certain areas and also reduce the use of herbicides. Tender shoots of Bamboo are used as vegetables and also as pickle by locals. The grains of grasses certainly provide a staple food supply for the human beings *Oryza sativa, Triticum aestivum, Zea mays, Avena sativa, Setaria italica, Eleusine coracana, Echinochloa colonum, Sorghum* speciesand rice feeds more human beings than any other plant product. Sugarcane is main source of sugar. A high proportion of the most fertile and productive soil were developed under a vegetative covers of grasses. Root, rhizome and other part of grasses are good soil builders and effective soil stabilizers. Most of the birds and animals depend upon grassland habitat for food, shelter and normal completion of their life cycles Gould (1968).

Despite utmost importance of grasses to human beings, the study on grasses continues to be a neglected subject. This is mainly because of the feeling that it is a difficult group for identification, the leaves and branches of grasses are very much similar, Small floral organs, special terminology and variation in the structure of spikelet and inflorescence. "*Grasses of Burma, Ceylon, India and Pakistan*" studied by Bor (1960) is the main standard reference work on Indian grasses.

Study Area:-

Amravati district is located in the state of Maharashtra-India. It is at $20^0$55' and 20.93 North latitude $77^0$45' and 77.75 East longitudes. It has an average elevation of 343 meters (1125 feet). Total area of the district is 12210 sq. km. Amravati district has tropical wet and dry climate with hot, dry summer from April to June. The annual average rainfall in the district is 852.1 mm and the temperature has recorded between 18^0C to 46^0C (Falling rain Genomics, inc. 2010).

Apart from this, Amravati is one of the largest district of Maharashtra states. It includes fourteen (14) taluka namely Amravati,Achalpur,Warud,Chandurbazar,Dharni, Morshi,Daryapur ,Anjangaon Surji, Chandur Railway, Dhamangaon Railway, Teosa, Nandgaon-Khandeshwar, Bhatkuli, and Chikhaldara . Chikhaldara is the largest talukas of Amravati district and Bhatkuli is the smallest one.

Review of Earlier Work

Though botanical exploration of India has long history, Vidarbha and Marathwada regions remained somewhat neglected. A thorough exploration of Marathwada has been done by Naik and his students for nearly 30 years. Outcome of this work is *"Flora of Marathwada"* by Naik (1998) which a wonderful survey and reference flora.

The monumental work of Bor.(1953) on *"Grasses of Burma,Ceylon, India and Pakistan"*(excluding Bambusiae) published about 50 years ago has changed this scenario and created interest on the study of grasses. This resulted in publication of several books on grasses and the latest addition is *"Flora of Tamil Nadu-Grasses"* by Altaf and Nair (2009) that deals with 447 species (excluding Bamboos).

Patunkar(1980) studied *"Grasses of Marathwada"* region has also published a book "*Grasses of Marathwada*".

Recently, Potdar(2012) has published "*Grasses of Maharashtra*", the book is an outcome of exploration and detailed studies conducted on documents of grass diversity of Maharashtra for last 20 years. During this period 415 species belonging to 125 genera have been described. There are above 10,000-11,000 species belonging to 700 genera in the world (Clayton and Renvoize, 1989 and Watson and Dallwitz, 1992) in India there are more than 1200 species belonging to 268 genera (Karthikeyan *et al*., 1989, and Moulk 1997). Kamble and Pradhan (1988) reported 87 species belonging to 49 genera from Akola district. Acharya (1985) reported 100 species belonging to 57 genera from Wardha district. Deore (2010) reported 65 species of grasses from Washim district. Karthikeyan (1993) reported 81 species from Yavatmal district and Diwakar (2000) reported 60 species from Buldhana district.

Floristic surveys of different area of Maharashtra have been compiled and published by Botanical Survey of India such as *"Flora of Maharashtra state, Monocotyledon"*, Sharma *et al.*, (1996), *"Flora of Maharashtra state, Dicotyledon"*vol. I Singh *et al*., (2000), vol.II Singh *et al*., (2001).

Material and Methods

Plan of Work

1) Study of Habitat

In every season the selected areas were explored systematically. Grass covered sites were targeted for study. Grasses were collected from different habitats like irrigated fields, unirrigated fields, open grasslands, forest, bunds of field, bank of rivers, wastelands, rice fields and rocky places.

2) Sample collection and preservation-

During excursion specimens of grasses were collected and field number is given to each specimen. Field observations were noted down in field diary. After collection the samples are critically studied in laboratory . Then it is dried properly, poisoned by using 2% Mercury Chloride and mounted using conventional methods. For critical cases BSI (Pune) was consulted to match the specimens.

3) Identification-

The identification was confirmed by using floras like flora of British India(Hooker 1872-1897), Flora of Bombay Presidency (Cook 1958), Flora of Marathwada (Naik 1998), Flora of Maharashtra(Almeida,1990), Grasses of Maharashtra (Potdar, Salunkhe and Yadav, 2012) Grasses of Marathawada (Patunkar,1980). Specimens were observed under Sterioscopic binocular microscope.

Artificial keys were provided for genera and species. Population variations are critically studied. Latest nomenclature are given in detail for proper taxonomic level. Each grass specimen description was supported by a note on distribution and herbarium specimen number. Genera and species are arranged alphabetically. Floristic analysis was done to get clear picture of grass biodiversity. Grass species are arranged according to N.L. Bor. All the specimens were deposited in the herbarium of S.S.S.K.R.Innani Mahavidyalaya, Karanja(Lad), Dist-Washim.(M.S.)

4) Observations

Species of *Digitaria* and habitat.

Sr. No.	Specimen No.	Name of Species	Habitat
1	PAM 94	*Digitaria abludens (Roem. & Schult) veldkamp.*	Cultivated fields
2	PAM 25	*Digitaria bicornis (Lam.) Roem & Schult.*	Cultivated fields
3	PAM 97	*Digitaria ciliaris (Retz.) koeler.Descr. Gram.*	Unirrigated fields
4	PAM 84	*Digitaria ischaemum (Schreb.)Muhl.*	Forest
5	PAM 58	*Digitaria stricta Roth.*	Cultivated fields

Key for the species of *DIGITARIA*

1a -	Hairs on the spikelet clavate	2
1b -	Hairs on the spikelet not clavate	4
2a -	Spikelets in triads	*D. ischaemum*
2b -	Spikelets in pairs	3
3a -	Tips of pedicels some what thickened without a rim of hairs	*D. abludens*

3b - Tips of pedicles cupuliform with a hair of rim *D. Stricta*
4a - Spikelets of each pair heteromorphous sessile of spikelets nearly glabrous in front the pedicelled coated with long hairs often. Spreading at maturity *D. bicornis*
4b - Spikelets elliptic to elliptic lanceolate spikelets appressed. glabrous when young with spreading white tomentum at maturity *D. cillaris*

Conclusion:-

Present study is the outcome of exploration tours conducted to document the grass diversity of study area from 2014-2018 and visited different areas of Amravati district in different seasons. During this period over 600 specimens were collected from the study area. During the study 117 species belonging to 60 genera were collected.

Out of 60 genera *Eragrostis* is the largest genus belonging to sub-family pooideae. The 35 species collected from study area were found to be monotypic. In Amravati district pure patches of *Aristada, Ischaemum, Themeda, Andropogon, Heteropogon, Dicanthium, Cynodon and Saccharum* were observed.

Though grasses are herbaceous in nature, but are tough in texture so it is easy to prepare herbarium speciman. Some of the beautiful grasses are *Thelepogon elegans, Mnesithea granularis, Chrysopogon fulvus, Ischaemum rugosum and Dichanthium species.*

Some dominant genera are *Apluda, Aristada, Dicanthium, Cynodon, Dinebra, Eragrostis, Ischaemum, Rottboellia, Heteropogon, Ophiuros, Setaria*.Some grasses have underground rhizomes i.e. *Ischaemum pilosum, Cynodon dactylon, Saccharum spontaneum* whichcan not be eradicated hence the productivity of crops decreases. *Cynodon* is the first class fodder grass present throughout study area. It is palatable and resistant to grazing and trampling because of underground rhizomes. *Dactyloctenium aegyptium* , *Chrysopogon fulvus* are other palatable species of grasses. *Cymbopogon martini*,*Vetiveria zizanioides, Saccharum spontaneum* and *Cynodon dactylon* are the medicinal grasses. Hollow internodes of *Arundo donax* are used formaking pens and musical pipes by locals. The forest areas of Melghat (Chikhaldara and Dharni) are of mixed dry deciduous type with teak as dominant species.

Saccharum spontaneum, Vetiveria zizanioides, Arundo donax present along the sides of rivers and stream which reduce the pressure of flood. The dominant tribes of Melghat are Gond, Korku and Gawali. Gond, and Gawali are the tribal residents of Melghat forest range are the consumers as they feed their livestock mainly by grazing of grasses. Efforts are required to prevent free grazing as once vegetation is lost, it is very difficult to restore.

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Qualitative Phytochemical Screening And Antimicrobial Activity of *Oxalis Corniculata* L.

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Abstract
Medicinal plants have been a valuable source of natural active phytoconstituents that play an important role in treatment of many human ailments. In the present study, Oxalis corniculata L. (stem, leaves, roots and flowers) was evaluated for its phytochemicals and antibacterial potential. The Soxhlet extraction was done by using three different solvents viz. acetone, methanol and water. Qualitative phytochemical analysis showed the presence of various phytoconstituents. The antimicrobial activity was evaluated by disc diffusion method against four bacterial strains (Enterobacter aerogenes, Pseudomonas aerogenosa, Escherichia coli and Staphylococcus aureus) and two fungal strains (Fusarium oxysporum and Fusarium proliferatum). The methanol extracts showed better antimicrobial activity than acetone and aqueous extracts. This may be because of the difference in the presence of various phytoconstituents in them.
Key Words: *Oxalis corniculata, herbal medicine, phytochemical analysis and antimicrobial activity, etc.*

Introduction
Medicinal plants have been useful in the development of new drugs and continue to play a valuable role in the drug discovery process [1]. Herbal medicines have already formed the basis of therapeutic use in developing countries, but recently have also seen an increase in the use of herbal medications in the developed world as well. The biogeographic position of India is unique which makes India rich in all the three levels of biodiversity [2]. Some studies focusing on the investigation of traditional Indian medicinal plants have resulted in the identification of new sources of therapeutic agents [3]. Plants are recognized for their ability to produce a wealth of secondary metabolites and mankind has used many species for centuries to treat a variety of diseases. Many of these natural products have been shown to present interesting biological and pharmacological activities and are used as chemotherapeutic agents or serve as the starting point in the development of modern medicines [4, 5].

In addition, in developing countries, synthetic drugs are not only expensive and inadequate for the treatment of disease, but are also faced with adulteration and side effects. Therefore, there is a need to search new safe infection fighting strategies to control microbial infection. Natural products, either as pure compounds or as standardized plant extracts, provide unlimited opportunities for new drug leads because of the unmatched availability of chemical diversity. There is a continuous and an urgent need to discover new antimicrobial compounds with diverse chemical structures and novel mechanisms of action for new and re-emerging infectious diseases [6]. Therefore, researchers are increasingly turning their attention to folk medicine, looking for new leads to develop better drugs against microbial infections. The increasing failure of chemotherapeutics and antibiotic resistance exhibited by pathogenic microbial infectious agents has led to the screening of several medicinal plants for their potential antimicrobial activity.

So, the present study deals with the evaluation of phytoconstituents and antimicrobial efficacy of *O. corniculata*.

Materials And Methods
Collection of Plant Materials: Collection will be carried out from garden of Shivramji Moghe College Kelapur (Pandharkawada). Identification will be made with the help of standard floras [5, 6, 9, 12].

Preparation of Powder and Extract: The collected plant materials will be shade dried and mechanically powdered and stored in an airtight container. Various extracts will be prepared according to the methodology [11], will be subjected to our entire studies. The shade dried plants parts will be allowed to pulverization to get coarse powder. The coarse powder material will be subjected to Soxhlet extraction successively with acetone, methanol and aqueous extracts. These extracts will be concentrated to dryness in flash evaporator.

Qualitative Phytochemical Analysis: The study of bioactive component will be made to understand the medicinal values of the plant materials will be screened for bioactive compounds like, proteins, amino acids, carbohydrates, alkaloids, steroids, cardiac glycosides, anthroquinone, glycosides, saponine, flavonoids, terpenoids, quinine and coumarins. The qualitative phytochemicals analysis will be carried out using standard procedure [4, 7, 11].

Antimicrobial Activity: Antimicrobial activity will be carried by using antibiotic sensitivity Agar (Hi-Media) by disc diffusion method [3] against four bacterial (*Enterobacter aerogenes, Pseudomonas aerogenosa, Escherichia coli* and *Staphylococcus aureus*) and two fungal strains (*Fusarium oxysporum* and *Fusarium proliferatum*).

Results And Discussion

Phytochemical study of *Oxalis corniculata* L. showed the presence of carbohydrate, proteins, alkaloid, flavonoids, steroid and saponin. Alkaloid and steroid present in all parts of plant extract except in acetone extract of fruit and methanol extract of leaf respectively. Flavonoid present only in methanol extract of fruit and aqueous extract of leaf. Tannin and Phenolic compound present in all plant extract except acetone extract of fruit (Table-1). For antimicrobial activity, methanol, acetone and aqueous extract of all parts of plant extracts were tested with four bacterial strains - *E. aerogenes, P. aerogenosa, E.coli, S. aureus* and two fungal strains- *F. oxysporum* and *F. proliferatum* (Table-2). Methanol extract shows better antimicrobial activity than acetone and aqueous extract. Methanol extract of stem, leaves, roots and fruits shows a higher zone of inhibition for *S. aureus* than other microbes. This is because of the difference in the presence of phytoconstituents present in them.

Table 1. Qualitative phytochemical analysis of *O. corniculata*

Sr.No.	Phytoconstituents	Test	Plant parts	Acetone extract	Methanol extract	Aqueous extract
1	Carbohydrate	Benedict's Test	St	+	+	-
			Lf	+	+	+
			Rt	+	+	-
			Fl	+	+	-
2	Protein	Million's Test	St	+	+	-
			Lf	-	+	+
			Rt	-	+	+
			Fl	-	+	-
3	Antraquinone glycoside	Borntrager's Test	St	-	+	-
			Lf	+	-	+
			Rt	-	+	-
			Fl	-	-	-
4	Cardiac glycoside	Kellar-Killiani Test	St	+	+	+
			Lf	+	+	+
			Rt	+	+	+
			Fl	+	+	+
5	Coumarins		St	-	-	-
			Lf	+	-	-
			Rt	-	-	-
			Fl	-	-	-
6	Quinone		St	+	+	+
			Lf	+	+	+
			Rt	-	+	+
			Fl	+	+	+
7	Steroids	Salkowski Test	St	-	-	-
			Lf	-	-	+
			Rt	-	-	-
			Fl	+	-	-
8	Alkaloids	Hager's Test	St	+	+	+
			Lf	+	-	+
			Rt	+	+	+
			Fl	+	+	+
9	Flavonoids	Lead acetate Test	St	-	+	-
			Lf	-	-	-
			Rt	-	-	-
			Fl	+	+	-
10	Tannins and Phenolic compounds	$FeCl_3$ Solution Test	St	+	+	+
			Lf	+	+	+

			Rt	+	+	+
			Fl	-	+	+
11	Saponin	Foam Test	St	+	+	+
			Lf	+	-	+
			Rt	+	+	+
			Fl	+	-	+

[Note : St - Stem , Lf – Leaf , Rt – Root , Fl – Flower , Aq – Aqueous , Ac – Acetone , Me – Methanol]

Table 2. Antimicrobial activity of *O. corniculata*

Sr.No.	Name of Microorganism	Extract	Diameter of Zone of Inhibition in mm			
			St	Lf	Rt	Fl
1	*Enterobacter aerogenes*	Aq	6	11	12	10
		Ac	12	14	16	15
		Me	14	14	16	15
2	*Pseudomonas aerogenosa*	Aq	6	13	11	17
		Ac	10	17	16	20
		Me	12	18	17	21
3	*Escherichia coli*	Aq	6	6	10	14
		Ac	13	12	15	16
		Me	15	14	16	16
4	*Staphylococcus aureus*	Aq	6	10	13	15
		Ac	15	21	20	20
		Me	16	21	24	22
5	*Fusarium oxysporum*	Aq	11	6	10	11
		Ac	14	14	11	13
		Me	14	15	13	16
6	*Fusarium proliferatum*	Aq	8	6	10	9
		Ac	10	12	14	10
		Me	10	14	15	16

[Note : St - Stem ,Lf – Leaf ,Rt – Root ,Fl– Flower , Aq – Aqueous , Ac – Acetone , Me – Methanol]

Conclusion

The results obtained from the present investigation indicate that, the plant *O. corniculata* rich in alkaloids, flavonoids, steroids and saponin. They are known to show medicinal potential and antimicrobial activity for selected microbes. Thus, the plant under investigation showed their medicinal potential and can be a source of useful drugs. More phytochemical research work is required for isolation, purification and characterization of biologically active compounds. Since the plant *Oxalis corniculata* L. is useful in traditional medicine for the treatment of various ailments; it is need of time to standardize the plant for development of quality control parameters.

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Ethno-Medicinal Uses of Some Selected Medicinal Plants of Pusad Forest Ranges, Maharashtra

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Abstract:
Pusadtalukais enclosed within hilly region with forest vegetation consisting of medicinal and aromatic plants which have traditionally used by local peoples from 100 of years. Traditional indigenous knowledge reveals the immense value of almost all parts of the plant i.e. roots, leaves, fruits, seeds and gum for various medicinal uses. These species has high socioeconomic value providing livelihood to tribal population of the area and has high potential as commercial value.
***Keywords**: Pusad, Ethno-medicnalroperties, Medicinal plants.*

Introduction

Pusadtaluka is situated on the bank of river Pus and in the mountainous hilly region in Yavatmal district of Maharashtra state. Pusad is located at 19°54′N77°35′E19.9°N 77.58°E. It has an average elevation of 315 metres (1033 feet). River Pus flows very near to the town that is why the city was named as Pusad. Climate of Pusad is very high with the temperature going as high as 49 degree Celsius during summers and as low as 5 degree during the time of winters. It receives an average rainfall of about 471mm per year. Pusad is well furnished with hilly region with forest vegetation and separated forest divisionPusad; which is surrounded by hills from almost all the sides and is at little lower elevation than these hills. The name of the city originates from the name of the adjoining river called Pus river.

Plants provide the predominant ingredients of medicines in most medical traditions while the demand for medicinal plants is growing hence, some of them are increasingly being threatened in their natural habitat. Threats can be human-induced such as clearing of habitat, pollution, overharvesting, introduced species, or random natural events such as cyclones, floods, droughts, fire. Traditional methodologies cannot provide the increasing demand of worlds need in medicinal plants and hence there is urgency of development of new technologies to fluffiness of present requirements.

Traditionally from prehistoric times, the use of different parts of medicinal plants was practiced to cure specific ailments evidently due to presence of some bioactive compounds like alkaloids, flavonoids, essential oil, glycosides, tannins, terpenoids, steroids and others. Many of the drugs, currently in use have been isolated from natural sources based on information about curative agent in folklore medicine (Sameera and Mandakini, 2015). About 47000 plant species are found in different parts of India, of them 17,000 flowering plants, 6850 species are endemic to India and 8000 are ethnobotanically important (Wildlife Institute of India, 2007). Singh (1999) reported that out of 250,000 to 300,000 total plants of the world, India harbors' about 45,000 plants. Out of 20,000 medicinal plants of the world, India contributes about 3000-5000 plants. Biodiversity is one of the key components of our basic life support system. The traditional herbal medicines are still practiced in large part of our country in tribal and rural areas. The present attempt is to survey of different regions of Pusad and its surrounding area for medicinal plants and contribution to the knowledge of traditional uses of medicinal plants of this region.

Materials and Methods

For the study of different types of plants author visited different localities of Pusad and adjoining hilly region during all seasons of year. During visits various types of plant were found viz., trees, shrubs, herbs, grasses, ornamentals & medicinal and aromatic plants. For collection of these plants the author was plan to visit different localities at different times. The collected plants at the time of flowering were identified with the help of Botanical flora (Ugemuge, 1986). The medicinal uses of plants and plant parts were recorded from local peoples and the literature.

Observations and Results

S.N.	Botanical Name	Common Name	Family	Category	Locality
1	*Curcuma*aromatica	Ranhalad	Zingiberaceae	Threatened	Isapur
2	*Iphigenia indica*	Ranlasun	Liliaceae	Threatened	Khandala, Dhundi, Isapur,
3	*Gloriosasuperba*	Kal-lawi	Liliaceae	Threatened	Dhundi, Khandala, Belghavhan, Isapur, Katkheda, Harshi
4	*Withaniasomnifera*	Ashwagandha	Solanaceae	Rare	Pusad, Belghavhan, Khandala,

					Katkheda
5	*Vitexnegundo*	Nirgundi	Lamiaceae	Rare	Khandala, Dhundi, Belghavan, Isapur
6	*Amorphophallous* sp.	Dukkarkand	Araceae	Threatened	Khandala
7	*Terminaliaarjuna*	Arjun	Combretaceae	Rare	Khandala, Dhundi, Belghavhan, Harshi, Isapur, Khandala
8	*Buchananiacochinchinensis*	Charoli	Anacardiaceae	Rare	Belghavhan, Isapur, Khandala, Dhundi,
9	*Asparagus racemosus*	Shatawari	Liliaceae	Rare	Khandala, Dhundi, Belghavhan, Harshi, Isapur,
10	*Buteamonosperma*	Palas	Fabaceae	Rare	Khandala, Dhundi, Harshi,
11	*Bombaxceiba*	Katesawari	Malvaceae	Rare	Khandala, Dhundi, Harshi,Isapur
12	*Madhucaindica*	Moh	Sapotaceae	Rare	Khandala, Dhundi, Harshi,Isapur

Medicinal uses

1) *Curcuma aromatic*: It is used traditionally for eliminating blood stasis, delaying the ageing process, pain relief, liver disease, tonic, skin ailments, antidote for snake bite, wound healing, dysentery, indigestion, cosmetics, skincare, anticancer.
2) *Iphigenia indica*:The plant body is useful in damaged breast cancer, against different tumours, gout, skin infections, scrofula, snake bite, rheumatism, as a laxative; used against different types of cancers namely, thyroid, skin, cervix etc.
3) *Gloriosasuperba*: All the plant parts are useful as an abortifacient, tonic, in the treatment of ulcers, leprosy, piles, abdominal pains, itching, and indigestion.
4) *Withaniasomnifera*: In traditional medicine, the consumption of the roots improves cardiovascular health, reduces swelling and stress, strengthens heart muscles, regulates cholesterol, and reduces hair loss in the human body, bronchitis and malaria.
5) *Vitexnegundo*: The plants root, bark, leaves, fruits are useful as antiseptic, bronchitis, asthma, tonic anti-rheumatic, diuretic, wound , ulcers, muscle relaxant, cardiac disorder,
6) *Amorphophallous*sp.: The plant is useful in gastrointestinal diseases viz. haemorrhoids, vomiting, abdominal pain, liver tonics, digestive, bronchitis, asthma, cough and anaemia.
7) *Terminaliaarjuna*: The bark and fruits are used traditionally as cardio-tonic, tonic in fracture, ulcers, spermatorrhoea, diabetes, cough, tumour, asthma, skin disorder, provide energy to heart muscle.
8) *Buchananiacochinchinensis*: All parts of plant body use in the treatment of various disorders diarrhea, inter costal pains, relive itching, blood disorder, fever, ulcers, dysentery, asthma, snakebite.
9) *Asparagus racemosus*: This plant is recommended in Ayurvedic tests for prevention and treatment of gastric ulcers, inflammation, nervous disorder, liver diseases dyspepsia and as a galactogogue.
10)*Buteamonosperma*: Flowers are astringent to bowel, in cure "Kapha", leprosy, strangury, gout, skin diseases, thirst; flower juice is useful in eye diseases. Flower is bitter, aphrodisiac, expectorant, tonic, diuretic, and good in biliousness, inflammation and gonorrhoea.
11)*Bombaxceiba*: The plant has been used extensively for treatment of some diseases like anti-inflammatory, anti-HIV, hepato-protective, hypotensive, antiangiogenic, antioxidant activities
12. *Madhucaindica*: It is used as Anti diabetic, antiulcer, antiulcers, antipyretic, antifertility, analgesic, antioxidant, swelling, inflammation, piles, wound healing, dermatological, laxative, tonic, antiburn, headache and many more problems.

Conclusion

The plants collected and reported from Pusad, District Yavatmal in the present study are used by the local peoples and tribal in their routine treatment practices. All the traditional drugs obtained from different medicinal plants studied in present attempt are very effective, cheap and available around agricultural fields and in wastelands. So the tribals are using these plants as alternative to allopathic medicines. Further research on these plants on scientific lines may help in developing effective drugs for human health care.

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Ethno- Veterinary Plants Used in Animal Health Care Practices by Livestock Owners From Katepurna Region Dist- Akola (M.S.) India

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Abstract
Livestock economy forms a major part of our agriculture economics. Tribals in far flung rural areas are still depending upon plant and household remedies for curing various veterinary ailments. The folk knowledge of ethno-veterinary significance has been identified by tribals through a process of experience over hundreds of year. The present study throws a light on herbal remedies used in animal health care of Katepurna region district Akola, Maharashtra, India. The paper deals with 15 diseases of domestic animals and their treatments by 50 plant species found in close vicinity of the rural peoples of the study area.
Key Words: Domestic animals, herbal medicines, animal healthcare and Katepurna region.

Introduction
In India enough attention has not been given to the traditional veterinary herbal remedies (Boddings, 1927; Bandyopadhyay *et. al*., 2005 and Prajapati & Kumar, 2005). The use of plant and animal parts for medicines long been in existence and documented in records kept in ancient China, India and Egypt. These ancient indigenous practices were discovered by a series of trial and error which then could not be substantiated by proven scientific theories. However, these practices have produce result of proven efficacies compared to conventional modern medicines (Chopra *et. al*., 1956 and Prajapati *et. al*., 2003).

In recent times, herbal medicines have become indispensable and are forming an integral part of the primary health care system of many nations. There has been rich tradition and indigenous knowledge about animal healthcare in India (Raja Reddy, 1987; Sharma, 1993 and Bhattacharjee, 2001). Modern healthcare in the tribal and rural areas of Katepurna region is characterized by the deficiency of infrastructure, of qualities personal and of medicine. So, the present study was undertaken in rural as well as in forest areas of Katepurna in Akola district.

Methodology
The traditional knowledge of plant base remedies for the treatment of ailments rests with the medicine man, all of which belong to one family of hereditary indigenous practitioners. Skill and experiences are passed on from one generation to the next by word of mouth and guarded like secrets. In view of secretiveness of traditional men and women, it was decided to interview a number of elderly people, who have a great deal of practical knowledge about the plants and animal products used as medicine in the native system. Before actually launching into the field work, rapport was established with tribals of the locality. Experienced people, such as some elders, professional healers, medicine men can provide important information on useful medicinal plants.

To determine the authenticity of information collected during field work, repeated verification of data from different people and at different times was done. The collected plants were identified up to species level with the help of flora (Kamble & Pradhan, 1988; Karthikeyan & Kumar, 1993; Naik, 1998; Singh & Karthikeyan, 2000 and Singh *et. al.*, 2001). The information presented includes the name of ailment, plant parts, animal product or chemical used, their scientific names and mode of usage. The data are presented alphabetically disease and disorder wise.

Observations
In all 50 plant species are used by the natives in the treatment of domestic animals.

1] Anorexia: 50 gm tuber powder of *Corallocarpus epigaeus* Rottl.et Willed. mixed in 250 ml wine is given in anorexia for Loss of appetite.

2] Bloat: Leaves of *Ocimum basilicum* L. crushed with sugar and the decoction in water is given for blood purification. Tuber of *Discorea bulbifera* L. rubbed in cow urine and paste is applied over bloat. Inflorescence of *Mangifera indica* L. crushed in cow urine and the paste applied thrice a day on bloat. Tuber paste of *Corallocarpus epigaeus* Rottl.et. willd. Clarke made in cow urine administered over bloat.

3] Blood purification: Agents believed to remove impurities or deficiencies from blood. Leaves of *Ocimum basilicum* L. crushed with sugar and the decoction in water is given for blood purification.

4] Bone fracture: The stem branches of *Viscum articulatum* Burm. f. given orally or mixed with fodder. Warm leaves of *Soymida febrifuga* (Roxb.) A.Juss applied on fracture part. Poweder of leaves of *Blepharis repens* (Vahl) Roth. mixed with whey or pulses of black gram given for healing bones. Stem bark paste of *Terminalia arjuna* (Roxb.ex DC.) Wight & Arn. applied over bone fracture . Root powder of *Bauhinia racemosa* Lamk. with butter and rice given to animals to join the bones. Leaves of *Capparis zeylanica* L. crushed within castor oil, mixed with bulk of egg and sieve white soil. Paste prepared is plastered around fracture bone bandage with the help of hairs, cloth strips and wooden splints made of lightwood.

5] Cough, Cold and pneumonia: This disease makes the animal to cough continuously due to climate change or by grazing newly raised grasses on the ground. Warm vapour of *Eucalyptus globus* given to the animal in cough and cold.

6] Constipation: Constipation is a condition of bowels when defecation of faeces is irregular or difficult. *Abrus precatorious* L. seeds powder are used orally along with water. Crushed seeds of *Jatropha curcas* L. after removing epicarp are given to animals for same.

7] Dysentery: A disease caused by bacteria or protozoa, causing inflammation of mucus membrane and glands of large intestine, resulting in painful dysentery. The stool often accompanied by mucus or blood. Decoction of leaves of *Eucalyptus globules* Labill mixed with water and by adding by camphor given to animals. Decoction of leaves *Embelia ribes* N. Burm mixed with boiled fruit in water given to animals in dysentery. Dried fruits of *Cucumis melo* L. var. crushed and mixed with wheat for three days in morning given to cattel. Decoction of leaves of *Dolichondrone falcata* (Wall. Ex DC) Seem. after sieving through piece of cloth mixed with butter and given to animals. Decoction of pods of *Cassia fistula* L. mixed with water given to animals. Crushed leaves of *Cardiospermum halicacabum* L. mixed with butter milk given to animals against dysentery. Fruits of *Aegle marmelos* (L.) fed to animals to cure. Fruit powder of *Careva arborea* Roxb., *Sappindus emarginatus* Vahl mixed with *Curcuma longa* L. and decoction is prepared in ghee and 1 lit. decoctions given to cure dysentery.

8] Diarrhoea: A common symptom of gastro- intenstinal diseases resulting infrequent discharge of watery stool. Bark of *Ixora arborea* Roxb. Ex Smith soaked with pulses of *Phaseolus mungo* L. overnight in water then next day mixture is crushed together and mixed with 1 litre whey and given twice a day to cure body diarrhoea. The decoction of leaves of *Barleria prionitis* L. mixed in water is given to animals. Leaves and flowers of *Madhuca indica* J. The decoctionis given to cure body diarrhoea. Crushed leaves of *Cayratia auriculata* (Wall. Ex Wight & Arn.) Gamblle mixed with one liter butter milk and sieving through a piece of cloth is given to animals. The decoction of leaves and young pods of *Acacia nilotica* (L.) Willd. Ex Del. is given to animals against diarrhoea.

9] Eye diseases: Seed paste of *Balanites aegyptiaca* (L.) Del. Applied to eyes to cure corneal opacity. Seed paste mixed with juice of *Citrus limon* L. and *Curcuma aromatic* Salisb. Applied to cure injury of eyes. Fruit paste made in cow urine applied to cure redness of eyes. Latex from leaves of *Ficus benghalensis* L. applied in eyes to cure corneal opacity and watering of eyes. Fruits of *Semecarpus anacardium* L. f. crushed in cotton and soaked cotton is moved in eyes two to four times to cure redness in eyes.

10] External parasites: The leaf juice of *Ailanthus excels* Roxb. is used to kill external parasites like lice and ticks.

11] Fever: Body temperature increases, which can be judge b the touching the animals ear. Decoction of roots or leaves of *Trianthema portulacastrum* L. given to cure fever after worm infection. Decoction of crushed roots of *Marsdenia tenacissima* (Roxb.) Moon. given to cure fever. Bark of *Butea monosperma* (Lamk.) Taub. crushed in cow milk, mixed in cow milk , mixed in water and given to cure fever of bullocks. Leaves and flowers of *Madhuca indica* J.F. Gmel and *Tamarindus indica* L. crushed together and decoction is given to cure fever of Goat.

12] Maggoted wounds: Root powder of *Gloriosa superba* L. is dusted on maggoted wounds to kill worms. Leaf decoction of *Alianthus excels* Roxb. is applied on the wound to remove maggot. Decoction of leaves of *Datura metel* L. used to cure maggot wounds. Decoction of leaves of *Cleome viscosa* L. applied on sores for killing maggots. Decoction of leaves of *Clerodendrum multiflorum* (Burm. f.) O. Ktze. droped on worm infested wounds and crushed leaves are also applied to kill worms.

13] Hebicide poisoning: Roots of *Baliospermum montanum* (Willd.) Muell. – Arg. Are crushed and put under canine tooth in herbicide poisoning. Whole plant of *Cuscuta reflexa* Roxb. Crushed and mixed with 250 gm butter is given orally in herbicide poisoning.

14] Itch: Sense of irritation on skin. Inner bark of *Acacia nilotica* (L.) Willd. Ex. Del. *Emblica officinallis* Gaertn. *Ziziphus nummularia* Burm. f. and leaves of *Feronia elephantum* Corr. Boiled together . The

decoction is sieved through a piece of cloth, one spoon of pepper powder mixed with two spoon hot butter is added into above decoction and one bottle is given twice a day in itching.

15] Repeat breeder: Crushed fruits of *Thespesia populnea* (L.) Soland. Ex Corr. Boiled, mixed with half litter water and given orally for three days in repeat breeder or anestrus.

Discussion

The present study included extensive survey and research work regarding the use of herbal medicine in the Akola district. As observed in most of the cattle owners and common peoples, first choice of treating their animals is traditional herbals remedies. On field tests, it is revealed that the above common ailments were cured fully in all the cases excepting the few negligible. There were no side effects. Further, the costs of all these herbal remedies were negligible in comparison to modern veterinary medicines as prescribe by the veterinarians. As majority of the inhabitant of the Katepurna region solely depends on agriculture and animal husbandry sectors, their poor economic condition does not permit them to meet the cost of allopathic medicines. Hence, they strongly believe and rely upon their traditional herbal medicines.

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Impact of Laser Irradiation on Germination of Seeds

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Abstract

Majority of the population of India has agriculture as the source of their livelihood and it cannot be underestimated. The increasing population and globalization effects demands increase in quality as well as quantity of food along with its variety. Along with that food safety and security is essential factor to be consider. Since decades, novel techniques and technologies are employed to fulfill these demands. Laser technologies have been proved trustworthy in field of agronomy. This article represents the review on impact of laser irradiation on germination of seeds. It includes Laser applications namely impact of coherent laser irradiation on germination of seeds, effect of laser on fresh and dry weight, irradiation effects at different wavelengths on phenology and yield components of pretreated seeds. Herein the review of above mentioned applications of Laser technology in agriculture, its advantages, challenges and possible future work as well as impact of Laser irradiation on germination of seeds is included.

Keywords: *Laser, agriculture, coherent, irradiation.*

Introduction

Agriculture is the means of livelihood of majority of population of India. Even in twenty first century the agriculture field is facing challenges like water shortage, lack of use of technology, energy resources constraints, less availability of land under cultivation. The increasing world population demands increase in availability of foodgrains. Some innovative methods and smart use of available technology should be the wise way to overcome these issue. Along with that food safety and security is the major factor to be consider. Overuse of fertilizers, pesticides, fungicides makes the land infertile. Moreover, many climate changing activities making hazardous effect on environment. Thus there is need of use of novel techniques to fulfill the demands. Sustainable agriculture is a management system for renewable natural resource for food production income and livelihood for present and future generations, maintaining and improving in comic productivity and the ecosystem. (10)

Laser means Light amplification by stimulated emission of radiation. It is an optical device that can generate monochromatic and highly coherent light. (1). The laser discovery in the past century has been of great impact and applied in the society from its conception until today. Among its applications, its use in agriculture as a biostimulator device. The laser light of low intensity produces bio stimulation when used on seeds, seedlings and plants. (9)

Impact of coherent Laser irradiation on germination of seeds

Laser technology is mainly used for pre-sown seed exposure in order to achieve better and faster germination in various, often unfavorable, habitat conditions.Experiments were done on Soybean seeds which includes exposure of seeds to Laser light of different intensities in combination with bacterial vaccine dose. The samples were exposed to two types of laser, a Helium-Neon laser comprised of red light with a wavelength of 632.8 nm and irradiation density of 2 W m^{-2}, and an Argon laser with a blue light, a wavelength of 514 nm and irradiation density of 5W m^{-2}. After performing experiments, the morphological analysis, Isolation and identification of fungi colonized seeds and statistical analysis of the experimental soybean seeds were done. For 21 days the seeds were kept in chamber and effects on germination were observed. It was found that of all the examined cases, seeds germinated best after being photo stimulatedwith a red or blue laser. The highest number of germinating seeds was found in the case of irradiation of the seeds plus vaccine. This is an effective technique in protecting germinating soybeans and the roots of older plants against infestation by soil-borne pathogenic fungi(3)It is observed that the absorbed energy from laser light increased activities of biochemical and physiological process of seeds by the transformation of light energy into chemical energy(9)

Irradiation effects at different wavelengths on phenology and yield components of pretreated seeds

The aim of the study was to determine effects of different dose and different wavelengths on irradiation . The maize was chosen as experimental material. Three types of laser were used: He–Ne (red), Nd:YAG second harmonic generation (green), and diode (blue), generated at 632.8, 532, and 410 nm, respectively. It was found that with different exposure time and power density of the laser the maize plant showed remarkable effects. The irradiation of the sowing material hada positive influence on the seed yield of maize. (4).

Effect of laser on fresh and dry weight, root length, hypocotyl length

In the simple optical experiments of pretreating mug beans with laser of wavelength 632.8 and 488nm shows improvement in root length, hypocotyl length by 28% and 22% respectively (5). Researcher has exposed seeds of pea to helium neon rays for 10 min. gave the highest values of plant dry weight compared to untreated plants and other period (2 and5 min). (6)

Laser treatment for resistance to fungal and bacterial infection

Experiment were performed on wheat. As wheat is the major part of our daily food Development of new alternative therapeutic approach is necessary to curtail fungi infection. This invitro study demonstrated that pre sowing exposure to SHG Nd-YAG laser in wet and dry condition was able to sterilize wheat seeds, improve its growth and development, and may be a good candidate for novel treatment of fungal infected wheat seeds. (8). the irradiation of seeds with 660 nm laser light seems to induce resistance against diseases caused by microorganisms in seedlings (7), which could be an interesting and sustainable area of research. Furthermore, irradiatingseeds with red laser light seems to improve the nutritional value of seedlingsthrough the accumulation of vitamins, minerals, pigments and antioxidants, and isalso capable of boosting both the antioxidant capacity and anti-inflammatory activities(2)

Future Scope and limitations

Herein this review paper presented the impact of irradiation of deed germination of seeds. It is effective for enhancing the agricultural production. The above mentioned study shows the effect of pretreatment to seeds by laser with coherent sources, with sources of different wavelength as well as the use of laser for proper maintenance of water and fertilizers in field. But there are few limitations also. Laser induced changes are positive as well as negative. Bio stimulation by lasers may cause negative effects as well. Thus further study and investigation is needed in this field. This may offer us new horizons to explore and will prove worthy in fulfilling the demand of sustainable growth.

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ORB Weaver Spiders Fauna of Sugarcane Agroecosystems of Mahagaon Taluka Maharashtra, India

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Abstract: -

Spiders play a significant role in ambiguous insect pests in agricultural ecosystem. Modern trends in farming towards condensed pesticide use and natural sustainability lead to enlarged importance in spiders as potential biological control agents.

The association of a powerful involvement among species richness and an exchange the catalog is a serious issue in conservation biology. Such a association could gives the foundation for the association of commercial and easy-to-monitor methods intended for measuring biodiversity, given that an another prioritization of sites for conservation. Together family and genus richness are studied for their capability to calculate the number of spider species self-sufficient of diversity. Genus only is found to be trustworthy sign for ranking sites according to species richness. This study recommends accomplishment of higher taxonomic level as a hopeful loom for calculation of spider species richness or estimation and standing of areas according to conservation significance. This paper is an attempt to understand the diversity and assemblage of spider's fauna from Sugarcane argoecosystem of Mahagaon taluka of Yavatmal district. Out of 154 spider population Total 17 species were observed from 7 genera from Aranidae family.

Keywords:- Agroecosystems, Aranidae Integrated Pest Management ,Spiders, Sugarcane.

I. Introduction:-

ORB Web Spiders is the biggest family amongst spider's world. All species from this family spins web the particular structure of the web is useful for identification of species. Spiders from this family having flat cephalothorax; thoracic region is oval, or almost spherical, divided from head by tilted depression. Eyes are not different in size. Legs are covered with lots of hairy spines, with three tarsal claws. The legs are also varies greatly in length. When spider is in resting stage legs are likely to be drawn up tightly against carapace, which may be completely hidden. In this family male is much smaller and very differ from female and has large, rounded tarsal bulb on the end of each palp. Sternum is triangular or may be heart shaped and coxa IV is being next to it.

The biodiversity of invertebrate species on agricultural land is very important in terms of pest control and conservation. Spiders are principal predator found in Arthropods communities (Gertssch, 1979).

Spiders are significant but in general disappointingly studied arthropods due to unawareness, lack of knowledge, fear and general dislike towards them. The broadly spread concept that spiders are toxic and dangerous, may be the one of reason to stay away from them. All spiders are not venomous only a small number of species such as Black Widow spider, Recluse spider or Red Back spiders bite is harmful for human beings, and sometime they may cause allergic reactions. Venom produced by spiders is poisonous to their common pray like insects, mites and other small Arthropods; venom is inserted to pray through the fangs to immobilize them. Spiders only use their venom to immobilize their prey and hence they act as natural pest controller, so the study of diversity and variety of spiders in agro ecosystem is useful for determination of the benefits of agricultural practices for conservation of spiders, important for pest control (Eyre *et al.*, 1989). Spiders are wide spread in agro ecosystems making up to 20-80% of predatory fauna (Legotay, 1980; Zhang, 1992). To control effects of pests various pesticides are regularly been used by farmers, but these pesticides are having various adverse effects on non target fauna, sometimes these pesticides are harmful to human beings also, therefore more emphasis should be given on bio-pesticides, spiders plays major role in controlling population of insect pests.

II. Material & Method

A. Study Area:-

The area selected for collection of orb weaver's spiders is Sugarcane agroecosystems of Mahagaon Taluka of Yavatmal District (Maharashtra state). Mahagaon and nearby areas habitually depend on agriculture as the main resource of income. The land in the region is very well irrigated because of Pus dam, Veni Dam, Senad Dam, Pimpalgaon Dam And Mudana dam which provide multipurpose benefits of irrigation, drinking water supply, flood control and hydropower generation.. Pus River also provides direct irrigation water to farms. Drinking water is also sourced from this canal. The catchment area is hilly and forested in its upper niches from its source and the lower niches are flat wide valleys. (Rivers, Government of India 2010). Main

crops include Sugarcane, Cotton, Soybean, Bengal gram, Jawar, and Wheat.sugar cane is an irrigated crop, it *can* be *cultivated* on almost all types of soils provided sufficient organic matter is applied under rained conditions.

Mahagaon taluka of Yavatmal district, (Maharashtra) is located at the latitude of 19.7877244, and the longitude is 77.772378**. Mahagaon , Maharashtra, India** is located at *India* country in the *Cities* place category with the GPS coordinates of 20.7277° N and 80.0591° E. **Mahagaon , Maharashtra, India** 398 meters. Above Sea level, that is equal to 1,167 feet. Mahagaon taluka has an extreme variation in temperature with hot summer and cold winter. The rainfall comes from South Western called monsoon mainly in the month of June, July, August and September. The annual average rainfall in the Morshi is 738.40mm and temperature recorded between 17^0C to 45^0C.

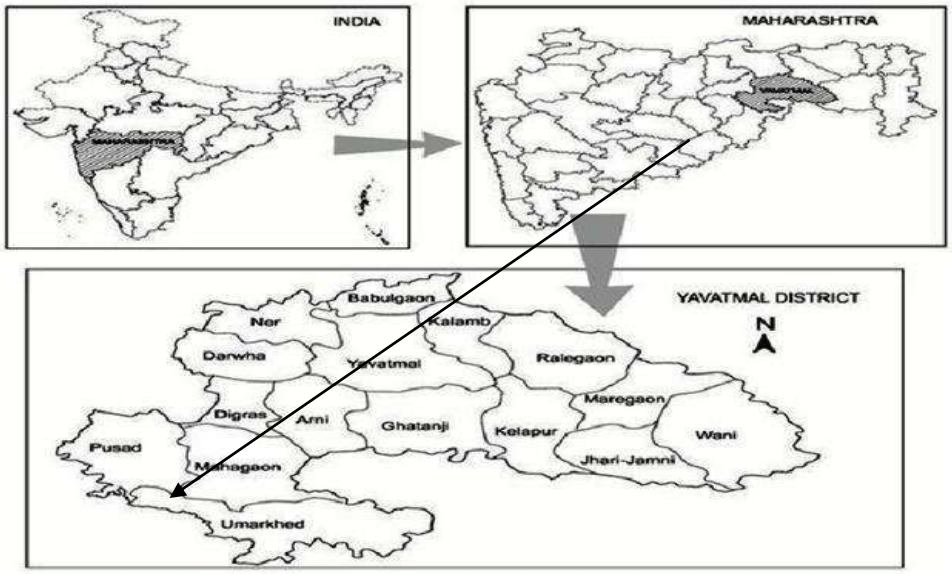

Fig: - Study Area

B. Method

a) Study Period

The investigation was carried out for a period of six months from September 2020 to February 2021. Sampling was conducted in six months at the randomly selected sugarcane field.

b) Sampling

Sampling was done every Saturday - Sunday from quadrates. Spiders were collected only for photographic purpose and released immediately in their natural habitats. Quadrates (1sq. m × 1sq m) placed at four corners and one centre of 10 sq. m × 10 sq. m region by visual search process between 8.00 Am to 12 PM 4 hours in morning and 4 to 6 PM 2 hours in Evening. An adequate interior part was left to avoid boundary possessions. All 1 quadrates were searched. Spiders were collected from the ground stratum and from the terminals of crops. Total 15 Villages were visited consistently for study of spiders.

c) Identification:

Identification of spiders is done with the help of keys available. The specimens were observed for their preserved or photographed. For identification keys of Tikader (1963), Gajabe (2005), Z.S.I. and other literature.

The family wise identification was mainly done with the help of eye position as well as other morphological characters.

III. Result & Discussion:-

Aranidae was the most dominant family in both the study areas as they are very good predators on web. They control the insect and other harmful arthropods which get entangled in the webs. Aranidae shows great predation towards *Leptocorisa acuta* (bugs), and White grubs than the other spider species. Various other observations suggested that spider distribution and re-colonization in fields are important aspects of spider population dynamics in agro ecosystems. (Bishop, L.and S.E. Riechert, 1990). Genus Araneus was dominant during winter followed by Cyclosa these two genera were represents 37% species richness from Aranidae family during 2020-21 but in 2022 the number reduced up to 26% from Sugarcane argoecosystem as the result of pesticide, burning of raw residues of sugarcane and human encroachment in study area.

Family	Species in Sugarcane agroecosystems	Population	Region	Meta- Region
1. ARANEIDAE	*Araneus mitificus* (Female)	9	Site 4	Sawana
	Araneus pahalgaonensis (Female)	11	Site 4	Kalgaon
	Araneus sp.(Female)	10	Site 2	Veni
	Araneus sp.(Male)	12	Site 4	Sawana
	Argiope sp. (Male)	8	Site 1	Pedhi
	Argiope aemula (Male) and (Female)	9	Site 2	Sawna
	Argiope anasuja (Thorell) (Female)	5	Site 3	Mahagaon
	Chorizopes calciope (Female)	6	Site 3	Malkinhi
	Cyclosa hexatuberulata (Female)	7	Site 1	Leva
	Neoscona nautica (Female)	10	Site 2	Tembhi kali
	Neoscona theis (Female)	16	Site 2	Gunj
	Neoscona mukharjee (Female)	11	Site 3	Bhosa
	Neoscona sp. (Male)	14	Site 4	Bori Ijara
	Telacantha brevispina (Female)	12	Site 1	Amni
	Telacantha sp.(Female)	5	Site 2	Amboda
	Zygeilla sp. (Female)	5	Site 4	Kalgaon
	Zygeilla sp.(Male)	4	Site 4	Veni

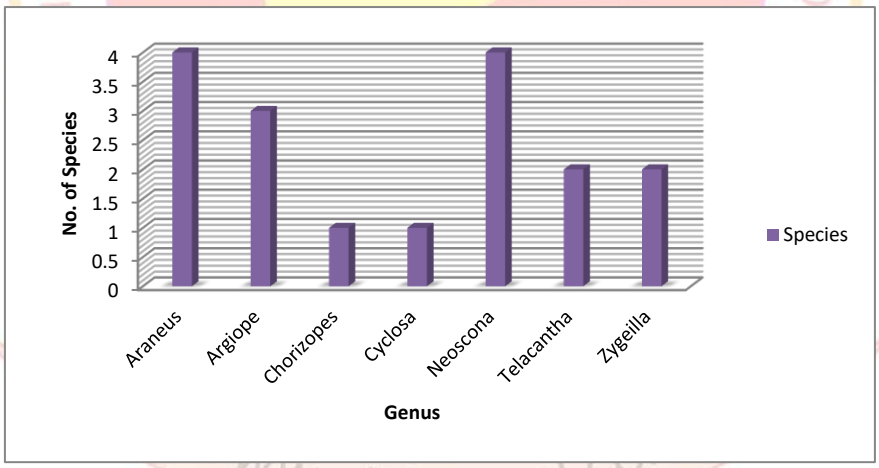

Chart No of Species against Genus of Aranidae Family.

Statistical Analysis:-

Total number of Organisms:-	**154**	Total number of Species	**17**
Average population size: -	**9.059**	Decimal Accuracy: -	4
Number of Regions	**15**	Region sets	6

Alpha Biodiversity [α]

Simpson Index $\frac{\sum_i n_i(n_i-1)}{N(N-1)}$ 0.06069 Simpson Index Approximation $\frac{\sum_i n_i^2}{N^2}$ 0.06679

Beta Biodiversity [β] Comparing two sample areas

Absolute beta Value ($(S_0$-c)-(S_1-c)…): **208** Whittaker's Index (S/alpha): **15**

Sorensen's similarity index: **0** Alternate Whittaker's Index (S/alpha-1):**14**

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Ethnomedicinal Study &Qualitative Analysis of Jatamansi- A Case Study in Lanku valley, Darjeeling, West Bengal.

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Abstract

Medicinal plants have important contribution in the healthcare system of local communities as the main source of medicine for the majority of rural population. The paper is about treatment of various diseases using ethno medicinal practices of Jatamansi. Nardostachysjatamansiis a flowering plant belonging to family Caprifoliaceae. This plant is also known as "Tapaswani" in Ayurveda. It is a perennial, dwarf, hairy, herbaceous and endangered plant species. According to herbal practitioners the plant is used in various herbal formulations to treat epilepsy, hysteria, convulsions, mental weakness, anxiety and insomnia. The study is conducted in Lanku valley, Darjeeing, West Bengal and it is located 60 kms. from the city of Siliguri. The main population of this area is tribal communities and they have their distinct knowledge of language, culture and food habits. In spite of availability of modern medicines, the tribes of Lanku valley region use plant therapy for treatment of various diseases. One of the main reasons of this is rich plant diversity of Lanku valley. Jatamansi is used for various medical purposes by tribes of Lanku valley. The phytochemicals obtained from the plant are widely applied in the traditional herbal medicines. This paper deals with the ethnomedicinal practices of Nardostychysjatamansiand its phytochemical analysis.

Key Word *Nardostychysjatamansi, Ethno Medicine, Traditional Knowledge, Tribal*

Introduction

Human civilisation have used plant for different purposes for centuries. They also found use of plants in treatment of health problems. Systematic study of ethnomedicinal plants are important to find new drugs from indigenous knowledge of medicinal plants. [1] This paper deals with the medicinal importance and preparation, extraction, and qualitative analysis of phytochemicals present in *Nardostachysjatamansi* DC belonging to the familyCaprifoliaceae. It is an endangered, therapeutic herbal plant mostly grows in moist, rocky and steep slopes of undisturbed grass in India, Nepal, Bhutan and China in Himalayan region from 2300 to 6000 m above sea level. The root of this perennial small rhizomatous herb has thick, short dark grey rhizomes which are crowned with fibrous remains of reddish brown petioles of the radical leaves. Different medicinal systems use these rhizomes in traditional medicines as tonic, laxative, antiepileptic, stimulant and antispasmodic. [2]In traditional herbal medicines It is used to treat neurological disorders like hysteria, epilepsy, convulsions and mental weakness. The decoction of its rhizomes also used in treating insomnia and cardiovascular system. [3]*Nardostachysjatamansi* is an endangered aromatic herbal plant is on the verge of extinction due to over-utilization. [4] The study was conducted in Lanku valley it is a village located in Kurseong block of Darjeeling district, West Bengal. The valley is covered with dense forest of both deciduous and evergreen trees, herbs, shrubs and thousands of varieties of flowerless plants like mosses lichens and ferns. [5] In spite of availability of modern medicines People prefer plant therapy for treatment of various diseases. This paper deals with the ethnomedicinal practices of Jatamansi used for the treatment of some selected health problems like insomnia, epilepsy, anxiety and depression. This paper also deals with the preparation, extraction and qualitative analysis of phytochemicals present in this plant.

Objective

To gather information about traditional knowledge aimed at redressing some medicinal value of Jatamansi used by local baidya of Lanku valley, Darjeeling, West Bengal.Authentic documentation of medicinal role of Jatamansi, reefing the existing knowledge and exploring future aspect of this medicinal plant.To provide a new interpretation of Jatamansi with respect to cultural, economic, ecological and conservational point of view.To motivate local people on conservation of JatamansiinLanku region. Phytochemical analysis ofJatamansi has also been performed.

Materials And Methods

For case study and collection of the data semi-structured interviews, questionnaire and direct observation were used. The information was gathered and confirmed by repeated queries raised time to time among the local herbal practitioners and the users as well.Healers have been registered for documentation.

The qualitative analysis has been done to identify the phytochemical constituents present in *Nardostachysjatamansi*DC . The preliminary phytochemical analysis for Proteins, Carbohydrates, Phenol & Tannins, Flavonoids, Saponins, Glycosides, Steroids, Phlobatannins, Alkaloids and Terpenoids has been done. [6]

Collection of plant material

The dried form of roots of Jatamansi is collected from local herbal practitioner of Lanku valley of Drajeeing District. The practitioner collects plant material from different parts of Sikkim that is Nathang, Tamsay and Kisheong.

Extraction of plant material

The extraction of plant material was done by hot water extraction method. The dried plant material was grinded and powder was kept in an appropriately labelled air tight bottle. To get aqueous extract 5gms of powdered material was weighed using an electronic weighing balance. Then it was taken in a beaker and 100 ml of distilled water was added. The mixture was heated on a hot plate with continuous stirring at 30°-40°C for 20 minutes. [7]Then water extract was filtered through filter paper and filtrate was used for the phytochemical analysis. Same process was repeated to get ethanolic and methanolic extract using ethanol and methanol in place of distilled water.

The Plant extract was tested for the presence of bioactive compounds by using standard methods of: *Sofawora,A.1993, *Trease,G.E, *W.C.1989, *Harborne,J.B.1973

Photochemical Analysis of: *Nardostachysjatamansi*
Family-Caprifoliaceae

Phytochemical analysis	**Plant Part used: Roots**
Proteins	**(a) Million's test: 2ml Ext.+2ml Million's reagent Δ→white/ red ppt**
	(b) Ninhydrin test: 2ml Ext.+2ml of 2% Ninhydrin sol. Δ→violet
Carbohydrates	**(a) Fehling's test: 2ml Ext.+(1ml Fehl.A+1ml Fehl.B) Δ→Brick red ppt**
	(b) Benedict's test: 2ml Ext.+2ml Benedict's reagent Δ→Reddish brown
	(c) Iodine test: 2ml Ext.+2ml Iodine solution →Dark blue/ purple
Phenol & Tannins	**2ml Ext.+2% $FeCl_3$ sol. →Blue/ Green or Black**
Flavonoids	**(a) Shinoda test: 2ml Ext.+few fragments magnesium ribbon + conc. HCl→Scarlet pink**
	(b) Alkaline reagent test: 2ml Ext.+2% NaOH Sol. →Intense yellow → few drops dil. H_2SO_4→Colourless
Saponins	**Foam test: 2ml Ext.+ 5 ml distilled water → Foam**
Glycosides	**(a) Liebermann's test: 2ml Ext.+ 2ml chloroform + 2ml acetic acid + conc. H_2SO_4→V/B/G**
	(b) Salkowski's test: 2ml Ext+2ml chloroform+2ml conc. H_2SO_4→Reddish brown
	(c) Keller-kilani test: 2ml Ext+2ml acetic acid+1-2 drops $FeCl_3$→2 ml conc. H_2SO_4→Brown ring
Steroids	**(a) 2ml Ext. + Acetic acid + conc. H_2SO_4→Blue green**
	(b) 2ml Ext. + Chloroform + conc. H_2SO_4→Red
	(c) 2ml Ext. + Chloroform ← Acetic acid + conc. H_2SO_4→Greenish
Phlobatannins	**2ml Ext.+1% HClΔ→Red ppt**
Alkaloids	**2ml Ext.+1% HClΔ + Mayer's reagent + Wagner's reagent →Red ppt**
Terpenoids	**Ext.+Chloroform+ conc. H_2SO_4Δ→Greyish**

(Δ)= Heat Ext=Extract

Case Study

For the case study the semi structured interviews and questionnaire are prepared and the questionnaire was designed to gather information regarding patient's description, case history, their believes and practices, treatment plan, expected outcome of the treatment and actual outcome. This case study was conducted between the month of October (14.10.2020) to April (15.04.2021) and the three patients were under observation.

s. no.	Name of the patient	Age	Disease/ Health problem	Doses	Duration	outcome
1.	Dil Kumar Biswakarma	44	Insomnia	½ tea spoon Jatamansi powder with honey twice a day	Three Months	No symptoms observed
2.	Salim Thapa	58	Epilepsy	1 tea spoon Jatamansi powder with honey or luke warm water twice a day	Four Months7 days	asymptomatic
3.	GhanshyamChhetri	24	Anxiety & Depression	½ tea spoon Jatamansi powder with honey twice a day	Two Months	No symptoms observed

Table.1: Phytochemical analysis of *Nardostachysjatamansi*. in aqueous, ethanolic and methanolic extract

Phytochemical Analysis of: *Nardostachysjatamansi* **Family-Caprifoliaceae**				
Phytochemical analysis	**Plant Part used: Roots**	**Aqueous extract**	**Ethanol extract**	**Methanol extract**
Proteins	**(a) Million's test**	++	++	_
	(b) Ninhydrin test	_	_	_
Carbohydrates	**(a) Fehling's test**	++	_	++
	(b) Benedict's test	_	++	_
	(c) Iodine test	_	_	_
Phenol & Tannins	**Ferric Chloride Test**	++	_	++
Flavonoids	**(a) Shinoda test**	_	++	_
	(b) Alkaline reagent test	++	++	_
Saponins	**Foam test**	++	_	++
Glycosides	**(a) Liebermann's test**	++	_	++
	(b) Salkowski's test	_	++	++
	(c) Keller-kilani test	_	_	++
Steroids	**(a) Liebermann's test**	_	++	++
	(b) Salkowski's test	++	_	++
	(c) Keller-kilani test	++	_	++
Phlobatannins	**1% HCL Test**	_	++	++
Alkaloids	**Mayer's & Wagner's reagents test**	_	_	++
Terpenoids	**Salkowski's test**	++	++	++

(+)= Trace (++)= Present (+++)= Strongly present (--)= Absent (Δ)= Heat Ext=Extract

Result And Discussion

The case study was conducted by selecting three patients randomly who were visiting to local Baidya of Lanku valley and being administered roots of Jatamansi in powdered form. These patients are of different age group who were suffering from different health problems. The method of administration and doses of the plant product was almost same. By certain courses and duration, it was found that the treatment was successful for all the cases.

The qualitative analysis has been done to identify the chemical constituents present in *Nardostachysjatamansi*. Here the + symbol indicates the presence of phytochemical in trace amount, ++

indicates in adequate amount, +++ indicates strong presence of phytochemicals, and -- indicates absence of phytochemicals.

Fig.1: Phytochemical analysis of *Nardostachysjatamansi*, Aqueous Extract

Fig.2: Phytochemical analysis of *Nardostachysjatamansi,* Ethanolic test

Fig.3: Phytochemical analysis of *Nardostachysjatamansi*, Methanolic test

Conclusion

The information gathered from local Baidya and three patients who were suffering from different health problems were consulted and it was found that treatment was successful for all the patients.Despite having modern medical facilities people of Lanku valley used plant therapy to a considerable extent. The phytochemical analysis of *Nardostachysjatamansi*suggested the plantcontains all the primary metabolites and one or other active secondary metabolites like phenol, tannins, Flavonoids, saponin, steroids, phlobatannins, alkaloids and terpenoids. The presence of such secondary metabolites in *Nardostachysjatamansi* shows it has very significant role in the treatment of various diseases in human being.

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Dioscorea bulbifera : A Review of its Phytochemical analysis of some Phenolics & Pigments by spectrophotometric method

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Abstract:

The present study was undertaken to find out phenolic compound content and pigments of leaves of Dioscorea bulbifera L. Collection of plant material were done from Melghat forest region, Dist.- Amravati, Maharashtra. Dioscorea bulbifera L. is tuberous climbing herb,it is commonly known as air potato. its leaves and bulb used in traditional medicine . Dioscorea bulbifera is effective against several therapeutic diseases such as cancer, skin infection,goiter and orchitis.Plants were identified with the help of the standard floras.1gm of were leaves used for determination of Phenolic compounds & some pigments. Phenolic compound act as antioxidant. Antioxidants have been reported to prevent oxidative damage caused by free radical. Estimation of total phenol, quinones, flavonols and tannins were done and estimation of some pigments Anthocyanin, Leuco-anthocyanins and Total carotenoids were done.

Keywords: *Dioscorea bulbifera L, Phenolic compounds, pigments, Spectrophotometer.*

Introduction

Ayurveda, the Indian system of medicine mainly uses plant based drugs or formulations to treat various human ailments because they contain the components of therapeutic value. In addition, plant based drugs remain an important source of therapeutic agents because of the availability, relatively cheaper cost and non-toxic nature when compared to modern medicine.Plant produces these chemicals to protect itself but recent research demonstrates that many phytochemicals can protect humans against diseases.

An ever increasing demand for herbal medicines due to its safety and less side effective has led to usage of medicinal plants worldwide(Kumar et al.,2016). D*ioscorea bulbifera* L. (family: Dioscoreaceae) commonly known as "air potato "is an important edible medicinal plant. Tuber, Bulbils, Leaves, Inflorescence and Flowers are edible, Cooked asVegetable. It is Considered as a very delicious dish by local as well as Trible People.

A variety of plant secondary metabolites have been reported to act as antioxidants and amongst them phenolic compounds from a major group. There are several reports on the contribution of phenolic compounds to the antioxidant potential of different plant species (Cai *et al.*, 2004). flavonoids are naturally occurring phenolic compound which largely include anthoxanthins (flavones, flavonols, flavanones, flavanols, chalcones and isoflavones), anthocyanins, leucoxanthins and flavonoidal alkaloid (Houghton, 2002).

Yam leaves and tubers used are to treat a variety ofaliments. the leaf of aerial yam is used as a poultice for pimples and tumors and inbath water to soothe skin irritations and stings.(Gao *et al*., 2002).D*ioscorea bulbifera* tubers contain furanoid, norditerpenes, norditerpene, norditerpene glucosides,diosbulbinoside D and F and diosbulbin B and D (Su *et al*., 2003).

Dioscorea bulbifera has gained less attention and an organized synthesis of literature is still missing. therefore ,this study helps to other researchers. According to traditional medicine *D. bulbifera* has used to treat several diseases and detoxify poison and clot blood to stop bleeding.(vasanthi et al.,2010).

Materials and Methods:

Plant material

***Dioscorea bulbifera* L.**

A genus belonging to Discoreaceae family, Large unarmed, tuberous climbing herb, tubershairy stem terete with bulbils in the leaf axils, leaves alternate, broadly ovate to orbicular reniform.flowers small, green, turning purplish with maturity male flowers in short slender, axillary, solitary or fascilated pendulousspikes. perianth

white, stamens 2-2.5 mm long,acute,staminodes 6;styles short;stigmas 3.capsule ablong 1.5-2 0.5-1.2 cm,reflexed 3-winged.seeds winged at one end only.

Flowers and Fruits- August to October

Flowers and fruits : October to January

Uses

Tuber, Bulbils, Leaves, Inflorescence and Flowers are edible, Cooked as Vegetable. It is Considered as a very delicious dish by local as well as Trible People.

Tubers use as Medicinal Properties like dispersing Tonic Intiflamatory, Cough, Bile, Bronchial, Asthma, Rheumatism, Swelling and bone Fracture. (Shkirsagar, 2010).

Preparation of plant material

Fresh leaves were collected and the dried in sunlight. After them powdered with mechanical grinder and stored in airtight container. samples were powdered separately. 1gm each of samples were taken for estimation of Phenolic compounds and pigments grm/ µgm.

Methods:

Estimation of Phenolics such as total phenol, Quinones, Flavonols and Tannins were done according to the methods prescribed by Thimmaiah (1999), which are given below.

Estimation of Total Phenols

1gm of sample was grind with the help of mortar Pestle with 10 ml of 80% ethanol. The homogenate was centrifuged for 20 mininutes at 10,ooo rpm. Supernatant was collected. Supernatant was Evaporate to dryness.

Then after dryness residue was taken and make up the volume with 5ml distilled water. 1 ml aliquate was Pippette out in test tube , and volume make up 3 ml with distilled water . To it 0.5 ml of Folin-Ciocalteu reagent was added. After 3 minutes, 2 ml of 20% Na_2CO_3 solution was added into each tube.

Mixed thoroughly and tubes was kept in boiling water for 1 minute, then allowed to Cool and absorbance at 650 nm was measured against reagent blank.

Standard curve was prepared using different concentrations (0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, and 1 ml) of catechol. (Thimmaiah S. R. 1999)

Estimation of Quinones

1gm sample was grind with the help of mortar and pestle with using chilled phosphate buffer (5ml for each gm of tissue). The supernatant was collected by

Centrifugation for 30 minutes this was used as enzyme extract. 3ml of buffer, 3ml of standard catechol and 1.5 ml of enzyme extract was pipette in a test tube. It was shaken gently and incubated in water bath. 4ml of TCA (Trichloro acetic acid) reagent (without ascorbic acid) to one and 4ml of TCA reagent (with ascorbic acid) was added. Precipitate was filtered. Absorbance was measured at 400 nm against a reagent bank lacking only extract.

Standard curve was prepared using different concentrations (0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, and 1 ml) of working standard catechol. (Thimmaiah S. R. 1999)

Estimation of Flavonols :-

1gm sample was grind with the help of mortar and pestle with 10ml of ethanol and the supernatant was collected by centrifugation for 20 minutes.The supernatant was evaporated to dryness; then the residue was dissolved in 5 ml distilled water. 1ml of extract was pipette out into 25ml conical flask and 1 ml of distilled water was added.

Then 4ml of vanillin reagent was added from a burette rapidly within 10-15 sec to flask A and 4ml of 70% H_2SO_4 to flask B.

A blank was prepared in flask C containing 4 ml of vanillin reagent and 2ml of distill water. Shaken the both flasks A and B in a water bath at the temperature below 35^0C. Keeping the flasks at room temperature for exactly 15min. Absorbance was measured flask A, B and C at 500 nm against 47%. H_2SO_4 (flask D).

The absorbance of the flasks B and C from that of A.The flavonol content was calculated using a standard curve prepared from phlorogucinol or kaempferol (100 µg/ml). (Thimmaiah S. R. 1999)

Estimation of Tannins :-

Vanillin hydrochloride method was used. 1 gm of sample was mixed in 10ml methanol after 20-28 hrs. centrifuged and supernatant was collected .pipette out 1ml supernatant into test tube and quickly 5ml of vanillin hydrochloride reagent was added and mixed. After 20 min absorbance was read at 500nm. A reagent blank was prepared with vanillin hydrochloride reagent alone. A catechin standard graph was prepared from working standard (100µg/ml) of catechin and amount of tannins was calculated. (Thimmaiah S. R. 1999)

Estimation of Anthocyanins

1 gm of sample was grind with the help of mortar and pestle by using absolute alcohol. Centrifuge and the extract was collected. 1ml of alcohol extract was pipette in test tube and 3ml of HCL in aqueous methanol was added. 1ml of anthocyanin reagent was add in the samples. The Blank was prepared in the same manner by adding 1 ml of methanol - HCL instead of anthocyanin reagent.

After 15min of incubation in dark, Absorbance was measured at 525 nm After 15min of incubation in dark, Absorbance was measured at 525 nm against the bank laking only extract. (Thimmaiah,S. R. 1999)

Estimation of Leuco-Anthocyanins

1gm of sample was grinded with the help of mortar and pestle by using 10 ml methanol. Centrifuge and supernatant was collected. Pipette out 1ml of extract in test tube and volume was reduce to 0.5 ml on a hot water bath.0.5 ml of distill water and 10ml of anthocyanin reagent was mix thoroughly in reduced extract.

The tubes was heated in water bath for 3 min without covering and with covering total for 40 minute. After heating cool under a running tap. Absorbance was measured at 550 nm against a reagent blank laking only extract. (Thimmaiah, S. R.1999).

Estimation of Total Carotenoids

1 gm of sample was grinded with the help of mortar and pestle by using 10ml of acetone. Extract was filter on Buchner Funnel through whatman no. 42 filter paper. The extraction was repeated until the tissue was free from pigments. Pool the filtrates and partition thrice equal volume of peroxide free ether was using seperatory funnel. For producing two layers during initial ether extraction distilled water was added. Hot water bath was used for evaporation of the combined ether layer which contains carotenoid. The residue was dissolve in 5ml of ethanol. 0.5 ml of 60% aqueous KOH was used for 10 ml of the ethanol extract to saponify.,The mixture was kept in the dark forovernight at room temperature. After overnight equal volume of water and equal volume of diethyl ether was used for partition. Evaporate the combined ether layer as before and the residue was added in minimum volume of ethanol. Absorbance was measured at 450 nm against a reagent blank lacking only extract. Standard curve was prepared using different concentrations (0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, and 1ml) of β-carotene. (Thimmaiah,S. R. 1999) After 15min of incubation in dark, Absorbance was measured at 525 nm against the bank laking only extract. (Thimmaiah,S. R. 1999)

A standard curve is the plot obtained by plotting concentration of a given standard along X- axis and the corresponding absorbance values along Y- axis on a graph sheet resulting a straight line which passes through the origin. It is used to quantify the amount of a given compound present in an unknown sample whose absorbance value is matched against that of standard along Y-axis and a corresponding concentration could be read off along X-axis. . (Thimmaiah S. R. 1999)

Result And Discussion

Table 1: Estimation of Phenolics

Sr. No	Name of plant and part used for estimation	Total Phenol		Flavonol		Quinone		Tannin	
1	*Dioscorea bulbifera* (leaves)	Absorbance (650nm)	1900µgm /gm	Absorbance (500nm)	0.65µgm /gm	Absorbance (400nm)	520µgm /gm	Absorbance (500nm)	720µgm /gm

Table 2 : Estimation of Pigments

Sr.No.	Name of plant and part used for estimation	Total Carotenoids Absorbance at (450nm)	Anthocyanins Absorbance at (525nm)	Leuco-Anthocyanins Absorbance at (550nm)
1	*Dioscorea bulbifera* (leaves)	112µgm/gm	33µgm/gm	3.375µgm/gm

Highest amount of total phenol in leaves (1,900µgm/gm) and tanin was observed in leaves of *Dioscorea bulbifera* (720 µgm/gm) and while lowest content of flavonol in leaves (0.65µgm/gm). However there is significant amount of quinone was found (520µgm/gm). In *Dioscorea bulbifera* leaves the rich amount of (112 µgm/gm) total carotenoids was found.

Phenolic compounds and flavonoids have been reported to be associated with antioxidative action in biological systems, acting as scavengers of singlet Oxygen and free radicals. (Rice-Evans *et al.*,1997). The nitric oxide scavenging activity of flavonoids and phenolic compounds are known (Kim H. *et al.*, 2002) . *Dioscorea bulbifera* posses antitumor, anti bacteria, anti-feedant, anti-fungaland hallucinogenic activities.(Urones *et al*., 1995; Biswanath *et al*., 2005).

The significant lowering of blood glucose level shown in the alloxane–induced diabetic rats in good manifestation to show that *D*ioscorea *bulbifera* is an effective antidiabetic regimen. (Okonand Ofeni,2013).
Phenols are present in food, they may have an impact on health and most are known to have an antioxidant activity. (Demitrios 2006) .

Phenols and polyphenolic compounds such as flavonoids are widely found in plant sources and they have been shown to posse's significant antioxidant activities (Van Acker S. *et al.*, 1996). *Dioscorea bulbifera* is widely recongnized for treatment of cancer.(Li et al., 1999).

Carotenoids may also have important anti-ageing and anticancer properties such lutein, which protects the tissues of retina, while canthaxanthin has been demonstrated to inhibit cancer cell proliferation (Palozza *et al*., 1998). Anthocyanins possess a high the rmost ability and contribute towards antioxidative, antiflammatory, cardioprotective and hepatoprotective activities. The mechanisms behind the reduction of blood pressure by anthocyanins were reported due to their antioxidantactivity (Shindo *et al.*, 2007). Extracts of *D. bulbifera* has a strong antibacterial activity(Hu et al.,2005). Pharmacologist studies and ethanobotanical studies and conservation reviews of *Dioscorea bulbifera* given by(Bishwa Bhushan kundu et al.,2020). According to

Conclusion

This study revels that the leaves of *Dioscorea bulbifera* L**.** contain rich total phenol, quinone and tannin, flavonoids and pigments which are known to posses good source of antioxidant ,anticancer activity and anti-inflammatory, antibacterial, anti obesity, antiviral activity. The reported phytochemical studies support its traditional uses and may prove to be useful for clinical evaluation. The use of natural antioxidants has been promoted because of the concerns on the safety against synthetic drugs.

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Behavioral Study of Parrots Around Gram Takarkheda Dharni Region of Western Melghat

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Abstract:

This study make known that the every day flight activity rose ringed parrots at early morning with massive flocking of parrots, and they find the foodstuff around farms located at Dharni region nearer to the small village Takarkheda. Similarly the flight activities at evening time the pattern of flight were in a different way acted, when they back towards the nesting. The intension following the significant learning of flight activity of Adults and younger parrots showed special difference in their behavioral patterns of early morning and evening instance.

This study recommended that the daily observation of flight activity of rose ring neck parrots move early in the morning form their nesting towards the food searches in the forest, farm etc. and vice versa again towards the nesting areas when they get back flight activity of flocking at evening time.

Key words: *Behavior, Flocking, Rose ring Neck Parrots, Nesting, Food, Flight Patterns.*

Introduction:

Behaviour patterns illustrate Most of the time parrots are not easy to catch. Even after being pets, they have a bad mannerism if not maintained properly. Some researchers state that most wild birds can be controlled by banding or wing tagging, but parrots are not birds to be easily trifled with; they chew off such affections. The behaviour of parrots differs from type to type. Some of them are strong and have direct flight whereas most of the species spend their time perching or climbing.

The habitat of African grey parrots is usually moist lowland forests, although they are found up to 2,200 m altitude in the eastern parts of the range. They are commonly observed at forest edges, clearings, gallery forests, mangroves, wooded savannahs, cultivated areas, and gardens Athan and Deter, (2000). African grey parrots often visit open land adjacent to woodlands, they roost in trees over water and may prefer roosting on islands in rivers. These parrots make their nests in tree holes, sometimes choosing locations abandoned by birds like woodpeckers. In West Africa, the species makes seasonal movements out of the driest parts of the range in the dry season **Melo and O'Ryan (2007).**

They are highly social and nest in large groups, although family groups occupy their own nesting tree. They are often observed roosting in large, noisy flocks calling loudly during mornings and evenings and in flight. These flocks are composed parrots, unlike other parrots that are often found in mixed flocks. During the day, they break into smaller flocks and fly long distances to forage**.** They often roost in trees over water and are said to prefer roosting on islands in rivers. Young birds stay with their family groups for a long period of time, up to several years. They socialize with others of their age in nursery trees, but remain in their family group within the larger flock. Young parrots are cared for by older birds until they are educated enough and old enough to become independent flock members. Young exhibit appeasement behaviors towards older members. As they mature, birds become more aggressive with nonspecific, **Athan, (1999)**. Parrots in the wild must learn a complex set of skills. They need to learn how to separate desirable food plants from toxic plants, how to defend territory, how to recognize and avoid predators, how to find safe water, and how to rejoin their families when separated. Also, they must learn how to develop role-appropriate behaviors such as competing and defending nest sites and raising offspring **Galef, (2004)**. Competition for nest holes during mating season makes the species extremely aggressive. Because parrots are partial ground feeders, there is a series of behavioral events that occur before landing and safe consumption takes place **Luescher, (2006)**. Groups of parrots gather at a barren tree until it is completely filled with hundreds of birds that partake in preening, climbing, vocalizing, and socializing. Eventually the birds make their way down to the ground in waves with the entire group never being on the ground at the same time. Once on the ground, they are extremely vigilant, reacting to any movement or sound **Wright, (2002).**

Materials and Methods:

Flocking behavioral and flocking routine of rose- ringed parakeet were studied for a period of 12 weeks (November 2021 to January 2022) in irrigated farm fields of Tehsil Dharni located Village Takarkheda, where adequately bulky crops be present. Incidence of such crops largely remains experimental throughout the year, and therefore, no possibility occurs here for the limitation of food to variety of birds. Various crops *viz.* wheat, maize, rice, fodders besides fruit orchards like citrus, mango, guava, occurs in good proportions. Different trees of variable heights also perform not only as shelter for birds', but also offer appropriate a place where birds regularly settle or congregate to rest at night, and nests (hollows), maintained by them for long durations. For

the present study, surveys were conducted to flight behavioral activity of flocks of the rose-ringed parakeet within the large agricultural area of Dharni region of Melghat. The parakeet settle was quite huge and was located less than distance away from the well grown croplands. Observations were made consecutively in the present studies and were observation on the basis of bulk flocking, forward journey at early morning for the searching of food and return journey towards the nesting at evening.

Results and Discussion:

In this observational study reveal that the flocking behavioral pattern shows modest difference pertaining to the flight towards food availability at early morning at 6 to 7 am for the searching of food and *vice versa* returning journey towards nesting at evening 5 to 6 pm daily observational study through the photographic analysis or flocking size and height of the flight of rose ringed parakeets. It seems to be observed that the early morning flight showed more height approximately 90-100 feet. of flock size containing 400-500 parrots group from the land surface area with creating sound as for call and communicate to each other. But in the return journey of flocking flight behavior seems to different, flocking flight at evening time showed very less distance approximately 10-15 feet contains 200-300 parrots group. Distance from land surface to the flight area, without noising any sound as communication in between the flocks size of parakeets.

Fig. 1. Map view of Dharni region of Amravati District

Fig. 2- Map view where the Observational study were performed

(Note: study area were noted with red colour arrow mark)

Fig. 3. Monthly parrots flights of flocking behavior and size
(November & December-2021 at Morning & Evening flight)

Fig. 4. Monthly parrots flights of flocking behavior and size
(December and January-2022 at Morning & Evening flight)

Table-1 Monthly noted flocking behavior and size of parrots (2021):

Months	Morning Time (Forward Journey from the Nesting) 6:00 to 7:00 am	Evening Time (Back Journey towards Nesting) 5:00 to 6:00 pm
November	400-500*	200-300*
December	400-500*	200-300*
January	400-500*	200-300*

**Note: approximate number of parrots in flight as per photographic collection may vary.*

Present reading circumstances showed that observation on the basis of the flock size of parrots in their natural habitats and behavioral patterns characteristically appears as in morning flight had a dispersed patterns in flight as shown in photo plates which indicates that random flight in parrots, more height than that of evening flight in four month observation. And in the return flight of parrots towards nesting they showed very less distance flight, and made pattern of flight were 'V' shaped noted in photograph captured.

Conclusion:

In this observational study showed that flocking size and their behavioral patterns vary. Parrots are locally common in the area of Dharni Melghat region; it appears seasonally available with the great quantity of nourish in surrounded areas such as, maiz, rice, cajanus, chickpea, and wheat as well as fruits such as guava, berry etc. conventionally yield taken by the Melghat peoples. This observation may show in the futuristic development and identified the issue act as pest for cropping because they feed voraciously on available food in their farm field. This available basic information of theirs seasonal flight and behavioral patterns seems to be identified as their habits and habitat learning in the additional improvements.

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Alteration In Enzyme Of Freshwater Fish,*Channa Orientalis*(Sch.), Exposed To Cyppermethrin And Fenvalerate

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Abstract:
Toxicity study was conducted on Freshwater Fish Channaorientalis to evaluate the enzyme activity of two Pesticides, Cypermethrin and Fenvalerateupto 96 hrs at a duration of 24, 48, 76, and 96 hrs, which shown toxic effect of Cypermethrin and Fenvalerate on Glutamate Oxaloacetate Transaminase. In present study Cypermethrin was found to be more toxic than Fenvalerate to the experimental fish, Channaorientalis.
***KeyWords** : Alterations in Glutamate Oxaloacetate Transaminase, Channaorientalis .*

Introduction:

In Vertebrates and Invertebrates, Cypermethrin acts mainly on nervous systym. Cypermethrin is both stomach and Contact poison(Jin and Webster, 1998).It has been shownto inhibit ATPase enzyme involved in movement of ions against a concentration gradient which are regulated by active transport, this action is especially critical to fish and aquatic insect, where ATPase enzyme provide the energy to active transport, are very important at the sites of oxygen exchange. ATPase inhibition and disruption of active transport, possibly affect ion movement and ability to maintain ion balance and disrupt respiratory surfaces, indicating that Cypermethrn is inherently more toxic to aquatic organism (Siegfried,1993). In pond water that contained apparantly lethal concentration of Cypermehrin(5ppb) because the chemical was absorbed on to suspended solids(Crossland,1982).

The use of synthetic pyrethroids for control various pests is regularly increasing. They are drained into rivers, tanks and pools resulting to pollute aquatic environment. Such chemicals are toxic to non target species and hamper human health too via ecological cycling and biological magnification. Aquatic pollution is greatly affecting the metabolism of fishes and some time heavy mortality has been experienced. A major part of worlds food is being supplied fish source, so it is essential to secure the health of fishes. Among the pyrethroids, Fenvalerate is widely used as synthetic toxicant that causes severe metabolic disorders in fishes(Coats et.al., 1979, Reddy et.al.,1989, Reddy and Philip, 1994,Thakur and Bais 2000).It has been extensively popularised because because of high insecticidal potency, low mammalian toxicity and very short persistance. However, Fenvalerate is extremely toxic to fish. The extreme toxicity of Fenvalerate to fish may be due to efficient gill uptake in efficient detoxification, elimination and sensitivity at the site of action(Bradbury et.al., 1997, Coats et.al.,1989,Tripathi et.al.,2001). Thus low rate of Fenvalerate elimination and metabolism appears to play an important role on the piscidal activity of this insecticide(Bradbury et.al.,1986).So for there are much limited response dealing with the effects Cypermethrin&Fenvalerate on enzyme activity of freshwater fish. Therefore, it is considered of an interest to analyse the effect of CypermethrinandFenvalerate on fish enzyme, Glutamate Oxaloacetate Transaminase.

Materials and Methods:

The freshwater fish, *Channaorientalis* were collected from Amravati local market and Rushi lake of Karanja (lad),(M.S.), and maintained in the laboratory conditions in large aquarium to the maximum number 2 lit/g of fish weight for a period of one month for acclimatization in aerated well water. Fishes were fed daily with ad-libitum and boiled eggs. Fishes weighing about 15 g and 10 cm in length were selected for evaluation or actual toxicity study. Fishes were starved for 48 hrs. Before the start of experiments and kept separately in a group of 10 fishes in each aquarium(test container about 20 lit. capacity). They were kept clean and away from visual and mechanical disturbances. The various physicochemical parameter of test water such as temperature, pH(by pH meter\) Conductivity (byConductometer), Acidity, Alkalinity, Hardness ,dissolved Oxygen and salinity were calculated daily during the toxicity test(following the method described in APHA). The test water was changed every day.Average value of all those environmental parameters were recorded. The pesticides Cypermethrin and Fenvalerate were added to the test water to obtain the described concentration. Then healthy fishes were exposed to various concentration of pesticides for 24, 48, 64, 72, 96 hrs. period respectively. Simultaneously the control aquarium was also maintained without pesticide concentrations. The fishes that survived for the test were sacrificed, by pitching, their different tissues like Liver, Kidney, Brain, Muscle and Gill were taken out for enzyme study. The required tissues from fish were immediately removed and weighed. The extracts were prepared in Mortar&Pestle using ice cold 0.25 m sucrose solution. All extracts were used as

early as possible and stored in the deepfreeze when required too. Substrate buffer (pH 9.0) was prepared by mixing 3ml.of petroleum ether,80 ml. of distilled water, 0.5 g of Sodium glycerophosphate and 0.0424 g. of sodium barbiturate.

The effect of Cypermethrin Glutamate Oxaloacetate Transaminase enzyme in different experimental fish groups (values are significant between p<0.01 to p<0.001).

Sr. No.	Group	Liver		Kidney		Muscle	
		Control	Expt.	Control	Expt.	Control	Expt.
1	Normal Pesticide	56.16± 3.32	53.53± 3.40	40.58± 2.86	38.32± 2.56	40.22± 3.78	39.92± 3.10
2	Low pH Alk. 8.5pH	58.28± 2.125	55.38± 2.39	42.21± 1.38	40.32± 1.37	41.35± 1.35	38.72± 2.82
3	Acidic pH 6.5	52.39± 2.38	51.29± 1.28	37.52± 2.35	35.25± 1.29	38.23± 1.72	36.85± 1.25
4	Hardness (100-200ppm)	48.35± 1.35	46.21± 2.73	33.72± 1.42	32.38± 1.25	35.29± 1.38	33.27± 2.38
5	Salinity (1.2%)	45.27± 2.35	42.6± 2.12	30.92± 1.82	28.28± 2.38	31.32± 01.25	28.65± 2.65

The effect of Fenvalerate on Glutamate Oxaloacetate Transaminase enzyme in differentexperimentalgroup (values are significant between p<0.01 to p<0.001).

Sr. No.	Group	Liver		Kidney		Muscle		
		Control	Expt.	Control	Expt.	Control	Expt.	
1	Normal Pesticide	57.28± 40.10	55.38± 9.88	40.66± 2.442.00	40.26±	40.88± 2.36	36.210± 3.32	
2	Low pH Alk. 8.5pH	58.28± 21.251.28	56.37±	42.21± 1.38	41.05± 1.28	41.35± 1.35	39.76± 2.21	
3	Acidic pH 6.5	52.39± 2.381.35	50.28±	37.9± 2.35	35.23± 2.25	38.73± 1.38	36.72±	1.72±
4	Hardness (100-200ppm)	48.35± 1.95 1.72	45.39±	33.72± 1.41	32.28± 1.27	28.29± 1.38	32.65± 1.25	
5	Salinity (1.2%)	45.27± 2.351.32	43.72±	30.92± 1.821.36	29.35±	31.32± 1.25	30.25± 1.72	

Result andDiscussion:

The Glutamate Oxaloacetate Transaminase activity was decreased in the tissues of *Channa oriental*streated with Cypermethrin and Fenvalerate. In control fishes the Glutamate Oxaloacetate Transaminase activity was maximum at 24 hrs. thengradually reduced upto 96 hrs. Maximum activity was recorded in liver,then followed by Kidney and Muscle. In experimental group of fishes the Glutamate Oxaloacetate Transaminase activity was significantly reduced in liver, kidney and muscle.

Conclusion:

Over all view concluded that very low quantity of pesticides affects aquatic organism and their metabolic activity.

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Histological changes in the ovary of *Catlacatla*exposed to lethal concentration of *B. aegyptiaca* root.

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Abstract:
20 fresh water fish Catlacatla of both sexes were purchased from local fisherman. They were kept in aquaria and well aerated. The differential acute toxicity of water extracts of B. aegyptiaca root on fish C. catla were carried out under laboratory conditions. The LC_{50} after 96 h of exposure for water extracts of Balanites aegyptiaca root were9.00, 11.00 and 13.00 mg/L, respectively. These values showed that water extracts of Balanites aegyptiaca root was more toxic.Histological alteration in the ovary tissues showed lesion, necrosis, malignancy, cellular degeneration and inflammation, when the fish were exposed to various concentrations (9.00 mg/L, 11.00 mg/L and 13.00 mg/L) of water extracts of B. aegyptiaca root for a period of 96 h revealed that root of B. aegyptiacamay be toxic to fish C. catlaas characterized by severe degeneration ofovary cells.The study concluded that caution must be taken in the disposal of this plant in water bodies as extended exposure time and at higher concentrations could pose adverse effect on the fish Catlacatla.
Key words: Histology, Balanites aegyptiaca, Catlacatla.

Introduction:

Water pollution, has been increasing at an alarming rate due to rapid industrialization, civilization and green revolution. Urban, agricultural and industrial activities release xenobiotic compounds that may pollute the aquatic habitat. Industrialization and growth of human population have led to a progressive deterioration in the quality of the earth's environment. **(Schwarzenbach*et al.*, 2006)** reported that about 300 million tons of synthetic compounds seep annually into water systems (rivers, lakes and sea) leading to water pollution. Pollution of water sources due to chemicals plays a primary role in the destruction of ecosystems. To improve the quality of aquatic ecosystems, it is necessary to know how the rivers and lakes are impaired and what factors caused the environmental deterioration.

Acute toxicities have been measured for many species in variety of ecological systems and most of the commonly used pesticides against Rainbow trout, Blue gills, Sun fish and the gaps are being filled for other species, such as channel fish, some cyprinids and salmons was reported by some authers**(Koprucu*et al.*, 2006)**. Test organisms to be used for acute toxicity test must be ecologically important, occupy trophic position leading to humans or other important species, and have adequate background biology, be widely distributed, be genetically stable, have its early stages (larvae, fry, and juveniles) available throughout the year and be sensitive **(Ernest Hodgson, 2004)**.*Catlacatla*(Hamilton) is one of the major fresh water carps native to India, Bangladesh, Myanmar, Nepal, and Pakistan and introduced in many other countries as exotic species. *C. catla*is a very rich source of proteins and is reported to attain a maximum size of 182 cm and weight of about 50 Kilograms. It is a surface and mid-water feeder, mainly omnivorous with juveniles feeding on aquatic and terrestrial insects, detritus and phytoplankton. It has a characteristically large, upturned mouth with a prominent protruding jaw. Because of its high nutritive value, it is a highly priced food fish and of great demand in the market. The physical and chemical changes in aquatic environment often cause some physiological changes in fish, thus, the water quality of an aquatic body is very crucial because it determines the productivity and other parameters necessary for the fish survival **(Fafioye, 2001)**.

Since prehistoric times, various cultures throughout the world have used piscicidal plants for fishing. Plants are regarded as inexhaustible sources of structurally diverse and biologically active substances **(APHA, 1976)**. Fossil record dates back the use of plants by man for various purposes including medicinal use **(Bhatt, J.P. 1991)**. There are various methods to capture fish from water. These include the use of hooks, net, setting of traps with baits, use of chemical substances and the use of plants and plant products **(Fafioye*et al.*, 2004)**. These methods seem cheap and affordable hence commonly practiced by fisher's folk all over the world. Histology can be used as biomonitoring tools for health in toxicity studies. Histological alterations are biomarkers of effect exposure to environmental stressors, revealing alterations in physiological and biochemical function. Histopathology, the study of lesions or abnormalities on cellular and tissue levels is useful tool for assessing the degree of pollution, particularly for sub lethal and chronic effects. Due to residual effects of pesticides, important organs like the kidney, liver, gill are the first organs to be damaged **(Rahman *et al.*, 2002)**.

In the present study, an attempt has been made to observe possible toxicity and histological changes in vital organ such as overy of the fish *Catlacatla*(Hamilton) exposed to lethal concentrations of plant *Balanites aegyptiaca*root extract for 96h.

Material and Methods:

Roots of *B. aegyptiaca* are collected from local area near to the Daryapur. After shade drying the plant material was grounded into powder using pestle and mortar. One liter of distilled water was mixed with 200 g of powdered plant material. The mixtures were kept for 2 days in tightly sealed vessels at room temperature and stirred several times daily with a sterile glass rod. This mixture was filtered through muslin cloth. Further extraction of the residue was repeated 3-5 times until a clear colorless supernatant extraction liquid was obtained indicating that no more extraction from the plant material was possible. The extracted liquid was subjected to water bath evaporation to remove the solvent. The water bath temperature was adjusted to 400^0 C. The semi-solid extract produced was kept under a ceiling fan to dry. The extract was weighed and portion of it used for phytochemical screening while the rest was use for the susceptibility test.

The adult specimens of *Catlacatla*were collected from the local market and brought to the laboratory. So for this experiment, fish are acclimatized in glass aquarium for 10 days.The survived fish are maintained in aerated condition and are fed regularly with fish food. The water is replaced every week and replaced with declorinated water. Faecal material and debris, if any, is also removed as and when necessary.

Lethal concentration of 09.00 mg/l, 11.00 mg/l and 13.00 mg/l was selected for this experiment. Ten fishes were exposed to each concentration. Along with this, appropriate control was maintained for each test. The mortality did not exceed 5% during the test period in control. Survival and mortality percentage were tabulated after 24, 48, 72 and 96 hrs.

For the lethal toxicity test, the fresh water fishes were divided in two groups as follows.

Group I: - Control group of *Catlacatla*

Group II: - Fishes *Catlacatla*were exposed to lethal concentration of root water extract.

To determine structural changes in internal tissues such as ovaryof both control and exposed fishes of lethal concentration were examined histologically.

Result and Discussion:

For lethal concentration at control there are no lesion, no necrosis, no pigments, no malignancy, no inflammation and cellular degeneration seen for the 24hrs, 48hrs, 72hrs, and 96hrs(Fig-1.1).While at 9.00mg/l inflammation of epithelial layer for 96hrs while no lesion, no inflammation, no necrosis, no pigments, no malignancy, and cellular degradation seen for the 24hrs, 48hrs and 72hrs(Fig-1.2).At 11.00mg/l inflammation on epithelial layer for 48hrs, for 72hrs lesion occurs on epithelial layer, while for 96hrs lesion occurs in epithelial layer and follicle cells and for 24hrs no lesion, no inflammation, no necrosis, no pigments, no malignancy and cellular degradation seen(Fig-1.3).At 13.00mg/l inflammation occurs on epithelial layer for 24hrs, for 48hrs lesion occurs in epithelial layer and follicle cells while, for 72hrs necrosis occurs in epithelial layer and lesion on follicle cells and oocytes and for 96hrs cellular degradation of epithelial layer and necrosis occurs on follicle cells and oocytes(Fig-1.4).

fig-1.1: Ovary (Section) of *Catlacatla* exposed to lethal concentration (control) of root water extract of *B.aegyptiaca*.

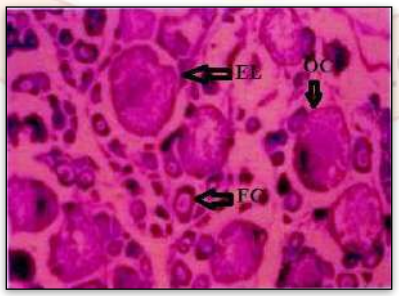


Fig.-Ovary of *Catlacatla* **(Control).**

EL: epithelial layer, **FC**: follicle cellsand**OC**: oocytes. No lesion (L), inflammation (I), pigment (P), necrosis (N), malignancy (M) and cellular degeneration(C).

Fig-1.2: Ovary (Section) of *Catlacatla* exposed to lethal concentration (9.00 mg/l) of root water extract of *B.aegyptiaca*showing lesion (L).

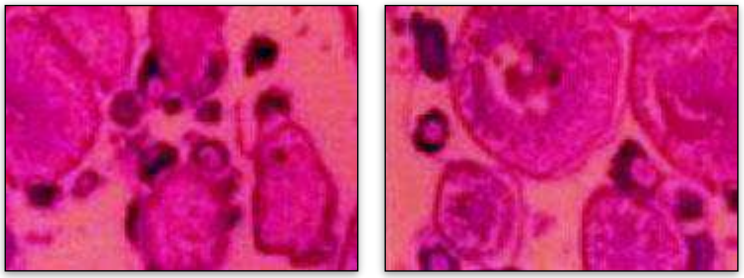


Fig.- 24hrs. **Fig.- 48hrs.**

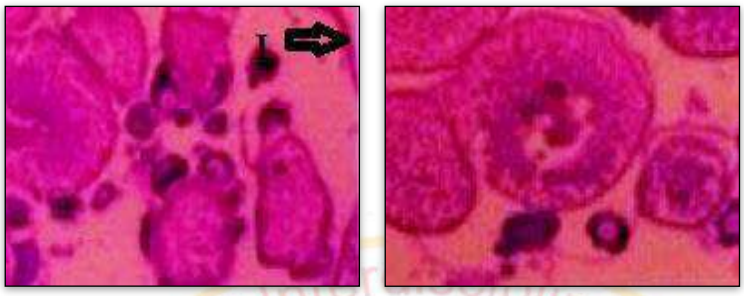


Fig.- 72hrs. **Fig.- 96hrs.**

Fig-1.3: Ovary (Section) of *Catlacatla* exposed to lethal concentration (11.00 mg/l) of root water extract of *B.aegyptiaca*showinglesion (L) andinflammation (I).

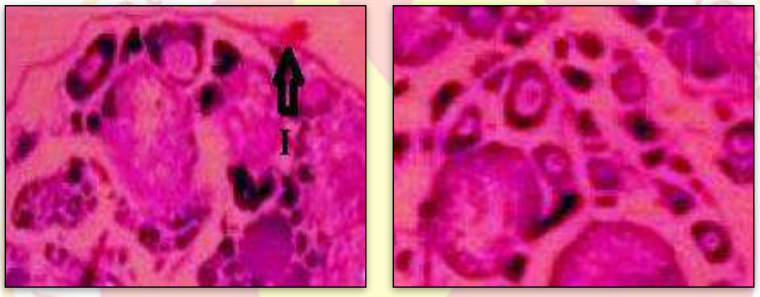


Fig.- 24hrs. **Fig.- 48hrs.**

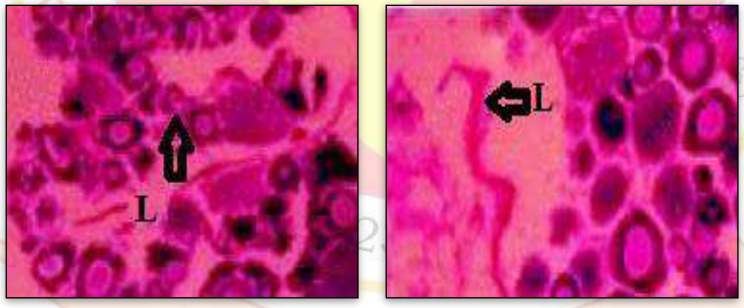


Fig.- 72hrs. **Fig.- 96hrs.**

Fig-1.4: Ovary (Section) of *Catlacatla* exposed to lethal concentration (13.00 mg/l) of root water extract of *B.aegyptiaca*showinglesion (L), inflammation (I),necrosis (N), and cellular degeneration(C).

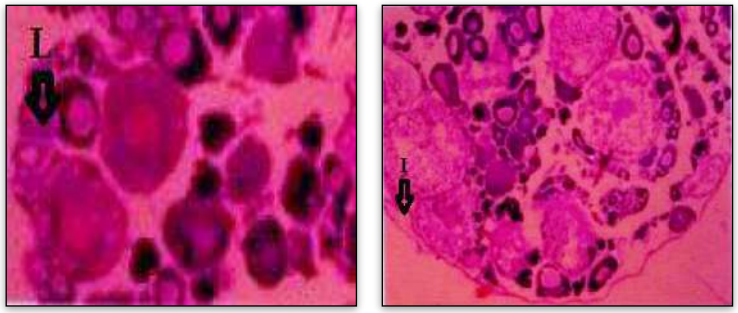
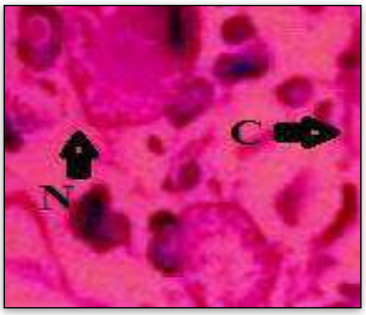


Fig.- 24hrs. **Fig.- 48hrs.**



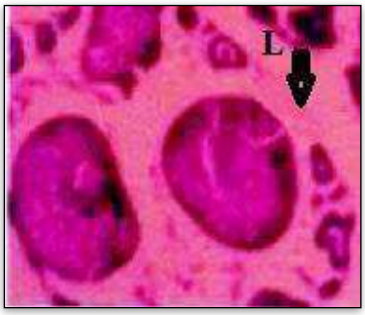


Fig.- 72hrs. **Fig.- 96hrs.**

In the present investigation the ovary of fish exposed to lethal concentration for different time exposure (24hrs. 48hrs. 72hrs. and 96hrs.) showed inflammation and lesion of epithelial layer and follicle cells during low concentration while, increasing concentration for different time exposure showed inflammation, lesion, necrosis and cellular degeneration of epithelial layer, follicle cells and oocytes were seen at later time of exposure(Fig-1.2 to 1.4).

In the present investigationshowed inflammation, lesion, necrosis and cellular degeneration of epithelial layer, follicle cells and oocytes in lethal and sub-lethal concentration. Similar observations agree with the finding of**(Khillare, 1992)** observed oocyte maturation and arrest of oocyte development in tertiary yolk stage.**(Lee and Yang, 2002)** observed at the dose of 100 ppm of sumithion, fragmented ova with abnormal shape and arrangement in the experimental fish as compaired to normal.

Conclusion:

The present study proves the toxic potential of the plant root extract and shows moderate to severe alterations inovary tissues which can lead to metabolic changes in the fish. The results of the present study clearly indicated that piscicides have a direct impact on the structural alterations in *Catlacatla*. The plant root extract is known to impair the metabolic and the physiological activities of the organism and through repeated exposure the piscicides tends to accumulate in its tissues even atlethal concentration.

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Effect of Selected Vigna Protease Inhibitors on Growth of Helicoverpa armigera, Hubner

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Abstract

Proteinase inhibitors are the most studied class of defense proteins. The genus Vigna belongs to Fabaceae, formerly called Leguminosae was used as the source material to screen for protease inhibitory activity against the polyphagous pest, H. armigera. The results showed significant reduction in weight of H. armigera larvae and more larval mortality when fed on proteinase inhibitors of studied Vigna. The LC_{50} values of V. hainiana, V. aconotifolia and V. sublobata were found to be 15%, 20% and 20% respectively after 72 hours of exposure.

Introduction:

H. armigera, Hubner (Lepidoptera: Noctuidae), is a major polyphagous pest present widespread in Asia, Africa and Oceania (EPPO, 2006) responsible for significant levels of yield losses in many economically important crops. Helicoverpa pest attack is the big problem as it has covered major part of the world from tropical climates to regions with cooler temperate climate and spread easily to natural migration. Application of huge amount of the pesticides resulted in to high levels of resistance in *H. armigera*. Some of the examples of pesticides to which *Helicoverpa* has acquired resistance are pyrethroids, endosulfan, carbamates and organophosphates (Armes, 1993 and 1995; Armes et al., 1992, 1994 and 1996; Forrester et al., 1993; Kranthi et al., 2001; Martin et al., 2000 and 2003; Torres Villa et al., 2002a). The genus Vigna belongs to Fabaceae, formerly called Leguminosae. It is found that, seeds of the Leguminosae generally contain large quantities of PIs active against insect serine proteases such as trypsin and chymotrypsin (Ryan, 1974). The earlier study indicates that wing bean proteinase inhibitors are good candidates for engineering resistance in to *Helicoverpa armigera* host plants (Harsulkar et al., 1999). Therefore, the study of interactions between such plant proteinase inhibitors and insect proteases can be useful in further insect pest management system.

Material And Methods:

Rearing of *H. armigera:*

Healthy, actively feeding H. armigera larvae were collected from the field & reared on an artificial diet (Nagarkatti and Prakash, 1974 with modification) & maintained under controlled conditions in the laboratory at Dr. Panjabrao Deshmukh Krishi Vidyapith, Akola, India. The laboratory conditions were maintained at 28±2^{0}C temperature, humidity 75±5% and 14:10 h light: dark period. The pupae were collected and disinfected with 0.02 per cent sodium hypochloride solution and transferred to the individual screw capped vials, containing soil bed. The adults emerged from the pupae after 7-10 days were then transferred to the bell jar covered with muslin cloth at its mouth. The sexes were differentiated on the basis of coloration pattern of the wings as female shows chocolate brown wings whereas male are pale brown. The adults were provided sterile cotton swabs imbibed with liquid diet of honey, sucrose and vitamin-E.

Plants for study:

The genus Vigna belongs to Fabaceae, formerly called Leguminosae was used as the source material to screen for protease inhibitory activity. Some of the wild Vigna seeds were collected from Melghat Region of Maharashtra.

Bioassay of PIs against *H. armigera* larvae:

The in vivo effect of Vigna proteinase inhibitors on larval growth of *Helicoverpa* was studied using feeding assay after screening 3 genotypes of Vigna. In spectrophotometric and electrophoretic studies, three accessions of Vigna were found to have potent proteinase inhibitors against *H. armigera*, hence these Vigna relatives were selected for bioassay studies. Early instars larvae were taken from the homogenous culture of *H. armigera* for experimental studies and were allowed to feed on chickpea-based diet having equal quantity of Vigna proteinase inhibitors. This culture was maintained in the laboratory at 27^{o}C with 80% relative humidity. The weight of larvae was taken after every 24 hrs after ingestion of food. Fresh food was given to the larvae on every alternate day to avoid the chances of microbial contamination. Control population was also maintained simultaneously on chickpea bases diet without PIs. The larval mortality and larval weight was recorded.

IC 50 Value of protease inhibition:

It is the amount of PI needed for 50% inhibition of protease activity was determined by conducting the assay. Bioassay of PIs against *H. armigera* larvae was conducted using different vigna genotypes such as *V.*

hainiana, V. aconotifolia and *V. sublobata*. The chickpea-based diet (PI removed by heat treatment) was used for feeding assay. The 10%, 15% and 20% concentrations of the PIs extracted from seed samples were made and equally added to chickpea-based diet for feeding assay. Ten neonates *Helicoverpa* larvae were released on the chickpea-based diet with PIs. The observations were recorded at 24 hours up to 3 days. The mortality data were recorded with the moribund larvae considered as dead. Water spray as control was maintained to study mortality percentage.

Results And Discussion

Bioassay of *Vigna* PIs against *H. armigera* larvae

Bioassay of PIs against *H. armigera* larvae was conducted using different vigna genotypes such as *V. hainiana, V. aconotifolia* and *V. sublobata*. The chickpea-based diet (PI removed by heat treatment) was used for feeding assay. Equal quantity of PIs extracted from seed samples was added to chickpea diet for feeding assay. The initial weights of the larvae were taken at the time of releasing the larvae on the diet and the final weights were taken on 13th day. The diet was changed on alternate day to avoid the chances of contamination. The results showed significant reduction in weight of *H. armigera* larvae and more larval mortality when fed on proteinase inhibitors of *V. hainiana, and V. aconotifolia* as compared to *V. sublobata* whereas, in control (Chickpea diet without PI) no larval mortality was recorded.

Table 1. Bioassay of PIs against *H. armigera* larvae

PI Source	Initial weight of larvae in (mg)	Final weight of larvae in (mg)	Weight gain in (mg)	Weight reduction as compare to control (%)	Mortality observed at 11th day (%)
V. hainiana	23.7	199.7	176.0	37.61%	45%
V. aconotifolia	23.7	198.3	174.6	38.05%	47%
V. sublobata	23.9	215.2	191.3	32.77%	41%
Control	24.0	320.1	296.1	0% (control)	0%

IC 50 value of protease inhibition

For determining LC_{50} values, the homogenous population of 10 *Helicoverpa armigera* neonates was subjected to chick pea-based diet having different concentrations of *Vigna* protease inhibitors as given in the chapter" Materials and Method". The observed mortality was recorded up to 72 hours at 24 hours interval. The values of median lethal concentrations (LC_{50}) of respective *Vigna* PIs were recorded and presented in the following table.

Table 2: Toxicity of *Vigna* PIs against *Helicoverpa armigera* neonates

Protease inhibitors source	LC_{50} Value in % after 72 hrs.
Vigna hainiana	15%
Vigna aconotifolia	20%
Vigna sublobata	20%
Control	No mortality on 3rd day

The LC_{50} values of *V. hainiana, V. aconotifolia and V. sublobata* were found to be 15%, 20% and 20% respectively after 72 hours of exposure.

Conclusion

Protease inhibitors are important tools for regulating the target proteases. They play a crucial role in controlling many physiological functions. The gut of this insect found to have both trypsin and chymotrypsin proteinases like activity. These proteinases were involved in protein digestion and provided the source of essential amino acids and energy to the insect. Thus, such proteinases become a target for the proteinase inhibitors having tryptic and chymotryptic inhibitory potential.

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The Study of Seed Germination. Seedling and Early Plant Growth by the Effect of Metal Ion and Their Complexes in Plumbago Zeylanica (Chitrak) Plant

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Abstract

This work investigates the usefulness of 3-(2-methoxyphenoxy)-1,2-propanediol as an alternate fertilizer by field experiments on growing Plumbago Zeylanica. Separate field experiments using 3-(2-methoxyphenoxy)-1,2-propanediol and original soil compare the effectiveness of different products for agronomic applications. Attempt has been made with the impact of heavy metals and their complexes of 3-(2-methoxyphenoxy)-1,2-propanediol on to improve the yield of economically important plant Plumbago Zeylanica (Chitrak). The seeds were immersed in Co (II), ligand and its complexes to study the seed germination and growth pattern and certain physiological processes. Effect of ligand, metal ion and complex solution on growth, determination of % of nitrogen, proteins and chlorophyll in the leaves of plants, are studied. The data harvested indicates increased germinations in all seed treatments. The changes in growth pattern of roots length and shoots length are observed in the experimental plants. However, chlorophyll content was found to be higher in plant species. The percentage of nitrogen and proteins were found affected in the leaves of Plumbago Zeylanica(Chitrak). Plant treated with 3-(2-methoxyphenoxy)-1,2-propanediol, complex and metal Co (II). Nitrogen and protein contents are found higher in the treated plants as – Complex >3-(2-methoxyphenoxy)-1,2-propanediol > Co (II).

Key words *- 3-(2-methoxyphenoxy)-1,2-propanediol, Co (II), Plant, Seed Germination of Chitrak, Chlorophyll*

Introduction:

Plant growth regulators are organic compounds, other than nutrients, that produced naturally inhigher plants, controlling growth or other physiological functions at a site remote from its placeof productionand active in minute amounts, modify plant physiological process. The plant physiologists not only to supply basic information regarding how plants growand develop but also to undertake research program undergo designed specifically to increase yield of plant products. Seed germination behavior is important for horticulture and agriculture [1-2].One of the important contributions of the 19th century experimental plant physiology to agriculture was to discovery that soil fertility and adding several nutrients to the soil could increase crop yields. Agricultural scientists realize that crop plants grow in production to the amounts of various nutrients present in soils. Today the application of various salts to soils is a basic future of agricultural practice. With the application of these and other fertilizer to soils, the large crop yields obtained in developing countries throughout the world during the past 50 years and more could not be possible. In modern agricultural practice, various chemicals in solution or aqueous suspension are sprayed on the crop plants with in the object of accelerating and modifying the plant growth and developing.

The complexes of transition metals with bi- allyl thiourea are prepared and their herbicidal and plant growth regulating activities are tested with wheat and cucumbers by Daverski et al [3] Complexes of Piperidene-2-Carboxilic acid with some bivalent metal ions have been reported to be useful in agriculture as plant growth regulators [4]. The Complexes of rare earth with peptides showed the herbicidal and plant growth regularity activity with wheat and barley plant [5].

Since 3-(2-methoxyphenoxy)-1,2-propanediol has intense biological activities, anti-inflammatory, antipyretic and analgesic activities. 3-(2-methoxyphenoxy)-1,2-propanediol inhibits the activity of the enzymes and since no work is reported on the biological application of binary complexes of Co (II), with 3-(2-methoxyphenoxy)-1,2-propanedioland comparing with pure ligand, metal and control solution (double distilled water) to study the effect of complex, metal, ligand and control solution on germination, survival seedlings height etc, on Plumbago Zeylanica (Chitrak) plant in order to make suggestion whether complex metal and ligands can be used as a plant growth regulator.

Also, biological analysis of chlorophyll contents and percentage of nitrogen and proteins in the leaves of leafy vegetables are carried out at room temperature.

Material And Experimental Methods:

Seed of Plumbago Zeylanica Species were collected from forest department Akot. Various seed characteristic like seed size, Shape, color and weight of seed/gm. would beobserved. Seed shape - oblong, Seed coat- Hard, Seed color-reddish brown,no. of seeds/gm- 47.9 andSeed size-5-6mm. The solution of Co (II) in the form of nitrate and 3-(2-methoxyphenoxy)-1,2-propanediol of the concentration of 0.01 M was prepared in

double distilled water. The applications of complex, metal, ligand solution are studied by dissolving it in proper solvent at 4, 7.00 and 9.5 pH and at constant ionic strength of 0.01 M potassium nitrate solution. Fertilized soil was collected from agricultural land. It was then grindand filtered. This soil was filled in two wooden trays and tray was moistened with water. Sowing of seeds was done in the soil after one hour.

Experiments Performed:

In general practice various chemicals are used in agriculture as an ingredient of various pesticides, insecticides, fertilizers etc, to improve the crop yield. Amongst several economical and medicinally important plants Plumbago Zeylanica (Chitrak) is selected as a plant system.

1. 20 gm healthy seeds of Plumbago Zeylanica (Chitrak) were taken 4.0, 7.00 and 9.5 pH for about three hours. These seeds soaked were taken out of each solution and sowed in the wooden tray in a row, during 14 August 2021 to 30 Sept.2021; the wooden tray was kept under atmospheric pressure at room temperature.
2. Effect of ligand, metal Co (II), complex on percentage of nitrogen, protein and chlorophyll in the leaves of Plumbago Zeylanica (Chitrak) plant. Chlorophyll pigments in fresh leaves were determined by spectrophotometric method given by Jahagirdar[21].

Parameters:

Soil pH of soil sample was measured by taking extract of mixture of soil water withpH-meter. Plant growth is decided on the basis of parameter such as percentage of germination, survival, seedling height, shoot length; root length and thickness of young leaf having high values compare to control systems. Germination was noted after $3\frac{1}{2}$ days and survival were noted after 10 days.

After noting the survival of plant, they were taken out of soil. The seedling height and thickness of leaves of survived plants were measure.

Table 1
Effect of Ligand, Metal ion and Complex on Germination, Survival, Seedling height etc. on Plumbago Zeylanica (Chitrak) Test System.

Test System	Effect of	pH	Parameters						
			%Germination after $3\frac{1}{2}$ days	% Survival after 10 days	Seedling height (cm)	Root length (cm)	Shoot length (cm)	Root / Shoot	**Width of young leaf (cm)**
Plumbago Zeylanica (Chitrak). Test System	Water (Control)	4.0	73.00	72.00	21.084	7.552	13.478	0.5603	**3.25**
		7.0	78.66	76.66	22.569	7.256	13.698	0.5415	**3.27**
	Ligand	4.0	75.66	75.33	21.964	7.698	13.852	0.5557	**3.87**
		7.0	82.00	81.66	24.214	7.963	15.108	0.5270	**3.63**
	Complex	4.0	76.00	76.00	22.458	8.748	13.563	0.6449	**3.56**
		7.0	79.66	78.00	23.569	8.986	14.231	0.6314	**3.89**
	Metal	4.0	82.00	79.33	21.483	8.698	14.125	0.6157	**3.12**
		7.0	**50.00**	**91.33**	**26.586**	**9.025**	**14.244**	**0.6336**	**3.56**

Table 2
Estimation of Chlorophyll for Plumbago Zeylanica (Chitrak) Plants System

S.No.	Treatment	Leaves of plant	Total Chlorophyll gm/Lit.x10^{-3}	Chlorophyll 'a' gm/lit.x 10^{-3}	Chlorophyll 'b' gm/lit.x10^{-3}
1	Control	Plumbago Zeylanica(Chitrak).	4.986	3.714	**1.754**
2	Ligand		5.725	4.821	**1.018**
3	Complex		5.782	3.560	**1.215**
4	**Metal**		**6.312**	**5.255**	**1.196**

Table 3
Estimation of Total Nitrogen and Proteins in Leaf Powder of Plumbago Zeylanica (Chitrak)

S.No	Plant	Treatment	% Element			% Protein
			Nitrogen	Carbon	Nitrogen	
1		Control	6.58	55.28	7.52	**44.562**

2	Plumbago Zeylanica (Chitrak).	Ligand	6.90	56.22	7.34	**42.816**
3		Complex	7.26	54.28	7.12	**46.195**
4		**Metal**	**6.02**	**52.78**	**7.01**	**41.406**

Results And Discussion:

Seed of the target species were taken to study the germination behavior under the influence pre–treatments. Germination starts when the seed shows emergence phase of growth, which begins, with penetration of embryo from the seed coat and end with the development of root and shoot system. Elongation of shoot axis follows emergence of radical.

The rate and extent of elongation is subjected to the variety of controls, including nutrition, hormones and environmental factors. Though the root and shoot development start within a fraction of time but the further developments may vary according to the nutrients required for the development of root length and length shoot independently. Therefore, root length and shoot length differs. The observation table clearly indicates that average root length in 3-(2-methoxyphenoxy)-1,2-propanediol, complex, Co(II), at all pH increase over is seen that in complex, Co(II), showed decrease in shoot length control. But in case of Plumbago Zeylanica (Chitrak) plant system shoot length increases in 3-(2-methoxyphenoxy)-1,2-propanediol, complex and Co(II), and all pH over control.

Chlorophyll pigment / chlorophyll control were found affected in Plumbago Zeylanica (Chitrak) plant by the treatments. Total chlorophyll was found to be higher in Plumbago Zeylanica (Chitrak). Total chlorophyll content in 3-(2-methoxyphenoxy)-1,2-propanediol and complex is higher than in metal and control treatment in both plant systems.

Percentage of nitrogen and proteins were found affected in leaves of Plumbago Zeylanica (Chitrak) by the treatment of 3-(2-methoxyphenoxy)-1,2-propanediol, complex, Co (II). It is observed that percentage of nitrogen and protein are higher than that of control.

Complex >3-(2-methoxyphenoxy)-1,2-propanediol > H_2O > Co (II).

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Current Study on physico –chemical characteristics and biological factors of Chargaon Lake in Warora Taluka, District-Chandrapur (M.S.). India.

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Abstract

The physico-chemical parameters are water temperature, electric conductivity, total dissolved solids, total hardness, total alkalinity, turbidity, pH, dissolved oxygen, chlorides, COD , BOD, etc. The biological factors considered were macro-zoo benthos and plankton of the lake.Chargaon Lake was constructed as part of irrigation projects by Government of Maharashtra. Nearest city to Lake is Chimur and the Lake is situated in Warora Taluka of Chandrapur District of Maharashtra in India. In the present study an attempt has been made on physico –chemical characteristics and plankton diversity and density of a sub urban perennial water body, located in Chargaon in Warora Taluka District Chandrapur of Maharashtra. The study was conducted during August-2020 to July-2021. The samples were analyzed at monthly intervals for a period of one year. Limnological parameter and plankton diversity are an important criterion for determining the suitability of water for irrigation and drinking purpose. Chargaon Lake has greatest importance for humankind. Lake was highly productive as presence of various class and order of benthos, zooplankton and phytoplankton although there were no sign of problem like eutrophication. Biological studies indicate that lake water was fit for aquatic organism, such as fishes because of there were plenty of food in the form of benthos, zooplankton and phytoplankton repectively.

Keywords:*Humankind, Irrigation, Benthos, Diversity and Eutrophication.*

Introduction:

Biological production in any aquatic body gives direct correlation with its physico-chemical status which can be used as trophic status and fisheries resources potential (Jhingran*et al.,* 1969). Life in aquatic environment is largely governed by physico-chemical characteristics and their stability. The physico-chemical as well as the biological factor of lake have vital role in aquaculture and productivity of fishes. The quality of water determines the quality of fish to be produce in it. The physical factors are water temperature, water current and turbidity of water, whereas the chemical parameter of lake comprise pH, dissolved oxygen, total alkalinity and total hardness of water. The biological factors considered were macro-zoo benthos and plankton of the lake. The seasonal changes in different physico-chemical parameters are responsible for annual variation and growth of biological factors viz., macro-zoo benthos and plankton etc.

Tepe*et al.,* (2005) found that the water quality attributes such as water temperature, light penetration, dissolved oxygen, total alkalinity and total hardness are the representative of the seasonal fluctuation. Ali *et al.,* (2006) showed that the water quality of fresh water ecosystem undergoes complex changes due to all physico-chemical factors and water quality as a sequence disrupting the aquatic life. Hayat *et al.,* (1996) and Jena *et al.,* (1998) revealed that temperature and ecological conditions are responsible for the fluctuation of salt contents, which in turn influence the production, and growth of fish .

Materials and Methods:

The sampling was carried out in ChargaonLake at five different sites monthly between August-2020 to July-2021 for one year. About 12 water sample were collected in each months.

The physico-chemical factors are water temperature, watercurrent, turbidity of water pH,dissolved oxygen, total alkalinity and total hardness of water, whereas biological factors were macro-zoo benthos and plankton of the lake. Study of physico-chemical factors was carried out by using standard methods(APHA, 1998). For the qualitative estimation safe water quality standards were use(Boyd and Tucker, 1998; Ali*et al.,* 2000). Macro-zoo benthos collected from 1m²area of lake at the depth of 15cm. The plankton was sampled at each spot by filtering 100liters of water. Preservation was made on the spot in 4% formalin. The quantitative analysis of plankton was made with the help of Sedgwick-Rafter counting slide as suggested by Welch (1952).

Result and Discussion:

Water temperature

The average water temperature of lake was found to be varying from 14.12˚c to 21.58˚c during Jan.to July respectively. Thus, water of ChargaonLake is coldest in winter and hottest in monsoon. (Table 1)

Table.1 Average monthly and seasonal variation in water temperature (˚C) of Chargaon Lake (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	12.3	14.7	15.5	17.8	20.4	21.5	21.9	20.4	19.7	17.9	14.5	12.7
Spot B	15.5	17.3	17.3	19.6	20.5	20.4	20.8	19.5	18.6	17.7	16.4	15.6
Spot C	11.2	15.6	17.2	19.7	19.5	20.7	22.4	20.6	18.8	16.9	13.4	11.6
Spot D	16.3	17.8	18.5	20.5	20.8	21.5	21.3	19.6	18.6	17.6	16.8	15.3
Spot E	16.5	17.9	18.3	20.8	20.2	20.3	21.5	19.5	18.8	17.3	16.7	15.4
Average	14.36	16.66	17.36	19.68	20.28	20.28	21.58	19.92	18.9	17.48	15.56	14.12
Season	Summer				Monsoon				Winter			

Water velocity

While calculating the velocity of water, we observed that the rate of water flow is fluctuated from a minimum value of 0.307m/s in Feb.to a maximum value of 0.899m/s in Aug. Thus the water current with a rate of 0.313m/s in winters to 0.849m/s in monsoon is useful for fish survive (Table 2).

Table.2 Average monthly and seasonal variation in water current velocity (m/s) of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	0.289	0.364	0.393	0.416	0.576	0.663	0.849	0.615	0.433	0.269	0.281	0.274
Spot B	0.304	0.337	0.393	0.428	0.438	0.864	0.957	0.813	0.522	0.391	0.324	0.314
Spot C	0.271	0.366	0.398	0.421	0.421	0.633	0.765	0.651	0.434	0.354	0.265	0.261
Spot D	0.337	0.351	0.598	0.924	0.924	0.963	0.972	0.811	0.614	0.483	0.388	0.391
Spot E	0.334	0.349	0.598	0.944	0.923	0.877	0.951	0.813	0.619	0.433	0.335	0.325
Average	0.307	0.353	0.476	0.627	0.656	0.656	0.899	0.741	0.524	0.386	0.319	0.313
Season	Summer				Monsoon				Winter			

Turbidity

It has been observed that the water is highly turbid during monsoon period (July-August) with a value of 92.9NTU. Thus is obvious because water becomes turbid due to the rainfall and flash flood. With an unusual variation water was found extremely less turbid during rest of the seasons with the minimum of 7.9NTU in winter. (Table 3).

Table.3 Average monthly and seasonal variation in turbidity (NTU) of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	09	11	17	10	12	95	86	51	31	11	08	10
Spot B	06	05	11	09	17	91	96	64	41	18	07	10
Spot C	05	08	09	11	22	88	99	59	39	14	05	07
Spot D	07	09	06	13	21	89	94	61	31	12	11	08
Spot E	09	07	05	09	19	94	97	57	27	10	09	08
Average	7.2	8.0	9.6	10.4	18.2	91.4	94.4	58.4	33.8	13	8.0	8.6
Season	Summer				Monsoon				Winter			

pH

pH fluctuation occur only within a narrow range. The pH of lake was found to be varying from 7.6 to 8.32 during July to December. Therefore, during monsoon the water is least basic and it seems more basic during winter (Table 4).

Table.4 Average monthly and seasonal variation in pH of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	8.2	8.3	8.2	8.1	8.2	7.9	7.9	8.3	8.2	8.6	8.2	8.1
Spot B	7.4	8.3	8.2	8.7	8.6	7.6	7.6	7.3	7.4	7.7	8.1	8.3
Spot C	8.1	8.6	8.2	7.9	7.9	7.2	7.8	8.2	8.3	8.1	8.7	8.4
Spot D	8.2	8.1	8.2	8.3	8.5	8.1	8.1	7.9	7.8	8.3	8.5	8.2
Spot E	8.0	8.1	8.2	8.3	8.3	8.0	8.1	7.6	7.8	8.0	8.1	8.2
Average	7.98	8.28	8.2	8.26	8.3	7.76	7.9	7.86	7.9	8.14	8.32	8.24
Season	Summer				Monsoon				Winter			

Dissolved Oxygen

In December, the oxygen content dissolved in water was found to be highest with the value of 10.72mg/l.The Lake has less D. O. content in Jun. with the value of 7.6mg/l. Thus the fish can endure water having the dissolved oxygen content from7.93mg/l (during monsoon) to 10.57mg/l (during winter). (Table 5).

Table.5 Average monthly and seasonal variation in dissolve oxygen (mg/l) of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	9.8	8.9	8.4	8.6	7.8	7.2	8.1	8.5	9.3	9.8	10.5	10.3
Spot B	11.3	8.9	7.8	7.2	7.4	7.4	7.1	8.6	9.3	10.1	10.4	10.8
Spot C	9.8	8.9	9.5	8.3	7.9	8.2	8.7	8.7	9.4	9.2	10.9	10.1
Spot D	10.4	9.3	8.7	7.4	7.4	8.2	8.3	9.3	9.9	10.5	11.1	10.9
Spot E	10.4	9.3	8.6	7.9	7.5	7.9	8.2	9.5	9.8	10.5	10.7	11.2
Average	10.34	9.06	8.6	7.88	7.6	7.78	8.08	8.92	9.54	10.02	10.72	10.66
Season	Summer				Monsoon				Winter			

Total Alkalinity

In our observation it has been observed that the lake water was alkaline and the magnitude was varying from 59.34mg/l to 100.46mg/l from Augustto February. Thus, the water ofChargaon Lake is most alkaline during winter and then with a regular decrement is least alkaline during monsoon. (Table 6)

Table.6 Average monthly and seasonal variation in total alkalinity (mg/l) of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	91.9	80.1	76.2	71.0	64.2	62.4	60.8	64.4	73.5	85.9	89.9	92.4
Spot B	96.2	87.1	80.8	74.1	63	61.7	61.8	62.5	79.8	89.1	99.2	101
Spot C	99.6	83.4	78.5	74.7	62.7	65.4	59.9	67.8	77.6	81.1	101.5	99.2
Spot D	103.3	97.1	79.7	70.2	71.1	60.1	57.6	70.4	91.1	95.3	98.2	99.8
Spot E	111.3	97.1	81.7	73.2	73.1	62.8	56.6	71.1	87.1	91.3	91.9	108.2
Average	100.46	88.96	79.38	72.64	66.82	62.48	59.34	67.24	81.82	88.54	96.14	100.16
Season	Summer				Monsoon				Winter			

Total Hardness

The degree of hardness calculated in the lake water was lowest in July (78.52mg/l) and highest in February (109.26 mg/l). The study summarized that the water in winter in highly hard, while least hard during monsoon. (Table 7).

Table.7 Average monthly and seasonal variation in total hardness (mg/L) of Chargaonlake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	101.2	93.7	91.2	89.1	75.4	77.5	78.2	77.2	82.5	90.6	92.3	97.5
Spot B	109.3	98.8	85.9	78.2	77.1	75.9	74.9	78.2	82.1	89.2	96.7	101.2
Spot C	104.3	98.5	99.8	92	90	84.4	81.7	84.9	89.6	98.4	99.6	103.1
Spot D	112.4	96.5	94.7	87.5	85.1	74.9	82.4	88.2	91.5	101.4	106.1	109.2
Spot E	119.1	107.4	96.2	86.3	84.6	79.9	84.3	86.9	87.5	98.2	106.3	108.5
Average	109.26	98.98	93.56	86.62	82.44	78.52	80.3	83.08	86.64	95.56	100.2	103.9
Season	Summer				Monsoon				Winter			

Macro-zoo benthic Density

The number ofEphemeroptera (211Units/m²in December while 12 Unit/m² in July), Trichopteran (210 Unit/m² in December while 8Unit/m² in July), Dipteran (13 Units/m ² in July while 145 Units/m² in February), Plecopteran nymphs (51Units/m²in January while 1 Units/m² in August), Coleopteran larvae (99 Units/m²in December while 9 Units/m² in July). Odonata larvae (130 Units/m² in December while 7 Units/m² in June). The average total macro-zoo benthos observed (812Units/m² in December while56 Units/m²in July) and (in winter season 646.33 Units/m² while during monsoon 114 Units/m²). (Table 8).

Table 8. Average monthly and seasonal variations in Macro-zoo benthic density (Units/m^2) (2020-2021)

Macrobenthic groups (Units/m^2)	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Ephemeroptera	149	73	52	24	21	12	35	64	110	144	211	155
Trichoptera	140	77	35	21	10	08	35	64	110	144	210	150
Deptera	145	116	63	43	34	13	29	62	88	139	142	110
Plecoptera	48	39	43	40	21	02	01	14	03	14	20	51
Coleoptera	46	61	22	38	11	09	22	22	94	88	99	39
Odonata	42	76	39	29	07	12	50	52	92	110	130	52
Total Macro-zoo benthos (Unit/m^2)	570	442	254	195	104	56	172	278	497	639	812	557
Season	Summer				Monsoon				Winter			

Plankton Diversity

The total phytoplankton were Chlorophyceae, Bacillariophyceae and Cyanophyceae (2925 Units/l in January while 400 Units/l in August). The total zooplankton were Crustaceans and Rotifers (25Units/l in August and 400 Units/l in January). The total plankton density vary (3110 Units/l in January to 425 Units/l in August. (Table9).

Table 9. Average monthly and seasonal variations of Plankton density (Units/L). (2020-2021)

Plankton group (Units/L)	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Chlorophyceae	375	725	325	510	135	275	Nil	230	475	650	500	600
Cyanophyceae	225	175	Nil	200	125	125	Nil	125	75	150	200	250
Total phytoplankton	2175	1725	1550	1420	950	802	400	1080	2850	2629	2550	2925
Crustaceans	175	100	50	175	25	75	25	75	100	225	155	125
Rotifers	Nil	100	200	220	75	Nil	Nil	25	25	175	100	60
Total Zooplankton	175	200	250	395	100	75	25	100	125	400	215	185
Total Plankton (Units/L)	2350	1925	1800	1815	1050	877	425	1180	2975	3029	2850	3110
Season	Summer				Monsoon				Winter			

In the present study, the water temperature of the lake was observed to be moderate throughout the year. This moderate water temperature is due to its spring-fed nature of origin. It is also supported by Odum (1971) that photoperiod was shorter in winter than summer which is directly related to temperature and hence water temperature is highest in June. The velocity of water current was observed to be fluctuated from a minimum of 0.307 m/s (February) to a maximum of 0.899 m/s (August). It is also obvious from our study that the average rate of water is highest in monsoon whereas lowest in winter.

In present study water was highly turbid during Monsoon (July-August) while very low during rest of the seasons with the minimum of 7.9 NTU in winter. These observations are also supported by Jhingran (1965) who reported that turbidity generally increased to a maximum value in monsoon due to the suspended solids in the flooded water whereas, during the post monsoon months the turbidity values were low but increased again during the summer months with the increase in tidal management and intensity .Upadhyay (1997) calculated the turbidity variation from 2 to 162NTU.

pH is gradually increased from a minimum of 7.83 during monsoon to a maximum of 8.28 during summer. Similar variations in pH of the lake were recorded by Kumar *et al.*,(2006) in Garhwal Himalayas. They concluded that winter maxima for pH might be due to algal growth and minima in monsoon might be due to influx of organic and inorganic ions in to the lake caused by flash flood.

In our study D O highest during winter whereas lowest during, Ali (1999) reported that the dissolved oxygen variation shows inverse relationship with water temperature variation. Bhatt *et al.*, (1984) also reported high D O and low free CO2 concentration in winter.

In present study, the water of ChargaonLake was found to be most alkaline during winter and least during monsoon. Total hardness show minimum during monsoon to a maximum during winter.
Density of total macro-zoo benthos and total plankton populations were plenty in winter while rarely during monsoon. Detritus standing stock is the main reason for high density of benthos in winter and substratum stability too. Moderate temperature low gradient of velocity favors the growth of biotic communities. Similar study was carried out by Rautela*et al.*,(2006) who reported that the macro-zoo benthos had a maximum population during winter(325 Units/m ^{2}) and the minimum (15 Units/m ^{2}) during monsoon season.

Conclusion:

Briefly, present study concluded that physico-chemical parameters levels indicate the moderate quality of water, lake water of the study area was not polluted in respect to physico-chemical assessment. But biological studies indicate that lake water was fit for aquatic organism, such as fishes because of there were plenty of food in the form of benthos, zooplankton and phytoplankton.

Chargaon lake water was habitable for fishes and fit for development of aquaculture. There were no sign of problems like eutrophication. It is also concluded that the higher growth of macro-zoo benthos and planktons in the lake is favored by low water temperature, low current velocity, and moderate turbidity with high D High alkalinity and high hardness during winter's season.

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Isozyme study in *Leucas biflora* (Vahl.) R. Br. of Lamiaceae.

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Abstract:

The present study reveals plant allozymes of family Lamiaceae (Leucas biflora) to establish the phylogenetic relationship. In the present study five allozymes were tested Viz. Superoxide dismutase, Succinate Dehydrogenase, Polyphenol Oxidases, Catalase and Rubisco and data was interpreted by using STATISTICA package. Four enzymes showed reliable polymorphism except Catalase. In Catalase monomorphic allele was elucidated. The bands were stained and allele frequency was calculated. The difference in allele frequency can be helpful to the taxonomist in establishing genetic diversity amongst the taxa of Lamiaceae.

Keywords *- Isozymes, Zymogram, Allele frequency, Polymorphism, Phylogeny.*

Introduction:

The most widespread in its distribution amongst Plant kingdom is Angiosperms. "Tubiflorae" is the largest order of Engler and Diels (1936), revised system of classification with primarily herbaceous plants, gamopetalous corolla, and epipetalous stamens.Taxonomists treated the order Tubiflorae differently. The variation in allele frequency would support as an additional taximetrics in deciding the position of the families like Acanthaceae, Lamiaceae, Scrophulariaceae and Lentibulariaceae.

Allozymes share a common substrate but differ in their electrophoretic mobility that helps in making the comparisons between the populations. In the present investigation, efforts have made to support the new taximetrics on the basis of Isozyme pattern and shared loci.

Allozyme pattern has been studied for calculating the percentage of gene loci and polymorphism per population. For out crossing plants, the numbers and frequencies of alleles detected in any one population are often very similar to another population of the taxa belonging to same family studied. Thus, the findings in the present investigation proved to be helpful to justify the position of the family in the order Tubiflorae on molecular basis.

Review of Literature

Meister (1950), studied the taxa to understand the molecular heterogenesity. Markert (1975a, b, c) published the information about isozymes in 3 volumes namely Isozymes –I, Isozymes –II, &Isozymes –III. Sonnante et al. (1997) obtained better insight into genetic relationship within and between the taxonomic entities of *Vigna luteola* and *V. marina*. Bhat et al. (1998) studied the Isozyme diversity in Indian primitive maize landraces and observed polymorphism for Peroxidase, esterase and acid phosphatase. Apavatjrut et al. (1999) carried out the study on *Curcuma* species. Volis et al. (2003), interpreted that allozyme variation in wild barley is adaptive and directly related to local environment. Soltis & Soltis (2005) gave the detailed study of isozymes in different chapters of plant biology. Isozyme used as a molecular marker to assessed the genetic diversity and structure of wild Tunisian *Thymus capitatus* of Lamiaceae (Ali et. al.2011). Gömöry *et. al.* focussed on potential discordances in spatial patterns of allozyme and quantitative phenotypic variation.

Materials and Methods

The plant material was collected from localities in and around Nagpur District. The seeds of *Leucas biflora* were randomly collected. They were sun-dried and investigation was carried out with fresh material as well as water soaked viable seeds. Band variation was studied as per the method given by Sadashivam and Manickam, 1996; Vellejos, 1983; Wendel & Weeden, 1989.The gel was photographed and interpreted by using the "STATISTICA" package.

Observations

The taxa under investigation showed reliable polymorphism except Catalase due to variation in the banding pattern. Allozyme data was analyzed through cluster analysis by simple matching coefficient method. 27 significant alleles were resolved, of which, number of alleles (bands) found in Rubisco i.e. eight, next to it is seven in Amylase followed by two in Alcohol Dehydrogenase. Catalase is the only monomorphic showing single allele. Zymogram of Rubisco is explained in the given table and scored as follows-

The isozyme pattern of Rubisco is explained below:

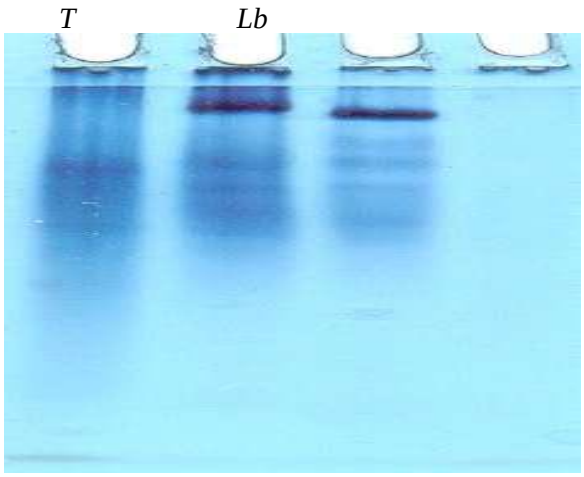

Fig: 1- Zymogram of of Rubisco

Table 1:

Name of Enzyme	**Alleles**	A	***Leucas***	B	C	**% of shared loci(P)**
Rubisco	1	1.000	1.000	1.000	0.000	75.000
Rubisco	2	0.000	1.000	1.000	0.000	50.000
Rubisco	3	0.000	0.000	1.000	0.000	50.000
Rubisco	4	1.000	1.000	1.000	1.000	100.000
Rubisco	5	1.000	1.000	1.000	0.000	75.000
Rubisco	6	1.000	1.000	1.000	0.000	75.000
Rubisco	7	0.000	1.000	1.000	0.000	50.000
Rubisco	8	0.000	0.000	1.000	0.000	25.000
Allele Frequency		**0.500**	**0.750**	**1.000**	**0.125**	

The zymogram represents various isozymes of Rubisco. Figure: 1 show 8 bands of four samples species (A, B, C) along with *Leucas biflora* studied for isozymes. The intensity of band indicates the amount of isozyme present in the sample loaded for electrophoresis. Rubisco 1,4,5,6 present in three samples. Rubisco 2, 7 reported as a single band in two taxa, while 8 in only sample C. 3 bands are shared by Maximum Species. The presence and the absence of band is stated as 1 or 0 respectively and the data is tabulated in Table- I & II. The percentage of population per sample sharing each band /allele/ locus has been calculated below.

The example studied is Rubisco. In Fig. 2 the first locus is present in 4^{th} samples and hence the distribution % among the population is 4/6 x 100 = 66.667. Second in only one sample and hence distribution % is 1/6 x 100 =16.667. Similarly the allele frequency is calculated for all the samples on the basis of enzyme locus present out of the total detected isozyme loci. Thus, the allele frequency of *Gantelbua*, *Leucas* and *Utricularia* is same i.e. 500, as far as the band pattern and sharing of loci is concern. The taxon showing more than one band is said to be polymorphic where as only one band is monomorphic by nature. The isozyme scoring and relative frequency in the taxa investigated is given in Table II.

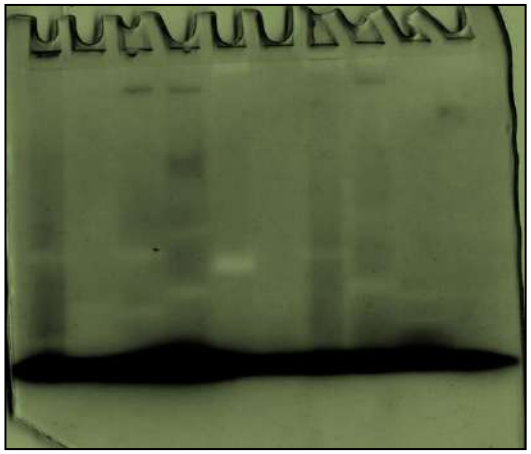

Fig2: Superoxide dismutase

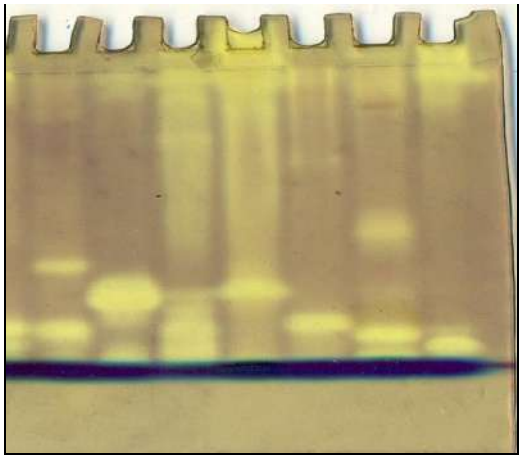

Fig3: Succinate Dehydrogenase

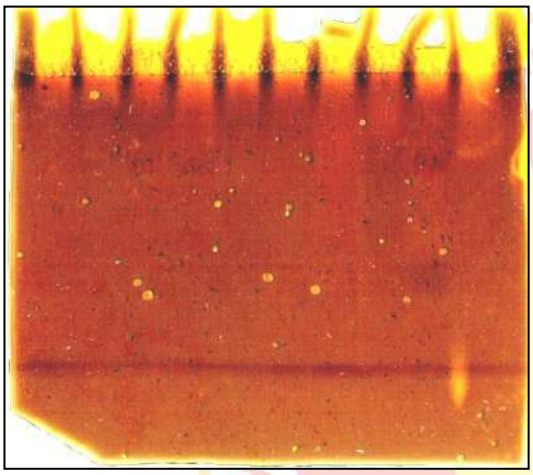

Fig3: Catalase

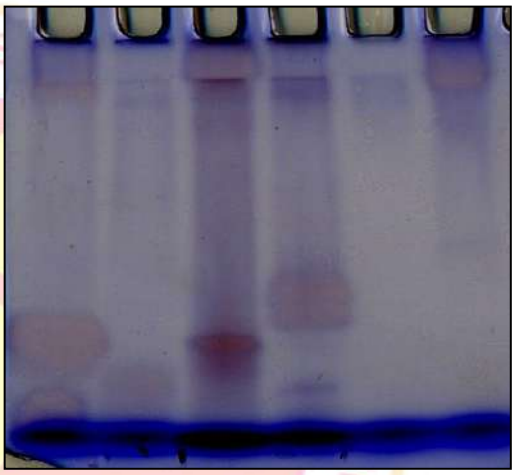

Fig4: Polyphenol Oxidases

The Rubisco shows 8 bands recorded in three taxa and roughly recorded in single taxon. The intensity of band indicates the amount of isozyme present. Rubisco 1 is shared by maximum Species present in all the four samples. Rubisco 1, 4, 5 & 6 reported in maximum taxa while 3 and 7 shared by only 2 taxa whereas 8 shared by only one percent population. In enzyme catalase, the first locus is present in all the four samples and hence the distribution % among the population is 4/4 x 100 = 100%. The allele frequency is calculated for all the samples on the basis of enzyme locus present out of the total detected allozyme loci. Thus, the allele frequency calculated of *Leucas biflora* is helpful when it is compared with the related data collected from the remaining taxa of same family. The band pattern and sharing of loci is concern. The taxon showing more than one band is said to be polymorphic where as only one band is monomorphic by nature. The isozyme scoring and relative frequency of the four other enzymes are given below:

Table: II

Name of Enzyme	A	***Leucas***	B	C	**% of shared loci(P)**
Catalase	1.000	1.000	1.000	1.000	100.000
Allele Frequency	**1.000**	**1.000**	**1.000**	**1.000**	
Polyphenol Oxidases	1.000	1.000	0.000	0.000	50.000
	1.000	1.000	0.000	1.000	75.000
	1.000	0.000	0.000	0.000	25.000
	0.000	0.000	0.000	1.000	25.000

	0.000	1.000	0.000	0.000	25.000
	0.000	1.000	0.000	0.000	25.000
	1.000	0.000	0.000	0.000	25.000
	1.000	1.000	1.000	1.000	100.000
Allele Frequency	**0.500**	**0.600**	**0.100**	**0.300**	
Superoxide dismutase	1.000	0.000	0.000	1.000	50.000
	0.000	0.000	1.000	1.000	50.000
	1.000	0.000	0.000	0.000	25.000
	0.000	0.000	0.000	0.000	00.000
	0.000	1.000	1.000	0.000	50.000
	0.000	0.000	1.000	0.000	25.000
Allele Frequency	**0.333**	**0.167**	**0.500**	**0.333**	
Succinic Dehydrogenase	1.000	0.000	0.000	1.000	50.000
	1.000	0.000	0.000	1.000	66.667
	1.000	0.000	0.000	0.000	25.000
	0.000	0.000	0.000	0.000	0.000
	0.000	1.000	0.000	0.000	25.000
	0.000	0.000	1.000	0.000	25.000
	1.000	0.000	1.000	0.000	50.000
	0.000	0.000	0.000	0.000	0.000
	0.000	1.000	0.000	0.000	25.000
	0.000	0.000	1.000	1.000	50.000
	0.000	0.000	0.000	1.000	25.000
	1.000	1.000	1.000	0.000	75.000
Allele Frequency	**0.417**	**0.250**	**0.333**	**0.333**	

Table II shows the total allele frequency in all the four taxa studied, depicting the affinity between them. It is calculated on the basis of total allozymes detected.

Discussion and Conclusions:

The investigation carried out could be helpful to find the co-relation among different families which shows affinities and to discuss the link between them. Here one taxon i.e. only Leucas biflora has been studied for five different plant enzymes so as to know about how far this data is reliable to establish the link between close families like Acanthaceae, Lamiaceae, Scrophulariaceae and Lentibulariaceae.

The use of new cladistics in taxonomy for ascertaining taxonomic similarities is recent at infra specific, generic and family level. In this aspect, the present investigation could be helpful for the taxonomists in ascertaining the new data. Earlier, in nineteenth century many taxonomists make use of phytochemical investigations, cellular details and took support of the embryological findings. The isozymes have been used for

the first time as a tool in the identification of some *Curcuma* species (Apavatjrut et al., 1999). Molecular markers proved to be effective in presenting the reliable data in deciding the positions of certain families. The isozyme data in the present investigation has been proved to be helpful in making the taxonomic clusters. For eg. One is of Acanthaceae and Scrophulariaceae and second of Lamiaceae and Lentibulariaceae .

Lange and SchifinoWittmann (2000), Batista and Sosa (2002), Fu and Dane (2003), Mateu-Andres (2004), Gonzalez Astorga et al. (2004) and Jaaska (2005). Das and Mukherjee (1997), and Kofi et al (2009) combinely analysed the isozyme data to confirm the taxonomic alignment. The isozyme data in the present investigation has been proved to be helpful in making the taxonomic clusters. For eg. One is of Acanthaceae and Scrophulariaceae and second of Lamiaceae and Lentibulariaceae .

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Ayurvedic Application of Butea monosperma and its histochemical investigation

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Abstract:
The histochemistry of plant is used to study of anatomical characters as well to find out synthesis and storage of metabolites. Each and every plant have medicinal importance but we does not know which plant parts have much more Synthesis and accumulation of actives Compounds. Plant parts like leaves ,stem ,roots bark are sources of production of one or more metabolites through this technique a correct detection of secretion and accumulation we can find out ,so we can used only that plant parts Systematic screening of them may result in the discovery of novel effective compounds. This studies helps in Histochemical investigation of Butea Monosperma, these plants have many folk medicinal used.
Key Words- Histochemistry, Butea monosperma, folk medicine

Introduction:

Histochemistry is the branch of histology handling the identification of chemical additives of cells and tissues. Starch deposition occurs extensively in the plant body, but the specifically not unusual locations of its accumulation are seeds, the parenchyma of the secondary vascular tissues within the stem and root, tubers, rhizomes and corn (V. B. Kadam, 1999) Starch and proteins are the main ergastic materials of the protoplasm (E. Kuster etal 1996). Fat are extensively distributed inside the plant frame and that they probably occurs in small quantity in every plant cellular (W. Seifriz., 1936). Fats are not unusual reserve fabric in seeds, spores and embryos in meristematic cells. Glucosides are the degradation made from the carbohydrates

Butea monosperma (Lamk.) is a quintessential tree. Tribals use its plants and younger fruits. The plant is used in Ayurveda, Unani and Siddha medicine for diverse ailments. nearly all the elements of the plant namely root, leaves, fruit, stem bark, flora, gum young branches are used as medicine, food, fiber and for other miscellaneous functions including fish poison, dye, fodder, utensils, etc. about forty five medicinal makes use of are related to the plant and out of those claims nearly half of the wide variety of claims have been scientifically studied and said these observations are noteworthy for further studies on present day medical lines. (Burli and Khade, 2007) Flowers are soaked in water in a single day and a cup of this infusion is drunk each morning towards leucorrhoea until remedy (Patil, et.al. 2006).

Histochemistry techniques:-

Fresh plant material are used for sectioning and prepare permanent for studies of histochemistry. Jeffery's fluid (Johansen, 1940) and Johansen (1940) and Gurr (1965). The specific tests achieved are indexed in Table

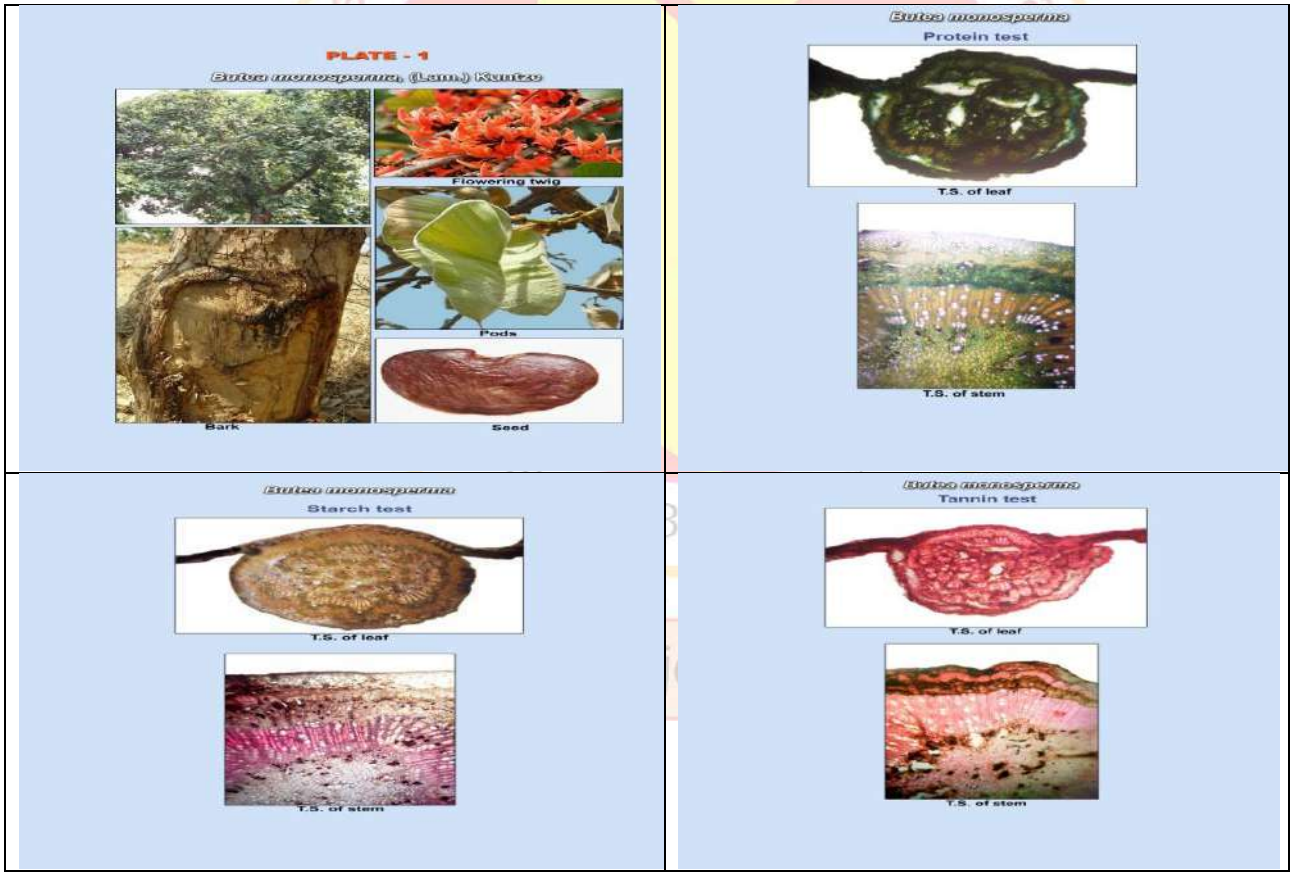
Sr. No	Erastic Content	Chemical Test	Reference:
1	Starch	Iodine, Potassium iodide soln. (IKI Solution.)	**Johansen (1940) and Gurr (1965)**
2	Protein	Potassium Ferro cyanide, Glacial acetic acid	**Johansen (1940)**
3	Tannins	10% ferric chloride solution (aq)	**Johansen (1940) and Gurr (1965)**
4	Saponin	Conc. Sulphuric Acid	**Johansen (1940)**
5	Fats	Sudan III Sudan IV	**Johansen (1940)**
6	Glucosides	Phloroglucinol in 90% alcohol+20% hydrochloric acid	**Johansen (1940) and Gurr (1965)**
7	Alkaloids	a) Idonine solution	**Johansen (1940)**
		b) dil. Nitric a cid	**Johansen (1940)**

Loose hand cutting of plants parts of Stem and leaves are used for histochemical studies with reference to Johansen and Gurr different reagent is used for study of localization of different metabolites Viz starch,

protein, tannin, saponin, fat, glucosides and alkaloids within the tissues (Johansen, 1940). The tests employed was observe:

Studies of histochemistry s of actives compound (metabolites) likes carbohydrates, protein, fats, tannin, saponin, glucoside and alkaloids reacts with specific reagent it offers diverse color stains in section through which accumulation of a few metabolites of the plant is localized in leaf and stem phase describe in table no 2 and picture plate no1

1) Most of starch accumulated in common places like in the parenchyma of the secondary vascular tissue in stem and roots, tuber, rhizome and corms inside the present work, for the taxa under examine, starch become found in leaves and timber of all of the taxa,
2) Protein have been observed within the top and; decrease dermis, scattered cells of mesophyll of leaves, pith parenchyma and cortical parenchyma inside the stem
3) Tannin additionally display distributions, taking place usually in dermis, mesophyll cortical as well as parenchymatous tissue, associated with conductive tissue. Tannins had been discovered inside the leaves
4) Saponin: were discovered within the mid-rib parenchyma of leaves and cortex and pith parenchyma of timber and inside the cells of mesophyll and xylem parenchyma in stem
5) Fats: In taxa underneath take a look at, fat was observed in cells of mesophyll and phloem parenchyma (leaves and stem)
6) Glucoside: Glucosides are the degradation production of carbohydrates glucosides were determined in the dermis ,pith parenchyma of leaves vascular bundles and scattered cells of medullary ray of stem
7) Alkaloids: have been located within the scattered cells of mesophyll of leaves and pith parenchyma of stem .In wanger's reagent, alkaloids were located inside the cells of mesophyll and cells of cortex parenchyma and pith parenchyma of stem



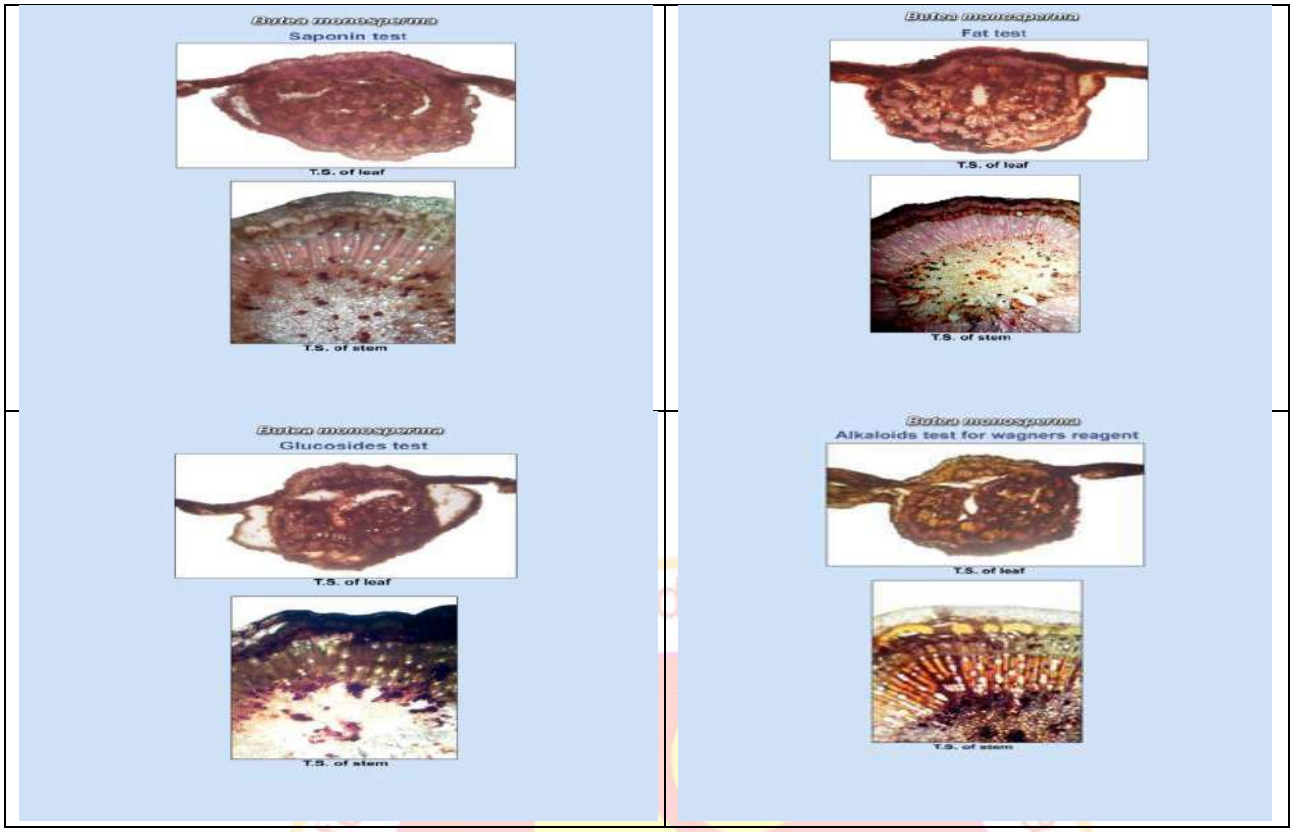


Photo plate shows slides of leaves and stem T.S of histochemistry of Butea monosperma

Sr. No.	Ergastic content	Reaction		Localization	
		Leaves	Stem	Leaves	Stem
1	Starch	$^{+}$ve	$^{+}$ve	Scattered cells of mesophyll, Mid –rib pith parenchyma,	**Cortical parenchyma, Medullary rays, Vascular bundle, and Pith parenchyma**
2	Protein	-do-	-do-	Epidermis, Scattered cells of mesophyll, mid – rib Pith parenchyma	**Epidermis, Scattered cells of Cortex and Pith parenchyma, and Phloem parenchyma.**
3	Tannin	-ve	-do-	-----	**, Scattered cells of Cortex and Pith parenchyma**
4	Saponin	-ve	-do-	----	**Epidermis, Scattered cells of Cortex parenchyma, and Pith**
5	Fat	-do-	-do-	Upper and lower epidermis, Scattered cells of Mesophyll cells and Mid –rib	**Cortical parenchyma, Medullary rays, Scattered cells of Pith parenchyma.**
6	Glucoside	-ve	-ve	-----	**-parenchyma, pith**
7	Alkaloids	-do-	-do-		
	a) Mayer's reagent	-do-	-do-	Cells of Mesophyll, Mid –rib	**Cortex, Xylem parenchyma, and Pith parenchyma.**

	b)Wagner's reagent	**-do-**	**-do-**	**Upper and lower Epidermis, Mid – rib parenchyma.**	**Epidermis, Cortical parenchyma, Medullary rays and Vascular bundle and Pith parenchyma**

Results and Discussion

Histochemical test for fresh section of leaves and stem of *Butea Monosperma*Conclusion

The present helps to save the medicinal plant through histochemical studies through this technique we find out sites of secretion and accumulation of bioactive compounds of the plant. Many plants are used as folk medicine through these techniques people get aware which plant parts are used instead of whole plants the identification of the chemical compounds of the species and its histolocalization contribute to enlarging the pharmacognostic knowledge about this species.

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Preliminary phytochemical screeningof stem bark of *Ficus hispida* L.

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Abstract

Skin infections create physiological and anatomical problems and also affect the social life of an individual. Plant medicines prove to be very effective in simple as well as chronic dermal disease.Traditional medicinal resources,especially plants, have been found to play a major role in managingdermatological ill conditions. The need of the hour is to screen a number ofmedicinal plants for promising biological activity against skin diseases. Hence the present study has been undertaken to investigate the phytochemical constituents from the extract of stem barkof Ficus hispida L.by using six solvents i.e., petroleum ether, benzene, acetone, chloroform, ethanol and distilled water.Preliminary phytochemical analysis revealed the presence of Carbohydrates, saponins, flavonoids, alkaloids, glycosoids, proteins, phytosterols, steroids, terpenoids and phenols in stem bark extracts.This indicates potential of stem bark of Ficus hispida L. in treatment of skin diseases.

Keywords *- Corticosteroids, Dematological, Leprosy, Phytosterols.*

Introduction

The skin as the largest organ of the body, play a number of vital role such as in protection, thermoregulation, percutaneous absorption, sensory and secretory activity. The acidic sebaceous secretions and surface of skin are aggressive to many pathogens. The rich blood and lymphatic supply of the dermis ensures that both specific and nonspecific immune responses can be quickly recruited against pathogens that invade the skin. The skin defense system may however, be compromised if the surface is penetrated via injury or thinned from the used of corticosteroids, excoriated by inflammatory processes (Barrister *et al.*2000). Disease of the skin may in their turn sharply and deeply affect the whole organism. General indisposition and loss of sleep in certain skin diseases which cause itching may serve as an example of such affections.

Psoriasis, Leprosy, vitiligo etc are among diseases that affect the aesthetics, appearance and social life of the patients. Use of herbal medicine can help the patient with dermatological disease to the quality of his social life which was impaired due to his disease condition. Traditional medicinal resources, especially plants, have been found to play a major role in managing dermatological ill conditions. The demand for herbal medicines is increasing rapidly due to their lack of side effects. Further as the health care costs continue to rise, there is attraction for low-cost remedies. The need of the hour is to screen a number of medicinal plants for promising biological activity against skin diseases. Hence the present study has been undertaken for preliminary phytochemical screening of *Ficus hispida* L.used for treatment of manifestations caused by microorganisms causing skin diseases.

Material and Methods

The material of study i.e., stem bark was collected and washed thoroughly with running tap water and after complete shade drying the plant material was grinded. The grinded plant material of 25 gms was taken in Whatman filter paper No.1. The extraction was done by using Soxhlet's extraction method with analytical grade refluxing solvents like.

a. Petroleum ether
b. Benzene
c. Acetone
d. chloroform
e. Ethanol
f. Distil water

The liquid extract obtained in each solvent was concentrated by distilling of the solvent and then evaporated to dryness at room temperature. At the completion of extraction process, the plant extract was used for the qualitative estimation of carbohydrates, saponins, tannins, flavonoids, alkaloids, glycosides, proteins, steroids, phytosterols, phenols and terpenoids.

Phytochemical analysis

Preliminary qualitative phytochemical screening was carried out for each solvent with the following methods.

1. **Test for Detection of carbohydrates :** Molisch's Test: To a small quantity of extract 10 ml of distil water and two drops of Ethanolic naphthol (20%) and 2ml of concentrated Sulphuric acid were added, formation of reddish violet ring at the junction indicates presence of carbohydrates.

2. **Test for Detection of Saponins :** Foam Test: 2 ml of extract was added to equal amount of distil water and shaken in a graduated cylinder for 15 minutes lengthwise. Formation of 1 cm layer of foam indicates the presence of saponins (Kumar *et al*., 2009).
3. **Test for Detection of Tannins:** Ferric Chloride Test: Small Quantity of extract was taken separately in water, 2-3 drops of 5% ferric chloride was added. Formation of black or green colour indicates the presence of tannins.
4. **Test for Detection of Flavonoids :** Sulphuric Acid Test: A fraction of extract was treated with concentrated sulphuric acid and observed for formation of orange colour.
5. **Test for Detection of Alkaloid**s : Mayer's Test: To 2ml of plant extract, 2ml of concentrated hydrochloric acid was added then few drops of Mayer's reagent were added. Presence of green colour or white precipitate indicates the presence of alkaloids.
6. **Test for Detection of Glycosides :** Sulphuric Acid Test: To 2ml of plant extract, 1ml of glacial acetic acid and 5% ferric chloride was added then few drops of concentrated sulphuric acid were added. Presence of greenish blue colour indicates the presence of glycosides.
7. **Test for Detection of Proteins and Amino acids :** Ninhydrin Test: To 2ml of plant extract, few drops of 0.2% Ninhydrin was added and heated for five minutes. Formation of blue colour indicates presence of proteins.
8. **Test for Detection of Steroids and phytosterols :** Sulphuric Acid Test: To 1 ml of plant extract, equal volume of chloroform and few drops of concentrated sulphuric acid were added. Formation of brown ring indicates the presence of steroids and formation of bluish green colour indicates the presence of phytosterols.
9. **Test for Detection of Phenols :** Ferric Chloride Test: To1 ml of plant extract, 2ml of distilled water followed by few drops of 10% ferric chloride was added. Formation of blue or green colour indicates presence of phenols.
10. **Test for Detection of Terpenoids :** Salkowski test: To 2ml of plant extract 2ml of chloroform and 3ml of concentratedsulphuric acid was carefully added to form a layer. Reddish brown coloration at theinterface is formed indicating the presence of Terpenoids.

Result and Discussion

The detail study of ethno-medicinal plants used in Skin diseases revealed that the most of these diseases remained incurable by the use of modern drugs. The treatment using modern drugs is costly, time consuming and have many side effects. Plant medicines and cosmetics are considered to be more beneficial in treatment of skin disease like psoriasis, eczema dermatitis, vitiligo, candidiasis, athlete's foot, carbuncle, ketosis, acne, pimples, wart, hives and ageing signs etc.

The observations in general revealed that mostly medicinal plants are concerned with traditional medicinal system.In the present investigation preliminary phytochemical investigation in different extracts of *Ficus hispida* L. stem bark showed the presence of phytochemical constituents namely carbohydrates, saponins, flavonoids, alkaloids, glycosoids, proteins, phytosterols, steroids, flavonoids, terpenoids and phenols.

Carbohydrates and proteins which were present in petroleum ether, benzene, chloroform and distilled water extract work together to maintain barrier functions of skin in face of everyday challenges. Saponin was extracted in all extracts except ethanol, shows protection against UV damage. Tannins and flavonoids was found in acetone and ethanol extract accountable for the potent antioxidant capacity of *Ficus hispida* L. Alkaloids showed positive test for petroleum ether, benzene, acetone and ethanol, alkaloids have extensive pharmacological activity such as antioxidant and anti-inflammatory. Glycosides are present in petroleum ether, benzene, chloroform and distilled water extract showed significant antioxidant, antifungal and antibacterial activity.

Phytosterols and steroids showed positive test for petroleum ether, acetone and ethanol. Phytosterols have anti-aging property whereas steroids are very effective in helping in itching and irritation. Phenols are present in acetone, ethanol and distilled water extract; they present antimicrobial, anti-inflammatory or anti-aging actions. Terpenoids showed positive test for petroleum ether, acetone, ethanol and distilled water extract it used to enhance skin penetration and prevent inflammatory disease.

Table 1: Preliminary Phytochemical Screening of various extracts
(Obtained by Successive solvent extraction of plant material)
Ficus hispida L.Present:- **'+ ve'** and Absent:- **'- ve'**

Sr. No	Secondary metabolite	S_1 Petroleum ether	S_2 Benzene	S_3 Acetone	S_4 Chloroform	S_5 Ethanol	S_6 Distil water
1	Carbohydrates	+	+	---	+	---	+
2	Saponins	++	+++	+	+	---	+
3	Tannins	---	---	++	---	+++	+
4	Flavonoids	+	---	+++	---	+++	+
5	Alkaloids (Mayer's test)	++	+++	++	---	++	---
6	Glycosides	+	+	---	+	---	+
7	Proteins	++	++	---	++	---	+
8	Phytosterol & Steroids	+	---	++	---	+	---
9	Phenols	---	---	++	---	+++	+
10	Terpenoids	+	---	+++	---	++	+

Conclusions

The results of phytochemical analysis of stem bark of *Ficus hispida* L. showed presence of many phytochemical constituents which has potential to cure many infectious diseases. The curative potential of ethno-medicinal plants studied during the present investigation will be helpful to evaluate the effectiveness of herbal medicine against skin diseases.

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Study of Diversity of Mollusca and Fish in Borgaon Dam District Yavatmal, Maharashtra, India

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Abstract:-

Molluscan and fish diversity of Borgaon dam Dist Yavatmal Maharashtra have been studies during June 2019 to May 2021 of Borgaon dam of Yavatmal, District Yavatmal and factor which affecting on them. Study reveals that molluscan diversity in Borgaon dam of Yavatmal region, Dist. Yavatmal, Maharashtra, India, reported that total of 18 fish species were recorded and 14 species of molluscs from the dam. The dominant class Gastropoda of Mollusca was dominated by 14 species including Pila globosa, Thiara scabra, Melanoides tuberculata, Bellamya bengalensis, Lymnaea accuminata, Lymnaea lutiola, Indoplanarbis exustus, Zootecus insularis, Tarebia lineate Cerastua maussonianus Filicaulis alte, Laevicaulis alte, Senperula maculata and Rachis punctatus.. Ichthyo fauna of Borgaon dam Dist Yavatmal Maharashtra were dominated by major carps with 10 members belonging to cypriniformes including Labeo rohita, Catla catla, Cyprinus carpeo, Cirrhinus marigala, Labeo calbasu, Labeo bata, Labeo fimbriatus, Puntius sarana followed by 6 members of family siluriformes including Clarius batrachus, Mystus bleekeri, Mystus vittatus, Ompak bimaculatus, Wallago attu, Heteropnoustes fossilis, Amblypharyngodon mola, Puntius sophore and one genera with two species of family channiformes represented by Channa punctatus and Channa striatus. The composition, distribution of benthic organisms over a period of time provide index of the ecosystem as well as sustain a rich molluscan and fish fauna.

Key Words:- Borgaon dam, Mollusca, Ichthyo fauna, cypriniformes.

Introduction:-

The Phylum Mollusca is a second largest phylum in invertebrate. Molluscan are soft bodied animals with or without calcareous shell adapted to almost all habitats with varied ecology. Molluscs are divided into freshwater, marine and terrestrial forms. It includes snails, slugs, clams, oysters, mussels, scallops, cuttlefish, squid and octopus. All the molluscan comprises in three groups, Gastropods, Bivalves and Cephalopods. The freshwater ecosystems in India harbour a rich diversity of molluscs, representing 212 species belonging to 21 families. Of these, 164 species were recorded from rivers and streams (Subba Rao, 1993). Biodiversity is one of the important lives supporting system on the earth. Molluscs are found in various habitat and are divided into freshwater, marine and terrestrial forms. The freshwater Mollusca play an important role in water ecosystem. Gastropoda is extremely diverse group in Mollusca and adapted to all habitats, includes snails and slugs. Bivalves as a group have no head and it characterized by a shell that is divided from front to back into left and right valves. They include clams, oysters, mussels and number of families that live in freshwater (Subba Rao,1989; Patil and Talmale, 2005; Kumar and Vyas 2012; Tripathy and Mukhpadhyay, 2015). Aquatic ecosystem provides a home to many species including phytoplanktons, zooplanktons, aquatic plants, insects, molluscans etc. They are organized at many levels from smallest building blocks of life to complete ecosystems, encompassing communities, populations, species and genetic levels. All aquatic ecosystems around the globe are generally colonized by the representatives of phylum Arthropoda and Mollusca. Benthic invertebrates occupy the bottom of water body. The functional role of benthic communities in the trophic dynamics of river ecosystem is well acknowledged. The composition, distribution of benthic organisms over a period of time provide index of the ecosystem. In recent years, there is a greater emphasis world over for better understanding of benthic environment, For present study the Borgaon dam is selected which was constructed as part of Irrigation Projects by the Government of Maharashtra in the year 1993. It is built on and impounds a local Nallah River. Nearest city to dam is Yavatmal in Yavatmal District of Maharashtra. The dam is an Earth fill Dam .The purpose of the dam is for Irrigation. The Length of dam is 830 m (2723.1 Feet) , while the Height of the dam above lowest foundation is 20 m (65.6168 Feet) . The above lake is used for fishing and bird watching. As per availablity of Literature no authentic data on various species of Mollusca was found Borgaon dam . So present work has carried out to study the diversity of molluscan in Borgaon dam.

Study Area:-

Borgaon dam is 10 km from city Distric Yavatmal located near village Borgaon at 20.3533°N, 78.5879°E which was constructed by the Government of Maharashtra in 1975. It contains rich treasure of flora and fauna. It is fresh water annual lake; water is used for irrigation as well as fishing Purpose by the villagers map.

Material And Method:-

The present work was carried out from studies during June 2019 to May 2020 in Borgaon dam near Borgaon . District. Yavatmal. The sample were hand picked from surface area and by fishing net submerged

surface. The few collected live samples were Preserved in 70% ethanol and dead sample were washed, dried and photographer were taken by Nikon D 5000 camera and species were identified from the handbook an Indian freshwater Mollusca by Ramkrishan and Dey,2007

Result And Discussion:-

Molluscs, a group of most diverse and dominant benthic fauna in water bodies, the Borgaon dam is harbors a number of aquatic weeds in the submerged as well as floating state. Molluscans are of great significance because they form the food of fishes and their productivity play an important link in the food chain. In present study, It was come to notice that molluscan specimens were represented in Borgaondam by only one doinated class Gastropoda. The quantitative analysis of molluscs was not done but it observed that Bellamya species, Pila globosa species and Lymnaea species was the dominant than other because the shell of these species were seen scattered throughout the margin of dam compared to other species.

Observation Table:-

Table 1. Systematic classification of molluscan species observed in Borgaon Dam during June 2019-May 2021 Class Order Family Genus and species of Gastropoda

Sr.No	Class	Order	Family	Genus and Species
1.	Gastropoda	Pectinibranchiata	Pilidae	Pila globosa (Swainson)
2	Gastropoda	Mesogastropoda	Thaiaridae	Thiara scabra (Muller)
3	Gastropoda	Mesogastropoda	Thaiaridae	Melanoides tuberculata (Muller)
4	Gastropoda	Mesogastropoda	Thaiaridae	Tarebia lineate (Benson)
5	Gastropoda	Stylommatophora	Viviparidae	Bellamya bengalensis (Lamark)
6	Gastropoda	Stylommatophora	Cerastuidae	Cerastua maussonianus (Petit)
7	Gastropoda	Stylommatophora	Veronicellidae	Laevicaulis alte (Ferrussac)
8	Gastropoda	Stylommatophora	Veronicellidae	Senperula maculate (Templeton
9	Gastropoda	Stylommatophora	Subulinidae	Zootecus insularis (Pfieffer)
10	Gastropoda	Stylommatophora	Enidae	Rachis punctatus (Anton)
11	Gastropoda	Stylommatophora	Lymnaeidae	Lymnaea accuminata (Gray)
12	Gastropoda	Stylommatophora	Lymnaeidae	Lymnaea lutiola (Gray)
13	Gastropoda	Stylommatophora	Planorbidae	Indoplanarbis exustus (Deshayes)
14	Gastropoda	Soleolifera	Veronicellidae	Filicaulis alte (Ferrussaca)

* Not directly found in water but on grass, moist soil and under rocks near Dam

Table 2. Fish species observed in Borgaon Dam during June 2019-May 2021 Family, Genus and species of Fishes .

Sr.No.	Family	Genus and Species
1	Cyprinidae	*Labeo rohita*
2	Cyprinidae	*Catla catla*
3	Cyprinidae	*Cyprinus carpeo*
4	Cyprinidae	*Cirrhinus marigala*
5	Cyprinidae	*Labeo calbasu*
6	Cyprinidae	*Labeo bata*
7.	Cyprinidae	*Labeo fimbriatus*
8	Cyprinidae	*Puntius sarana*
9	Siluriformes	*Clarius batrachus*
10	Siluriformes	*Mystus bleekeri*
11	Siluriformes	*Mystus vittatus*
12	Siluriformes	*Ompak bimaculatus*
13	Siluriformes	*Wallago attu*
14	Siluriformes	*Heteropnoustes fossilis*
15	Siluriformes	*Amblypharyngodon mola*
16	Siluriformes	*Puntius sophore*
17	Channiformes	*Channa punctatus*
18	Channiformes	*Channa striatus*.

* Directly found in Dam water collected by fisherman's.

Number of workers conducted studies on molluscan diversity in different parts of India the freshwater ecosystem in India harbors a rich diversity of molluscs representing 212 belonging to 21 families out of these 164 species recorded from river and streams. Mollusca perform key role in functioning the aquatic ecosystem. The availability of maximum molluscs during summer months could be related to two important ecological phenomenons. Kumar and vyas, reported the eleven species of molluscs from narmada sagar, out of which 8 species comprises of Rachis bengalensis, R. punctatus, Bellamya bengalensis, Melanoides tuberculatus, M. seabra, Lymnaea acuminate, L. lutola and Indoplanorbis exustus. The species of freshwater molluscs as gathered in the present study were quite different and also as reported earlier by some authors. 23 A study on the molluscan diversity of saipung wildlife sanctuary, Meghalaya. Revealed 13 species of molluscs, out of which 12 species were identified as gastropoda and 1 species of Bivalvia bengalensis, F.annadalei, Pila theobaldi, Thiara (lareba) lineata, Brotia (Antimelania) costula, Paludomus (poludomus) Conica, P. (P.) regulaa,, P. (P) Stephanus and Indoplanorbis exustus. Water temperature exhibit a positive correlation with molluscs during 2 years of present study. This shows that increase in temperature within the observed range favors. The growth of molluscs. As per the finding of researcher from above data. The generic as well as species diversity seen in freshwater aquatic ecosystem in different region, Tyagi, 2018 mentioned that there was a variation in molluscan diversity in different freshwater bodies as earlier studied by different researcher which was not due either a single factors is responsible for such variation. Malhotra et.al. 1996 reported the maximum molluscas during summer month could be related to some ecological important phenomenon's such as maximum abundance of decomposers, settled organic matter and macrophytes on bottom of water body and also increase water temperature activating the process of decomposition of organic sediments. Bath et.al. observed that the important for breeding and feeding of the molluscs. Borgaon dam is due to moderate amount of water, temperature and available micro vegetation and decomposers. The abundance of molluscan fauna from present study area indicates the rich productivity. The species inhibiting bottom of lake plays an important role in converting organic matter together with the microbenthos into a biomass, which in turn consumed by the fishes thus help in the secondary productivity and form an important component in the food web of ecosystem.

Conclusion:-

It can be conclude from the present study that among the selected site. The freshwater mollusks and fishes aid in assessment of ecological status of water bodies. The study relevant to the diversity distribution and ecology become imperative during the study. Present study observed the present status of mollusks and fish shows richness of Borgaon dam. Some anthrogenic activities may be consider as a threat to the mollusks and fishes as well as other living organisms of this dam. Hence the mollusks and fishes have a tremendous impact on Indian tradition and economy and it is also considered as bioindicatores of pollution and ecosystem health. The identification, taxonomic account and distribution of mollusks and fishes found in Borgaon dam is useful for better management and Borgaon dam region.

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Review on Effect of EMS as a Chemical mutagen for improvement of Legume Cropsvarieties

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Abstract

Mutation is defined as any heritable changes in an individual's genome and phenotype. In the hands of plant breeders, mutation breeding is the most potent and effective weapon available. It has been used to improve morphological and physiological characters, disease resistance, draught resistance and quantitative characters including yielding ability.

It is a cheap and fast method of developing new improved varieties.Plant breeding aims to generate novel, high-yielding, and improved cultivars by examining genetic variability in important qualities. The chemical ethyl methane sulfonate (EMS) is routinely used to cause mutations at loci that control economically important features.

Keywords: *Mutation, Phenotype, breeding, cultivar, EMS.*

Introductions:

Hugo de Vries first time used the term "mutation" in 1901. Mutation is described as a change in the number or sequence of nucleotides that is permanent and relatively uncommon. The genetic improvement of crop plants for various economic characters through the use of induced mutations is referred to as mutation breeding.

Mutations have been induced using physical mutagens such as X-rays, Gamma rays, fast and thermal neutrons, heavy ion beams, and chemicals such as EMS, DES, and SA. As of now, 408 mutant varieties of food legume crops from 24 distinct crop species have been released for cultivation utilising mutation procedures around the world (Kharkwal et al., 2005).

There is immense scope to enhance mineral nutrient (biofortification) and essential amino acid contents of human food as well as animal feed along with altered protein and fatty acid profiles, physicochemical properties of starch, enhance phytonutrients in fruits and reduced antinutritional factors in staple food grains. Induced mutations could play a key role in inducing mutations in crop plants to improve nutritional quality. 776 mutant varieties have been recognised for their improved nutritional qualities among the globally developed 3,000 mutant types. (Jain et. al., 2011).

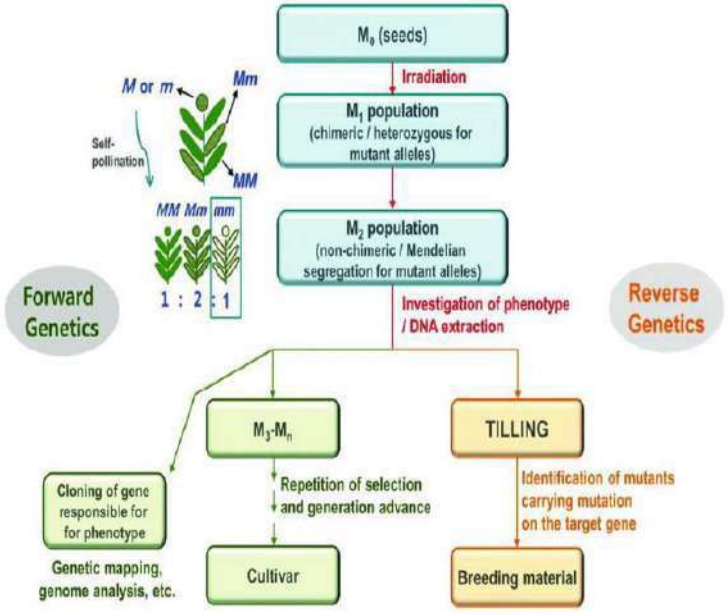

Fig.1. Mutation breeding integrated use with modern techniques.
Source: Directly taken from Jo and Kim, 2019.

Development of legume mutant varieties:

Physical or chemical mutagens can cause mutations. This is an excellent method for increasing genetic diversity for use in functional genomics and plant breeding. There have been 3,218 mutant varieties released around the world so far. Free exchange of mutant material and deployment in locations where farmers' needs are vital can maximise the use of mutant lines around the world.

Mutagenesis can be made more beneficial in the improvement of crop plants with the help of well-defined objectives in national research programmes, the availability of effective mutagenesis techniques, and efficient phenotype screening tools. Mutant identification/selection at the genotypic level, using new, high-throughput technologies, has changed the way mutations are now used in genetics and breeding.

Chemical mutagens are popular in in-vitro mutation induction, although irradiation can also be applied at low doses, EMS has become the mutagen of choice for developing mutant populations for high throughput screening such as in developing TILLING populations (Pathirana et. al. 2016)

As a result of sustained efforts through the use of physical and chemical mutagens, the IARI institute has made important contributions in understanding of induced mutagenesis(Kharkwal et al., 2004, 2005) and also achieved major success in developing eleven high yielding, disease resistant and agronomically suitable mutant varieties in several crops like chickpea,cow pea, field pea, pigeonpea and soybean(Kharkwal et al, 2004, Kharkwal et al., 2008).

Sagade (2008) used gamma rays, EMS, and MMS to achieve dramatic results in quantitative features in urdbean.

In Chickpea (Cicer arietinum L.) Var. Virat, the effect of Ethyl Methane Sulphonate (EMS) on seed germination and seeding injury was investigated. With rising EMS concentrations, the percentage of seeds germination reduced and seedling damage rose. Chickpea yield has not increased significantly in the last ten years. (Barshile et. al., 2006).

One of the reasons for chickpea's failure to achieve breakthrough productivity has been suggested to be a lack of genetic variety.Long pod mutants with greater diameter are a beneficial variant that can be used to boost seed yield by increasing the number of seeds per pod and seed size.

Long pod mutants with gamma rays, EMS, HZ, and SA in mungbean were identified by Sharma and Singh (1992) and Wani et al. (2011). while long pod mutants with EMS, gamma rays, and their combination in cluster bean were reported by Singh and Agarwal (1986) to have higher genetic variation and yield potential.

Four gigas mutant plant types were obtained from the M2 population of Chickpea cultivar Vijay; three from 300 Grey dosage and one from 0.2 percent EMS.All gigas exhibit a dominating phenotypic appearance, with 1.5 times the height of the control, an elongated, strong stem, and wider and broader leaflets than the control. The EMS gigas has fewer primary branches and larger, smooth leaves. One of the 300 Grey dose was sterile, while the other three contained flowers and pods. In comparison to the control, one gigas (EMS 0.2%) demonstrated 10 days of early flowering (Bogawar et. al. 2017).

Physical mutagen (gamma rays at 300 and 400 Gy doses) and chemical mutagen (ethyl-methane sulphonate 0.5 percent) treatments were used to mutagenize the seeds of three desi varieties of Chickpea released from Pantnagar. M1 generation showed gradual decrease in germination with increase in mutagen strength in addition to this, combination treatments caused more biological damage than individual mutagen treatment. Except for two agronomic traits, number of primary branches per plant and pod length, variation for variety demonstrated considerable differences in M2 generation..For eight traits, including yield per plant, all types of mutagenic treatments and variety treatment variance were significant (Dinkar et. al.,2020). Chickpea secondary branch number grew significantly in both the 300 Gy alone and the combination treatment with 0.5 EMS treatments. For several traits, the genotypic response was variable at different mutagenic levels.Although none of the genotypes outperformed the control for yield per plant at all of the treatment levels, one genotype, PG114, showed a substantial improvement in yield component trait pods per plant at 300 Gy + 0.5 percent EMS (Dinkar et. al.,2020).

M2 generation showed a complete positive trend of shift as a result of EMS treatment to mungbean, with lower and moderate doses of the mutagens increasing the mean number of seeds per pod and 100-seed weight, whereas M3 generation showed a complete positive trend of shift as a result of EMS treatment to mungbean. By increasing the quantity of seeds per pod and seed size, long pod and bold seeded mutants can be employed to increase yield potential The genotypic coefficient of variation, heritability, and genetic advancement in the treated population increased considerably for all of these variables, showing that mutagen-induced variability has a significant potential to improve the mungbean crop (Wani et. al. 2017).

When compared to gamma rays and combo therapies, EMS was found to be more successful at causing mutations. In this way, gamma rays were the least effective. The reaction to mutagenic efficacy was higher in the var. pusa-372 than in the var. Pusa-212 among the two Chickpea varieties (Wani 2009).

Conclusion:

From the above discussion regarding mutagens EMS (Ethyl Methane Sulphonate) is a effective chemical mutagen for the improvement of pulse crops like Chickpea, mungbean, urdbean etc. these improvement may be in the quantity or the quality of the crop.

The effect of EMS in the specified amount of dose is may be useful for the improvement of legume crops varieties and can be use as a best tool for mutational breeding to fulfil the food demand of country and having an economical value.

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Case Studies in Kidney Stone Herbal Treatment

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Abstract

The efficacy and safety of Ayurvedic drugs is a proved one, through clinical experiences, over not only hundreds but thousands of years. However, for global acceptance there is need to assess the efficacy of these drugs through scientific clinical research. A kidney stone, also known as renal calculus, is a solid concretion or crystal aggregation formed in the kidneys from minerals in the urine. If stones grow to sufficient size (usually at least 3 mm or 0.12 in) they can cause blockage of the ureter. Finally it results into renal colic. Herbal treatment was given for twelve days. Clinical follow-up was taken after 3 days, 6 days and 12 days. In all 15 studies were made to understand the efficacy of the treatment.

Keywords: *Case Studies, Kidney Stone, Herbal Treatment.*

Introduction:

During the past two decades, the cost for the development of novel drugs has tremendously increased. In parallel, the number of novel drug candidates with acceptable toxicity is decreasing. Therefore, pharmaceutical companies focused their attention on novel technologies such as genomic, bioinformatic methods and the development of macromolecular drugs (Simon, 2008; Deverka et al, 2010; Allerheiligen, 2010). The availability of sophisticated therapies developed by high-tech medical and pharmaceutical research in industrialized countries will be more and more restricted to rich elites. On the other hand, traditional medicines have been developed in almost all cultures worldwide. As a consequence, two-thirds of the world population with insufficient access to modern drugs still relies on natural medicines (Efferth, 2011).

Routine of drug development involves a synthesis of bioactive compounds (taking clues either from alternative systems or ethnobotany) and their preclinical (animal experimentation) and clinical trials before bringing the medicine in market. This is a time consuming as well as tremendously costly method. However, in the eyes of traditional healers and also researchers working in the field of ethnobotany, traditional medicines have been applied for hundreds or thousands of years in patients. Therefore, it is not obvious why the activity of natural medicines should be first tested in cell lines in-vitro or in mouse experiments in-vivo.

Uses of crude drug in treatment are almost unacceptable to the modern society. Modern society thinks that to give an 'Herbal Tea' to a patient is unethical, only because they culturally do not recognize the value of popular tradition. Best example of this mentality is the failure of herbal drug programme in Brazil. In 1970s a programme was started in Brazil to introduce the herbal preparation into primary health service. In-spite of wonderful results the programme was stopped for unknown reasons (Elisabetsky and Posey, 1994).

There has been a gradual increase in use of alternative therapy worldwide. A survey released in May 2004 by the National Center for Complementary and Alternative Medicine focused on who used complementary and alternative medicines (CAM), what was used, and why it was used. The survey was limited to adults living in the United States. According to this survey, herbal therapy, or use of natural products other than vitamins and minerals, was the most commonly used CAM therapy (18.9%) when everything else proved to be ineffective (Mwangi and Gitonga, 2014). In the United Kingdom, it is estimated that in 1996 alone, at least 72 million pounds was spent on alternative therapies (licensed herbal medicine, homeopathic remedies and essential oils for aromatherapy). Herbal remedies are very common in Europe. In Germany, herbal medications are dispensed by apothecaries (e.g., Apotheke). Prescription drugs are sold alongside essential oils, herbal extracts, or herbal teas. Herbal remedies are seen by some as a treatment to be preferred to pure medical compounds regulated as supplements, same case with the US (Goldman, 2001). In USA approximately 40% of the annual expenditure on medicine can be attributed to sales of herbal remedies directly to the public and other naturopathic treatments (Barnes, 2002). However, in India selling the traditional drugs or practicing the local traditional health system has no legal acceptance.

In case of Ayurveda people are now actively conducting clinical trials to establish the authenticity of Ayurvedic medicines. In fact, Ayurveda has been practiced in India since ages and has stood the test of time. The efficacy and safety of Ayurvedic drugs is a proved one through clinical experiences over not only hundreds but thousands of years. However, for global acceptance there is need to assess the efficacy of these drugs through scientific clinical research.

A kidney stone, also known as renal calculus, is a solid concretion or crystal aggregation formed in the kidneys from minerals in the urine. Kidney stones typically leave the body by passage in the urine stream, and

many stones are formed and passed without causing symptoms. If stones grow to sufficient size (usually at least 3 mm or 0.12 in) they can cause blockage of the ureter. Blockage of the ureter causes decreased kidney function and dilation of the kidney. This leads to pain in the flank or lower back and often radiating to the groin or genitals. This pain is often known as renal colic. It is commonly accompanied by urinary urgency, restlessness, hematuria, sweating, nausea, and vomiting. Other associated symptoms include: fever, blood in the urine, pus in the urine, and painful urination. Urinary stones are typically classified by their location in the kidney (nephrolithiasis), ureter (ureterolithiasis), bladder (cystolithiasis), or by their chemical composition (calcium-containing, struvite, uric acid or other compounds). Calcium (calcium oxalate) is one of the most common types of component in human kidney stones. Vegetarians tend to have higher levels of citrate excretion and low risk of stone formation (Johri et al., 2010). About 80% of those with kidney stones are men. For stones pain control is usually the first measure. More severe cases may require procedures, e.g. extracorporeal shock wave lithotripsy and percutaneous nephrolithotomy.

Methodology:

In case of Ayurveda people are now actively conducting clinical trials to establish the authenticity of Ayurvedic medicines. In fact, Ayurveda has been practiced in India since ages and has stood the test of time. The efficacy and safety of Ayurvedic drugs is a proved one, through clinical experiences over not only hundreds but thousands of years. However, for global acceptance there is need to assess the efficacy of these drugs through scientific clinical research.

For case studies selection of disease was based on two important criteria-

1) The disease should be non-infectious or is the result of changed life style (life style diseases).
2) It was strictly avoided to select the critical diseases like cancer or those which need surgery.

Consent form was prepared with the help of registered medical practitioner.

Only those patients were considered who were willing to give the consent without any condition or hesitation. Before taking consent the proper counseling of concerned person was done regarding the disease for which he/she was taking the treatment and need to keep record at particular time intervals.

Consent form was also prepared for medicinemen. The most important fact mentioned in the consent form was that his formulations will not be disclosed to any other person who can take the disadvantage of his knowledge and secondly he will not face any medicolegal situation.

Case studies were undertaken to examine and establish the credibility of ethnic health practices. Collaboration was made with registered medical practitioner Dr. S. G. Kadu (M. B. B. S., Ex Medical Officer, Regi. No. 1080) and local vaidus. To make it very clear I would like to state that these are not clinical trials but is simply scientific case follow-up with the consent of patient and vaidu.

In case studies the diagnosis made by medicineman was either confirmed by registered medical practitioner or the patient started traditional/herbal treatment after the ailment was diagnosed by the doctor. All are non-comparative studies (no comparison parallel to allopathic medicine). Original papers of case studies signed by registered medical practitioner and local herbal healer as well as consent forms signed by patients are retained with author.

Study Treatment:

Fully expanded leaf of *Bryophyllum calycinum* Salisb. and fruits of *Piper nigrum* L. was given to eat on empty stomach. After half an hour, 50 ml of decoction, prepared from roots of *Hemidesmus indicus* (L.) Schult. and fruits of *Tribulus terrestris* L., was given. Treatment was repeated twice/day till relief upto twelve days. Clinical follow-up was taken after 3 days, 6 days and 12 days. In all 15 studies were made to understand the efficacy of the treatment.

Result and Discussion:

It is mainly confirmed by acute stomach-pain over the kidney angle in abdomen, difficulty in passing urine and painful urination. In all 15 case studies have been recorded. The age of the test group varies from 20 Yrs. to 78 Yrs. Period of suffering varies from 1- 4 Yrs. In all cases 6-7 days of treatment resulted in 90% relief irrespective of the period of suffering and age. In one case even sonography reports were procured. In Ayurveda, *Bryophyllum pinnatum* (Lam.) Oken (Syn. *B. calycinum* Salisb.) known as 'Pashanbhed' is used to treat the kidney stone. In Warud tahsil also traditional healers use the same plant. This shows intimate relationship between ethnomedicine and the ancient life science i. e. Ayurveda in India (Sharma, 1982).

In traditional practices whole plant or its extract or polyherbal extract are used. It is the synergistic effect of phytoconstituents in a plant which exhibit their action. It is frequently observed that single medicinal

herb or complex herbal mixture show the expected bioactivity, but during fractionation with bioactively-guided isolation of natural products the activity gets weaker and finally can even be lost. An interesting aspect in this context is that one compound of an herbal mixture may activate some proteins of a signal transduction pathway of interest, while another constituent of the mixture may activate the other proteins of the same signaling cascade. Hence the reciprocal supplementation leads to full stimulation of a signaling route and thereby therapeutic effects (Efferth, 2011). Hence there is a need to adapt traditional treatments after more scientific validation.

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An Investigation of Plant Growth and Nutrient Content by the Effect of Metal Ion and Their Complexes in Cassia Tora (Tarota) Plant

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Abstract

*In the present study Cassia Torawere taken as experimental plant in order to study effect of heavy metals and their complexes of (1S- cis)- 4- (3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine on to improve the yield of economically important plant.*Cassia tora *Linn. (Family: Leguminosae) is well known plant widely distributed in India. Different parts of the plant (Leaves, seed, and root) are reputed for their medicinal value.The seeds were immersed in Mg (II), ions, ligand and its complexes to study the germination and growth pattern and certain physiological processes. Effect of ligand, metal ion and complex solution on growth, determination of % of nitrogen, proteins and chlorophyll in the leaves of plants were studied. The data harvested indicates increased germinations in all seed treatments. The changes in growth pattern of roots length and shoots length are observed in the experimental plants. However, chlorophyll content was found to be higher in plant species. The percentage of nitrogen and proteins were found affected in the leaves of Tarota plant treated with Sartraline, complex and metal Mg(II). Nitrogen and protein contents are found higher in the treated plants as compared to control.*

Key words –Sartraline, Mg (II), Plant, Chlorophyll, Nitrogen, Protein.

Introduction:

India is virtually a herbarium of the world. In India, we are using plants and herbs as the basic source of medicine because we are rich in them. The plant physiologists not only to supply basic information regarding how plants grow and develop but also to undertake research program to increase yield of plant products. Seed germination behavior is important for horticulture and agriculture.[1,2]

Metals are acting a beneficial role for plant growth, development, and productivity at an optimum concentration in the form of the essential micronutrient[3]. To grow and complete the life cycle plants use the essential micronutrients[4]. The plant takes these essential heavy metals like iron, zinc, copper, and manganese from the soil due to concentration gradients and selective uptake of these metals[5]. These ions enthusiastically affected the function of many enzymes and cellular metabolism. These metals also play a prominent role in the synthesis of protein, nucleic acids, photosynthetic pigment, and it also take part in the structural and functional integrity of cell membranes[6].Agricultural scientists realize that crop plants grow in production to the amounts of various nutrients present in soils. Today the application of various salts to soils is a basic future of agricultural practice. With the application of these and other fertilizer to soils, the large crop yields obtained in developing. In modern agricultural practice, various chemicals in solution or aqueous suspension are sprayed on the crop plants with in the object of accelerating and modifying the plant growth and their development.Manganese (Mn) is an essential plant mineral nutrient, playing a key role in several physiological processes, particularly photosynthesis.

Some of heavy metals (Fe, Cu and Zn) are essential for plants[7].Oxines and Gibberlines are the growth promoting harmones.[8-10] Very dilute solution of these growths promoting hormone solutions, if sprayed over the plant, chlorophyll synthesis is accelerated and consequently vegetative growth has been observed. Experimental results indicate that, if the hormonal solution sprayed over crop plants, the crop yield increases to a considerable extent.

Since *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine*has intense biological activities,antidepressant, selective competitive inhibitor. Sertralineinhibits the activity of the enzymes and since no work is reported on the biological application of binary complexes of Mg (II), with *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine* and comparing with pure ligand, metal and control solution (double distilled water) to study the effect of complex, metal, ligand over control solution on germination, survival seedlings height etc, on *Tarota* plant in order to make suggestion whether complex, metal and ligands can be used as a plant growth regulator.

Also, biological analysis of chlorophyll contents and percentage of nitrogen and proteins in the leaves of leafy vegetables are carried out at room temperature.

Material And Experimental Methods:

The solution of Mg (II)in the form of nitrate and *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine*of the concentration of 0.01 M was prepared in double distilled water. The applications of complex, metal, ligand solution is studied by dissolving it in proper solvent at 3.60, 7.00 and

10.5 pH and at constant ionic strength of 0.01 M potassium nitrate solution. Fertilized soil was collected from agricultural land. It was then ground and filtered. This soil was filled in two wooden trays and tray was moistened with water. Sowing of seeds was done in the soil after one hour.Passioura J.B.[11] has studied on soil structure and plant growth. Many soils contain continuous macrospores that provided niches for the roots to grow in. The presence of such macrospores increases the extent of the root system, Soil structure not only affect the ability of root to grow and to supply the leaves with water and nutrients it also induces them to send hormonal signals that slow the growth of shoot.

Experiments Performed:

In general practice various chemicals are used in agriculture as an ingredient of various pesticides, insecticides, fertilizers etc., to improve the crop yield. Amongst several economical important plants *Tarota* is selected as a plant system.

1. 100 healthy seeds of *Tarota* were taken 3.5 and 7.00 pH for about two hours. These seeds soaked were taken out of each solution and sowed in the wooden tray in a row, the wooden tray was kept under atmospheric pressure at room temperature.
2. Effect of ligand, metal ion, complex solution on growth of Tarota (*Cassia tora) species*plants was studied at different pH (3.5 and 7.00).
3. Effect of ligand, metal Mg (II), complex on percentage of Nitrogen, Proteins and Chlorophyll in the leave of *Cassia tora* plants were studied.
4. Chlorophyll content in fresh leaves were determined by spectrophotometric method given by Jahagirdar[12].

Parameters:

Plant growth is decided on the basis of parameter such as percentage of germination, survival, seedling height, shoot length; root length and thickness of young leaf having high values compare to control systems. Germination was noted after 3 days and survival was noted after 10 days. After noting the survival of plant, they were taken out of soil. The seedling height and thickness of leaves of survived *Tarota*plants were measured.

Table 1.1-Effect of Ligand, Metal ion and Complex on Germination, Survival, Seedling height etc. on *Cassia tora*Test System.

Test System	Effect of	pH	Parameters						
			%Germination after 2&1/2 days	% Survival after 10 days	Seedling height (cm)	Root length (cm)	Shoot length (cm)	Root / Shoot	**Width of young leaf (cm)**
***Tarota*Test System**	Water (Control)	3.5	60.00	60.00	23.072	8.621	14.450	0.590	**1.65**
		7.0	66.66	66.66	23.62	8.84	14.78	0.5981	**1.620**
	Ligand	3.5	73.33	73.33	22.984	8.718	14.603	0.5970	**1.761**
		7.0	80.00	86.66	25.24	9.14	16.08	0.5440	**1.841**
	Complex	3.5	60.00	60.00	23.614	8.712	14.702	0.5925	**1.421**
		7.0	73.33	80.00	24.49	9.07	15.41	0.5885	**1.490**
	Metal	3.5	80.00	73.33	23.881	8.804	15.077	0.584	**1.850**
		7.0	**30.00**	**93.33**	**27.71**	**8.22**	**14.44**	**0.5692**	**1.843**

Table 1.2- Estimation of Chlorophyll for ***Cassia tora***Plants System

Sr.No.	Treatment	Leaves of plant	Total Chlorophyll gm/Lit.x10^{-3}	Chlorophyll 'a' gm/lit. x 10^{-3}	Chlorophyll 'b' gm/lit. x 10^{-3}
1	Control	*Tarota*	5.125	3.714	**1.754**
2	Ligand		6.725	5.921	**2.028**
3	Complex		6.873	4.659	**2.316**
4	**Metal**		**7.413**	**6.354**	**2.292**

Table 1.3 - Estimate of Total Nitrogen and Proteins in Leaf Powder of***Cassia tora***

Sr. No	Plant	Treatment	% Element			% Protein
			Nitrogen	Carbon	Hydrogen	
1		Control	7.35	38.18	6.85	**38.657**

2	*Tarota*	Ligand	7.87	37.23	6.78	**39.213**
3		Complex	8.11	35.54	6.67	**39.443**
4		**Metal**	**8.32**	**33.76**	**6.39**	**39.574**

Results And Discussion:

Germination starts when the seed shows emergence phase of growth, which begins, with penetration of embryo from the seed coat and end with the development of root and shoot system. Elongation of shoot axis follows emergence of radical.

The rate and extent of elongation is subjected to the variety of controls, including nutrition, hormones and environmental factors. Though the root and shoot development start within a fraction of time but the further developments may vary according to the nutrients required for the development of root length and length shoot independently. Therefore, root length and shoot length differs. The observation table 1.1 clearly indicates that average root length in *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine*, complex, Mg (II), at all pH increases over control.

Chlorophyll control / chlorophyll pigment were found affected in *Tarota*plant by the treatments. Total chlorophyll was found to be higher in *Tarota*.

Percentage of nitrogen and proteins were found affected in leaves of *Tarota* by the treatment of *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine*, complex, Mg (II). It is observed that percentage of nitrogen and protein are higher than that of control.

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Extraction of Natural Dyes From *Nerium Oleander* L.Flowers For Cotton And Silk Colouration

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Abstract:
Alarming environmental issues posed by largescale use of synthetic dyes in textile industries made researchers to focus on the development of safer alternatives i.e. natural dyes. In present investigation, aqueous, ethanoland alcohol extracts of flowers of Nerium oleanderused for dyeing cotton and silk.Protocol adopted were – without mordanting and with two different chemical mordant i.e. Ferrous ammonium sulphate and Copper sulphate. Aqueous extract shows lighter color shade than the ethanolic and alcoholic extracts. All extracts with mordant ferrous ammonium sulphate shows darker color than Copper sulphate. In dyeing without mordant procedure, dark and lightest colors obtained were Grey beige and Thunder respectively. It was found that mordant ferrrous ammonium sulphate exhibit darker coloration on cotton than the Copper sulphate. Dark olive and uniform were the darkest shades obtained by dyeing with mordant ferrous ammonium sulphate. While silk exhibitthree lighter coloration i.e. Surfmist, Squirrel grey and Light pewter by dyeing with mordant Copper sulphate.
Keywords: *Natural dyes, Nerium oleander, Ferrous ammonium sulphate, Copper sulphate, mordants.*

Introduction:

Nature is full of wonderful colours, which enriched our life. These colors are utilize for dyeing purposes. Colour variability and promising shades can be obtained by using synthetic dyes, they posed devastating effects in the form of pollution, health hazards, toxicity and high saturation rate in environment. As hazards of synthetic dyes are no longer unknown, evaluation of natural resources available for their possible dye yielding potential is gaining more attention in recent years.

The word "Natural dyes" comprises all those colorants that can be obtained from plant, animal or mineral resources without any chemical processing. As the food, pharmaceutical, cosmetic as well as the textile coloration industry increased demand for these dyes during the last decade, use of natural dyes has gained more importance. Certain natural dyes are known to have mutagenic effects e.g., safflower yellow and elderberry color; while some like carmine, can cause serious respiratory consequences like asthma. But yet most of them are safe, mostly eco-friendly, biodegradable,less toxic, and less allergenic as compared to synthetic dyes. In the beginning, there were dyes derived only from natural sources which were used in the coloration of textiles, food, drugs, cosmetics and also for coloration of paper leather, shoe polish, wood, cane, candles in smaller quantities (Han and Yang, 2005; Hill, 1997; Ali *et al.,* 2006; Gulrajani, 2001).

Even though natural dyes have so many advantages over synthetic dyes, non-availability in their color shades and non-efficient applicationprocedure limiting their use as a most promising dye resources. *Nerium oleander* (Syn. *Neriumindicum*) is a large, spreading, evergreen shrub with whorled branches and leaves. Flowers are red, pink or rosy colored born in terminal cymes (Dhore,2002). Present investigation is an attempt to evaluate dye yielding potential of flowers of *Nerium oleander* (red variant) for cotton and silk coloration.

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Materials and Methods:

Flowers of *Nerium oleander* L. were collected from local area of Pawan Nagar, Amravati and were identifiedby using standard flora(Dhore, 2002). Fresh flower petals of *Nerium oleander* (Red variant) were used for dye extraction and dyeing process (Figure 1).Two different fabric materials -Tasar silk and cotton fabric were bought from Amravatimarket.2% Ferrous Ammonium sulphate and 5% Copper sulphate were used as chemical mordents.Three different solvents - water, ethanol and alcohol were used for dye extraction.50 gm of fresh flowers petals of *Nerium oleander* were crushed in mortar and pestle with 100 ml. of solvent. The solution was filtered through muslin cloth to obtain dye.

For dyeing without mordanting procedure,cotton and silk fabrics were immersed directly in a dye bath solution containing dye. After dyeing, the dyed material was dried at room temperature.For dyeing with mordanting procedure,Cotton and silk were first immersed in beaker containing either 2% Ferrous Ammonium Sulpahte or 5% Copper Sulphate for 3 hours and then they were further immersed in a dye bath solution containing dye. After dyeing, the dyed material was dried at room temperature.For washing and shade analysis, dyed fabrics were washed with tap water and finally dried in air at room temperature. Pantone shade color charts system was used for matching the naturalcolorants shade.

Results and Discussions

Different shades of colors obtained from Aqueous, alcoholic and ethanolic extract of *Nerium oleander* with and without use of chemical mordantshas been tabulated in Table I and Table II (Figure 2) with their Panton shade number.

About six different color shades obtained by direct treatment of cotton and silk fabrics in dye solution. Among those darkest shade exhibited by alcoholic extract on cotton (Grey beige, Panton paint shade no. 5773) while most lighter color exhibited by alcoholic extract on silk(Thunder, Panton paint shade no. 5645). All other extracts exhibited different intermediate colors on cotton and silk fibers.

Table I: Effect of aqueous, alcoholic and ethanolic extract of *Nerium oleander*on cotton and silk without mordant.

Sr. No.	Materials	Extract	Color shade (Panton paints color chart)	Color
1	Cotton	Aqueous	5845	Dark beige
2	Silk	Aqueous	5527	Edge comb grey
3	Cotton	Alcoholic	5773	Grey beige
4	Silk	Alcoholic	5645	Thunder
5	Cotton	Ethanolic	451	Himalaya
6	Silk	Ethanolic	452	Paper bark

About twelve different color shades were obtained from aqueous, alcoholic and ethanolic extracts of *Nerium oleander* with mordantsFerrous ammonium sulphate (FAS)and Copper sulphate were tabulated in Table II (Figure 3).

Ethanolic and alcoholic extract with mordant Ferrous ammonium sulphate found to exhibit Dark olive (Panton paint shade no.418) and Uniform (Panton paint shade no. 5615) respectively on cotton which are the darkest shades while most lighter shades exhibited by silk fiber dyed by ethanolic extract with Copper sulphate (Surfmist, Panton paint shade no. 4535), alcoholic extract with Copper sulphate (Squirrel grey, Panton paint shade no. 442) and aqueous extract with Copper sulphate (Light pewter, Panton paint shade no. 5517).

Table II: Effect of aqueous, alcoholic and ethanolic extract of *Nerium oleander* on cotton and silk with mordant.

Sr. No.	Materials	Mordant	Extract	Color shade (Panton Paints color chart)	Color
1	Cotton	FAS	Aqueous	448	Best bronze
2	Silk	FAS	Aqueous	416	Gulf
3	Cotton	Copper sulphate	Aqueous	5797	Dark ivory
4	Silk	Copper sulphate	Aqueous	5517	Light pewter
5	Cotton	FAS	Alcoholic	5615	Uniform
6	Silk	FAS	Alcoholic	443	Shale grey
7	Cotton	Copper sulphate	Alcoholic	5783	Moss
8	Silk	Copper sulphate	Alcoholic	442	Squirrel grey
9	Cotton	FAS	Ethanolic	418	Dark olive
10	Silk	FAS	Ethanolic	429	Harbor grey
11	Cotton	Copper sulphate	Ethanolic	15-1218	Flaxen
12	Silk	Copper sulphate	Ethanolic	4535	Surfmist

Bhuyan and Saikia (2005) evaluated dye yielding potential of different parts of five plant species *Rubiacordifolia, Morindaangustifolia, Tectonagrandis, Mimusopselengi* and *Terminalia arjuna*and concluded that dyes obtained from native plants might be alternative sources to synthetic dyes for dyeing of natural silk and cotton. Parthsarthi and Lokesh (2015) tested efficiency of dye extracted fromdried and semidried sample (without calyx) of*Spathodeacampanulata* and found that cotton fabricdyed with water extract was found to have bestresults and can be used for textile application.

The color variability from camel brown to dark chocolate brown was obtain by Vankar*et al.* (2009) when cotton, silk and wool yarn fabrics were dyed with *Garcinia mangostana*pericarp after premordantaing with metal salts of Al, Sn, Fe, Cr and Cu. Again Vankar*et al.* (2009) proposed that huge amounts of

Tagetuserecta(marigold) flowers offered in Indian temples generate very large waste. They suggested use of this floral waste as a source of natural dye for cotton, silk and wool coloration on industrial scale.

Figure 1 : Plant Material

Nerium oleander

Figure 2 : Notable color variation obtained by using dye extracted from *Nerium oleander*

P. S. No. – Panton Paint Shade Number

Singh *et al.* (2004) even reported antimicrobial properties of natural dyes obtained from five plants *Acacia catechu, Kerrialacca, Quercusinfectoria, Rubiacordifolia*and *Rumexmaritimus*against common pathogens *Escherichia coli, Bacillus subtilis, Klebsiellapneumoniae, Proteusvulgaris* and *Pseudomonas aeruginosa.*They found that*Quercusinfectoria*dye was most effective and showed maximum zone of inhibition.

Many workers worked on applications of plant based dyes for fabric and textile coloration. Ali *et al.* (2006) Eucalyptus bark, Sachan and Kapoor (2007) from turmeric rhizome (*Curcuma longa*), Nilani*et al.* (2008) from marigold (*Tageteserecta*), Kulkarni *et al.* (2011) from Pomegranate (*Punicagranatum*) Peel,Kamel*et al.*(2009) from *Crocus sativus*, Mongkholrattanasit*et al.*(2010) from Eucalyptus leaves, Shingane in *Bombaxceiba* (2015).

Conclusions

In aqueous extract of *Neriumoleander* there is lighter color shade than the ethanolic and alcoholic extracts on cotton and silk fiber. On cotton dark color obtained than silk fiber. Six color shades obtained when cotton and silk fabrics in dye solution out of which Grey beige was the darkest one while Thunderwas the lighter shade. There are twelve different color shades obtained in dyeing with mordant treatment. All extracts with mordantFerrous ammonium sulphate showed darker color than Copper sulphate. Dark olive and affix uniform to fabrics the dark shades obtained by dyeing with mordant Ferrous ammonium sulphate. While silk exhibit three lighter colorations i.e. Surfmist, Squirrel grey and Light pewter by dyeing with mordant Copper sulphate.

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Inventory of Scorpion Fauna from Akot Tehsil of Akola District, Maharashtra, India

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Abstract:

The present paper deals with the inventory of the scorpion fauna of Akot tehsil of Akola district, Maharashtra, India. Two species of scorpions were recorded from different microhabitats. Present information provides a baseline biological data for further demographic and ecological studies and stresses the need for impact assessment prior to undertaking developmental projects in region, since Arachnids exhibit restricted movements and are vulnerable to habitat modification.

Key words:*Akola, Akot, India, Inventory, Maharashtra, Scorpion.*

Introduction

Scorpions are predatory arachnids of the order Scorpiones. They have eight legs, and are easily recognized by a pair of grasping pincers and a narrow, segmented tail, often carried in a characteristic forward curve over the back and always ending with a stinger. The evolutionary history of scorpions goes back 435 million years. They mainly live in deserts but have adapted to a wide range of environmental conditions, and can be found on all continents except Antarctica. There are over 2,500 described species, with 22 extant (living) families recognized to date. Their taxonomy is being revised to account for 21st-century genomic studies (Ahmadi*et al.,* 2020; Anderson *et al.,* 2021).

Scorpions primarily prey on insects and other invertebrates, but some species hunt vertebrates. They use their pincers to restrain and kill prey, or to prevent their own predation. The venomous sting is used for offense and defense. During courtship, the male and female grasp each other's pincers and dance while he tries to move her onto his sperm packet. All known species give live birth and the female cares for the young as their exoskeletons harden, transporting them on her back. The exoskeleton contains fluorescent chemicals and glows under ultraviolet light (Feola. *et al.,* 2020).

The vast majority of species do not seriously threaten humans, and healthy adults usually do not need medical treatment after a sting. About 25 species have venom capable of killing a human, which happens frequently in the parts of the world where they live, primarily where access to medical treatment is unlikely.Scorpions appear in art, folklore, mythology, and commercial brands. Scorpion motifs are woven into kilim carpets for protection from their sting. Scorpius is the name of a constellation; the corresponding astrological sign is Scorpio. A classical myth about Scorpius tells how the giant scorpion and its enemy Orion became constellations on opposite sides of the sky (Howard. *et al.,* 2019).

In this concern, a present study is an approach to understand the diversity of Scorpion Fauna from Akot Tehsil of Akola District, Maharashtra, India

Materials and Methods

The Akot tehsil of Akola district is one of the most diversified regions in Maharashtra State of India, with respect to biodiversity. Its healthy climate, mountainous terrain, rugged configuration, and sudden fall in elevation are phenomenal. Akot is a city in the Vidarbha Region and a municipal council in Akola district in the Indian state of Maharashtra. It is located between 21.1°N 77.06°E. The climatic condition of this district is characterized by a hot summer, well-distributed rainfall during the south-west monsoon season, and generally dry weather during the rest of the year (Akola Gazetteer,2022). The survey was conducted to prepare an inventory of Scorpion Fauna from Akot Tehsil of Akola District, Maharashtra, India. The observed scorpion species were identified on the spot using published keys (Tikader and Bastawade 1983);

Results and Discussion

The study was conducted during 2021 in Akot tehsil of Akola district, Maharashtra, India. Study reveals the presence of two scorpion species. *Heterometrusphipsoni* (Pocock, 1893), the forest scorpions, is a species of scorpions belonging to the family Scorpionidae. *Hottentottapachyurus* (Fabricius, 1798), the Indian scorpion is a species of scorpion of the family Buthidae.Heterometrusphipsoni (Pocock, 1893) are lapidicolous scorpions found under stones. Hottentottapachyurus (Pocock, 1897) are non-burrowing species and mostly found only under tree bark.

Warburg (1997) studied biogeographic and demographic changes in the distribution and abundance of scorpions inhabiting the Mediterranean region in northern Israel. Warburg (2000) studied intra- and inter-specific cohabitation of scorpions in the field and the effect of density, food, and shelter on their interactions. Raz*et al.* (2009) have studied biodiversity, species abundance, inter-slope divergence and other aspects of scorpion fauna of Mt. Carmel, Israel. Pande*et al.*, (2012) studied the diversity of scorpion fauna of Saswad-Jejuri, Pune District, Maharashtra, India. Thus, scorpion diversity, distribution, abundance as well as other related aspects of scorpion ecology are well studied elsewhere. As the study area is earmarked for development projects such as plantation, beautification, dam construction, urbanization and industrialization that will lead to habitat loss through land use modification.

Detailed studies on scorpion fauna of India including various ecological aspects such as population estimates, diversity, distribution, abundance, biogeographic and demographic changes, microhabitat preferences, etc. are necessary to understand the potential threats to the scorpion fauna and to direct conservation efforts.

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The Effect of Feed Cycling And Ration Level on Compensatory Growth Response in Fresh Water Fish Ctarias Batrchus

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Abstrat:
To investigate the nature of compensatory growth in fish, a 6 week study was performed on fresh water fish claras batsaushus Fishes were starved for 0 (control-lA), 1 (IB), 2 (1C) and 3 (ID, IE & IF) weeks and then re-fed to satiation for 1,2 and 3 weeks. Weekly changes in weight gain, percentage weight gain and specific growth rate were monitored during re-feeding. Although «1 and I/ feeding cycle group (IB) with 5% ration level performed better than '3 and 3* and '2 and 2' feeding cycle groups since all the parameters viz. mean weight gain, percentage weight gain, SGR and FCR values showed an improving trend after re-feeding in this group but it is much less than control group. Final results suggested that growth parameters were significantly different (P<0.05) in case of control group as compared to experimental groups suggesting that starvation followed by subsequent re-feeding did not play a role in more growth of Cyprinus carpio.*
Keywords: *Compensatory growth, Starvation, Specific growth rate Food conversion ratio. Feed cycle.*

Introduction

catch-up growth refers to the unusually fast growth that follows a period of reduced growth resulting from restricted food availability. Compensatory growth is a phase of unusually rapid growth following a period of undcr-nutrition. Compensatory growth is usually accompanied by hyperphagia (an increase in appetite) and sometimes improved growth efficiency. This phenomenon has been reported in a range offish species covering different taxa (Dobson & Holmes, 1984; Russell & Wootton, 1992; Jobling *et al.*, 1994; Kirn & Lovell, 1995; Hayward *et al.*, 1997; Sacther & Jobling.1999; Qian *et at.* ,2000; Wang *et al.* ,2000 and AH *et al.* ,2003).

Present study was designed to investigate the effect of feed cycling/starvation on *C.carpio.* Particular emphasis was laid to understand whether compensatory growth is present or not since it is a way to ameliorate fish growth performance, as in some of the species, compensatory growth is so intense that fish exhibit a higher growth rate than those continuously fed. Moreover, this information can also be utilized in designing the feeding schedules of particular fish in culture operations.

Material And Methods

Fishes were divided into 6 groups having 6 fishes in each group. Feed cycling period and ration level were changed in all the treatments.

Group 1A - (Control group) Fed @ 5% body weight during the whole experimental period.

Group IB - Starved for one week and then re-fed for next week. This feed cycling (alternate starvation periods and feeding periods) continued throughout the period of experiment i.e. 6 weeks. Again the feed was given @ 5% of the body weight.

Group 1C - Initially starved for 2 weeks and then re-fed for next 2 weeks. The feed was provided @ 5% of the body weight.

Group ID- Fasted for first 3 weeks and then re-fed for next 3 weeks. The feed was provided® 3% of the body weight.

Group IE - Fasted for first 3 weeks and then re-fed for next 3 weeks. The feed was provided @ 5% of the body weight.

Croup IF - fasted for first 3 weeks and then re-fed for next 3 weeks. The feed was provided @7% of the body weigh! per day ration level, adjusted weekly.

In all the treatments, diet was given once a day. Groups were .sampled weekly. Three fishes were netted from each group and measured and then were returned to their appropriate groups. The experiment was conducted in duplicate and it continued for six weeks. The left over feed and excreta were removed once a week. The left over feed was collected in already weighed beakers and oven-dried at 105°C aad weighed. The data was statistically analysed to calculate ANOVA with the help of MS, Excel 2003 and SPSS (12.0 version Inc. Chicago, USA) and mean compared by using Duncan's Multiple Range Test (Duncan, 1955).

Results And Discussion

1. Weight gain : Analysis of Table. 1 reveals that at the end of sixth week:
1. The weight gain was observed to be best in group-IA with weight gain of about 0.33±0.02 gm which was signi ficantly different (P<0.05) from all other groups;

2. The weight gain was found to be less in group ID having -0.04±0.01 grn weight gain which was not found to be significantly different (p<0.05) from the value recorded for group 1C, having weight gain of-0.08±0.01 gm.
3.The value of the weight gain showed a decreasing trend from groups IA to ID and again a little increase in group IF, and IF.

Table. 1 Observed values for weight grain, % weight grain, specific growth rate ; and food conversion ratio for groups IA-IF.

Parameters	Weight gain		Percentage weight gain		Specific growth rate	
Weeks/Groups	Week 3	Week 6	Week 3	Week 6	Week 3	Week 6
IA	0.12i0.05"	0.33i0.02"	11.53±0.02'	31.73iO.03"	0.52^.01"	0.64iO.()l"
IB	0.10±0.02[a]	0.26±0.03[b]	10.OOiO.05"	26.00i2.00"	0.42i0.01[b]	0.54*0.01"
1C	-0.05iO.01"	-0.08±0.01[d]	-4.76i0.01[c]	-2.85i0.01[c]	-0.19iO.01"	-0.16iO.01"
ID	-0.24iO.01"	-0.04±0.01[d]	-35.41±0.01[r]	-4.16i0.04°	-1.14±0.01[f]	-0.38i0.01[c]
IB	-0.I8iO.OP	0.05i0.01[c]	-17.82±0.02[C]	4.95i0.05<	-0.81i0.01[c]	-0.07i0.01[d]
IF	-0,!6±0,01[C]	0.05±0.01'	-10.73i0.03[c]	3.35i0.05[d]	-0.52±0.0!°	-0.0710.01"

2. Percentage weight gain (% WG): Analysis of Table. 1 reveals that at the end of sixth week
   1. The percentage weight gain was observed to be best in group IA with percentage weight of about 3! .73 ; 0 03% which was significantly different (P<0.05) from all other groups;
   2. The percentage weight gain was found to be less in group ID having -4.16±0.04% which was not found to be significantly different (P<0.05) from the values recorded for group 1C, having % weight gain of-2.85±0.01 %.
   3. The values of the % weight gain showed a decreasing trend from groups IA to ID and again a little increase in group IF and IF.
3. Specific Growth Rate (SGR): Analysis of Table. 1 reveals that at the end of sixth week:
   1. The specific growth rate was observed to be best in sub-group IA with SGR of about 0.64±0.01% which was significantly different (P<0.05) from all other groups;
   2. The SGR was found to be less in group ID having -0.38i0.01% which was not found to be significantly different (PO.05) from the values recorded for group 1C, having SGR of QO. 16±0.01%.
   3. The value of the SGR showed a decreasing trend from group IA to ID and again a little increase in the group IE and IF.

The results suggested that the growth parameters were found to be significantly different (P<0.05) in case of group IA and was best among all treatments suggesting that starvation followed by subsequent re-feeding did not play a role in the more growth of the fishes. Our observations are in accordance with Schwarz et al. (1985) who have also observed that the controlled groups with constant and regular ration level showed better growth than other groups. The experiment performed showed that compensatory growth does not occur Almost every group undergoing starvation showed the largest weight loss during the first week of starvation as found by Dobson and Holmes (1984) due to gut emptying (Elliott,1972). The rate of weight loss declined in subsequent weeks upon re-feeding there was a moderate increase in the weight due to gut refilling in all the groups, same has been recorded by Quinton and Blake (1990) while studying the effect of feed cycling and ration level on compensatory growth response in rainbow trout, Oncorhynchus mykiss.

A perusal of the Table. 1 reveals that as the experiment progressed, a decline in specific growth rate (SGR) was observed in groups (IB-IF) as compared to control group IA with starvation producing a negative specific growth rate in all the groups. The present observation thus indicates that the length of starvation had a marked effect on SGR. Similar results have been put forth by Furhan et al. (2006) in Cirrhinus mrigala and Muhammcd et al. (2006) in Labeo rohita. Further, The results indicate that common carp was unable to maintain its SGR during re-feeding periods like that of control (lA).Contrary to this however, Van Dijk et al (2005) observed that juvenile roach, Rutilus rutilus was able to fully compensate SGR when transferred to rc-fccding after 21 days of starvation. Similar results have been recorded by AH (1999) for three-spined sticklebacks, Gastrosteus aculeatus.

Data reveals that occurrence of compensatory growth is species specific and depends upon the duration of fasting period in warm water fish species (Xie et al. ,2001). A comparative analysis of all the treatments reveals that' 1 and 1' feeding cycle group with 5% ration level (IB) performed better than rest of the experimental groups and weight gain, % weight gain, SGR and FCR values also showed an improving trend after re-feeding in restricted fish (Table. 1). Such an improving trend cannot be designated as compensatory

gain rather it appears more to be a case of the stunted/restricted fish performing at the level expected for smaller/restricted fish. Thus, it can be safely concluded that compensatory growth does not exist in Cyprinus carpio as data of our present study is also quite convincing for this conclusion.

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Some Wood-Rotting Fungi from Khultabad Tehsil, District Aurangabad (M.S.) India.

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Abstract

Wood rotting fungi are the parasite as well as saprophytic which grow on the living trees, dead trees, wood logs and decay the external and internal structural components which are cellulose, hemicellulose, and lignin. In the present investigation, thirty-seven specimens of macro-fungi were collected from different areas of Khultabad Tehsil, District Aurangabad (M.S.) India, from that twelve specimens were studied. Based on morphological and microscopic characteristics which belong to nine genera and twelve species. It was observed that Auricularia nigricans, Flavodon flavus, Phellinus badius, Pseudofavolus tenuis, Scytinostroma duriusculum, Trametes cingulata, and Truncospora tephropora were most abundantly found while Ganoderma mediosinense, Phellinus allardii, Phellinus gilvus, Pleurotus djamor, and Trametes ellipsospora are rarely observed macro-fungi.

Keywords: *Khultabad, Macro-fungi, Microscopic, Morphological, Saprophytic.*

Introduction

Wood rotting fungi have the ability to decompose wood causing rot, fruiting bodies of macro-fungi grow on living trees, dead trees, and wood logs which comprise 10% of total fungal diversity from which 16–41% have been described to date (Rossman 1994, Mueller et al, 2007). Wood decaying fungi are classified into three groups i.e. brown rot, white rot, and soft rot, wood decay by brown rot fungi is brown and crumbly which degrade via the enzymatic and non-enzymatic system. Cellulase enzymes are secreted by brown rot fungi for degradation, but no lignin-degrading enzyme is involved. White rot fungi associated with hardwood decay show different decaying patterns by secretion of cellulase and lignin-degrading enzyme. According to (Jasalavinch et al. 2000) white rot fungi can utilize all major components of the cell wall including carbohydrates and lignin. Soft rot fungi secrete cellulase enzyme from hyphae which break down cellulose and lower lignin content in wood and create the cavity in the wood cell wall. The injuries to branches, roots and the main trunk of trees allow wood-decaying agents to gain entry through wounds and make the serious loss of wood's mechanical strength. Wood decaying fungi are an important component of the forest ecosystem (Wang et al, 2011).

Studies on Indian wood-rotting fungi were initiated with Europeans' launch of studies in Indian fungi. The first Indian record of its kind could be traced back to the work of (Klotzsch 1832) in his paper on Indian Polyporaceae. (Ranadive et al., 2013) studied eight families, fourteen genera, and twenty species of Aphyllophorales from Pune district. (Chouse and Mali 2020) on the diversity of Aphyllophorales from Latur district, Maharashtra reported thirty-four genera and forty-seven species of wood-rotting fungi. (Gore and Mali 2021) reported seventeen genera and eighteen species of wood-decaying fungi from Paithan Tehsil, Aurangabad district (M.S.) India.

Materials And Methods

In the present investigation, the thirty-seven specimens of wood-rotting macro-fungi were collected 20 to 25 days after heavy rainfall during the year 2014 – 2019 after several intervals from various regions of Khultabad Tehsil, District Aurangabad (M.S.) India. The specimen of Basidiome were collected in brown paper bags, noting the hostname, locality, date of collection, color of the specimen, and type of attachment suggested by Gilbertson and Ryvarden (1986). The morphological and microscopic character was recorded, fresh material from the field and dried material in the laboratory. Macroscopic observations were carried out by using Cosmo Compound Light Microscope under a 10X objective. The freehand thin section cutting of fruiting bodies was done by chopping method with the help of sharp razor blades, stained and studied in 10% KOH, Lactophenol, Cotton Blue, and Melzer's reagent and microscopic observations were made under 40X and 100X Magnification (Olympus CX 41) in the laboratory.

Result And Discussion

Details of the wood rotting fungi collected during present investigation has been described with photo plate 1 as fallows.

***Auricularia nigricans* (Sw.) Birkebak, Looney& Sancher–Garcia.**

Basidiome 5–31 × 4–26 mm, annual, pileate, lossely attached with small tapered stalk, moist dependent, jelly like when fresh and brittle on drying. Upper surface velvety hairy. Margin acute, decurved. Lower fertile surface smooth. Context jelly like when fresh, waxy hard when dry. Basidia cylindrical, hyaline, 3-septate, 39 –

58 × 3.5 –5 µm with 1–3 lateral sterigmata, sterigmata 9–14 × 1.5–11 µm. Spores 13–15 × 4–5µm, cylindrical to allantois, slightly kidney shaped, thin walled, smooth. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′39″N 75˚14′10″E; alt 677m; on the wood logs of *Mangifera indica* L.; 08/09/2016; Vijay Gore (VUG/VPM–360).

***Flavodon flavus* (Klotzsch) Ryvarden**

Basidiome 5–73 × 4–59 mm annual, resupinate to pileate, widely effused reflex. Upper sterile surface concentric zonation, tomentose. Lower fertile surface poroid, lamellate, iripicoid to hynoid, pores 1–2 per mm. Tube up to 3 mm deep. Context up to 2 mm thick. Hyphal system dimitic. Generative hyphae hyaline, thin to slightly thick-walled, septate, branched, 1.4–3 µm wide. Skeletal hyphae thick-walled, branched, 2–6 µm wide. Cystidia occur as skeletal hyphal projection, thick-walled, encrusted at the tip, 11–32 × 6–11µm. Basidia 23 – 28 × 6 – 8 µm, clavate, hyaline, thin-walled, with 4-sterigmata. Spores 5.3–7 × 3–4.5 µm, ellipsoid, smooth, thin–walled, hyaline.

Specimens examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Gadhana; 20˚02′23″N 75˚15′33″E; alt 702m; on the living tree but on dried main trunk *Senna siamea* (Lam.) H.S.Irwin & Barneby; 22/09/2016; Vijay Gore (VUG/VPM–397).

***Ganoderma mediosinense* J.D. Zhao**

Basidiome 87–132 × 52–108 × 3–29 mm annual, pileate, laterally to centrally stipitate, leathery when fresh, corky to woody on drying. Upper sterile surface mostly sulcate, weakly zonate, glabrous. Margin distinct, acute to obtuse. Lower fertile surface poroid round, regular, pores 3–4 per mm. Context up to 19 mm wide, homogenous. Tubes up to 10 mm deep. Stipe 59–79 × 14–26 mm, cylindrical to inflated near pileus, homogenous. Hyphal system trimitic, generative hyphae 1.4–3 µm wide, clamped, septate, thin-walled, hyaline. Skeletal hyphae 2–5 µm wide, thick-walled. Binding hyphae 1.4–3 µm wide, thin, hyaline. Basidia clavate, 4-sterigmate, clamped at base. Spores 8–10 × 5–6 µm, ovoid to ellipsoid, exospore smooth and hyaline, endospore distinctly echinulate. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′19″N 75˚13′48″E; alt 718m; on the wood logs of *Senna siamea* (Lam.) H.S.Irwin & Barneby; 08/09/2016; Vijay Gore (VUG/VPM–358).

***Phellinus allardii* (Bres.) S. Ahmad**

Basidiome 72 × 106 × 2–18 mm, perennial, resupinate to pileate. heavy when fresh, corky hard on drying, broadly attached and elongated, frequently sub-resupinate. Upper sterile surface narrowly sulcate. Margin fertile, sharp, undulating, velvety. Lower fertile surface poroid, round, pores 5–8 per mm. Context very thin, sometimes almost absent. Tubes up to 3 mm deep. Hyphal system dimitic, generative hyphae 2–3 µm wide, simple septate, smooth, hyaline. Skeletal hyphae 3–3.5 µm wide, thick-walled, smooth, hyaline. Basidia 11–15 × 5–6 µm, clavate, 4-sterigmate, septate at base. Spores 4.5–6 × 3–4 µm, broadly ellipsoid to subglobose, thick-walled, smooth. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′20″N 75˚13′48″E; alt 719m; on the living tree but on dried main trunk *Senna siamea* (Lam.) H.S.Irwin & Barneby; 07/11/2019; Vijay Gore (VUG/VPM–771).

***Phellinus badius* (Cooke) G. Cunn.**

Basidiome 34–109 × 22–71 × 2–28 mm, perennial, sessile, semicircular, easily detachable from the host. Upper sterile surface velvety. Margin obtuse, sterile. Lower surface poroid, pores 4– 7 per mm, thick-walled. Context up to 22 mm thick, corky when fresh, hard on drying. Tube up to 4 mm deep. Hyphal system dimitic, generative hyphae hyaline, septate, branched, 3.5–4 µm wide. Skeletal hyphae thick-walled, 3.5–5 µm wide. hymenial setae absent. Basidia broadly clavate 10.5–14 × 5.5–7 µm, 4–sterigmate. Spores 6–7.5 × 5–6.5 µm, ellipsoid to sub-globose. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′19″N 75˚13′47″E; alt 722m; on the living tree on main trunk *Senna siamea* (Lam.) H.S.Irwin & Barneby; 07/11/2019; Vijay Gore (VUG/VPM–769).

***Phellinus gilvus* (Schwein.) Pat.**

Basidiome 22–54 × 18–37 × 4–11 mm, annual to perennial, imbricate, sessile to effuse reflexed, corky to brittle on drying. Upper sterile surface weakly zonate, finely velutinate, glabrous, strigose to radiate-striate. Margin acute, lobed. Lower surface poroid, round and regular, smooth, shiny, pores 6–9 per mm. Context homogenous, up to 7 mm thick. Tube up to 4 mm deep. Hyphal system dimitic, generative hyphae septate, branched, 2.4–4 µ m wide. Skeletal hyphae thick-walled 3.5–5 µm. Hymenial setae thick-walled, 25–35 × 6–10 µm. Basidia 5.8–11 × 4.4–6 µm, clavate, hyaline with 4-sterigmata. Spores sub-globose to ellipsoid, 4.5–6 × 2.4–3.5 µm, thin-walled, smooth. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Varegoan; 20˚05′01″N 75˚21′40″E; alt 655m; on the dried standing stump at main trunk *Azadirachta indica* A.Juss.; 21/08/2016; Vijay Gore (VUG/VPM–272).

***Pleurotus djamor* (Rumph. ex Fr.) Boedijn**

Basidiome 15– 39 × 12–31 mm, annual, spathulate to flabelliform, convex or depressed towards the base. Upper sterile surface finely tomentose towards the base, finely striate. Margin at first involute, often incised. Lamellae are deeply decurrent, sometimes with yellowish cream or pale red tints, narrow, moderately crowded. Stipe absent or reduced and then lateral or eccentric, 1–5 × 3–4 mm, cylindrical, solid. Context thin, 1–4 mm thick, soft, fleshy. Hyphal system dimitic generative hyphae 3–8 µm, with prominent clamp-connections, skeletal hyphae, 2.5–8 µm. Basidia 23–30 × 3–6 µm, narrowly clavate bearing 4-sterigmata. Cheilocystidia 22.5–30 × 6–7 µm, inflated clavate. Spores 7.5–9×4–5 µm, cylindric, hyaline, thin-walled, Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′20″N 75˚14′48″E; alt 679m; on the wood logs of *Mangifera indica* L.; 08/09/2016; Vijay Gore (VUG/VPM–753).

***Pseudofavolus tenuis* (Fr.) G. Cunn.**

Basidiome 25–53 × 19–38 mm, annual to perennial, dimidiate, flabelliform to semicircular, effused-reflexed to pileate, leathery when fresh, corky to tough on drying. Upper sterile surface smooth concentrically zonate, sulcate, glabrous, radially wrinkled. Lower fertile surface poroid 1–2 per mm wide, angular to hexagonal. Context up to 1 mm wide, homogenous; Tubes 1–2 mm long, homogenous. Hyphal system trimitic, generative hyphae hyaline, thin-walled, clamp, branched, 1.5–3 µm wide. Skeletal hyphae thick-walled, 3.5–6 µm wide. Binding hyphae hyaline, thick-walled, 3–5.5 µm wide. Spores 14–17.5 × 4–6 µm, cylindrical, hyaline, thick-walled. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Gadhana; 20˚02′23″N 75˚15′32″E; alt 702m; on the fallen dried twing of *Senna siamea* (Lam.) H.S.Irwin & Barneby; 22/09/2016; Vijay Gore (VUG/VPM–394).

***Scytinostroma duriusculum* (Berk. & Broome) Donk.**

Basidiome 19–104 × 17–72 mm, annual, membranous, resupinate to widely effused papery thin, and brittle on drying. Fertile surface smooth, when touched gives velvety sensation. Context finely layered, smooth, dense, subhyaline in section, faintly stratose, homogeneous. Hyphal system dimitic, generative hyphae thin-walled, clamp absent, branched, nondextrinoid, 1.5–2.4 µm wide. Skeletal hyphae branched, branches mostly lateral, 1.2–2 µm wide. Spores 5.5–7.5 × 4–7.5 µm in diameter, globose, amyloid, smooth. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Gadhana; 20˚02′20″N 75˚15′32″E; alt 711m; on the living tree at main trunk *Senna siamea* (Lam.) H.S.Irwin & Barneby; 22/09/2016; Vijay Gore (VUG/VPM–390).

***Trametes cingulata* Berk.**

Basidiome 20–39 × 12–16 × 3–6 mm, annual, dimidiate, semicircular, hard, corky, sessile. Upper sterile surface glabrous, weakly zonate, concentrically ridged to radially wrinkle. Margin thin, acute to obtuse, wavy. Lower fertile surface poroid, round to regular, 5–7 per mm. Context homogenous, up to 4 mm thick. Tubes up to 2 mm deep. Hyphal system trimitic, generative hyphae hyaline, thin-walled, septate with clamp, 2–3.5 µm wide, skeletal hyphae hyaline, thick-walled, unbranched, narrow lumen, 3–5.5 µm wide. Binding hyphae 1.5–3 µm wide, thick-walled, smooth, hyaline. Basdia clavate, thin-walled, 4- sterigmate, 16–22 × 4–6 µm. Basidiole clavate, thin-walled, 19–26 × 9–12 µm. Spores 3.5–5.5 × 3–3.5 ellipsoid, thin-walled, smooth, hyaline. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Khultabad; 20˚00′51″N 75˚12′08″E; alt 706m; on wood log *Acacia nilotica* (L.) Delile; 10/08/2014; Vijay Gore (VUG/VPM–12).

***Trametes ellipsospora* Ryvarden**

Basidiome 16–34 × 10–19 × 2–4 mm, annual, resupinate to effused reflex to pileate, sessile with a broad base, leathery when fresh, brittle on drying.. Upper sterile surface covered with stiff persistent strigose hairs, shiny, sulcate, weakly zonate. Margin thin, acute, wavy. Lower fertile surface poroid 4–6 per mm pores, pores surface flat or decurrent, angular, irregular, toothed. Context duplex, up to 2 mm thick. Tubes up to 2 mm deep. Hyphal system dimitic, generative hyphae hyaline, thin-walled, septate with clamp, 1.5–3 µm wide, skeletal hyphae hyaline, thick-walled, unbranched, narrow lumen, 2–5 µm wide. Binding hyphae 2–3.5 µm wide, thick-walled, smooth, hyaline. Basdia clavate, thin-walled, 11–14 × 4–6 µm. Basidiole clavate, thin-walled, 19–26 × 9–12 µm. Spores 3.5–5.5 × 2–3.5 µm, ellipsoid, thin-walled, smooth, hyaline. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′20″N 75˚13′47″E; alt 725m; on the living tree on dried branch *Senna siamea* (Lam.) H.S.Irwin & Barneby; 07/11/2019; Vijay Gore (VUG/VPM–772).

***Truncospora tephropora* (Mont.) Zmitr.**

Basidiome, 72 × 34 cm, up to 1.4 cm thick at the center, resupinate to widely effused, tough to hard when fresh, woody hard on drying, broadly elongated. Margin sterile, obtuse. Fertile surface poroid, 4–6 per mm pores, round, regular, cracked when mature. Context papery thin to almost absent, hard, homogenous. Tubes up to 14

mm wide, duplex or in the layer, each layer or strata up to 3 mm wide. Hyphal system trimitic, Generative hyphae 2.1–3 µm wide, clamped, thin-walled, smooth, hyaline. Skeletal hyphae 3.2–4 µm wide, thick-walled, smooth. Binding hyphae1.4–3 µm wide, thin to thick-walled, branched, smooth, hyaline. Basidia 13–16 × 4–5 µm, narrowly clavate, 4-sterigmata, clamped at the base. Spores 4.7–6 × 3.5–4.5 µm, broadly ellipsoid, truncate, collapsed partly, moderately thick-walled. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Yesgaon; 20˚04′56″N 75˚20′24″E; alt 660m; on the dried standing stump on main trunk *Eucalyptus oblique* L'Hér.; 21/08/2016; Vijay Gore (VUG/VPM–273).

Conclusion

Wood-rotting fungi were collected during July (2014) to November (2019) after the regular interval from different sites of Khultabad Tehsil, Aurangabad district (M.S.) India. Thirty-seven specimens of macrofungi were examined, and from that nine different types of genera and twelve species, were studied (Photo Plate 1) which belong to six families Auriculariaceae, Hymenochaetaceae, Irpicaceae, Peniophoraceae, Pleurotaceae, and Polyporaceae. Polyporaceae is dominating family consists of four genera. From the above discussion, it is concluded that *Auricularia nigricans*, *Flavodon flavus*, *Phellinus badius*, *Pseudofavolus tenuis*, *Scytinostroma duriusculum*, *Trametes cingulata*, and *Truncospora tephropora* were most abundantly found while *Ganoderma mediosinense*, *Phellinus allardii*, *Phellinus gilvus*, *Pleurotus djamor*, and *Trametes ellipsospora* are rarely observed macro-fungi, belongs to four hosts *Acacia nilotica*, *Azadirachta indica*, *Mangifera indica*, and *Senna siamea*.

Photo Plate-I

Auricularia nigricans (Sw.) Birkebak, Looney& Sancher–Garcia.

Flavodon flavus (Klotzsch) Ryvarden

Ganoderma mediosinense J.D. Zhao

Phellinus allardii (Bres.) S. Ahmad

Phellinus badius (Cooke) G. Cunn.

Phellinus gilvus (Schwein.) Pat.

Pleurotus djamor (Rumph. ex Fr.) Boedijn

Pseudofavolus tenuis (Fr.) G. Cunn.

Scytinostroma duriusculum (Berk. & Broome) Donk.

Trametes cingulata Berk.

Trametes ellipsospora Ryvarden

Truncospora tephropora (Mont.) Zmitr

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Ethnoveterinary Plants to Treat Bone Fractures of Animals in Buldana district, Maharashtra.

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Abstract:

The people of rural areas still depend to a large extent upon plants and household remedies for curing Veterinary ailments. The folk knowledge of Ethnoveterinary medicine and its significance has been identified by the traditional communities through a process of experience over thousands of years. This paper deals with commonly found in different categories of livestock (i.e. Cow., oxen, buffalo etc) and their treatment with10 medicinal plants 10 species belonging to 10genera and 9 families that occur in forests as well as close vicinity of the rural settlements. Out of the Total population, majority of the people was found dependent on traditional (herbal) system of treatments practiced by local herbal healers. In this study observed that old aged people have more knowledge and experience particularly in remote areas for curing Veterinary ailments. The traditional system of Treatment is one of the most important Prevailing systems in the area where modern Veterinary health care facilities are rare or in very poor conditions.

The purpose of the present Study was to unravel the mode of application of the medicine prepared from Plants and quantify the dependence of the local people on herbal and allopathic systems of veterinary health care.

Key words: *Ethnoveterinary plants, livestock.*

Introduction:

Ancient human beings were closely associated with animals ,especially the domesticated ones and with the plants those were found in and around their close vicinity as well as with other plants which were used for their daily necessities like food ,shelter, clothing and medicines .Ethnoveterinary medicine consists of local peoples knowledge dealing with folk beliefs ,skiills,methods, and practices pertaining to animal health care and production .This knowledge is based on close observation of animals and or the oral transmission of experience from one generation to the Next .The Buldana district has a predominately livestock based economy and social welfare .However ,economic dependence on livestock ,lack of effective veterinary infrastructure have forced the local farmers even today to apply their indigenous knowledge to look after and maintain their livestock population. This paper includes social practices and the ways in which livestock are incorporated into farming system. Over centuries people have developed their own system of keeping animals healthy and productive using age old remedies, surgical and manipulative techniques and religious practice. The use of ethnoveterinary medicine uses differ not only from region to region but also among and within communities. Ethnoveterinary medicinal practice and skills have developed through time mainly by tribal and error and sometimes through experimentation and innovation.This paper deals with commonly found in different categories of livestock (i.e. Cow., oxen, buffalo etc) and their treatment with10 medicinal plants 10 species belonging to 10genera and 9 families that occur in forests as well as close vicinity of the rural settlements.

Material and Method: -

During investigation, repeated field visits were made to the remote villages. After establishing good rapport with local herbal healers, elderly persons and a person athorough knowledge of veterinary practices. Some of the commonly occurring veterinarydiseases were listed. The morpho taxonomical description of each plant taxon was done and identified with the help of different floras.

Observation-

Local people of various regions used 10 different types of plants for Bone fracture in animals. The plants arranged alphabetically with family name and Mode of Administration.

Sr. no.	Name of Plant	Family	Mode of Administration
1.	*Bauhinia racemosa*	Fabaceae	Root powder with butter and boiled rice is given to animals for three days in bone fracture to join the bones.
2.	*Blepharis repens*	Acanthaceae	Powder of leaves mixed with pulses of Black gram given to bone facture in animals.
3.	*Buchanania latifolia*	Anacardiaceae	Gum resin is used in case of Bone fracture where plaster cannot be tied
4	*Capparis zeylanica* L.	Capparaceae	Leaves crushed with water mixed with 250ml edible oil and

			applied on bone of cattle on Bone of cattle in Bone fracture.
5.	*Cassia fistula*	Fabaceae	One Pinch seed powder is mixed with melted Jaggery and applied on thigh swelling in lamness.
6.	*Cissus quadrangularis*	Vitaceae	1.Stems are crushed, and the paste is applied on bone fracture in cattle. 2. Stems crushed and mixed with jawar floor and the bolus is fed to animals for healing the bone fracture.
7.	*Clematis triloba*	Ranunculaceae	The vegetable oil or butter is applied over the fractured part and then the decoction of leaves is applied for joining bone of Animals. This treatment used in case where plaster can not be tied.
8.	*Soyamida febrifuga*	Meliaceae	Warmed leaves are tied on the fractured bone.
9.	*Terminalia arjuna*	Combrataceae	Stem bark crushed in water and the paste applied over bone fracture.
10.	*Viscum articulatum*	Santalaceae	Stem branches are given orally or mixed with fodder.

Conclusion-

The ethnoveterinary medicinal plants species are collected by local people from the surrounding areas, forests and are being used as remedies for various animal ailments. Documentation of ethnoveterinary medicinal plant survey of vital importance in finding some miraculous medicines for curing various veterinary diseases .10 plants from 9 families used in bone fracture of animals. Taking into consideration all these facts and the importance of plats Uses it is very necessary to save plant and to undertake such studies before the knowledge is lost forever.

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Status and distribution of Barn owl *Tyto alba* from Melghat Tiger Reserve, Amravati, Maharashtra, India

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Abstract
Distribution and population status of Barn owl Tyto alba was assessed by survey methods. This study implies thatowl species distribution is not common and also the species is less observed in dense forests.
Keywords – MTR, Owls, Owlets, Population status, Birds of prey, Barn owl

Introduction
Owls are found in diverse habitats such as from deserts to forests, including human habitations. However, despite their wide presence they are confined and difficult to be seen (Kumar *et al*. 2017).Owls are of great economic, scientific and aesthetic values hence the species has been given much importance (Santhankrishnan, 2011).

All owls have a large, rounded head with eyes directed forward. The basic morphological features of the members of this group include a curved bill with a pointed tip similar to diurnal birds of prey, and talons having curved and sharp claws which are very powerful which may be considered as an adaptation for carnivory. These birds have mostly coloured plumage which is soft and fluffy. Ecologically Owls may be considered as nocturnal counterparts to diurnal birds of prey, without being related to them.

Barn owls are Normally nocturnal, sometimes hunting diurnally in dim weather; flies slowly low over fields. This species roosts and nests mainly in cavities in old buildings, ancient forts and ruins or caves. Breeds throughout year, Nest is a collection of straw, twigs, rags and rubbish padded into tree-hollow and holes. The same site is used year after year.

The Indian subcontinent is home to 32 species of owls, according to Grimmet et al. (1999) 30 of them recorded from India. Also recently updated checklist of India by Praveen *et al.* (2016) recorded presence of all 32 owl species.

Amravati district harbours dense forest cover. It includes the famous widely spread Melghat Tiger Reserve and many other forests adjoining the Amravati city. Diversity studies have been done many years ago (MTR official checklist) thus requiring re- assessment of current status of owl diversity with location data, hence an effort was made in the present work to study the diversity of owls and owlets in this region.

Materials and Methods -

The work was conducted in the Melghat Tiger Reserve of Amravati district, Melghat is the hotspot of biodiversity of the state. It is located in Central India, as a southern part of Satpuda hill range. The Melghat Tiger Reserve and adjoining forest lies at the Northern extreme of Amravati district of Maharashtra State on the Madhya Pradesh border. Melghat Tiger Reserve is a representative of the Biogeographic Zone '6 E Deccan peninsula' Central Highlands in the central India.

Fig – 1 – Map of Melghat Tiger Reserve.

Extensive Survey of Melghat Tigre reserve was done during the July 2013 to December 2017 to enlist number of owl and owlet species. Interviews with local indigenous people were conducted for collecting

information about sightings of the owls. Various other inputs from the local people were also taken into accord. Following survey techniques were used in the present study,

1) Surveys were done systematically in the study area by making use of existing forest roads, local trails, animal trails along rivers and streams and around water holes. Surveys were conducted either by foot or by motorized vehicle. Information provided by the local people was considered during each visit
2) Point survey (around villages and Rest Houses, ancient trees and riverine ecosystem) were done. At larger spatial scales, counts or detections at points have been used to document raptor presence (Kennedy and Stahlecker 1993), community diversity (Manosa and Pedrocchi 1997), and to estimate occupancy (McLeod and Andersen 1998).
3) Sighted owls were photographed and identified with the help of different field guides, some owls were identified with self recorded calls, using Sony ICD voice recorder and parabolic disc. The latitude and longitude data (GPS) of the sites of sightings of the owls were recorded by a GPS device.

Result and Discussion–

Species was not commonly recorded in Melghat Tiger Reserve. The species was reported from both East and west Melghat but not in dense forest. Total 21 individuals were reported, of which 10 were sighted. All of which were in association with human habitation such as Rest house premises, and agricultural farms. Surprisingly all nests were found in old or dry Banayan tree holes. It is observed that it is present in its nest in tree cavity for whole day and is not seen generally in day time. Pellets from the owl species were collected and studied.

According to Taylor (1992), Bam Owl selected isolated trees around farm sheds and villages and along hedgerows and woodland edges, rather than in the centres of woodland, which is in corroboration with the present study. Following map depicts an idea about distribution of Barn owls from MTR.

Fig. 2 – Map Showing Barn owl sighting locations recorded during Study.

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Phylogeny of Vertebrates from striated muscle proteins

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Abstract

Every living cell requires specific enzymes for the thousands of chemical reactions that maintain life. Like enzymes muscle proteins such as actin and myosin are specified by genes with unique DNA sequences. Both actin and myosin and the unique structures into which they are organized are conserved among all animals, no matter how diverse. This conservation implies that the encoding DNA sequences have changed little through evolutionary time. Just as similarities of structures indicate a common descent, variations and differences indicate divergence on the evolutionary tree. A complete understanding of DNA and inheritance, however, requires a greater appreciation of the importance of proteins. DNA dictates the production of specific proteins, but the proteins themselves directly determine an organism's traits. Therefore, a close study and comparison of particular proteins from different species may indicate how closely related the species are. Proteins have important in phylogeny and the classification and hence the present study designed to know evolutionary correlation between different vertebrate animals with respect to striated muscle proteins which are involved in movements in the selected animals.

Key words : skeletal muscle, muscle protein, amino acid sequences , molecular phylogeny

Introduction :

Recently DNA has been a primary focus of research, but the ultimate function of DNA is to specify what proteins are made. In fact, recent studies of the genome sequences of humans and other organisms have revealed that the number of proteins expressed by a species contributes more to its complexity than does the number of genes (Jasny and Kennedy, 2001, International Human Genome Consortium, 2001).

The genes for actin and myosin are members of gene families that encode proteins that enable movement while actin and myosin are highly conserved across all animal species, other muscle proteins show more variability . The variations in an organism's proteins are the results of random DNA mutations within the encoding genes, which have occurred over thousands to millions of years. Each mutation may results in some kind of change in a protein. These changes can lead to novel traits and generate diversity individual differences among members of a population. Occasionally, a genetic mutation will alter a protein's structure to confer a functional advantage, enhancing an organism's survival in a particular niche, environment, or predator-prey relationship. Thus, genetic diversity makes evolution possible, The Evolutionary biologists are interested in how individual species arose from earlier forms. A classic way of addressing this question is to compare the morphology of different living organisms to one another and to fossilized species. With the onset and advancement of molecular biology, it is now possible for evolutionary biologists to compare not only the physical form and structure of different organisms, but their DNA and proteins as well.

Therefore, a close study and comparison of particular proteins from different species may indicate how closely related the species are. Species that diverged from a common ancestor a long time ago are less similar biochemically than those that diverged more recently. The biochemical composition of organisms includes their protein molecules. Thus, the degree of relatedness of two species can be estimated from the amount of similarity between their protein make ups. Molecular phylogeny , is the use of the structure of molecules to gain information on an organism's evolutionary relationship. The origin of species over a century later, evolutionary biologists still use tree diagrams to depict evolution because the floral analogy effectively convey the concept that speciation occurs. Recent advances in molecular technique as well as more powerful phylogenetic algorithms and faster computers have made it possible to infer phylogenetic relationships using sequences data, (Zardoya, and Meyer,). Different branches of related organisms separated at evolutionary times. The further apart species are on the tree, the less related they are, Molluscs and arthropods diverged from one another before the emergence of chordate animals with backbones, very early in evolutionary time. These animals are only distantly related to fish, birds, reptiles, mammals and amphibian, which are more closely related to each other. Just as similarities of structures indicate a common descent, variations and differences indicates divergence on the evolutionary tree. Proteins have important in phylogeny and the classification and hence the present study designed to know evolutionary correlation between different vertebrate animals with respect to striated muscle proteins which are involved in movements in the selected animals.

Materials and Methods :

Analysis of Proteins by using Block Maker and Peptool online software

The analysis of molecular information of muscle proteins in the different Vertebrates. Their amino acid sequences were obtained in the FASTA format from the NCBI Home Page by using NCBI sequence viewer v 2.0 windows internet explorer cited by www google com and conducted a comprehensive search for muscle protein sequences such as Actin, Myosin, Troponin, Tropomyosin. From selected species and their fasta formats were aligned together by Block Maker by accessing the website WWW. Block Server. Finally build the Phylogenetic tree for each protein. A set of blocks can also be used to construct and display a neighbour joining tree for examination of possible subfamily relationships. Because blocks represents the most highly conserved regions of proteins, misaligned regions were avoided to get a high quality tree. Further studies was carried out by using pep tool a protein analysis software.

Observations and Results :

I) Phylogeny of Actin :

The results obtained are shown in Fig.1.1 All the 14 sequences selected for phylogeny resulted into one block, with a width 14. The tree (Fig.1.1) showed 3 clades . First clade comprises of 4 lineages, B.gargarizans, C.batrachus, R.tigrina and C.punctatus. Second clade comprises of 6 lineages , C.coturnix, G.gallus, H.japonica, M.musculus, N.naja, and R.norvegicus as these lineages split originated from a common ancestor. The third clade includes 4 species with a common ancestor which splits into 2 subclades. C.livia showed the separate lineage and other three L.rohita, O.cuniculus and C.versicolor mutuated at various time from one common ancestor. The most recent lineages are C.versicolor and L.rohita with more mutational changes. C.versicolor and O.cuniculus developed from a common ancestor.

Fig.1.1 Phylogeny of Actin

ii) Phylogeny of Myosin:

The results obtained are shown in Fig. 1.2 All the nine myosin sequences used for phylogeny studies resulted into one block, with a width 17.The phylogram of myosin (Fig.1.2) showed four clades, among the 4 clades first and fourth clades comprises 2 lineages, the *R. tigrina* and *H. chrysoscelis* which split from common ancestor. The second clade comprises of 2 lineages, *O.cuniculus* and *N.naja* as a sister taxa. The lineage *O.cuniculus* has undergone less changes in myosin development during evolution than lineage *N.naja* The third clade represents 5 species with a common ancestor which further evolved in 4 different directions (4 subclades). *G.gallus* showed the separate lineage and other four *C.coturnix*, *M.musculus*,

L.rohita and *R.norvegicus* mutuated at various time from one common ancestor, the most recent lineages are *R.norvegicus* and *C.coturnix* with more mutuational changes, *R.norvegicus* and *L.rohita* developed from a common ancestor. *C.coturnix, M.musculus, L.rohita* and *R.norvegicus* are the cousins with respect to development of myosin.

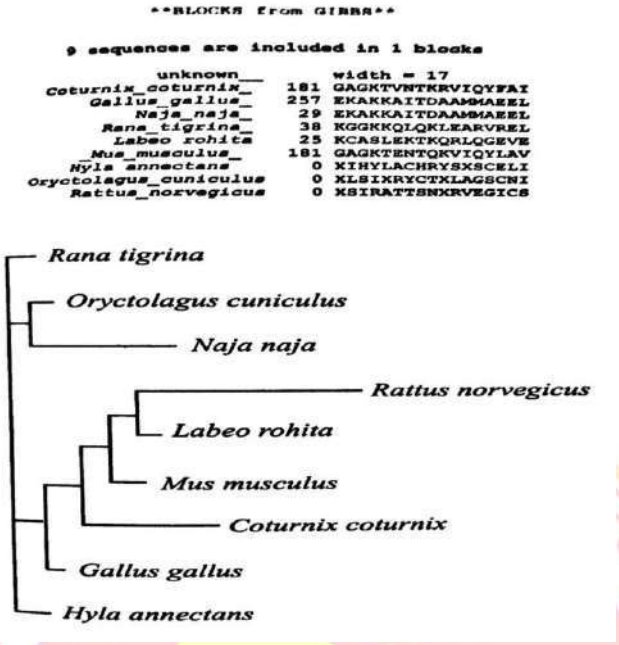

Fig.1.2 Phylogeny of Myosin

iii) Phylogeny of Troponin :

The results obtained are shown in (Fig.1.3). All the nine sequences selected for phylogeny of troponin resulted into one block with a width, 23. The phylogram (Fig.1.3) showed four clades. First, second and third clades comprises 3 separate lineages leading to *M.musculus, R.norvegicus, R.tigrina.* These lineages originate from a common ancestor.The fourth clade includes 6 species with a common ancestor which splits into 2 subclades. *C.coturnix* showed separate lineage and other five *L.rohita, G.gallus, B.marinus, N.naja* and *O.cuniculus* mutuated at various times from a common ancestor. *N.naja* and *B.marinus* are sister taxa developed from a common ancestor. The most recent lineage is *O.cuniculus. O.cuniculus* and *N.naja* are cousin lineages in the development of troponin.

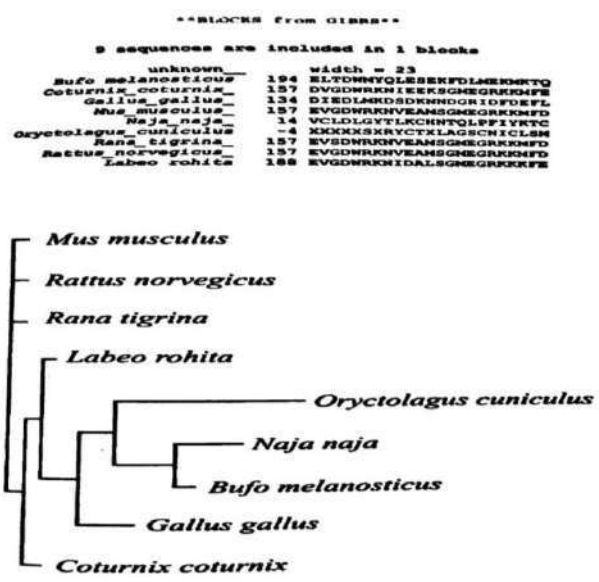

Fig.1.3 Phylogeny of Troponin

iv) Phylogeny of Tropomyosin :

The results obtained are shown in (Fig.1.4). All the ten sequences selected for phylogeny of tropomyosin resulted into one block with a width,32. The tree (Fig.1.4) showed four clades. First, second and third clades comprises 3 separate lineages leading to *M.musculus*, *R.norvegicus* and *G.gallus.* The fourth clade is separated into 4 lineages *B.viridis*, *H.chrysoscelis* , *R.tigrina* and a fourth complex lineage. The fourth clade includes two main lineages which split from a common ancestor. *C.coturnix* is quite separate lineage and the remaining three *O.cuniculus*, *L.rohita* and *N.naja* develop separately. *L.rohita* and *O.cuniculus* are the sister taxa developed from a common ancestor. The most recent lineages are *N.naja and O.cuniculus* with a more mutational changes and they are cousins with respect to tropomyosin development.

```
**BLOCKS from GIBBS**

10 sequences are included in 1 blocks

unknown__          width = 32
Bufo_melanosticus_    25 ESERGMKVIENRALKDEEKMELQEIQLKEAKH
Coturnix_coturnix_   166 EEKSGMEGRKKMFEAGESXXXXXXXXXXXXXX
Hyla_annectans_      120 ESERGMKVIENRALKDEEKMELQEIQLKEAKH
Mus_musculus_        122 ESERGMKVIESRAQKDEEKMEIQEIQLKEAKH
Oryctolagus_cuniculus -4 XXXXXSXRYCTXLAGSCNICLSMDAIKKKMQM
Rana_tigrina_        122 ESERGMKVIENRALKDEEKMELQEIQLKEAKH
Rattus_norvegicus_   122 ESERGMKVIESRAQKDEEKMEIQEIQLKEAKH
Labeo_rohita          50 DTQQCCSVINAKYARRLADSFLASCRIQKKQI
_Gallus_gallus_      122 ESERGMKVIENRAQKDEEKMEIQEIQLKEAKH
_Naja_naja_           50 HQRRPFSLRYIRGCAATCPETKPRDMVECCST
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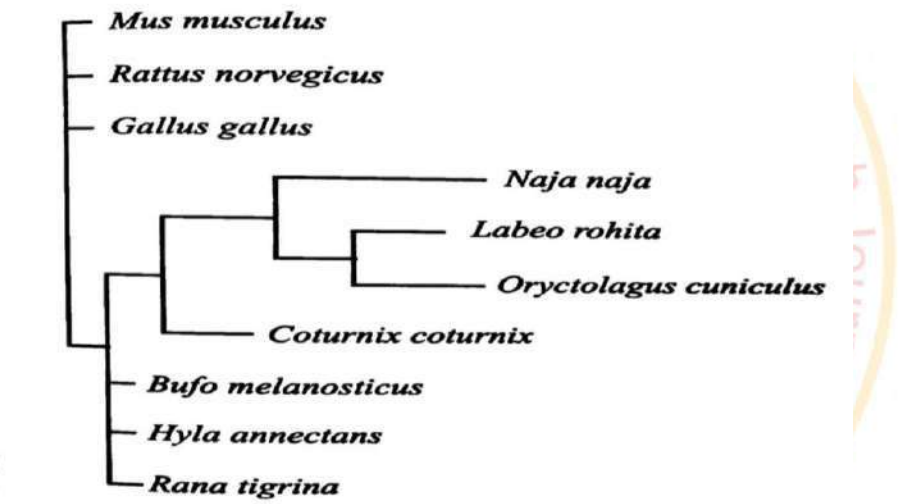

Fig.1.4 Phylogeny of Tropomyosin

Discussion and Conclusion:

The muscle protein phylogeny studies indicated divergent evolution with respect to Actin, Myosin, Tropomyosin and Troponin on different lines (Fig.1.1 to1.4) . Actin exhibited conserved amino acid sequences in C.coturnix, G.gallus, H.japonica, M.musculus, N.naja and R.norvegicus with a width of 14 amino acids . Thereafter actin exhibited divergent evolution with similar conserved amino sequences in Bufo, Clarias, Rana and Channa and diversified sequences in Columba, Labeo, Oryctolagus and Calotes. Actin in Columba livia striated muscles evolved simultaneously with Bufo. The phylogeny tree drawn for Actin amino acid sequences indicate the latest mutation in Labeo rohita which could be because of the genetic modification and or its introduction as an invasive species.

Similar observations are recorded by Volff (2005) who stated that the striated muscle development in all the culturable fish species are recent in the evolution. Myosin phylogeny was found to be more divergent than that of actin. Astonishingly, a conserved sequences of 17 amino acid width is found in Gallus gallus and Naja naja , though both of them evolved on separate lines.With respect to myosin evolution myosin in R.norvegicus, Labeo rohita and Coturnix coturnix, the mutations appear to be recent and this could be because all of them are culturable species. However, in R.tigrina and H.chrysoscelis myosin is evolved separately showing their divergent evolution and thus they are distantly related. Zardoya and Meyer (2001) studied the origin and phylogenetic relationships among living amphibians and supported the Batrachus hypothesis from both molecule and morphology based studies provides a robust phylogenetic framework that will be helpful to

comparative studies among the living amphibians and will permit better understanding of the considerably divergent digit developmental patterns found in frogs and tree frogs. Troponin in all the culturable species like Rattus norvegicus, Labeo rohita and Coturnix coturnix show primitive nature , however all the molecules in all these culturable species show divergent evolution from a common ancestor. Mus musculus, Rana tigrina and Rattus norvegicus exhibit a conserved block of 23 amino acids. Troponin from Labeo rohita also shows the similarity in this 23 amino acid block with 5 replacements as shown below.

Rattus norvegicus EVGDWRKNVEAMSGMEGRKKMFD
Labeo rohita EVGDWRKNIDALSGMEGRKKFE

The troponin evolution which is much more divergent proves the functional modifications. Performance is an intermediate step between morphology and biochemical evolution (Harris and Steudel, 2002). The bones to which the striated muscles are attached change the functional efficiency of the animal variability in the myosin ,tropomyosin and other muscle proteins are studied by Harris and Sterdel (2002) and concluded that the existence of most of the vertebrates are because of survival of fittest and the muscle proteins play a major role in it. Thus during evolution of striated muscle, biochemical changes took placed in Actin, Myosin, Troponin and Tropomyosin elimination some amino acids and by addition of some amino acids. Secondly, these alterations in amino acids sequences might have taken place as a change in the bones to which these muscles are attached with respect to increase the functional efficiency for survival. The present results also indicated that the amino acids proline, alnine, glutamic acid and glycine are lost gradually from actin and myosin during evolution. Protein analysis is quite cheaper, time saving and more reliable for phylogenetic relationship of animals.

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X-ray Diffraction Analysis of Mn-Ti doped Co-ferrite Nanoparticles

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Abstract

In the present investigation, Mn-Ti doped $CoFe_2O_4$ with the formula $CoFe_{2-2x}Mn_xTi_xO_4$ ($x = 0.05$) using well known standard sol-gel auto combustion synthesis method with a view to understand the influence of Mn-Ti doping on the structural properties. X-ray diffraction technique was used to investigate the crystal structure, nano-crystalline nature and for the determination of structural parameters. Absence of impurity peaks in the XRD pattern revealed the single-phase formation. Powder X-ray diffraction analysis of the XRD pattern proves that prepared nanoparticles belong to cubic spinel structure. The crystallite size estimated from Debye Scherrer formula was found to be 21 nm. The lattice constant obtained from XRD data found to increase as compared to pure cobalt ferrite.

Key words: *Sol-gel method, X-ray diffraction, lattice constant.*

1. Introduction

Magnetic materials are key aspects of today world. Nanotechnology and nana science are the two side of coins leads to develop magnetic materials. The magnetic materials in particular ferrite plays a key role in many technological applications on the basis of their very good electrical and magnetic properties. Iron oxide and metal oxide are the basic composition of ferrite materials.

Ferrite materials are metal oxides have high electrical resistivity, low eddy current losses and convincingly low costs coupled with their potential microwave applications such as circulators, isolators and phase shifters. Now a day nanosized ferrite materials have been widely used to prepare many electromagnetic devices such as inductors, converters, phase shifters and electromagnetic wave absorbers. The crystal structure of ferrite leads to different types namely spinel ferrites, cubic garnet and hexagonal ferrite. Spinel ferrite are the most common magnetic material represented by AB_2O_4 formula (where A= divalent metal ions and B = trivalent Fe^{3+} ions)[1]. These materials are widely studied because of their interesting electrical and magnetic properties. .

Various electrical and magnetic properties of ferrite such as DC electrical resistivity, activation energy, drift mobility, saturation magnetization, coercivity, permeability, Curie temperature are of current interest to many researchers. The combined electrical and magnetic properties along with low eddy current and dielectric loss associated with the ferrite have placed them at the top of the magnetic materials. Many researchers have carried out synthesis and investigations of electrical and magnetic properties of ferrite for different applications[2].The crystal structure of the ferrite is such that any cations of different valance and size can accommodate in the interstitial sites bringing wide variation in the properties of ferrite. The synthesis of ferrite is simple and can affect the properties of ferrite. Apart from method of synthesis chemical composition, choice of dopant cation distribution, etc also influences the properties of ferrite. Spinel ferrite, garnet and hexagonal ferrites are of great interest to many scientists and technologist. However, considering the processing, cost and applicability spinel ferrite are found to be more versatile and useful in many technological applications. Interest in the production of nonmetric metal oxides has enormously risen in the last years because of the novel and/or exalted properties they display. Among the many synthetic methods proposed, good results have been obtained by standard sol-gel auto combustion synthesis method.

Spinel ferrite possesses cubic spinel structure with FCC type and has two interstitial sites[3]. In the family of spinel ferrite, cobalt ferrite is one of the best and promising candidates for many applications. Cobalt ferrite possesses inverse spinel structure in which cobalt ions occupy octahedral [B]site and F^{3+} occupy both tetrahedral (A) and octahedral [B] site. The coercivity of the cobalt ferrite is much more than another spinel ferrite. The high saturation magnetization, high magneto crystalline anisotropy and high permeability are the features of cobalt ferrite[4]. In the literature there are many reports on the various properties of cobalt ferrite and substituted cobalt

ferrite. In last two to three decades cobalt ferrite in nanocrystalline form has attracted the attention of many researchers. The properties of nanoparticles are very much different than that of their bulk counterpart. Greater reactivity, larger surface area to volume ratio, greater stability, chemical homogeneity etc are the important characteristics of the spinel ferrite nanoparticles[5]. Researchers have investigated various electrical and magnetic properties of the cobalt ferrite nanoparticles for various applications such as drug delivery, magnetic hyperthermia, sensors, catalyst, water purification, photo degradation etc. There is ample scope to prepare the cobalt ferrite using different technique with improved properties which can lead to novel applications. Therefore, it is of great interest to prepare cobalt ferrite in nanosized form by wet chemical method. Doping of Zn, Al, Cd, Mg etc ions in Cobalt ferrite have been reported in literature, however, co-doping of magnetic Mn^{2+} ions and non-magnetic Ti^{4+} ions in cobalt ferrite is not reported in the literature. Therefore, attempt is made to synthesize Mn-Ti doped cobalt ferrite and study the X-ray diffraction analysis.

2. Experimental details

2.1. Chemicals

For the preparation of $CoFe_{2-2x}Mn_xTi_xO_4$ (x = 0.05) nanoparticles, the chemical such as Co $(NO_3)_2 \cdot 6H_2O$, Fe $(NO_3)_2 \cdot 9H_2O$, Ti $(OC_4H_9)_4$, Mn $(NO_3)_3 \bullet 4H_2O$, $C_6H_8O_7$, NH_3 samples having 99.99 % pure AR grade chemicals are used. The following (Fig.1) flow chart shows the stages involved in the complete process for preparation of spinel ferrite by sol-gel auto combustion method

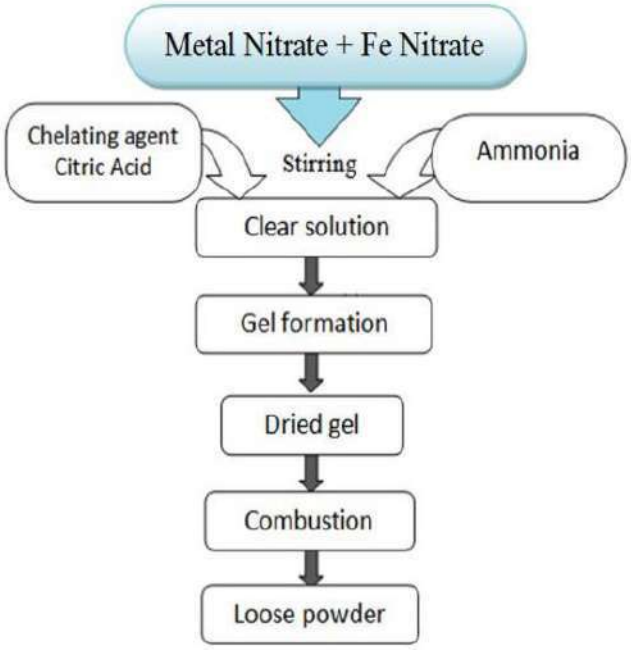

Fig. 1: Flow chart shows the stages involved in preparation of spinel ferrite by sol-gel auto combustion method

2.2. Characterization tools

To study the X-ray diffraction (XRD) analysis, $CoFe_{2-2x}Mn_xTi_xO_4$ (x=0.05) nanoparticles were carried out at room temperature by using standard characterization tools. The details of characterization tools along with their make and specification applied are given in Table 1.

Table 1: Details of the characterization techniques

Name of the Technique	Make and Model	Specifications
X-ray diffraction (XRD)	Rigaku X-ray diffractometer	Source: Cu-Kα radiation Range: 10^0 - 70^0
UV-Visible spectrophotometer (UV-Vis)	Agilent Technologies Carry 100 UV-Vis	Range: 100-1000nm

3. Results and discussion

3.1. X-ray diffraction analysis

Crystallographic structures were examined by powder X-ray diffraction (XRD) using Rigaku X-ray diffractometer. The prepared Mn-Ti doped cobalt ferrite ($CoFe_{2-2x}Mn_xTi_xO_4$, where x = 0.05) nanoparticles were characterized by X-ray diffraction technique. The X-ray diffractogram were recorded at room temperature is shown in **Fig. 2.**

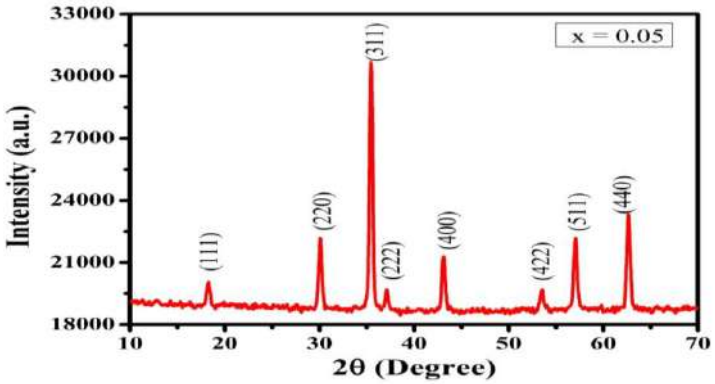

Fig.2: XRD pattern of $CoFe_{2-2x}Ti_xMn_xO_4$ (x= 0.05) nanoparticles

A close examination of XRD pattern shows that the presence of well-defined intense and sharp Bragg's peaks which are indexed using Bragg's law. The diffraction peaks are designated as (220), (311) (222), (400), (440), (511) oriented at various Bragg's angle[6]. All these diffraction peaks are the part of cubic structure with FCC type. No extra peaks other than the cubic phase was observed in the XRD pattern. Thus, it proves that the prepared nanoparticles possess single phase cubic spinel structure. The structural parameters like lattice constant (a), unit cell volume (V) and X-ray density (d_X) were determined using the XRD data and their values are put in Table 2. On comparison with the lattice constant of the pure cobalt ferrite (a = 8.382, [7]), it is noticed that that the lattice constant of the presents Mn-Ti doped cobalt ferrite has been increased. These results can be supported by the ionic radii of Mn-Ti is greater than that of Fe^{3+} ions. The replacement of Fe^{3+} ions by Mn-Ti composition x results in increase of lattice constant. The unit cell volume and X-ray density was also determined using the value of lattice constant. The X-ray density (d_x) of all the samples was calculated using the molecular weight and volume of the unit cell using the following relation.

$d_x = 8M / Na^3$

where, M is molecular weight and N is Avogadro's number.

Table 2 shows the values of unit cell volume and X-ray density, which show increased and decrease respectively in comparison with pure cobalt ferrite. These results can be attributed to the fact that both unit cell volume and X-ray density depends directly and inversely respectively to the lattice constant.

Table 2: Variation of lattice constant 'a' (Å), Crystallite size 't' (nm), X-ray density 'dx' (g/cm^3), lattice volume (Å^3)

Composition (x)	a (Å)	t (nm)	d_X(g/cm^3)	V (Å^3)
0.05	8.385	21	5.324	589.6

4. Conclusions

The successful incorporation of Mn-Ti dopants in cobalt ferrite has been achieved through sol-gel auto combustion synthesis technique. The X-ray diffraction pattern and its analysis revealed the formation of single-phase cubic spinel structure of prepared samples. Lattice constant and unit cell volume increased, whereas X-ray density is decreased as compared to lattice constant of pristine cobalt ferrite nanoparticles.

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Characterization and Thermal Stability measurement of Chemically Synthesized polyaniline-SnO_2 nanocomposites

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1. Introduction

In earlier days, use of conventional sources of energy is increased due to increase in necessity and also this result in increase in pollution for environment. [1] Hence there arises a need of some alternate and renewable source that exists last long and should not pollute the environment and soil as well. For this purpose some conducting polymers like polyaniline (PANI) has gained much interest as having some interesting applications such as sensors, microactuators, polymeric batteries, electronic devices and electrolytic capacitors. [2] The commercial exploitation of most of the applications based on polyaniline is closely linked to the lack of its processability and mechanical properties [3]

The properties of electronically conductive polymers depend strongly on their microstructure and morphology. [4] It is well known that polymer composites can be produced exhibiting enhanced properties that the constituent materials may not exhibit. Conducting polymer nanocomposites formed by immobilization of metal nanoparticles into the conjugated conducting polymer matrices [5]. Conducting polymers synthesized with doping any metal oxide such as SnO_2 given much increased conductivity and stability of the composite formed in nanosize.

In the present work, chemical oxidative polymerization method used to synthesize polyaniline doped with SnO_2 at a particular weight percent. The SEM images shows, polyaniline nanoparticles of different diameters were obtained, Thermal stability of the polymers plays important role to modify the polymer properties to be used for advanced applications. Also it indicates that, the morphology and particle size of product are depend on the temperature during synthesis Hence thermal stability of conducting PANI and its composites has great importance.[6,7] It is measured using TG-DTA analysis.

2. Methods and Materials:

2.1 Materials used:

The Aniline Hydrochloride (AR grade), Ammonium Persulphate (AR grade), Hydrochloric Acid, Acetone (AR grade) obtained from Loba Chem. Mumbai, (India). All the chemicals were used as received. Double distilled (DD) water was used for synthesis.

2.2 Synthesis of Polyaniline (PANI) nanoparticles:

In this process polyaniline nanocomposite was synthesized by chemical oxidative polymerization method [8]. 2.59 gm of aniline hydrochloride was dissolved in 50 ml distilled water in a volumetric flask. Similarly 5.71 g of ammonium persulfate (APS) was dissolved in 50 ml distilled water kept for 1 h. at room temperature (303 K), During additions, the mixture is stirred for 2 h. and allowed to polymerize for next 1 h. Then the resulting dark green precipitate of PANI was filtered. Then washed with three 100 ml portions of 0.2 M HCl and acetone. Obtained precipitate was kept in oven to dry for about 8 hrs. at 50-60 ^{0}C.

2.3 Synthesis of PANI- SnO_2 Nanocomposite:

In this process polymer composite was synthesized by in-situ chemical oxidative polymerization method [9] for 15 wt. % of SnO2. SnO2 nanoparticles were dispersed into the APS solution of 50 ml DD water and stirred for 1 h before added to aniline monomer. Aqueous solutions of 2.59 g of aniline hydrochloride prepared in 50 ml DD water. It is then added slowly in APS under vigorous stirring for 2 h. and allowed to polymerize for next 1 hr. The resulting dark green PANI-SnO2 precipitate was filtered and washed with three 100 ml portions of 0.2 M HCl, and acetone. Obtained precipitate was kept in oven to dry for about 8 h. at 50-60 0C. In this way PANI-SnO2 nanoparticles were formed.

3. Characterization Techniques:

3.1 Scanning Electron Microscopy (SEM):

In the present work Field Emission Gun-Scanning Electron Microscope with model number JSM-7600F was used. Magnification was about 25 times to 1,000,000 times. This technique gives the morphology of synthesized composite.

3.2 X-Ray Diffraction Technique (XRD):

XRD is a method for structural materials characterization and quality measurement. To determine particle size Debye-Scherrer method is used. Sixth generation MiniFlex 600 X-ray diffractometer (XRD) is used for the determination of crystallite size, strain and molecular structure of material.

4. Result and discussion:

4.1 Scanning Electron Microscopy:

The surface morphology of PANI and PANI-SnO_2 (15 wt %) nanocomposite was observed under scanning electron microscope (SEM) and obtained images are as shown in figure. The surface morphology of nanocomposite was completely different compared to without dopant. The surface morphology changes from rough to smooth. PANI - SnO_2 shows fine microsphroidal surface observed with poor matrix.

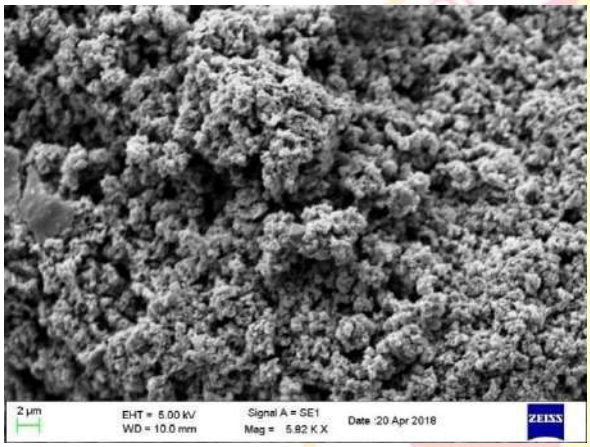
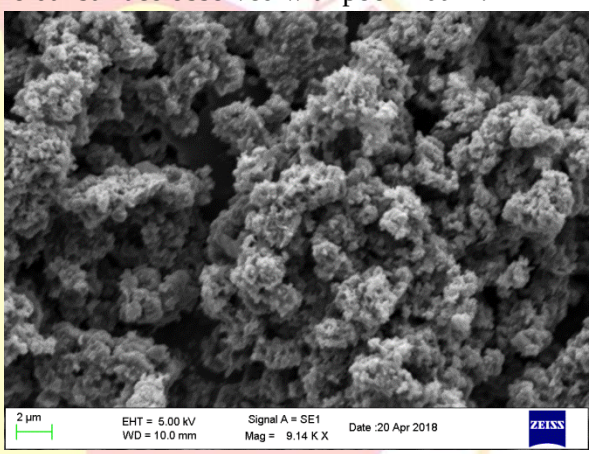


Fig. Pure PANI



PANI-SnO_2 nanocomposite

The average size of the particles is 15-268 nm. PANI is completely amorphous in nature whereas PANI-SnO_2 nanocomposite shows partly crystalline as well as amorphous phase. The micrograph shows porous microstructure in which SnO_2 nanoparticles are dispersed in fibrous PANI forming a nanocomposite. It is highly microporous and thus capable of increasing the liquid–solid interfacial area providing more locations for the insertion.

4.2 X-Ray Ddiffraction:

From the following figures it can be stated that the more crystalline regions in the zinc oxide sample are observed with major reflections between 20° and 30° (2θ values). Also less intense peaks at 17°, 20°, 25° (2θ values) indicate the high crystallinity of SnO_2 samples.

Absence of peak in the intensity versus 2θ curve represents complete amorphous state of sample. Indication of peak or peaks in the curve suggests formation of phase or phases in the composite during polymerization process.[10] The degree of crystallinity increased in PANI-SnO_2 nanocomposite than pure conventional PANI, clearly indicated the homogeneous distribution of nanoparticles in the polymer matrix.

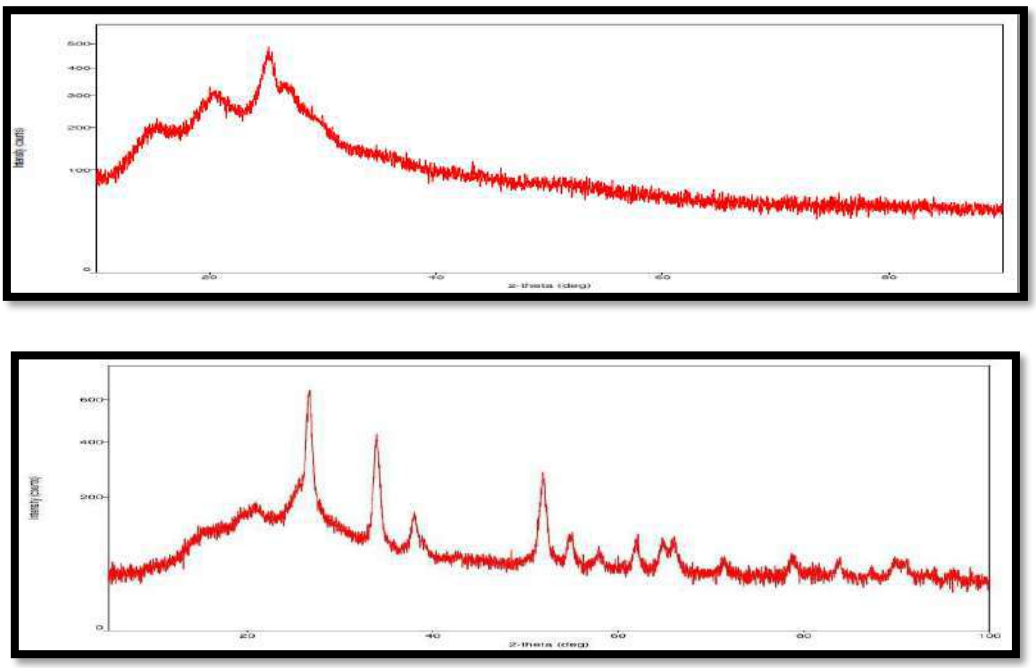


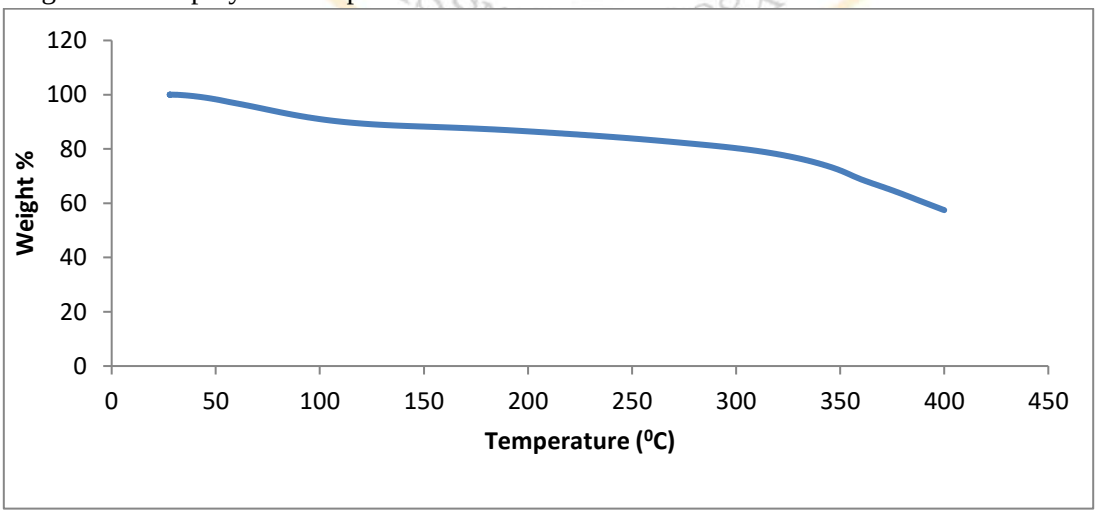
Fig. XRD pattern of Pure PANI and PANI-SnO_2 nanocomposite

The crystallite size can be determined using Debye Scherrer formula and found as 40 nm. The XRD-pattern of PANI-SnO_2 shows sharp diffraction peaks at 26°, 34°, 51° which confirms the presence of SnO_2 nanoparticles are highly crystalline and can be indexed as (110), (101) and (211) planes of SnO_2. Also these peaks were slightly shifted from their respective standard positions which may be due to metal oxide. [11] The XRD pattern of PANI shows the three broad peaks at 2θ= 15.13°, 20.34°, 25.20°.PANI showed two broad hallows at 2θ =20.34° and 25.20°. A nanocomposite show the greater crystallinity due to the addition of SnO_2.

4.3 Thermogravimetric Analysis and Differential Thermal Analysis:

Thermal properties of pure Polyaniline and PANI doped with Tin Oxide (SnO_2) nanocomposite were evaluated by TGA/DTA in the temperature range 0ºC to 700 ºC at a heating rate of 15 ºC/min as shows Figure.

TGA thermograph of PANI-SnO_2 nanocomposites shows two step degradation. In first step the initial weight loss was observed between 35 to 200^0 C and was attributed to the loss of moisture and low molecular weight compounds in polymer composite. It can be clearly seen that both samples exhibit minimal weight loss until the samples reached 200^0 C. In second step, a major weight loss was observed form 200 to 700^0 C and was due to the degradation of polymer composite.



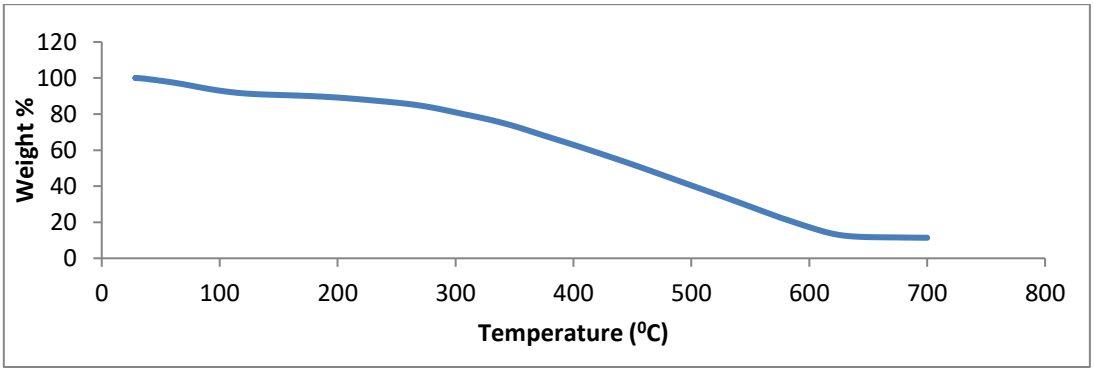


Fig. Thermogravimetric Analysis Curve of Pure PANI and PANI-SnO_2 nanocomposite

Figure shows that in two step degradation of PANI-SnO_2 nanocomposite, loss of ~ 93 % of its weight when it was heated to 670^0 C. It indicates that ~ 83 to 93 % of the sample consists of polymers and softeners. The residual about ~ 6 to 16 % was considered to account for metallic compounds, added as Tin Oxide and dopant.

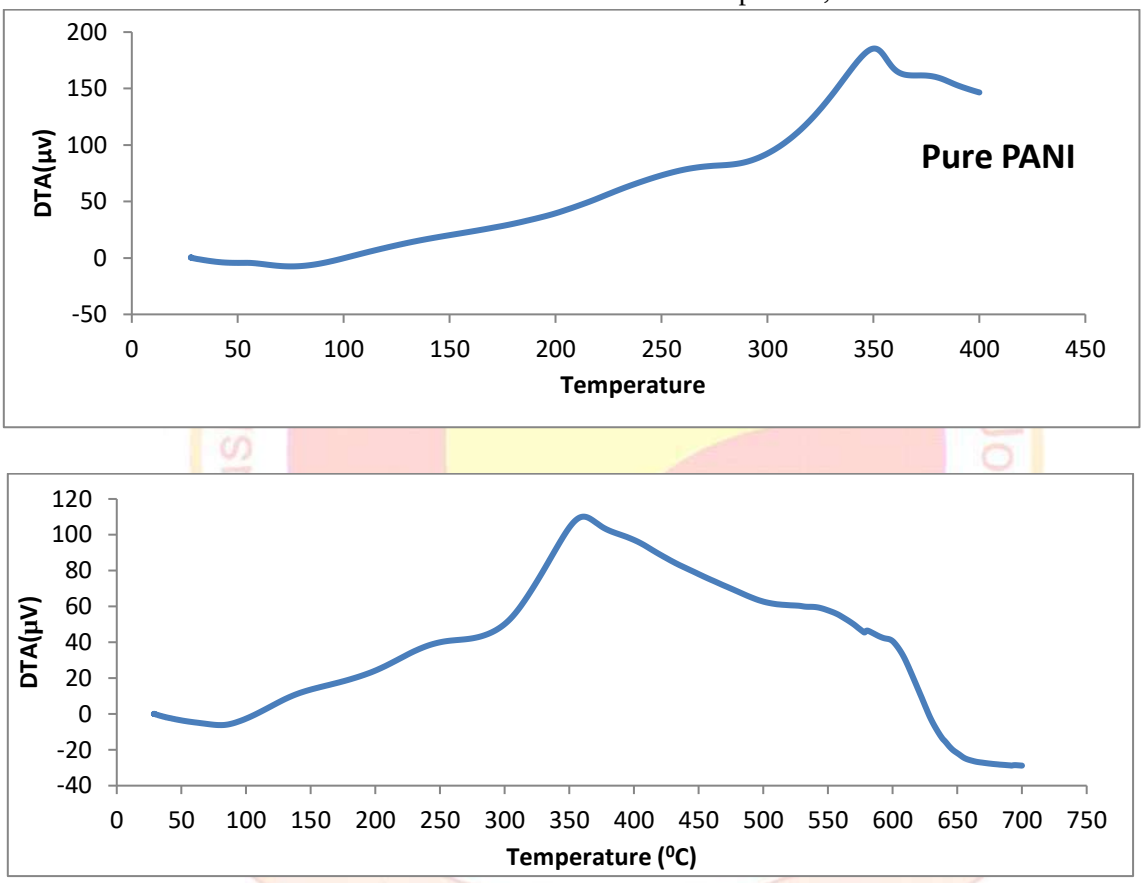


Fig. Differential Thermal Analysis Curve of Pure PANI and PANI-SnO_2 nanocomposite

Figure shows DTA curves of pure Polyaniline and PANI doped with SnO_2. In DTA curve, the endothermic peak appearing at ~ 75-100^0 C is probably due to the melting point of PANI that identified as melting of crystalline phase of polymer. Another endothermic peak appearing at 273 – 285^0C in the in situ synthesised hybrids is assigned to the decomposition and elimination of dopant. The sample PANI-SnO_2 nanocomposite shows the strong and broad exothermic peak in the range 350 to 400 ^{0}C accompanied by rapid weight loss can be ascribed to the decomposition of PANI-SnO_2 nanocomposite. This study indicated that the sample is thermally stable up to 343^0C.

PANI doped with Tin Oxide (SnO_2) shows the strong and narrow exothermic peak as compared with pure Polyaniline. It shows that with the addition of Tin Oxide the thermal stability of PANI-SnO_2 nanocomposite was increased. Thus it indicates that PANI-SnO_2 nanocomposite is more thermally stable than pure Polyaniline.

5. Conclusion

In this work, Pure polyaniline (PANI) and PANI-SnO_2 nanocomposites were successfully prepared by *insitu* polymerization method at room temperature. The particle size of PANI-SnO_2 was found to be 15 to 268 nm. SEM image shows the formation of nanoparticles of composite with agglomeration of the particles. XRD shows a size of about 40 nm for the nanoparticles of PANI-ZnO with 15% of weight. Also thermal stability of the nanocomposite is observed as more than the pure PANI. At about 400 and 500 deg. celcius the powder is degraded. It is more stable and less degradation of the nanocomposite is observed due to addition of metal oxide SnO_2. Such type of material could be used for various applications such as photovoltaic cell, rechargeable batteries, etc.

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Synthesis And Characterization of Zinc Oxide Nanoparticles from *Alishewanella Sp*. And Its Antimicrobial Activity Against Escherichia Coli

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Abstract

Metal nanoparticles have been intensively studied within the past decade. Nanosized materials have been an important subject in basic and applied sciences. Zinc oxide nanoparticles have received considerable attention due to their unique antibacterial, antifungal, and UV filtering properties, high catalytic and photochemical activity. The objective of this work is to synthesize Zinc oxide nanoparticles using green synthesisl method and characterize zinc oxide nanoparticles using scanning electron microscope and X-ray diffractometer. Further its antimicrobial activity against Escherichia coli is studied.
Key words: *Nanoparticles, Zinc oxide, Alishewanella sp., Escherichia coli.*

Introduction

New technologies often create new challenges to science in addition to their benefits, raise concerns about health and various environmental problems. Recent nanotechnology holds a promise and a broad aspect towards wide applications of nanoparticles in a multiple way of emerging fields of science and technology. Over last decades, nanotechnology has established as the great innovation of science and technology. Nanotechnology is a science and engineering branch of recent well established technology refering at the nanoscale, i.e. 1 to 100 nm Generally, metal oxide nanoparticles are inorganic. Various nanoparticles like Fe, Ni, Co, Mn, Zn, etc. are known as the enormously accepted magnetic materials for a wide range of applications like various electronic ignition systems, generators, vending machines, medical implants, wrist watches, inductor core, transformer circuits, magnetic sensors and recording equipment, telecommunications, magnetic fluids, microwave absorbers, etc. They are also applicable in other high-frequency applications. Green synthesis method is proved as beneficial over other methods which are implemented for the synthesis of nanoparticles. Green synthesis methods are eco-friendly approach and compatible for pharmaceutical and other biomedical applications, as the toxic chemicals are not used in these methods.

Besides, this method does not require high pressure, temperature. Synthesis of various nanoparticles by microorganisms is used more than the other techniques due to its ecofriendly nature. The use of environmentally beneficial materials like plant leaf extract, bacteria, fungi and enzymes for the synthesis of zinc nanoparticles proposes abundant benefits of eco-friendliness and compatibility for pharmaceutical and many other biomedical applications

These compounds act as chemo-therapeutic agents for the treatment or prevention of bacterial infections (Saunders Comprehensive Veterinary Dictionary 2007). An antibacterial agent is considered as bactericidal if it kills bacteria or as bacteriostatic if it inhibits their growth. Different methods have been adopted for the assessment and investigation of antibacterial activity in vitro. These methods include disk diffusion, broth dilution, agar dilution, and the microtiter plate-based method.

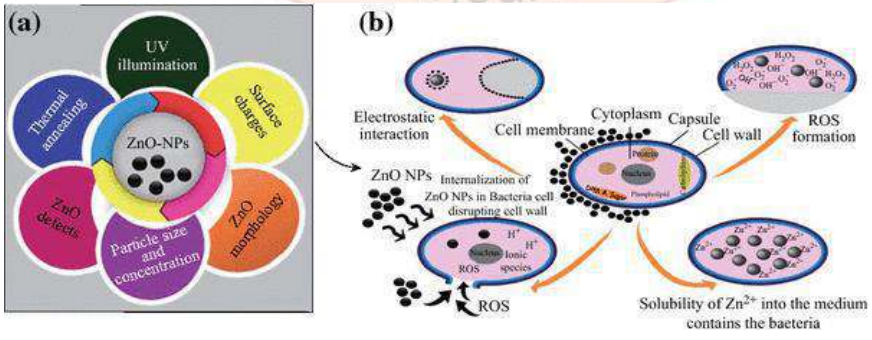


Fig:2 Correlation between the a influence of essential ZnO-NPs parameters on the antibacterial response and the different possible mechanisms of ZnO-NPs antibacterial activity.

Correlation between the influence of essential ZnO-NPs parameters on the antibacterial response and the **b** different possible mechanisms of ZnO-NPs antibacterial activity, including: ROS formation, Zn^{2+} release, internalization of ZnO-NPs into bacteria, and electrostatic interactions.

The antimicrobial property of nanoparticles is determined by their size, shape, morphology, composition and crystallinity. Researchers are going on to synthesize nanoparticles, designing of nanodevices and application of these in different fields like medical science, environment, energy, information, and communication, industries and also in food technology etc. Generally there are two parts of nanoparticles, the core material and a surface converter. The surface converter is responsible for alteration in the physicochemical properties of core materials. The core material consists of a variety of biological materials like phospholipids, lipids, lactic acid, chitosan, and dextran or may be formed of carbon, chemical polymers, silica or meta

Experimental:

Materials And Methods

- Culture of *Alishewanella species*
- Distilled water
- Zinc Sulphate
- Mueller Hinton Agar
- Nutrient agar
- Nutrient broth

Nutrient agar:

Composition

Ingredients	Gms/lit
Peptic digest of animal tissue	5.000
Sodium chloride	5.000
Beef extract	1.500
Yeast extract	1.500
Agar	15.000
Final Ph (at 25^0)	7.4 to 0.2

Nutrient broth:

Composition

Ingredients	Gms/lit
Peptic digest of animal tissue	5.000
Sodium chloride	5.000
Beef extract	1.500
Yeast extract	1.500
Agar	15.000
Final Ph (at 25^0)	7.4 to 0.2

Muller Hinton Agar

The major used of Mueller hinton agar is for antimicrobial susceptibility testing

Composition

Ingredients	Gms/lit
Beef extract	2.00 gm
Acid hydrolysate of casein	17.50 gm
Starch	1.50 gm
Agar	17.00 gm
Distilled water	1000 ml
Final pH (at 25^0)	7.3 to 0.1

Reagent

- Crystal violet
- Iodine
- Safranin (0.25%)
- Alcohol (95%)
- Hydrogen peroxide (3%)
- Oxidase reagent (1% tetramethylene paraphenylene diamine dihydrochloride).
- N HCl.

Following reagent was used for identification and characterization of isolated.

1. Crystal violet stain

Solution A:

Crystal violet - 2.0 g
Ethyl alcohol - 20ml

Solution B:

Ammonium oxalate - 0.8 gm
Distilled water - 80 ml
Mixture of solution A and B

2. Grams Iodine solution

Iodine - 1gm
Potassium Iodine - 2.0 gm
Distilled water - 100 ml

3. 95% alcohol

4. Safranin solution (1%)

Safranin - 1.0 gm
Distilled water - 100ml

Preparation of 2mM ZnO solution

100ml $ZnSO_4$ solution was prepared which has the molecular weight of 161.47g/mol. 2.86 gm of $ZnSO_4$ was dissolved in 100ml distilled water.

Method

Enrichment of culture

Enrichment culture is a medium having specific and known qualities that favour the growth of particular microorganism. Enrichment culture's support the growth of particular microorganisms while inhibiting the growth of others. These cultures are used to increase the small number of desired organism to detectable work in the present work. Enrichment of culture was done in nutrient broth containing zinc sulphate solution as a source for synthesis of ZnO nanoparticle.

Centrifugation

Centrifugation is used to separate the two miscible substances. The culture was centrifuged at 3000rpm for 20 minutes. After centrifugation cell pellets were seperated by removing supernant. Separated cell pellets were inoculated in 100ml of 2mM zinc sulphate solution.

Synthesis of ZnO NPs

For synthesis of ZnO nanoparticle flask containing 2mM solution of zinc sulphate with cell pellets was incubated on rotary shaker for 3 days at 100 rpm. Zinc oxide nanoparticle synthesis was seen by means of change in colour from white to pale yellow.

For confirmation of zinc oxide nanoparticle synthesis UV-visible spectophotometric studies was done, from which the graph was obtained showing spectra at 430nm.

Results And Discussion

Nutritional responses, optimization of pH and temperatures of *Alishwanella sp.*			
Colour	Creamy	Trehalose	-
Size	Large	Arabinose	+
Shape	Circular	Galactose	-
Texture	Moist	Rhamnose	-
Elevation	Flat	Salicin	-
Opacity	Opaque	Xylose	-
Margine	Serrete	Esculin	-
Gram staining	-	Malic acid	-
Shape	Rod	pH 6	-
Catalase	+	pH 7	+
Oxidase	+	pH 8	+
Indole	-	pH 9	++
Methyl red	-	pH 10	++
Voges Proskauer	-	pH 11	++
Citrate utilization	-	pH 12	+
Nitrate reduction	+	Temp 30ºC	+
Dextrose	+	Temp 40ºC	++
Lactose	-	Temp 60ºC	-
SR- Short Rod; (+) = Positive; (-) = Negative; + = Normal growth; ++ = Moderate growth; +++ = Luxuriant growth			

Biosynthesis of ZnO NP's

Fig 1. Biosynthesis of Zno NPs

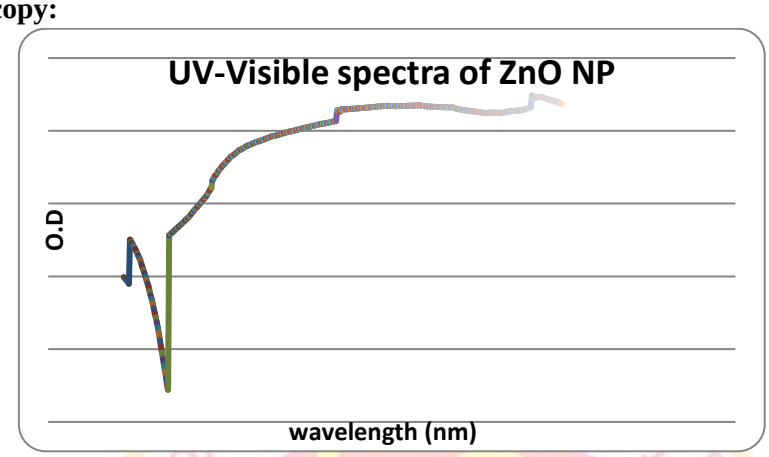
1. Control eppendrop without cell pellets
2. Experimental eppendrop with cell pellets showing colour change from white to pale yellow.

Culture was maintained by serial sub-culturing on nutrient agar slants. Two experimental flask was used for the zinc oxide nanoparticles synthesis of nanoparticle shown in the figure. Confirmation of synthesized nanoparticle in the medium was characterized by the change in color of the reaction mixture from white to pale yellow after 24h of incubation. First flask was used as a control containing 2mM $ZnSO_4$ without inoculation of cell pellet kept on rotary shaker, which did not show color change after 24 hours. The second flask containing 2mM $ZnSO_4$ with cell pellet kept on rotary shaker, pale yellow color formed after 24 hours which shows positive result. That means it confirmed that the zinc oxide nanoparticle was synthesized (Fig 1).

reaction mixture from white to pale yellow after 24h of incubation. First flask was used as a control containing 2mM ZnSO4 without inoculation of cell pellet kept on rotary shaker, which did not show color change after 24 hours. The second flask containing 2mM ZnSO4 with cell pellet kept on rotary shaker, pale yellow color formed after 24 hours which shows positive result. That means it confirmed that the zinc oxide nanoparticle was synthesized.

Characterization of zinc oxide nanoparticles:

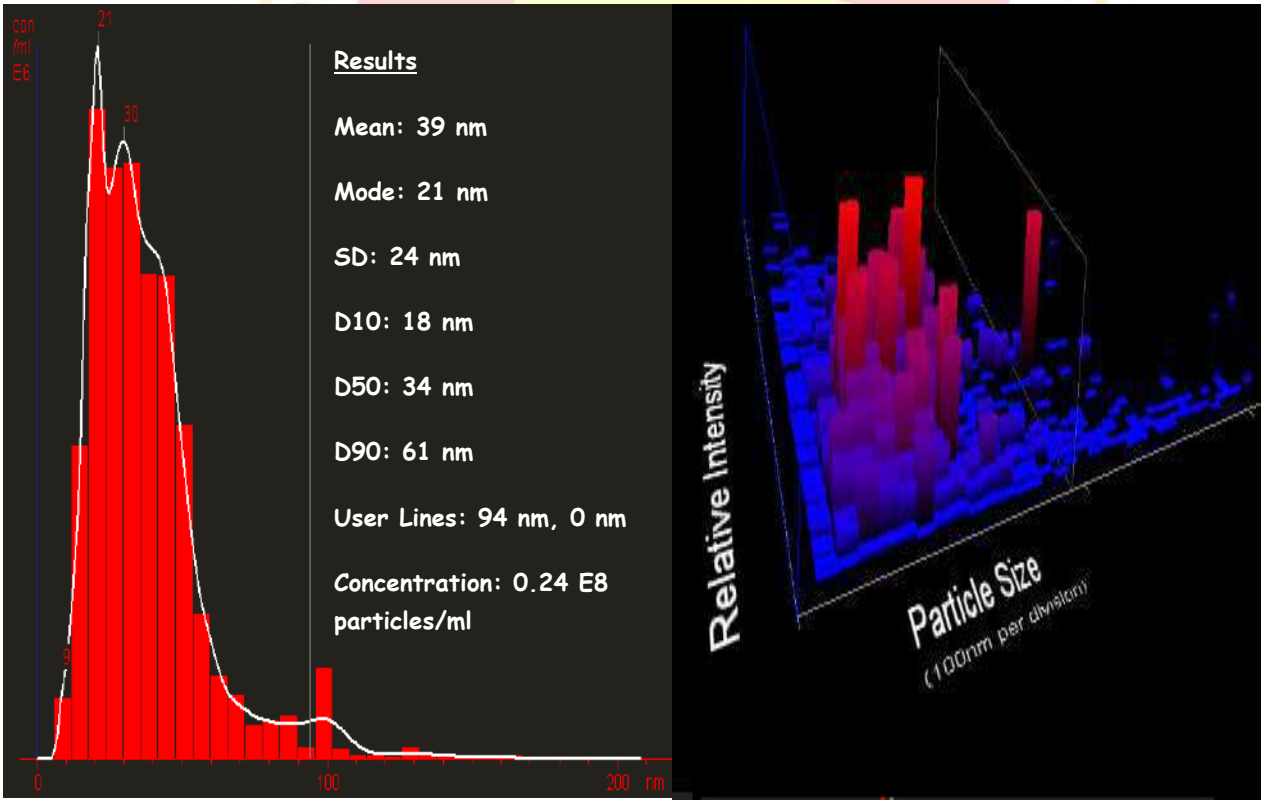
UV- Visible spectroscopy:



Graph1. UV-Visible spectra of ZnO NPs

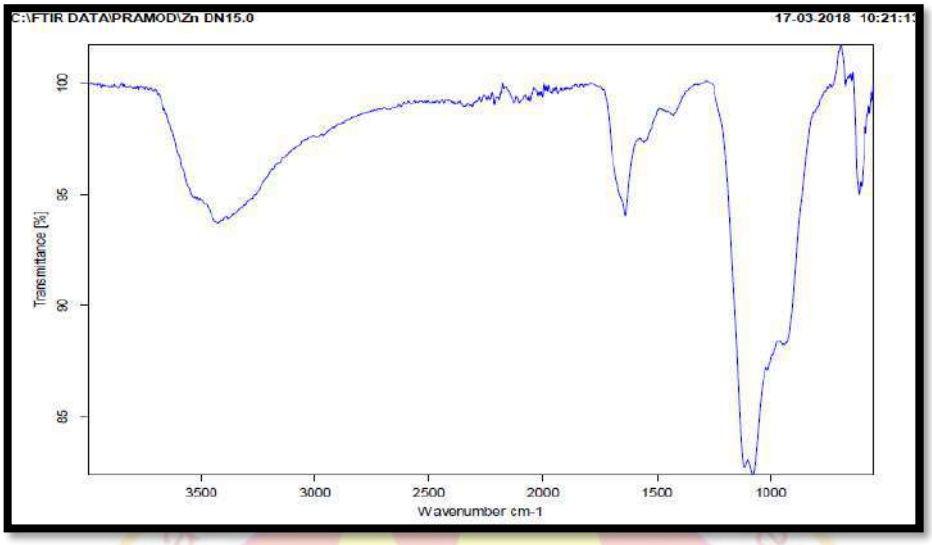
The synthesized zinc oxide nanoparticle solution was observed in UV–visible spectra, the change in color of this solution was recorded in Spectrophotometer in the range of 350–500nm. The absorption Maxima was seen at 440 nm, which confirms the synthesis of zinc oxide nanoparticles for studied bacterium. The absorption maxima was at 440 (Graph1).

Nanoparticles tracking and analysis (Nanosight LM 20)



Nanoparticle tracking analysis NTA (NanoSight-LM 20) histogram showing particle size distribution and the average size of zinc oxide nanoparticles (39 nm). The particle analyzer results revealed the presence of nanoparticle in the range of 21 to 39 nm. The mode displayed by the analyzer was 21 and the mean was 39nm.

Fourier transform Infra-red spectroscopy



Graph 2: FT-IR of zinc oxide nanoparticle

Graph 2.Shows the of FTIR spectrum of the ZnO nanoparticles synthesized by biological, which was acquired in the range of 500-4000cm-1. The band between the 500-550cm^{-1} corelated to metal oxide bond (ZnO). FTIR method measurements was carried out to identify the possible biomolecules responsible for capping and efficient stabilization of the metal nanoparticles synthesized by the microbes. It also confirms the reduction of metal ions by the used bacteria. The peaks in the range of 1100-1600cm^{-1} corresponds to the C=O bonds.

Antimicrobial activity of ZnO NPs:

A. Experimental **B. Control Positive**

Fig 2: Antimicribial action of ZnO NPs

Fig 2 A: Action of zinc oxide nanoparticle against *E.coli*.

Fig 2 B: Action of standard antibiotic tetracycline

Table 2: Antibacterial action of zinc oxide nanoparticle.

Test organism	Zone of inhibition (mm)
E.coli	**19**

Table 3: Antibacterial action of standard antibiotic

Antibiotic	Zone of inhibition (mm)
Tetracycline	22

The antibacterial activity of zinc oxide nanoparticle against pathogens was performed by well diffusion method. For testing the antibacterial activity of zinc oxide nanoparticle the well diffusion method was used, the pure bacterial culture was subculture on muller hinton agar respectively. Wells of 8 mm diameter made on muller hinton agar using cork borer. The strain was swabbed uniformly into the individual plates using spreader. After that Using a micropipette, sample of nanoparticles solution poured into the well and incubated plates for 24 hours. And the zone of inhibition was observed.

This work demonstrates that zinc oxide nanoparticle showed the property to synthesized by bacteria. The isolated strain of *Alishwanella sp.* was found to have the potential to form zinc nanoparticles at room temperature within 24 h. The synthesized zinc oxide nanoparticles was characterized by UV– Vis spectroscopy and confirmed by particle analyze, FT-IR spectroscopy and Zeta potential. Zinc oxide nanoparticle was again tested for its antimicrobial activity against pathogenic *E.coli*. These zinc oxide nanoparticles shows very good effectivity on some pathogens.

Conclusion

Alishwanella sp. was able to synthesized zinc oxide nanoparticle efficiently. The source used for synthesizing zinc oxide nanoparticle was zinc sulphate. The nanoparticle was characterized by visual observation, UV-VIS spectrophotometer, FT-IR spectroscopy and zeta potential. The size of zinc oxide nanoparticle ranged from 21 to 39 nm.

The UV-Vis spectroscopic study shows the Plasmon resonance property, confirmed the reduction of metal ion and formation of nanoparticle with plasma resonance peak at 440 nm. The change in color of ZnO solution was recorded in Spectrophotometer in the range of 350–500nm. The sharp bands of zinc colloids were observed at 426 nm proves the zinc metal reduces the bacterial cell extract more efficiently.

Nanoparticle tracking analysis NTA (NanoSight-LM 20) showed particle size distribution and the average size of zinc oxide nanoparticles (39 nm). FTIR confirms the reduction of metal ions by the used bacteria. The peaks in the range of 1100-1600cm^{-}1.The nanoparticles was found to be the potent inhibitors of pathogenic bacteria and have shown significant zone of inhibition against pathogenic *E. coli*.
particle size.

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Water vapour sensing mechanism of pristine SnO_2 nanoparticle based thick film sensor

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Abstract

The SnO_2 was synthesized by co-precipitation method. The gross structure and phase purity of the pure SnO_2 nano powder were examined by powder X-ray diffraction technique. It reveals that the sample crystallize in tetragonal structure. The surface morphology investigated through field emission scanning electron microscope(FE-SEM) results that pure SnO_2 possesses uniform grains and is almost homogeneously distributed, which indicates the high packing density of the materials and nano spheres like structures. Further, Water vapour or humidity sensing investigations of pristine SnO_2 nano powder were study. Our result indicates that pristine SnO_2 in form of thick film was most sensitive for humidity under same conditions. The hysteresis plot between increasing and decreasing the RH range of 30–90% Rh and vice versa. The samples resistance decreases from 10^{11} Ω to 10^{8} Ω. The similar change was also observed in sensitivity. The response and recovery time were also studies. The results were re- producible up to ± 79% after 2 months of observations.

Key words: *SnO_2 nanoparticle, Humidity sensor.*

1. Introduction

Humidity plays a significant role in every part of the Earth in biology factors and varrious industrial processes. To have a desirable surrounding atmosphere, it is essential to monitor, detect and control the ambient humidity under different conditions ranging from low temperature to high or in combinations with other gases by precise and provident sensors [1,2]. Due to the different operating conditions of moisture sensors in different areas of application ranging from indoor to open air uses, various types of humidity sensing instruments have been developed based on different work principles and diverse hygroscopic sensing materials [3-5]. The operating principle of metal oxide semiconductor sensors is based on the change in conductivity of the sensitive layer by the chemical adsorption of molecules. Typically, the metal oxides semiconductors (SnO_2, In_2O_3, WO_3, ZnO, etc.) are used to create sensitive layers [6-8]. Tin oxide is an n- type wide band gap semiconductor (Eg = 3.6 ~3.97eV) and its electrical properties critically depend on its stoichiometry with respect to oxygen, on the nature and amount of impurities or dopants present and on its size as well as shape of nanostructures [9-11]. Stannic oxide is formed in the structure of rutile, the spatial group being P4/mnm. The unit cell is tetragonal, it consists of six atoms – two stannum and four oxygen atoms – and is characterized by the lattice parameters a and c and intrinsic parameter u. The optimized cell parameters obtained in the calculation are as follows: a=b= 4.738Å, c= 3.188Å and u = 0.30756. In the bulk all Sn atoms are six-fold coordinated to threefold coordinate oxygen atoms. The SnO_2 is an anisotropic polar crystal, which crystallizes in tetragonal rutile structure [12-16]

In this work, SnO_2 nanoparticles is synthesized by using co-precipitation method. The humidity sensing properties of the synthesized material such as hysteresis cycle, sensitivity and response time of pure synthesized material were studied.

2. Experimental

2.1 Synthesis of SnO_2 nanoparticle

All the chemicals used in this study were of GR grade purchase from Sd-fine, India (purity 99.99%). In preparation of SnO_2, 2 g (0.1 M) of stannous chloride dehydrate ($SnCl_2.2H_2O$) is dissolved in 100 ml distilled water. After complete dissolution, about 4 ml ammonia solution is added to above prepared aqueous solution with magnetic stirring. The solution was stirred for 20 minutes to make homogeneous solution. White gel precipitate is immediately formed and it is allowed to settle for 12 hrs. Then it is filtered and washed with deionised water 2-3 times. The obtain precipitate were mixed with 0.27 g carbon black powder (charcoal activated). The obtained mixer is kept in vacuum oven at 70 ºC for 24 hours so that the mixer gets completely in to dried powder. Then this dry product was crushed into a find powder by grinder. Now obtained product of fine nano powder of SnO_2

was calcinated at 800°C up to 8 hours in the auto-controlled muffle furnace (*Gayatri Scientific, Mumbai, India*.) so that the impurities from product will be completely removed.

Preparation of thick films

The thick film was prepared by screen printing technique on a glass substrate. Initially, for the screen printing the thixotropic paste was formulated by mixing the sintered fine powder of pure nano SnO_2 powder a with a solution of ethyl cellulose (as 10% temporary binder) in a mixture of organic solvent such as butyl cellulose, butyl carbitol acetate and turpineol. The ratio of inorganic to organic part was kept as 75:25 in formulating the paste. The paste of pure SnO_2 and it was screen printed on a glass substrate in the form of thick films. The prepared films were dried at 80-110°C in oven for 1hrs then the dried films are kept for fired at 500°C for 25 min in muffle furnace (Kumar make Mumbai), so that all the organic materials (in the form of binders) and organic impurities can be evaporated form the sensor material. For the surface conductance measurement, the electrodes of silver paint were formed on adjacent sides of the films and again, the films were subjected to heating at 80°C for 15 min for drying the silver paint.

2.2 Characterization

X-ray diffraction (XRD)

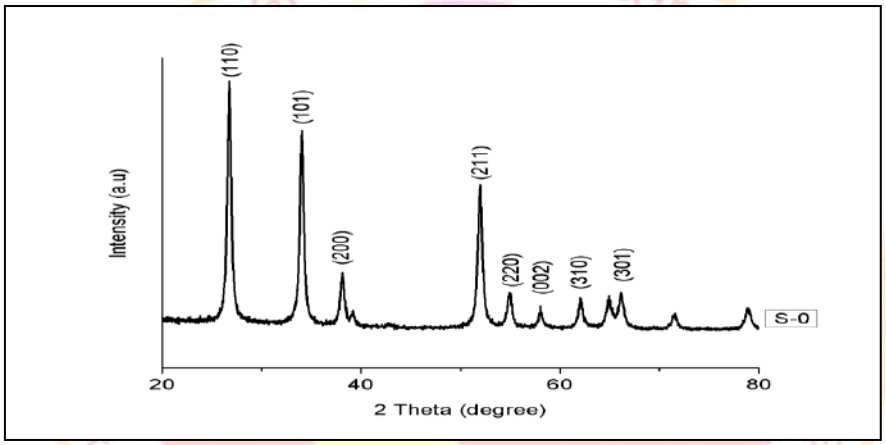

Figure 1 XRD pattern of pristine stannic oxide (SnO_2)

Figure 1. shows the XRD pattern of pristine stannic oxide (SnO_2) nanostructure synthesized by liquid phase via co-precipitation method calcinated at 400°C it is clearly observed that the highest intensity peak is obtained at (110) crystal planes and other peaks lying at (101), (200), (211), (220) and (002) of SnO_2. All the peaks match well with the standard tetragonal structure of SnO_2 with lattice constant a = 4.723 nm and c = 3.238 nm and its unit cell volume ($V=72.24A^{o3}$) with JCPDS card no. 71-0652. All the peaks are perfectly match with pure SnO_2 nanostructure, which indicates the high purity of obtained SnO_2 nanoparticles. The average crystalline size was found to be 23.19 nm calculated by using Debye-Scherer formula [17].

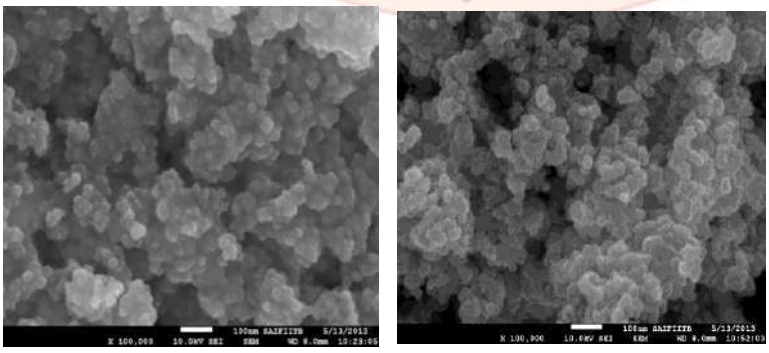

Figure 2. FE-SEM of pure SnO_2

Figure 2. shows the micrograph of sample pure SnO_2 thick films in this the particles are found to in the tetragonal shape within the particle size in the range of about 15 nm to 31.2 nm.

3. Result and Discussion

Hysteresis Plot

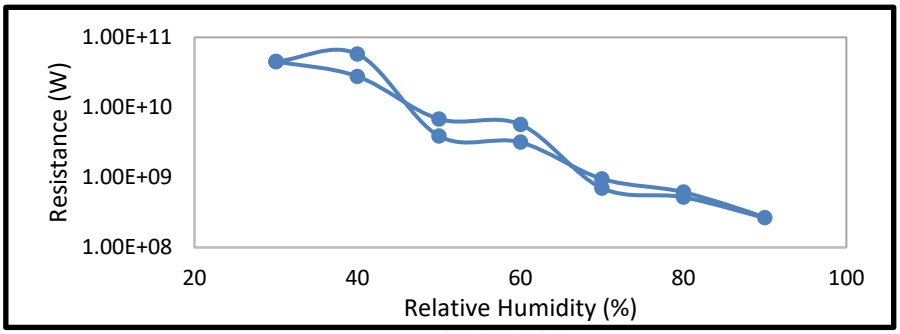

Figure 3. Hysteresis Plot

Hysteresis plot of pristine SnO_2 shows the variation between resistances of sample with respect to the relative humidity in increasing and decreasing order from 30 to 90 % RH as shown in the figure 3. A very small hysteresis present during forward and reverse cycle of relative humidity, where as a very significant average change observed in the value of resistance from 10^{11} Ω to 10^{8} Ω, these is a very remarkable change in the observed in the value of resistance in pristine SnO_2 material. In all the prepared sample the hysteresis is present which shows processes of regeneration is quite slower. Apart from these a sample shows comparable decrease in resistance with an increase in % RH which indicates that the conduction occurred at the grain surface by release of electron from the water molecule and possessed a high sensitivity factor due to large surface area and porosity in the form of thick films.

Sensitivity

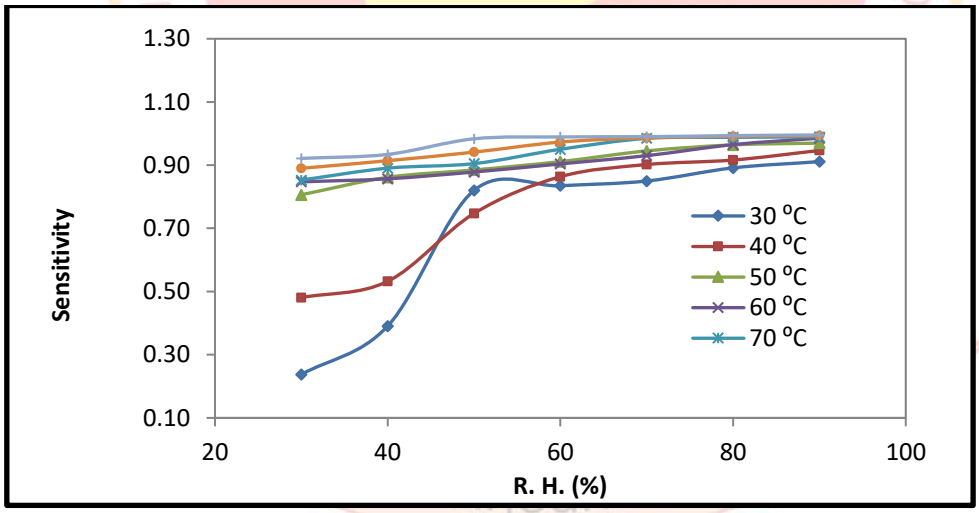

Figure 4. Sensitivity curve

The sensitivity is found to be increasing with the RH for the thick films and it is increasing up to some particular RH and then afterward it remains constant as shown in figure 4. For higher RH the sensitivity curve is found to be higher for the thick film of pristine SnO_2. It also state that the change in conductivity is more in SnO_2 nano materials the similar change is observed in sensitivity also. The Pure SnO_2 nanoparticle-based sensors exhibits significantly higher sensitivity it is due to the formation of heterogeneous interface between them and more adsorption site was created to absorbed more water vapuors. The fall in resistance is mainly due to the increased amount of conduction electron or charge carrier upon adsorption of water vapours by the surface layer of the thick films.

Response Time

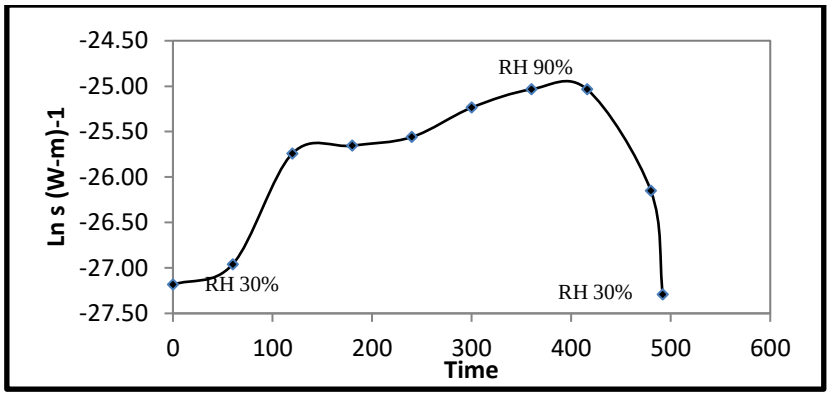

Figure 5. Response Curve

The responses curve pristine SnO_2 at constant temperature is as shown in figure 5. From the response curve, on time and recovery times are measured. Under the condition of constant temperature, the relative humidity is increases from 30 % RH to 90% RH in some appropriate time and then at the 90 % RH it is stopped, (ON response time) 360 sec which is after, it was allowed to fall up to 30 % RH (OFF recovery time) which is 127 sec. It is observed that response and recovery time is nearly fast in the pristine SnO_2.

4. Conclusion

SnO_2 nanoparticle was successfully synthesise co-precipitation method. Minimum crystallite size was found to be 23.19 nm for SnO_2 nanoparticle. The Surface morphology of pure SnO_2 shows that most particles are spherical in shape leaving more space as pores and hence it was most sensitive for humidity sensing. The Hysteresis plot shows very significant average change in the value of the resistance from 10^{11} Ω to 10^{8} Ω during forward and reversed cycles. Sensitivity is found to be increasing with the RH in pure SnO_2 thick film and it is increasing up to some particular RH and then afterward it remains constant. This shows that it has good scope for the development of moisture sensor in the range of relative humidity 30% to 90% RH. The response and recovery time of pristine SnO_2 based thick film sensors were satisfactory i.e. the sensors were found to be fast in operation. The recovery time found to 127 s at constant temperature respectively.

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Green And Facile Synthesis Of Silver Nanoparticles Using *Azadirachta Indica* (NEEM) Extract

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Abstract:
Nanoparticles are gaining interest in biomedical applications due to its importance such as anti-bacterial, anti-fungal and anti-cancer agents. Eco-friendly green methods using plant extracts are gaining popularity due to the abundance of raw materials and the production of non-toxic by-products threatening to the environment. For the synthesis of silver nanoparticles (SNPs) using the leaf extract of Azadirachta indica as a reducing agent from 1 mM silver nitrate ($AgNO_3$) has been investigated. The synthesis silver nanoparticles were characterized by UV/VIS spectroscopy, XRD, EDAX, IR and Scanning Electron Microscopy. Thus from this study it can be concluded that Azadirachta Indica can be effectively used for synthesizing silver oxide nanoparticles.
Keywords: *Silver oxide Nanoparticles, Green Synthesis, Azadirachta indica*

Introduction

Biological synthesis process provides a wide range of environmentally acceptable methodology, low cost production and minimum time required. At the same time the biologically synthesized silver nanoparticles has many applications includes catalysts in chemical reactions [1]. In this context, the concepts of green chemistry have gained immense popularity; these are mainly concerned with replacing chemical products and improving or developing processes and technologies to reduce or even eliminate substances that are harmful to health and the environment [2]. Generally, metal nanoparticles can be prepared and stabilized by chemical, physical, and biological methods; the chemical approach, such as chemical reduction, electrochemical techniques, photochemical reduction and pyrolysis and physical methods, such as Arcdischarge and physical vapor condensation are used. To synthesis stable metal nanoparticles with controlled size and shape, there has been search for inexpensive, safe, and reliable and "green" approach. The novel methods so called green/biosynthesis have been recently developed by a variety of plant extract such as Ocimum Sanctum, Petroselinum crispum, Murraya koenigii, Coriandrum Sativum for the synthesis of metal nanoparticles[3-5]. Among the various metal nanoparticles synthesized (such as silver, gold, iron, zinc and platinum), silver nanoparticles have gained more importance in the nanotechnology field. As, silver in the nano size is safe inorganic and non-toxic agents and encompasses a wide range of applications such as antibacterial and antifungal effects. It promotes reactions without hazardous solvents, reducing agents, and stabilizers [6]. Several green methods have been applied so far for the preparation of AgNPs including electrochemical reduction, microwave and sonochemical preparation, or synthesis from supercritical liquids [7].

Here we have developed a rapid, eco-friendly and convenient green method for the synthesis of silver nanoparticles from silver nitrate using leaf extracts of Azadirachta indica.

Material And Methods

Materials: Materials used in this research consist of Silver nitrate, *A. indica* (Neem) used in this work were collected from the garden of Shri. Shivaji science college Akot.

Preparation of Water Leaf Extract of A. indica (Neem): To 10 gram of powered leaf sample 100 ml of water as a solvent was added (10g/100ml). Plugged with cotton wool and then kept on a rotary shaker at 200 for 10 hours. After 10 hours the extract was filtered and the filtrate was concentrated using flash evaporator and stored in air tight containers at 4°C and used for further experiments.

Synthesis of Silver Nanoparticles (AgNPs) from water Leaf Extract of A. indica (Neem): Silver nanoparticles were prepared from water leaf extract of *A. indica (Neem)*. To 10 ml of the water leaf extract 90 ml of 1mM silver

nitrate solution was added. The extent of nanoparticles synthesis was monitored by measuring the absorbance at 400-600nm

Characterization of Silver nanoparticles

UV-Vis spectrophotometer:

Formation of silver nanoparticles is easily detected by spectroscopy because the colored nanoparticle solution shows a peak ~400 nm. The band in silver nanoparticles solution was found to be close to 400 nm. In this study, spectrophotometer was used to measure the optical density of solutions.

EDAX Spectroscopy:

The EDAX is a reliable tool to determine the elemental composition of the synthesized AgNPs from *A. indica (Neem)* extract. The EDX profile of the AgNPs from *A. indica (Neem)* extract showed the presence of typical peaks for silver. Additional peaks also observed which indicated the presence of nitrogen and oxygen, representing the existence of other elemental compounds in the AgNPs.

FTIR Spectroscopy:

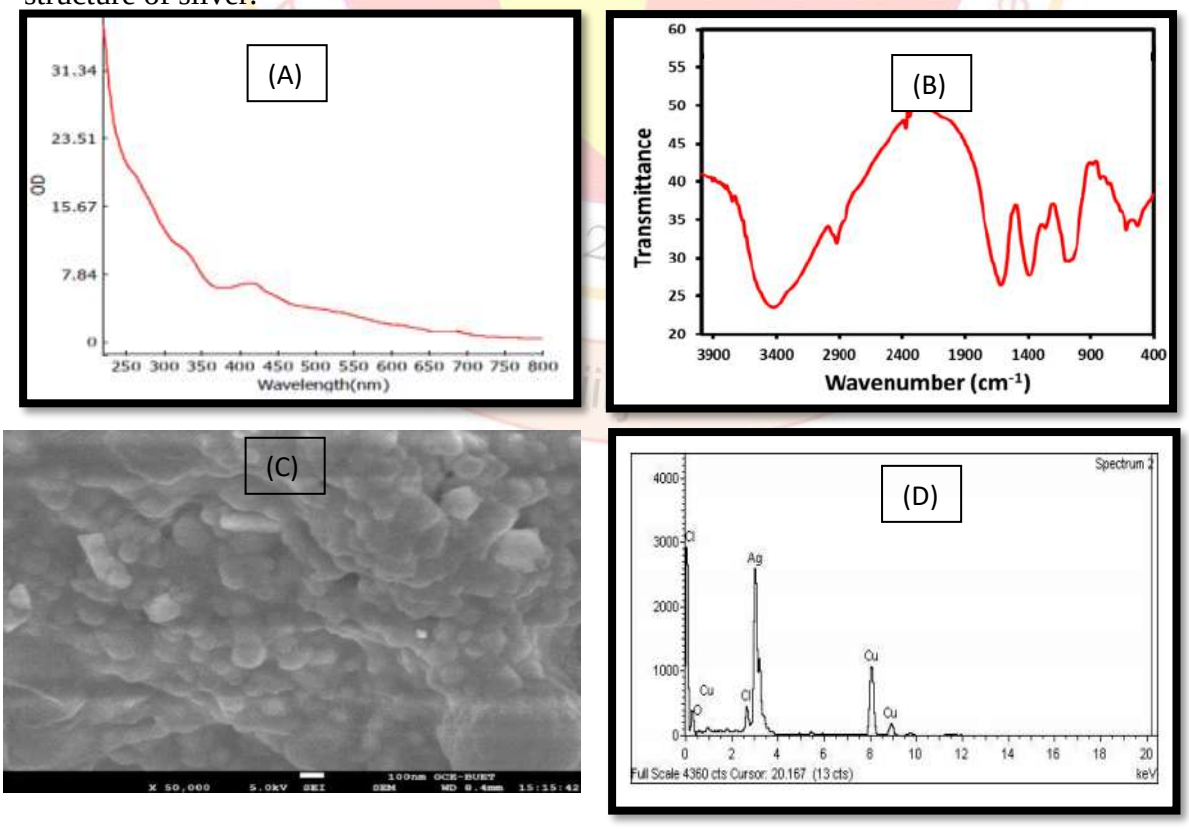
The FTIR spectra of *A. indica (Neem)* extract leaf extract showed the characteristic peaks of OH, alkene, aldehyde groups which may be involved in the reduction and stabilization of silver nanoparticles. The presence of OH, aldehyde and alkene in the extract acted as the capping and stabilizing agent for the synthesis of silver nanoparticles. The silver nanoparticles synthesized from *A. indica (Neem)* extract leaf extract showed the presence of phytoconstituents namely amides, alkenes, aliphatic amines, alkanes and alkyls, responsible for the reduction of silver nitrate.

Scanning electron microscopy:

SEM images showed that most of the silver nanoparticles are predominately spherical in shape having smooth surface and well dispersed with close compact arrangement shown in fig. (C).

X-Ray Diffraction:

The XRD pattern of synthesized AgNPs using *A. indica (Neem)* leaf extract was shown in Fig. (E). The XRD was done to determine the crystalline nature of AgNPs and the resulted peaks were found at 37.90°, 44.05°, 64.25° and 77.20° representing (111), (200), (220) and (311) face centered cubic structure of silver.



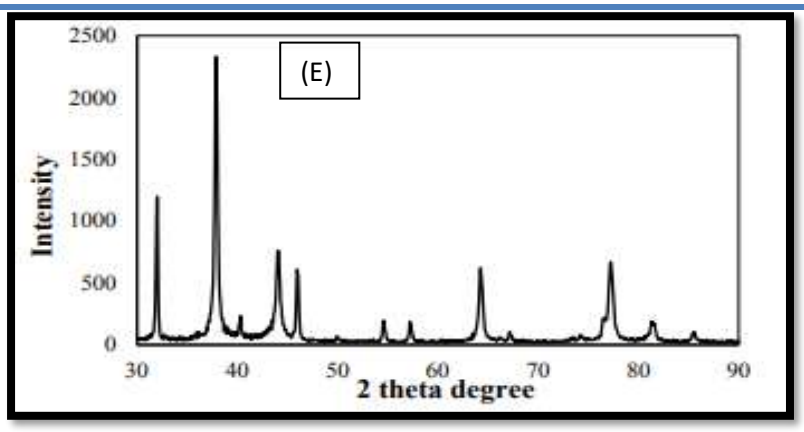


Fig. (A) UV-Vis spectrum (B) FTIR spectrum (C) SEM spectrum (D) EDAX spectrum (E) XRD spectrum of silver nanoparticles.

Conclusions

The green synthesis of AgNPs using *A. indica (Neem)* leaf extract was shown to be rapid, eco-friendly and produced nanoparticles are fairly uniform in size and shape. The functional groups present on their surface confirm the bioactive potential. The AgNPs showed a good stability profile. The ideally suited structure for AgNPs was successfully characterized. This work indicates that neem leaf extract had a good valuable potential in the future for production of silver nanoparticles

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Application of Nanotechnology in Food Packaging: A Review

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Abstract

Nanotechnology has validated its competence in almost all feasible fields. But still, Food Nano packaging is an incompletely explored discipline of observe both in Nano technology and food science. The motive of this paper is to expose the applications of nanotechnology in food packaging. Bio primarily based packaging is a one of the terrific techniques to reduce the environmental pollution. It replaces the non-degradable polymers with biodegradable materials which reduces waste and may be altered to increase the shelf life, and beautify food nice. Next is advanced packaging, which objectives in producing packaging cloth with excellent barrier homes, mechanical energy, flexibility and stability. Smart packaging is set use of Nano sensors and Nano devices inside the detection of freshness of food, contaminants in meals, screen changes and integrity of packaging fabric.

Keywords: Nanoparticels, Nano biosensors, Nanopacking

I. Introduction

Nanotechnology is the engineering of practical systems at less than a hundred nm scale degree. Nanotechnology applications are multiplied in the numerous sectors within the industrial world so as in food industry. Nanotechnology acts a distinguished function in food enterprise via supporting to enhance its range of sub sectors together with meals packaging. At present studies are being carried out to extend the shelf lifestyles and enhance meals first-rate even as decreasing packaging waste.

Thus, Nanotechnology applications in food packaging have brought about big amount of improvements which can be used inside the packaging industry commercially. This evaluate covers the position of novel nanotechnology primarily based meals packaging strategies in order to get higher enhancement in Food Quality and Safety.

Application of nanotechnology in improvement of bio based totally packaging which includes starch and polylactic acid, progressed packaging consisting of Nano laminates, Nano coatings and Nano clay, and clever/shrewd zone such as spoilage indicators, Nano-primarily based sensors and lively tags have been reviewed

II. Bio Based Packaging

The developing problem related to disposable of plastic in-turn has caused the development of bio degradable packaging. Bio based totally packaging are biodegradable packaging movie which can be able to controlling moisture switch and/or fuel trade with the intention to enhance protection and keep the dietary and sensory satisfactory. Bio polymers are used to produce these sorts of packaging movies. Bio polymers have poor mechanical, thermal and barrier houses [1].

Particularly, high brittleness, low warmth distortion temperature, excessive permeability of gasoline and vapored bad resistance to processing operations has confined their programs in meals enterprise [2,3]. Thus nanotechnology has been applied to improve the properties of these biopolymers. Nano-composites are advanced to conquer these boundaries of the biopolymers via nanotechnology. At nano scale degree, the size of the filler is immensely decreased, leading to the full-size increment in the floor area of the fillers. This is desired due to the fact bio Nano composites depend upon the high floor location of the Nano sized fillers which ends up in a massive boundary or interfacial place among the matrix or biopolymer and Nano filler. These kinds of alteration to biopolymers have advanced the homes of it as food packaging materials.

Biopolymers consist of plant-derived substances along with, starch, cellulose, other polysaccharides, and proteins; microbial products like polyhydroxylbutyrate and polymers synthesized chemically from naturally derived monomers including, polylacticacid. Most reviews centered on software biopolymer movies as fit for human consumption films

III.**Starch**

Starch and derivate are the most commonly used form of biopolymers that has been studied to supply bio-Nano composite materials for food packaging programs. Studies display that starch is absolutely degradable and will induce biodegradability of non-biodegrable substances while mixed Unfortunately, the starch has some limitations, including poorer mechanical residences and robust hydrophilic behavior (bad moisture barrier) [4, 5]. To conquer this problem, incorporating inorganic materials and artificial polymers has been proposed to improve water barrier belongings of starch. If starch is processed in an extruder via both mechanical and thermal power, it may be transformed to a thermoplastic fabric.

Here, plasticizers are used to reduce intra-molecular hydrogen bonds and to offer balance to product residences. But still thermoplastic starch (TPS) cannot meet some of these necessities along with green mechanical, oxygen and moisture protection. To overcome this problem, clay turned into used as follows. Clay has been used as a potential filler to improve the residences of TPS. Starch or clay Nano composite films have been obtained through dispersing montmorillonite (MMT) nanoparticles via polymer melt processing techniques [6].

IV.**Polylactic Acid (PLA)**

Polylactic acid (PLA) is the maximum common artificial biopolymer that has been studied until nowadays. PLA has received attention as a biocompatible, sustainable, biodegradable cloth with better mechanical properties. Therefore, PLA presents greater disposal alternatives and its production is much less environmentally burdensome than traditional petroleum-primarily based plastics [7, 8].The most essential barriers for the packages of PLA in meals packaging are its negative hardness, sluggish degradation, terrible gasoline barrier properties, and hydrophobicity [8]. Nanotechnology may be carried out to enhance this assets through the usage of Nano composites. Solvent casting of combinations of PLA and organophilic clay in chloroform led to substances with an improved crystallization tendency and extended Young's modulus.

The PLA layered silicate Nano composites, evolved by means of simple soften extrusion, exhibited considerable development of material residences in each solid and soften states as compared to the matrix without clay [2]. The oxygen barrier residences of Nano composite of amorphous PLA blended with chemically changed kaolinite had progressed by using 50%. The mixture of PLA and MMT layered silicate may additionally bring about a Nano composite with barrier homes appropriate for food packaging applications [4].

V. **Improved Packaging**

In the improved packaging improvement, nanomaterials are mixed into the polymer matrix to get better barrier properties and to enhance temperature and humidity resistance of the packaging [4]. Such new packaging materials have top notch barrier houses to save you the migration/diffusion of O2, CO2, water vapor, and taste compounds. This could have a high effect at the shelf existence of clean and processed meals. In many events, it has been stated that the barrier residences of this new packaging film can be improved through about 50% as compared to the properties of the neat polymer. This is due to the creation of a maze shape results in a tortuous route for gases and different molecules and by way of that decreasing their permeation fee [9]

VI. **Nano Coatings**

Coating in meals may be defined as skinny film of edible fabric placed among meals additives to provide a barrier to mass switch. Edible coatings are currently broadly used on a spread of ingredients, consisting of veggies, end result, chocolate, meats, cheese, bakery products, candies and French fries [6].Up to now range of researches has been done in order to improve the bodily homes of these suitable for eating movies by way of the combination of Nano-debris.

In order to decrease the migration of oxygen, clay MMT has been integrated into pectin. Anoticeableraise in stability of chitosan layered Nano composites become received [6]. The inclusion of inorganic Nano fillers which include, TiO2, ZnO and ZnS, and carbon nanotubes has more desirable the retention of taste, acids, sugars, shade and texture, elevated balance at some point of delivery and garage, stepped forward look and decreased spoilage [8].

VII. **Nano Laminates**

A Nano laminate is made of two or more layers of fabric with nanometer dimensions which can be bodily or chemically bonded to each different. Nano laminates provide some blessings over traditional technologies for the practise of fit to be eaten coatings and films and therefore have some of crucial applications in the food enterprise [10]. A range of various adsorbing substances could be used to increase the distinctive layers, which includes; natural poly electrolytes (proteins, polysaccharides), charged lipids (phospholipids, surfactants), and colloidal debris (micelles, vesicles, droplets) [11,12]. It could be useful to incorporate active functional agents such as antioxidants, antimicrobials, enzymes, anti-browning dealers, flavors, and colors into the movies. These purposeful agents might increase the shelf lifestyles and high-quality of coated ingredients [6]. These Nano laminates may be created completely from food-grade ingredients (proteins, polysaccharides, lipids) by way of the usage of easy processing operations which includes dipping and washing [11].

VIII. **Nano Clays**

Nano clays are bi-dimensional platelets with a completely minute thickness (1 nm) and several micrometer lengths. Those are high performance, enormously to be had and occasional price substances. Thus vast range of clinical researches has been carried out approximately nanoclays. Interaction among the Nano clays and polymers are considered as the number one principle for Nano primarily based packaging. According to the prevailing clinical researches; two varieties of Nano scale composites are created by means of the interactions among Nano clays and polymers, named as intercalated Nanocomposites and exfoliated Nano composites.Beer packaging gives particular examples on Nano clay packages in packaging zone.

In the past, plastic was no longer used as a packaging material in beer industry because of the oxidation and unwanted flavour improvement.

Nanotechnology has given a practical answer using Nano composites to conquer the hassle. This caused employment of plastic substances in beer bottling and this cloth offers 6 month shelf existence for beer. This era may be additionally carried out in packaging of gentle liquids (ETC institution 2004). In addition to liquids, positive meals gadgets such as processed meat, cheese, confectionary, and boil-in-bag ingredients can also be packaged according to this era. Other than the shelf life extension, there are numerous different blessings in Nano clays and Nano-crystals primarily based packaging. As an example, the weight of the Nano-based packaging is appreciably less and as a result it results in cut-off the transportation value. Significant boom in film electricity is also may be performed in these types of substances and this ends in make certain the protection of the meals stuff that is within the packaging. The maximum full-size limitation of this generation is that the Nano clays on polymers reduce the transparency of the packaging.

IX. **Nano-Based Sensors**

Environmental modifications leads to the deterioration of food product and also leads to boom the microbial hobby on meals stuffs and toxicant generation. Nano particles and Nano composites may be used to meals packages which can be act as reactive particles and pick out unwanted changes. These kinds of substances are considered as nanosensors.Nanosensors can discover precise chemical substances, pathogens and toxicants, with reaction to their level of incidence in food stuff.

Time temperature integrators, gasoline detectors for food spoilage and O2 sensors are the not unusual kinds of Nano sensors applied in food packaging. As an instance, Scientists at Kraft, Rutgers University and the University of Connecticut, have designed the “digital tongue” to come across pathogenic microorganisms and other substances in elements in step with trillion with the assist of embedded Nano sensors within the packaging substances using nanotechnology. The sensors can detect coloration modifications in the bundle when the food merchandise start to destroy

X.**Conclusion**

Researches screen that nanotechnology is a promising generation that facilitates in innovative tendencies inside the meals packaging. Application of nanotechnology in meals packaging shows sizeable enhancements in

the processing, shelflife, fitness and packaging functionalities, transportability, and decreased expenses. Nanotechnology can be applied in food packaging in many approaches. Most of this applications are nonetheless in the experimental or fundamental level and some are handiest restrained to excessive-cost merchandise.

Bio based packaging is one among such utility. Increased interest in environmental pollutants made bio based packaging an indeed generation. Bio based totally programs have changed the non-degradable polymers. The problems associated with these biopolymers are overall performance, processing and value. The Nano composite is evolved to triumph over those barriers of the biopolymers via nanotechnology. In starch to improve its first-class Nano composite is produced the use of MMT clay as Nano filler. The mixture of PLA and MMT layered silicate results in a Nano composite with better barrier houses appropriate for meals packaging.

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Particle Size Confinement of Hybrid Nanostructured Zinc Oxide / Polyaniline Matrix

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Abstract

Hybrid matrix of Zinc oxide/Polyaniline (ZnO/PANI) nanocomposite material was synthesized by typical oxidative polymerization which followed by Ultra-sonication treatment. Due to this post treatment of ultra-sonication radiation bombardment; particle size was reduce which causes confinement in particle size. This confinement of particle size reveled by XRD patterns, also it is found that at polymerization stage nanotube were formed. These reduce small sized hybrid nanostructured Zinc oxide/Polyaniline materialmay enhanceextensive properties like electrical and gas sensing properties.

Keywords: Hybrid ZnO/PANI, Ultra-sonication, X-ray diffraction, Particle Size, Confinement.

1. Introduction

The use of nano-sized materials, nano-composite materials and hybrid structurematrix nano-compositematerial are rapidly arousing interest in scientific community due its intensive properties like the surface-to-bulk ratio for the nano-sized materials is much greater than that for coarse materials [1]. In nano-sized materials, a large fraction of the atoms are present at the surface and hence the surface properties become paramount.

Since then, broad research has been carried out on nano-sized conducting polymers because of their excellent electrical, optical and sensing properties. These materials have broad application in areas ranging from anticorrosion coatings to chemical sensors and biosensors, light-emitting devices, and solar cells, as well as many others [2]. Among the variety of conducting polymers due to unique electrical properties, stability and easy fabrication process polyaniline is one of the most attractive materials. Because of these interesting properties, polyaniline has been a potential candidate in many applications [3, 4].

Semiconductor Metal oxide (SMOx) material like Zinc Oxide (ZnO), Titanium dioxide (TiO2), Magnesium Oxide (MgO) etc has many applications in electrical, thermal, optical and sensing devices. These materials are easily synthesized by using large variety of synthesis methods. These SMOx materials particle sized varies from bulk to nano- size; depending upon synthesis techniques and conditions during synthesis [5-7].

Now days, there are emergent interests to combine both organic and inorganic materials for applications in electro-optic [8-10]. Combination of nanosized metal oxides and conducting polymer has the potential to enhance the property of the hybrid complex matrix of metal oxide and conducting polymer. Such composites material enhances properties due to its optimized volume to surface ratio of nanosized metal oxides. The properties of nanocomposite materials depend not only on the properties of their constituents but also on their combined morphology and interfacial characteristics [9-12].

Among the various semiconductor oxides materials, Zinc Oxide (ZnO) has been chosen as the key sensing material. Zinc Oxide is among the extensively studied metal oxide outstanding because of their unique properties and important characteristics for example low cost, easy availability and wide range of applications

Polyaniline which can be synthesized either by chemical oxidization polymerization [13-15] or electro polymerization [16]. Conventional chemical polymerization is conducted by polymerizing aniline monomers in the presence of a free radical activator.In past two decades, a variety of methods have been used to synthesize polyaniline nanofibers, including electrospinning, interfacial polymerization, rapid- mixing,nanofibers seeding, templates and surfactants or oligomer-assisted polymerization [12].

In present work composite material of Zinc Oxide (ZnO) and Polyaniline (PANI) synthesized and structural properties were studied also on the basis of X-ray diffraction (XRD) patterns the property of particle size confinement was studied.

2. Experimental

I. Synthesis of Nanomaterial Metal Oxide: Zinc Oxide (ZnO)

All the chemicals used in this study were of GR grade purchase from Sd-Fine, India (purity 99%). The chemicals are used without any further purification. Synthesis method adopted from S.D. Charpe *etal*[17] liquid –phase method. Finally we get product of ZnO nanoparticles.

II. Synthesis of Conducting Polymer: Polyaniline

In present work, use International Union of Pure Applied Chemistry (IUPAC) method is used prepare polyaniline in which aniline hydrochloride (5.18gm) is dissolved in 100 ml distilled water to make up volume. Ammonium peroxydisulphate (11.42gm) is dissolved in 100 ml distilled H_2O in a volumetric flask. The solutions are kept for 1 hour at room temperature. The above solutions are mixed together in equally proportion with constant stirring [18].

The precipitated is collected by filtration and washed with 0.2 M HCl, to remove all residual monomers, oxidant and its decomposing products. Finally it is washed with acetone to removes low –molecular-weight organic intermediates and oligomers. It also prevents the aggregation of PANI precipitated during drying. The precipitated is dried at 60^0C for 12 hours. The resultant material is a polyemeraldine salt.

2.1.Synthesis of Nanocomposite (PANI/ZnO)

In the experimental work, there were syntheses of hybrid matrix of ZnO/PANI done. For this synthesis process *in –situ polymerization* method was adopted [17-20] to prepare nanocomposite of PANI/ZnO hybrid matrix. First we prepare 1 M HCl solution in distilled water. Here we used Zinc Oxide which prepared in steps I.

In preparation we add Zinc Oxide (ZnO) in 1M HCl solution to achieved 0.1 M gel solution of Zinc Oxide then this solution under treatment of sonication for 1 hour. Now prepared 100 ml 0.1 M Aniline hydrochloride Solution then add 10 ml sonicated ZnO solution. Again go for sonication for 10 minutes then add 100 ml Ammonium peroxydisulphate (APS) solution slowly with continues stirring, after 3 hours we achieved polymerization. This type polymerization is called as *in-situ Polymerization*[21-22].

After 3 hours filter, washed above solution with 1 M HCl solution and dried under vacuum for 12 hours. Hence, nanocomposite hybrid matrix structures of PANI/ ZnO were synthesized [21].The yield of synthesized ZnO/PANI nanostructure was found to be well proportion. To study particle size conferment effect, bombardment of Ultra-sonication radiation of specified voltage and for specific time intervals.Synthesized ZnO/ PANI nanostructure which were sonicated for 0 min(without sonication),10 min and 20 min time period named as 0 min ZnO (S_1), 10 min ZnO (S_2) and 20 min ZnO (S_3) respectively.

3. Results and discussion

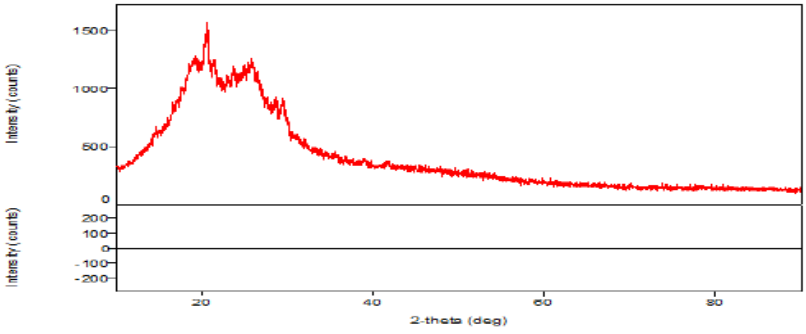
3.1. X-Ray Diffraction Studies

3.1.1 ZnO/PANI Composite

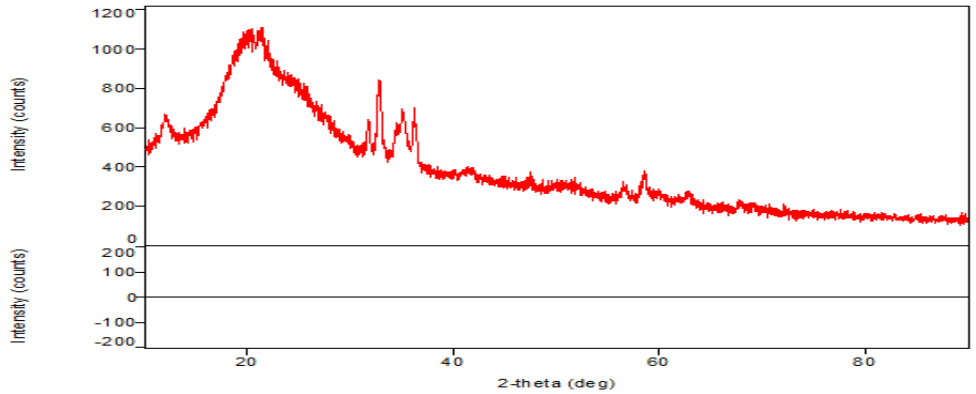
The main objective of the present investigation is synthesis of nanocomposite of ZnO/PANI. In present work three samples were studied and they are labelled 10% Zinc Oxide – Polyaniline (10%-ZP) [S_1], 15% Zinc Oxide – Polyaniline (15%-ZP) [S_2], 20% Zinc Oxide – Polyaniline (20%-ZP) [S_3].

The semi-crystalline structure of nanocomposite (ZnO/PANI) were characterized by powder X-ray diffraction (RigakuX-ray diffractometer) with Cu-α source and 2θ range of 10° - 90°.

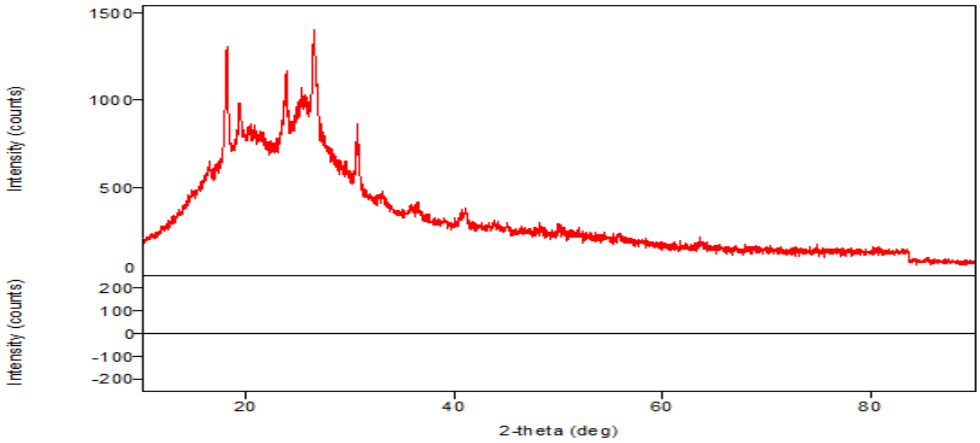
Figure 01 (a, b and c) shows X-ray diffraction patterns of synthesized nanocomposite samples of ZnO/PANI (S_1 to S_3).



(a)



(b)



(c)

Fig. 1: XRD Pattern (a) 10%-ZP, (b) 15%--ZP, (c) 20%-ZP

Left part of all figures 1(a) to 1(b) showscrystalline nature. The corresponding X-ray diffraction peak for (100), (002), (101), (102) (110), (103), (200), (112), (201), (004), (202) and (104) planes confirm the formation of hexagonal wurtzite structure of ZnO (DB card no.-2300013).Hence XRD pattern confirmed that synthesized ZnO are highly crystalline in nature [23].

The recorded XRD pattern figure 1 (a to c) confirmed that synthesized composite of ZnO/PANI Zinc Oxide/ Polyaniline are polycrystalline nature that is semi amorphous in nature [24, 25].One can see the presence of peaks corresponding to zinc oxide nanocrystallites. However, these peaks are slightly shifted, from their respective standard positions, may due presence of PANI matrix. This superficial property of the nanocomposites as has also been suggested by Tang *et al* [26] in the study of x-rays patterns of Polymethylmethacrylate (PMMA) and zinc oxide composites.

With increasing concentration of ZnO, a slight broadening in all the peaks corresponding to PANI is observed. The broadening is however more pronounced as the concentration of the zinc oxide increases in composites and as concentration of zinc oxides in polyaniline (PANI) increases crystallinity increases. The probable reason for this is influence induced on nanoparticles due to the surface effects arising from the surrounding PANI [27]. However, the presence of such polymer matrix seems to cause the decrease in the size of zinc oxide nanoparticles due to the formation of polymer-Zn complex on the surface of zinc oxide nanoparticles present within/on the surface of the nanocomposites. Various nanocomposites combinations showed similar peak patterns, therefore, it may be assumed that presence of polyaniline did not cause any change in crystal structure of zinc oxide or negligible change which may be ignored.

3.2. Effect of Ultra-Sonication on ZnO/PANI Matrix:

To compare the broadening of peaks obtained in case of different samples, XRD patterns are merged together. Further, the calculated average crystallite size of prepared samples is shown in Table 1.It was found that

average crystallite size decreases due to increase in sonication time interval [28-29]. The influence of thesonication time on the crystallite size was the main subject of interest here.

Furthermore, from XRD patterns can be seen that there little shift in diffraction peaks due to ultrasonic radiation treatment

Table1: Comparison of crystallite size among S_1, S_2 and S_3

Sr. No	Sample	2 Theta (degree)	FWHM Value (degree)	Crystallite Size (nm)
1	S_1	36.25	0.1022	85.46
2	S_2	36.41	0.1235	70.76
3	S_3	36.45	0.1485	58.85

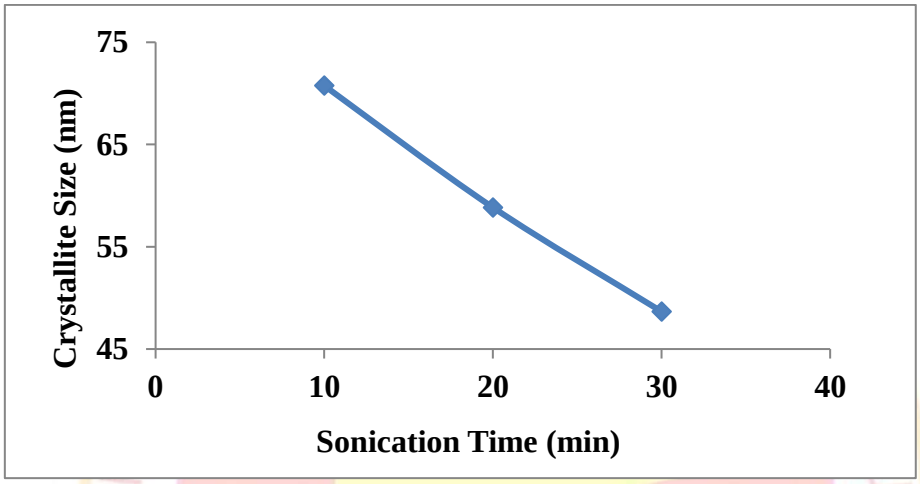
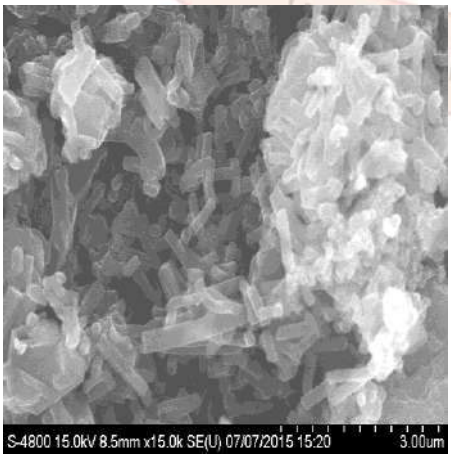


Fig. 2: Variation of crystallite size with sonication time.

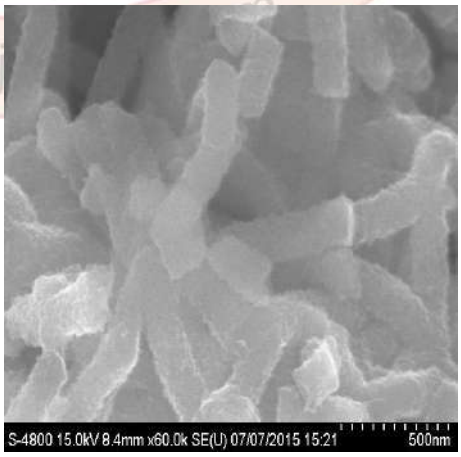
Figure 2 shows the variation of crystallite size of synthesized ZnO/PANI with its sonication time. It is seen that poly-crystallite size decreases with sonication time. So it observed that the mechanical influence produced by ultrasonic waves such as emulsification, stir, and others, could prevent the crystal growth and aggregation [30].

3.3. SEM of Nanocomposite PANI/ZnO

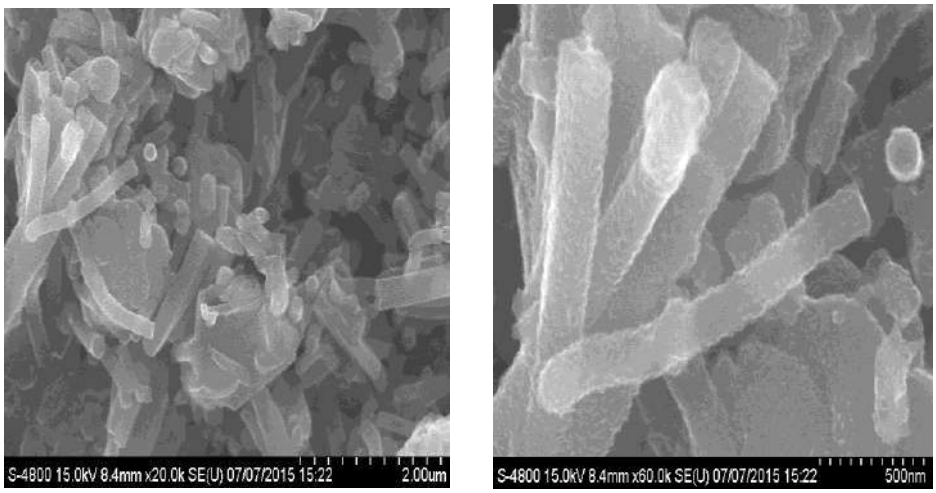
Figure 3(a, b, c & d) shows SEM micrograph of nanocomposite of zinc oxide and polyaniline at different resolution scale. From micrographs it is cleared that there were formation of nanotubes of nanocomposite material ZnO/PANI. It is observed that from SEMimage 3 (a and d) on head of polyaniline nanotube there is decomposition of nanosized Zinc Oxide. This is evidence for *in –situ polymerization* method of PANI and ZnO to synthesis nanocomposite of ZnO/PANI.



(a)



(b)



(c) **(d)**

Fig. 3 (a to d) SEM micrograph of ZnO/PANI at different resolution scale

4. Conclusions

The Pure Zinc Oxide, Pure Polyaniline and ZnO/PANI nanocomposites have been successfully synthesized. ZnO nanotubes were successfully covered with PANI by process of '*in situ'* chemical oxidative polymerization of aniline. Due to interfacial interactions between nanocomposite ZnO and PANI, there is formation of PANI and ZnO matrix. This type of hybrid material will use in many applications.

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Humidity Sensing Propertiesof PANI Doped Zinc Oxide Nanocomposites Thick Film Sensor

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Abstract

Over the last decades a variety of chemical sensors have been developed based upon semiconductors, which monitor different characteristic sensor properties such as conductivities for electronic conductivity sensors. In the present work Polyaniline is prepared by polymerizationof aniline under acidic condition. Zinc Oxide (ZnO) nanopartical prepaired by wet chemical method at room temperature using zinc nitrate and sodium hydroxide as starting material . ZnO nanoparticles were combined with conducting (PANI) polymer via polymerization in acidic aqueous solution to obtain a new type of inorganic – organic composites nanostructured . It is observed that PANI doped ZnO nanocomposites sensor shows a high response and sensitivity with good repeatability as compared to that of purePANI and ZnO nanoparticle.Theeffect of hysteresis is of the sensors, theeffects of pure and composite oxide on sensitivity of the sensors were studied. The crystallinity and the crystallite size were examined byX-Ray Diffraction technique.

Keywords: Polyaniline ,Zinc Oxide Nanocomposites,Humidity sensor.

1. Introduction

There is a growing demand for a sensing system that has high sensitivity, wide dynamic range, good stability, quick response, good reproducibility, simple structure and minimal cost. Metal oxide films sensitive to humidity have been reported earlier where sensing has been done using optical means. However, metal oxide humidity sensors depending upon measurements of electrical parameters require high temperature operation and consume significant amount of power.Humidity control and monitoring are of great interest to a wide area; these include moisture sensitive products, fresh and pack-age food, drug storage and environmental control for valuable Antiques or paintings etc. [1, 2]. Humidity sensors that are available in the market include dew point, infrared, catalytic and tin oxide-basedsensors, which may be expensive, or require high temperature operation and consume significant amount of power and high cost ofmaintenance [3].Much research has been focused on the development of humidity sensitive material [4–6]. Among these are the investigation of using conducting polymers such as polyaniline, polypyrrole, and polythiophene for humidity and gas sensing [7–9]. Advantages with polymers as sensing materials are light weight, flexible, low cost and simple fabrication process [10]. Pure polymer, polymer blends and polymer–inorganic composites have also been studied for the purposes, resulting in different degree of advancements in this area [11–16].

2. Synthesis of Material:

A) Synthesis of Polyaniline (PANI): In general is synthesized using two major polymerization approaches: electronic and chemical polymerization. In the present work polyaniline is synthesized by chemical polymerization method in which 0.2 M aniline hydrochloride is used as monomer unit. The synthesis is done by oxidative polymerization with 0.25 M ammonia peroxysulphate in aqueous medium. Bothsolutions kept 1 hour at room temperature then mixed in beaker, briefly stirred. And left at rest to polymerized , next day, the pani precipitate was collected on a filter , washed with three 100 ml portion of 0.2 M HCL and similarly with acetone . polyaniline hydrochloride powder was dried in air and then in vaccum at 60°c. Polyaniline prepared under these reactions and processing condition are further referred to as standard sample.

B) Synthesis of Zinc oxide (ZnO): It is prepared by the aqueous solution of zinc nitrate. And ispreparedbydissolving 0. 2M of zinc nitrate hexahydrate in 100 ml of distilled water .To this aqueous zinc nitrate solution 0.2 M sodium hydroxide is added and the reaction mixture was heated at 80°c along with stirring and the

process is carried out for four hour after which the white precipitate was obtained. The formed oxide wet precipitate is centrifuged Then the wet precipitate is washed with de-ionized water to remove impurity ions present in it and further heated in the oven at 150°c to dry the precipitate formed.

Characterization :The above synthesized PANI-ZnO composites are structurally and surface morphologically characterized by using different technique like X- ray diffraction (XRD),the x-ray diffraction patterns of the prepared samples are obtained by Siemens D 5000 X-ray diffractometer using CuKα radition (λ =1.717 A°). The diffractograms are recorded in terms of 2ᵬ in the range 40°-50° at ambient temperature with scanning rate of 2° per minute .The surface morphology of polyaniline and its composites are studied by using Leica's SEM (modal S 440) at 10kv.

Result And Disscusions:

XRD Pattern of ZnO

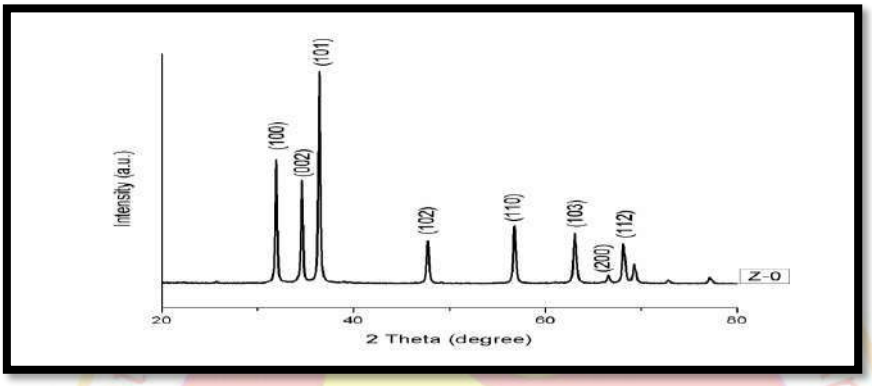

Fig. 1 XRD of Pure ZnO

XRD pattern of pristine zinc oxide (ZnO) nanostructure synthesized by liquid phase method via chemical wet reaction method were calcinated at 800ºC as shown in figure 1.The crystalline nature with 2θ peak lying at (100), (002), (101), (102), (110) and (103) planes. All the peaks match well the standard hexagonal wurtize structure of zinc oxide (ZnO) with lattice constants a = b = 0.3249 nm and c = 0.5206 nm [JCPDS card no. 36-1451]. All the peaks are perfectly match with pure ZnO structure, which indicates the high purity of the obtained ZnO nanoparticle. The average crystalline size was found to be 37.38 nm calculated by Deye-Scherrer formula.

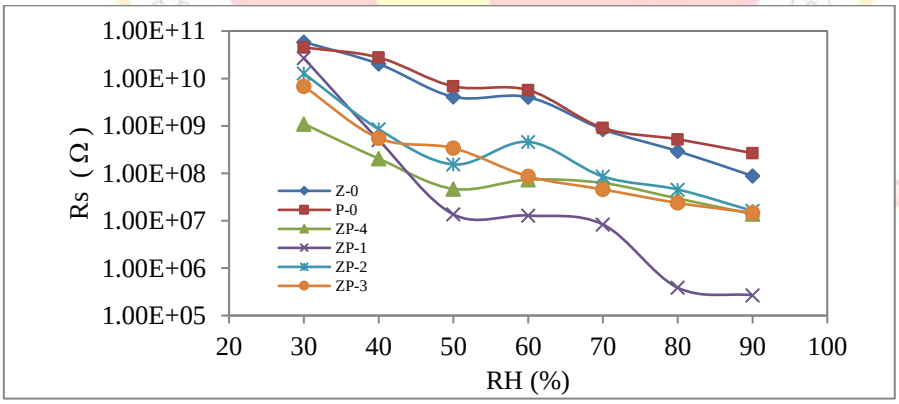

Figure: 2 Hysteresis plot

Hysteresis plot shows the variation between resistances of sample with respect to the relative humidity in increasing and decreasing order from 30 to 90 % RH as shown in the fig. 2. A very small hysteresis present during forward and reverse cycle of relative humidity, where as a very significant average change observed in the value of resistance of sample, in the sample ZP-1 (10ZnO – 90PANI) the change in value of resistance is from $10^{11}\Omega$ to $10^{5}\Omega$, these is a remarkable change in the value of resistance.

Sensitivity

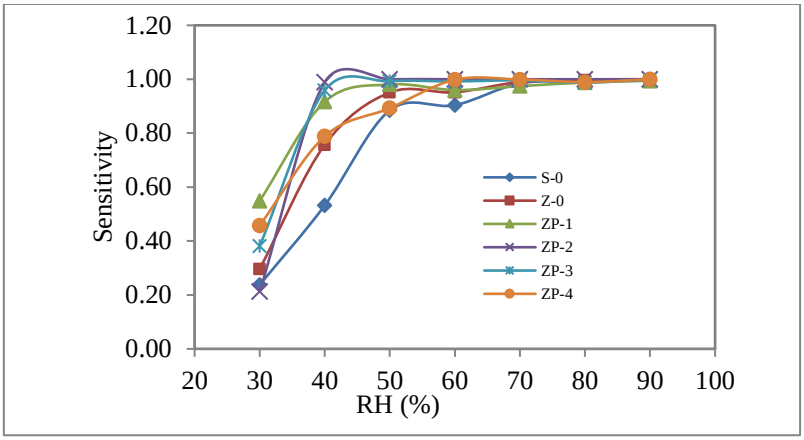

Figure: 3 Variation of sensitivity with Relative Humidity

In the above samples the sensitivity is found to be increasing with the RH for all the samples of thick films and it is increasing up to some particular RH and then afterward it remains constant as shown in fig. 3 For higher RH the sensitivity is found to be higher in case of all samples of thick films. The sensitivity of ZP-1 (10ZnO-90PANI) is more than ZP-2, ZP-3, and ZP-4 samples and also from the pristine samples P-0 and Z-0. The (ZnO-PANI) composite sensors exhibits significantly higher sensitivity than sensor constructed specially from ZnO nanoparticles and PANI itself due to the formation of heterogeneous interface between them and more adsorption site was created to absorbed more water vapours.

5. Conclusions:

Nanostructured ZnO was successfully prepared via chemical precipitation method and PANI with IUPACpolymerization technique. Minimum crystallite size was found to be for ZnO is 37.38 nm. The Hysteresis plot shows very significant average change in the value of the resistance from$10^{11}\Omega$ to $10^{5}\Omega$during forward and reversed cycles of sampleZP-1(10ZnO-90PANI). The sensitivity is found to be increasing with the RH for all the samples of thick films and it is increasing up to some particular RH and then afterward it remains constant.Amongst all the prepared samples ZP-1 is more sensitivity than other prepared composite samples.

References:

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Ba TiO_3 doped Polyaniline based Nanocomposites thick film senor for humidity sensing Application

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Abstract

Polyaniline (PANI) and $BaTiO_3$-Pani composites were synthesized by chemical polymerization method using ammonium per sulphate (APS) as an oxidizing agent. This is a single step polymerization process to synthesize the conducting polymer. Thick films of PANI and BaTiO3-Pani were fabricated by Screen – Printing followed by firing at 70º c for 30 min. BaTiO3-Pani thick films resulted in humidity sensor. An exceptional sensitivity was found to the relative sensor at 80º c and no cross sensitivity was observed to other hazardous and polluting gases ever at higher concentration. . The effect of microstructure and dopant concentrations on the gas response,Hysteresis , sensitivity, of the sensor in the presence of humidity were studied and discussed.

Keywords: *Polyaniline , Barium Titanate,BaTiO3-Pani composites , Humidity sensor.*

1. Introduction

The use of sensors by human being has been day by day increasing at an astounding rate in the last few years and modern society depends heavily on the use of the sensors for variety of purposes. Over the last decades a variety of chemical sensors have been developed based upon semiconductors, which monitor different characteristic sensor properties such as conductivities for electronic conductivity sensors, impedance for capacitance sensors, potentials for field effect sensors or temperatures for calorimetric sensors. For the determination of gas components, many of these devices make use of the same molecular detection principle. Depending on the operation temperature, their signals are caused by changes in the concentration of free electrons, dielectric constants, electrical fields and heats of adsorption or reaction. These changes result from physisorption, chemisorption, catalytic reactions, and surface or bulk defect reaction with particles from the gas phase.

There is a continuing need for accurate, reliable, inexpensive sensing systems for measuring relative humidity (RH), not only for human comfort but also for a broad spectrum of applications in chemical industry, process control, atmospheric sciences, agriculture etc. Humidity is one of the most common constituents present in the environment and its measurement is indispensable when it comes to monitoring of various environmental parameters. For instance, detecting organic pollutants in indoor atmosphere, organic vapour monitoring, maintenance of Green houses, performance of air/ smoke filters, hydrocarbon sensing are all affected by relative humidity conditions. Therefore, sensing and controlling relative humidity is of great importance [1].

In the recent years there has been significant progress in the field of polymer based humidity sensors. According to their sensing mechanisms these can be either resistive type or capacitive type. In addition to the traditional quaternary ammonium and sulfonate compounds, polymers containing phosphonium have also been studied for humidity sensing. Copolymers, mutually reactive copolymers and conjugated polymers have also been reported for humidity sensing. Conjugated polymers especially conducting polymers like polypyrrole, polyethylene, polypropylene etc. have shown humidity sensing properties [2]. Besides these metal-polymer nanocomposites for instance iron oxide-polypyrrole have also been reported for relative humidity sensing sensor. The present study deals with the humidity sensing application such as relative humidity, stability humidity, selectivity etc. of selected inorganic materials.

Humidity control and monitoring are of great interest to a wide area; these include moisture sensitive products, fresh and pack-age food, drug storage and environmental control for valuable Antiques or paintings etc. [3,4]. Humidity sensors that are avail-able in the market include dew point, infrared, catalytic and tin oxide sensors, which may be expensive, or require high temperature operation and consume significant amount of power

and high cost ofmaintenance [5].Much research has been focused on the development of humidity sensitive material [6–8]. Among these are the investigation of using conducting polymers such as polyaniline, polypyrrole, and polythiophene for humidity and gas sensing [9–11]. Advantages with polymers as sensing materials are light weight, flexible, low cost and simple fabrication process [12]. Pure polymer, polymer blends and polymer–inorganic composites have also been studied for the purposes, resulting in different degree of advancements in this area [13–19].

2. Synthesis of Material :

A) Synthesis of Polyaniline (PANI): In general is synthesized using two major polymerization approaches : electronic and chemical polymerization. In the present work polyaniline is synthesized by chemical polymerization method in which 0.2 M aniline hydrochloride is used as monomer unit . the synthesis is done by oxidative polymerization with 0.25 M ammonia peroxysulphate inaqeous medium . both solution kept 1 hour at room temperature then mixed in beaker ,briefly stirred. And left at rest to polymerize, next day, the pani precipitate was collected on a filter , washed with three 100 ml portion of 0.2 M HCL and similarly with acetone . polyaniline hydrochloride powder was dried in air and then in vaccum at 60°c. Polyaniline prepared under these reaction and processing condition are further referred to as standard sample[63].

B)Synthesis of Barium titanate ($BaTiO_3$): In preparation of barium titanate ($BaTiO_3$) 0.25 M $Ba(NO_3)_2$ solution and 0.25 M $TiO(NO_3)_2$ solution were dissolved in 2 N nitric acid solution in a beaker. About 0.6 M tartaric acid solution was then added to under constant magnetic string. The solution heated under continuous string to its boiling point until all the liquid evaporated. About 7 gm of ammonium nitrate was added towards the ends to avoid slurry formation. Brown fumes evolution takes places and fluffy mass were settled at the base of the beaker. The product is then dried in vacuum oven at 96^oC for 2 hrs. So that moisture will removed from the final product and we will get dry product. Then this dry product was crushed into fine powder and finally this fine nanopowder of $BaTiO_3$ was calcinated at temperature 800^oC for 5 hrs. in the auto controlled muffle furnace to remove the impurity form the product will be completely removed and get a final product of $BaTiO_3$ nanoparticle.

3. Experimental methodology for humidity: -

The humidity chamber/ stability chamber has stainless steel body purchased from Gayatri Scientific, Mumbai . The working size of humidity chamber is 50×43×430cm (H×D×W). The chamber having two open side door window namely inner side door and outside door, inner side is full length inner plexi glass door which is transparent and outer side door was metal door with magnetic gasket and lock . inside the chamber it has two trays, which are made of stainless steel. it has PID digital display temperature indicators which is outside at the top of the chamber , indicating the current temperature of the chamber .indicating the current temperature of chamber. The power sources of 230 V having frequency of 50Hz required. the temp[rapture range is ambient to 80 C. The chamber has temperature accuracy of ± 1.0 C .

The range of humidity varying from 40% RH to 80% RH having the accuracy of ± 3% RH. To operate the chamber a program feed for the varying RH as well as different temperature. Which will sets the controlled the humidity of set temperature for given time. To measure the humidity characteristics , the sensor element was placed inside the humidity chamber by operating the program at different RH and temperature the humidity was varied . The sensor element was placed inside the humidity was measured by standard hygrometer which is already placed inside chamber . The electrical resistance of the file was measured by using Keithley source meter (2400). The humidity and temperature of the chamber camn be controlled by using Bull's Eye control UK-100, it is a program controller for humidity and temperature verses time even controller .The UK-100 can be program by varing RH, temperature , time parameters. The total number of programs are 99out of this are set program for set temperature 40 C by varying RH 1 steps NO. Of program 8, event 0001, are tabulated

4.Characterization :

The above synthesized PANI-$BaTiO_3$ composites are structurally and surface morphologically characterized by using different technique like X- ray diffraction (XRD), and scanning electron microscopy (SEM).the x-ray diffraction patterns of the prepared samples are obtained by Siemens D 5000 X-ray diffractometer using CuKα radition (λ =1.717 A°). The diffractograms are recorded in terms of 2ꝏ in the range

40°-50° at ambient temperature with scanning rate of 2° per minute .The surface morphology of polyaniline and its composites are studied by using Leica's SEM (modal S 440) at 10kv.

X-Ray Diffaration

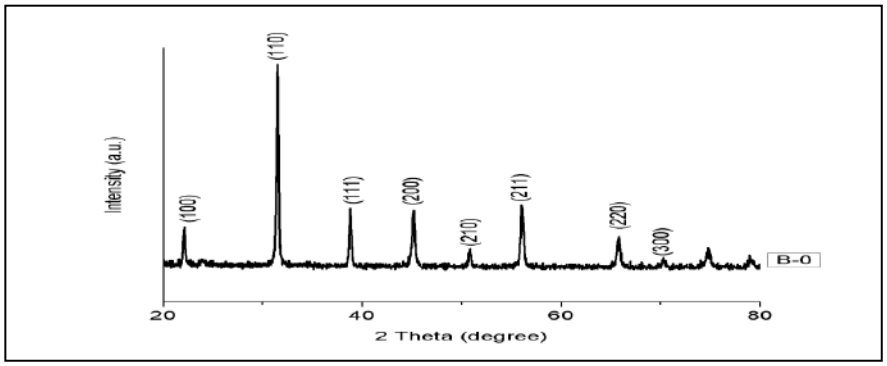

Figure: 1 XRD of ($BaTiO_3$) (B-0)

The XRD pattern of pristine Barium Titanate ($BaTiO_3$) nanostructure synthesized by liquid phase method via solid state method calcinated at 800ºC as shown in figure 1.The crystalline nature with 2θ peak lying at (100), (110), (111), (200), (210) and (220) planes. All the peaks match well the standard provskite type structure of Barium Titanate ($BaTiO_3$) with lattice constants a = 3.992 nm and c = 4.036 nm . All the peaks are perfectly match with pure $BaTiO_3$structure, which indicates the high purity of the obtained $BaTiO_3$nanoparticle. The average crystalline size was found to be 46.90 nm calculated by Deye-Scherrer formula.

Hysteresis plot :

Hysteresis plot shows the variation between resistances of sample with respect to the relative humidity in increasing and decreasing order from 30 to 90 % RH as shown in the figure. 2. A very small hysteresis present during forward and reverse cycle of relative humidity, where as a very significant average change observed in the value of resistance of sample, in the sample BP-1 (10$BaTiO_3$ – 90PANI) the change in value of resistance is from $10^{11}\Omega$ to $10^{3}\Omega$, these is a remarkable change in the value of resistance.

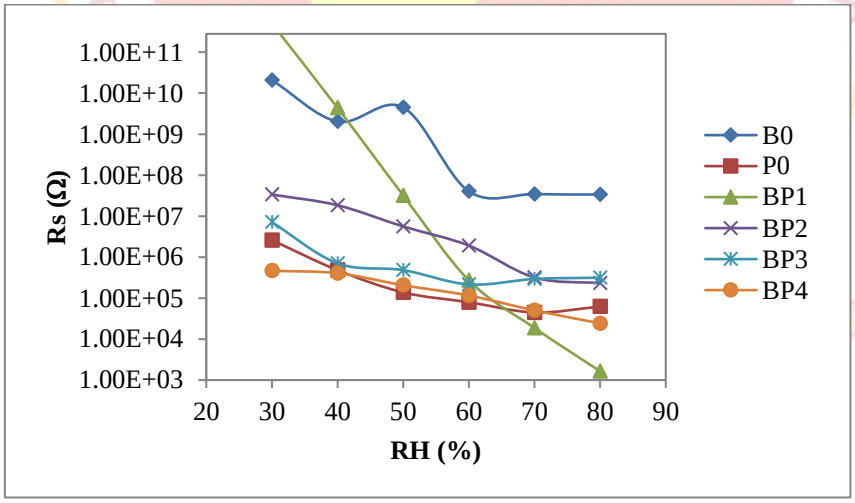

Figure: 2 Hysteresis plot

Sensitivity

In the above samples the sensitivity is found to be increasing with the RH for all the samples of thick films and it is increasing up to some particular RH and then afterward it remains constant as shown in figure 3. For higher RH the sensitivity is found to be higher in case of all samples of thick films. The sensitivity of BP-1 (10 $BaTiO_3$ -90PANI) is more than BP-2, BP-3, and BP-4 samples and also from the pristine samples P-0 and B-0. The ($BaTiO_3$-PANI) composite sensors exhibits significantly higher sensitivity than sensor constructed specially from Barium Titanate nanoparticles and PANI itself due to the formation of heterogeneous interface between them and more adsorption site was created to absorbed more water vapours.

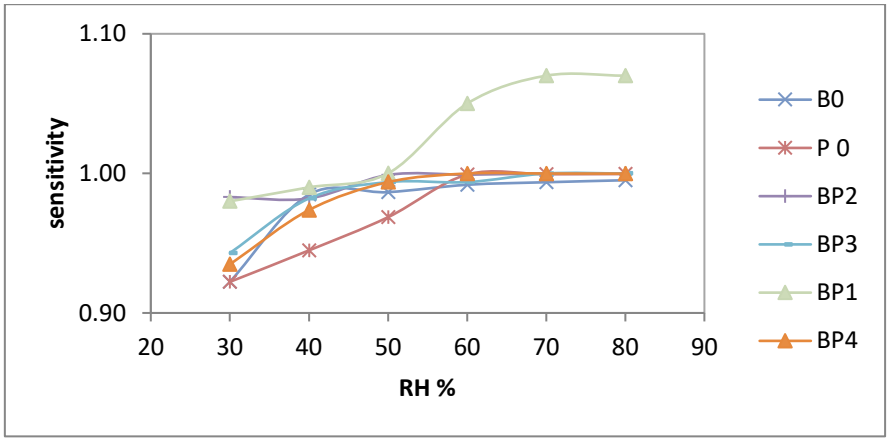

Figure: 3 Sensitivity curve

5. Conclusions

Nanostructured $BaTiO_3$ was successfully prepared via chemical precipitation method and PANI with IUPAC polymerization technique. Minimum crystallite size was found to be $BaTiO_3$ is 46..90 nm. The Hysteresis plot shows very significant average change in the value of the resistance from $10^{11}\Omega$ to $10^{3}\Omega$ during forward and reversed cycles of sample BP-1 (10 $BaTiO_3$-90PANI)). The sensitivity is found to be increasing with the RH for all the samples of thick films and it is increasing up to some particular RH and then afterward it remains constant. Amongst all the prepared samples BP-1 is more sensitivity than other prepared composite samples.

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Sol-gel Auto Combustion Synthesis and Characterizations of Cobalt Ferrite Nanoparticles

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Abstract
Cobalt ferrite ($CoFe_2O_4$) nanoparticles were successfully synthesized by sol-gel auto combustion method. Pure phase formation of cobalt ferrite with cubic spinel structure was observed in X-ray diffraction pattern. The average crystallite size, lattice parameter and other structural parameters were calculated from XRD data and they were in reported range. The magnetic parameters were measured by M-H hysteresis loop technique at room temperature and saturation magnetization, remenant magnetization and coercivity was estimated.
Keywords: *Cobalt ferrite, Sol-gel auto combustion,XRD, Magnetization.*

1. Introduction:
In order to meet today's technologies requirement, the development of new synthes is technique to develop new materials is essential which produces nanosized materials with superiormagnetic performance compared to that of bulk materials is desired. Different wet chemical methods areavailableforthesynthesis of spinel ferrite nanoparticles, suchas, chemical co-precipitation,sol–gel, hydrothermal, solvothermal, thermaldecomposition and microwavecombustion methods[1, 2]. These wet chemical methods are economic, easy, requires less time and low temperature, produces particles of nanometer dimensions and therefore now a days commonly used in the synthesis of magnetic nanoparticles of spinel ferrite.

Amongst these wet chemical methods, thesol–gel auto-combustion technique is one of the most convenient and effective method, involving a low reaction temperature(80°C–100 °C) and a rapid turn-around time for powder synthesis[3]. In the variety of spinel ferrite materials, cobalt ferrite is the unique spinel ferrite with inverse spinel structure, in which Co^{2+}ions occupy an octahedral [B] site. The high saturation magnetization,high permeability,high electrical resistivity,high Curie temperature, high magneto-crystalline anisotropy etc are the notable properties of nanocrystalline cobaltferrite[4].These properties are useful in many applications including magnetic recording media, magnetic sensors, magnetic memories, magnetic fluids, magnetic composites and catalysis, antennarods, permanentmagnets etc[5].

Thus, the present work reports on synthesis of nano-crystalline spinel structured cobalt ferrite sample by sol-gel auto combustion method using citric acid as a fuel. The results on structural, morphological and magnetic properties are reported in this work.

2. Experimental
The nano-crystalline cubic spinel structured cobalt ferrite ($CoFe_2O_4$) sample was prepared by sol-gel auto combustion method using citric acid as a fuel. AR grade chemicals such as cobalt nitrate ($Co(NO_3)_26H_2O$), ferric nitrate ($Fe(NO_3)_39H_2O$) and citric acid ($C_6H_8O_7$) were used for the synthesis. The metal nitrates to fuel ratio calculated using propellant chemistry was taken as 1:3. Ammonia solution was added to maintain the pH of the solution at 7. The as-synthesized powder is sintered at 550°C for 4 h and then used for further investigations. The detailed procedure is reported in the literature[6].

The prepared sample was characterized by X-ray diffraction (XRD) technique by Regaku model. The XRD patterns were recorded at room temperature in the 2θ range of 20° to 80° using Cu-Kα radiation (λ = 1.54056 Å). The magnetic properties of the cobalt ferrite sample were measured using pulse field hysteresis loop technique at room temperature.

3. Results and Discussions
3.1 Structural characterizations
The room temperature X-ray diffractions patterns of un-irradiatedand irradiated $CoFe_2O_4$ ferrite nano-particles are shown in Fig. 1. All the reflection peaks in the XRD pattern were indexed by using Bragg's law. The presence of planes (220), (311), (222), (400), (422), (511) and (440) in the XRD pattern reveals the cubic spinel structure of all the samples.It is also evident that all the reflection peaks are intense and sharp. No impurity peaks were observed thus the samples are single phase in nature[7].

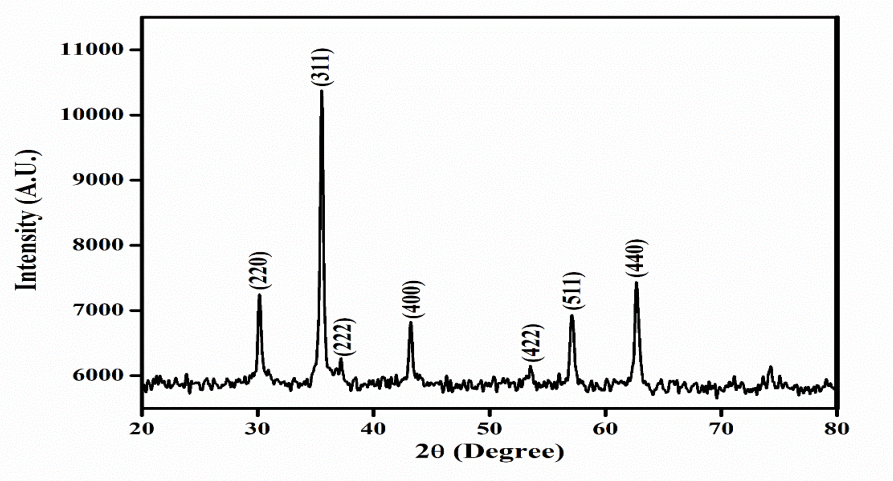

Fig.1. X-ray diffraction pattern of $CoFe_2O_4$

The Lattice constant (a) values of the cobalt ferrite samples was calculated using standard relation,

$$a = d\sqrt{(h^2+k^2+l^2)} \quad Å$$

where, (d) is interplanar spacing;(h k l) is Miller Indices.
The obtained values of the lattice constant (a) are tabulated in Table 1.
The unit cell volume (V) was calculated by using the following equation

$$V = a^3 \quad Å$$

where, V is the unit cell volume, a is the lattice constant.
The X-ray density (d_X) was calculated by using the relation and values are summarized in Table 1;

$$d_x = \frac{Z \times M}{V \times N_A} \text{ gm/cm}^3$$

where, Z is the number of molecules per formula unit (Z = 8 for spinel system),M is molecular mass of the sample,V= $a^3$is the unit cell volume,$N_A$is the Avogadro's number.

Table 1. Lattice parameter (a), Average particle size (t), Unit cell volume (V) and X-ray density (d_x) of $CoFe_2O_4$

a (Å)	**8.28**
t (nm)	26
V (Å^3)	588
d_x (gm/cm^3)	5.19

The crystallite size of cobalt ferrite powder was calculated using the Debye-Scherer's relation for small and uniform sized cubic crystals mentioned below;

$$t = \frac{0.9\lambda}{\beta \cos\theta}$$

where, λ is wavelength of the Cu-Kα radiation, β is the full width of the half maximum, θ is Bragg's angle. The obtained values of the particle size are presented in Table 1 and are having good agreement with the literature [8].

Magnetic characterizations

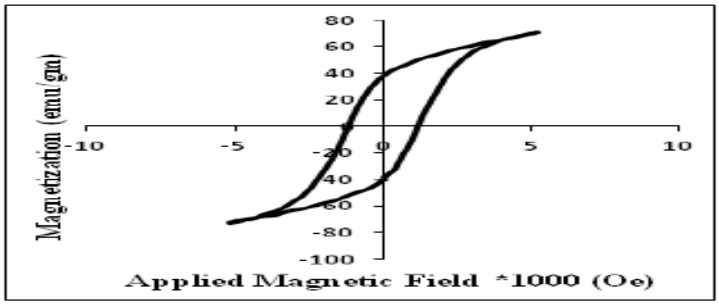

Fig. 2 The M-H plot of the $CoFe_2O_4$nanoparticles

The magnetic properties of present cobalt ferrite sample were recorded using pulsed field hysteresis loop technique at room temperature with the applied field ranging upto 1000 kOe is shown in Fig. 2.Saturation magnetization(M_s), remenance magnetization(M_r) and coercivity(H_c) values are reported in Table2. The magnetic hysteresis(M–H) loop confirms that the sample possessferro magnetic performance with soft magnetic nature[8, 9].

Table 2: Saturation magnetization (M_s), coercivity (H_c), remenance magnetization (M_r) of cobalt ferrite nanoparticle

M_s (emu/gm)	M_r (emu/gm)	M_r/M_s	H_c (Oe)
68.70	40.50	1.69	1096

4. Conclusion

The spinel structured cobalt ferrite nanoparticles were successfully synthesized by sol-gel auto combustion method usingcitric acid as a fuel. Pure phase formation of spinel type cobalt ferrite with no impurities was observed from X-ray diffraction pattern. The average crystallite size of the prepared sample was found to be 26 nm. The values of saturation magnetization (M_s) and coercivity (H_c) were found to be 68.70 emu/gm, and 1096 Oe respectively.

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Study of thermal properties of Polyaniline-Poly vinyl acetate blend

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Abstract

An attempt was made to study the thermal properties of Pani-PVAc blend. Pani-PVAc blends were prepared by chemical synthesis method. Thermo gravimetric analysis was carried out for various polymers to determine the wt. loss at different temperatures. The themal analysis of pure conducting polymer was recorded for comparison as original standard. TGA/DTA data shows that, interaction between the polymers, altered the rate of degradation and wt. loss decreases as the PVAc concentration increases in the blend i.e. thermal stability increases. The decrease in wt. loss was observed from 68.75% to 52%.

Keywords: Pani-PVAc blend, Chemical synthesis, TGA/DTA.

1. Introduction

In last few decades, there has been a great deal of increasing interest in the synthesis and characterization of conducting polymers because of their applications in organic batteries, sensors, microelectronic devices, electro catalysis and also their electrical, electrochemical and optical properties [1].

Earlier the blends of PVC and PPy were prepared by oxidative chemical polymerization of pyrrole with an oxidizing agent $FeCl_3$. Ionic conductivity study of such material was carried out and studied the effect of oxidizing agent on conductivity of the films [2]. Polyvinyl acetate (PVAc) is used extensively in coatings, adhesives [3] and films. The carbonyl group (C=O) in the structure of PVAc forms hydrogen bonding (like polyamide) with amine and hydroxyl groups and this may also enhance miscibility with polyaniline. Hence, PVAc has been chosen for blending with Pani.

There are many methods of blending polymers but only limited techniques can be applicable for conducting polymers. PVAc is soluble in high dielectric constant solvent such as methanol. However, Pani is not soluble in this solvent even after modification with suitable dopants. Hence, a new method has been adopted for blending these two components [4].

2. Experimental

Poly vinyl acetate obtained (M.W. 40000), 2 gram dissolved in 100 ml methanol was taken in a beaker. To that, 0.51 gram of monomer aniline (0.005M) and 5 ml of 1 N HCL solution were added. About 25 ml of 0.1 M initiator ammonium per sulphate was added slowly to the above reaction mixture under constant stirring. Similar reactions were carried out with aniline concentration of 0.01M, 0.02M and 0.05M and 10 ml of 1N HCL, 20 ml of 1N HCL, 50 ml of 1N HCL solution. The aniline to ammonium per sulphate molar ratio in all the above reactions was 1:1, so as to reproduce same conditions in all cases.

The polymerization of aniline was carried out simultaneously in each vessel. The reaction was carried out at ambient temperature for 10 Hr. The blend was precipitated in distilled water, filtered, washed with distilled water several times and dried in a vacuum till moisture was removed. The green mass of each composition of the blend was crushed in mortar and pestle to a fine powder.

Thermo gravimetric analysis was carried out for various samples to determine the weight loss at different temperatures. All the measurements were carried out using TG/DTA (Seiko II SSC 5100 Japan model). The samples used were in the form of powder and tested under nitrogen atmosphere at the rate 10^0/min from room temperature to 500^0 C.

3. Results

The interaction between the polymers can also be noted from the degradation curves through TGA studies. Given figure shows the wt. loss and thermal stability in the blend. Thermogram was scanned under the nitrogen atmosphere at the rate of 10^0/min (heating) and the temperature range were 25^0C to 500^0C. Thermal data is given in the table. The TGA curve of Pani and PVAc shows three steps wt. loss. The first wt. loss in both the prestine polymers at 150^0C to 300^0C was owing to the loss of absorbed moisture and solvent from room temperature to around 300^0C. The second stage occurring at 350^0C, decreased from 68.75^0C to 52^0C and the broad DTA peak of PVAc shows that the melting owing to the loss of acid dopant in Pani salt, as there is very less interaction between N atom and Cl atom and degradation of PVAc chain. The final degradation of the polymers occurs from 350^0Cto 500^0C. S. H. Goh, etal [5] has studied the TGA of the same blend film. It was observed that the nature of the degradation pattern matches very closely to our data.

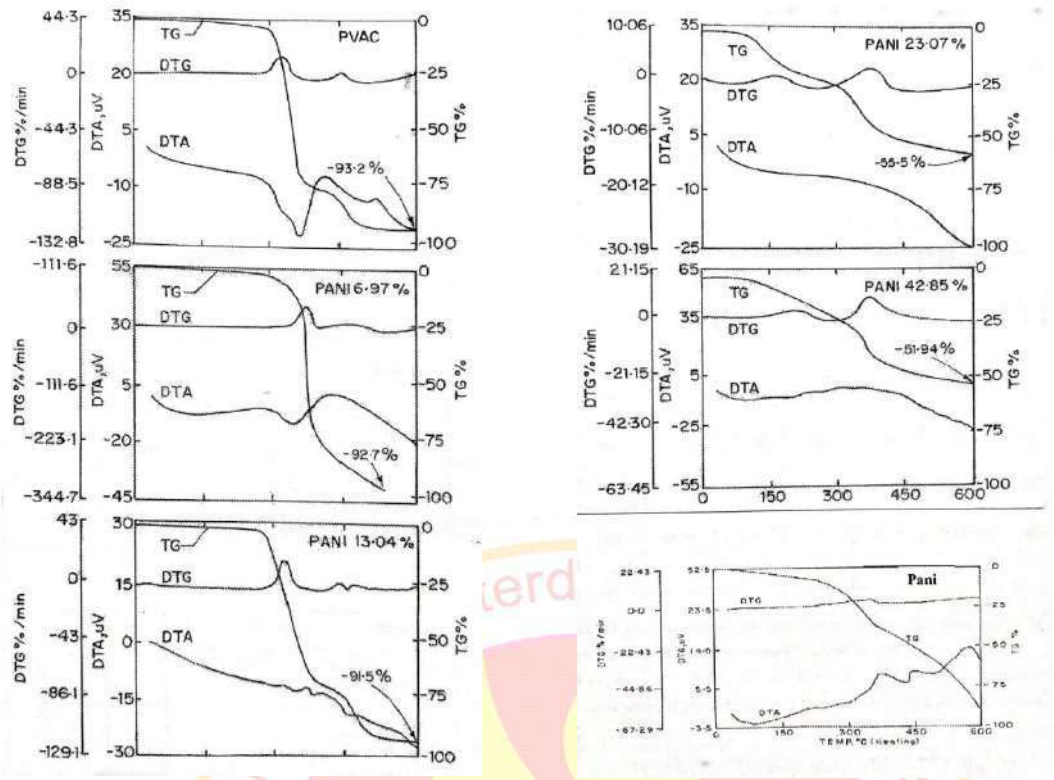

Figure: Thermogram of Pani-PVAc blends

It was noticed that as the percolation of Pani in the blend is increased, the wt. loss decreased from 68.75^{0}C to 52^{0}C and the broad DTA peak of PVAc shows that the melting temperature was reduced on modification. From the thermogram it was observed that the blend shows the improvement in thermal stability.

Table: Thermal data of Pani-PVAc blend

S.N.	Temp (^{0}C)	PVAc wt. loss in %	Pani (3%) wt. loss in %	Pani (7%) wt. loss in %	Pani (13%) wt. loss in %	Pani (68%) wt. loss in %	Pani wt. loss in %
1	100	1	1	1	3	2	3
2	200	4	2	6.25	14	13.50	6
3	300	10.50	36.50	29	26	30	18
4	400	37	44	48	43.75	43.50	40
5	500	68.75	63	72	56.25	52	60

As the PVAc concentration increases in the blend, and blend concentration follows the same trend of degradation pattern as observed in PVAc. The wt. loss found in the blend concentration is not observed in prestine polymers, suggesting the presence of interaction between the polymers, which alters the degradation pattern.

4. Conclusion

TGA/DTA data shows that, interaction between the polymers, altered the rate of degradation and wt. loss decreases as the PVAc concentration increases in the blend i.e. thermal stability increases. The decrease in wt. loss was observed from 68.75% to 52%.

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Recent Advancement of Electrochemical Biosensors Based On Conducting Polymers: A Mini Review

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Abstract :

Day by day humans life style become fast due to this fast life style people forgot to take care of their health. From the health care point of view the development of biosensors is necessary. The various conducting polymers showed prominent response in the field of biosensing due to their great electrochemical, physical, optical and thermal properties. The many researchers try to enhance the sensitivity by adding the dopant or taking their composition such as TiO2, SiO2 andMnO2 etc. These mini-reviews give the information about recent development in the field of electrochemical biosensors based conducting polymer. Also tell us about the process of biological sensing and their different electrochemical technique for detection.

Keywords : electrochemical biosensors, paper based biosensor, urea biosensor, glucose biosensor, cancer biosensor.

1.Introduction

The health care point of view biosensing is necessity in our everyday life. Now a day's world suffering from most silent health related issues one of them is diabetes can damaged the heart, blood vessels, eyes, kidneys and nerves, leading to disability and premature death [1]. Generally most of the patient insulin which is utilized by the cell to get glucose inside cell decreases so that cell cannot utilize glucose. Hence the sugar level in the blood increases. The patient health is depends on glucose concentration that related to the symptoms of diabetes mellitus [2]. The classification of various types of biosensors which are shown below.

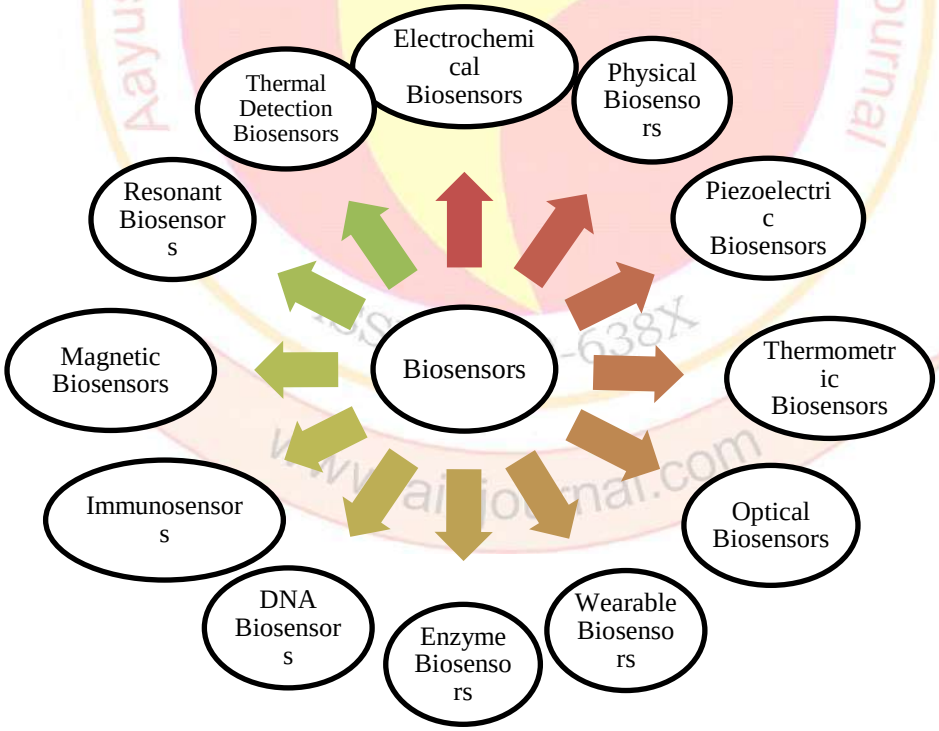

Figure1.https://www.elprocus.com/what-is-a-biosensor-types-of-biosensors-and-applications/

Paper based diagnostic technologies are affordable, robust, rapid, user friendly and scalable for manufacturing for the determination of blood glucose in real time is very important for diabetic patient [3]. Polymers are studied in the different field of polymer science that is polymer chemistry and polymer physics, biophysics and materials science and engineering. Conducting polymers are attracted more interest in the field

of gas sensor, biosensor, actuators, super capacitor and electronic devices due to their unique attribution, ease of production and often ductile nature and light weight [4]. A variety of conducting polymer such as polyaniline, polypyrrole, polythiophene and PEDOT (Poly-3,4ethylenedioxythiophene) has given more attention toward nanoscience and nanotechnology [5]. There are a lot of progress remain in the field of biosensor. Now a day's researcher focus on PEDOT polymer has been a significant and promising one of the conducting polymers family due to its high electrical conductivity, superior optical transparency, long term electrochemical stability, highly mechanical strength and very less study has been happened using graphene and titania nanoparticles [6]. The homogeneous entrapment on the paper, antistatic and electrochemical property has turned a new page for the paper based biosensing application [7-9]. Different type of oxides are radially used in the field biosensor such TiO_2, MnO_2, ZnO_2, iron oxide and phytic acid. Titania is identifying better dopant in the PEDOT-PSS polymer to enhance the conducting ability by several order of magnitude and biosensing and humidity response due to its porous morphology. Moreover reliable glucose detection methods with high sensitivity, excellent selectivity, good stability, fast response and portability have been the focus of scientist [10].

1. Electrochemical Biosensors

The biosensor is device of biological recognition element using transducer [11]. The basic principle of electrochemical biosensors that convey the biological signal such as enzymes, tissues, cells etc. that can detect with the help of transducer element then transducer signal may converted into an electric signal and amplified with the help of detector circuit; get physical parameters and measurements from computer software for the analysis [12].

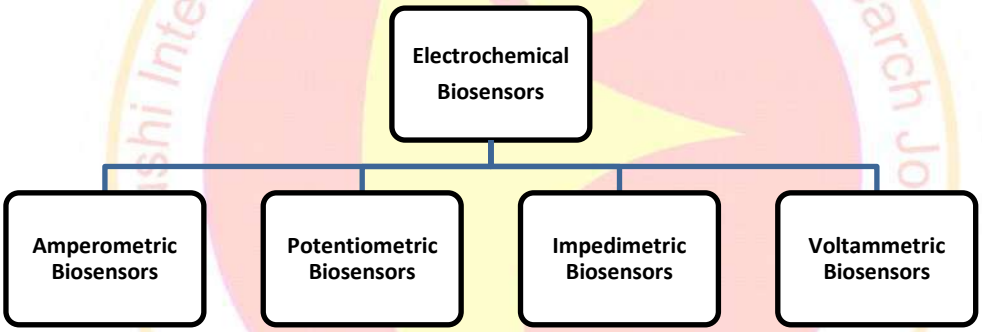

Figure 2. These show the different types electrochemical biosensors.

The commonly used paper substrate for the fabrication of electrochemical biosensors is whatman No.1 chromatography paper. This whatman paper having uniform structure, excellent wicking properties, smooth surface, high content of α- cellulose and free hydrophobic binders [13]. Researcher have special attention towards that certain enzymeless glucose sensors have numerous advantages of high sensitivity, simplicity in the development, high stability and no need to be immobilize enzyme [14].

2. Process of Biological Sensing:

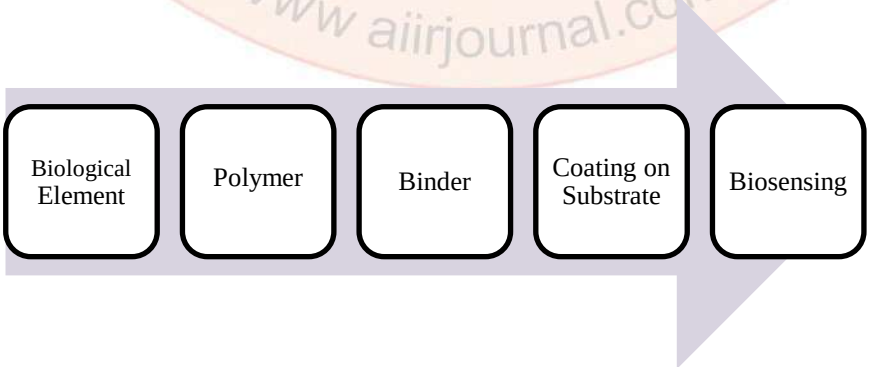

Figure 3. These show the procedure of biological detection.

Firstly take the biological element (e.g. glucose oxidase, antigen, H_2O_2, etc.) that use as sensing then this element attach to the surface of polymer with the help binder (e.g. n- butyl carbitol , ethyl cellulose, polyvinyl alcohol, etc.) after that it will be coated with the help of different method such as layer by layer [15], chemical bath deposition [16] , spin coat [17] and SILAR [18]. The biosensing response check by using electrochemical method. To increase the efficiency and capacity of the biosensor system certain dynamic and static measurement are necessary. Selectivity, sensitivity, linearity, response time, stability and reproducibility are the different characteristics of biosensors [19].

4. Biosensors:

According to the properties there are various types of biosensors and their recent development in most focus biosensor can be discussed as follows.

1] Urea Biosensor:

X. Hung and his team developed a disposable conducting paper based analytical device for measuring the salivary uric acid in human body based on electropolymerization of PEDOT and graphene composite on the ITO substrate. The electrochemical behavior of uric acid at different working electrode was determined by cyclic voltammetry in PBS with Ph 7.5. The linear range for uric acid detection is 2-1000 µM. The result indicated that the developed device is promising for non invasive monitoring of salivary uric acid [20]. The researcher Zhybak M. and his coworker developed creatinine and urea biosensors based on polyaniline-Nafion-Cu composite.Immobilisation of enzymes was shown the important step in the development of biological sensor. The electrochemical measurements done with the help of three electrode system and analytical performance were measured. It shows high selectivity for creatinine and urea biosensor. The sensitivity of urea and creatinine biosensor are found to be 112±3.36 mA $M^{-1}cm^{-2}$ and 85±3.4 mA M^{-1} cm^{-2}.The response time for analytes to be 15 sec and limit of detection foun to be 0.5 µM. The linear concentration range to respond the biosensor to be 1 to 125 µM [21]. Singh A.K. and his team studied urea biosensor and its application in milk sample. This sensor developed with the help of Fe_3O_4/MWCNT- polyaniline nanocomposite film. This composite polymer with enzyme characterized by scanning electron microscope, fourier transform infrared shows strong sharp band around 1031.09cm^{-1} and different electrochemical techniques were used for the analysis. The linear range of urea biosensor found to be 1.0-25.0 mM with detection limit 67 µM. The biosensor response gives great result up to 40 days with 90% activity and it can be responded up to 60 days with 70% activity [22]. The researcher Botewad S.N. and his coworker reported about fiber optic urea biosensor modified by polyaniline-cladding. The active cladding was obtained by depositing uniform layer of polyaniline. In UV-vis spectrum shows two peaks at ~ 227nm and 280 nm. The two broad diffraction peaks occur between 20 and 40°. The exposure time response for each concentration of urea solution was ~120 sec. It shown variation in absorbance at ~250 nm with different concentration urea sample. The stability of sensor tells us about that the sensor is stable about 28 days. It shows lower sensing limit up to 100 nm [23].

2] Cancer Biosensor :

S. Kumar and his team developed a flexible, lightweight and disposable paper based elctrode modified with nFe_2O_3:PEDOT:PSS for the detection of carcinoembryonic antigen (CEA), a cancer biomarker. The electrochemical response measured with the help of chronoamperometry method and concluded the sensitivity of 2.1µAng^{-1}mL.cm^{-2}which is nearly 4.8 times lower than electrochemical paper electrode. The electrical conductivity was found to be 2.4 ×10^{-2} Scm^{-1}. The proposed electrode was verified by ELISA for the CEA detection in serum sample of cancer patients [24]. S. Kumar and his team developed PEDOT-PSS and reduced grapheme oxide (RGO) composite based paper sensor studied for cancer biosensor. The incorporation of RGO into the conducting paper results in improved electrochemical performance and signal stability. The conductivity found to be 1.16×10^{-4} S$cm^{-1}$to~3.57×10^{-2} Scm^{-1}(nearly 300 times increases) on the treatment with ethylene glycol increase in electrical conductivity is due to the conformational rearrangement in the polymer [25]. Kivrak E. and his Coworker studied aptamer based electrochemical biosensing on human non small cell lung cancer. The sensing response done by using polyacrylonitrile and polypyrrole polymers with the help of nanofiber modified disposable pencil graphite electrodes. The surface morphology of composite nanofibers was confirmed

using scanning electron microscopy. Analytical performance of the aptasensor achieves high sensitivity and sample of optimization condition were tested. The aptasensor showed low detection limit of 1.2× 10^3cells/mL [26]. Soni A. and his team gives information about cancer biomarker detection. The sensing of cancer biomarker done with the help of polyaniline-MoS_2 hybrid nanostructures. The composite material detect the chronic myelogenous leukemia (CML) using electrochemical impedance spectroscopy method. The composite material has wide range of target DNA concentration (10^{-6}-10^{-17}M).The low limit of detection found to be 3×10^{-18} M. This biosensor was found the high stability of 6 weeks and retained 87.5% to the original signal [27].

3] **Glucose Biosensor:**

L. Yang and his co-worker studied an electrochemical two step synthesis route to produce CuNPs(copper nanoparticale) /PEDOT/PA(Phytic acid) nanocomposite through electrochemical oxidation of EDOT and PA substrate and reduction of CuNPs. This shows a wide analytical range (5-403µM), high sensitivity upto 79.27 $\mu A.\mu M^{-1}.cm^{-2}$, low detection limit of 0.278µM and response time of the glucose sensor 4 sec. The hospital provided glucose value 3.8mM, 5.5mM, 7.5mM and biosensor detected values 3.6mM, 5.3mM, 7.6mM matches approximately 98% for enzymeless glucose sensing [28]. J. Liu and his co-worker studied organic thin film transistor for glucose sensor with the help of spin coating technique using PEDOT conducting polymer film. This showed that a linear increase in the OTFT drain current was observed resulting from the increase in glucose concentration. This developed glucose sensor showed rapid response time within 20 sec and give high sensitivity of 1.65 µA per mM. The result was indicated that the OTFT based glucose sensor retain the enzyme bioactivity [29]. Z. Amirzadeh and his co-worker developed a non-enzymatic glucose sensor based on a pencil graphite electrode (PGE) using PEDOT-PSS/CuO/MWCNTs composite. A cheap electrode, as well as simple modification process, make the developed glucose sensor economic as the modifier film were simply prepared by drop coating of the modifier suspension on the surface of a pencil graphite electrode. At an applied potential of +0.70V gave an acceptable sensitivity of 663.2 µA $mM^{-1}cm^{-2}$ in wide linear range upto 10mM [30]. Popov et.al. has prepared, rGO in combination with PANI,Nafion and Gox for an amperometric biosensor. The developed glucose biosensor showed a wide linear range (0.5-50) mM, low limit of detection 0.089 mM, good selectivity, better reproducibility, and good stability. The PANI nanostructure and rGO dispersion is proved to be an excellent material for the glucose biosensor [31]. Yang J and his team developed non-enzymatic an amperometric glucose biosensor. The investigation done with the help of polypyrrol nanowires electrode loaded with nickel hydroxide nanoflakes by chemical bath deposition method on substrate. The surface morphology of the composite material characterized by scanning electron microscopy and verified by X-ray photoelectron spectroscopy. The electrochemical behavior showed excellent performance and result tell us about the current was increased from 0.4 V to 0.7 V in glucose solution. The sensing characterization was evaluated by its dynamic detection range, stability, selectivity and reproducibility.The performance of the glucose biosensor detected range of 0.001-4.863 mM with sensitivity 1049.2 $\mu A\cdot mM^{-1}\cdot cm^{-2}$ and low detection limit found to be 0.3 µM [32]. Sheng L. and his team developed enzyme-free glucose sensor with novel nanocomposite of Ni(OH)2 over reduced graphene oxide and PEDOT with the help of electrodeposition method and show that Ni(OH)2 nanoparticles uniformly deposited on PEDOT-RGO hybrid film for detecting glucose. This sensor gives ultrafast response time (< 1 S), low detection limit, a wide linear range up to 7.1mM and the sensitivity found to be 346 µA mM^{-1} cm^{-2} [33]. Paul G. and his coworker developed the conducting paper-based biosensor using PEDOT-PSS grafted reduced graphene oxide-titanium dioxide [rGO-TiO2] nanohybrid. The different dopant like ethylene glycol, methanol and glycerin were doped and their effect on the conductivity of sample was investigated. Electrochemical results show that modified conducting paper (CP) shows high sensitivity with a low limit of detection 0.01mM [34]. The information regarding the other biosensor can be given in the following table.

Table : The below table represent the development in biosensor based conducting polymer.

Sr. No.	Material	Biosensor Analyte	Limit of Detection	Stability	Response Time	Linear Range	References
1.	(P(3HT-co-3TAA))	Urea	5mM	-	6 min	1.3-3.5 mM	[35]
2.	polythiophene-AgBr (PT-AgBr)	glucose	310 nM/10.4 µA mM^{-1} cm^{-2}	14 days	<1 min	370 nM/756 µA mM^{-1} cm^{-2}	[36]
3.	PANI-MMT	glucose	0.1 µM	40 dayes	-	10 µM-1.94mM	[37]
4.	Polythiophene	small RNA	0.7 pM miR-221	-	1.2 h	1-100 pM	[38]
5.	functional Polythiophene	cancer cell (sialic acid)	10 cells mL^{-1}	-	10 min	$1x10^1$-$1x10^6$ cells mL^{-1}	[39]
6.	pdAg NSPs-PPy	Dopamine	0.0258 -0.0860µM	-	-	0.001-200 µM	[40]
7.	Pt-PPy-Uri-Grap	Uric acid	0.541nmol^{-1}	-	-	0.002 to 0.024 nmol^{-1}	41]
8.	Ppy-CS-TiO_2	non enzymatic Glucose	614µM	14 days	<3 sec	1-14 mM	[42]
9.	PPY-(MWCNT-COOH)	DNA	0.08 µmol L^{-1}	15 days	150 sec	0.2–100.0 µmol L^{-1}	[43]
10.	PPY-NrG	epirubicin	1.0nM	-	-	0.004-55.0 µM	[44]
11.	PPy-PtPd	H_2O_2	(sensitivity)	60 days	-	2.5-8000 µM 1360.83 µA.mM^{-1}.cm^{-2}	[45]
12.	PANI-AuNPs	DNA	0.01fM	10 week	5 Min	1000-0.001 pM	[46]
13.	GRA-PANI	glucose	2.769 µM	-	400 sec	10.0 µM-1.48 mM	[47]
14.	PANI-CQD	dopamine	0.1013 µM	-	50-300 sec	0.1-100 µM	[48]
15.	PANI-Ni-MOF	HCV	0.75 fM	-	15 min.	1f -100 nM	[49]
16.	TiO_2/ PANI / GCE	glucose	18 µM	30 days	10sec	0.02 mM to 6.0 mM	[50]
17.	HCS@PANI	AChE	0.16 ng mL^{-1}	15 days	-	1.0 ng mL^{-1} to 10 µg mL^{-1}	[51]
18.	rGO-PANI	Hg^{2+}	0.035 nM	-	-	0.1 nM to 100 nM	[52]
19.	SiO_2($LuPc_2$)PANI-(PVIA)-CNB	Glucose	0.1 mM	45 days	~2 sec	1-16 mM	[53]
20.	GCE/PEDOT:PSS-AuNPs	xanthine	3.0 × 10^{-8}	4 week	5 min	5.0 × 10^{-8} to 1.0 × 10^{-5} M	[54]

Conclusion:

The present review article, we have discussed the electrochemical paper based biosensors due to their unique properties such as low cost, light weight , easily portable and gives instant result. Also discuss the procedure of analyte the biosensing element these can be done with their various coating methods. The sensitivity , selectivity, stability , limit of detection , linear range and fast response time in biosensor can be understood on different conducting polymer such as Poly(3,4-ethylenedioxythiophene), Polypyrrol, Polyaniline and Polythiophene with their composition. A very few of the biosensors were achieved sensitivity, fast response time and made their stability. The researchers need to focus on this parameter and try to evolve another method to reach the efficiency of biosensor.

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AC conduction of Polythiophene composite thin films doped with Bromine

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Abstract
Thin solid films of PTh-PVAc doped withBromine (3.5, 5.5, 10.4, 14.9, 18.9 and 22.5 wt %) were synthesized by chemical oxidative polymerization method in order to study the ac conduction at various temperature ranges. The impedance spectra of PTh-PVAc doped with Bromine films (323-343K over frequencies from 0.1-200 KHz) found to consist of only one arc suggest various parameters such as relaxation time, bulk resistance, bulk capacitance, dielectric activation energy etc. Comparison of impedance spectra was done on the basis of various AC conduction parameters
Keywords: Poly(vinyl acetate) (PVAc), Polythiophene (PTh), Bromine, dc,ac

1.Introduction
The conjugating polymers thin films have been studied by many workers, because of special electrical properties, considerable thermal stability and oxidation resistance that are favorable in applications such as optoelectronic, biosensors, electro chromic displays and chemical sensors [1-3]. Roncali [4] surveyed the electrochemical synthesis and the electronic properties of substituted PThs in 1997. The overall review on chemical synthesis of PThs and applications as chemical sensors, organic memory devices, photo conductivity, etc., is given by many researchers [5,6]. Temperature-dependent conductivity, in the case of ion conducting solid electrolytes, is more completely explained by Vogel-Tamman-Fulcher (VTF) [7-9] rather than other models. Ryu et al. [10-11] predicted that PTh powder prepared by electrochemical method, shows better results than that prepared by the fast oxidation method. The present paper focuses on comparison in electrical properties of Polythiophene composite thin films doped with Bromine.

2 Experimental Procedures
2.1 Sample preparation
Thin solid films of PTh-PVAc doped withBromine (3.5, 5.5, 10.4, 14.9, 18.9 and 22.5 wt %) were synthesized by chemical oxidative polymerization method in order to study the ac conduction at various temperature ranges.

2.2 ac conductivity measurement
ac conductivity of the samples were recorded on LCR meter (Wayne Kerr, UK) having range of frequencies from 0.1-200 KHz at temperature in the range 323-343K with heating rate 1°C min^{-1}. A constant voltage is applied to the sample and corresponding impedance and phase angle was measured at constant temperature for all frequency range. ac conductivity of the pure PTh-PVAc sample and doped with different Bromine wt % was measured at various temperatures 323-343K by applying a wide range of frequencies from 0.1-200 KHz.

3 Results and discussion
3.1 ac conductivity of PTh-PVAc films doped with Bromine
Fig.3.1.1-3.1.3 shows Nyquist plots of the samples DD7, DD8 and DD9 and it is observed that the resistance of all the samples decreases with the rise of temperature. From the fig., it is observed that the sample shows similar trend of semicircle for temperature 323-343 K. Many researchers [12-15] reported a similar behavior in the Nyquist diagram. The impedance spectrum of PTh-PVAc films doped with Bromine is found to consist of only one arc.

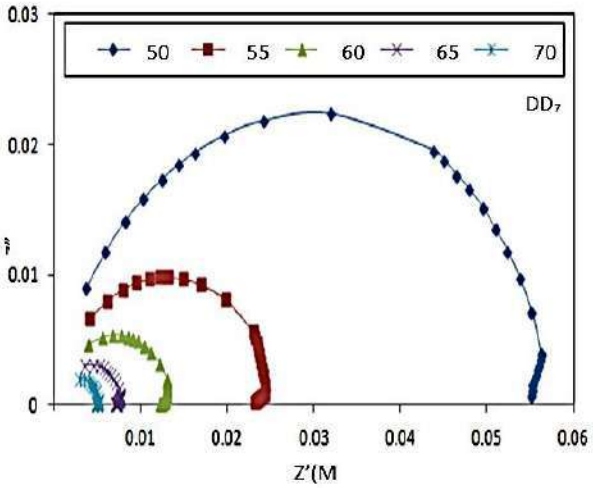

Fig.3.1.1

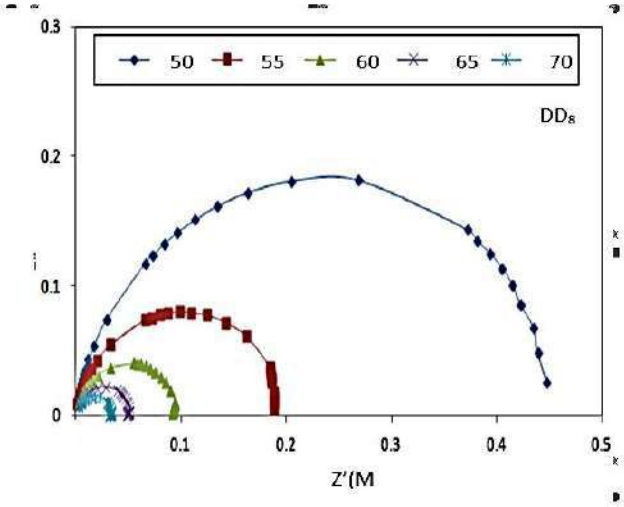

Fig.3.1.2

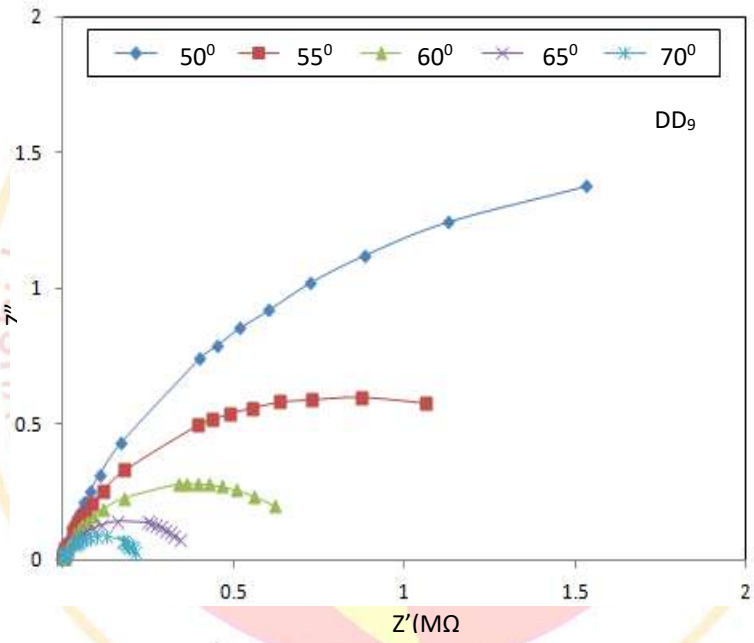

Fig.3.1.3

Also it may be argued that as the temperature increases for PTh-PVAc films doped with Bromine reduces the arc of semicircle indicating the increase in conductivity. The impedance spectra in figure 5.24 exhibited a single capacitive time constant at high frequencies and a finite length transport impedance with a permeable boundary at the low frequency end. The basic features of the spectra seem to be qualitatively similar to those obtained by Johnson et al. [14] for polythiophene films and Komura et al [23] for polypyrrole polystyrenesulfonate composite films. The arcs are found to be highly depressed for all films for different temperatures which indicate the distribution of relaxation times [15]. From the semicircle, the values of bulk resistance are calculated and noted in table 3.2.2. The variation of log f versus Z' at different temperature is as shown in fig 3.1.4-3.16.

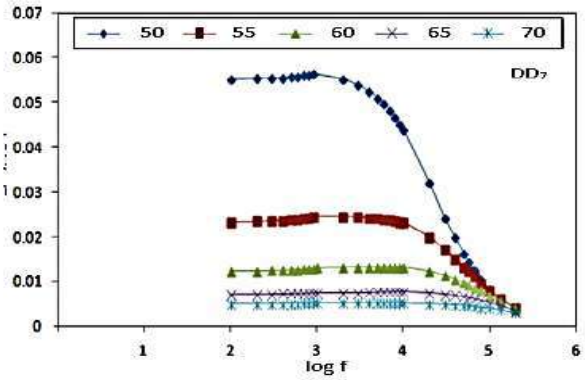

Fig.3.1.4

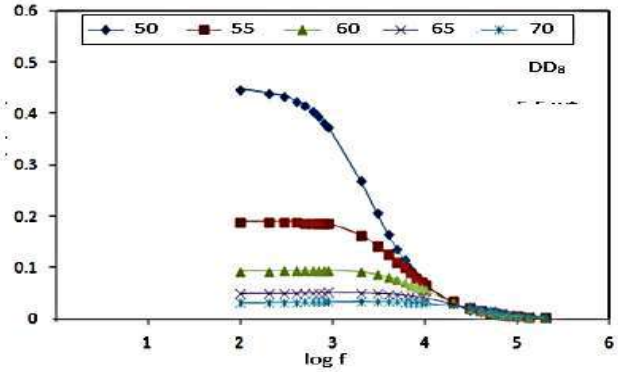

Fig.3.1.5

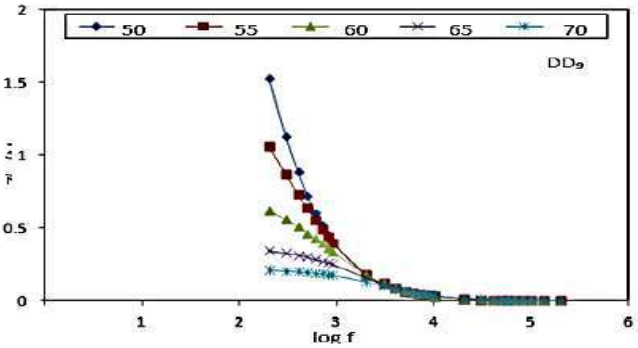

Fig.3.1.6

From the figure it is observed that the pure PTh-PVAc sample shows the wide variation of resistance with all frequencies. The resistance of the sample is found to be decreased with increase in frequency. Also as the concentration of the dopant Bromine is increasing, the sample constitutes much lesser resistance for increasing frequencies. The magnitude decreases on increasing temperature in the low frequency range which merges in the high-frequency region irrespective of temperature. This nature may be due to the release of space charge [16].

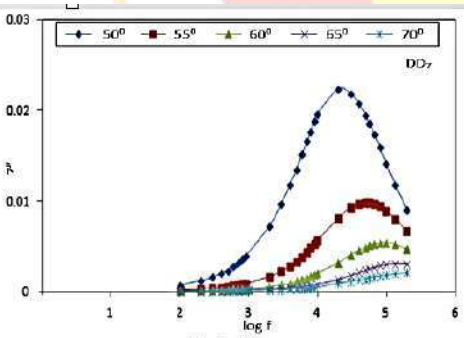

Fig.3.1.7

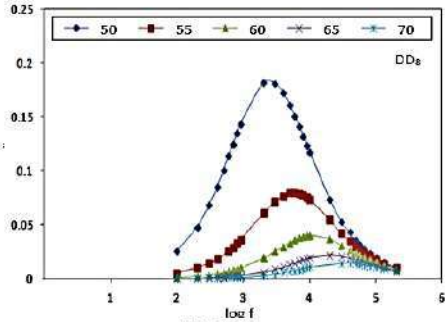

Fig.3.1.8

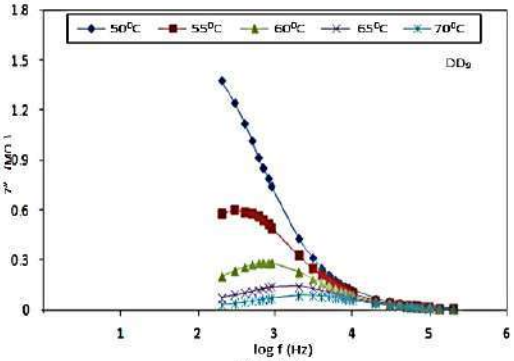

Fig.3.1.9

The reduction in barrier properties of the materials with rise in temperature may be a responsible factor for enhancement of a.c. conductivity of the materials at higher frequencies [17-18]. Further, in the low frequency region, there is a decrease in magnitude with rise in temperature showing negative temperature coefficient of resistance (NTCR) behavior [19]. This behavior is changed drastically in the high frequency region showing complete merger of plot above a certain fixed frequency. The variation of log f versus Z" is as shown in fig.3.1.7-3.1.9 which shows asymmetric peaks at different temperatures. Each peak is associated with a maximum frequency called as relaxation frequency. As the temperature increases the relaxation frequency is found to be shifting towards higher frequency [20-21]. The relaxation frequency (fr) follows the Arrhenius behavior as same in **equation no 3.2.1**. This equation is explored to find out the dielectric relaxation activation energy (ΔE) and relaxation time (τ).

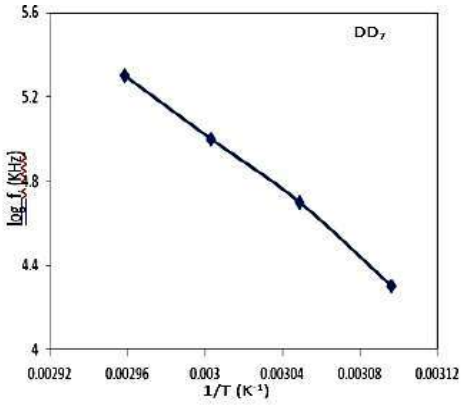

Fig 3.1.10

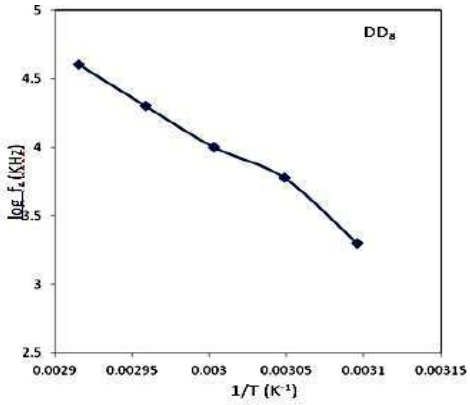

Fig 3.1.11

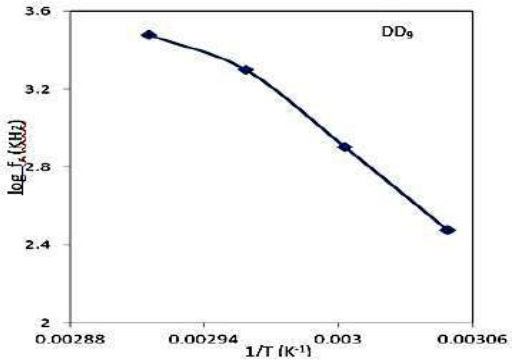

Fig. 3.1.12

The variation of 1/T versus log fr for samples DD7, DD8 and DD9 in fig.3.1.10-3.1.12. shows a straight line nature [20-22]. The values of peak frequencies (log f) are plotted against the 1/T as shown in fig 3.2.10-3.2.12. From this straight lines dielectric relaxation activation energy (ΔE) and relaxation time (τ) is calculated and tabulated in table 3.1.1.

Table 3.1.1: Dielectric relaxation activation energy and Relaxation time of PTh-PVAc with doped Bromine

Sr.No.	Bromine wt %	ΔE (eV)	τ (μs)
1	3.5	0.6224	2.51
2	5.5	0.5985	17.78
3	10.4	0.6619	199.52

From the table it is observed that, dielectric relaxation activation energy and relaxation time is maximum for the sample 10.4 wt % of Bromine and minimum for 3.5 wt % of Bromine.

Table 3.1.2: Bulk resistance and Bulk capacitance of PTh-PV Ac doped with Bromine at different temperature

Bromine wt %	323K		328K		333K		338K		343K	
	R_b(KΩ)	C_b(pF)	R_b(KΩ)	C_b(pF)	R_b(KΩ)	C_b(pF)	R_b(KΩ)	C_b(pF)	R_b(KΩ)	C_b(pF)
3.5	57	139.7	24.2	131.6	13	153.1	7.9	150.2	5.3	-
5.5	450	176.9	185	172.1	98	180.3	51.8	153.7	35	113.7
10.4	3800	-	1700	312.2	750	303.3	380	209.5	225	235.1

The values of bulk resistance (Rb) and bulk capacitance (Cb) at peak frequencies are noted in table 3.1.2.From the table it is observed that the bulk resistance of the sample is decreasing as the temperature increases but the bulk capacitance of the samples almost remain constant at all temperature. The bulk capacitance is found maximum for the sample with 10.4 wt % of dopant Bromine.

4. Conclusion

The impedance spectra of PTh-PVAc for the samples 5.5, 10.4, 14.9 and 22.5 wt % of Bromine dopant consist of only one arc which may be taken to mean that the conduction processes have identical time constants. The variation of real axis Z' with log f shows negative temperature coefficient of resistance (NTCR). The variation of imaginary axis Z" versus log f shows asymmetric peaks at different temperatures that lead to Debye type of relaxation. On the basis of impedance spectra various parameters such as relaxation time, bulk resistance, bulk capacitance, dielectric activation energy etc. are calculated. Dielectric relaxation activation energy and relaxation time is maximum for 5.5wt% of Bromine and minimum for 10.4 wt % of Bromine. The bulk capacitance is found to be maximum for the sample with 5.5 wt % Bromine. Dielectric relaxation activation energy and relaxation time is minimum for 5.5 wt % of Bromine. The bulk capacitance is found to be maximum for the sample with 10.4 wt % Bromine.

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Synthesis And Experimental Evaluation of New Chalcone Derivative.

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Abstract:

Chalcones which are also known as α,β-unsaturated ketones is an important class of organic compounds and reported to possess a wide spectrum of biological activities such as antibacterial, antifungal, anticancer, anti-inflammatory etc. This compound is the main precursor in the synthesis of a variety of heterocyclic compounds, therefore it is very important to develop the latest strategies in the synthesis of Chalcone. Chalcones are a valuable molecule of medicinal importance due to presence of reactive ketoethylenic group –CO–CH=CH–, belonging to the flavonoid family. These reactive α,βunsaturatedketo function in chalcones are responsible for their biological activity. Chalcone can be synthesized by several methods using aldehydes and ketones as starting material.

This paper is focused about different methods of synthesis and characterization done by NMR, MASS and IR spectroscopic techniques and physical properties with experimental data such as melting point, molecular weight,density,refractive index and viscosity of chalcones.

Keywords :Chalcone, Molecular weight,Density, Refractive index, Viscosity etc.

Introduction:

Chalcones are the aromatic ketones which belong to 1, 3-diaryl-2-propen-1-ones, which forms the central core for the synthesis of variety of important biologically active compounds.They are ubiquitous in natural products and belong to the family of flavonoids examples - licochalcone and morachalcone[1,2].

The compounds with the backbone of chalcone have been reported to exhibit a wide variety of pharmacological activity including antimalarial[3],antibacterial [4], antitubercular[5,6], antiviral[7], anticancer [8], anti-inflammatory [9], antifungal [10], antioxidant [11], antileishmanial[12], antidiabetics[13] etc.. Furthermore, chalcones are industrially used as light stabilizing agent[14], Sweetening agent[15], analytical reagent in amperometry[16] ,spectrometric reagent[17] and synthetic reagent for the synthesis of pharmacologically active heterocyclic compounds[18–20].Chalcones are also present in nature and can be obtained from plant species like Angelica, Glycyrrhiza, Humulus and Scutellaria, which are widely used as traditional folk remedies. Chalcones are important intermediates for the biosynthesis of flavonoids. The bright yellow-colored chalcones found in many plants and in some families contribute significantly in the pigmentation of corolla. Chalcones can be synthesized in the laboratory by Aldol condensation between a benzaldehyde and an acetophenone in the presence of base.

In this study we synthesized,characterize and physical interpretation of the new substituted chalcone. The structure of the compound was characterized by NMR,MASS and IR spectroscopic studies.

Refractive Index along with density, molecular mass andviscosity is very useful in the evaluation of variousthermodynamics properties of chemical materials. The number of atoms, groups, radicals and bonds present in thecompound can also be calculated by refractive indexmeasurement.

Scheme for Synthesis of Chalcone derivatives :

Substituted acetophenone [21] and substituted benzaldehyde[22] were mixed in a round bottom flask. Ethanol was annexed and then sodium hydroxide.The mixture was stirred at room temperature, then left to stand for 24 h. The mixture was poured into a beaker containing crushed ice to quench the reaction and then neutralized with HCl. The precipitates formed were filtered, washed with distilled water and dried. They were then recrystallized fromabsolute ethanol to obtain the desired products[23-29].

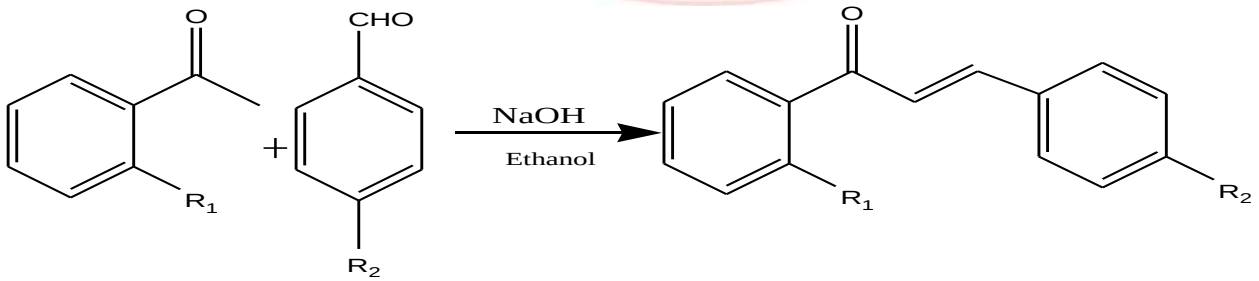


Table : 1 : Physical parameters of synthesized Chalcone.

Sr. No.	Compound	Substitution	Molecular Formula	Molecular Weight	Yield
1	Chalcone	OH and Cl	C15H11O2Cl1	258.5	75 %

Experimental

I.Synthesis :

Substituted chalconehave been synthesized andtheir general structures were confirmed by IR, 1H NMR and mass spectral data. Table 1,Table 2, Table 3,Table 4and Table 5 shows thevarious physicalparameters of synthesized Chalcone.

II.Physicochemical studies:

The synthesized chalconewas recrystallized from DMF. The solvents dimethylformamide(DMF) and dimethylsulfoxide (DMSO) were used for thephysicochemical studies.The selection of solvents indifferent physicochemical study is due to solubility andother practical problems.

III.Density and Refractive index:

Solutions of differentconcentrations were made in DMF and DMSO of the synthesized compound. The density and refractive index ofsolutions were measured at various temperatures and various concentrations. Abbe refractometer was used to determine the refractive index of all the solutions. Table shows the refractive index of synthesized chalcone at various temperatures and various concentrations.

Results and Discussions:

I.Refractive Index of synthesized Chalcone:

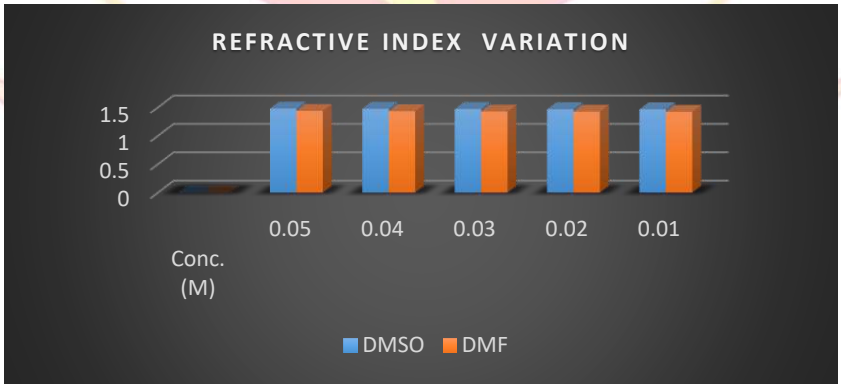
Values of refractive index are varies with various concentrations of solution at 313.15 K temperatures.The below table shows the dynamic values of refractive index.

Table :2 **Temperature: 313.15 K**

Conc. (M)	DMSO solvent	DMF solvent
	RI	**RI**
0.05	1.482	1.440
0.04	1.479	1.434
0.03	1.474	1.429
0.02	1.470	1.426
0.01	1.468	1.424

Space Graph:

Below space graph clarifies that the refractive index with solvent DMF is lesser than that of solvent DMSO.



II. Density and Viscosityof synthesized Chalcone:

The table below shows the dynamic experimental values of density (ρ), and viscosity (η), at different temperature and different concentrations.

Table :3 **Temperature: 303.15 K**

Conc.	DMSO Solvent	DMF Solvent

(M)	Density(ρ) ($g.cm^{-3}$)	Viscosity ($\eta.10^{-3}$)poise	Density(ρ) ($g.cm^{-3}$)	Viscosity ($\eta.10^{-3}$)poise
0.05	1.1209	12.349	0.9619	7.882
0.04	1.1199	12.297	0.9612	7.789
0.03	1.1192	12.274	0.9608	7.753
0.02	1.1187	12.135	0.9602	7.691
0.01	1.1170	12.058	0.9576	7.651

Table :4 **Temperature: 308.15 K**

Conc. (M)	DMSO Solvent		DMF Solvent	
	Density(ρ) ($g.cm^{-3}$)	Viscosity($\eta.10^{-3}$)poise	Density(ρ) ($g.cm^{-3}$)	Viscosity ($\eta.10^{-3}$)poise
0.05	1.1204	11.190	0.9642	7.281
0.04	1.1201	11.082	0.9644	7.202
0.03	1.1193	11.031	0.9633	7.139
0.02	1.1188	10.929	0.9629	7.088
0.01	1.1171	10.899	0.9617	7.002

Table :5 **Temperature: 313.15 K**

Conc. (M)	DMSO Solvent		DMF Solvent	
	Density(ρ) ($g.cm^{-3}$)	Viscosity($\eta.10^{-3}$)poise	Density(ρ) ($g.cm^{-3}$)	Viscosity ($\eta.10^{-3}$)poise
0.05	1.1198	10.397	0.9658	6.583
0.04	1.1193	10.331	0.9653	6.494
0.03	1.1180	10.294	0.9641	6.437
0.02	1.1175	10.184	0.9632	6.382
0.01	1.1172	10.131	0.9605	6.284

The above physical parameters show that, decrease in concentration of solution,the density and viscosity are decreased,while the same values were increased in increased temperatures.Table 1 shows the experimental values of refractiveindex of solutions of the newsynthesized compound in DMF and DMSO at 313.15 K.Table 2,Table 3 and Table 4 shows the dynamic valuesof densities and viscosities of compound in various concentration and various temperatures with solvent DMF and solvent DMSO.

Conclusions:

From above experimental values it is concluded that densities,viscosities and refractive index of solution are changes by changing temperatures and by changing the solvent due to solute-solvent interaction.

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A short theoretical view on fundamental aspect of material science

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Abstract:
Materials science still incorporates elements of physics, chemistry, and engineering. The interdisciplinary field of materials science, also commonly termed materials science and engineering, covers the design and discovery of new materials, particularly solids. The basis of materials science is studying the interplay between the structure of materials, the processing methods to make that material and the resulting material properties.
Key word: *chemistry, physics, engineering, phenomenological, ancient,*

Introduction:

Beginning in the 1940s, materials science began to be more widely recognized as a specific and distinct field of science and engineering, and major technical universities around the world created dedicated schools for its study. Materials scientists emphasize understanding, how the history of a material (*processing*) influences its structure, and thus the material's properties and performance. The understanding of processing-structure-properties relationships is called the materials paradigm. This paradigm is used to advance understanding in a variety of research areas, including nanotechnology, biomaterials, and metallurgy.

Methodology:

Materials science is also an important part of forensic engineering and failure analysis – investigating materials, products, structures or components, which fail or do not function as intended, causing personal injury or damage to property. Such investigations are key to understanding, for example, the causes of various aviation accidents and incidents.

1. **Fundamental**
   The main classes of materials are metals, semiconductors, ceramics and polymers.
   A material is defined as a substance (most often a solid, but other condensed phases can be included) that is intended to be used for certain applications. There are large numbers of materials around us they can be found in anything from buildings and cars to spacecraft. New and advanced materials that are being developed include nonmaterials, biomaterials, and energy materials. The complex combination of these produces the performance of a material in a specific application. Many features across many length scales impact material performance, from the constituent chemical elements its microstructure and macroscopic features from processing. Together with the laws of thermodynamics and kinetics materials scientists aim to understand and improve materials
2. **Structure**
   Structure is one of the most important components of the field of materials science. Materials science examines the structure of materials from the atomic scale, all the way up to the macro scale. Characterization is the way materials scientists examine the structure of a material. This involves methods such as diffraction with X-rays, electrons or neutrons, and various forms of spectroscopy and chemical analysis such as Raman spectroscopy, energy-dispersive spectroscopy, chromatography, thermal analysis, electron microscope analysis, etc. Structure is studied in the following levels
3. **Atomic structure**
   Atomic structure deals with the atoms of the materials, and how they are arranged to give rise to molecules, crystals, etc. The length scales involved are in angstroms (Å). The chemical bonding and atomic arrangement (crystallography) are fundamental to studying the properties and behavior of any material. Much of the electrical, magnetic and chemical properties of materials arise from this level of structure.
4. **Bonding**
   This involves the study and use of quantum chemistry or quantum physics. Solid-state physics, solid-state chemistry and physical chemistry are also involved in the study of bonding and structure. To obtain a full understanding of the material structure and how it relates to its properties, the materials scientist must study how the different atoms, ions and molecules are arranged and bonded to each other.
5. **Crystallography**
   Crystallography is a useful tool for materials scientists. Crystallography is the science that examines the arrangement of atoms in crystalline solids. In single crystals the effects of the crystalline arrangement

of atoms is often easy to see macroscopically because the natural shapes of crystals reflect the atomic structure. The understanding of crystal structures is an important prerequisite for understanding crystallographic defects. Further physical properties are often controlled by crystalline defects. Mostly materials do not occur as a single crystal but in polycrystalline form as an aggregate of small crystals or grains with different orientations.

6. **Nanostructure**
   Nanomaterials are subject of intense research in the materials science community due to the unique properties that they exhibit Materials which atoms and molecules form constituents in the nanoscale (i.e., they form nanostructure) are called nanomaterials. Nanostructure deals with objects and structures that are in the 1 - 100 nm range. In many materials, atoms or molecules together to form objects at the nanoscale. This causes many interesting electrical, magnetic, optical and mechanical properties in describing nanostructures it is necessary to differentiate between the numbers of dimensions on the nanoscale
7. **Microstructure**
   Microstructure is defined as the structure of a prepared surface or thin foil of material as revealed by a microscope above 25× magnification. It deals with objects from 100 nm to a few cm. The microstructure of a material (which can be broadly classified into metallic, polymeric, ceramic and composite) can strongly influence physical properties such as toughness, strength, hardness, ductility, corrosion resistance, high/low temperature behavior wear resistance and so on. Most of the traditional materials such as metals and ceramics are micro structured
8. **Macrostructure**
   Macrostructure is the appearance of a material in the scale millimeters to meters, it is the structure of the material as seen with the naked eye
9. **Thermodynamic**
   Thermodynamics is concerned with heat and temperature and their relation to energy and work. Thermodynamics describes the bulk behavior of the body not the microscopic behaviors of the very large numbers of its microscopic constituents such as molecules. It defines macroscopic variables such as internal energy, entropy, and pressure that partly describe a body of matter or radiation. These general constraints are expressed in the four laws of thermodynamics. It states that the behavior of those variables is subject to general constraints common to all materials. The behavior of these microscopic particles is described by and the laws of thermodynamics are derived from statistical mechanics the study of thermodynamics is fundamental to materials science.

Result and Discussion:

Materials science is a highly active area of research. Together with materials science departments, physics, chemistry, and many engineering departments are involved in materials research. Materials research covers a broad range of topics. Materials science is also an important part of forensic engineering and failure analysis – investigating materials, products, structures or components, which fail or do not function as intended, causing personal injury or damage to property.

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Fabrication of FeSe thin films deposited by successive ionic layer adsorption and reaction method.

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Abstract
Fabrication of Iron chalcogenide materials has been the subject of much interest in essential research because of their novel physical and chemical properties. In this paper, FeSe thin films were deposited on glass substrates by successive ionic layer adsorption and reaction deposition method and the number of cycle varies. These deposition techniques are a very simple and produce thin films at room temperature. The spaceman were investigated by X-ray diffraction techniques and SEM. The XRD pattern confirmed that Iron Selenide thin film. The SEM image exhibited that the obtained sample is homogonous in nature.
Key Words: *Thin Films, XRD, SILAR method, Morphological properties*

1. Introduction
Chalcogenide thin films are persistently under development to extend new potential materials appropriate for photo-voltic devices. The chalcogenides materials have magnetized scientists maybe due to their potential uses in a variety of optoelectronic devices[1,2]. The structural, morphological, magnetic, electrical, and optical properties of FeSe thin film materials are strongly dependent on production methods. Among these methods, it is known that parameters such as solution temperature, molarity, pH value, annealing temperature and time, drying atmosphere, substrate have an influence on the quality, thickness, and production cost of the film. When the literature is reviewed, It is seen that a wide variety of methods like Pulsed Laser Dep, chemical method and other method[3,4] The most important plan of this learning is to set up a successive ionic layer adsorption and reaction deposited FeSe thin films and studies its morphological and structural characteristics.

2 Experimental
2.1 Deposition of thin films
The thin films of iron selenide (FeSe) have been grown on glass substrates by successive ionic layer adsorption and reaction deposition technique. The chemicals used in this work were of analytical reagent grade (99% purity). Before the deposition the glass slides with dimensions 75 × 25 × 1 mm^3 ultrasonically were cleaned and rising with distilled water for each 6 min. The Na_2SeSO_3 solution was prepared by mixing 100 g anhydrous sodium sulfite in 500 ml of distilled water with 10 g selenium powder (99% purity, Merck) with constant stirring for 10 h at 80 ^{0}C. It was sealed and kept overnight, since on cooling, a little selenium separated out from the solution. It was then filtered to obtain a clear solution. The deposition of FeSe films was done at room temperature in a reactive solution prepared in a beaker. Glass substrates were immersed in the 60 ml of Fe $(NO_3)_3.9H_2O$ solution for 10 s. It was then immersed in the 30 ml of EDTA solution for 10 s and then to immersed in 60 ml of freshly prepared Na_2SeSO_3 solution for 10 s. This forms one SILAR deposition cycle. Deposition cycles were varied from 100 to 250 cycles in the steps of 25 cycles. All the prepared samples were annealed for 24 h for the complete transformation. The X-ray diffraction was used to study the structure of the film. X-ray diffraction patterns of the films were taken with a PANalytical X'Pert PRO MRD X-ray diffractometer with Cukα radiation in the 2θ range from 20^0 to 90^0. The morphological study of the film was carried out using scanning electron microscopy (SEM) with a Park Scientific Instruments and SEM/EDAX with JOEL's JSM -7600F.The scanning electron microscope gives topographical and elemental information at various magnifications.

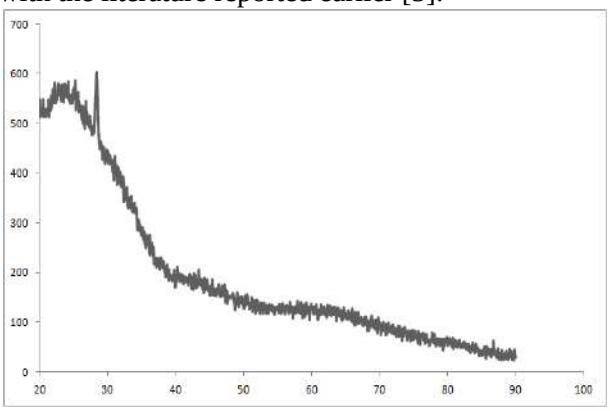
2.2 X-ray diffraction
X-ray diffraction technique is an appropriate system for studying the crystal formation of the deposited thin films. The inter-planar spacing's d was calculated using the relation,

$$D_{hkl} = (\lambda/2)\ \mathrm{Sin}\theta$$

Fig.1. shows the x-ray diffraction pattern of FeSe thin film deposited on glass substrate at room temperature. The differaction peakes of FeSe is found at 2θ values of 28.3912, corresponding to the lattice plane (100). The d value calculated using equation confirm well with available JCPDS standered for FeSe. The average crystallite size of the deposited material is determined by using Debye-Scherer's formula,

$$d = \frac{0.9\,\lambda}{\beta \cos\theta}$$

where β is Full Width at Half Maximum of the peak in radians, λ is the wavelength of CuKα radiation (λ=1.5418 A^0), θ is the Bragg diffraction angle at peak position in degrees. These results are in good agreement with the literature reported earlier [5].



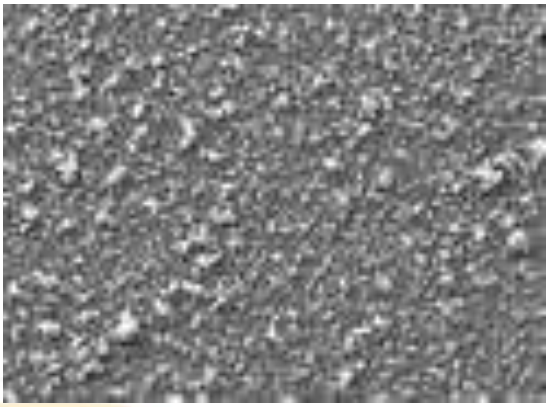


Fig.1. shows the x-ray diffraction pattern of FeSe thin film and Fig.2. shows, the SEM image of as deposited FeSe thin film on to glass substrate

2.3 Surface morphology

Fig.2. shows, the SEM image of as deposited FeSe thin film on to glass substrate. From SEM, we can examined that as-deposited FeSe film is homogeneous and covering the substrate. The surface investigation from two dimensional micrograph showed that the film surface is uneven which confirms its absorbent nature observed in SEM image.

3. Conclusions

The structural properties of FeSe thin films deposited by successive ionic layer adsorption and reaction deposition technique have been studies. These results are in good agreement with the literature reported earlier.

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Application of PANI-Mn Nano-composite for Removal of Dyes from Wastewater

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Abstract

The waste water generated from industries creates severe public health issue and environmental pollution concern, create a major challenge to existing conventional water treatment systems. The different biological and physiochemical treatment process have been studied, but they shows different removal ability on the basis of their experimental condition. Among them, adsorption methods is most efficient due to its high removal efficiency, cost-effective, easy to operated and recyclability of adsorbent. In this research Facile synthesis of Polyaniline-Mn Nano-composite was done by oxidative polymerization methods and used as an adsorbent for removal of methyl orange dyes from waste water. The effect of some important parameter such as Initial Concentration of dyes, pH of water, temperature and contact time on the removal and efficiency was investigated in adsorption system. The adsorption capacity of PANI-Mn Nano-composite was high 94%at pH of 3-4 and the adsorption of dyes increased with 92.60% to 96.42% increase in temperature from 35ºC to 50ºC.

Keyword: *Polymer, PANI-Mn, Polyaniline, Methyl Orange, Dyes.*

1. Introduction

The dye may be defined as a coloured substance which when applied to the fibres gives it a permanent color. The dyes contain Chromophore which are responsible for producing color to a dye because they are capable of absorbing light in near U.V region.[1]The dyes are classified mainly on the basis of structure and their application. Depending upon the type of chromophore present in their structure the dyes are Nitro and Nitroso dyes, Azo dyes, Triphenyl methane dyes, Phthalein dyes, Indigoid and Thioindigoid dyes, Anthraquinone dyes, Miscellaneous dyes.[2] The Methyl Orange dyes an azo dye containing one azo (-N=N-)group. It contain sulphuric acid (-SO_3H) group and hence it is acidic Azo dye. This –SO_3H group make the dye more soluble and It is also used as reactive point for fixing the dyes. This –SO_3H group act as auxochrome.[3] The IUPAC name is dimethyl amino azobenzene sulphonic acid. In our country the use of dye is high and wastewater from textile industries causes damages to water living organism. Consequently these are affecting to the ecological system of environment. It also affect to public health, hence its removal from waste water is big challenge.[4] It also affect to soil if it is not degradable because most of the dyes are stable to light and non-degradable.

The many researchers are attracted towards its removal with the help of Nano scale material. When polyaniline doped with any transition metal then it is called Nano-composite. Some researchers used the Nano-composite for different dyes for example, the polyaniline sawdust is used to removal of Acid Violate 49 dyes.[5] The removal of cationic dye using a new magnetic Nano-composite based on starch-g-poly (vinylalcohol) and functionalized with sulphate group.[6] Polyaniline Nano-composite for the adsorption of Acid dyes from aqueous solution. The polyaniline Nano-layer composite for removal of tartrazine dyes from aqueous solution.[7] The basic blue dye adsorption from water using Polyaniline/Magnrtite (Fe3O4) Composite.[8] The green synthesis of magnetic nano- composite by Cordia Africana(CA) leaves extract for the treatment of Methylene blue.[9] An Eco-Friendly NiO/Polydopamine Nano-Composite used for efficient removal of Dyes from wastewater.[10] polyacrylamide/Ni,ZnO, Nano-composite an efficient adsorbent capacity for toxic dyes.[11] The various adsorbents such as bio-adsorbents, carbon-based Nano-adsorbent,[12] Transition metal oxides-based adsorbent,[13] Polymer-based adsorbent[14] are used to treat waste water containing dyes. It can be observed that adsorbents such as polymer-based material and activated carbon are studied more for the removal of dyes. There has been increasing interest in finding the easy and efficient Nano-composite for removal of dyes from waste water.

In present research the facile synthesis of Polyaniline–Mn Nano-composite and its application in removal of methyl Orange dyes from waste water. The Factors which affects removal from waste water i.e Initial dyes concentration, pH, temperature describe here.

2. Materials and Methods

The chemicals used such as Ammonia, aniline, ammonium persulphate, manganese dichloride, ethanol, concentrated HCl, aldehyde, dethyl phosphite are of analytical grade, The Distilled water used for experimental work.

2.1 Synthesis of Polyaniline:

The 0.5 M aniline monomer (99%) and 0.5 M ammonium persulphate (APS) was prepared in 0.5M Cons. HCl solution, In a round bottom flask. These are mixed slowly with constant stirring on magnetic stirrer. This mixture was kept in ice bath maintaining the temp below 0-4ºC for 8-10 hours. The reaction mixture was

poured into 200 ml water to complete the precipitation, washed with distilled water and HCl solution to remove un-reacted monomers.[15] After some time polymerization take place and the dark suspension becomes green in color. The green colored residue like paste was obtained. The final product was washed 2-3 times with D.W. and ethanol. Finally the dark-green powder is dried at 80°C for 6-8 Hours in Oven[16] The final product was grinded to form a green powder is known as conducting PANI (ES).Fig-1.

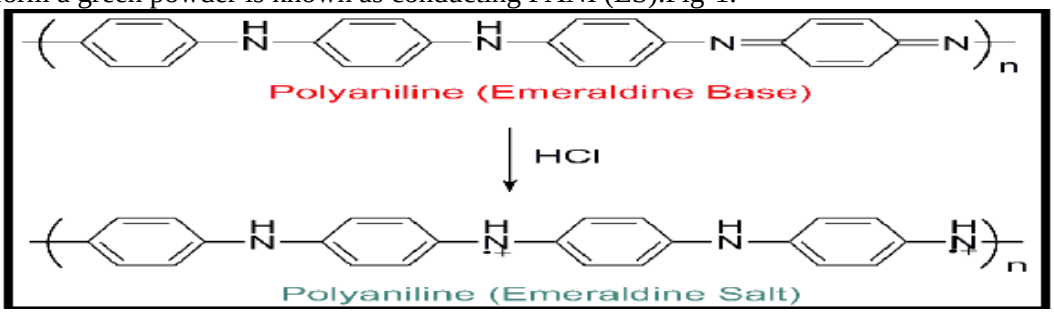

Fig-1 Structure of Polyaniline

2.2 Synthesis of PANI-Mn Nano-composite:

After formation of Polyaniline Emeraldine Salt (ES) the accurate amount of 0.2 M solution of Manganese chloride ($MnCl_2$) slowly and carefully dissolved in polyaniline. The Polyaniline Manganese chloride solution was kept in R. B. flask and kept for vigorous stirring with the help of hot plate with magnetic stirrer (700 RPM) is adjusted, about 3-5 hours. The dark green suspension is formation in the R. B. flask after that this R B flask was kept in Ice bath for 12 Hours. After filtration, The product were washed with 2 times with distilled water and 3 times with ethanol. The prepared Nano catalyst was kept in hot air oven for 7 hours at 70^0C.[17] In this method the Nano particle of Mn is uniformly distributed in Polyaniline. There is formation of Nano- catalyst having dark green color, The surface morphology was studied on Scanning Electron Microscopy. **(Fig-2)**

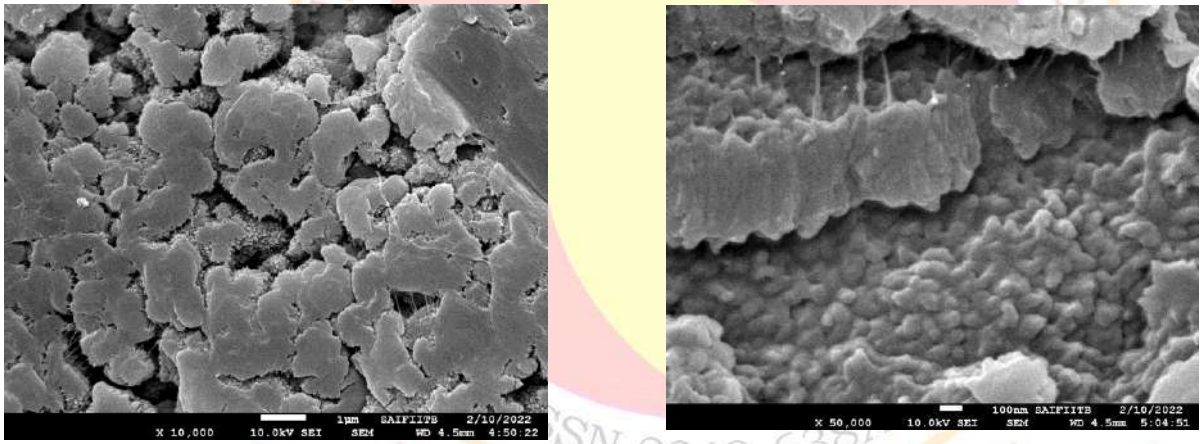

Fig-2 SEM images of PANI-Mn Nano-composite at 1nm and 100 nm

On the basis of scanning electron microscope structure the manganese molecule is uniformly distributed in the polyaniline. The size of particle is 1-100nm. The high surface area is available for electrostatic attraction to methyl orange dyes.

3. Adsorbate

The dyes used in this studies was methyl orange it is an acidic dyes. Having molecular formula $C_{14}H_{14}N_3NaO_3S$ and Molecular weight 327.34g mol^{-1} The molecular structure is given in Fig-2. The stock solution of 1000mg/L prepared by by dissolving appropriate amount of dyes in 1 litre of Distiled water. The solution were obtained by diluting the dye stock solution in accurate proportion to different initial concentration.

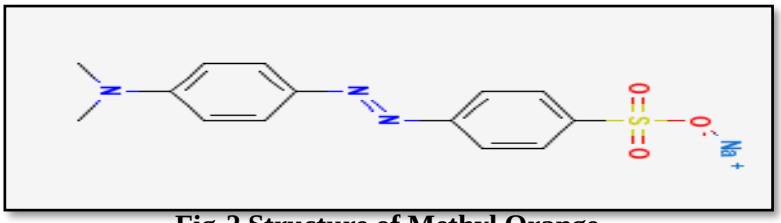

Fig-2 Structure of Methyl Orange

4. Batch mode adsorption experiments

The adsorption experiments were carried out by agitating 100 mg adsorbent with 200 mL of dye solutions of 25 to 100 mg/L concentration at 150 rpm on Hot Plate with magnetic stirrer. The mixture was withdrawn at specified intervals, centrifuged using electrical centrifuge at 4500rpm for 20 minutes and un adsorbed supernatant liquid was analyzed for the residual dye concentration using spectrophotometer. at 558 nm.

The effect of temperature on adsorbent was studied at four different temperature i.e. 25ºC, 30ºC, 35ºC, 40ºC. The effect of pH was studied by using dilute HCl and NaOH solutions. . All experiments were carried out repeated and the mean values are reported, where the maximum deviation was within 5%.

5. Desorption Studies

The main aim to study the Desorption to analyze the mechanism of adsorption and recovery of the adsorbate and adsorbent. The supernatant Liquid was separated after centrifugation and the adsorbent was separated and allowed to agitate with 100 mL of distilled water at different pH i.e. 3-12 above the equilibrium time of adsorption. The desorbed dye solution was estimated as given in the adsorption studies. [18-19]

6. Mechanism of adsorption

In process of adsorption firstly Nano-composite having high surface area. On this surface the surface diffusion process take place and molecules of dyes attracted towards surface area of Nano-composite. It should be noted that adsorption of methyl orange dye present in waste water on surface of adsorbent is mainly due to electrostatic attraction, pi-pi interaction, "van der waals" forces, hydrogen bonding, acid base reaction, and hydrophobic interaction.[20] Out of which adsorption of methyl orange dye on surface of adsorbent mainly due to electrostatic attraction and ion exchange phenomenon. In electrostatic attraction -SO3H groups having negative charge and adsorbent surface having positive charge they attract each other and easily removed. In ion exchange mechanism involves exchange of ion between dyes solution and solid phase adsorbent.

Fig-3

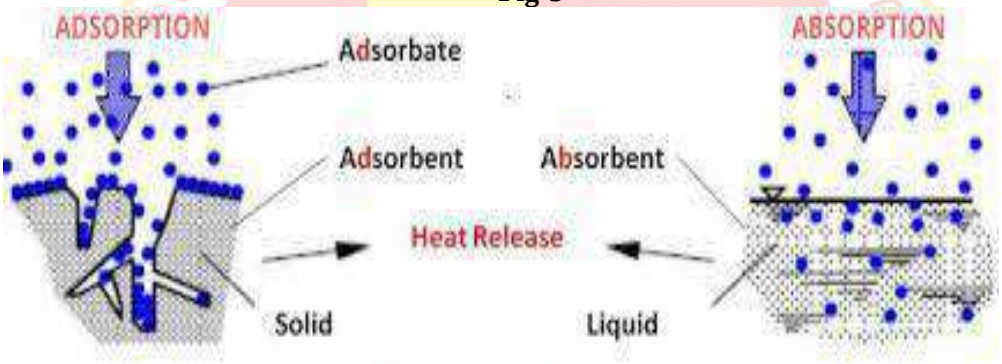

Fig-3 Mechanism of Adsorption

6.1 Effect of Initial dye concentration

The effect of time on the removal of Methyl orange dye is observed. The percentage of removal increases with time and attains equilibrium at 50 minutes for all concentrations studied (30 to 100 mg/L). After that no significant change was observed in the extent of adsorption. The amount of dye adsorption increases from 49.45 mg/g to 174.51 mg/g. while increasing the initial dye concentration from 30 to 100 mg/L. This is due to the fact that with increase in dyes concentration, it shows that dyes molecule near the adsorbent also increased.

6.2 Effect of pH

It is found that the percentage removal of Methyl Orange was higher when the pH is below 4. After pH 4, the adsorption rate decreased. In acidic conditions, the surface of the adsorbent is positively charged due to high concentration of H^+ ions, so electrostatic attraction between the adsorbent and the adsorbate is enhanced.[21] Lower adsorption of Methyl Orange under alkaline conditions is due to the presence of hydroxyl ions on the surface of adsorbents competing with the adsorbate for adsorption sites . Methyl Orange has anionic dipositively fixed charged sites which are balanced with the anions originating from monomer or oxidant solution during their synthesis. The small size dopant anions can be exchanged with other anionic species in treated, solutions which have stronger interactions with the polymer . It may be suggested that the rate of anionic dye removal is high due to the ion exchange mechanism between mobile cation and anionic dye molecules. It was observed that The removal of Methyl Orange dyes 94% at lower pH i.e 3-4.

6.3 Effect of temperature

It has been observed that the percentage removal of Methyl Orange by PANI-Mn Nano-composite increases from 92.60 % to 96.42% on increasing the temperature from 35°C to 50°C. This indicates that the adsorption of anionic dyes is endothermic in nature[19]. These adsorption data were further analyzed with adsorption isotherm models to find out the suitable model.

7.Equilibrium adsorption isotherm

The Langmuir adsorption isotherm has been used successfully for many adsorption processes of monolayer adsorption. Langmuir model[21] is represented by the following equation

Equation-1

$$C_e/q_e = 1/Q_o b_L + (1/Q_o) C_e$$

where, qe is the amount of dye adsorbed at equilibrium (mg/g), Q0 is the monolayer adsorption capacity (mg/g) and bL is Langmuir constant related to energy of adsorption, Ce is the equilibrium concentration (mg/L) It shows a linear plot of Ce / qe against Ce for the removal of AV49 by PAC. The Langmuir adsorption capacity varies from 187.77 mg/g to 212.18 mg/g for Mehyl orange onto PANi-Mn Nano-composite with increase in temperature from 35°C to 50°C. This indicates that the adsorption is favored at high operating temperature.

7.1 Kinetics of Adsorption

In this present research paper, the following two kinetic models were applied for the experimental data. Adsorption kinetics is necessary for the design of adsorption systems[22]

Pseudo first - order kinetic model assumes that the rate of change of solute uptake with time is directly proportional to difference in saturation concentration and the amount of solid uptake with time.[23-24] The rate constant of adsorption is expressed as a first – order rate expression given as: Eq-2.

Equation-2

$$\log (q_e - q_t) = \log q_e - K_1/2.303\, t$$

Where, k1 is the pseudo-first-order rate constant (min^{-1}). The plot of log (qe-qt) versus t should give a straight line with slope of –k1/2.303 and intercept log qe which allows calculation of adsorption rate constant k1 and equilibrium adsorption capacity qe . Calculated values of k1 and qe for the adsorption of Methyl orange dyes on PANI-Mn Nano-composite.

7.2 The pseudo second-order kinetic equation

$$t/q_t = 1/k_2 q^2_e + t/q_e$$

Equation-3

In Eq-3. Where, 2 k is the rate constant of pseudo second –order adsorption (g/mg min) and e q is the equilibrium adsorption capacity (mg/g). The pseudo second -order plot for the adsorption of Methyl Orange at various initial dye concentrations (Temperature 30°C). A plot of t/qt against t should give a linear relationship from which 2 k and qe can be determined from the intercept and slope of the plot.[25-26] The correlation coefficient values are greater and the data points give a linear straight line. It indicates that the adsorption of Methyl Orange by PANI-Mn follow the pseudo second order kinetic model.

7. Conclusions

In this present research paper The Polyaniline-Mn Nano-composite was easily synthesized by Oxidative polymerization. The removal of Methyl orange is pH dependent and the maximum removal is observed below pH 4, due to its mechanism. The adsorption of dyes increased with 92.60% to 96.42% increase in temperature from 35ºC to 50ºC. The kinetic study shows that adsorption of Methyl orange followed pseudo-second order kinetics model. It was observed that PANI-Mn Nano-composite having potential to remove Methyl Orange dyes from waste water.

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Graphene Based Space Qualified Battery Materials

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Abstract

Space craft's require different technologies that envisioned for power generation, storage and its management. Generally, in the CubeSats, solar cells are the power generator and secondary batteries serve as energy storage. The primary task of the battery is to deliver power when the production of power from solar panels is stop or not sufficient to cover the consumption. When a satellite passes through an eclipse and no light available for solar cells to produce power, that time batteries take charge of power supply. If the battery fails to provide power to satellite, it leads to interruption of the mission or loss of the satellite. Hence battery is very crucial component in satellites for smooth functioning. Therefore, by considering the need of battery system in space mission, present review paper reports some noteworthy contribution in this field. In this review, some recent advances in the graphene-containing materials used in lithium-ion batteries are summarized and future prospects are highlighted.

Key words: *Space Qualified, Rechargeable Battery, Non-Rechargeable Battery*

Introduction

Graphene is single layered atomic sheet of carbon atoms, which has outstanding mechanical, electrical and optical properties [1]. A continuous and conductive composites formed by graphene can effectively improve the electron and ion transportation of the electrode materials. Therefore, the use of graphene can greatly boost Li-ion battery's properties with considerable chemical stability, higher electrical conductivity and higher capacity [2]. Figure 1 shows the single sheet graphene.

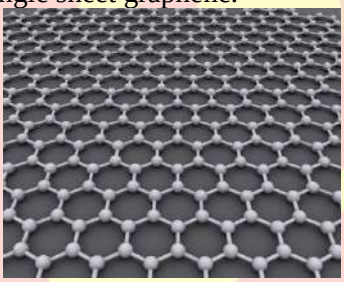

Figure 1. Single sheet of graphene.

CubeSats and small satellite are very useful solutions for space missions they enable a fast, cheap, and agile. To make them powered, crucial component of satellite system is the energy storage device, which is practically equal to a battery. In power system of space vehicle, group of several batteries used as secondary power source for a space mission.

The desired characteristics from Space Batteries are,

- Reliability and robustness
- Light weight and compact for reducing the launch costs
- Capability to perform under extreme temperatures
- Long calendar life
- Tolerance to high intensity radiations.

The small satellites have mainly two benefits, first is they are cost effective due to their size and shape. Second, their compactness fit to the structure and combability [3].

In light of above discussion, this brief review is planned to reports some recent developments in space qualified rechargeable and non-rechargeable battery materials. In subsequent section, some noteworthy reports in this field are discussed. Figure 2 depicts the batteries which are used in space missions.

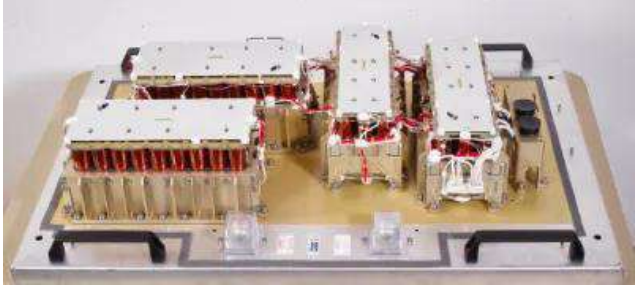

Figure 2. Batteries used in outer space.

Literature survey

In order to meet all above listed qualities, graphene-based materials are the key option. Due to two-dimensional structure of graphene, it has many outstanding characteristics such as high conductivity, mechanical strength, high charge carrier mobility and high surface area which make graphene a suitable electrode material for Li-ion battery.

However, graphene-based composites face many problems like low tap density, volumetric energy density and more capacitor-like behavior. But all these issues which are associated with graphene can resolve by incorporating proper metal oxide on graphene surface, which results in improving the electrochemical properties.

During literature survey, we came across with two significant contributions. First is reported by Mussa et al, which reports a microwave irradiation method for the preparation of reduced graphene oxide (RGO) based Co_3O_4 nanocomposites as anodes for lithium-ion (li-ion) batteries. The Co_3O_4/RGO nanocomposites displayed good electrochemical behavior as anodic materials for li-ion batteries when compared to pure Co_3O_4. The Co_3O_4/RGO nanocomposites with low RGO content resulted in stable electrochemical performance with 100% coulombic efficiency at a high current density of 500 mA/g for 50 cycles. The enhanced capacity of the Co_3O_4/RGO nanocomposites is due to the incorporation of RGO, which resulted in a four times larger surface area than that of Co_3O_4. This increased surface area could facilitate the absorption of more lithium ions, resulting in excellent electrochemical performance. Interestingly, the novelty of this work is that the designed li-ion batteries showed stable electrochemical performance even at a high temperature of 100 °C, which might be useful for rechargeable battery applications in a wide temperature range [4].

And second report made by Cheng et al, which reports carbon material called graphene-like-graphite (GLG) as anode material of lithium-ion batteries that delivers a high capacity of 608 mAh/g and provides superior rate capability. The morphology and crystal structure of GLG are quite similar to those of graphite, which is currently used as the anode material of lithium-ion batteries. Therefore, it is expected to be used in the same manner of conventional graphite materials to fabricate the cells. Based on the data obtained from various spectroscopic techniques, this work propose a structural GLG model in which nanopores and pairs of C-O-C units are introduced within the carbon layers stacked with three-dimensional regularity. Three types of highly ionic lithium ions are found in fully charged GLG and stored between its layers. The oxygen atoms introduced within the carbon layers seem to play an important role in accommodating a large amount of lithium ions in GLG. Moreover, the large increase in the interlayer spacing observed for fully charged GLG is ascribed to the migration of oxygen atoms within the carbon layer introduced in the state of C-O-C to the interlayer space maintaining one of the C-O bonds [5].

Due to cost effectiveness, easy availability and environmental friendliness, $LiMn_2O_4$ is used as cathode material since 1990s. But the disadvantages like its low electrical conductivity and low-rate capacitance make it less commercial for use in battery. Bak et al experimentally shows that graphene sheets are very efficient in improving the electrical conductivity and rate capacity. This study prepares the $LiMn_2O_4$-graphene composites using microwave assisted hydrothermal method which showed the reversible capacities of 117 mAh/g and 101 mAh/g at 50 C and 100 C [6]. Figure 3 shows the TEM image and Specific Capacitance response of $LiMn_2O_4$-graphene composites.

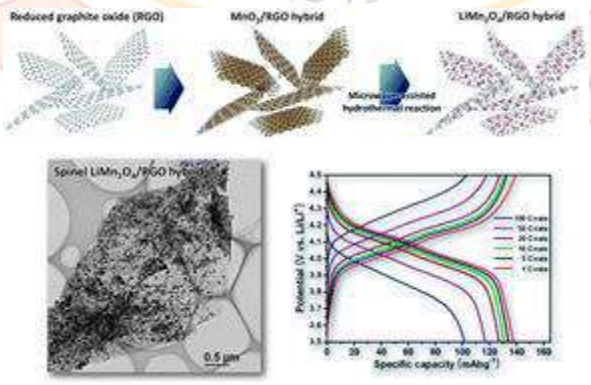

Figure 3. TEM image and Specific Capacitance response of $LiMn_2O_4$-graphene composites.

$LiNi_{1/3}Mn_{1/3}Co_{1/3}O_2$ is another potential cathode material for battery application due to its outstanding properties such as high energy density, good stability, enhanced safety and low cost. Jiang et al demonstrated that

$LiNi_{1/3}Mn_{1/3}Co_{1/3}O_2$-graphene composites are prepared as cathode materials for battery application which deliver a capacity of 115 mAh/g at 6C [7].

Relevance with ISRO's Activities

Presently, ISRO pressing on exploration and envisions to send humans/space craft to Mars, spacecraft into the atmosphere of Venus, onto the surface of outer planetary icy moons, and even boring through the ice covering liquid oceans on these moons. To complete these challenging missions, presently available space-rated Li-ion batteries are not satisfactory. Therefore, it is extremely necessary to extend the operational temperature range, increase the specific energy of the electrodes, to improve the radiation tolerance of Li-ion batteries.

In 2018, ISRO offers Technology Transfer of Lithium-ion cells intends to qualify and shortlist suitable industries in India/Start-ups based on eligibility criteria through an open evaluation process.

Conclusions

Current studies demonstrated that pristine graphene can't become straight substitute for current carbon-based commercial electrode materials in lithium-ion batteries. As it has low coulombic efficiency, high charge–discharge platform and poor cycle stability. However, when used as a matrix or in synergetic form in the composite electrode materials, graphene can play a very important role.

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Study of Infrared spectra of PVC –PS Polymer blend and Polyaniline doped polymer Blend

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Abstract :

InfraRed Spectra of PVC –PS Polymer blend and Polyaniline doped polymer Blend has been measured in the region 4000 to 650 cm^{-1} on spectrophotometer.The infrared absorption band frequencies , their intensities and tentative vibrational assignments are discussed.

Keywords *: PVC – PS Blend , InfraRed Spectra*

Introduction

Polymers having different properties and chemical structures are usually mixed togrther to obtain polymer blendswhich may acquire a set of valuable properties. A lot of attention has been devoted in recent years to the characterization of polymer blends as was studied by Ahn et al [1]and Straka et al [2] FTIR spectrum of 2-chloro-6-methyl benzonitrile in the region 2-4000 cm has been recorded in KBr pellet technique with a Braver IFS - Fourier transform spectrometer. FT-Raman spectrum in powder form has been recorded in the region 50-4000cm on a Bruker IFS 66 optical each with an FRA 106 Raman module attachment interfaced to a microcomputer. Geometry and vibrational wavenumbers were calculated using ab-initio calculations with HF method by Virendra Kumar et al [3].Sharma et al [4] characterised the super ionic AgI-$Ag_2O.V_2O_5$-TeO_2 glasses by X-ray FTIR and DSC studies. The FTIR spectra reveal that the network structure remains essentially the same with AgI concentrations.Pradeep kumar et al [5] measured near nomal incidence for infrared (FIR) reflectivity spectra of a single crystal of $TbMnO_3$ from 10K to 300 K in the spectral range of 50 cm^{-1} - 700 cm^{-1} Indulal and Raveendran [6] used The FTIR for study of the stretching and bending frequencies of molecular groups in the sample.The pressure of of naphthalene in PS thin film was confirmed by IR spectra of the sample taken on FTIR - 8400 spectrophotometer by Sangawar et al [7] IR spectra of undoped polyblend and 30% napthalene doped polyblend was studied by Dhokne et al The infrared spectra of undoped and naphthalene doped polyblend are observed in the range of 500 cm^{-1} to 4000 cm^{-1} FTIR spectra for gamma doses of 0, 10, 35 and 50 KGY was student by Tarafdar et al [8]. They showed the results of infrared absorption frequencies for doses 0, 10, 35 and 50 kGy. Thicknesses are nearly equal and salt concentration is 18% for all samples studied and so intensities of the peaks in the graphs can be directly compared. There are evident changes with gamma irradiation. The most prominent change is in the peak at 1150 cm^{-1} which has been attributed to C-C bond stretching and C-0-C asymmetric stretching The morphology of PVF_2, films grown from the selection has been studied by Mehendra and Chand [9]. The IR spectra in the frequency range $90-480 cm^{-1} were recorded at room temperature and compared with Murayama's spectra. Venkata Chalapathy et al [10] carried out the FTIR analysis of Neyvelilignite and fly ash samples. The extinction coefficient (K) values calculated for the bands at 3450, 2900, 2835, 1695, 1600 cm^{-1} etc. Saikia et al[11] have carried out FTIR and impedance spectroscopy studies of PVC-PMMA-NH_4 SCN-DBP based polymer blend electrolyte to see the formation of polymer-salt complex and to measure the bervity respectively. Deshpande and Tyagarajan [12] have recorded the polarised IR polyvinyl alcohol (PVA) film. Ishra [13] studied the IR spectra of pure and 1.0 wt% I_2 doped PVC/NBR blend. The results obtained by him showed that a new band of weak intensity appeared at 1670 cm^{-1} and the intensity of bands at 3510 cm^{-1} and 555 cm^{-1} decreased on doping with iodine. Agari et al [14] prepared 200 µm films of PVC/ PMMA gradient polymer blends containing a wide compositional gradient phase. They characterized the films with FTIR technique. The ideal blend was found to have significantly new or improved properties (eg a large half width of temperature of dissipation factor) which cannot be observed in any PVC,PMMA homogeneously (that is ordinarily) miscible blend or laminate system.

Experimental details

The polyvinyl chloride (PVO) and polysterene (PS) of standard grade product supplied by Polychem Industries, Mumbai were used for the study The conducting polymer (polyaniline)was prepared by chemical oxidation using ferric chloride by conventional procedure. Polyaniline was used as a dopant Sample Preparation For the preparation of PVC-PS polyblend, the two polymers PVC (1.25g) and PS (0.25g) were taken in the ratio 5:1 by weight. 1.25 g of PVC in 15 ml tetrahydrofuran (THF) and 0.5g of PS in 10 ml of THF dissolved seperately and subsequently mixed together. For the preparation of Polyaniline doped thin films the two polymers PVC (1.25g) and PS (0.25g) were taken in the ratio 5:1 by weight. 1.25 g of PVC in 15 ml tetrahydrofuran (THF) and 0.5g of PS in 10 ml of THF dissolved seperately and subsequently mixed together.

Polyaniline was taken in 25 wt % and was dissolved in 5 ml of THE to produce Polyaniline solution . After allowing them to dissolve completely. the three solutions were mixed together The solution was heated at 60° c for two hours to allow polymers to dissolve completely to yield a clear solution . A glass plate thoroughly cleaned with hot water and then with acetone was used as a substrate, To achieve perfect levelling and uniformity in the thickness of the film, a pool of mercury was used in a plastic tray in which the glass plate was freely suspended .The solution was poured on the glass plate and allowed to spread uniformly in all directions on the substrate. The whole assembly was placed in a dust free chamber maintained at a constant temperature (40°C). In this way, the film was prepared by isothermal evaporation technique [15.16]. The film was subjected to 12 hours heating at constant temperature of 50°C and for another 12 hours at room temperature to remove traces of solvent .Finally, the film was removed from the glass plate, it was cut into small pieces of suitable size which were washed with ethyl alcohol to remove the surface impurities Thickness measurement For measuring the thickness, micrometer screw guage [16] with least count 0.001cm (10 μ m) was used. But for greater accuracy and resolution, a compound microscope in conjunction with an acculometer which gives least count 1.3 μ m and 3.3 μ m, at the magnification of 1:10 and 1 100 respectively was used. A small section of the sample was taken mounted vertically to get a clear section of view of the thickness. The film used for the present study was of the thickness 70 μ m Electrode coating The electrode coating on the film of measured thickness was done by quick drying and highly conducting silver paste [16] supplied by Eltecks Corporation, Bangalore. A mask of a circular aperture of 25 cm diameter was used while coating to ensure uniformity in size of coated silver electrode

Study of Infrared Spectra

The infrared spectra of all the samples of series I and II are studied in the region 4000 to 650 cm^{1} on Perkin Elmer (Japan) spectrophotometer. The KBr technique was used. All the spectra were taken at the department of metallurgical and materials Engineering, Visvesvaraya National Institute of Technology, Nagpur - 440011 (India). Typical IR spectra of series I . (samples are J1, J2, J3, J4 and J5) and series II (samples are JPI, JP2. JP3, JP4 and JP5)are shown in fig 3.3.1 and 3.3.2 respectively

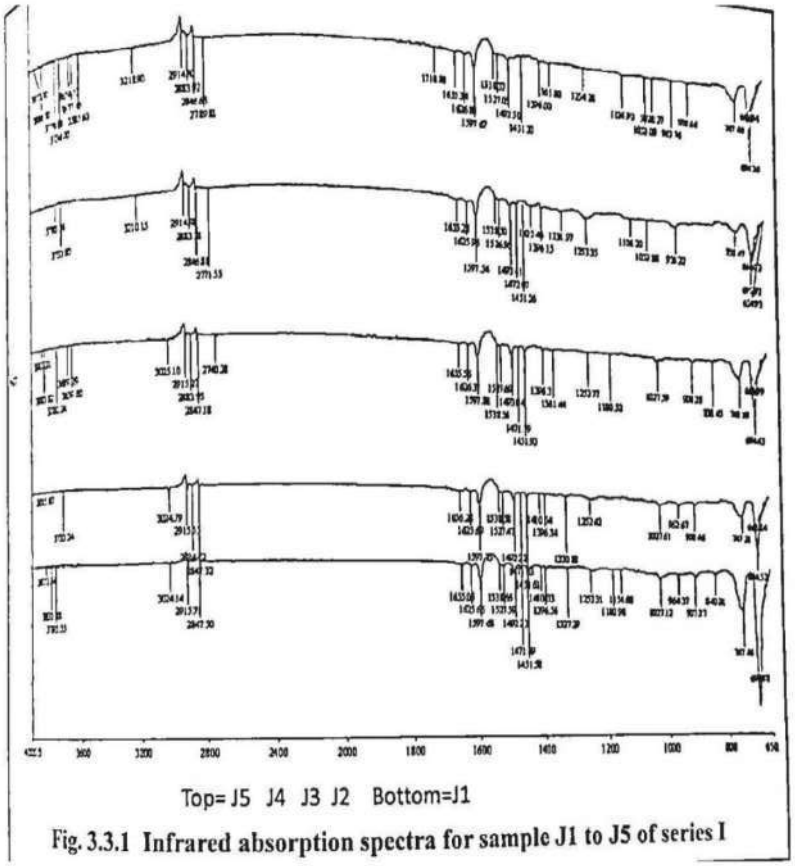

Fig. 3.3.1 Infrared absorption spectra for sample J1 to J5 of series I

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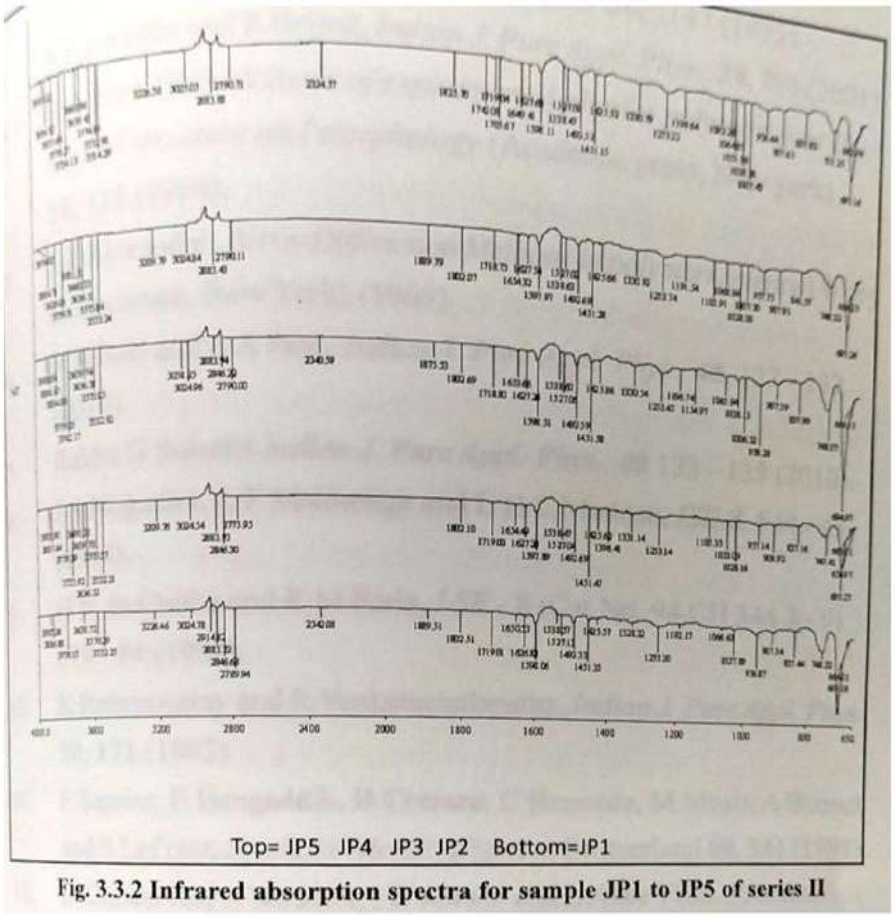

Fig. 3.3.2 **Infrared absorption spectra for sample JP1 to JP5 of series II**

Result and Discussion

A weak absorption band appeared for all the samples in the frequency 3024. 14 to 3025.13 cm^{-1} and attributed to C-H stretching due to aromatic ring (benzene ring) A strong absorption band appeared in all the samples range except JS (medium absorption band) in the frequency range 2914.76 to 2915.70 cm^{-1} which indicates the presence of C-H stretching of monosubstituted alkane. The medium absorption band appeared for all the samples in the frequency range 1625.57 to 1626.29 cm^{-1} which can be attributed to C-C stretching alkene nonconjugated.The strong absorption band appeared in all the samples in the frequency range 1597.57 to 1597.83 cm^{-1} which indicates the presence of C=C in aromatic (benzene ring).The strong absorption band appeared for all the samples in the frequency range 1492.22 to 1493.20 cm^{-1} which attributed to C-H bonding in methylene group.A medium absorption band appeared for all the samples except J5 (Weak absorption band) in the frequency range 907.29 to 908.81 which attributed to Ar - H bending.These strong absorption band observed at 747.23 to 750.42 cm^{-1} and 93.80 to 695.97 cm^{-1} in all the samples which is attributed to C-H out c ane bending and C-Cl stretching.

Similarly in the IR spectrum of PVC+PS +PANI (Samples JP1,JP2,JP3,JP4 and JP5), All the samples show a weak absorption band in the frequency range 3514.29 to 3533.24 cm^{-1} which indicates the presence of N-H amines.A weak absorption band for all samples in the frequency range 3024.79 to 3025.07 cm^{-1} which is attributed to C-H stretching due to aromatic ring.

There is medium absorption band for all samples in the frequency range 2883.32 to 2884.04 cm^{-1} and 1626.78 to 1627.52 cm^{-1} which is attributed to C-H stretching of monosubstituted alkane and C- C stretching alkene nonconjugated.The strong absorption band in the region 1597.93 to 1598.15 and 1492.31 to 1492.68 cm^{-1} for all samples are assigned as = C aromatic stretching and C-H bonding in methylene group. The presence of weak absorption band at around 1053.09 to 1068.86 cm^{-1} show the presence of C-N vibrations.There is medium absorption band for all samples in the frequency range 907.63 to 909.01 cm^{-1} which is due to Ar-H bending.The strong absorption band for all samples in the frequency 751-26 and 694.96 to 695.26 cm^{-1} which is due to C-H out of plane bending and C-Cl stretching.

Conclusions

The values of frequencies observed in the IR spectrum agree well standard IR spectrum frequencies. The orientation of NH, group in aniline makes ortho and para positions more susceptible towards electrophilic attack and as a result of this polymerization of aniline monomers into polyaniline molecule is occuring at these (ortho and para) positions. The polymer thus obtained still has possibility to expose its reactive sites towards suitable reactants under the influence of -NH-/- NH = groups . It was therefore thought that it is interesting to use polyaniline as PVC-PS blend to study the conductivity of the mixture (blend) The electron rich ortho and para positions of polyaniline aromatic nucleus also shows susceptibility towards the attack of electropositive sites of PVC-PS blend. The overall influence of -NH-/- NH= group on geometry of PVC-PS blend and the interaction of positive centres with ortho and para positions of aromatic nucleus enchances the conductive property to considerable extent, so also a protonic exchange between –NH-/-NH= groups of polyaniline helps to increase the conductance in PVC –PS blend

Acknowledgement

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Comparative Study of Blood Glucose Measurement Using Non- Invasive Method

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Abstract –

The past three decades has attracted tremendous attention in the diagnosis and monitoring of diabetes by non-invasive methods. The main objective of this paper is to compare measurement of blood glucose concentration using invasive and non-invasive method. Measurement of blood glucose levels was done using an existing invasive in the pathology laboratory and non-invasive tool that have been develop in this research. Non-invasive method based on NIR spectroscopy is used as it can be easy and safe to measure blood glucose concentration. In this study 50 patients glucose measurement test readings are recorded using both methods and has been compared. The result found is in the standard range.

Keywords: Diabetes mellitus, Invasive, Non-invasive, Optical Spectroscopy.

1. Introduction

In the 21st century diabetes is one of the fastest growing global health emergencies. It is estimated that 537 million people have diabetes in 2021[1]. Diabetes Mellitus is a condition in the human body wherein body does not produce enough insulin required to maintain normal circulating blood glucose. Insulin is a hormone that enables glucose to enter the body's cells to be used for energy [2]. Regular monitoring of blood glucose is very important as diabetes can lead to very serious and severe complications including heart failure, blindness, gangrene and amputation. Blood glucose measuring in day to day life is becoming a need of society. Regular monitoring of blood glucose is important to avoid complications of diabetes. In recent medical practice, glucose in blood is measured using an invasive technique which involves pricking of finger for blood sample. Non-invasive method is a pain free technology which helps patient's regular blood glucose monitoring [3,4,5].

There are two main types of diabetes, type 1 and type 2. The implications of your blood glucose results will depend on the type of blood glucose test used. For a fasting blood glucose test, a normal blood glucose level is between 70 and 100 mg/dL. For a random blood glucose test, a normal level is usually around or below 125 mg/dL. Mostly the exact level will depend on when you last ate [6].

II. Methods for glucose measurement

1) Invasive Method

Invasive method is used in recent medical practice to measure the concentration of glucose in blood. Invasive technique involves finger puncturing for the blood sample. This simple test involves giving a small sample of blood. In pathology laboratories, before drawing blood the healthcare provider cleans the area with an antiseptic to kill any germs and tie an elastic band around upper arm of patient, causing veins to swell with blood. Once a vein is found, they insert a sterile needle into it and then blood drawn into a tube attached to the needle. When drawing blood have been finished, the healthcare provider removes the needle and places a bandage over the puncture site and pressure will be applied to the puncture site for a few minutes to prevent bruising. The sample of blood is then passed through the standard chemical tests to measure glucose concentration.

In generic few ml of blood required where as recently patient can measure blood glucose at home using invasive glucometer, less than a drop of blood is taken out. The sample of blood will be placed on the strip and is inserted into the blood glucose meter. Inside a glucometer, a series of chemical reactions will take place and result is display on the screen.

Being a diabetic, it is necessary to check your blood glucose level regularly but regular use of an invasive method has many drawbacks such as,

1) For diabetics, measuring blood glucose level is an everyday thing so it is very difficult to incorporate pain into routine.
2) Both Laboratory and glucometer tests are costly. While using glucometer, one strip is used at a time and need to be replaced once finished.
3) Due to low immunity, diabetic people are more prone to infection. Invasive method has more risk of infection.
4) Non-compliance can be dangerous as it can increase the complications of diabetes. [7,8]

2) Non-Invasive Method

The advent of a pain free non-invasive technology would improve the patient's compliance for regular blood glucose monitoring. Subsequently the diabetic patient's life will improve considerably [9]. It prevents both chronic and acute complications, as this blood glucose measurement method is without drawing blood, puncturing the skin, causing pain or trauma. This technique is applied to overcome the pain, scare procedure, infections.

In non-invasive blood glucose monitoring the most commonly approaches are by using optical detection or optical scanning methods. i.e., Polarimetry, Raman Spectroscopy, Photo Acoustic Spectroscopy, Mid-Infrared (MIR), Spectroscopy using an Attenuated Total Reflection (ATR) Prism, and Near- Infrared (NIR) spectroscopy. The NIR spectroscopy is one of the most promising optical methods. NIR spectroscopy is very useful in Non- Invasive blood glucose monitoring [10].

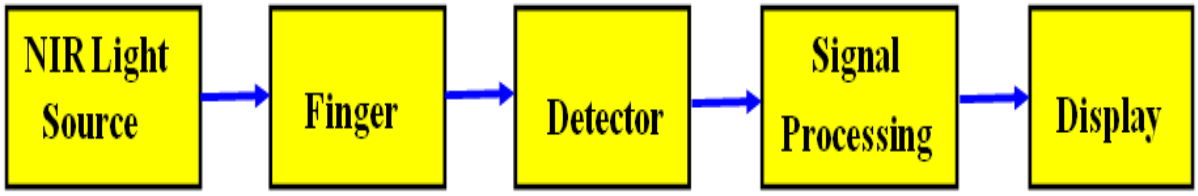

Figure-1

III. Comparative blood glucose measurement

Glucose concentration is measured non-invasively with the help of developed system and invasively with the help of pathology laboratories. Following figures are the result mapping chart of different age group, which shows the glucose concentration measured by the designed system and at the same time, for the same person glucose concentration measured in pathology laboratories. Good correlation is found between the blood glucose concentration value measured by the both methods.

To calculate error in measurement of invasive and non-invasive method the formula used is,

$$\% \text{ Error} = \frac{IV - NIV}{IV} \times 100$$

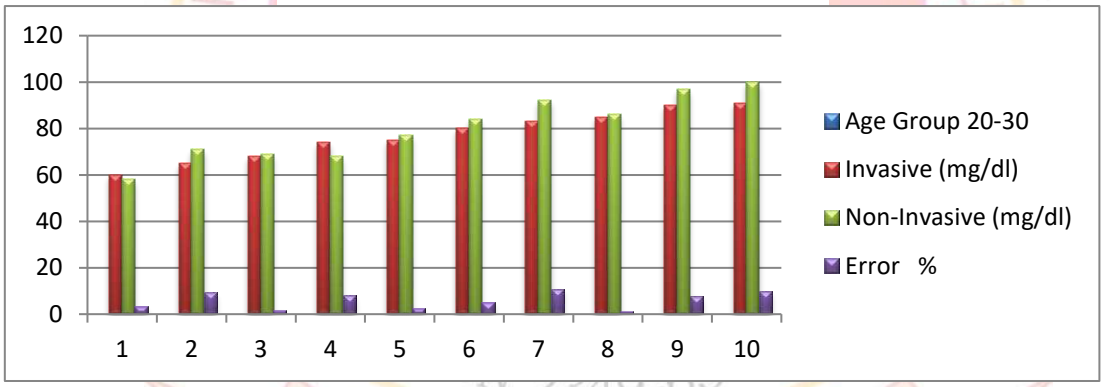

Figure-2: Blood glucose measurement of ten persons of age group 20-30

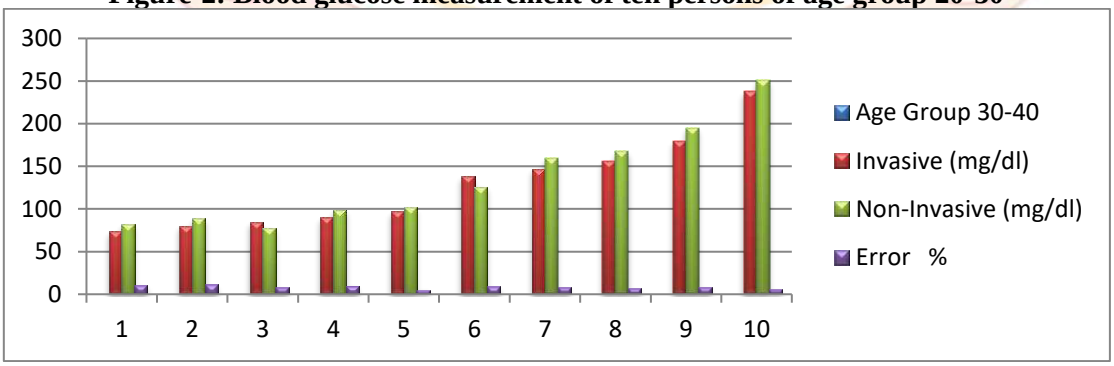

Figure-3: Blood glucose measurement of ten persons of age group 30-40

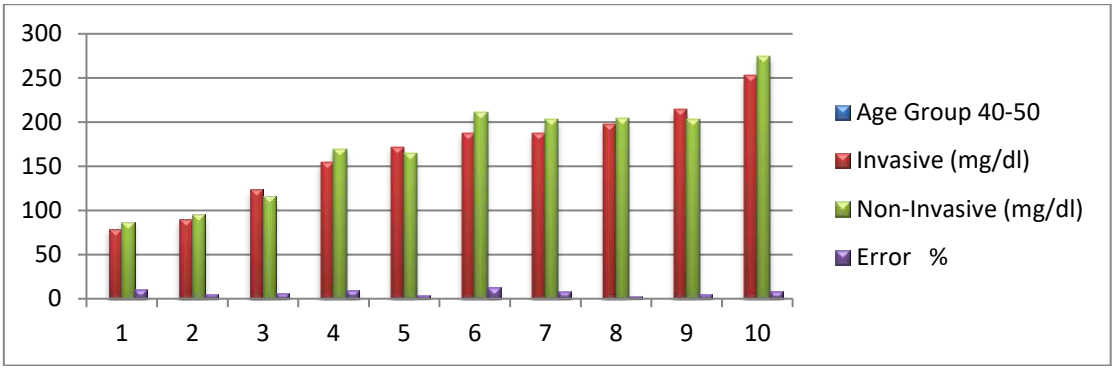

Figure-4: Blood glucose measurement of ten persons of age group 40-50

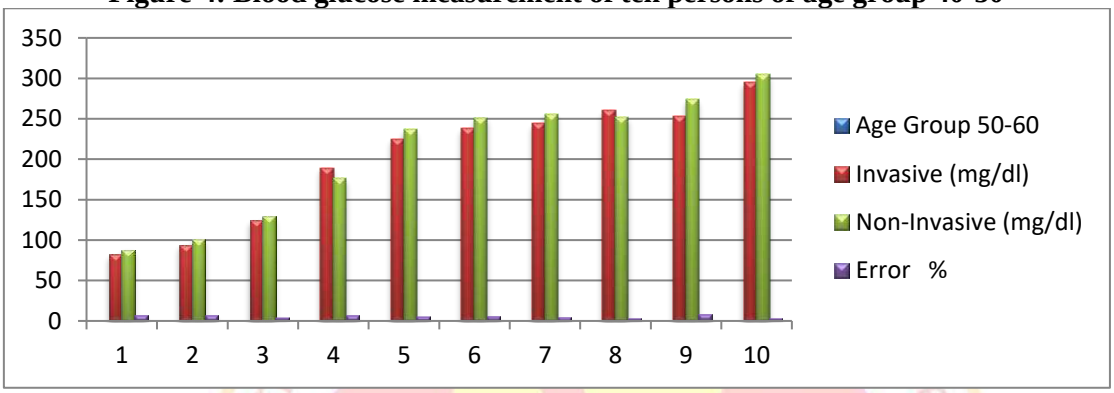

Figure-5: Blood glucose measurement of ten persons of age group 50-60

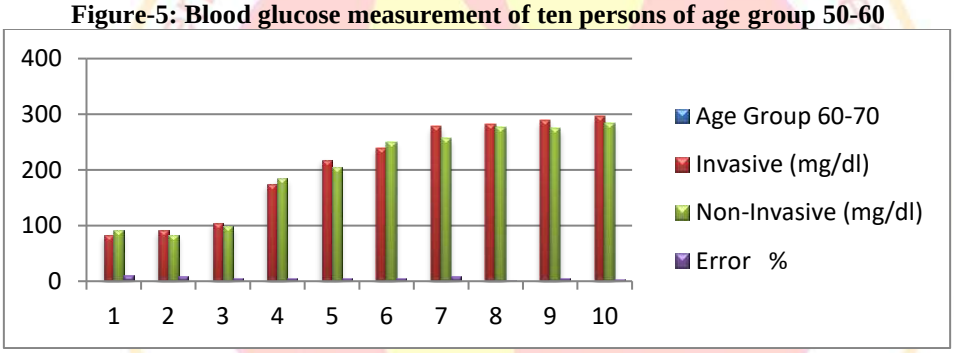

Figure-6: Blood glucose measurement of ten persons of age group 60-70

III. Result and Discussion

Regular monitoring of blood glucose level is important to avoid the long-term and short-term effects of diabetes. Data analysis was done by measuring the percentage error of invasive and non-invasive blood glucose measurement results. The result shows that the lowest percentage error measurement is 1.17% and the highest is 12.83%. In this research, lowest error was obtained in blood glucose measurement of 8th person from the age group of 20-30 and highest error was obtained in blood glucose measurement of 6th person from the age group of 40-50. The result obtained shows the feasibility of using NIR based non-invasive blood glucose measurement technique.

IV. Conclusion

Non-Invasive blood glucose monitoring system needs to improve for continuous monitoring in healthcare centres and homes hence, diabetic patient will monitor their blood glucose regularly. The performance of the system can be increased by developing suitable signal conditioning circuit to minimize error.

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Study Sem and Ftir Analysis of PEO: PVP: Naclbased Polymer Electrolyte

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Abstract

The sodium ion conducting polymer electrolyte complexes with PEO and PVP were prepared by solution caste technique with different compositions of PEO, PVP with NaClrespectively. Theoretical aspects of characterization technique such as Scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR) analysis were used to characterize these electrolyte.

SEM result shows the crystalline behavior of the polymer electrolyte. In FTIR spectra it is observed that, the intensity of the aliphatic C-H stretching vibrational band observed around 2900 cm^{-1} in pure PEO, PVP which is found to be decreased with increased in concentration of salt in the polymer. The width of the C-O stretching band observed around 1100 cm^{-1}in pure PEO,PVP which is also found to be decreased with increased in concentration of salt.

Keywords: Polymer electrolyte, PEO, PVP, NaCl.

Introduction

The polymer electrolyte (Solutions) serve as electronic insulators between the anode and cathode but it must be a good ionic conductor. Polyethylene oxide (PEO) is used as the polymer matrix because it is chemically inert, able to dissolve in number of inorganic salts and it provides moderate ionic conductivity. Polymer electrolytes based on PEO complexed with $NaClO_3$, $AgNO_3$ and $NaYF_4$ etc. have been reported [1]-[6]. Also the polymer electrolytes based on PVP complexed with $NaClO_3$ have been prepared [7]-[8]. The polymer electrolyte based on PEO, PVP complexed with $NaClO_3$ were prepared [9].Keeping this view in mind, authors prepared polymer electrolyte based on PEO, PVP complexed with NaCland study their SEM and FTIR analysis.

Preparation of polymer electrolyte

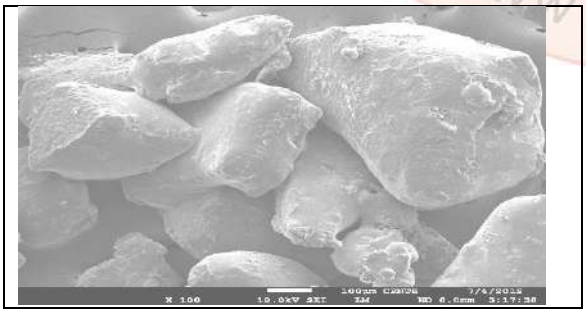
The polymers PEO and PVP were taken separately at different ratio with NaClwt% as (40:50:10) (35:50:15), (30:50:20), (25:50:25), (20:50:30) and (15:50:35). Each mixture dissolved in methanol for making polymer-salt mixture into solution. To obtain the perfect solution of this mixture, the solution was stirred well for 24 hours and powered into a polypropylene dishes. The solution was slowly evaporated at room temperature. Thus, thin film of polymer electrolyte was prepared by solution cast technique. Further these films were crushed into powder form. This powder is used for SEM and FTIR analysis.

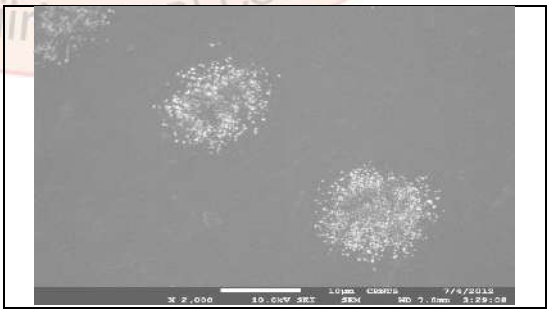
Result and discussion

4.1 Scanning electron microscopy (SEM)

The surface morphology of the composite films of 25wt% of NaCl was analyzed by SEM and the pictures are shown in Fig.1.The SEM pictures show crystalline behavior. The distorted crystals of NaCl are seen. Because of random size of crystals voids are created.

Energy dispersive X-ray analysis was performed for different wt% of NaCland pictures are shown in Fig.2 Energy dispersive spectroscopy (EDS) allows to identify particular elements and their relative proportions. From EDAX measurements the characteristics peaks corresponding to NaCl , PEO and PVP are identified which shows the existence of these in composite films.





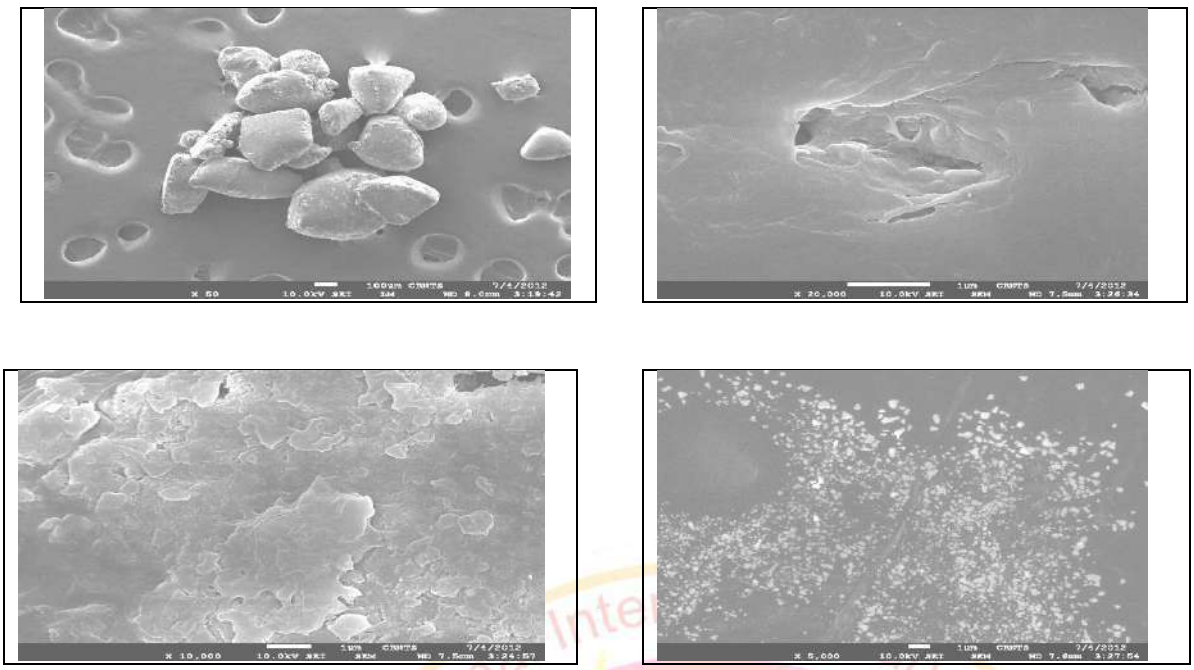


Fig.1 : SEM pictures of 25 wt% of NaCl at different magnification

Element	Weight%	Atomic%
C K	61.09	67.91
N K	9.48	9.03
O K	25.30	21.11
Na K	1.76	1.02
Si K	0.33	0.16
Cl K	2.05	0.77

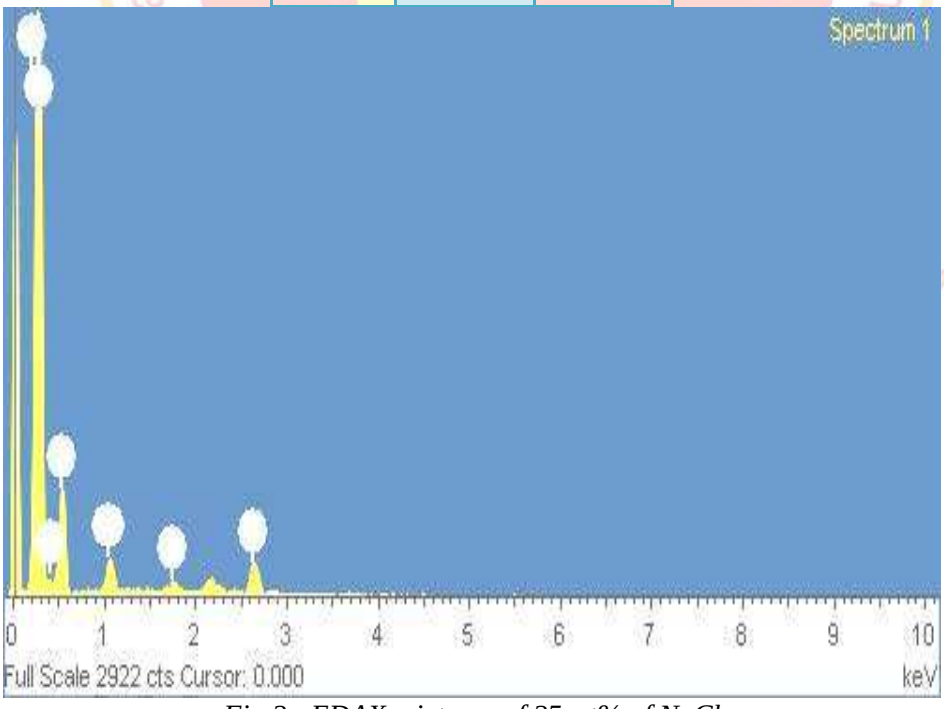


Fig.2 : EDAX pictures of 25 wt% of NaCl

4.3 Fourier transform infrared spectroscopy (FTIR) analysis

Sr. No	Composition Wt % NaCl	Peak Position cm^{-1}									
1	20	680	840	1100	1310	1500	1700	1880	2400	2900	3900
2	25	680	840	1100	1310	1500	1700	1880	2400	2900	3900
3	30	680	840	1100	1310	1500	1700	1880	2400	2900	3900

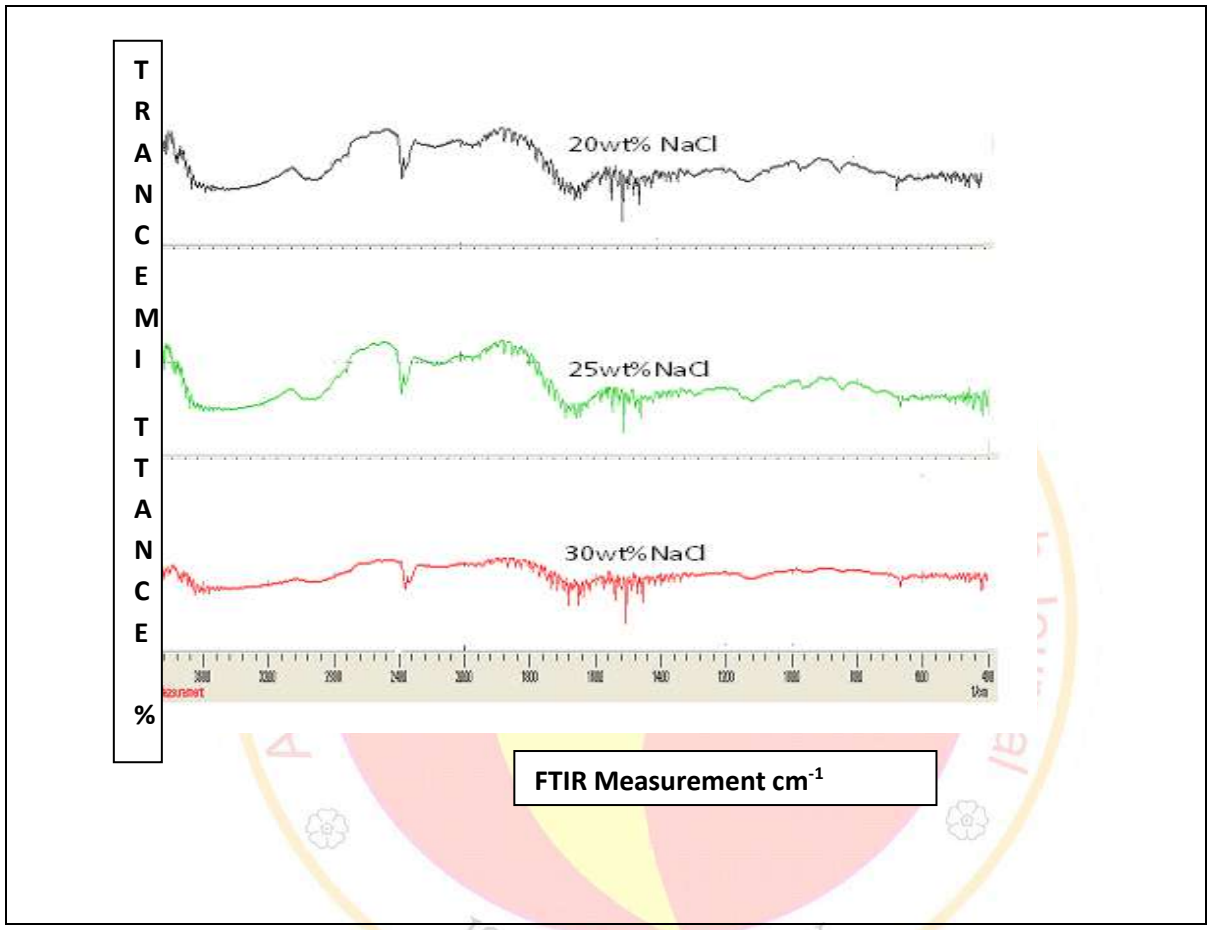


Fig.3 FTIR spectra of 20,25 and 30 wt% NaCl

The FTIR spectra of 20,25 and 30 wt% NaCl were recorded in the range 4000- 400 cm^{-1} and are shown in fig.3.

In the IR spectra of pure PEO and PVP strong broad absorption band is observed around 2900 cm^{-1} corresponds to the symmetric and asymmetric C-H stretching mode of CH_2 group. The width of the band decreased with increased in concentration of NaCl salt in the polymer. Also the band is observed around1100 cm^{-1}in IR spectra of pure PEO and PVP corresponds to the C-O stretching . The width of this band is decreased with increased in concentration of NaClsalt[10,11].Several new peaks are around 3900,2400,1880,1700,1500,1310,840 and 680 cm^{-1} have been observed in PEO:PVP complexed with NaClsalt. The appearance of the new peaks along with the changes in existing peaks (and/or their disappearance) in the IR spectra directly indicate thecomplexation of NaClsalt with PEO:PVP.

Conclusion

A sodium ion conducting polymer electrolyte based on PEO with PVP was prepared by solution cast technique. Polymers PEO and PVP were taken separately at three different ratios with NaClsalt. Each component was dissolved in methanol for making polymer salt mixture into solution. This solution was stirred well for 24 hrs. so that homogeneous solution was obtained and then polymer electrolyte was made.

PEO:PVP:NaCl polymer electrolyte was studied via structural , thermal characterization. Following conclusions were drawn.

In NaCl series distorted crystals of NaCl are seen. So, SEM result shows the crystalline behavior of the polymer electrolyte.

From FTIR spectra it is observed that, the intensity of the aliphatic C-H stretching vibrational band observed around 2900 cm^{-1} in pure PEO, PVP which is found to be decreased with increased in concentration of salt in the polymer. The width of the C-O stretching band observed around 1100 cm^{-1}inpure PEO,PVP which is also found to be decreased with increased in concentration of salt. The appearance of the new peaks along with the changes in existing peaks (and/or their disappearance) in the IR spectra directly indicate the complexation of salt with PEO:PVP.

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Development of Polyaniline -Metal oxide Nanocomposite: Brief Review

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Abstract:

Nanostructures and Nano composites of conducting polymers have developed as a new field dedicated to the manufacture of smart materials for use in forthcoming technologies. Preparation of Blends of inorganic nanoparticles in intrinsically conducting polymer matrix is believed to be an easy method to prepare and design Nano composites where delocalized -electrons can interact with inorganic nanoparticles, which have a unique combination of mechanical properties, the processability of conventional polymers and the electrical property of conducting polymers. The current review paper will emphasize PANI composites with thermosetting polymer matrices Many studies special attention is given on synthesis of Polyaniline Nano composite have been reported in the quest to develop new advanced materials with improved mechanical, electrical, optical and catalytic properties or to improve conduction mechanism in electronic devices. These materials have found their use in many electronic and nanoelctronic devices.

Keyword: (PANI)- Polyaniline Nano composites

Introduction:

In recent years, developments of inorganic–organic hybrid materials on nanometer scale have been receiving significant attention due to a wide range of potential applications and high absorption in the visible part of the spectrum and high mobility of the charge carriers. Polyaniline is the most attractive conductive polymer because of the presence of the reactive – NH– groups in polymer chain [1-2], and used in broad applications such as batteries, sensors , electronic devices , super capacitors and corrosion protection in organic coatings due to its physical and chemical properties, good electrical conductivity (p-type), high environmental stability, low cost, light weight, flexibility, facile fabrication and possibility of both chemical and electrochemical syntheses . Electrical conductivity of polyaniline is a very important parameter and it could be modified by the addition of inorganic fillers . Additionally, electrical conductivity of polyaniline depends on dopant ions . Metals and semiconducting nanostructure materials are used as stabilizers or capping agents of these conducting polymers. In recent decades, several reports have been published on the synthesis of the PANI nanocomposites with the inorganic nano-scale such as TiO2, CdS, Silica , Ag, CeO2 , Fe3O4 , Zn and MnO2 [3-5].

Polyaniline (PANI) is a promising conducting polymer due to its easy synthesis, environmental stability and high electrical conductivity on doping with protonic acids [5-6]. The highly ordered structures such as crystalline or self-assembled structures of ideal conducting polymer with conjugated structure is expected to have Metal - like electrical conductivity .To induce an ordered structure, other materials acting as filler for the composite are required [7-12]. The preparation of PANI composites with various materials has received great attention because of their unique properties and applications in various electrical and electronic devices.

Literature Review:

Among the various conducting polymers, Polyaniline (PANI) has been investigated as a potential material for gas sensing applications, due to its controllable electrical conductivity, environmental stability and interesting redox properties associated with the chain nitrogen's. It is the unique type of conducting polymer in which the charge delocalization can, in principle, offer multiple active sites on its backbone for the adsorption and desorption of gas analyte [8]. However, PANI is not as sensitive as metal oxides towards gas species, and its poor solubility in organic solvents limits its applications, but it is suitable as a matrix for preparation of conducting polymer nanocomposites [9-10]. Therefore, there has been increasing interest of the researchers for the preparation of nanocomposites based on PANI for gas sensing applications. Hybridization of metal oxide and conducting polymer could improve the properties of pure metal oxides or conducting polymers based gas sensor and the new synthesized material shows the synergistic effect of these two materials

PANI-ZnO with different weight percentage of zinc oxide were successfully synthesized and tested for hydrogen gas sensing. It was concluded that PANI-ZnO showed the best response compared to other composition[12].

A Mehata et al [13] synthesized polyaniline/ZnO nanocomposites for ammonia gas sensing application. The lower intensity polaron absorption bands for polyaniline/ZnO nanocomposites in the UV-Vis spectra indicate that the conducting state of the polymer has been improved. Observed results clearly indicate that polyaniline/ZnO nanocomposite is a good candidate for ammonia sensing with better sensitivity.

M. Sawarkar et.al. [14] studied PANI, ZnO and CdO nanoparticles along with PANI/ZnO, PANI /CdO nanocomposites had been successfully synthesized by a simple, cost effective technique. ZnO and CdO nanoparticles were synthesised by sol gel method. XRD studies clearly showed the crystalline and hexagonal quartzite nature of the ZnO nanoparticles and PANI/ZnO nanocomposites of 32 nm and 48 nm, respectively. A change in the lattice parameters of ZnO in the PANI/ZnO nanocomposites was observed which also indicated the interaction between ZnO particles and PANI matrix. The SEM study of PANI/ZnO nanocomposites revealed uniform distribution of ZnO nanoparticles in PANI matrix. FTIR spectra revealed that the absorption peaks of PANI/ZnO nanocomposite were found to shift towards lower wave number as compared to those observed in pure PANI. The shifting of absorption bands were attributed to the interaction of ZnO nanoparticles with the PANI molecular chains.

Meng, F et. Al. [15] Polyaniline (PANI) and MnO2/PANI composites are simply fabricated by one-step interfacial polymerization. The morphologies and components of MnO2/PANI composites are modulated by changing the pH of the solution. Formation procedure and capacitive property of the products are investigated by XRD, FTIR, TEM, and electrochemical techniques. We demonstrate that MnO2 as an intermedia material plays a key role in the formation of sample structures. The MnO2/PANI composites exhibit good cycling stability as well as a high capacitance close to 207 F g−1. Samples fabricated with the facile one-step method are also expected to be adopted in other field such as catalysis, lithium ion battery, and biosensor.

Conclusion

The current review paper will emphasize PANI composites with thermosetting polymer matrices Many studies special attention is given on synthesis of Polyaniline Nano composite have been reported in the quest to develop new advanced materials with improved mechanical, electrical, optical and catalytic properties or to improve conduction mechanism in electronic devices. These materials have found their use in many electronic and nanoelctronic devices.

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DC Conductivity and Thermal Analysis of Polyaniline Cadmium Sulphide nanocomposite

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Introduction

In recent years, with the rapid development of nanotechnology and composite materials, polyanline (PANI) nanocomposites have attracted considerable interest. PANI is one of the most promising conducting polymers due to its high conductivity, easy preparation, good environmental stability and large variety of applications [1]. Unlike other conjugated polymers, PANI has a simple and reversible acid/ base doping/dedoping chemistry, enabling control over properties such as solubility, electrical conductivity and optical activity [2]. Polymer nanocomposites show quite different properties from the constituent materials due to interfacial interactions between nanostructured semiconductors and polymers.

CPs join the electronic and optical properties of semiconductors and metals with the alluring mechanical properties and handling preferences of polymers. CPs have numerous profitable properties in chemical, electrical, physical and optical angles, contrasted with ordinary polymers. These properties cover high conductance, iridescence, electrochromism and high thermal soundness. This has set off the improvement of novel CPs, for example, polyaniline (PANI), polypyrrole (PPY), polythiophene, polyphenylene, etc. [3-5] and their application in batteries [6-9].

Polyaniline (PANI) has gotten much consideration in view of its electronic, thermoelectric and optical properties and additionally its great ecological solidness and simplicity of synthesis. Polyaniline is likewise one of a kind among natural conducting polymers in that its electrical properties are controlled by the two its oxidation state and level of protonation. Thus, polyaniline is generally utilized for different applications, for example, battery-powered batteries [10,11], chemical transtiors , supercapicitors , electrochromic shows , actuators, sensors and hostile to corrision covering .

Among conducting polymers, polyaniline (PANI) is presumably the most generally examined because of its few interesting properties [12,13]. It simplicity of arrangement, light weight, ease, better electronic, optical properties, exceptionally stable in air and dissolvable in different solvents, and great processibility [14-16]. Then again it very well may be utilized in numerous applications, for example, electromagnetic obstruction (EMI) protecting, electro-impetuses, battery-powered battery, light-producing diodes (LEDs), solar cell, chemical sensor, biosensor, erosion gadgets and microwave ingestion [17,18].

Experimental

Materials

The Aniline monomer (AR grade) and Ammonium Persulphate (AR grade). Cadmium Nitrate (AR grade), Ammonium Sulphide (AR Grade)

Synthesis of Polyaniline Cds Nanocomposite

In the Present work polymer composite film of Polyaniline (PANI)-CdS was prepared for different weight percent of Cadmium Sulphide (CdS).

Synthesis steps of PANI/CdS nanocomposite are similar to the synthesis method of PANI. Different amount of CdS were dispersed into the APS solution and stirred for 1 h prior to the addition of aniline. Aniline (0.4 mol) stirred with 0.4M H_2SO_4 in 100 ml of distilled water were added drop-wised using burette into the APS-CdS solution and stirred vigorously to form homogeneous dispersion. For convenience, PANI Composites were prepared with different weight percentages of CdS [19]. Same synthesis conditions were maintained for all composites as that of pure PANI.

Result and Discussion

1) TG/DTA

Thermogravimetric Analysis or thermal gravimetric analysis is a sort of testing performed on tests that decides changes in weight in connection to a temperature program in a controlled atmosphere.Such analysis relies on a high degree of precision in three measurements: weight, temperature, and temperature change. TGA is commonly employed in research to determine characteristics of materials, degradation temperatures, absorbed moisture content of materials, the level of inorganic and organic components in materials,

decomposition points of explosives and solvent residues. The TGA/DTA of PANI-CdS nanocomposite TGA/DSC temperature is maintained up to 973K. and heating rate of the sample was 10°C/min.

Thermal properties of pure Polyaniline polymer and PANI doped with Cadmium Sulphide (CdS) were evaluated by TGA/DTA in the temperature range 0 °C to 500 °C at a heating rate of 10 °C /min (Figure 1).

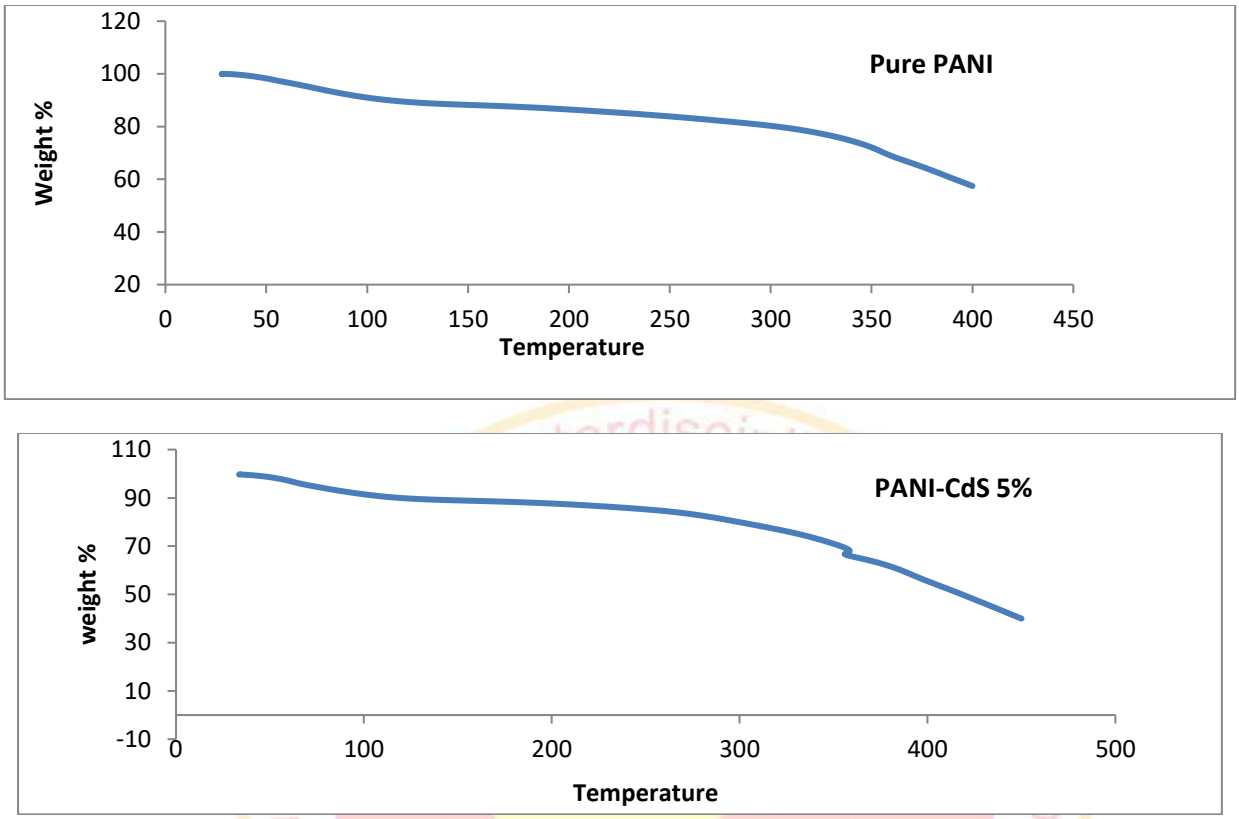
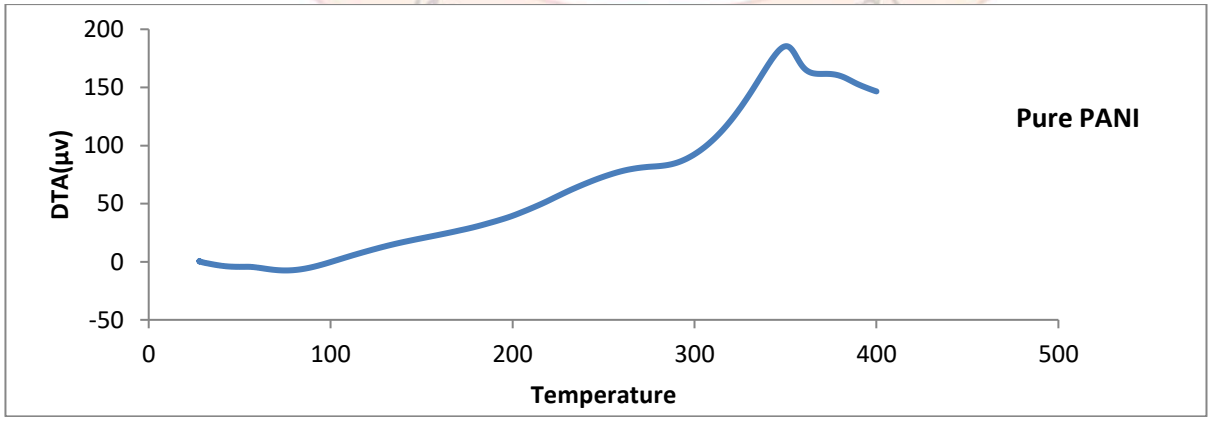


Fig. 1 TGA thermographs of pure PANI and PANI doped with 5 wt % of Cadmium Sulphide CdS

TGA thermograph of PANI-CdS nanocomposites shows two step degradation Figure 1 shows the two step degradation of PANI-CdS nanocomposite having 60-65% of its weight loss when it was heated to 500^{0}C. It indicates that 60-65 % of the sample consists of polymers and softeners. The residual about 35-40 % was considered to account for metallic compounds, added as sulphide and dopant. Residual was increases with increasing the wt. % of dopant. Addition of CdS weakens the structure of PANI as weight loss increases.

Figure 2 shows DTA curves of pure Polyaniline and PANI doped with CdS(10 %). In DTA curve, the endothermic peak appearing at ~ 70-80 ^{0}C is probably due to the melting point of PANI that identified as melting of crystalline phase of polymer. The sample PANI-CdS nanocomposite shows the strong and broad exothermic peak in the range 340 to 400 °C accompanied by rapid weight loss can be ascribed to the decomposition of PANI-CdS nanocomposite.



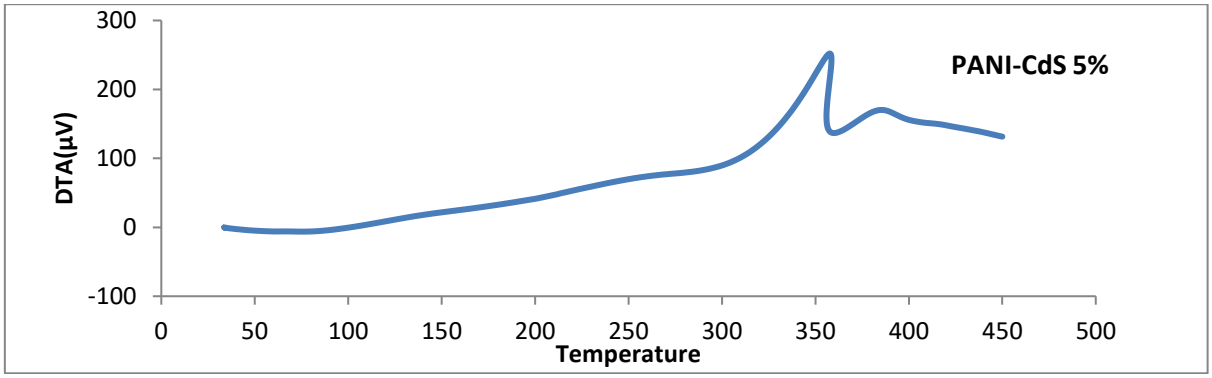


Fig. 2 DTA Curve of pure PANI and PANI doped with 5 % of Cadmium Sulphide CdS

ll) DC Conductivity

A suitable heating rate (2^0C/min.) was maintained with the help of dimmer stat. A digital temperature indicator connected to a thermocouple (resolution 1^0C) placed near the sample to measure the temperature of the sample. A constant voltage is applied to the sample and corresponding current (Pico-ammeter, Scientific Equipment Roorkee, resolution 1 pA) was measured at constant temperature, which gives resistance of the sample. Then the change in conductivity of the samples with temperature was estimated.

DC conductivity of the pure PANI polymer and doped with different wt. % of CdS was measured in the temperature range 308 to 328K by using Ohms law. The resistance of the samples was measured. It is observed that the value of resistance depends on temperature as well as on composition.

The variation of dc conductivity with different wt. % of CdS is shown in fig 3 As compared to pure Polyaniline the conductivity increases with CdS wt. % . Polyaniline doped with the 5 wt. % CdS shows the maximum value of dc conductivity.

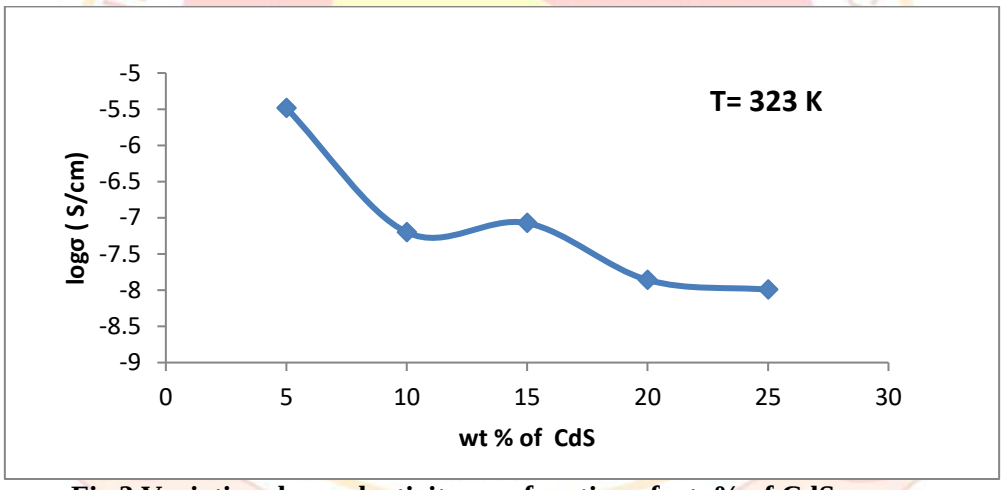


Fig 3 Variation dc conductivity as a function of wt. % of CdS

The variation of dc conductivity as a function of inverse temperature for Polyaniline polymer doped with the different wt. % CdS was estimated. The nature of plots is shown in Figure 4, over the temperature range 308 to 328 K. It can be observed that the dc conductivity for all the compositions of PANI doped with the different wt. % CdS increases with increasing temperature for the entire range.

It tends to be seen that the Arrhenius plots for every one of the examples show a comparative behavior. The dc conductivity esteems increments with the different wt. % CdS at various temperatures.

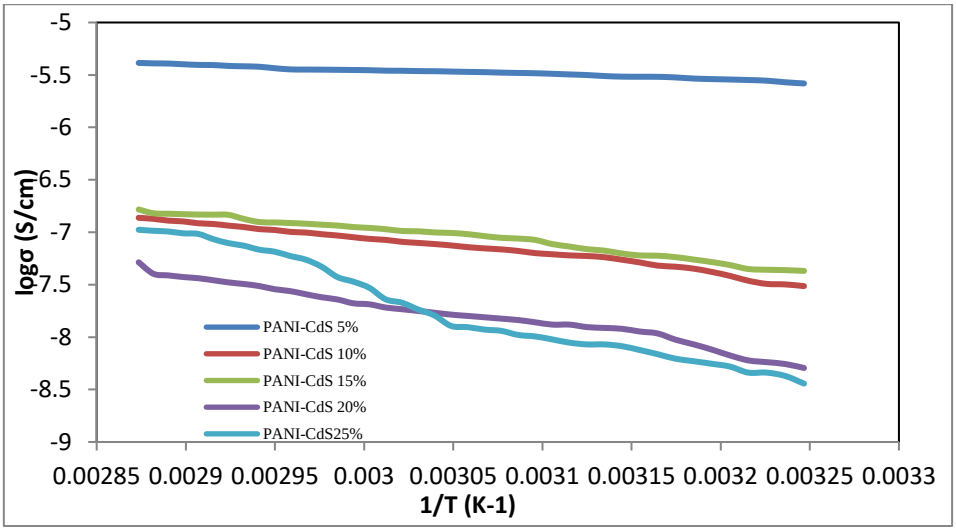


Fig 4 Arrhenius plots of the dc conductivity of PANI-CdS composite for different wt. % of CdS

As the temperature builds, versatility of the ions expands, which results the rise in conductivity . Uppermost curve belong to 5 wt % of CdS for which conductivity is maximum. The conductivity versus temperature curves of all synthesized samples shows the increase in conductivity. The rate of increase of conductivity is linear for the composite; which may be due to the segmental motion of the ions in the polymer [20].

The natures of the curves are consistent with Arrhenius type charge conduction in polymer composites and the conductivity relationship follows the equation,

$$\sigma = \sigma_0 \, ex \, (-E_a/kT) \qquad (1)$$

Where E_a is the activation energy, σ_0, is the pre-exponential factor and k is the Boltzmann's constant. The slope of each straight line gives the activation energy which lies between 0.039 and 0.36 eV. From the figure 5, DC parameters are calculated and noted in table 5.1.

Sr.No.	CdS wt %	Activation Energy E_a (eV)	Conductivity σ (S/cm)
1	5	0.039	3.2833×10^{-6}
2	10	0.146	6.3232×10^{-8}
3	15	0.135	8.4481×10^{-8}
4	20	0.201	1.3852×10^{-8}
5	25	0.364	1.0162×10^{-8}

Table 1 : DC parameter for the PANI-CdS Nanocomposite

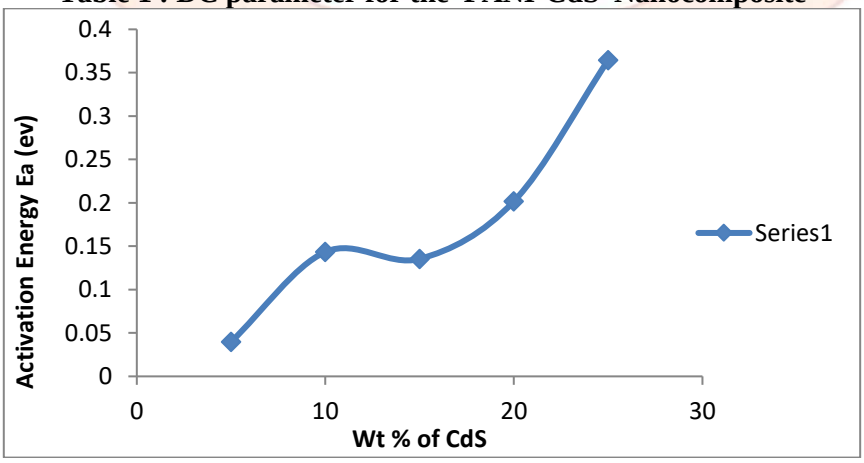


Fig. 5 Variation Activation Energy as a function of wt. % of CdS

Plot of activation energy with different wt. % of CdS is illustrated in figure 5.8, which shows that activation energy Ea is found to be maximum for the 25 wt % of CdS. The value of activation energy increases with wt. % CdS.

Conclusion

In this work PANI-CdS nanocomposites were successfully prepared by *insitu* polymerization method at room temperature. As compared to pure Polyaniline the conductivity increases with CdS wt. % . Polyaniline doped with the 5 wt. % CdS shows the maximum value of dc conductivity and 25 wt % CdS shows maximum activation energy. TGA shows the two step degradation of PANI-CdS nanocomposite having 60-65% of its weight loss when it was heated to 500^0C. In DTA curve, the endothermic peak appearing at ~ 70-80 ^{0}C is probably due to the melting point of PANI that identified as melting of crystalline phase of polymer.

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Density, Viscosity and Ultrasonic Velocity Studies of Aqueous Solution of D-(-) - Tartaric Acid at Different Temperature

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Abstract

At concentration range (0.01 to 0.1) mol/kg and temperature range T = (298.15 and 303.15) K, densities (ρ) , ultrasonic speeds (u) and viscosities (η) of aqueous solutions of D-(-) - Tartaric acid were measured. From these experimentally measured values the parameters such as Adiabatic Compressibility (β_a), Free Length (L_f), Free Volume (V_f), M_{eff}, Internal Pressure (P_i), Acoustic Impedance (Z), Gibbs free energy (ΔG), Molar Cohesive Energy (M_{CE}), Relaxation Time (τ), Molar Volume (V_m) and Rao Constant (R) have been evaluated. The results have been interpreted in terms of solute-solvent and solute-solute interactions in these systems. It has been observed that there exist strong solute-solvent interactions in these systems and these interactions increases with concentration of solute in aqueous medium.

Keywords: *Density, Ultrasonic speed, Viscosity, molecular interaction.*

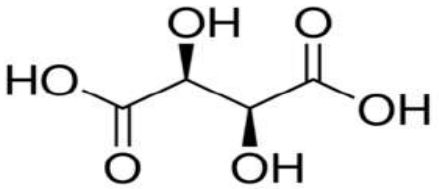
Introduction

Tartaric acid is a white, crystalline organic acid that occurs naturally in many fruits, most notably in grapes, but also in bananas, tamarinds, and citrus. Tartaric acid has three stereoisomeric forms dextrorotatory tartaric acid, levorotatory tartaric acid and racemic tartaric acid. Tartaric acid is an alpha-hydroxy carboxylic acid, and is diprotic organic acid [1]. All the forms of tartaric acid are readily soluble in water. It can form salts with bases, and some of the important salts of tartaric acid are cream of tartar (potassium hydrogen tartrate) and Rochelle salt (potassium sodium tartrate).Tartaric acid plays an important role in the preparation of many food additives. Tartaric acid is used in pharmaceutical products, skin care, beverages, agriculture products and textiles. The studies on Tartaric acid solute solvent interactions are most important for the field of biosynthesis, medicine, immunology and pharmacology. The study of physiochemical behaviour and molecular interaction in liquid mixtures is of considerable importance and number of techniques has been used to investigate the interaction between the components of binary liquid mixtures. In recent years, the measurement of ultrasonic velocity has been extensively applied in understanding the nature of molecular systems, physiochemical behavior and molecular interactions in liquid mixture.

In the present article, we report the densities, ρ, ultrasonic speeds u and viscosities η of solutions of Tartaric acid in water at different temperatures and atmospheric pressure have been computed using standard relations given by literature [2-4]. Various physicochemical parameters, viz., Adiabatic Compressibility (β_a), Free Length (L_f), Free Volume (Vf), M_{eff}, Internal Pressure (P_i), Acoustic Impedance (Z), Gibbs free energy (ΔG), Molar Cohesive Energy (M_{CE}),Relaxation Time (τ),Molar Volume (Vm) and Rao Constant (R) have been calculated using the experimental data.

Material and Methods

Tartaric acid (AR 99%) having molecular weight of 182.65 was obtained from Sigma Aldrich chemicals Ltd. The molecular structure of this compound is as follows



D-(-)-tartaric acid

The aqueous solutions of Tartaric acid of different concentrations were freshly prepared by using double distilled water. The required amount of solute was measured by using a digital weighing machine. The solutions were made on the basis of molality and stored in special airtight bottles to avoid contamination and evaporation. The densities measurements have been done by using specific gravity bottle (10ml). Ultrasonic velocities have been determined by using digital ultrasonic pulse echo velocity meter (VCT -70A). The viscosities of the solutions were measured by using Ostwald's type viscometer. The instrument has been calibrated with double distilled water at certain temperatures before taking measurements. The flow time has been measured with a digital stopwatch and average flow times were taken for each series of liquid solutions.

Mathematical Formulation

Apparent molal volume measurements (v_φ)

$$\emptyset_v = \frac{1000(\rho_0 - \rho)}{m\rho\rho_0} + \frac{M}{\rho} \quad (1)$$

Where, m= molality of the solute

ρ = density of solution

ρ_o= density of solvent

M= molar mass of the solute (tartaric acid)

Where f = frequency of the ultrasonic wave

Apparent molar compressibility (k_s, φ)

$$K_s, \varphi = \frac{1000(K_s\rho_0 - K_s^0\rho)}{m\rho\rho_0} + \frac{K_s M}{\rho} \quad (2)$$

Where, $k_s$and k_s^0= isentropic compressibility of the solution and solvent (water) respectively.

Isentropic Compressibility

$$K_s = \frac{1}{u^2}\rho \quad (3)$$

Acoustic Impedance (Z)

The specific acoustic impedance is given by

$$Z = U\,\rho_s \qquad \text{Kg } m^{-2}s^{-1} \quad (4)$$

ρ_s = Density of solution

U = ultrasonic velocity of solution

Relaxation Time (τ)

$$\tau = \frac{4}{3\beta\eta} \quad (5)$$

where η is the viscosity of solution

Classical absorption $(\alpha/f^2)_{cl}$

$$(\alpha/f^2)_{cl} = \frac{8\pi^2\eta}{3\rho U^3} \quad (6)$$

Where f = frequency of the ultrasonic wave

Free Length (L_f)

$$L_f = K\beta^{1/2} \quad (7)$$

K= temperature dependant constant

Result and Discussion

The experimental values of basic parameter of Ultrasonic velocity (u), Density) and Viscosity obtained are given in table 1 and by using these basic parameter the various acoustic parameter such as Acoustic Impedance (Z), Adiabatic compressibility (βa), Relaxation Time (T), Free Length (Lf), Free Volume (Vf),Meff (kg), Internal Pressure (Pi), MCE,Molar Volume (Vm), Rao Cont. Molar Sound Velo.etc are calculated in table2,3,4 and 5 the various acoustic parameter's calculated values are given.

Composition M(mol/kg)	298.15 K			303.15 K		
	Velocity U(m/s)	Density ρ (kg/m^3)	Viscosity η (N.s.m^3)	Velocity U(m/s)	Density ρ (kg/m^3)	Viscosity η (N.s.m^3)
0.01	1410.19	1035.1220	9.81E-04	1503.14	1020.2290	8.67E-04
0.02	1493.54	999.0480	9.58E-04	1503.75	1020.2290	8.62E-04
0.03	1494.14	1001.0520	9.60E-04	1503.76	1020.2290	8.43E-04
0.04	1494.14	1002.0540	9.45E-04	1504.35	1021.2520	8.48E-04
0.05	1494.73	1000.0500	9.37E-04	1504.96	1022.2760	8.24E-04
0.06	1495.33	1001.0520	9.76E-04	1504.96	1023.2990	8.38E-04
0.07	1495.33	1003.0560	9.83E-04	1505.56	1023.2990	8.73E-04
0.08	1495.93	1004.0580	9.63E-04	1505.56	1026.3690	8.55E-04
0.09	1496.53	1005.0600	9.42E-04	1506.17	1025.3460	8.17E-04
0.1	1497.53	1006.0620	9.48E-04	1506.17	1027.3920	8.53E-04

Experimental Values of density, viscosity and ultrasonic velocity of aqueous D- (-)-Tartaric Acid and other parameters

Table 1
Table 2.

	298.15 K			303.15 K		
Composition M	Adiabatic Compre. βa ($10^{-10}N^{-1}.m^2$)	Free LengthL$_f$ (10^{-11}m)	Free Volume V$_f$ ($10^{-8}m^3.mol^{-1}$)	Adiabatic Compre. βa	Free Length L$_f$ (10^{-11}m)	Free Volume V$_f$ ($10^{-8}m^3.mol^{-1}$)
0.01	4.858E-10	4.534E-11	1.5E-08	4.338E-10	4.324E-11	2E-08
0.02	4.487E-10	4.357E-11	1.7E-08	4.335E-10	4.322E-11	2.0E-08
0.03	4.475E-10	4.351E-11	1.7E-08	4.335E-10	4.322E-11	2.1E-08
0.04	4.470E-10	4.349E-11	1.7E-08	4.327E-10	4.318E-11	2.1E-08
0.05	4.476E-10	4.352E-11	1.8E-08	4.319E-10	4.314E-11	2.1E-08
0.06	4.468E-10	4.348E-11	1.6E-08	4.315E-10	4.312E-11	2.1E-08
0.07	4.459E-10	4.343E-11	1.6E-08	4.311E-10	4.310E-11	2E-08
0.08	4.451E-10	4.340E-11	1.7E-08	4.298E-10	4.304E-11	2E-08
0.09	4.443E-10	4.336E-11	1.8E-08	4.299E-10	4.304E-11	2.2E-08
0.1	4.432E-10	4.331E-11	1.7E-08	4.291E-10	4.300E-11	2.1E-08

	298.15 K			303.15 K		
Composition m	Meff (kg)	Internal Pressure Pi (10^9pas)	Acoustic Imped. Z (kg. m^{-2}.s^{-1})	Meff (kg)	Internal Pressure Pi (10^9pas)	Acoustic Imped. Z (kg. m^{-2}.s^{-1})
0.01	1.80E-02	3.004E+09	1.460E+06	1.80E-02	2.709E+09	1.534E+06
0.02	1.80E-02	2.817E+09	1.492E+06	1.80E-02	2.701E+09	1.534E+06
0.03	1.81E-02	2.805E+09	1.496E+06	1.81E-02	2.654E+09	1.534E+06
0.04	1.81E-02	2.785E+09	1.497E+06	1.81E-02	2.663E+09	1.536E+06
0.05	1.81E-02	2.769E+09	1.495E+06	1.81E-02	2.626E+09	1.538E+06
0.06	1.81E-02	2.827E+09	1.497E+06	1.81E-02	2.650E+09	1.540E+06
0.07	1.82E-02	2.823E+09	1.500E+06	1.82E-02	2.687E+09	1.541E+06
0.08	1.82E-02	2.796E+09	1.502E+06	1.82E-02	2.664E+09	1.545E+06
0.09	1.82E-02	2.766E+09	1.504E+06	1.82E-02	2.602E+09	1.544E+06
0.1	1.82E-02	2.776E+09	1.507E+06	1.82E-02	2.663E+09	1.547E+06

Table 3.
Table 4.

	298.15 K		303.15 K	
Composition m	Gibbs free energy ΔG (Jmol^{-1})	Molar Cohesive Energy MCE (kJ mol^{-1})	Gibbs free energy ΔG (Jmol^{-1})	Molar Cohesive Energy MCE (kJ mol^{-1})
0.01	4.616E-21	5.224E+04	3.748E-21	4.780E+04
0.02	4.238E-21	5.076E+04	3.724E-21	4.765E+04
0.03	4.235E-21	5.072E+04	3.642E-21	4.708E+04
0.04	4.174E-21	5.031E+04	3.657E-21	4.719E+04
0.05	4.147E-21	5.012E+04	3.545E-21	4.650E+04
0.06	4.290E-21	5.112E+04	3.603E-21	4.687E+04
0.07	4.309E-21	5.122E+04	3.750E-21	4.779E+04
0.08	4.227E-21	5.067E+04	3.663E-21	4.725E+04
0.09	4.139E-21	5.009E+04	3.497E-21	4.619E+04
0.1	4.154E-21	5.022E+04	3.648E-21	4.717E+04

Table 5.

	298.15 K			303.15 K		
Composition M	Relaxation Time T (10^{-13}sec)	Molar Volume Vm ($10^{-5}m^3.mol^{-1}$)	Rao Const. (Mol. Sound Velo.) R ($10^4m^5.N^{-2}$)	Relaxation Time T (10^{-13}sec)	Molar Volume Vm ($10^{-5}m^3.mol^{-1}$)	Rao Const. (Mol. Sound Velo.) R ($10^4m^5.N^{-2}$)
0.01	6.354E-13	1.739E-05	1.95E-04	5.015E-13	1.764E-05	2.02E-04
0.02	5.732E-13	1.802E-05	2.06E-04	4.982E-13	1.764E-05	2.02E-04
0.03	5.728E-13	1.808E-05	2.07E-04	4.872E-13	1.774E-05	2.03E-04
0.04	5.632E-13	1.806E-05	2.06E-04	4.892E-13	1.772E-05	2.03E-04
0.05	5.592E-13	1.810E-05	2.07E-04	4.745E-13	1.771E-05	2.03E-04
0.06	5.814E-13	1.808E-05	2.07E-04	4.821E-13	1.769E-05	2.03E-04
0.07	5.844E-13	1.814E-05	2.07E-04	5.018E-13	1.779E-05	2.04E-04
0.08	5.715E-13	1.813E-05	2.07E-04	4.900E-13	1.773E-05	2.03E-04
0.09	5.580E-13	1.811E-05	2.07E-04	4.683E-13	1.775E-05	2.03E-04
0.1	5.602E-13	1.809E-05	2.07E-04	4.880E-13	1.771E-05	2.03E-04

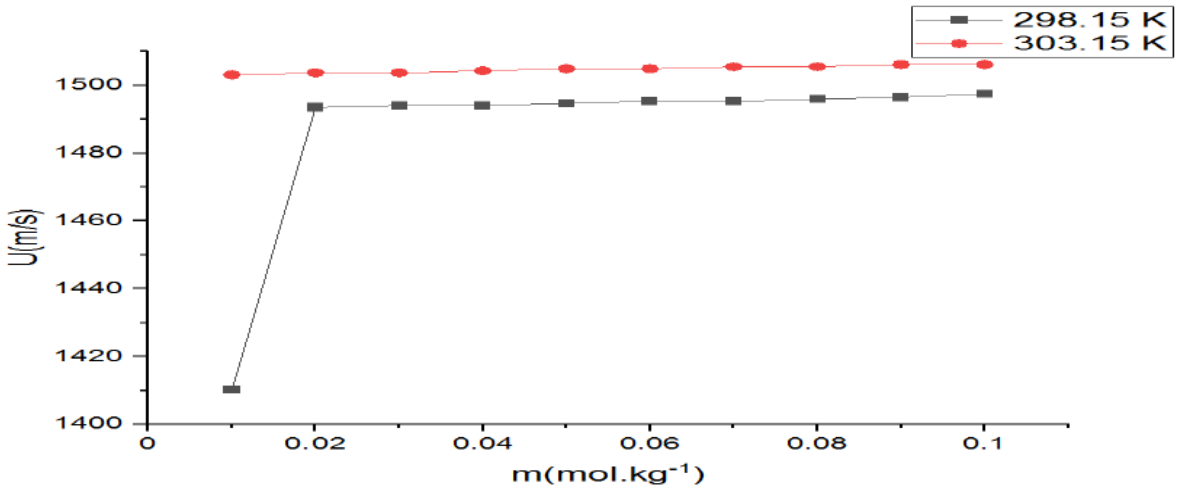


Fig.1 Variation of Ultrasonic Velocity with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

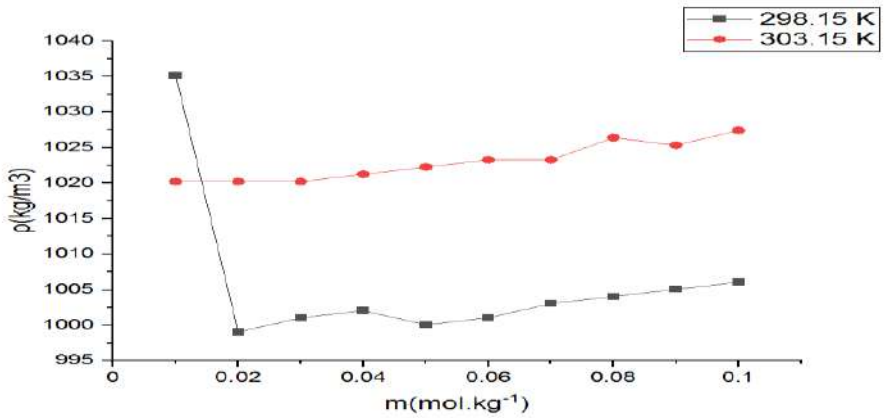


Fig.2 Variation of Ultrasonic Density with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

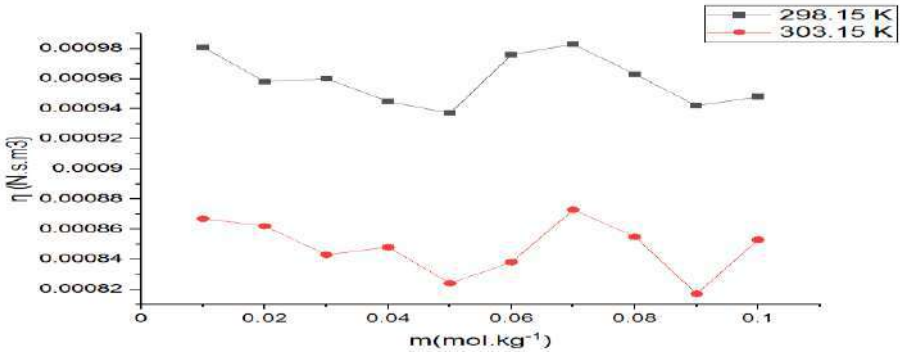


Fig.3 Variation of Ultrasonic Viscosity with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

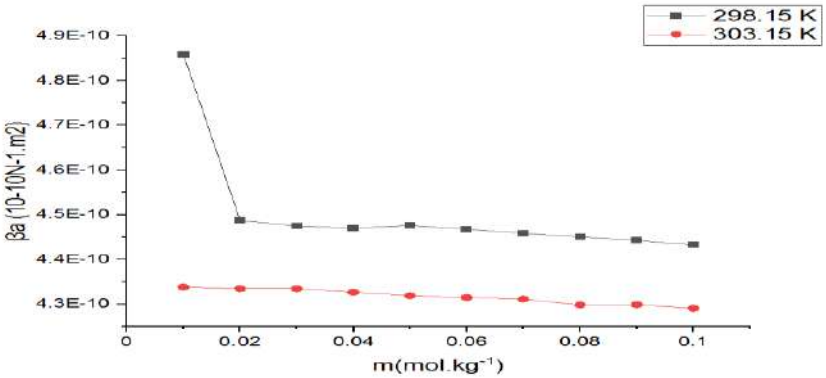


Fig.4 Variation of Adiabatic Compressibility with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

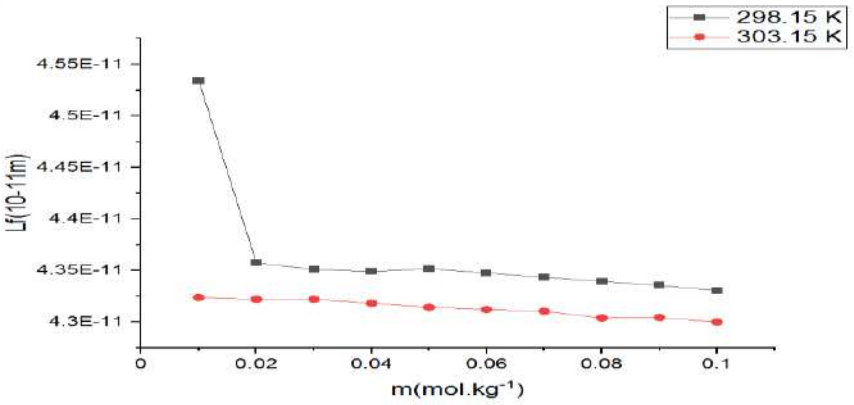


Fig.5 Variation of Free Length with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

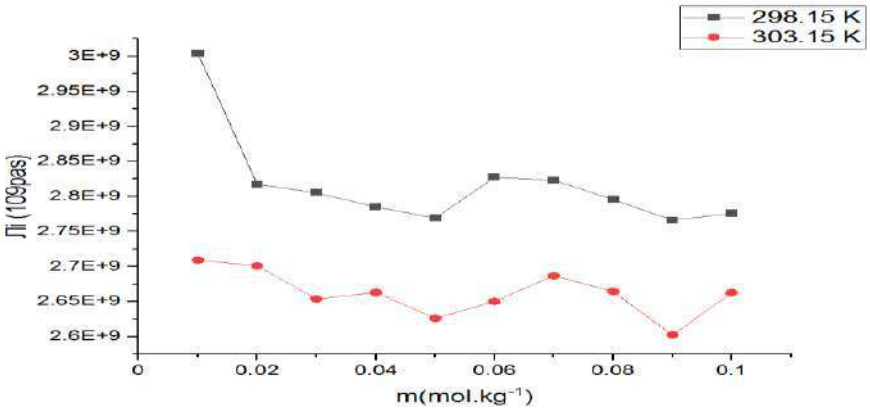


Fig.6 Variation of Internal Pressure with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

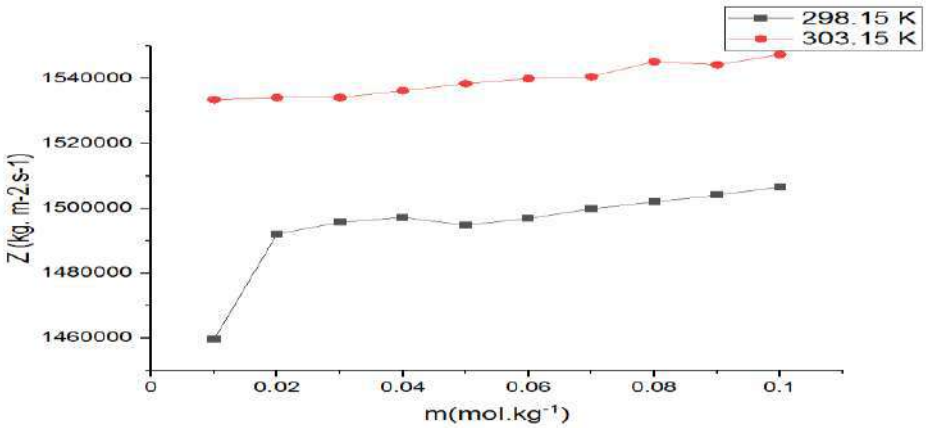


Fig.7 Variation of Acoustic Impedance with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

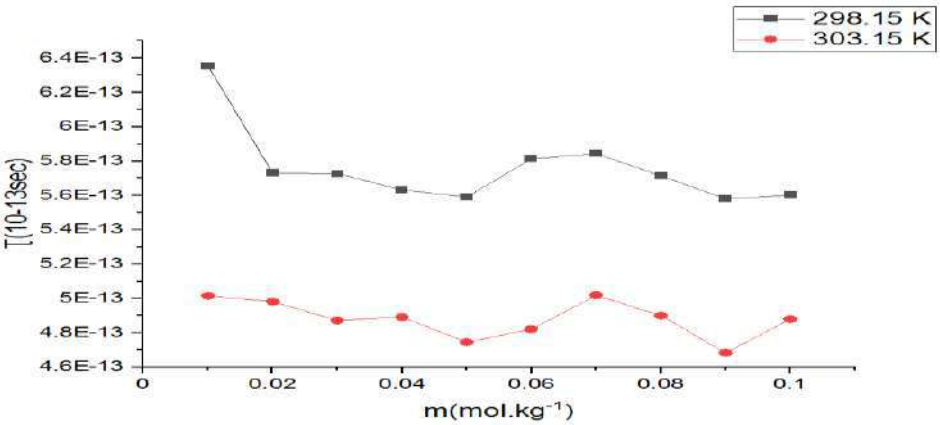


Fig.8 Variation of Relaxation Time with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

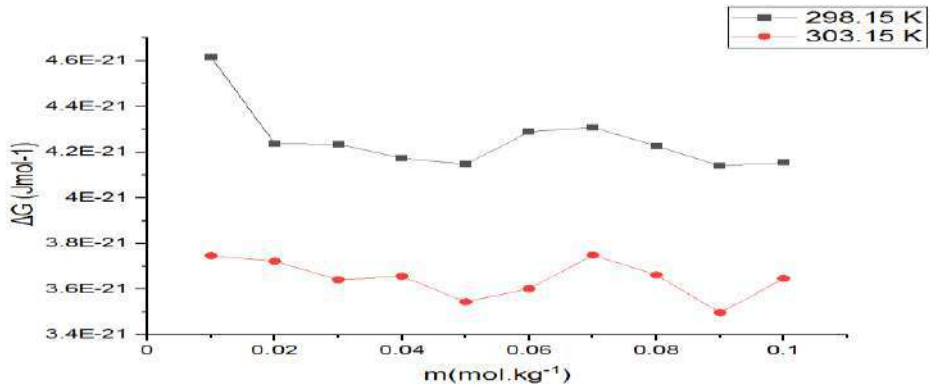


Fig.9 Variation of Gibbs free energy molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

In the present study, the experimental value of ultrasonic velocity, density and viscosity with different concentration of D-(-)-tartaric acid in distilled water at temperature 298.15K and 303.15K are tabulated table 1. While other parameters such as adiabatic compressibility ,free length, free volume, internal pressure , acoustic impedance , relaxation time, molar volume, Gibbs free energy , meff , rao constant and molar cohesive energy are tabulated table 2 to table 5 Fig.1. Shows that the ultrasonic velocity increases with increasing number of solute particle in solvent double distilled water and also with rise in temperature. The increase in ultrasonic velocity is an indication of enhanced solute solvent molecule interaction and structure making tendency of solute D-(-) - Tartaric acid in water.

Fig.2. shows that density of solution increases with increase in concentration due to increase in number of particle in solution. It is predict that there strong interaction in molecule of solution. The density of solution increases with rise in temperature.Fig.3. shows that Viscosity is inversely proportional to the adiabatic compressibility means that adiabatic compressibility decreases at that time viscosity is increases. Fig.4. It

represents the adiabatic compressibility decreases with increase in the concentration also with temperature. The decrease in the compressibility shows that there are enhanced molecular association in this system with increase in the solute content as the new entities become compact and less compressible [5].Fig.5. It is observed from this figure that the free length of aqueous D-(-) - Tartaric acid solution decrease with rise in concentration . This indicates that there exists a significant solute-solvent interaction which leads to a structure promoting behavior. The decreasing trends of free length with rise in concentration is due to decrease in spacing between the molecule of D-(-) - Tartaric acid solution. The free volume increases with increase in concentration as well as temperature. The increase in free volume may be attributed to lose packing of the molecule inside the shield. This may be brought about by weakness of molecular interaction. The free volume is inverse function of internal pressure.Fig.6. shows that the internal pressure decrease with increase in concentration which indicates the decrease in cohesive forces. The reduction in internal pressure may be due to loosening of cohesive force leading to breaking the structure of the solute. Decrease in internal pressure indicates that there is a weak interaction between the solute and solvent molecule [6]. Fig.7. It is observed that acoustic impedance increase with concentration and also with temperature. This may be due to the variation of pressure from one particle to another particle and the increase in acoustic impedance value with solute concentration can be attributed to the effective solute solvent interaction.Fig.8. shows that relaxation time decreases with increase in concentration also with temperature. The relaxation time is order of 10^{-12} sec is due to structural relaxation process in such a case it is suggested that molecule get rearranged due to co-operative process. It was reported that if the variation in Rao's constant is linear then it show that there is complex formation and so is found in the present investigation which means that there is no complex formation.Fig.9. Gibbs free energy first decreases and then increase with concentration of solution also with temperature. This result are in accordance with clathrate like structure of D-(-) - Tartaric acid.

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Synthesis and Characterization of Bis-Schiff Bases Derived from Vaniline

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Abstract

The Schiff Bases are the utmost extensively used organic compounds . Schiff bases are significant class of compounds in medicinal and pharmaceutical field as they have also been shown toexhibit wide range of biological activities, including antifungal, antibacterial,antiferative, anti inflammatory, antiviral, and antitumor properties.

The Bis-schiff bases are the product of the reaction between Bis-aldehydes and triazole amine. Some Bis-Schiff base derivatives of 1,2,4- triazole amine and their reduced derivatives have been also found to posses pharmacological activities[6-8].

Keyword *Synthesis of Bis-schiff base,anti inflammatory, antifungal, antibacterial, antitumor etc.*

Introduction

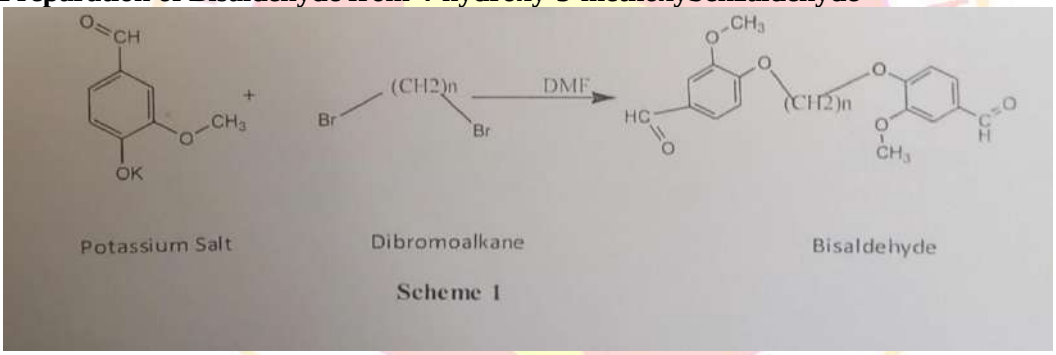
Schiff bases are the condensation products of primary amines and carbonyl compounds[1]. In present investigation,we report synthesis, characterization of Schiff Base derived from 1,2,4-triazole-4-amine and 4-hydroxy 3-methoxy benzaldehyde. Synthesis of various triazole derivatives have been reported[10-11].

In general Schiff base are most widely used compounds. They have been shown to exhibit a broad range of biological activities.

Litrature survey has revealed several advantages of Schiff bases derived from triazole. In vitro antibacterial , antifungal and cytotoxic activities of some Schiff bases and their complexes give the more research focus on this compounds[4-5].

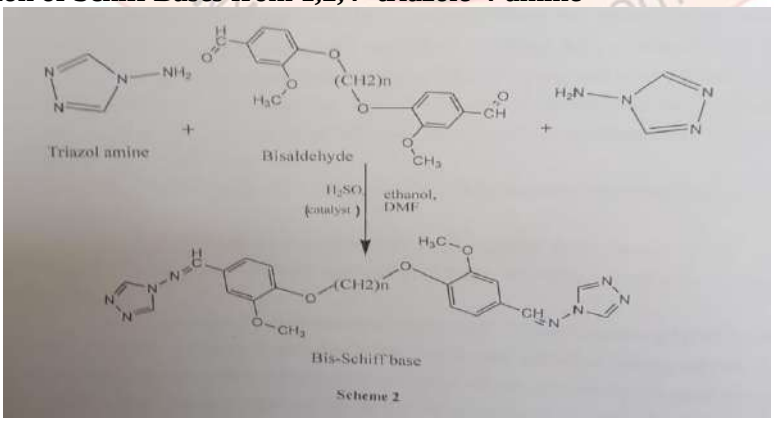
Methods for synthesis of Schiff base

Scheme I- Preparation of Bisaldehyde from 4-hydroxy-3-methoxybenzaldehyde



Take 1.5 g of 4-hydroxy-3-methoxybenzaldehyde dissolve in methanoic KOH. Stirr for 15 min. and remove solvent. Dissolve remaining in DMF and add Dibromoalkane. Reflux the reaction mixture for half an hour . Pour the content in crushed ice after ther completion of reaction . Collect solid Bis aldehyde from recrystalisation.

Scheme II – Preparation of Schiff Bases from 1,2,4- triazole-4-amine



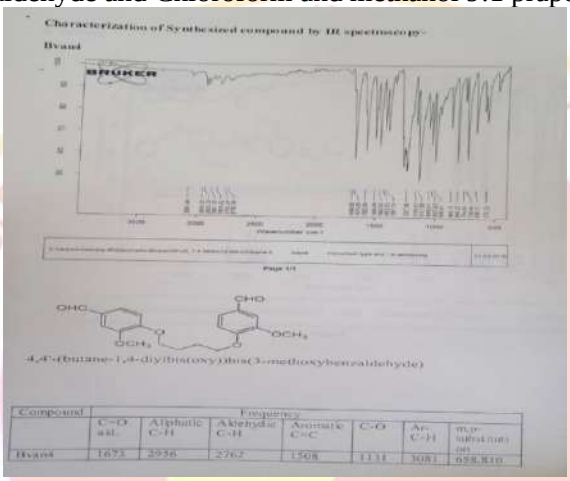
Take 0.86 g of Bisaldehyde and 0.42g of triazole in round bottom flask. Add ethanol and DMF in 9:1 praportion resp. Heat the solution till it will be completely soluble . Add 2-3 drops of H_2SO_4 to it. Reflux the solution till ppt appears.

Properties of the compound synthesized-

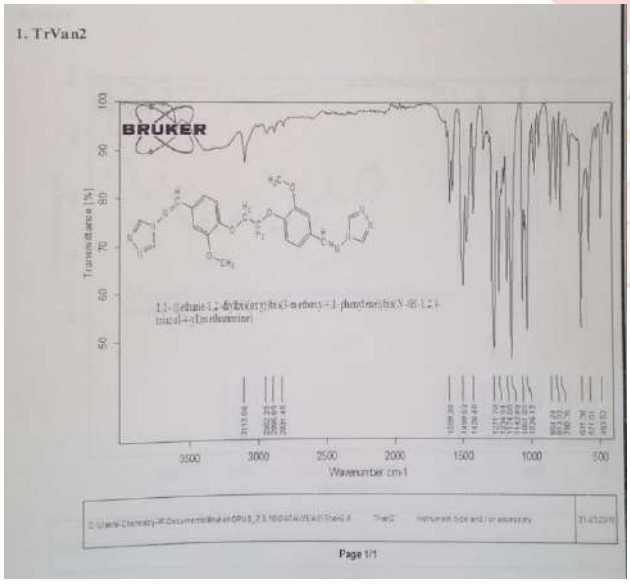
Compound	N	Molecular Formula	Molecular Weight	Melting Point
TrVan 2	$-(CH_2)_2-$	$C_{22}H_{22}N_8O_4$	430.198	228^0C
TrVan 3	$-(CH_2)_3-$	$C_{23}H_{24}N_8O_4$	444.208	244^0C
TrVan 4	$-(CH_2)_4-$	$C_{24}H_{26}N_8O_4$	458.218	240^0C
TrVan 5	$-(CH_2)_5-$	$C_{25}H_{28}N_8O_4$	472.228	216^0C

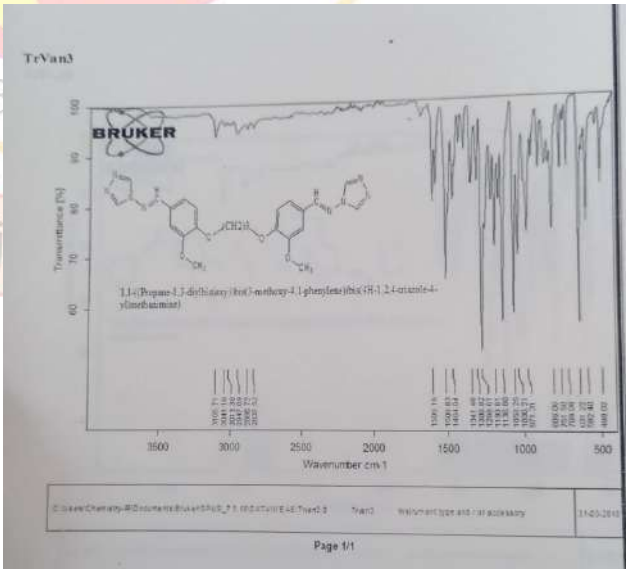
Result and Discussion-

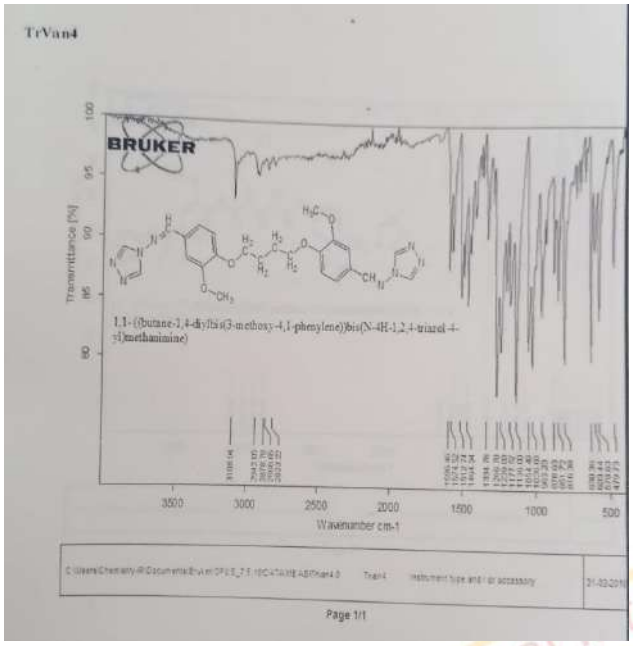
The synthesis of Schiff bases from triazolamine and bisaldehyde is very efficient required short reaction time , atom economical and with better yield. In present investigation the reaction of the various bisaldehyde with triazole were studied. The purity of the product obtained was checked by TLC using ethyl acetate and cyclohexane in 6:4 ratio for bisaldehyde and Chloroform and methanol 9:1 praportion for Schiff bases.

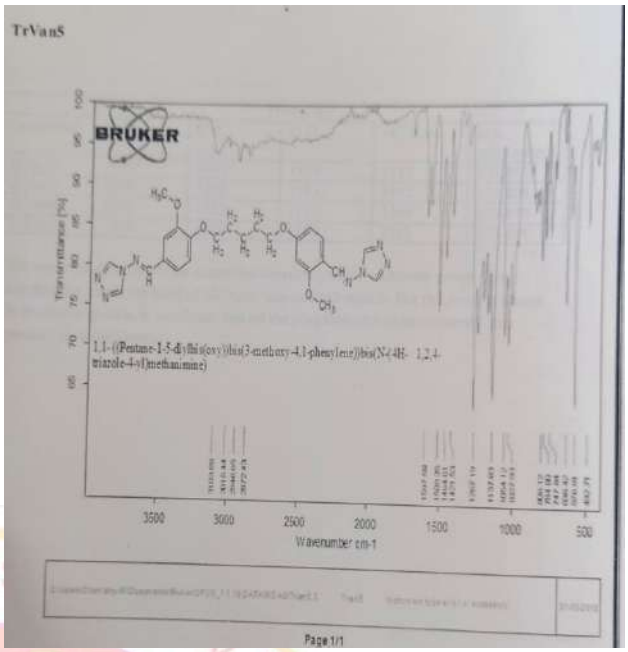


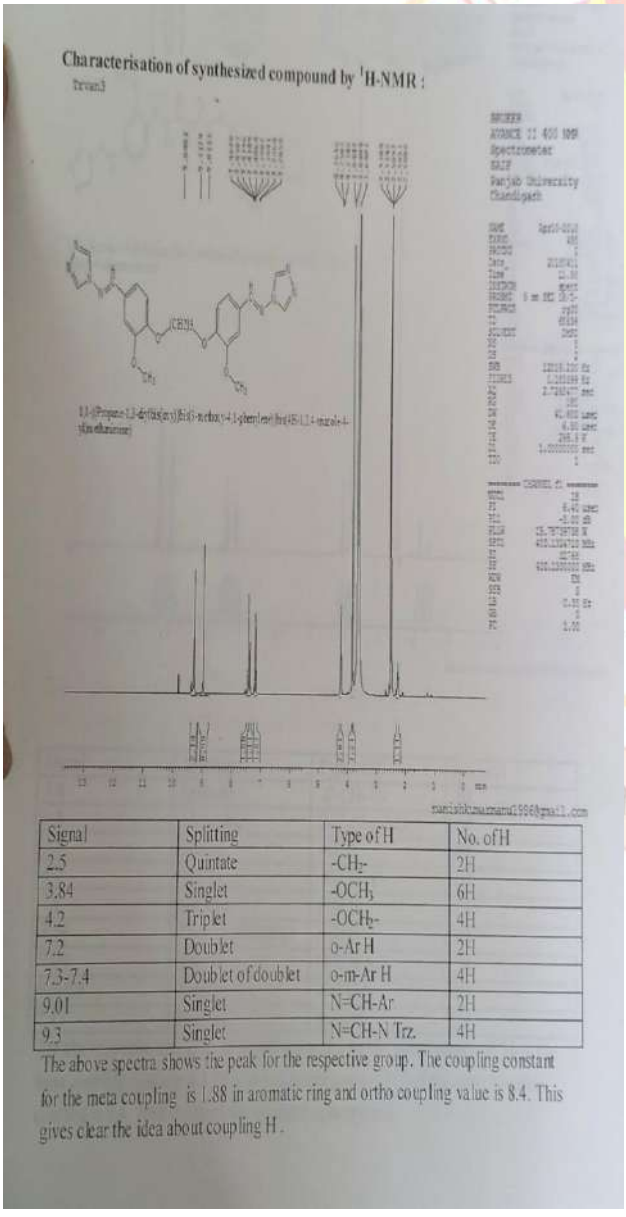
The conventional method take more time for the completion of reaction. But by using H_2SO_4 as the catalyst we can increase the rate of reaction . After addition of catalyst we get the product immediately within 5-10 min. This process is energy efficient and also autoeconomical. All the new compounds are tested with TLC , purified and crystalize with ethanol.





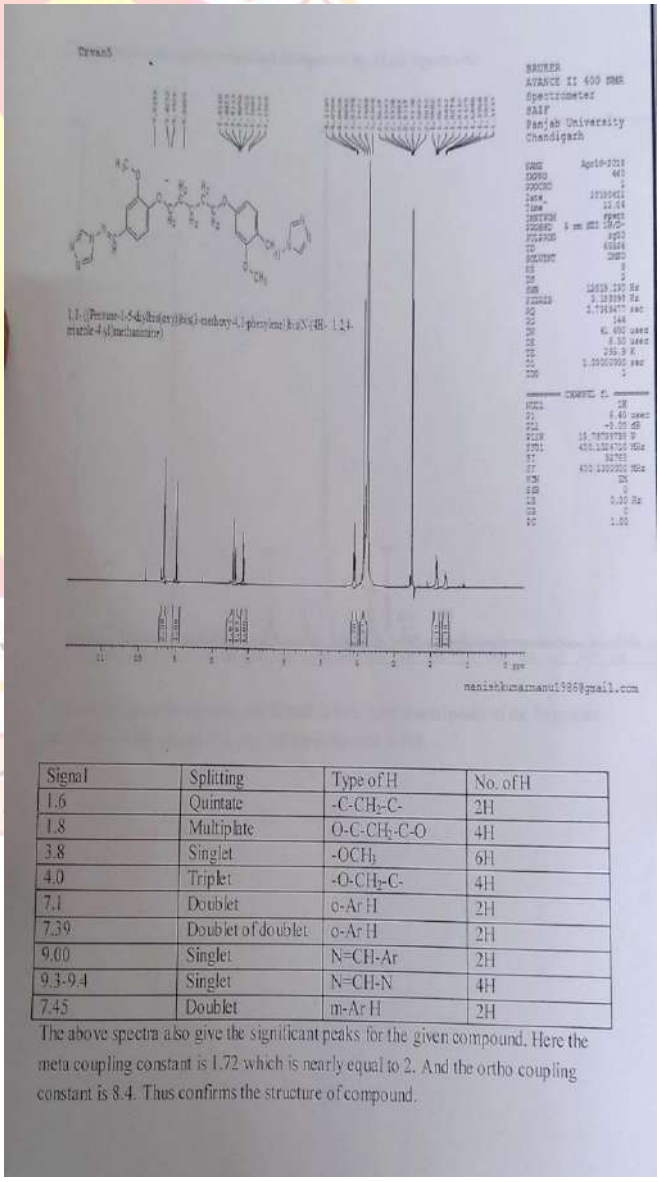






Signal	Splitting	Type of H	No. of H
2.5	Quintate	-CH_2-	2H
3.84	Singlet	-OCH_3	6H
4.2	Triplet	-OCH_2-	4H
7.2	Doublet	o-Ar H	2H
7.3-7.4	Doublet of doublet	o-m-Ar H	4H
9.01	Singlet	N=CH-Ar	2H
9.3	Singlet	N=CH-N Trz.	4H

The above spectra shows the peak for the respective group. The coupling constant for the meta coupling is 1.88 in aromatic ring and ortho coupling value is 8.4. This gives clear the idea about coupling H.



Signal	Splitting	Type of H	No. of H
1.6	Quintate	-C-CH_2-C-	2H
1.8	Multiplate	O-C-CH_2-C-O	4H
3.8	Singlet	-OCH_3	6H
4.0	Triplet	-O-CH_2-C-	4H
7.1	Doublet	o-Ar H	2H
7.39	Doublet of doublet	o-Ar H	2H
9.00	Singlet	N=CH-Ar	2H
9.3-9.4	Singlet	N=CH-N	4H
7.45	Doublet	m-Ar H	2H

The above spectra also give the significant peaks for the given compound. Here the meta coupling constant is 1.72 which is nearly equal to 2. And the ortho coupling constant is 8.4. Thus confirms the structure of compound.

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Thermokinetic Studies of Cr(III), Mn(III) and Fe(III) Complexes Derived From Thiazole Schiff Base.

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Abstract:
Thiazole Schiff base ligand was derived from the condensation of thiazole and 2-hydroxy-5-chloro-3-nitro acetophenone. The Schiff bases behaved as charge bidentade ligand. The ligand was characterized by elemental analysis and spectral methods. The coordinating ability of the ligand is investigated by preparing its metal complexes with Cr(III), Mn(III) and Fe(III),) have been prepared and characterized by elemental analysis, conductance measurements, molecular weight determinations, spectral and thermal studies. The synthesized products are coloured solids, soluble in DMF, DMSO and THF.
Keywords: *Schiff base, Magnetic susceptibility, Thermal*

Introduction :

Synthesis, characterization and antifungal activity of manganese (II) complex with Schiff Base derived from acetylacetone andl leucine[1] synthesis, characterisation and various methods of Schiff base derived from sulphanilic acid and salicylaldehyde and Comparative study of Schiff base using various synthesis methods and their theoretical prediction of activities[2] The newly synthesized Schiff bases, 2-acetylthiophene thiosemicarbazone and thiophene-2-aldehyde thiosemicarbazone and their metal complexes with Co(II), Cu(II), Zn(II) and Ni(II) complexes and Their Schiff bases metal complexes were tested for antibacterial activity[3] There is the combination of the azo group, the imidazole unit and the Schiff base fragment to studies the synthesis, characterization, and optical properties of four different Schiff bases ligands. They are reported the possible use of such systems in biological applications for their antifungal properties and antioxidant activities[4]. Synthesis and structural diversity transition metal coordination complexes with diverse Schiff base ligands and macrocyclic systems[5] The aim of present investigation is to synthesize various transition metal complexes of Schiff base derived from 2-hydroxy-5-chloro-3-nitro acetophenone and 2-amino-4-phenylthiazole

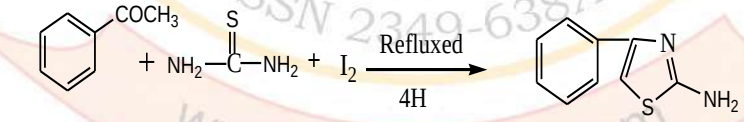
Experimental :

All the chemicals were of A.R. grade and used as received. 2-hydroxy-5-chloro-3-nitro acetophenone (HCNA) and 2-amino-4-phenylthiazole was prepared by known methods6-9. The solvents were purified by standard methods10.

Synthesis of 2-amino-4-phenylthiazole;

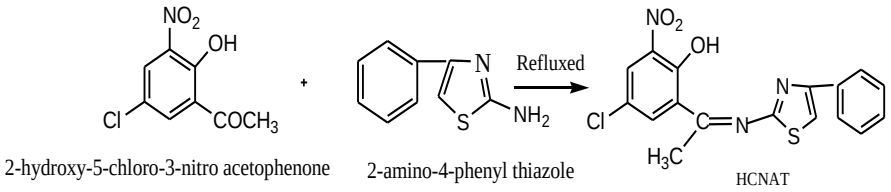
The synthesis of 2-amino-4-phenylthiazole prepared by known method7-9. The product was filtered and crystallized from 70% ethanol, after several minutes the golden coloured product of 2-amino-4-phenylthiazole was separated out.

Yield: 9g (75%); m.p.: 148-1500C



Acetophenone 2-amino-4-phenylthiazole

Synthesis of 2-hydroxy-5-chloro-3-nitroacetophenone 4-phenyl-2 imino thiazole [HCNAT]: A solution of 4-phenyl-2 imino thiazole (0.02M) in 25ml of ethanol was added to an ethanolic solution(25ml) of 2-hydroxy-5-chloro-3-nitro acetophenone (0.02M) and the reaction mixture was refluxed on a water bath for 4h. After cooling a pale yellow coloured crystalline solid was separated out. It was filtered and washed with ethanol, crystallized from DMF and dried under reduced pressure at ambient temperature. The purity of ligand was checked by elemental analysis and m.p. It was also characterized by IR and 1H NMR spectral studies. Yield:75%; m.p. 3050C



2-hydroxy-5-chloro-3-nitro acetophenone 2-amino-4-phenyl thiazole HCNAT

Table1. Analytical data of the Ligands.

Ligand	Molecular Formula	Formula Weight	Color and nature	Elemental Analysis			
				C% found (Cal.)	H% Found (Cal.)	Cl% Found (Cal.)	S% Found (Cal.)
HCNAT	**$C_{17}H_{12}N_3O_3SCl$**	**373.06**	**Yellow Crystalline**	**52.35 (52.20)**	**03.20 (03.34)**	**9.22 (9.38)**	**08.34 (08.46)**

Preparation of complexes:

All the metal complexes were prepared in a similar way by following method. To a hot solution of ligand HCNAT (0.02M) in 25ml of ethanol a suspension of respective metal salts was added drop wise with constant stirring. The reaction mixture was refluxed on a water bath for 3-5 h. The precipitated complexes were filtered, washed with ethanol followed by ether and dried over fused calcium chloride. Yield : 55-60%. The complexes are soluble in DMSO and DMF but insoluble in water and common organic solvents. The metal chloride content of complexes were analyzed by standard methods11,12 The 1H NMR spectra of ligand was recorded and obtained from RSIC Chandigarh. IR spectra of the compounds were recorded on Perkin Elmer 842 spectrophotometer in the region 400-4000cm-1, Carbon, Hydrogen and Nitrogen analysis were carried out at RSIC, Punjab University, Chandigarh. The molar conductance of the complexes at 10-3 M dilution in DMF were determined using equiptronic digital conductivity meter EQ-660 with a cell constant 1.00 cm-1 at room temperature. The magnetic moment measurement were made on a Gouy balance at room temperature using [HgCo(SCN)4] as the calibrant. The thermogravimetric analysis were performed on laboratory set up apparatus in air atmosphere at 100 C min-1 heating rate. The molecular weights of the complexes were determined by Rast method.

Table 2. Analytical data and molar conductance of the compounds.

Ligand	Formula weight g $mole^{-1}$	Colour	Elemental Analysis Found (Calcd.)				μ_{eff} B. M	Λ_M (Ω^{-1} cm^2 mol^{-1})
			M%	C%	H%	Cl%		
$[CrL_2(H_2O)Cl]$ H_2O	868.7	Green	5.42	44.98	2.56	11.18	3.6	17.6
			(5.96)	(45.29)	(2.98)	(11.19)		
$[MnL_2(OAc)]$ H_2O	895.1	Brown	5.46	46.35	3.23	7.41	4.8	17.4
			(5.80)	(46.59)	(3.42)	(7.53)		
$[FeL_2(H_2O)Cl]$ H_2O	872.6	Black	6.12	44.85	3.22	11.46	5.4	21.2
			(6.19)	(45.10)	(3.28)	(11.72)		

Result and Disscution:

The Schiff base HCNAT and its complexes have been characterized on the basis of ^{1}H NMR, IR spectral data, elemental analysis, molar conductance, magnetic succeptibility measurements and thermogravimetric analysis data .

All these values and analytical data is consistent with proposed molecular formula of ligand . All the compounds are coloured solid and stable in air. They are insoluble in water but soluble in coordinating solvents like DMF and DMSO. The molar conductance values in DMF(10^{-3} M) solution at room temperature (Table2) shows all the complexes are non electrolytes.

The ^{1}H NMR spectra of ligand shows signals at δ 12.14,(1H, s phenolic OH), δ 7.56, 7.54, 7.53 and 7.52 (4H, m, phenyl) δ 6.81,6.80, and 6.78 (3H, s, Phenyl), 6.68 (1H,s, thiophene), and 2.56 (3H, s, methyl) [11,13-15].

IR spectra of ligand and metal complexes shows ν(C=N) peaks at 1622 cm^{-1} and absence of C=O peak at around 1700 – 1750 cm^{-1} indicates the Schiff base formation[16-19].

Table 3. IR spectra of ligand and metal complexes

Compound	(O H) hydrogen bonded	(C=N) imine	(C O) phenolic	(M O)	(M N)	(C S)
HCNAT (LH)	3119	1622	1514	--	--	1126
$[CrL_2(H_2O)Cl]\ H_2O$	--	1595	1500	478	406	1118
$[MnL_2(OAc)]\ 2H_2O$	--	1567	1462	498	418	1095
$[FeL_2(H_2O)Cl]\ H_2O$	--	1605	1505	513	436	1085

Table 4. Thermal decomposition data of HCNAT and its complexes.

Compounds	**Half Decompo-sition** Tempera-ture **(°C)**	**Activation Energy (kJ $mole^{-1}$)**			**Frequency Factor** Z **(sec^{-1})**	**Entropy Change -ΔS (J mol^{-1} K^{-1})**	**Free Energy Change ΔF (kJ mol^{-1})**
		B*	H-M**	F-C***			
HCNAT (LH)	260.46	3.22	5.47	4.31	87.28	211.42	118.65
$[CrL_2(H_2O)Cl]\ H_2O$	550.32	9.78	12.92	12.92	259.78	208.14	183.62
$[MnL_2(OAc)]\ 2H_2O$	710.34	11.15	18.54	11.16	222.34	208.83	217.88
$[FeL_2(H_2O)Cl]\ H_2O$	429.25	3.78	9.48	8.40	169.78	208.34	156.57

Thermogravimetric studies : Thermogravimetric study indicates all the complexes are stable up to 60-700C. All the complexes shows half decomposition temperature(Table 4). The Thermal activation energy was calculated by Freeman-Carroll,20 Horowitz-metzger21 and Broido22 method.

Conclusions

In conclusion, we have synthesized new ligand 2-hydroxy-5-chloro-3-nitro acetophenone 4-phenyl-2 imino thiazole and their metal complexes. Ligand was found to bind the metal ion monobasic (ON) bidentate manner. Conclusion of thermal decomposition temperature and activation energy of synthesized Schiff base metal complexes

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Fabrication and Characterization of Ce modified $SmFeO_3$thick film

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Abstract
Thick films of $SmFeO_3$ were prepared onto a glass substrate by screen printing technique and fired at 500^0C for 30 min. As-prepared pure $SmFeO_3$ thick films were then dipped into 0.1 M aqueous solution of Cerium Chloride for 5 min. The films were then fired at 550 ^{0}C for 30 min to obtainCe modified $SmFeO_3$ thick films. Structural and morphological properties ofboth pure and surface modified $SmFeO_3$ thick films were characterized by Field Effect Scanning Electron Microscopy (FE-SEM) and Energy Dispersive X-Ray Analysis (EDAX) techniques. The effect of cerium doping on microstructure and surface morphology of pure $SmFeO_3$ thick film was discussed.
Keywords: $SmFeO_3$, Surface modification, Perovskite, Gas sensor.

Intruduction
Presently, environmental pollution due to hazardous gases emitting from auto and industrial exhaust has become a big challenge for human being. Therefore, detection and monitoring these gases is strongly required for better air quality. Different techniques have been employed for environmental monitoring. Among them metal oxide based gas sensors are of practical interest due to their small size. In 1962, Seiyama et al reported first semiconductor metal oxide gas sensor and since then different semiconducting metal oxides have been studied for ethanol, benzene, NO_2 and VOCs [1-3].But, their gas sensing characteristics such as sensitivity, selectivity, stability and operating temperature are still unsatisfactory.

Over a past few decade, perovskites of type ABO_3 (A: rare earth, B: transition metal) have attracted a great deal of attention for gas sensordue to their improved physical and chemical properties.Due to its doping flexibility, adsorption and desorption behavior can be controlled and sensor performance can be optimize. Properties of perovskite such as ionic and electronic conductivity, chemical stability and reactivity depends on the nature and amount of A and B cations. These properties can be tuned for particular application by partial substitutions at A-site, B-site and/or both A-site and B-site. Therefore perovskites have extensively studied for wide range of applications including solid oxide fuel cell[4], catalysis[5] and gas sensors[6-7].Among various perovskite oxides, $SmFeO_3$is reported to be a promising material for gas sensor due to its stability in thermal and chemical atmosphere. $SmFeO_3$is one of the rare earth orthoferritep-type semiconducting material[8]. It is extensively used in gas sensor for oxidizing gases like O_3,NO_2, ethanol. However, its use for reducing gases, like CO and $H_2$is limited because of its lower reduction stability and electrical conductivity[9-10] .Both reduction stability and electrical conductivity depends on nature of A and B cations. ABO_3 type perovskite structure of $SmFeO_3$ permits the modification in microstructure by partial substitution at A-site and/or the B-site. Literature survey showed that doping of A-site with bigger cation enhances reduction stability whereas doping at B-site affects electrical conductivity as well as thermal stability. Researchers have reported the advantages of introducing Ce at A-site and Co, Ni and Mg at B-site[11-12] . S.M. Bukhari et al have reported that the partial substitution of Sm by Ce within the solubility limit improves the electrical conductivity of perovskite as well as prevents it from decomposing under reducing conditions[13] . This creates the possibility of using Ce doped $SmFeO_3$ as a gas sensor for reducing gases.

For the synthesis of $SmFeO_3$ perovskite different methods like sol-gel method[14] and hydrothermal method [15] have been adopted. Sol-gel method in citric system has advantage of providing $SmFeO_3$ perovskite powder with high sensitivity and selectivity.
In our previous work, we reported the synthesis of pure $SmFeO_3$ perovskite powder by Sol-gel method. In the present work, surface modification in $SmFeO_3$ thick films prepared by screen printing method was achieved by dipping technique.

Methods And Material
2.1.Preparation of $SmFeO_3$ powder
Stoichiometric amounts of samarium nitrate$Sm(NO_3)_3.6H_2O$, iron nitrate $Fe(NO_3)_3.9H_2O$and citric acid monohydrate were mixed in the ratio 1:1:1. The mixture was grounded in Agate mortar for 30 minutes. Ethylene glycol was added to this mixture under constant stirring at 75^0C for 2 hours to obtaina sole which was then dried into a gel. The gel was dried in oven at 110^0C for 12 hours and allowed to cool naturally. Finally, sample was calcined at 800^0C for 4 hours.

2.2.Preparation of $SmFeO_3$ thick films

The thixotropic paste was formulated by mixing the fine powder of $SmFeO_3$ with the solution of ethyl cellulose in a mixture of organic solvent The ratio of inorganic to organic part was 75:25 .This paste was then screen-printed on glass substrate in desired pattern.The films were fired at 500^0C for 30 min. and termed as pure $SmFeO_3$thick film.

2.3.Preparation of Ce surface modified thick films

As-prepared pure $SmFeO_3$thick films were dipped into 0.1 M aqueous solution of cerium chloride for 5 min. After drying, these films were fired at 550 ^{0}C for 30 min and termed as Ce surface modified $SmFeO_3$thick film.

Results And Discussion

3.1. X-ray diffraction and surface morphology analysis of pure $SmFeO_3$ powder

X-ray diffraction pattern of synthesized pure $SmFeO_3$ powder was reported in our previous paper [16]. The crystallite size was estimated to be 50.08 nm.

3.2. Surface morphology of pure and modified $SmFeO_3$ thick films by FESEM analysis

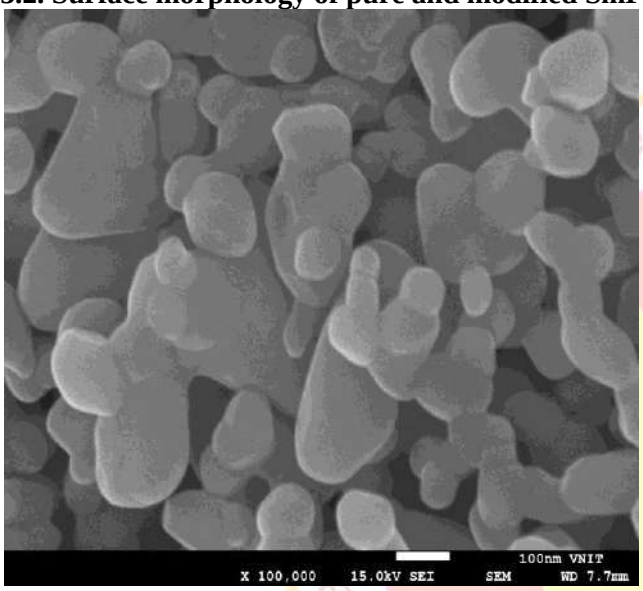

Fig. 1: FESEM of pure $SmFeO_3$ thick film.

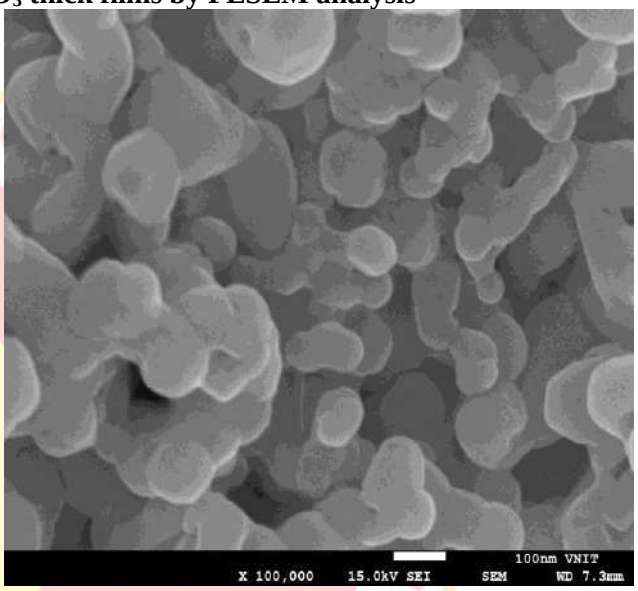

Fig. 2: FESEM of Ce doped $SmFeO_3$ thick film.

Fig. 1 represents the FESEM images of pure $SmFeO_3$ thick film fired at 500 ^{0}C for 30 min. The micrograph shows the presence of large number of grains with grain size ranging from 53 nm to 131 nm on the film. The films were highly porous with inner layer of perovskite type oxide adhere to the substrate.Due to the firing temperature, sintering proceeded and growth of the grains was observed. The composition of organic vehicle also influences the morphology of film. The presence of α-terpineol favored the sintering of grains.Fig. 2 depict FESEM image of Ce doped $SmFeO_3$ thick film for dipping time interval 5 min and fired at 550 ^{0}C for 30 min. The micrograph shows the distribution of smaller particles around the larger grains. The smaller particles may be attributed as Ce species. The modified thick film appears to have comparatively high porosity and large surface area for oxygen adsorption.

3.3.Elemental composition of pure and modified $SmFeO_3$ thick films by EDS analysis

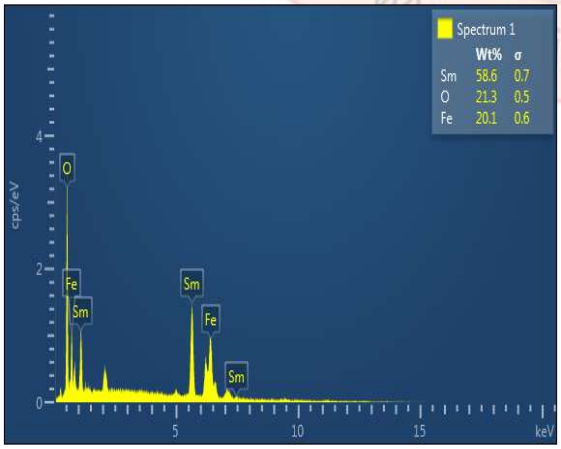

Fig 3: EDS of pure $SmFeO_3$ thick film.

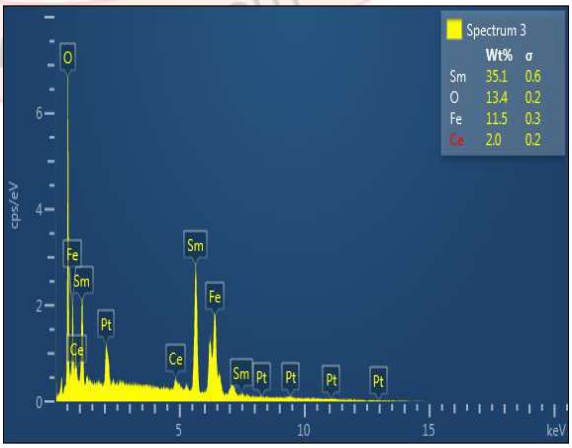

Fig 4: EDS of Ce doped $SmFeO_3$ thick film.

Elemental analysis of pure and Ce doped thick films was carried out by EDS technique. Table 1 represents the wt % of constituent elements of both pure and modified films.

Table 1**:** Quantitative elemental analysis**.**

	Pure $SmFeO_3$ thick film	**Ce modified $SmFeO_3$ thick film**
Sm (wt.%)	58.6	35.1
O (wt.%)	21.3	13.4
Fe (wt.%)	20.1	11.5
Ce (wt.%)	---	2.0
Total	100	100

It is observed from table 1 that weight percentage of oxygen decreases due to Ce doping. Further it was observed that both the samples are oxygen deficient but oxygen deficiency is more in Ce doped thick film than pure SmFeO3 thick film. Therefore,Ce doped SmFeO3 thick film may facilitate increased oxygen adsorption.

Conclusions

The results demonstrated that surface modification of SmFeO3thick films can be achieved by dipping technique.Moreover Surface modification promotes increased oxygen adsorption. FESEM analysis and EDX analysis respectively confirm the structural morphology and the elemental composition of both pure and modified thick films .

Acknowledgement : Authors would like to acknowledge VNIT, Nagpur for providing characterization facilities[16].

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X-ray diffraction, Uv-Vissible and Photoluminescence Study of Dysprosium Doped Lanthanum Calcium Borate La_2O_3-8CaO-$3B_2O_3$ Glasses

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Abstract.

In the present work, borate glasses doped with dysprosium in the system (x)Dy_2O_3-(1-x)La_2O_3-8CaO-$3B_2O_3$ with x = 0 (LaCOB), 0.01, 0.03, 0.05 and 0.07 (Dy:LaCOB) were prepared by melt-quench technique. The synthesized amorphous material confirmed by the X-ray techniques. The various optical transition states of dysprosium ions doped in glasses are analyzed by using ultraviolet-visible spectroscopy. The optical band gaps of the grown glasses have been evaluated form optical transparency data. The results show that there are decreases in the optical band gap as the concentration of dysprosium ions increases. The luminescence properties of LaCOB glasses doped with different concentrations of Dy^{3+} ions show emission bands at 470 nm ($^4F_{9/2}\rightarrow{}^6H_{15/2}$) and 575 nm ($^4F_{9/2}\rightarrow{}^6H_{13}$) under the excitation of 358 nm. The chromacity colour coordinates have also been calculated.

Introduction

The rare earth ions doped borate glasses and crystals find important application in the area of solid state laser, fiber laser, waveguide laser, laser amplifier in optical communication, optical data storage and amplifier in integrated optical components [1-4]. Different glassy materials like as borate, phosphate, fluoride, fluoroborate and tellurite have been usually investigated to understand the outcome of host glass on the lasing properties of rare earth ions [5, 6]. Borate glasses as a host material doped with different rare earth (RE) ions are being developed and their suitability as laser material has been tested by studying optical properties [7, 8]. The chemical composition of borate and oxide glass plays a vital purpose in the photoluminescent properties of RE ions, affecting the usefulness of the energy transition process. Oxide glasses are classical stable hosts for obtaining efficient luminescence in rare earth ions due to their high thermal stability, high transparency, and good rare earth ion solubility [6, 9-11].

Recently, the physical and optical properties of rare earth ion Dy^{3+} doped Li_2O–K_2O–B_2O_3 glasses were reported by Azizan et al [10]. Luminescence and spectroscopic properties of Dy^{3+} doped sodium fluoro-phosphate (FP) glasses useful for white light emission were reported by Babu et al [11]. Optical properties of lead borate glasses containing Dy^{3+} ions have been studies by Pisarska et al [12]. Glasses doped with trivalent dysprosium are being considered as promising laser materials due to their optical transitions. Dy^{3+} ions have two strong emission transitions with $^4F_{9/2}\rightarrow{}^6H_{15/2}$ transition corresponding to magnetic dipole at 470 nm in the blue wavelength region and $^4F_{9/2}\rightarrow{}^6H_{13/2}$ transition corresponding to electric dipole at 575 nm in the yellow wavelength. The currently transition is hypersensitive and is effectively dependent lying on the host glass composition. This transition is also significantly affected by the radial integral of 4f and 5d electrons. Thus, by providing suitable environment and varying Dy^{3+} ion concentration we can tailor the intensity ratio of yellow to blue transition so as to generate white light [3, 5, 8].

This report, present the synthesis of borate glasses doped with dysprosium in the system (x)Dy_2O_3-(1-x)La_2O_3-8CaO-$3B_2O_3$ with x =0 (LaCOB), 0.01(1%Dy:LaCOB), 0.03 (3%Dy:LaCOB), 0.05 (5%Dy:LaCOB) and 0.07 (7%Dy:LaCOB) prepared by melt-quench technique. Prepared glasses were subjected to optical and luminescence studies.

Experimental

The Lanthanum oxide (La_2O_3) was purchased from Central Drug House (CDH) Ltd, India. Calcium carbonate ($CaCO_3$) was purchased from Fisher Scientific, Dysprosium oxide (Dy_2O_3) was purchased from LOBA, India and boric acid (H_3BO_3) was purchased from sd Fine chemicals. All materials were of analytical reagent grade.

An alkali borate glasses (LaCOB), (1%Dy:LaCOB), (3%Dy:LaCOB), (5%Dy:LaCOB) and (7%Dy:LaCOB) were prepared by the melt-quenching method. The chemicals La_2O_3, $CaCO_3$, Dy_2O_3 and H_3BO_3 with 99.99% purity used as the starting raw materials. Dy_2O_3 in appropriate amount was mixed with La_2O_3, $CaCO_3$, and H_3BO_3. The raw materials were crushed in a mortar with the help of pestle to make the homogeneous mixtures. The mixtures were calcinated at 550^{o}C for 6 hours to remove moisture. The material was removed from the crucible and once again crushed and calcinated at 950 ^{o}C for 12 hours. This process was repeated two times. The obtained polycrystalline powders of LaCOB, 1%Dy:LaCOB, 3%Dy:LaCOB,

5%Dy:LaCOB and 7%Dy:LaCOB compound were melted in a platinum crucible in an electric furnace at 1000 ^{o}C and kept it for 120 minutes [6]. The obtained melt was poured on a stainless steel plate and immediately pressed with second one for immediate quenching to form amorphous phased solid. The formed glass samples were allowed to cool gradually to room temperature. The obtained glasses were cut into rectangular slabs of dimensions 4x2x1 mm^3 and polished to use for further characterizations.

Characterizations

Powder X-ray diffraction (XRD) patterns of powdered glass samples were recorded on a X-ray diffractometer (Rigaku, Miniflex-600, Japan) using Cu-Kα (λ=1.504 Å) radiation to check the amorphous state of the prepared glass sample at the scanning rate of 8 deg/min and 2θ varied from 10–90^{o}. Ultraviolet-visible (UV-Vis) transmission and optical band gap studies have been performed using Black-CSR-50 Stellar Net Spectrophotometer, USA. Photoluminescence study has been done using FL-7000 Hitachi Fluorescence spectrophotometer.

Results and discussion

1.1. **Powder XRD study**

XRD patterns were taken to confirm the glassy nature for all the glass samples. The typical XRD profile of the LaCOB, 1%Dy:LaCOB, 3%Dy:LaCOB, 5%Dy:LaCOB and 7%Dy:LaCOB are shown in figure 1. The pattern doesn't exhibit any sharp peak that reflects amorphous nature of the material.

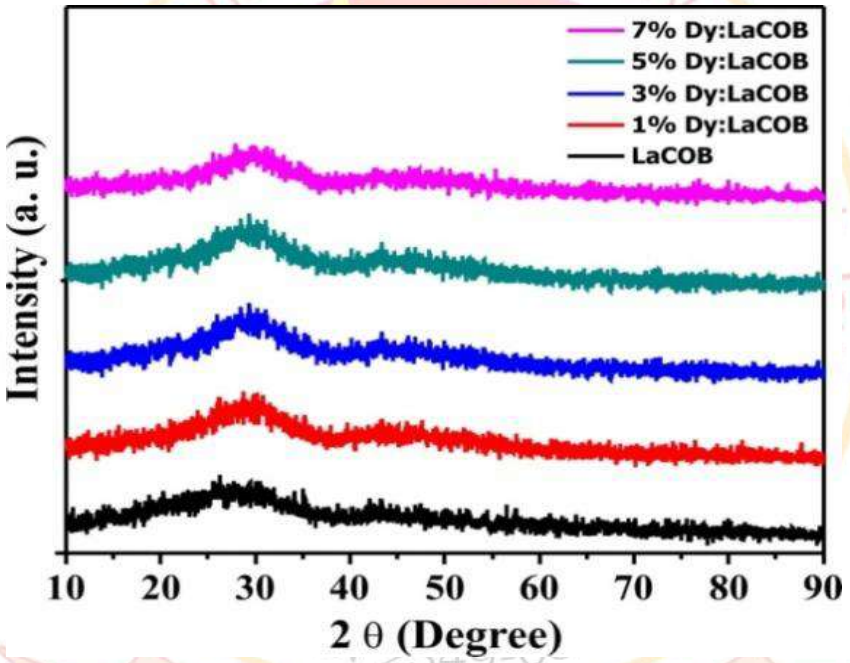

Figure 1. Powder XRD patterns of pure and Dy doped LaCOB glasses.

1.2. **UV-Vis spectroscopy**

Figure 2 a) shows the optical transmission spectra of prepared glasses recorded in the wavelength range 190-1083 nm. It can be observed that, the absorption peak for the grown glasses have lower cutoff wavelength in the range 204 - 220 nm. The glasses LaCOB, 1%Dy:LaCOB, 3%Dy:LaCOB, 5%Dy:LaCOB and 7%Dy:LaCOB show the optical transparencies around 75, 67, 53, 45 and 34% of in the UV and visible region, respectively. The optical transparencies of prepared LaCOB glasses doped with dysprosium are found to be decreased with increasing concentration of Dy^{3+}. The values of optical absorption coefficient (α) were determined using the relation (1) from the absorption data;

$$\alpha = (2.303/d)\log(1/T) \quad (1)$$

Where, T is the transmittance and d is the thickness of the glass [6]. The direct optical band gap of the glass can be determined by using relation (2);

$$(\alpha h\nu)^2 = A\,(Eg - h\nu) \quad (2)$$

Where, A is a constant.

Plotting a graph between $(\alpha h\nu)^2$ and photon energy ($h\nu$), as shown the figure 2 b), and drawing tangent to straight portion intercepting energy axis gives energy band gap and it was found to be 6.3, 6.2, 6.1, 5.7 and 5.3eV for LaCOB, 1%Dy:LaCOB, 3%Dy:LaCOB, 5%Dy:LaCOB and 7%Dy:LaCOB, respectively.

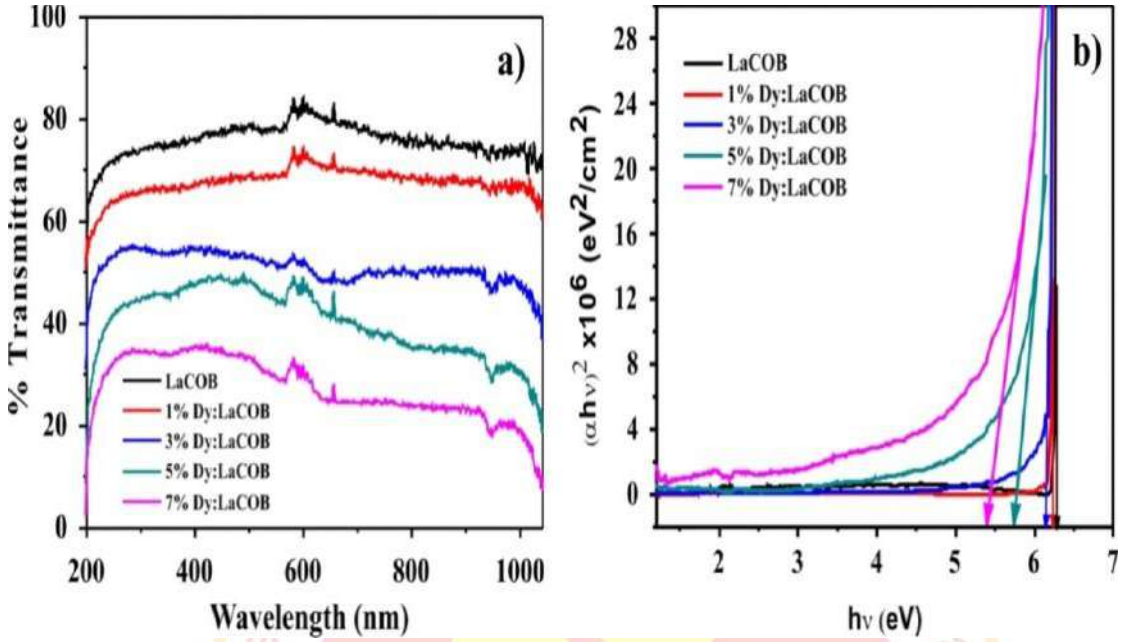

Figure 2.
a) UV-Vis transmission spectra and
b) a plot of variation of $(\alpha h\nu)^2$ versus hν pure and Dy doped LaCOB glasses.

1.3. Photoluminescence study and color quality of light Source (CIE)

The figure 3 (a) shows the photoluminescence spectra of Dy^{3+} doped LaCOB glasses. The glass shows emissions at 470 and 575 nm under the excitation at wavelength 358 nm. The peak centered at blue emission band (at 470 nm) is a typical emission of Dy^{3+} ions corresponding to transition $^4F_{9/2}\rightarrow{}^6H_{15/2}$ ground state, while the peak centered at yellow emission (at 575 nm) corresponds to the $^4F_{9/2}\rightarrow{}^6H_{13/2}$ optical transition of Dy^{3+} [2, 5, 13]. Similar results were reported for Dy^{3+} doped sodium aluminum phosphate and alkali lead tellurofluoro borate glasses [13-15]. The transition from $^4F_{9/2}\rightarrow{}^6H_{15/2}$ is a magnetic dipole transition which possess most intense blue emission band at wavelength 470 nm. The transition from $^4F_{9/2}\rightarrow{}^6H_{13/2}$ is electric dipole transition which possess moderate intense yellow emission band at 575 nm [1, 6, 7, 14]. The excitation spectrum Dy^{3+}:LaCOB shows narrows line in the UV range [15]. From figure 3 a), emission spectra also indicate that luminescence intensity increases with increase in concentration of Dy^{3+} dopant [10, 2]. The photoluminescence intensity for both blue and yellow emissions increased with the concentration of Dy^{3+} ions reaching a maximum at x = 0.05, and then it decreased for x = 0.07 because of concentration quenching.

The excitation spectra of Dy^{3+} doped LaCOB glasses recorded at emission wavelength of 470 nm are as shown in the figure 3 (b). The spectra consist of excitation band ($^6H_{15/2}\rightarrow{}^4P_{5/2}$) at 358 nm for various concentrations of Dy^{3+} ions [3, 6, 16]. The energy level scheme for all the observed absorption of Dy^{3+} doped LaCOB glass is shown in Fig. 3 (c).

The emission spectra (as shown in figure 3 (d)) of Dy doped LaCOB glasses consist of two important emissions in blue color at 470 nm and yellow color at 575 nm wavelengths. The appropriate color combinations of blue and yellow light results into a white light emission. CIE diagram is provided for an understanding of color relationships [2, 5, 7, 17]. This outcome it is predict that Dy doped LaCOB glasses can be intended for white light emitting devices under ultraviolet excitation.

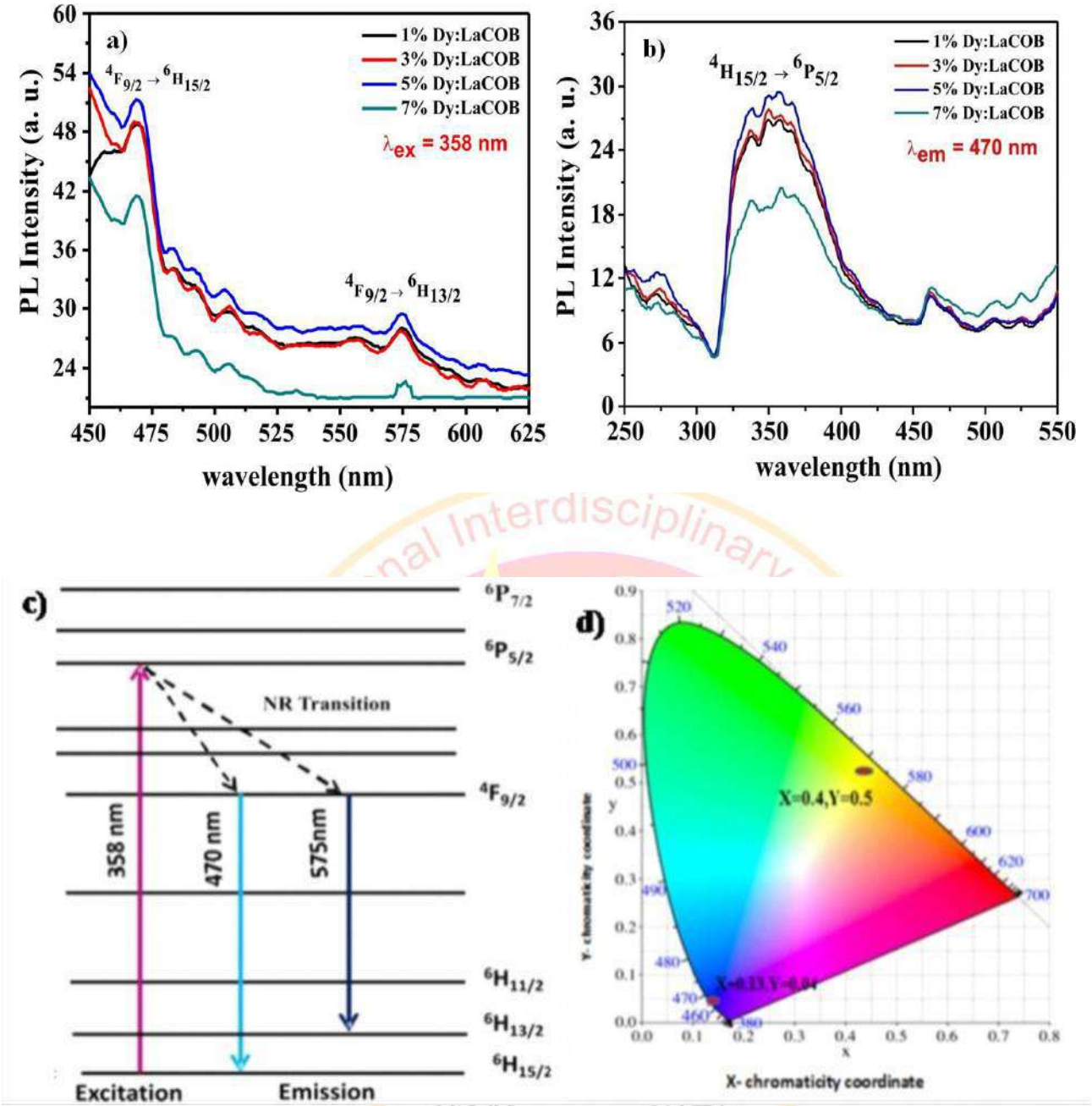

Figure 3.
a) Emission spectra, b) Excitation spectra,
c) Energy level diagram of Dy^{3+} ions showing transition and
d) The CIE diagram of Dy: LaCOB glasses.

Conclusion

The Pure and Dy doped LaCOB glasses are successfully synthesized by melt quenching method. The amorphous nature of the glasses was confirmed by XRD technique. Borate glasses pure and Dy doped LaCOB have been fabricated and characterized their properties through emission spectra and CIE 1931 color chromaticity studies. The photoluminescence of Dy^{3+} ions were studied and related to the host matrix nature. It is clear that there are two emission bands $^4F_{9/2} \rightarrow ^6H_{15/2}$ and $^4F_{9/2} \rightarrow ^6H_{13/2}$ over the excitation wavelength of 358 nm these bands correspond to the electron transitions from the discrete levels $^4F_{9/2} \rightarrow ^6H_{15/2}$ and $^4F_{9/2} \rightarrow ^6H_{13/2}$ transitions respectively for Dy^{3+} and which confirmed the presence of trivalent rare-earth ions in the glass matrix. The photoluminescence intensity for both blue and yellow emissions increased with the concentration of Dy^{3+} ions reaching a maximum at x = 0.05, and then it decreased for x = 0.07 because of concentration

quenching. It also provides guidelines for several applications in connection with industrial and technological needs. This outcome may potential to expand emission display and laser material applications.

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Optical Propertiesand IV characteristic of proton conductor solid polymer electrolyte

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Abstract:
In the present work proton conductor solid polymer electrolyte was prepared by solution cast technique. The dc conductivity was obtained from I-V characteristics by using Kitley 6487 picoammeter/voltage source meter instrument at various constant temperature. UV-Vis Double Beam Spectrophotometer in the wavelength range (190-700) nm were used to investigate the optical properties. It was found that the energy band gaps are decreased upon the increase of salts concentration. This is explained in terms of charge transfer complexes between the dopant and host matrix
Keywords: Polyvinyl alcohol, Ammonium Iodide, Optical properties

Introduction:

In recent year, there has been increase in focus on replacing traditional aqueous electrolyte by solid polymer electrolyte. Due to flexibility electrochemical stability, long life etc. Among solid polymer electrolyte proton conducting polymer electrolyte have receive considerable very much attention due to their large *applications.* Polyvinyl alcohol (PVA) is commercial availability, dopant dependent electrical and optical property, good film forming ability, mechanical strength, low cost etc. It has carbon chain backbone with hydro-oxyl group attach to the methane carbon. PVA is a nontoxin and water-soluble polymer having good charge storage capacity [1]. The electrical and optical properties of polymers can be modified by the addition of suitable dopants. [2-6]. This paper presents the results of investigations on the electrical and optical properties of NH_4I doped PVA films.

Experimental technique

In the present study, polyvinyl alcohol, ammonium iodide and deionized water were used to prepare solid polymer electrolyte. A solid polymer electrolyte system based on polyvinyl alcohol (PVA) with ammonium iodide (NH_4I) was prepared using solution cast technique. The film of pure and different composition of PVA -NH_4I has been prepared by solution cast technique. In this technique, appropriate amount of PVA and NH_4I have been dissolved individually in deionizedwater. These solutions have been mixed together in different molar ratio and stirred well by using magnetic stirred for 10-12 hr to obtained homogenous mixture. The obtained mixture is casted in petri dish. The whole assembly was placed in dust free chamber. The solvent was allowed to evaporate slowly at room temperature for 3-4 days. The films have been formed with uniformed thickness.

Result and Discussion:

I-V Characteristics

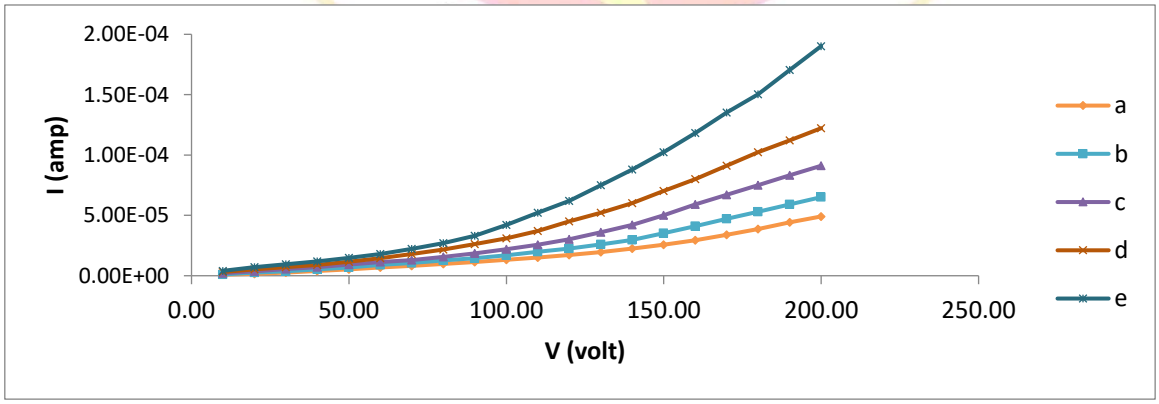

Fig 1: Variation of current (I) with voltage (V) for PVA with different (a) 5 mole %, (b) 10 mole %,(c) 15 mole %, (b) 20 mole %, (d) 25 mole % of NH_4I.

Current (I) with Voltage (V) characteristics of polyvinyl alcohol with ammonium iodide of different mole percent as shown in figure (1). The current increases linearly with applied voltage and followed ohmic conduction [7]. But in fig 1 when added the concentration of ammonium salts the current increases nonlinearly with applied voltage and absence of Ohmic conduction this mechanism is very different to intrinsic

semiconductor. There is no permanent dipole and random charge trap in sample. The localize motion of charge traped in the sample serves as effective electric dipole, when external electric field is applied. As a result, quasi particle was createdpolarons and bipolarons acts as charge, therefore the curve is nonlinear, when the strength of electric field is increases, the formation of charge are increases which contributing to increase in current with respect to voltage [8-9].

Optical properties:

Optical absorption spectra of PVA doped withammonium iodide in different molar percentages were carried out over a wavelength range 190-700 nmto determine the optical constants such as direct and indirect band gap. Most of the time, bandwidth divides semiconductors and insulations intotwo main parts, namely direct show energy bandwidth materials and indirect energy bandwidth materials. Valence and conduction bands both are exhibited a very less (zero) crystal momentum indirect bandgap. But in the indirect bandgap, the conduction band doesn't agree to crystal zero momentum and shift of the phonon energy. Shalliday and Davishad explained both the direct and indirect bandgap that occur near the basic edge of the band both direct and indirectand can be observed by plotting $(\alpha h\upsilon)^2$ and$(\alpha h\upsilon)^{1/2}$ as a function of energy hυ. [10]

The analysis of Thutpalli and Tomlin isbased on the following relations [11].

$(\alpha h\upsilon) = \beta_1(h\upsilon - E_{gd})^{1/2}$---------- (1)

$(\alpha h\upsilon) = \beta_2(h\upsilon - E_{gi})^{2}$---------- (2)

For direct and indirect electron transitions respectively, where hυis the photonenergy, $E_{gd}$is the direct band gap, E_{gi} is the indirect band gap, α is the absorption coefficient, and β_1, β_2 are constants. These expressions willbe helpful in the determination of the band structure of materials. To determine thenature and width of the band gaps $(\alpha h\upsilon)^2$ and $(\alpha h\upsilon)^{1/2}$ were plotted as a function ofincident photon energy.The direct band gap values are obtained from the plots of $(\alpha h\upsilon)^2$vs.hυshown in figure 2.

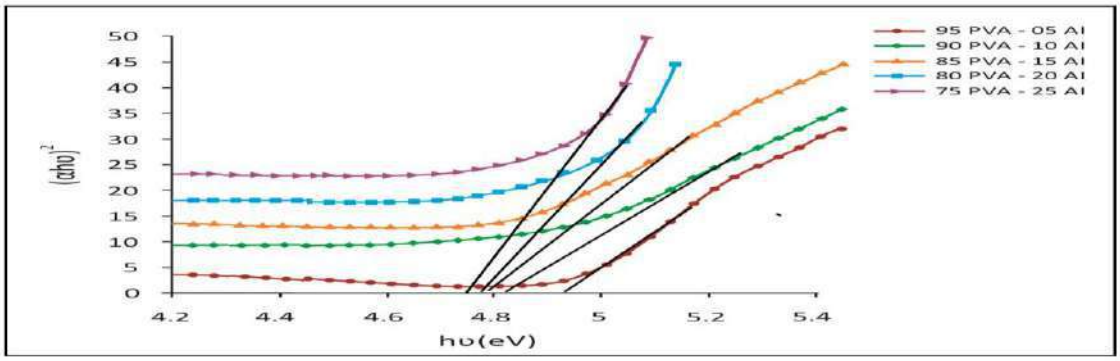

Fig:2 $(\alpha h\upsilon)^2$ as function of photon energy (hυ) for PVA with different ammonium iodide

The direct band gap value is determined byextrapolating the linear portion of the curve on to the energy axis. Theintercept on the x-axis gives the direct band gap energy value. It isshow that band gap decreases with increase in ammonium salt concentration. The direct band gap lies within 4.94ev to 4.74 ev.

For indirect transitions, which require photon assistance, the absorption coefficient has the following dependence on the photon energy

$\alpha h\upsilon = A(h\upsilon - E_g + E_p)^2 + B(h\upsilon - E_g + E_p)^2$

where Ep is the energy of the photon associated with the transition and A and B are constants depending on the band structure. The indirect band gaps were obtained from the plots of $(ahv)^{1/2}$ vs hν (photon energy) plots as shown in Fig 3.

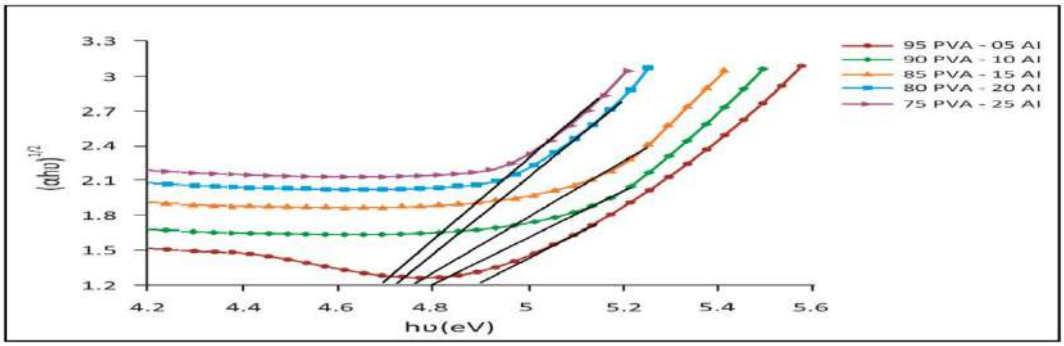

Fig: 3$(\alpha h\upsilon)^{1/2}$ as function of photon energy (hυ)for PVA with different ammonium salt

The indirect band gap value is determined by extrapolating the linear portion of the curve on to the energy axis. The intercept on the x-axis gives the indirect band gap energy value. The indirect band gap lies with 4.92 eV to 4.71 eV.It is observed that as the dopant concentration of polymer electrolyte is increased, thevalues of band gap energy have decreased gradually. This indicates theeffect of complexation on the value of band gap. Ammonium salt beingadded to the PVA polymer to enhance proton conduction. [12-15]

Conclusion:

Proton conductor solid polymer electrolyte of polyvinyl alcohol doped with different concentrationof ammonium iodidehas been successfully prepared by solution cast technique.In this investigation, I-V characteristics of prepared samples were studied. Optical absorption spectra of PVA doped with ammonium iodide in different molar percentages were carried out over a wavelength range 190-700 nmto determine the optical constants such as direct and indirect band gap. It was revealed that the energy band gaps are decreased with the increasing of salts concentrationdueto charge transfer complexes between the dopant and host matrix

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Study of Ac Electrical Conductivity and Dielectric Constant of 1:1 Pmma PVDF Polyblends At Various Temperatures and Frequencies

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Abstract

In the present work dielectric constant and ac conductivity of PMMA and PVDF (1:1) blend sample have been investigated at various constant temperatures ranging from (313K to 343K), in the frequency range of (1KHz to 500KHz).The results have been presented in the form of graphs. It has been found that the dielectric constant increases with increase of temperatures at constant frequencies, the dielectric constant decreases with decrease in temperatures at constant frequencies, the AC conductivity increases with frequencies at various constant temperatures. They attain almost saturation values as the frequency approaches its maximum value.

Index Terms: 'Solution cast method', percentage of amorphousness/crystallinity,1:1 (PMMA+PVDF), AC conductivity, dielectric constants etc.

Introduction

When two or more polymers are mixed together, polyblends or polymer alloys are obtained. This physical mixing or blending of two polymers produces alloys with quite different properties, which can be potentially useful. Two polymers are generally incompatible as they have very low combinatorial entropy of mixing for the components. This is insufficient to overcome the positive heat of mixing of polymers to make the Gibb's free energy of mixing negative. Only in the presence of specific interaction between two polymers (e.g. Hydrogen bonding, acid-base type interaction etc.), heat of mixing is negative that makes the free energy of mixing a negative quantity and then the mixing is spontaneous. Unlike the mixing of small molecules, the dictum like likens like does not hold good for mixing of macromolecules. However, both compatible and incompatible blends are industrially important materials. Two polymers may form the compatible blend, which exists as single phase. The incompatible blends on the other hand exist as two- phase system. Since most blends combine immiscible components and so the material that results contains tiny particles of one polymer in a matrix of the other. Controlled mixing and cooling of the blend makes it possible to form the .particles in the optimum concentration and range of sizes. Blending makes it possible to combine the good properties of several polymers. The most direct method to obtain a polyblend is to mix two component polymers in the molten state (melt mixing). In this case the extent of mixing depends on the rate of diffusion of the molecules. Since such a mixing requires high temperature, the polymer may decompose and undergo chemical changes.

Experimental Technique

Method of preparation of PMMA-PVDF (1:1) Undoped blends film:

Sample Preparation

Preparation of thin films using Pool of Mercury (As shown in fig 1).In the present work, Isothermal Evaporation Technique (Sangawar 1995,Belsare and Deogankar 1998) has been used, as it is best suited to the conditions in the laboratory. The two polymers PMMA-PVDF were taken in the ratio 1:1 were dissolved in the common solvent Dimethyl Formamide (DMF).The solution was kept for 1-2 days to allow polymers to dissolve completely to yield uniform solution. The solution mixture was stirrer with constant slow uniform speed for 1 hour at room temperature to get completely homogeneous solution. A glass plate (15 cm x 15 cm) thoroughly cleaned with water and later with acetone was used as a substrate. To achieve perfect levelling (and uniformity in thickness of the films), a pool of mercury was used (figure given below) in a plastic tray. The solution was poured on the glass plate and was allowed to spread uniformly in all directions on the substrate. The whole assembly was placed in a dust free chamber at room temperature. The solvent in the solution was thus allowed to evaporate completely and get air-dried. The film on the glass substrate was then removed and cut into small pieces of suitable sizes. In this way the films were prepared by isothermal evaporation technique. Further it was dried for 1 day to remove any traces of solvent.

Fig. 1 Pool of mercury

The solution was poured on the glass plate and was allowed to spread uniformly in all directions on the substrate. The whole assembly was placed in a dust free chamber at room temperature. The solvent in the solution was thus allowed to evaporate completely and get air-dried. The film on the glass substrate was then removed and cut into small pieces of suitable sizes. In this way the films were prepared by isothermal evaporation technique. Further it was dried for 3 days to remove any traces of solvent.

Thickness Measurement

The thickness of each sample film was measured at the four different places by using the Digital Micro meter (Mitutoyo Corporation, Japan) as shown in fig 2 . The average of four readings was taken as the sample thickness.

Fig 2. Digital Micrometer

Measurement of AC Electrical Conductivity and Dielectric Constant

The sample holder with temperature controlled electric oven supplied by **Pushpa Scientific, Hyderabad**, in conjunction with **4284 A Precision LCR meter (20 Hz - 1MHz) supplied by Agilent Technology, Singapore** has been used for the measurement of AC electrical conductivity and dielectric constant.

Fig.3 LCR meter and sample holder for the measurement of AC conductivity

The film sample was loaded into the sample holder in an oven. The entire experimental set up is as shown in fig 3.The AC frequencies were applied (in the range 1 KHz -1 MHz) across the sample by using the 4284 A precision LCR meter (20 Hz -1 MHz). The corresponding dielectric constants were measured by using LCR meter. From the dielectric data, the AC conductivity of the samples was calculated by using the relation [Rao, 2000],

$$\sigma_{ac} = \frac{f \cdot \varepsilon_r \cdot tan(\delta)}{1.8 \times 10^{10}}$$

Where,

f = Frequency applied in Hz

ε_r= Dielectric Constant at frequency f

$tan(\delta)$ = Dielectric loss tangent**.**

Results And Discussion

Several researchers [Shukla and Gupta 1987 , , Aziz and Aggour 1999, Khaled et al. 2003, Raghvendra et al. 2003, Muhammad Akram 2005] have studied the AC electrical conduction / Dielecrtic properties of various polymers composites . In the present work dielectric constant and ac conductivity of 1:1 PMMA-PVDF blend sample have been investigated at various constant temperatures ranging from (313K to 343K), In the frequency range of (1KHz to 500KHz).The results have been presented in the form of graphs (Fig no. 4, 5, 6, 7).

The graphs have been plotted for the variation of

1) *AC conductivity with frequencies at various constant temperature.*

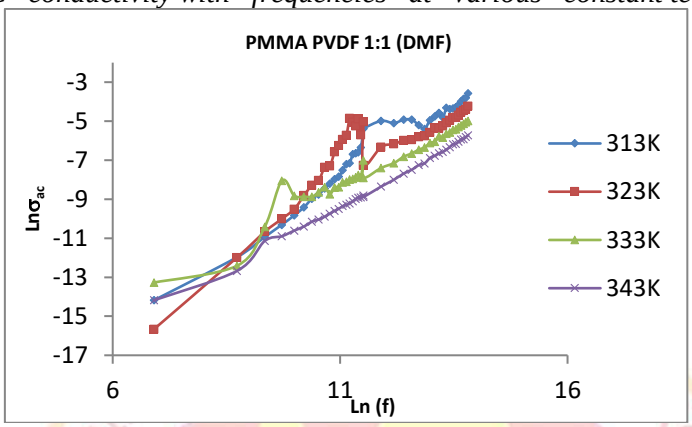

Fig. 4 $\log_e(\sigma_{ac})$s versus $\log_e(f)$

2) *Dielectric constant ε_r with frequency at various constant temperature.*

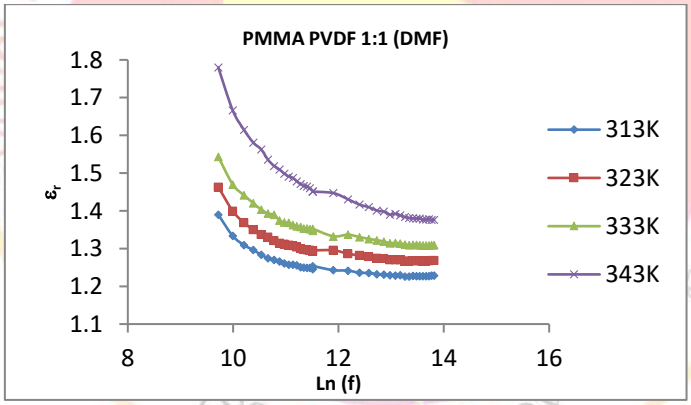

Fig. 5 ε_r *versus* $\log_e(f)$

3) *Dielectric constant with temperature at various constant frequencies.*

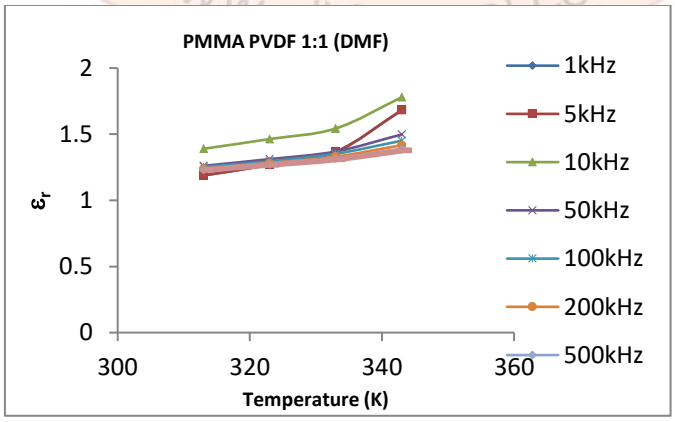

Fig. 6 ε_r versus temperature

4) *AC conductivity with temperature at various constant frequencies*.

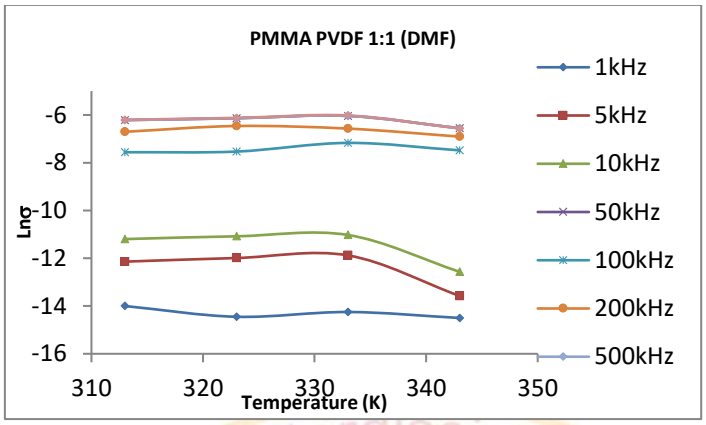

Fig. 7 $\log_e(\sigma_{ac})$s versus temperature

The following parameters have been consider for discussion
1) Dielectric constant(ε_r)
2) AC electrical conductivity(σ_{ac})

1) The Dielectric Constant (ε_r)
i) Increases with the increase of temperature
ii) Decreases with the increase of frequency

2) The AC conductivity (σ_{ac})
i) increases almost linearly with frequency above 1KH at the various constant temperatures and it attains almost constant saturation values as the frequency approaches its maximum value 1MH.
ii) At the constant frequency, seems to remain almost constant with the increases of temp in the range 313K to 363K.

Effect of temperature on dielectric constant:

It has been noticed that, there is an increase in the value of dielectric constant with the increase of temperature in case of 1:1 PMMA and PVDF polyblend samples.
Among two polymers used to form a blend system PVDF is non- polar while PMMA is weakly polar polymer. The introduction of polar polymer into the non-polar one is reported to reduce its resistance and hence increases the conductivity and also the dielectric constant.

Effect of frequency on dielectric constant:

The microscopic behaviour of the dielectric material under the influence of ac electric field can be understood from the polarization which constitutes a dielectric or which is introduced during its preparation. The polarization effect is dependent on the nature of dipoles and the frequency of the applied electric field.
As stated earlier, under the static electric field or the ac field of low frequency, the net polarization of the sample is contributed by electronic polarization, atomic polarization and orientational polarization. As the frequency is increased, orientational polarization becomes unable to follow field variation at higher frequencies. As a result dielectric constant decreases with the increase of frequency [Muhd. Akram et al.,(2005); Reda,(2006); Rao et al., (2000)].

Effect of frequency and temperature on ac conductivity:

The ac conductivity has been measured by increasing the frequency from 1KH to 1MHz at various constant temperatures 313K, 323K, 333K, and 343K for the blend system. It has been noticed that the ac conductivity increases with the increase in frequency. [Tripathi S. K. and Gupta A. (2012)]

Conclusions

1) The dielectric constant increases with increase of temperatures at constant frequencies
2)The dielectric constant decreases with decrease in temperatures at constant frequencies
3)The AC conductivity increases with frequencies at various constant temperatures
4)They attain almost saturation values as the frequency approaches its maximum value.
5) The dielectric constant does not significantly vary with temperature in the temperature range from (313K to 343K).

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Thermal Studies Of Thiazole Schiff Base Complexes Of Vo(Iv), Zr(Iv) And Uo_2(Vi)

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Abstract:

Newly synthesized product thiazole Schiff base was derived from the condensation of thiazole and 2-hydroxy-5-chloro-3-nitro acetophenone. The Schiff bases behaved as charge bidentade ligand. The ligand was characterized by elemental analysis and spectral methods. The coordinating ability of the ligand is investigated by preparing its metal complexes with VO(IV), Zr(IV) and UO_2(VI) have been prepared and characterized by elemental analysis, conductance measurements, molecular weight determinations, spectral and thermal studies. The synthesized products are coloured solids, soluble in DMF, DMSO and THF.

Keywords: *Schiff base, Magnetic susceptibility, Thermal*

Introduction :

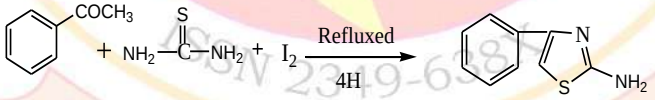
The newly synthesized Schiff bases, 2-acetylthiophene thiosemicarbazone and thiophene-2-aldehyde thiosemicarbazone and their metal complexes with Co(II), Cu(II), Zn(II) and Ni(II) complexes and Their Schiff bases metal complexes were tested for antibacterial activity[1] The Schiff bases play a significant role in the area of coordination chemistry. Synthesis, characterization and antifungal activity of manganese (II) complex with Schiff Base derived from acetylacetone andl leucine[2] and Spectral and thermal characterization of metal complexes containing schiff Base ligands.[3] Compounds containing an azomethine group (CH=N), known as Schiff bases, were formed by the condensation of a primary amine with a carbonyl compound. Schiff bases of aliphatic aldehydes were relatively unstable and were readily polymerizable. Schiff bases and their complexes are shows good progress in thermal analysis[4]. The thermogravimetric technique has been great significance research method on thermal stabilsation and thermal decomposition. Thermogravimetric could provide theory for material heating treatment and application.[5,] The aim of present investigation is to synthesize various transition metal complexes of Schiff base derived from 2-hydroxy-5-chloro-3-nitro acetophenone and 2-amino-4-phenylthiazole

Experimental ;

All the chemicals were of A.R. grade and used as received. 2-hydroxy-5-chloro-3-nitro acetophenone (HCNA) and 2-amino-4-phenylthiazole was prepared by known methods[6-9]. The solvents were purified by standard methods[10].

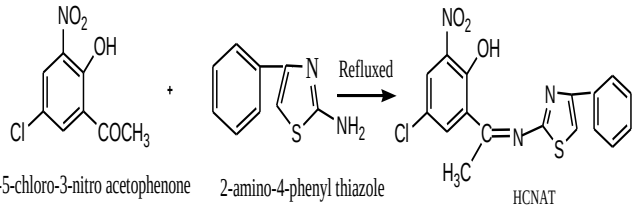
Synthesis of 2-amino-4-phenylthiazole;

The synthesis of 2-amino-4-phenylthiazole prepared by known method[7-9]. The product was filtered and crystallized from 70% ethanol, after several minutes the golden coloured product of 2-amino-4-phenylthiazole was separated out. Yield: 9g (75%); m.p.: 148-150^{0}C



Acetophenone 2-amino-4-phenylthiazole

Synthesis of 2-hydroxy-5-chloro-3-nitroacetophenone 4-phenyl-2 imino thiazole [HCNAT]: A solution of 4-phenyl-2 imino thiazole (0.02M) in 25ml of ethanol was added to an ethanolic solution(25ml) of 2-hydroxy-5-chloro-3-nitro acetophenone (0.02M) and the reaction mixture was refluxed on a water bath for 4h. After cooling a pale yellow coloured crystalline solid was separated out. It was filtered and washed with ethanol, crystallized from DMF and dried under reduced pressure at ambient temperature. The purity of ligand was checked by elemental analysis and m.p. It was also characterized by IR and ^{1}H NMR spectral studies. Yield:75%; m.p. 305^{0}C



2-hydroxy-5-chloro-3-nitro acetophenone 2-amino-4-phenyl thiazole HCNAT

Table1. Analytical data of the Ligands.

Ligand	Molecular Formula	Formula Weight	Color and nature	Elemental Analysis			
				C% found (Cal.)	H% Found (Cal.)	Cl% Found (Cal.)	S% Found (Cal.)
HCNAT	**$C_{17}H_{12}N_3O_3SCl$**	**373.06**	**Yellow Crystalline**	**52.35 (52.20)**	**03.20 (03.34)**	**9.22 (9.38)**	**08.34 (08.46)**

Preparation of complexes: All the metal complexes were prepared in a similar way by following method. To a hot solution of ligand HCNAT (0.02M) in 25ml of ethanol a suspension of respective metal salts was added drop wise with constant stirring. The reaction mixture was refluxed on a water bath for 3-5 h. The precipitated complexes were filtered, washed with ethanol followed by ether and dried over fused calcium chloride. Yield : 55-60%

The complexes are soluble in DMSO and DMF but insoluble in water and common organic solvents. The metal chloride content of complexes were analyzed by standard methods11,12 The 1H NMR spectra of ligand was recorded and obtained from RSIC Chandigarh. IR spectra of the compounds were recorded on Perkin Elmer 842 spectrophotometer in the region 400-4000cm-1, Carbon, Hydrogen and Nitrogen analysis were carried out at RSIC, Punjab University, Chandigarh. The molar conductance of the complexes at 10-3 M dilution in DMF were determined using equiptronic digital conductivity meter EQ-660 with a cell constant 1.00 cm-1 at room temperature. The magnetic moment measurement were made on a Gouy balance at room temperature using [HgCo(SCN)4] as the calibrant. The thermogravimetric analysis were performed on laboratory set up apparatus in air atmosphere at 100 C min-1 heating rate. The molecular weights of the complexes were determined by Rast method

Table 2. Analytical data and molar conductance of the compounds.

Ligand	Formula weight g $mole^{-1}$	Colour	Elemental Analysis Found (Calcd.)				μ_{eff} B.M	Λ_M (Ω^{-1} cm^2 mol^{-1})
			M%	C%	H%	Cl%		
$[VOL_2]$	812.2	Green	5.65	48.23	2.35	8.42	1.5	12.1
			(6.09)	(48.29)	(2.86)	(8.69)		
$[ZrL_2(OH)_2]\ 2H_2O$	906.4	Yellow	9.42	43.23	3.26	7.46	Dia	16.8
			(9.61)	(43.68)	(3.39)	(7.64)		
$[UO_2L_2]$	1015.3	Orange	22.34	38.58	2.12	6.52	Dia	14.7
			(22.62)	(38.63)	(2,22)	(6.86)		

Result and Disscution :

The Schiff base HCNAT and its complexes have been characterized on the basis of ^{1}H NMR, IR spectral data, elemental analysis, molar conductance, magnetic succeptibility measurements and thermogravimetric analysis data .

All these values and analytical data is consistent with proposed molecular formula of ligand . All the compounds are coloured solid and stable in air. They are insoluble in water but soluble in coordinating solvents like DMF and DMSO. The molar conductance values in DMF(10-3 M) solution at room temperature (Table2) shows all the complexes are non electrolytes.

The 1H NMR spectra of ligand shows signals at δ 12.14,(1H, s phenolic OH), δ 7.56, 7.54, 7.53 and 7.52 (4H, m, phenyl) δ 6.81,6.80, and 6.78 (3H, s, Phenyl), 6.68 (1H,s, thiophene), and 2.56 (3H, s, methyl) 11,13-15.

IR spectra of ligand and metal complexes shows (C=N) peaks at 1622 cm-1 and absence of C=O peak at around 1700 – 1750 cm-1 indicates the Schiff base formation16-19.

3. IR spectra of ligand and metal complexes

Compound	(O H) hydrogen bonded	(C=N) imine	(C O) phenolic	(M O)	(M N)	(C S)
HCNAT (LH)	3119	1622	1514	--	--	1126
$[VOL_2]$	--	1595	1508	515	438	1092
$[ZrL_2(OH)_2]\ 2H_2O$	--	1605	1499	448	418	1102
$[UO_2L_2]$	--	1590	1448	542	485	1074

Thermogravimetric studies: Thermogravimetric study indicates all the complexes are stable up to 60-700C. All the complexes shows half decomposition temperature(Table 4). The Thermal activation energy was calculated by Freeman-Carroll,20 Horowitz-metzger21 and Broido22 method.

Table 4. Thermal decomposition data of HCNAT and its complexes.

Compounds	**Half Decompo-sition** Tempera-ture **(°C)**	**Activation Energy (kJ mole^{-1})**			**Frequency Factor** Z **(sec^{-1})**	**Entropy Change -ΔS (J mol^{-1} K^{-1})**	**Free Energy Change ΔF (kJ mol^{-1})**
		B*	H-M**	F-C***			
HCNAT (LH)	260.46	3.22	5.47	4.31	87.28	211.42	118.65
$[VOL_2]$	400.35	5.22	8.62	6.36	138.82	211.82	148.78
$[ZrL_2(OH)_2]\ 2H_2O$	711.30	7.43	18.56	11.18	222.62	208.72	217.68
$UO_2L_2]$	800.00	19.88	22.16	17.69	353.24	207.74	239.69

Conclusions :

There is synthesized new ligand 2-hydroxy-5-chloro-3-nitro acetophenone 4-phenyl-2 imino thiazole and their metal complexes. Ligand was found to bind the metal ion monobasic (ON) bidentate manner. Conclusion of thermal decomposition temperature and activation energy of synthesized Schiff base metal complexes

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Investigation on Ionic Conductivity of PVA-PEG with NH_4Br Polymer Electrolyte

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Abstract:
A solid polymer film based on polyvinyl alcohol (PVA) and polyethylene glycol (PEG) complexed with ammonium bromide (NH_4Br) was prepared using solution cast technique. The ionic conductivity of the films was measured in the temperature range 323K–363 K. Dielectric constant and temperature dependant values of PVA –PEG poly blend film with NH_4Br where measured in the frequency range 20Hz-1MHz. The decrease in dielectric constant was observed with increase in frequency and also observed increase in temperature.
Keywords: PVA-PEG, NH_4Br, Ionic conductivity.

Introduction

In recent year, electrical conduction in polymer have been studied to understand the nature of charge transport. Polymer is a good insulating material with low ionic conductivity. PEG are synthetic water soluble polymers. They have a wide range of applications, including use in pharmaceutical experiments, food additives and plasticizers [1-2]. Polyvinyl alcohol (PVA) are commercial availability, dopant dependent electrical and optical property, good film forming ability, mechanical strength, low cost etc. It has carbon chain backbone with hydro-oxyl group attach to the methane carbon. PVA is a nontoxin and water soluble polymer having good charge storage capacity [3]. To increase the ionic conductivity depend on the addition of some dopant (ammonium salts) in polymer. Ammonium salts have been a very good proton doner to the polymer matrix system and to increase the conductivity [4-6]. Over the course of a year, a number of approaches were tested to increase the ionic conductivity of these polymeric electrolytes in the addition to developing new electrolytes **[7-9].** This system has been studied on account of the fact that both polyethylene glycol (PEG) and polyvinyl alcohol (PVA) are separately reported to form highly amorphous complexes and gels with salts and acids [10–13].

Eperimental technique

In the present study, polyvinyl alcohol, polyethylene glycol, ammonium bromide and deionized water were used to prepare solid polymer electrolyte. A solid polymer electrolyte system based on polyvinyl alcohol (PVA) and polyethylene glycol (PEG) complexed with ammonium bromide (NH_4Br) was prepared using solution cast technique. The film of pure and different composition of PVA-PEG-NH_4Br has been prepared by solution cast technique. In this technique, appropriate amount of PVA-PEG and NH_4Br have been dissolved individually in double distilled water .These solution have been mixed together in different molar ratio and stirred well by using magnetic stirred for 10-12 hr to obtained homogenous mixture. The obtained mixture is casted in petri dish. The whole assembly was placed in dust free chamber. The solvent was allowed to evaporate slowly at room temperature for 3-4 days. The films have been formed with uniformed thickness.

Result and discussion

Ionic conductivity

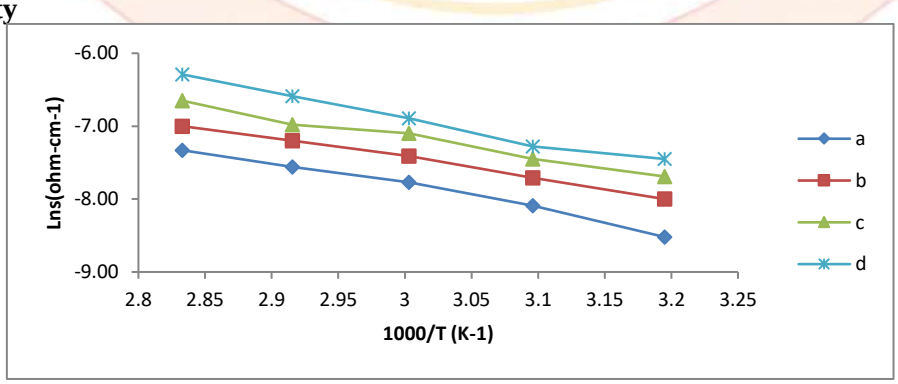

Fig 1:Variation of conductivity ln (σ) with temperature (Arrhenius plots) for (a) PVA-PEG with different (b) 5 mole %, (c) 15 mole %, (d) 25 mole % of NH_4Br.

The temperature dependence conductivity, lnσ verses 1000/T as shown in fig 1. The conductivity of solid polymer electrolyte PVA-PEG-NH_4Br is mostly depend on temperature. The temperature increases conductivity also increases in accordance with Arrhenius equation is given by -

$\sigma_T = \sigma_0 \exp(-Ea\backslash kT)$

Where σ_0 is the pre exponential factor, E_a is the activation energy and k is the Boltzmann constant [11-12]. The ionic conductivity is enhanced with increase of temperature and added with mole percent of ammonium bromide which suggest that the free volume around the polymer chain system increases causes the mobility of ions and polymer segments [13]. The segmental motion either allows the ions to hop from one side to another side. Hence ionic motion in polymer electrolyte is due to hopping of ions from one side to another site and the dynamic segmental motion of polymer , and accordingly the conductivity of polymer electrolyte becomes high. The ionic conductivity studies shows that the conductivity has been greatly affected by the addition of salt and the maximum conductivity has been observed for 25 mole % of salt doped in poly blend electrolyte.

Dielectric constant:

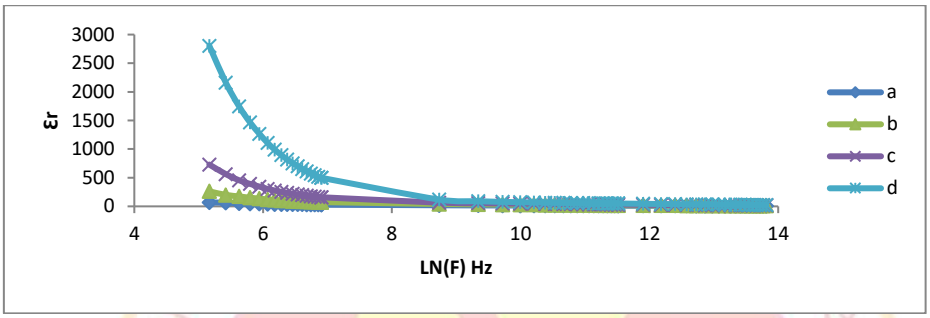

Fig 2: Variation of Dielectric constant with frequency (a) PVA-PEG (b) 5 mole %, (c) 15 mole %, (d) 25 mole % of NH_4Br.

The frequency dependent dielectric constant of PVA-PEG-NH_4Br mole % as shown in (figure 2) . It is observed that dielectric constant is high at low frequency. Due to contribution of charge accumulation at electrode-electrolyte interface. But in high frequency dielectric constant decreases and nearly constant value with increases in frequency. This is due to the dipole not being able to follow apposite of electric field variation at higher frequency [14-15].

Conclusion

A solid polymer electrolyte system based on polyvinyl alcohol (PVA) and polyethylene glycol (PEG) complexed with ammonium bromide (NH_4Br) was prepared using solution cast technique. The frequency dependant dielectric constant decreases with increase in frequency. It is reveal that electrical conductivity of PVA-PEG doped with NH_4Br increases with increasing salt concentration as well as temperature, which is attributed to the formation of charge transfer complexes.

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Magnetite Iron Oxide/Activated Charcoal (Fe_3O_4-AC) Composite for Arsenic Removal

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Abstract:

The article focuses on the development of magnetic Fe_3O_4 over the activated charcoal for the removal of arsenic (III) from synthetic aqueous solution. Chemical activation of activated charcoal was done using HNO_3 at 200°C to enhance the adsorption capacity of activated charcoal. Again, to enhance its adsorption capacity it was loaded with magnetic Fe_3O_4 which was synthesized by hydrothermal process. Batch study was conducted in which effect of pH, effect of contact time, effect of adsorbent dose on the arsenic adsorption were studied. The results shows that the activated charcoal loaded with magnetic Fe_3O_4 could remove arsenic very effectively at pH 8 at maximum adsorbent dose 1.2 g/L with the contact time 45 min at room temperature. Furthermore, the adsorption data were studied with Langmuir and Freundlich adsorption isotherm to analyze the equilibrium of the experiment. Langmuir model best fitted with the experimental results with the maximum adsorption capacity 7.28 mg/g. this finding indicated that the activated charcoal loaded with magnetic Fe_3O_4 could be used for the removal of trivalent arsenic from aqueous solution.

Keywords: Arsenic (III), Fe_3O_4, Activated charcoal, Langmuir model, Freundlich model

Introduction:

The whole countries in the world facing a problem of waste water contamination and its purification [1]. The government agencies around the world searching out the solution of wastewater contamination and its treatment by making various policies and in that Indian government specially focus on the swachchabharatabhiyan through that the treatment water of ganga river is the mainline task now a days. For the treatment of wastewater and also for the removal of toxic metal ions, organic and inorganic pollutants there are many methods available like reverse osmosis, physico-chemical treatment, advance oxidation treatment, coagulation-flocculation process, ion exchange, membrane filtration etc [2]. But treatment of wastewater is not an easy task because many facts have to be considered if we are looking for the treatment of wastewater. In to that first one is the process should be feasible, it should be carryout at any suitable workplace, it should be cost effective and as the green parameter consist it should not generate waste [3]. Looking in to that view the current work was carries out in which the removal of toxic metal i.e., arsenic from the synthetic aqueous solution onto the Magnetite Iron Oxide/Activated Charcoal (Fe_3O_4-AC). The activated charcoal is well known for the purification of wastewater because of its high porosity, easy availability, cost effective and Regenerability [4-6]. Furthermore, is surface is available for the modification by using surface active agents, nanomaterial, polymers etc. which will enhance its BET surface area and ultimately the adsorption capacity increases. Arsenic contamination is the major concern the various parts of the India [7]. As per the WHO guideline the maximum permissible limit for the arsenic in groundwater is 10 µg/L but in India highest concentration of arsenic was found to be in the range 0.003 - 3700µg/L. Usually inorganic arsenic is more toxic than the organic arsenic. In natural water arsenic persist in two oxidation state: arsenite (+3) and arsenate (+5). Long-term exposure to arsenic from drinking-water can cause diverse types of cancers, including skin, lungs, urinary bladder, kidney liver, and prostate cancers [8-9]. In developing countries two methods are widely used for the arsenic removal from wastewater one is precipitation and another is adsorption. A large amount of chemicals is required in precipitation method which finally creates sludge in the form of arsenic sulfide, calcium arsenate or ferric arsenate. On the other hand, adsorption method is easy to handle, cost effective and efficient and can be applied for the treatment of wastewater containing trace amount of pollutants [10]. Hence, the objective of this study was to find out the adsorption capacity of Magnetite Iron Oxide/Activated Charcoal (Fe_3O_4-AC) composite for the removal of As (III) from aqueous solutions

Material and Method

Synthesis of Adsorbent (Fe_3O_4-AC Composite)

Magnetic Fe_3O_4 was prepared by dissolving 0.8 g of $FeCl_3.6H_2O$ in 40 ml deionised water to it 2 ml ammonia solution were added under constant magnetic stirring at room temperature stir this mixture for about 30 min. Chemical activation of activated charcoal was done using HNO_3 at 200°C to enhance the adsorption capacity of activated charcoal.In beaker 0.1 g of activated charcoal were dissolve in 20 ml distilled water and 8 ml ethanol. Both this mixture was then transferred to Teflon crucible. For the hydrothermal treatment at 120°C, Teflon crucible was inserted in to stainless steel autoclave for 3 h. After the hydrothermal reaction, the autoclave was cooled down to room temperature. After that, the product was filtered, washed with deionised water and ethanol several times. The sample was dried in an oven at 60°C for 10 h Then, the obtained product designated as Fe_3O_4-AC composite and kept in cold condition for further studies.

Batch Adsorption Experiment

In the batch study various parameter like effect of pH, adsorbent dose, contact time were studied for the removal of Arsenic on Fe_3O_4-AC composite. A known concentration of Arsenic (III) solution was taken in a stoppered bottle to which definite amount of Fe_3O_4-AC composite were added and shaken at 500 rpm on rotary shaker for 1 h. After equilibrium the reacting solution was then filter and concentration of As(III) before and after was determine by molybdenum blue method at 840 nm using spectrophotometer.

Result And Discussion

Effect of pH: To study the effect of pH on As(III) removal in pH range 1-12 on Fe_3O_4-AC composite using 1.2 g of adsorbent, 5 mg/L initial As concentration and contact time 60 min are kept constant. 0.1 N HCl and 0.1 N NaOH was used to adjust the desired pH.

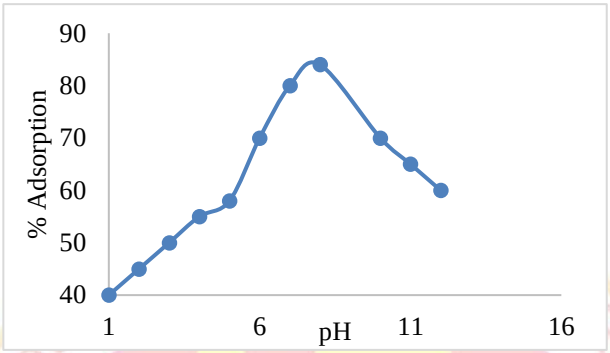


Fig. 1: Effect of pH

Effect of dose: To study the effect of adsorbent dose on As(III) removal on Fe_3O_4-AC composite by varying the dose of adsorbent from 0.1 g to 1.2 gm. pH 8, 5 mg/L initial As concentration and contact time 60 min are kept constant

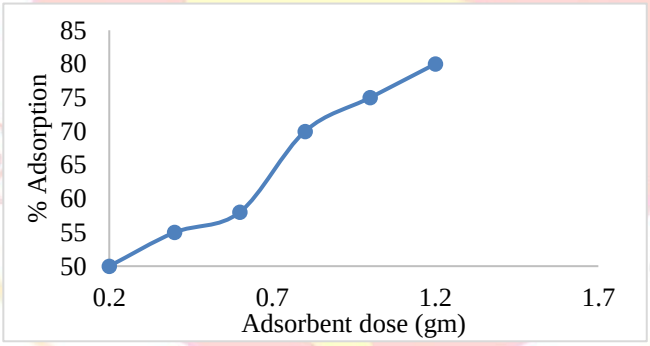


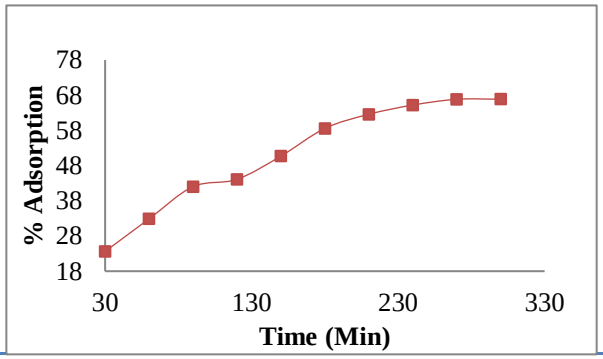
Fig. 2. Effect of adsorbent dose

Effect of contact time: The effect of contact time on the percentage of As(III) removal by Fe_3O_4-AC composite adsorbent was studied at different contact time from 5 to 120 min. Other parameters were kept constant,such as the adsorbent dose 0.5 g/L, initial As(III) concentration 5 mg/L, and pH 8. All the experimentswere carried out at room temperature. The percentage removal of As (III) adsorbed was calculated byusing the following equation.

$$\%\ \mathrm{As(III)Removal} = \frac{(\mathrm{Co} - \mathrm{Ce}) \times 100}{\mathrm{Co}}$$

Where Co = Initial concentration of Arsenic (mg/L) and Ce= final concentration of Arsenic (mg/L).

Fig.3. Effect of contact time



Adsorption Isotherm

To study the interaction between As(III) and magnetite Fe_3O_4-AC composite the equilibrium data was scrutinized and studied by using Langmuir and Freundlich adsorption model.TheresultsinAs(III)removal experimental datatobothFreundlichandLangmuirequation

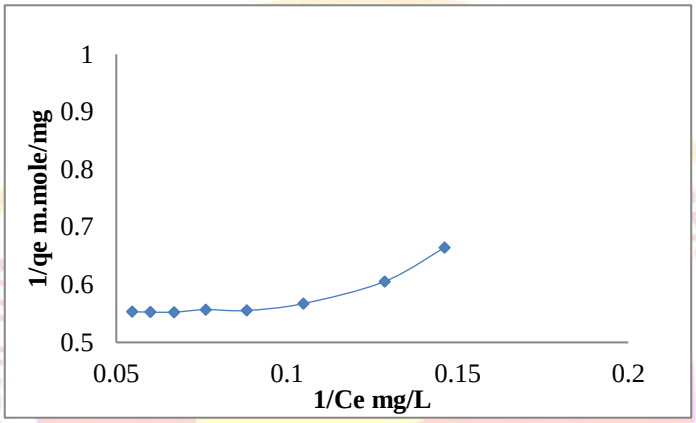
Isotherm Modelling

***Langmuir Adsorption Isotherm*: -**The Langmuir isothermmodel can be given as:

$$\frac{1}{q_e} = \frac{1}{Q^0 b} \times \frac{1}{Ce} + \frac{1}{Q^0}$$

The Langmuir constant Q^o is a measure of adsorption capacity and b is the measure of energy of adsorption. In order to observe whether the adsorption is favourable or not, a dimensionless parameter 'R_L' obtained from Langmuir Isotherm. The values of Q^o and b were evaluated from the intercept and slope of linear plots of $1/q_e$ vs. $1/C_e$ respectively.

***Freundlich Adsorption isotherm*: -** It is most commonly used adsorption isotherm model which describes adsorption on heterogeneous surfaces with interactions among adsorbed molecules. It helps to investigate the nature of adsorption and the adsorption capacity of an adsorbent. The linear form of Freundlich isotherm model is



$$\log q_e = B.\log C_e + \log K_f$$

Fig.4: Langmuir Adsorption Isotherm

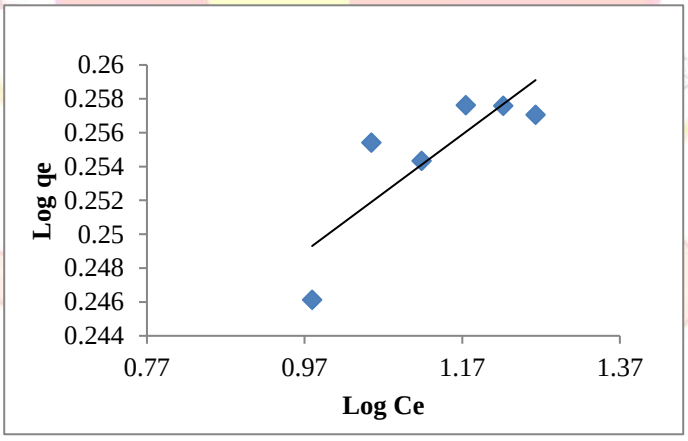


Fig. 5: Freundlich Adsorption Isotherm

Conclusion

Fe_3O_4-AC composite shows good adsorption efficiency for the removal of As (III). The removal efficiency was found to be rapid at initial stage and then slow down because it is depending upon the concentration of metal ions and active sites on the adsorbent for the binding of metal ions. The adsorption isotherm data was best revealed by the Langmuir adsorption isotherm. The maximum removal efficiency was found to be at pH 8. Batch study indicates that as the adsorption dose, contact time increases adsorption capacity increases.

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Conflict of interest: Nil

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A Efficient Synthesis of Nanoparticleof Some Benzothiazoles Derivative of Glucose

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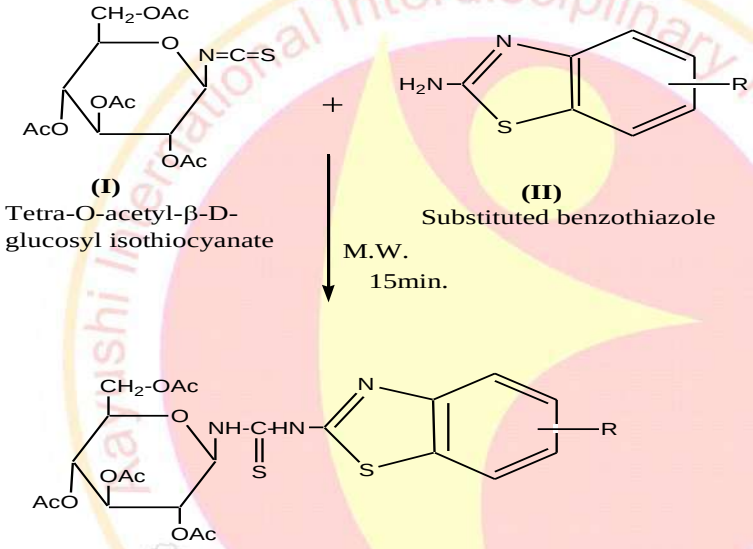
Abstract :-

Benzothiazoles have played an important role in the field of biochemistry and medicinal chemistry due to their highly pharmaceutical and biological activity. The development of synthetic processes is undoubtedly one of the most significant problems facing researchers.Nanotechnology also involves the synthesis of nanoparticles. These compounds arouse interest as potential biologically active substances and versatile intermediates for preparing various derivatives. To achieve the principle of green chemistry process, it leads to in search of green synthesis of nanoparticles.Here we havesynthesized 1-Tetra-O-acetyl- β -D-glucosyl-3-(2)- benzothiazolyl thiocarbamides by reaction of Tetra-O-Acetyl-B-D-glucosyl isothiocyanate with various substituted benzothiazole. The identities of newly synthesis compounds have been established based on usual chemical transformation and U.V, IR, NMR, Mass and Partical Size analysis Analytical studies.

Keywords: *TAG Isothiocyanate , substituted benzothiazoleand 1-Tetra-O-acetyl- β -D-glucosyl-3-(2)- benzothiazolyl thiocarbamidesnanoparticles.*

Graphical Abstract :-



Introduction :-

Benzothiazole is a representative class of sulfur-containing heterocycles and involves a benzene ring fused to a thiazole ring. The benzothiazole ring system was originally found in various marine and terrestrial natural compounds, which is widely used as vulcanization accelerators, antioxidants, plant growth regulators, anti-inflammatory agents, enzyme inhibitors, imaging reagents, fluorescence materials, and electroluminescent devices due to its highly pharmaceutical and biological activity [1,2,3,4]. Especially, benzothiazole plays an important role in the field of medicinal chemistry and renders an extensive range of biological activities including anti-cancer [5,6], anti-bacterial [7,8], anti-tuberculosis [9,10], anti-diabetic [11], anthelmintic [12], anti-tumor [13,14,15], anti-viral [16,17], anti-oxidant [18], anti-inflammatory [19,20], anti-glutamate and anti-parkinsonism [21], anticonvulsant [22], muscle relaxant activities [23], neuroprotective [24], inhibitors of several enzymes and so on [25]. Hence, the synthesis of benzothiazoles is of considerable interest due to their potent and significant biological activities and great pharmaceutical value.

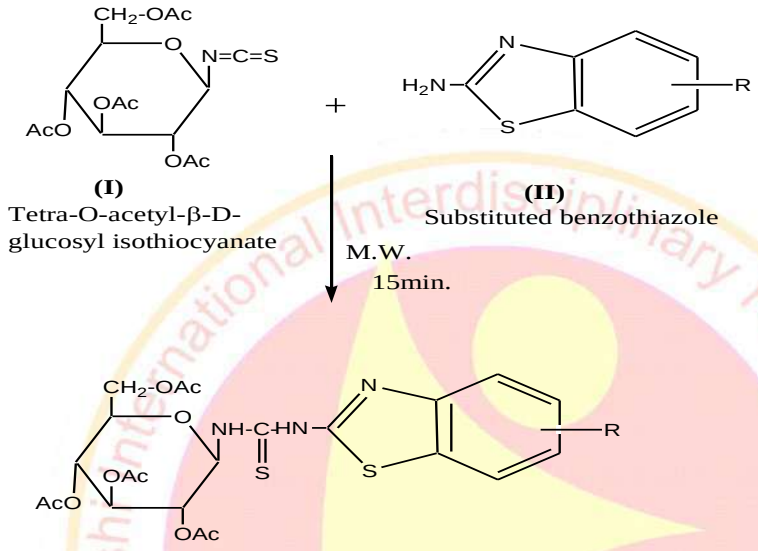
Nanotechnology, as defined by size, is naturally very broad, including the field of science as diverse as surface science, organic chemistry, molecular biology, semiconductor physics, energy storage, microfabrication, molecular engineering, etc. The associated research and applications are equally diverse, ranging from extensions of conventional device physics to completely new approaches based upon molecular self-assembly, from developing new materials with dimensions on the nanoscale to direct control of matter on the atomic scale. Nanotechnology may create many new materials and devices with various applications, such as in Nanomedicines, Nanoelectronics, and biomaterial energy production and consumer products.

Results And Discussion:

Nanoparticles:

A nanoparticle isa sub-classification of the ultrafine particle with lengths in two or three dimensions greater than 0.001 micrometer (1 nanometer) and smaller than about 0.1 micrometer (100 nanometers) and which may or may not exhibit a size-related intensive property. This term is a subject of controversy regarding the size range and the presence of a size-related property. Current usage emphasizes size and not properties in the definition. The length scale may be a hydrodynamic diameter or a geometric length appropriate to the intended use of the nanoparticle. The chemistry of thiourea of carbohydrates is extensively elaborated and well documented. These compounds arouse interest as potential biologically active substances and versatile intermediates for preparing various derivatives

Reaction Scheme:-



(I) Tetra-O-acetyl-β-D-glucosyl isothiocyanate

(II) Substituted benzothiazole

(III)

1-tetra-O-acetyl-β-D-glucosyl -3-substituted benzothiazolyl thiocarbamides

Here Tetra-O-Acetyl-β-D-Glucosyl-3-substitute benzothiazolyl thiocarbamide was synthesized by both methods; conventional and Microwave method.Tetra-O-acetyl-β-D-glucosyl isothioyanate was react with Substitute benzothiazole in benzene medium after that reaction mixture was titurate several times with petroleum ether . The product is confirmed based onthe melting point and other studies.

Experimental

Melting points were recorded on electro thermal melting point apparatus are uncorrected. Specificrotations were measured on Equip-Tronic digital polarimeter model no. EQ 800 at 30^0C in $CHCl_3$. IRspectra were recorded on a Perkin Elmer spectrometer. ^{1}H NMR were obtained on a Bruker DRX-300(300 MHz FT NMR) NMR spectrometer in $CDCl_3$ solution with TMS as an internal reference. The massspectra were recorded on a DART mass spectrometer were recorded. Partical Size was analysis by Malvern particalsizeanalysizer.

I) Preparation of Tetra-O-acetyl-β-D-glucopyranosyl isothiocyanate :

This has been prepared by the interaction of tetra-O-acetyl-α-D-glucopyranosyl bromide and lead thiocyanate, the former was prepared according to the procedure described earlier. Details of typical experimental are as follows :

a) Microwave assisted preparation of glucose penta acetate :-

Peracetylation of glucose to give the acetyl derivative with small excess of acetic anhydride under the catalyst of either Potassium or Sodium acetate (anhydrous) was found practically quantitative in less than 15 min with microwave heating.

Herein, we reported first time peracetylation of glucose in molecular proportion of acetic anhydride (30 ml) using catalyst sodium acetate 0.8 gm. Under Microwave heating the reaction was complete less than 10 min. Product was isolated by pour in ice cold water with constant stirring and cooling.

The glucose penta acetate is separated out; purification of product was done under water, ethanol system. Melting point of Glucose penta acetate was found to be 110°C.

b) **Synthesis of Tetra-O-acetyl-α-D-glucopyranosyl bromide** :

The finely powdered glucose pentaacetate (21.0g) was added gradually to the brominating reagent. After the addition the flask was kept for 2 hr. at room temperature. The reaction mixture was mixed with chloroform (50 ml) then the mixture was shaken vigorously for about 15 min. The resultant mixture was pour in ice cold water.

The chloroform layer was then separated. It was washed several time with aqueous sodium bicarbonate to removed excess of acetic acid followed by the aqueous sodium meta-bisulphate to remove the excess of bromine and finely 2-3 times with water. To the chloroform layer addition of petroleum ether afforded a solid (15 g). This solid was expected tetra-O-acetyl-ά-D-glucopyranosyl brominde, it was crystallized from ethanol, m.p. 88-90°C.

d) **Preparation of lead thiocyanate :**

Lead thiocyanate was prepared by mixing aqueous solution of lead nitrate and ammonium thiocyanate. The white granular lead cyanate was filtered washed with distilled water and dried at 50°C.

Preparation of Tetra-O-acetyl-β-D-glucopyranosyl isothiocyanate :

To a suspension of tetra-O-acetyl-α-D-glucopyranosyl bromide (21 g) in sodium dried xylene (80 ml) was added lead cyanate (15g). The reaction mixture was refluxed gently for 3 hr. with frequent shaking. This solution was then cooled and liberated lead bromide was removed by filtration. The xylene filtrate was then treated with petroleum ether (60-80°) with stirring, a pale yellow solid obtained (12 g). This solid was expected tetra-O-acetyl-β-D-glucopyranosyl isocyanate. It was purified by dissolving it in a minimum quantity of chloroform and reprecipitating with petroleum ether. m.p 115-120°C

Table No-2-: Study of synthesis of 1-tetra-*O*-acetyl-β-D-Glucosyl isothiocyanate under microwave irradiation[11]

Sr. No.	Amount of G-Bromide	Amount of Xylene	Time	Power in watt	Temp. °C	% Yield
1	10.0 gm	80 ml	35 min	P-70	120-130	**90%**
2	20.0 gm	120 ml	40 min	P-80	130-140	**80%**
3	**30.0 gm**	**150 ml**	**40 min**	**P-80**	**135-145**	**65%**

- Lead thiocyanate was taken in equimolar proportion of G-Bromide.
- G-Bromide :- 1-tetra-*O*-acetyl- -D-Glucosyl-Bromide

Experiment No. 1:- Tetra-O-acetyl-β-D-glucosyl-(3)-2-substituted benzothiazolylthiocarbamides

A benzene solution of tetra-O-acetyl- β -D-glucosyl isothiocyanate (0.005 M, 1.9 g, in 20 ml) was mixed with the suspension of 2-amino benzothiazole (0.005 M, 0.75 g in 10 ml) and mixture was under microwave irradiation After, benzene was distilled off and sticky mass obtained as a residue was triturated several time with petroleum ether to afford white solid. It was crystallized from ethanol water, m.p. 135-142°C. [Found: C, 52.00; H, 4.85; N, 8.14; S, 6.23, $C_{22}H_{25}O_{10}N_3S$. requires; C, 52.07, H, 4.93; N, 8.28; S, 6.31%].

The product was found soluble in ethanol, acetone, chloroform and benzene while insoluble in water and petroleum ether. It charred when heated with conc. sulphuric acid. It was non-desulphurisable when boiled with alkaline plumbite solution. It was found to be optically active and its specific rotation $[\alpha]_D^{29}$ = +74.46° (c, 0.94 in chloroform). The purity was checked by TLC and recorded Rf value 0.86 (CCl_4 : EtOAc, 3:2.1).

Analytical And Spectral Data Of Compounds:

Synthesis of 1-Tetra-O-acetyl-β -D-glucosyl-3-(2)- amino benzothiazolyl thiocarbamides (IIIa).

(IIIa) IR (KBr) : ν 3374 (N-H), 2969 (Ar-H) 1743 (C=O), 1588 (C=N), 1382 (C-N), 1239 (C-O) and 753 cm-1 (C-S); 1H NMR (CDCl3) : δ 7.57-7.20 (m, 5H Ar-H), 6.3-6.2 (s 1H N-H), 5.1-5.5 (m, 7H Glucopyranosyl ring), 2.1-1.9 (m, 12 H, 4COCH3); Mass : m/z 508 (M+), 331, 169, 109, Anal. Calcd. for C22H25N3O8S2; C, 48.97; H, 4.63; N, 8.24; S, 6.31; found C, 48.84; H, 4.59; N, 8.45; S 6.51%

Synthesis of 1-tetra-O-acetyl-β -D-glucosyl-3(2)-4-chloro benzothiazolyl thiocarbamide (IIIb).

(IIIb) IR (KBr) : ν 3340 (N-H), 2966 (Ar-H), 1745 (C=O), 1615 (C=N), 1378 (CN), 1231 (C-O) and 753 cm-1 (C-S) ; 1H NMR (CDCl3) : δ 7.7-7.6 (m, 1H, N-H), 7.4 - 7.1 (m, 4H, Ar-H), 5.1-4.7 (m, 7H, glucopyranosyl ring), 2.2-1.9 (m, 12H, 4 COCH3); Mass : m/z 544 (M+), 331, 169, 109; Anal. Calcd., C22H24N3O8S2-Cl, C, 46.07; H, 4.18; N, 7.72; S, 5.88 Found C, 46.13; H, 4.23; N, 7.21; S, 5.98%

Synthesis of 1-Tetra-O-acetyl-β -D-glucosyl-3-(2)-4-methyl benzothiazolyl thiocarbamide (IIIe) :

(IIIe) IR (KBr) : ν 3468 (N-H), 2997 (Ar-H), 1743 (C=O), 1610 (C=N), 1383 (C-N), 1238 (C-O) and 845 cm-1 (Glucopyranosyl ring); 1H NMR (CDCl3) : δ 7.4-7.0 (m, 4H, ArH), 5.15 (s, 1H , N-H), 2.3 (m, 3H, Ar-CH3)

5.4-5.5 (m, 7H, Glucopyranosyl ring), 2.2-1.8 (m, 12H, 4COCH3) Mass: m/z (Not predictable) 331, 109; Anal. Calcd. for C23H27N3O8S2; C, 49.90; H, 4.33; N, 8.04; S, 6.13; Found C, 4997; H, 4.26; N8.22; S , 6.21%.

Preparation of Nanoparticles of 1-tetra-O-acetyl-β-D-glucosyl-3-(2)-methyl benzothiazolyl thiocarbamide:

Take about 1 gm of 1-tetra-O-acetyl-β-D-glucosyl-3-*(2)*-methyl benzothiazolyl thiocarbamide and dissolve it completely in the 20ml of solvent in a 250 ml beaker and add poly vinyl alchole as a stibilizer 1.5ml . Now put this beaker in a sonicator. The highly penetrating acoustic waves are passed through the mixture, which creates high-pressure bubbles in the beaker due to which breakdown of the bulk material took place and desired sized nanoparticles are formed. Then stirred mixture about 6hr. in magnetic stirrer at room tempeture. The size determination of nanoparticlesis done by the partical size analysizer studies

Characterization of Nanoparticles:

1. Characterization using UV-Spectrophotometer: Single Beam UV-Spectrophotometer with software BI/CI/SP/SB-S-03 of Bio Era make. The UV-Visible Spectroscopy reveals the formation of Nanoparticles Characterization of Nanoparticles was done using a visible Spectrophotometer by using a model by showing different absorption those from bulk material.

2. Size determination ofGlucose Penta Acetate, Nanoparticles by X-ray Diffraction studies(Particle Size Analysis): From the X-ray diffraction, it comes to know that size of nano Glucose Penta Acetate is 97.57 nm.

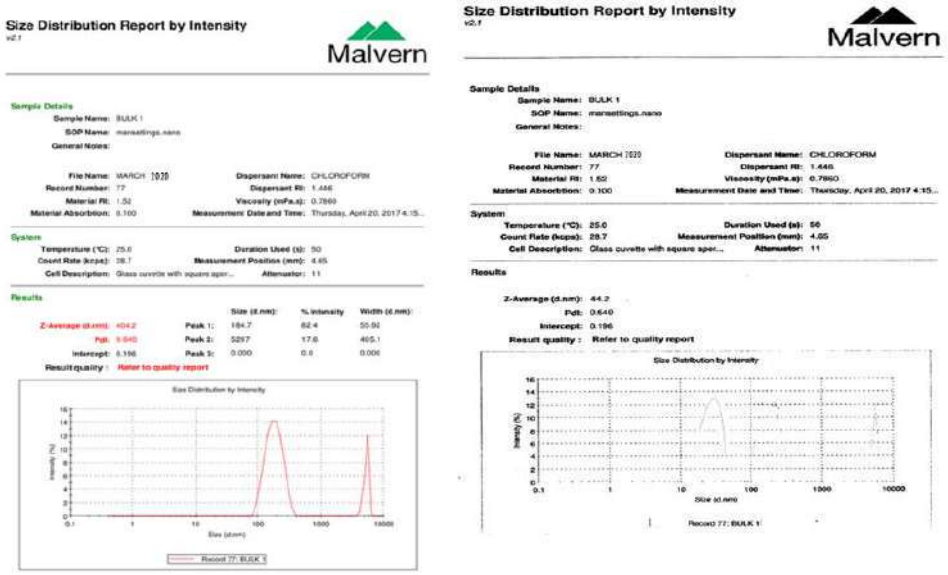


Table No. 2:- Tetra-O-acetyl-β-D-glucosyl-(3)-2-substituted benzothiazolylthiocarbamides

Sr.No.	-Nano of synthesis of Tetra-O-acetyl-β-D-glucosyl-(3)-2-substituted benzothiazolyl thio carbamides	M.P. °C	Particle Size
1	1-Tetra-O-acetyl- β -D-glucosyl-3-(2)- amino benzothiazolyl thiocarbamides	135-142	122.2nm
2	Synthesis of 1-tetra-O-acetyl- β -D-glucosyl-3(2)-4-chloro benzothiazolyl thio carbamide	112-120	153nm
3.	Synthesis of 1-Tetra-O-acetyl- β -D-glucosyl-3-(2)-4-methyl benzothiazolyl thio carbamide	152-155	97.57nm

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A three component synthesis of fused 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido [1,6-*a*]pyrimidine-3,9-dicarbonitriles with evaluation of their antioxidant activity

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Synthesis of novel fused 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives (4a-7d) have been accomplished via three-component reaction of 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3), ethyl-2-cyano-3,3-bis(methylthio)acrylate and nucleophiles such as substituted anilines/phenols/ hetryl amines/compounds containing active methylene group by using anhydrous K_2CO_3 as catalyst and DMF as solvent. Compound (3) was prepared by reaction between, simple condensation product of acetamidine hydrochloride (1) and bis(methylthio)methylene malononitrile (2) with same reaction condition which is used for title compounds. The chemical structures of newly constructed derivatives were corroborated by IR, ^{1}H-NMR, ^{13}C-NMR and Mass spectral analysis. Furthermore, these synthesized fused heterocycles were examined for their plausible antioxidant activity.
Keywords: Antioxidant, Bis(methylthio)methylene malononitrile, DMF and Potassium carbonate.

Introduction

Heterocyclic chemistry play a vital role in modern society and posses varied application in different fields due to which unabated research has been going on to synthesize new organic compounds including derivatization of naturally occurring scaffolds such as alkaloids, nucleic acids, vitamins, proteins and hormones etc. Synthetic heterocyclic compounds which contain N, S and O have enormous potential in the field of agrochemicals and medicinal chemistry.

Pyrimido[4,5-*d*]pyrimidines and pyrido[2,3-*a*]pyrimidines undoubtedly belong to the most ubiquitous heterocycles in nature. They are an important class of annulated uracils of biological importance [1], because of their connection with purine pteridine system [2]. Several patent have been reported for the synthesis of these fused heterocycles, derivatives of these are useful as antiallergic [3],vasodilators [4], bronchodilators [5], antihypertensive [6] agents. Fused pyrimido[4,5-*d*]pyrimidine ring system represent attractive target owing to divers pharmacological applications of these molecule that includes potent inhibitory properties regarding the tyrosine kinase domain of epidermal growth factor receptor [7], dihydrofolate reductase [8], 5-phosphoribosyl-1-pyrophosphate synthetase [9], antimicrobial [10], antitumor [11], antifungal [12], antiviral [13], antioxidant [14], hepatoprotective [15] activities.

Multicomponent reactions (MCRs) have been proved as simple and convenient way to produce diverse chemical libraries of 'drug like' molecules for biological screening, since the combination of three or more small molecular weight building blocks in a single operation leads to high combinatorial efficacy. In last decades many synthetic methods have been reported for the synthesis of pyrimido[4,5-*d*]pyrimidines and its derivatives [16-21]. Recently our research group have reported synthesis and antimicrobial activity of fused pyrido pyrimido pyrimido derivatives [22]. Hence in present investigation by considering the application of multicomponent reactions, it was thought to construct a novel multifunctionalized ring system such as 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives with evaluation of their antioxidant activity.

Material And Methods

All compounds were purchased from SD-Fine, Spectrochem and Avra chemical companies and used without any additional purification. Melting points of synthesized compounds were determined by Electrothermal IA 9000 SERIES digital melting point apparatus and were uncorrected. Purity of all the products were routinely checked by thin layer chromatography (TLC) on pre-coated sheets of silica gel-C plates of 0.25 mm thickness. FT-IR spectra were recorded in Nujol or as KBr pallets on infrared spectrophotometer. Brukner advance spectrophotometer 400 MHz was used to record ^{1}H-NMR and ^{13}C-NMR spectra using tetramethylsilane (TMS) as internal standard, Mass spectra were recorded on FT-VC-7070 H Mass spectrometer using the EI technique at 70 eV.

General procedure:

Synthesis of 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3)

A mixture acetamidine hydrochloride (1) (0.01mol) and bis(methylthio)methylene malononitrile (2) (0.01mol) in 10 ml of DMF and anhydrous potassium carbonate (10mg) was refluxed for 6 hours. The progress of the reaction was monitored by thin layer chromatography (TLC). After completion of reaction, the reaction

mixture was cooled to room temperature and poured into ice cold water. The separated solid product was filtered, washed with water and recrystalized from DMF-ethanol mixture to give pure compound (3).

Synthesis of 8-substituted derivative of 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives (4a-7d).

A mixture of compound (3) (0.001mol) and ethyl-2-cyano-3,3-bis(methylthio)acrylate refluxed independently with substituted anilines/ phenols/ hetryl amines/ compound containing active methylene groups (0.001mol) in 10 ml of DMF and anhydrous potassium carbonate(10mg) for 5-6 hours. The reaction progress was checked by TLC. The reaction mixture was cooled to room temperature and poured into ice cold water. The separated solid product was filtered, washed with water and recrystalized from DMF-ethanol (2:8) mixture to give pure compounds (4a-4d, 5a-5d, 6a-6d & 7a-7d).

Table 1. Physicochemical data.

Com.No.	MolecularFormula	Mol. Wt.	Colour	Yield %	M.P °C
3	$C_7H_8N_4S$	180	Gray	72.17	135-36
4a	$C_{18}H_{14}N_6OS$	362	Brown	68.31	184-85
4b	$C_{18}H_{14}N_6O_2S$	378	Brown	77.47	178-79
4c	$C_{17}H_{11}N_6OSCl$	382	Brown	56.82	136-38
4d	$C_{17}H_{11}N_7O_3S$	393	Yellow	62.24	181-82
5a	$C_{18}H_{13}N_5O_2S$	363	Brown	70.11	147-48
5b	$C_{17}H_{10}N_5O_2SCl$	383	Yellow	82.33	192-93
5c	$C_{17}H_{10}N_5O_2SBr$	426	Brown	61.65	206-07
5d	$C_{17}H_{10}N_6O_4S$	394	Yellow	63.94	173-74
6a	$C_{15}H_{14}N_6OS$	326	Brown	69.42	155-57
6b	$C_{16}H_{16}N_6OS$	340	Yellow	75.81	134-35
6c	$C_{15}H_{15}N_7OS$	341	Brown	72.56	139-40
6d	$C_{15}H_{14}N_6O_2S$	342	Brown	68.05	174-76
7a	$C_{14}H_7N_7OS$	321	Brown	65.89	197-98
7b	$C_{16}H_{12}N_6O_3S$	368	Brown	62.17	211-12
7c	$C_{16}H_{13}N_5O_3S$	355	Brown	54.46	160-61
7d	$C_{17}H_{15}N_5O_4S$	385	Brown	66.94	143-44

Spectral Analysis:

4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3).

IR (KBr/cm^{-1}) 2206 (CN), 3359 (NH_2): ^{1}H-NMR (400 MHz,DMSO-d_6): δ 2.38 (s, 3H, CH_3), 2.53 (s, 3H, SCH_3), 7.5 (s, 2H, NH_2): ^{13}C-NMR (DMSO-d_6): δ 11.84 (SCH_3), 25.98(CH_3), 81.79 (C-CN), 114.54 (CN), 162.59 (C=N), 168.04 (C=N), 172.10 (C-SCH_3) EI-MS(m/z: RA%): 180 (M^+).

8-(4-chlorophenylamino)-6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile (4c).

IR (KBr/cm^{-1}) 1631 (N-C=O), 2210 (CN), 3356 (NH): ^{1}HNMR (400 MHz,DMSO-d_6): δ 2.51 (s, 3H, CH_3), 2.80 (s, 3H, SCH_3), 6.82 (s, 1H, NH), 7.12-7.39 (m, 4H, Ar-H): EI-MS(m/z: RA%): 382 (M^+).

8-(4-chlorophenoxy)-6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile (5b).

IR (KBr/cm^{-1}) 1650 (N-C=O), 2221 (CN): ^{1}HNMR (400 MHz,DMSO-d_6): δ 2.50 (s, 3H, CH_3), 2.73 (s, 3H, SCH_3), 6.97-7.66 (m, 4H, Ar-H): EI-MS(m/z: RA%): 383 (M^+).

6-methyl-2-(methylthio)-8-morpholino-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile (6d)

IR (KBr/cm^{-1}) 1673 (N-C=O), 2204 (CN): ^{1}HNMR (400 MHz,DMSO-d_6): δ 2.37 (s, 3H, CH_3), 2.64 (s, 3H, SCH_3), 3.42 (S, 4H, NCH_2), 4.26-4.28 (S, 4H, OCH_2): EI-MS(m/z: RA%) : 342 (M^+).

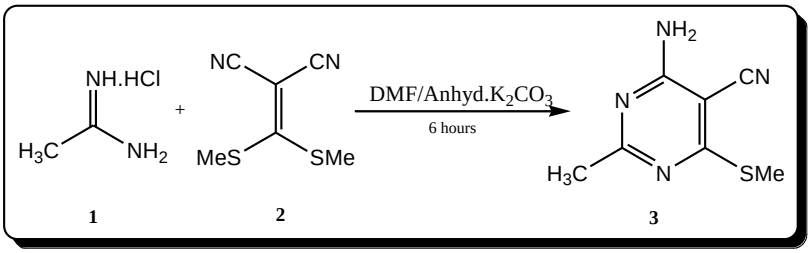
8-(dicyanomethyl)-6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile (7a)

IR (KBr/cm^{-1}) 1640 (N-C=O), 2203 (CN): ^{1}HNMR (400 MHz,DMSO-d_6): δ 2.37 (s, 3H, CH_3), 2.53 (s, 3H, SCH_3), 3.73 (S, 1H, CH): EI-MS(m/z: RA%): 321(M^+).

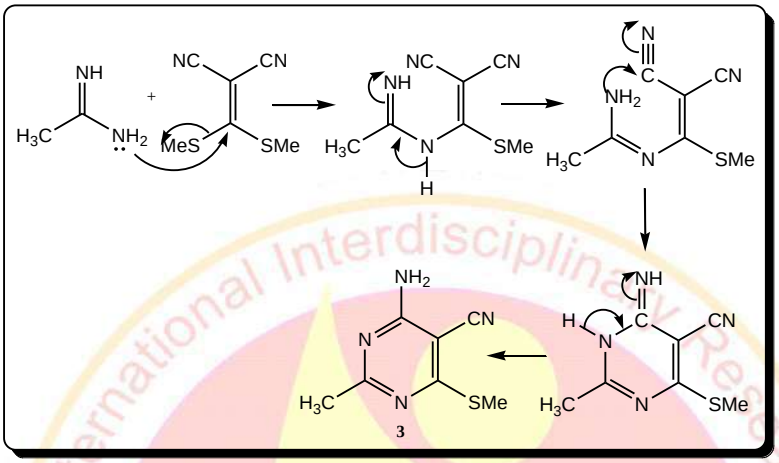
Result And Discussion

In present communication the most promising multicomponent method have been developed for synthesis of novel heterocyclic compound such as 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile its 8-substituted derivatives. Our synthetic plan commences from readily available acetamidine hydrochloride, which offers large number of annulated heterocycles. The requisite

starting material i.e. 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3) was prepared from condensation of acetamidine hydrochloride and bis(methyltio)methylene malononitrile **Scheme-1**.



Scheme-1. Formation of 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile

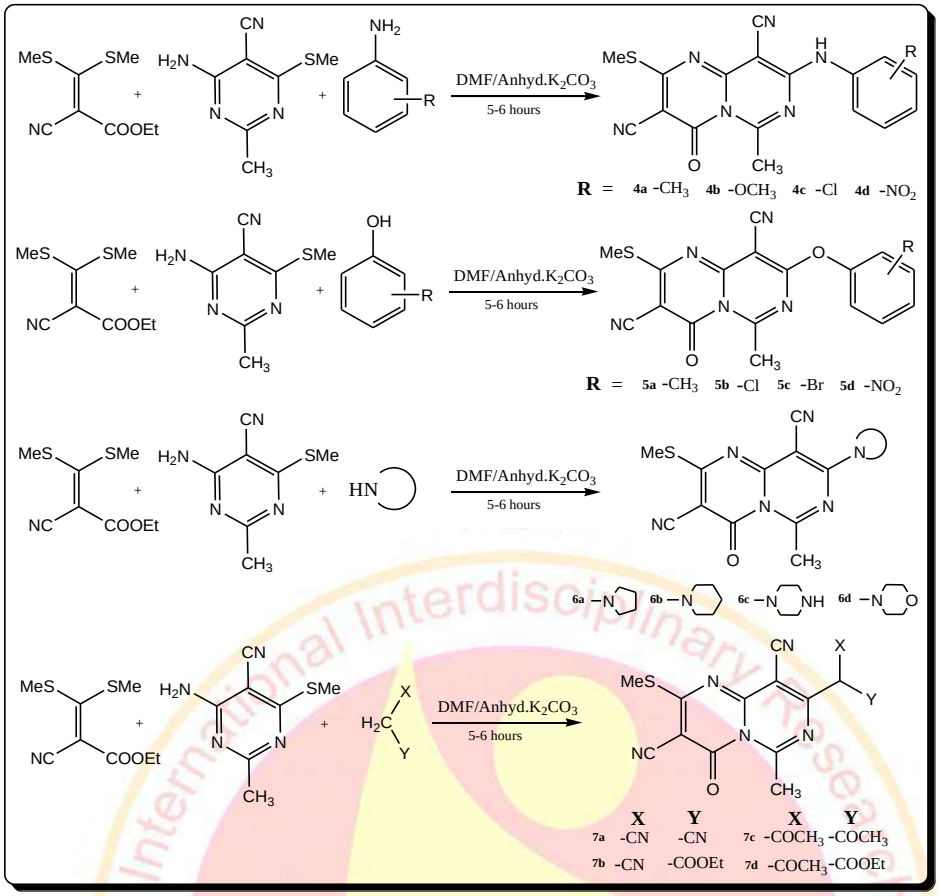


Scheme-1. Plausible mechanism for the formation of compound (3)

The presence of tautomerisable 1,3 nucleophilic positions of 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3) made itself more facile for attack on ethyl-2-cyano-3,3-bis(methylthio)acrylate, simultaneously compound (3) undergo nucleophilic substitution reaction due to presence of good leaving thiomethyl group resulting in the building of fused pyrimido[1,6-*a*]pyrimidine ring system via elimination of simple thiomethyl and ethoxy groups. **Scheme-2.**

The structure of newly synthesized compounds were assigned on the basis of IR, ^{1}H-NMR, ^{13}C-NMR and Mass spectral data. In IR spectrum of compounds absorption bands appear in the region 1675-1630 and 2221-2203 cm^{-1}for N-C=O, -CN respectively. ^{1}H-NMR spectra of compounds shows singlet peaks in the region of 2.30-2.52 and 2.53-2.80 ppm due to -CH_3, -SCH_3 protons respectively . ^{13}C-NMR spectrum of parent compound (3) shows peaks at 11.84, 25.98, 114.54 and 172.10 for –S<u>C</u>H$_3$, -<u>C</u>H$_3$, -<u>C</u>N and -<u>C</u>-SCH$_3$ carbons respectively. MASS spectra shows molecular ion peak which is corresponds to the molecular weight of respective compounds. Spectral studies of all compounds shows that compounds were stable and do not exhibit any tautomerism.

The overall DPPH radical scavenging activity of examined 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives (4a-7d) were in a range of 09.08-37.89 % as compared to the standard ascorbic acid (90.15%). The highest DPPH radical scavenging activity was exhibited by **6a** whereas **5c** demonstrate lowest activity. From the result of present work, it can be concluded that 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives are essential to boost the antioxidant activity.



Scheme-2. Formation of 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives (4a-7d)

Antioxidant activity:

DPPH radical scavenging assay :

The DPPH radical scavenging assay has been used for preliminary screening of the sample for antioxidant activity. The proton radical scavenging action is known as an important mechanism of antioxidants. The odd electron in DPPH radical gives a strong absorption maximum at 517 nm and is purple in colour. The colour turns from purple to yellow when the odd electron of DPPH radical becomes paired with hydrogen from free radicals scavenging antioxidants to form reduced DPPH:H. 1ml (1 mM) of test sample was added in to equal quantity of 0.1 mM solution of DPPH in ethanol. After 10 minutes of incubation at room temperature, the DPPH reduction was measured by reading the absorbance at 517 nm. Ascorbic acid was taken as standard reference. The result of DPPH reduction is summarized in table-2.

Table 2. Antioxidant activity of selected compounds.

Sr. No.	Compounds	Antioxidant activity
		DPPH radical scavenging activity (%)
1	4a	12.82±0.62
2	4b	31.78±0.47
3	5b	15.26±0.03
4	5c	09.08±0.88
5	5d	14.25±0.52
6	6a	37.89±0.93
7	6c	26.84±0.08
8	6d	12.59±0.76
9	7a	23.60±0.18
10	7d	36.32±0.55
6	Ascorbic acid	90.15±0.53

Conclusion

In summary with the aim of have a good contribution to design new heterocyclic compounds, we have developed new proficient multicomponent methodology for the synthesis of novel fused heterocles such as 6-

methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitriles with excellent product yield. The major advantage of this protocol is higher purity of derivatives, operational simplicity and short reaction time.

Acknowledgement

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Development of biobased acids cross linking of tamarind seed polysaccharide films and their coating

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Abstract

In the present study, Tamarind seed polysaccharide (TSP) was obtained by water-based extraction. For characterization of the extracted tamarind seed polysaccharide phytochemical screening was done and micromeritic properties were determined. It was also found that extracted tamarind seed polysaccharide had good flow properties and pH was 6.4, this showed that it can be used in dosage form without any irritation.

Further these tamarind seed polysaccharides modified by reacting with biobased acids such as citric acid and lactic acid and cast a film which can be further used as in packing. It has been used for coatings on various fruits and their effect has been studied and weight loss test.

Introduction

Edible polymers are the polymeric materials which can be easily consumed by human as well as animals without any harm on the health. Edible polymers have appeared as a substitute to synthetic plastic for food applications and have received significant attention in recent years because of their advantages over synthetic polymers. The main advantage of edible polymers over traditional synthetics is that they can be consumed along with the products. Edible polymer coatings can provide replacement and/or fortification of natural layers to prevent moisture losses, while selectively allowing controlled exchange of important gases, such as oxygen, carbon dioxide, and ethylene, which are involved in respiration processes.

Materials and Methods

All laboratory grade chemicals/reagents were acquired either from SD Fine Chemicals and Spectrochem, India and used as such with no further purification. The tamarind was obtained from Local market, Akola, Maharashtra and used as received.

Extraction procedure

Tamarind seeds were purchased from the seeds shop situated in the old Delhi, India. Seeds were boiled and mucilage was taken out to extract xyloglucan. Mucilage was dried, powdered and further passed from sieve # 20 and stored in air tight container until used.

Extraction of tamarind polysaccharide includes two steps:

Step 1: Extraction of tamarind polysaccharide

Xyloglucan extracted by tamarind seeds were done as follows:

Crude tamarind seeds were washed neat and clean then kept for 3 hrs boiling. After completion of boiling, boiled seeds were kept for cooling for 24 hrs so that mucilage is being expelled out from the seeds. Completing 24 hrs of expulsion of mucilage from seeds, heat them for few minutes then set for cooling. Pour seeds with mucilage in the muslin cloth and press till all the mucilage is squeezed from the seeds. Temperature of extraction media was maintained at 70C and duration of extraction was adjusted about 6 hrs [1].

Step 2: Isolation of tamarind seed polysaccharide

In hot water boiled tamarind seeds were kept for 24 hrs so that the mucilage can come out from the seeds. After 24 hrs, boiled the seeds containing xyloglucan for 1 hr. Water extracted juice were squeezed with muslin cloth bag and the concentrated juice was cooled to 4C. Tamarind seed polysaccharide xyloglucan was precipitated by alcohol- juice treatment 2:1(v/v) followed by continuous stirring for 15 min and mixture was further allowed to stand for 2 hrs for better tamarind seed polysaccharide precipitation. This allows filtering of polysaccharide substances because tamarind seed polysaccharide remains float on the surface of alcohol-water mixture. Floating tamarind polysaccharide coagulate was filtered through muslin cloth, washed with alcohol (95%) and squeezed. Squeezed tamarind seed polysaccharide was further dried to constant weight at 35-45°C in hot air oven. Hard tamarind seed polysaccharide cake was ground and sieved through sieve # 20, stored in desiccators for further use [1].

Physicochemical characterization of Xyloglucan consisted in Tamarind Seed Polysaccharide Identification tests for carbohydrates

Extracted mucilage was mixed with Molish's reagent followed by addition of sulfuric acid [4, 5].

Determination of Purity of Xyloglucan in Tamarind Seed Polysaccharide

For determination of purity of extracted xyloglucan test for alkaloids, proteins, gum. Fats tannins and amino acids were performed [1, 2].

Solubility behavior

One part of dry tamarind seed polysaccharide powder was shaken with different solvents and their solubility was determined. Solubility of tamarind seed polysaccharide was determined in basic solvents i.e Acetone, Chloroform, Hexane, Butanol and Water. It has been observed that polysaccharide is soluble in every solvent [1,2,].

pH of Xyloglucan in Tamarind Seed Polysaccharide:

Firstly, extracted Xyloglucan was weighed and then dissolved in water separately to get a 1% w/v solution. The pH of solution was determined using pH meter [1, 2].

FT-IR Study

The FTIR spectral analysis of tamarind seed polysaccharide and cross-linked biopolymers was carried out by KBR pellet technique using FTIR spectrophotometer and the FTIR spectral analysis was scanned between 500 to 4000 cm-1.

Cross-linking of Xyloglucan with Citric acid/ Lactic acid

The preparation of thin film proposed by Reddy et al. was performed with slight modification. The extracted polysaccharide was diluted with distilled water at 25 °C for 10-15 min. Citric acid/ Lactic acid (30% w/w polysaccharide) as a cross linking agent and glycerol (10 % v/w) as a plasticizer were added into the polysaccharide solution for preparing the film. The whole solution was stirred vigorously using a mechanical stirrer (speed 500 rpm) at 85-90 °C for 2-3 hrs. The viscous reaction mixture thus obtained was used for preparation of thin film and coating on fruits and vegetables. Film forming solution was poured immediately on a hot plate and cast film was cured at room temperature for 48-50 hrs [3].

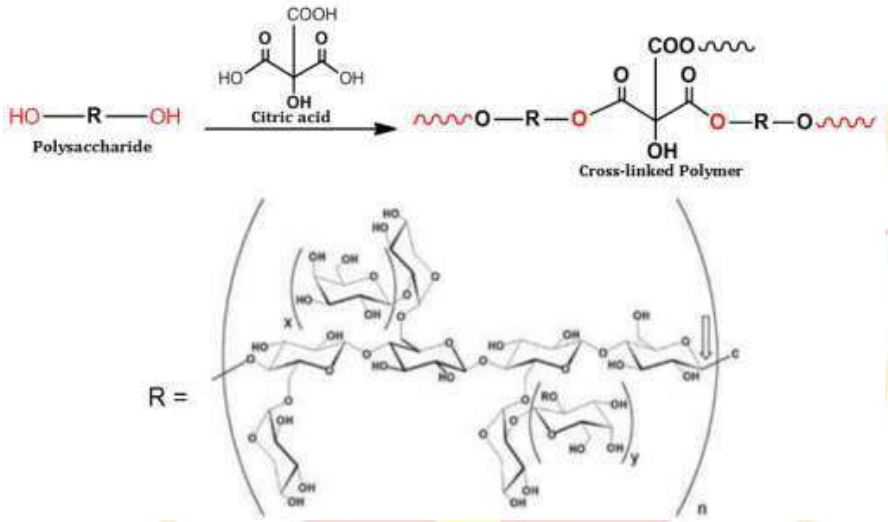


Figure 3.1: Synthesis scheme of cross-linked polymers (TSP-CA/TSP-LA)

Result and Discussion

Determination of purity of isolated tamarind seed polysaccharide

It has been observed that isolated tamarind seed polysaccharide was pinkish brown in color. It consist no odor and taste along with irregular shape as well as hard and rough in sensation and texture. The pH of 1% solution of TSP was found 6.4, which indicated that it should be non-irritating for mucus membrane. Solubility study showed that it was sparingly soluble in cold water, freely soluble and form viscous colloidal solution in warm water [1].

The isolated sample of TSP was subjected to identification. The violet color ring appeared at junction of mixture in test tube that confirms the presence of carbohydrates in sample powder. Confirmation test was also carried out for tamarind seed polysaccharide which gave positive test for mucilage, gums whereas negative for tannins, alkaloids and proteins. Other phyto-constituents were absent in the isolated powder [2]. This can be considered as proof for purity of the isolated tamarind seed polysaccharide as depicted in Table 3.1.

Polysaccharide is use for making edible plastic by using glycerol and CA as a plasticizer and crosslinker. This work investigated and developed the physical and chemical properties of polysaccharide based edible plastics and attempted to determine if they could be alternative to petrochemical plastics in the near future.

Multi-carboxyl structure of CA could induce interaction between CA and polysaccharide which will improve the barrier properties, moisture absorption, solubility of films etc. Modifiers have been used to

plasticized polysaccharide such as glycerol. Plasticizers have hydroxyl groups allowing compatibility with starch granules and they plasticized polysaccharide by breaking the internal hydrogen bonding between the glucose rings in starch. An effective plasticizer needs to be polar, hydrophilic and small enough to fit between the starch chains. Additionally, the boiling point of the plasticizer should be higher than manufacturing conditions so that it does not evaporate.

Table 3.1: Determination of purity of isolated tamarind seed polysaccharide

Test	Present/Absent
Carbohydrates	+
Hexose Sugar	+
Monosaccharides	-
Proteins	-
Fats and oils	-
Alkaloides	-
Amino acids	-
Mucilage	-
Gums	-

+ Present and - Absent

Percentage Yield of Tamarind Seed Polysaccharide

The % yield of the polysaccharide was found to be 70.0% for tamarind. During the processing of tamarind xyloglucan isolation washing is required many times which may result in loss of dissolved polysaccharides. However extraction processes tamarind is easy and hence gives better yield.

Solubility of Tamarind Seed Polysaccharide in various solvents

The solubility was checked in common solvents depending on their polarity such as water, phosphate buffers pH6.8, 0.1N HCl, acetone, ethanol, methanol etc. The polysaccharide was found to be soluble inorganic solvents and is also soluble in the aqueous solvents and swells to make a viscous solution. Hence the polysaccharides are hydrophilic in nature.

Rheological Behaviour of Tamarind Seed Polysaccharide

The viscosities of the different concentration (0.5%, 0.75% and 1%, w/v) of TSP solutions were determined by Brookfield viscometer at different shear. All the solutions showed sufficient viscosity at different shear rate and shows pseudoplastic flow. This was observed that viscosity decreases correspondingly with increasing shear. TSP shows consistent change behavior upon application of pressure

Fourier transforms infrared spectroscopy (FT-IR)

The FT-IR spectroscopy is simple but influential technique to study the curing of cross-linking. The FT-IR spectrum of tamarind seed polysaccharide (TSP), cross linked biopolymers TSP-CA and TSP-LA with citric acid and lactic acid respectively are shown in Figure 3.1.

In the FT-IR spectrum of TSP (Figure 3.1a), the vibration band at 3303.06 cm-1 is represented for the OH stretching. Two highly pronounced bands observed at vibrations 2924.09 cm-1 and 2862.36 cm-1 are result of -CH2 asymmetric and symmetric stretching vibrations respectively. A band observed at vibration 1375.25 cm-1 and corresponds to - CH2 bending vibration. The vibration at 1238.30 cm-1 and 1150 cm-1 is corresponds to - OH plane bending and glycosidic C-O-C stretching respectively. While the other vibration bands such as 945.12 cm-1, 898.83 cm-1 is corresponding to -CH bending.

The FT-IR spectrum of TSP cross linked with citric acid film (TSP-CA) is shown in Figure 3.1b. In FT-IR spectrum, the broad band at 3277.06 cm-1 is assigned for -OH stretching. The main peak of interest occurs at 1712.79 cm-1 and is associated with carboxyl and ester carbonyl bands [3]. The presence of the carbonyl peak confirms the crosslinking reaction between citric acid and polysaccharide. Two highly pronounced bands observed at vibrations 2983.88 cm-1 and 2889.37 cm-1 are result of -CH2 asymmetric and symmetric stretching vibrations respectively. A band observed at vibration 1352.10 cm-1 and corresponds to -CH2 bending vibration.

The vibration at 1276.88 cm-1 and 1143.79 cm-1 is corresponds to -OH plane bending and glycosidic C-O- C stretching respectively. While the other vibration bands such as 945.12 cm-1, 898.83 cm-1 is corresponding to -CH bending.

The FT-IR spectrum of TSP cross linked with lactic acid film (TSP-LA) is shown in Figure 3.1c. In FT-IR spectrum, the broad band at 3296.35 cm-1 is assigned for -OH stretching. The main peak of interest occurs at 1728.22 cm-1 and is associated with carboxyl and ester) carbonyl bands [3]. The presence of the carbonyl band confirms the crosslinking reaction between lactic acid and polysaccharide. A band observed at vibration 1375.25 cm-1 and corresponds to -CH2 bending vibration. The vibration at 1230.58 cm-1 and 1141.86 cm-1 is corresponds to -OH plane bending and glycosidic C-O- C stretching respectively. All other vibrational bands are in their respective region as similar to the TSP and TSP-CA spectrum.

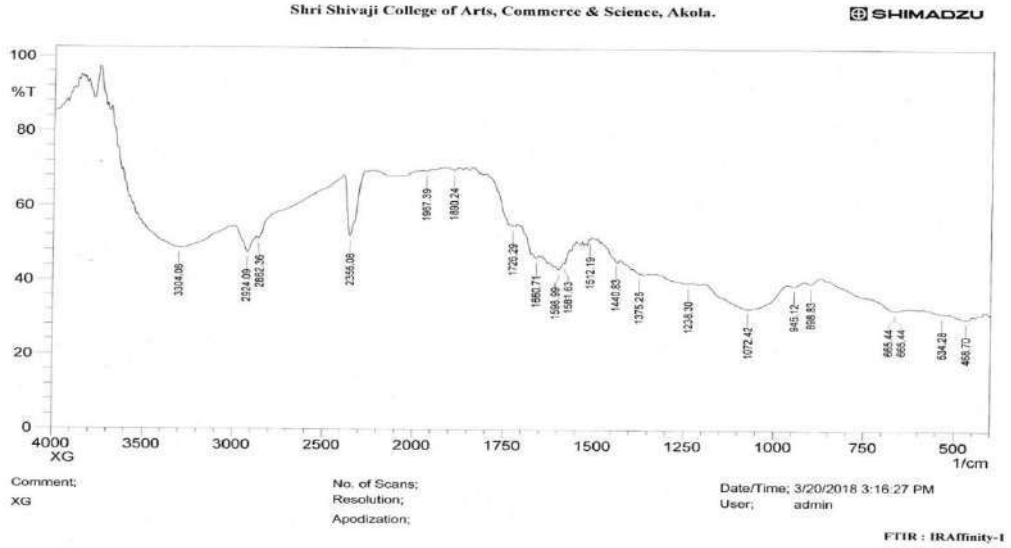


Figure 3.1: a) FTIR Spectrum of Tamarind seed Polysaccharide (Xyloglucon)

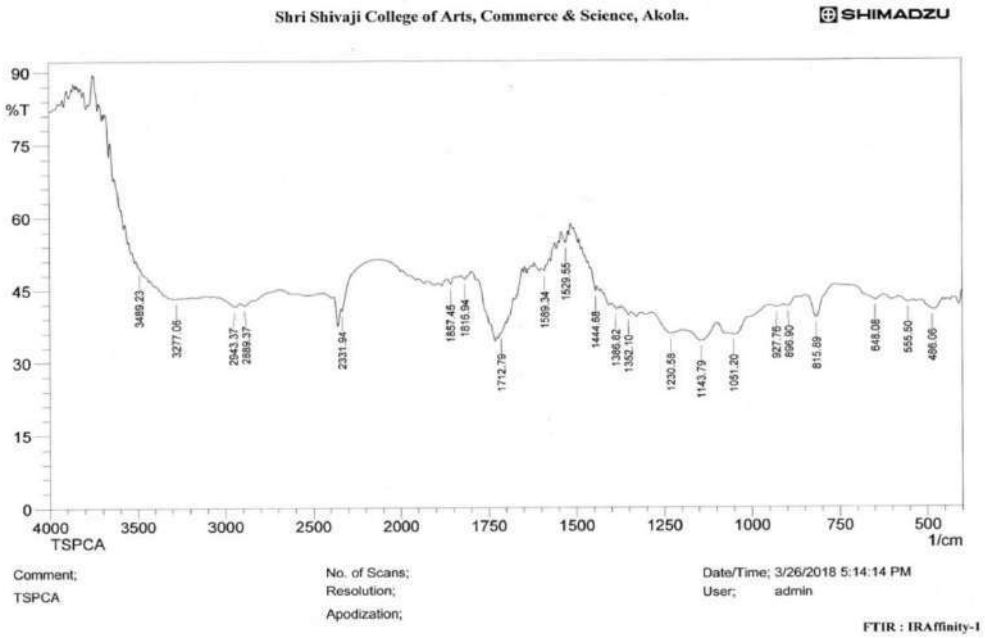


Figure 3.1: b) FTIR spectrum of Tamarind Seed Polysaccharide with Citric acid (TSP-CA)

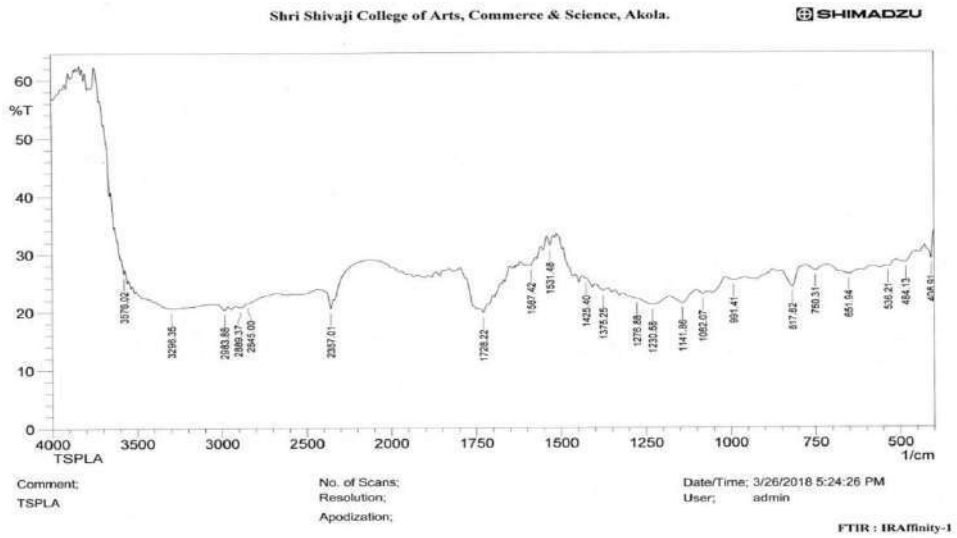


Figure 3.1: c) FTIR spectrum of Tamarind Seed Polysaccharide with Lactic acid (TSP-LA)

Chemical resistivity of cross-linked biopolymers TSP-CA and TSP-LA

The resistances to chemical factor test of TSP-CA and TSP-SA were studied using thin film in range of different protic as well as aprotic solvents such as NaOH, H2SO4, xylene, castor oil, dimethyl sulphoxide etc., The pieces of thin films were placed in different solvent for 5 days in a closed jar and the result were monitored at an interval of 24 h, by observing the change in their weights. The data has been tabulated in Table 3.2.

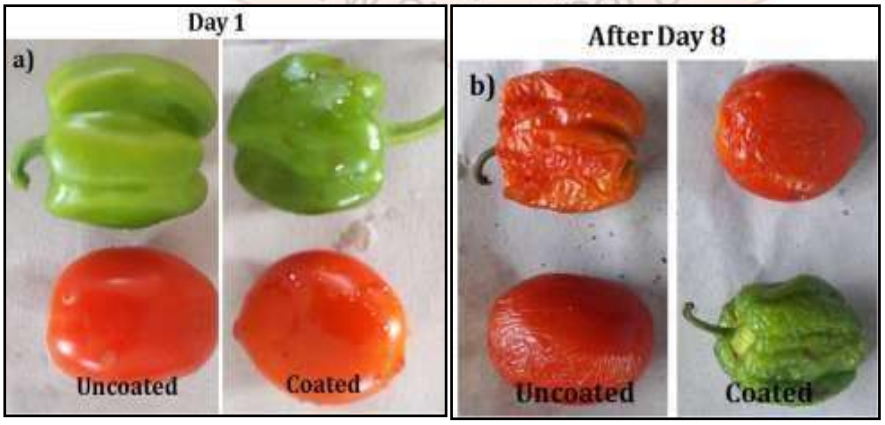
It was found that thin film is solubilized in both H2SO4 and NaOH solution as well as in DMSO and xylene solvent. However, it is resistance in all other solvents such as ethyl methyl ketone, acetone and chloroform etc.

Table 3.2: Determination of Chemical resistivity against different solvents

Solvents	TSP-CA	TSP-LA
Acetone	-	-
Ethyl methyl ketone	-	-
1 M NaOH	+	+
1 M H2SO4	+	+
Xylene	+	+
Castor oil	#	#
Chloroform	-	-
DMSO	+	+
Distilled water	#	#

Note: '+' is Soluble, '-' is Insoluble and '#' is Swelling.

Weight loss study of TSP-CA coating on fruits



The coating of TSP-citric acid crossed linked polymer on fruits and vegetables is shown in Figure 3.2. Coating is carried out to check the shelf life of fruits and vegetable by weight loss method. The weight loss and self life of data of coated fruits and vegetable are as shown in Figure 3.3. The data of weight loss study showed that weight loss is lower and shelf life is higher in case of coated capsicum and tomato compared to the uncoated. A result indicates that shelf life of fruits and vegetables increases by coating.

Figure 3.2: a) Uncoated and coated with TSP-CA cross-linked polymer and b) Uncoated and coated with TSP-CA cross-linked polymers after 6 days.

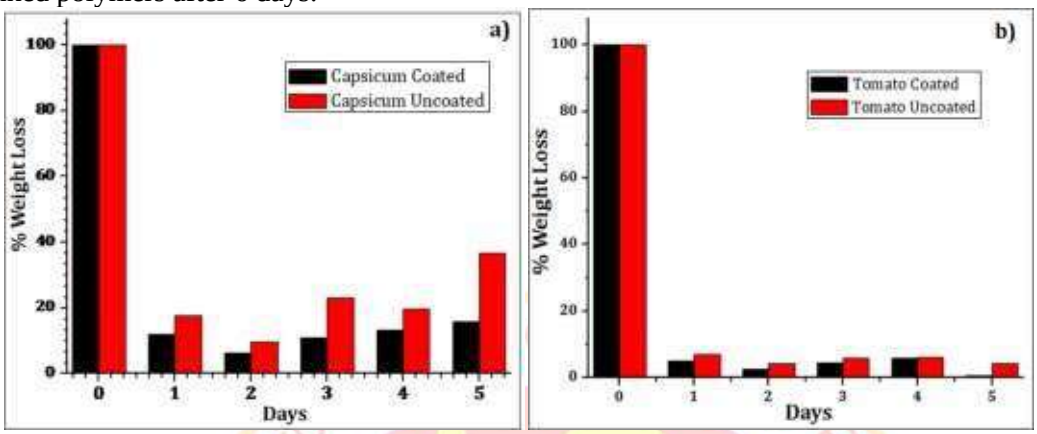


Figure 3.3: a) Comparative % weight moisture loss of Capsicum coated and uncoated and b) Comparative % weight moisture loss of Tomato coated and uncoated against 5 days.

Summary and Conclusion

The increasing interest in biodegradable and edible materials is being developed to solve the disposal of petroleum based conventional synthetic plastic materials. Petroleum based plastics requires lot of time for their degradation and most of them end up overwhelming the environment. In terms of end-use applications, packaging remains one of the major uses of plastics in the world.

Food packaging has become a centre of focus for waste reduction efforts, because in food packaging, a variety of petroleum-derived plastic materials are used at large scale due to their availability in large quantities at low cost and favorable functional characteristics. The use of edible films and coatings is constantly increasing in the food industry. Coatings can help to meet the many challenges involved in the storage and marketing of foods that are nutritious, safe and of high quality, stable and economic. The polysaccharide was isolated and characterized in terms of various physicochemical parameters of powder. From these characterized parameters it was observed that they possess substantial viscosity and very good mucoadhesive property. The mucoadhesive character of TSP may be due to resemblance with mucin structure. The other properties like pH, solubility etc. also found to be satisfactory. The observations showed that TSP exhibited good compatibility, cohesiveness and would be able to produce better flow properties in its granular form. It may be concluded that these polysaccharides can be chosen for the development of cross-linked edible polymeric materials. The tamarind seed polysaccharide was successfully utilized for modification by reacting with biobased acids such as citric acid and lactic acid. The developed cross- linked films are being resistant to most organic solvents whereas susceptible to acid alkali solution respectively. The weight loss study i.e., the coating on fruits and vegetable concluded that there is increase the shelf life of coated fruits compared to uncoated. The cast film can be further used as food packaging materials for future applications.

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Trace Elements Analysis in Ground Water Used for Drinking Purposes

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Abstract:

In this paper, assessment of trace metals in ground water used for drinking purposes in Nagpur city, Maharashtra, was carried out. Samples were collected from 10 Water Bodies supplying drinking water to the inhabitants in the region. All samples were analyzed for 10 trace and macro elements (Al, Pb, Cr, Ni, Cu, As, Cd, Zn, Fe, and Co) and using Inductively Coupled Plasma (ICP) spectrophotometer equipped with an ultrasonic nebulizer. Results recommended that an adequate and suitable treatment must be applied to the water bodies having elevated concentrations of the metals and supplying drinking water to the consumers.

Metal contamination issues are becoming increasingly common, with many documented cases of metal toxicity. Metals are a natural part of our ecosystem occurring in soil, rock, air, water and organisms. A few metals, including Cu, Mn, Zn, Co and Fe are however essential for metabolism in humans & plants in trace amounts. It is only when metals are present in bio- available forms at excessive levels that they have the potential to become toxic. Chronic poisoning occurs due to heavy metal content in the drinking water. Estimation should be made to differentiate between the possible cause and source of such poisoning case.

Keywords: Metal contamination, Drinking water Toxicity, Trace metals in ground water bodies

Introduction:

Providing quality drinking water to all citizens who are deprived of access to water will serve as the breaking point of poverty alleviation in most developing cities. Water supply systems and drinking water inaccessibility in developing countries is a global concern that calls for immediate action. About 884 mil-lion people in the world still do not get their drinking water from approved sources, and almost all of these people are in developing regions [1].

Water related diseases can often be attributed to exposure to elevated heavy metal concentrations of both organic and inorganic contaminants. Many of these compounds exist naturally, but their concentration has increased as a result of anthropogenic activities [2].

Living organisms require trace amounts of some metals including cobalt, copper, iron, manganese, molybdenum, vanadium, strontium and zinc. Excessive levels of these essential metals are detrimental to the organisms [3]. Non- essential metals like cadmium, chromium, mercury, lead, arsenic and antimony are of more concern to surface water system because these metals produce undesirable effects on human and animal life. Once these metals enter in a system, they remain for relatively longer periods [4]. Once absorbed, inorganic metals are capable of reacting with a variety of binding sites in the human body and have strong attraction to biological tissues. Natural water contains toxic metals in traces. All metals exist in surface water in colloidal, particulate and dissolved forms, although dissolved concentrations are generally low [5].

The magnitude of danger of environmental pollution by heavy metals was probably for first time realized with the Minimata disaster in Japan, where thousands of peoples suffered with mercury poisoning after consuming the fish caught in Minimata Bay. The bay got contaminated with mercury released from vinyl chloride plant between 1953 and 1960[6]. Similarly, it was also reported in Japan in 1955 that cadmium caused itai-itai Byo' disease in human beings, mainly in women over forty [7].

Heavy metals are important environmental pollutants and their toxicity is a problem of increasing significance for ecological, evolutionary, and environmental reasons. Heavy metals have played great roles in genesis of present-day civilization. In ancient times, the wealth of Emperors and Kings was attributed to the possession of metals like iron, gold, silver copper etc. in different forms. Still today, the dependence of heavy metals has not decreased as these are very commonly used in agriculture, medicine, engineering etc.

This was due to high level of cadmium in local foodstuffs attributable to irrigation water from soil heaps of an abandoned mine. Minimata raised its ugly head once again, not in Japan this time, but in fishing communities of Amazon rain forest. Heavy metal pollution has been worked out in recent days. Thus, in view of this widely used practice; it was of interest to undertake further investigation on these lines. The purpose of study is to promoting and coordinating activities in the field of environmental chemistry as well as health related water organizations.

Materials And Methods:

Collection of Samples: Assessment of trace metals in water supplied for drinking purposes in Nagpur city, Maharashtra, was carried out. Samples were collected from 10 Water Bodies supplying drinking water to the inhabitants in the region. Water samples were collected in one- liter plastic bottles, which were previously thoroughly washed with tap water and rinsed with distilled water. These were immediately acidified to pH 2 with HNO3 in order to keep metals in solution and prevent them from adhering to the walls of the bottles. All samples were transported to the laboratory in iceboxes and refrigerated at 4°C until analyzed. Sampling protocol was designed in such a way that samples collected in one sampling schedule were analyzed in the shortest possible time.

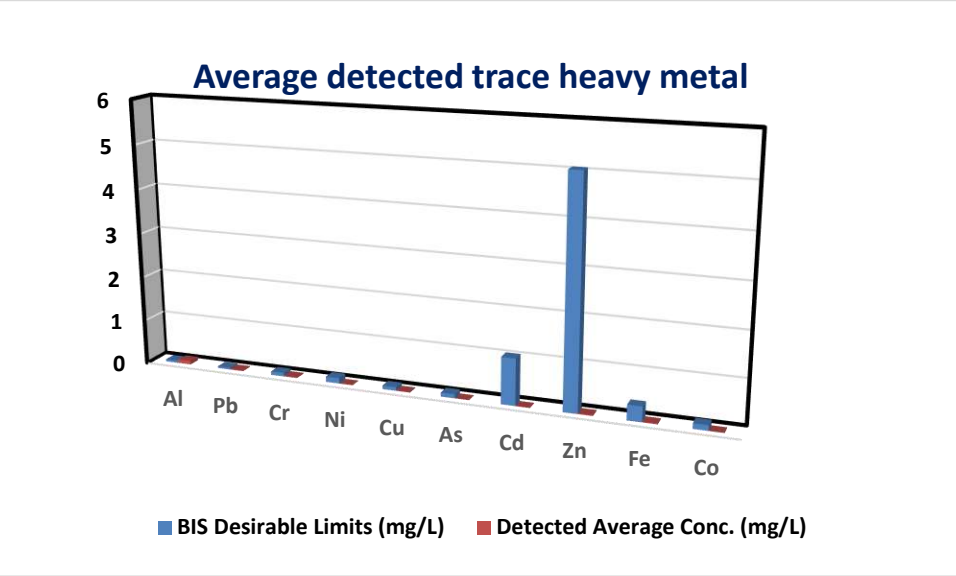
Sample Analysis: All samples were analyzed for 10 trace and macro elements using Inductively Coupled Plasma (ICP) spectrophotometer equipped with an ultrasonic nebulizer. Samples were analyzed for trace metals (Al, Pb, Cr, Ni, Cu, As, Cd, Zn, Fe, and Co) using a Perkin Elmer model 1000 Inductively Coupled Plasma. (ICP) spectrophotometer equipped with an ultrasonic nebulizer model Cetec-U 5000 AT. The use of the ultrasonic nebulizer instead of a pneumatic nebulizer provided a 5-to-50-fold improvement in detection limits and a 10-fold enhancement resulting in better reproducibility on trace metal level determinations. Analysis was carried out in duplicate and average values are reported. The ICP was calibrated with relevant Perkin Elmer Pe-Pure spectroscopy grade standards.

Results And Discussion:

The average detected trace heavy metal concentrations in the drinking water samples obtained from different parts of the Nagpur region has been presented in Table 1 and Fig-1.

Sr. No.	Trace Elements	BIS Desirable Limits (mg/L)	Detected Average Conc. (mg/L)
1.	**Al**	0.05	**0.008**
2.	**Pb**	0.04	**0.017**
3.	**Cr**	0.08	**0.018**
4.	**Ni**	0.12	**ND**
5.	**Cu**	0.08	**0.008**
6.	**As**	0.09	**ND**
7.	**Cd**	1.04	**0.001**
8.	**Zn**	5.06	**0.018**
9.	**Fe**	0.34	**0.014**
10	**Co**	0.12	**0.001**

Table 1



Aluminium (Al) - Soluble, colloidal, and insoluble aluminium may be present in treated water in residual form of coagulation with aluminium-containing material. BIS desirable limit is 0.05 mg/L Average Aluminum concentration in the analyzed drinking water samples was found to be 0.08mg/L.

Lead (Pb) - Tap water that are inherently not corrosive or not suitably treated may contain lead resulting from an attack on lead service pipes, lead interior plumbing, brass fixtures and fittings on solder pipe joints chiefly from galena (PbS). The BIS desirable limit is 0.04 mg/L Average Lead concentration in the analyzed drinking water samples was found to be 0.017mg/L.

Chromium (Cr) - Chromium may exist in water supplies in both the hexavalent and the trivalent state although the trivalent form rarely occurs in potable water. BIS desirable limit is 0.8 mg/L. Average Chromium concentration in the analyzed drinking water samples was found to be 0.018mg/L.

Nickel (Ni) - The average abundance of Ni in the earth's crust is 1.2 ppm; in soils it is 2.5 ppm; in streams it is 1 µg/L, and in groundwater it is <0.1 mg/L. BIS desirable limit is 0.12 mg/L. Arsenic was not detected in the analyzed drinking water samples. Nickel is a well-known human carcinogen and it affects the activity of α-tocopherol, the most common antioxidant in human body.

Copper (Cu) - Corrosion of copper-containing alloys in pipe fitting may introduce measurable amounts of copper into the water in a pipe system. BIS limit for copper is 0.08 mg/L. Average copper concentration in the analyzed drinking water samples was found to be 0.008mg/L.

Arsenic (As) - For the protection of aquatic life, the average concentration of As3+ in water should not exceed 72µg/L. And maximum should not exceed 140 µg/ L. BIS desirable limit is 0.09 mg/L. Arsenic was not detected in the analyzed drinking water samples.

Cadmium (Cd) - A cadmium concentration of 200µg/L is toxic to certain fishes. Cadmium may enter water as a result of industrial discharges or the deterioration of galvanized pipe. BIS desirable limit is 1.04 mg/L. Average cadmium concentration in the analyzed drinking water samples was found to be 0.001mg/L.

Zinc (Zn) - Zinc most commonly enters the domestic water supply from deterioration of galvanized iron and dezincification of brass. Zinc in water also may result from industrial waste
pollution. BIS desirable limit is 5.06 mg/L. Average Zinc concentration in the analyzed drinking water samples was found to be 0.018mg/L.

Iron (Fe) - Elevated iron levels in water can cause stains in plumbing, laundry and cooking utensils and can impart objectionable taste and colour to foods. The BIS standard desirable limit is 0.34 mg/L. Average Iron concentration in the analyzed drinking water samples was found to be 0.014mg/L.

Cobalt (Co)- The samples analyzed showed Co concentration in raw and treated water to be 0.06 and 0.02 ppm. BIS desirable limit is 0.09 mg/L, average Cobalt concentration in the analyzed drinking water samples was found to be 0.001mg/L. Cobalt is an integral part of vitamin B and essential for the production of

red blood cells. Its deficiency is thought to cause megaloblastic anemia called pernicious anemia. Salts of cobalt such as acetate, chloride, and sulphates are highly toxic to human beings.

Overview: In brief, Al exceeded the maximum desirable limits in the drinking water of Nagpur region. The detected average concentrations of Al, Pb, Cr, Ni, Cu, As, Cd, Zn, Fe, and Co did not exceed the maximum desirable limits in any of the drinking water samples in the Nagpur region.

Conclusions And Recommendations:

- Water samples were collected from 10 drinking water sources covering Nagpur.
- The minimum and maximum trace metals concentrations in different areas for Al, Pb, Cr, Ni, Cu, As, Cd, Zn, Fe, and Co ranged between ND-008, ND-0.017, ND- 0.018, ND, ND- 0.008, ND, ND-0.001, ND- 0.018, ND- 0.014 and ND-0.001 mg/L respectively.
- It is recommended to adopt some kind of inexpensive treatment to reduce the levels of trace metal Al in areas supplying water directly to consumers without any type of treatment.
- Further study in this area is required to access the quantity of trace heavy metals in various water bodies supplying drinking water, groundwater bodies as well as other natural water bodies.

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Study And Phytochemical Analysis Of Fenugreek (*Trigonella Foenumgraecum*)

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Abstract-

Fenugreek (*Trigonella foenumgraecum*) is an annual plant belongs to the family Leguminosae. It belongs to the class Magnoliopsida and order Fabales. It is the famous spices in human food. Fenugreek is a legume and it has been used as a spice throughout the world to enhance the sensory quality of foods. It is known for its medicinal qualities such as antidiabetic, anticarcinogenic, hypocholesterolemic, antioxidant, and immunological activities. Beside its medicinal value, it is also used as a part of various food product developments as food stabilizer, adhesive, and emulsifying agent. More importantly it is used for the development of healthy and nutritious extruded and bakery product. The present paper reviews about Phytochemical analysis of Fenugreek.

Keywords- Fenugreek, Seeds & Leaves, Phytochemical screening.

Introduction

Plants possess medicinal and drug activities. Current study on plants primarily focuses on its medicinal uses[1]. Plant can be extracted and used for chronic and infectious diseases[2].

The active drugs which play role are secondary metabolites. The antimicrobial activities of plant extract which produces different components including aldehyde and phenolic compounds[3]. Fenugreek, one of the earliest spices known to man belongs to the bean family trigonella foenumgraecum. It blooms white flowers in the summer and has very aromatic seeds. The herb can grow to be about two feet tall. Small and oblong shaped yellowish brown seeds of the fenugreek plant have a warm and slightly bitter taste. It is rich in vitamins and minerals and is high in protein. It has a long history as both a culinary and medicinal herb in the ancient world. Fenugreek leaves, which are high in iron, are used as a leaf vegetable in curries. The seeds and green leaves of fenugreek are used in food as well as in medicinal application that is the old practice of human history. It has been used to increase the flavoring and color, and also modifies the texture of food materials. Fenugreek (*Trigonella foenum-graecum*) being rich in phytochemicals has traditionally been used as a food, forage and medicinal plant[4]. Seeds of fenugreek spice have medicinal properties such as hypocholesterolemic, lactation aid, antibacterial, gastric stimulant, for anorexia, antidiabetic agent, galactogogue, hepatoprotective effect and anticancer. Fenugreek is a widely used herbal medicine for diabetes[5,6,7].

Phytochemistry

Fenugreek is well known for its fiber, gum, other chemical constituents and volatile contents.

These days it is used as food stabilizer, adhesive and emulsifying agent due to its high fiber, protein and gum content. The protein of fenugreek is found to be more soluble at alkaline pH Fenugreek is having beneficial influence on digestion and also has the ability to modify the food.

Leaves- The leaves contain seven saponins, known as graecunins. These compounds are glycosides of diosgenin. Leaves contain protein, fat, minerals, fiber, and carbohydrates which has therapeutic effects.[8] The mineral and vitamins present in leaves include calcium, zinc iron,phosphorous, riboflavin, carotene, thiamine, niacin and vitamin C.

Seed- Fenugreek is known for its pleasantly bitter, slightly sweet seeds. The seeds are available in any form whether whole or ground form is used to flavor many foods mostly curry powders, teas and spice blend.

List of chemical constituents is shown in table 1. The chemical composition of fenugreek showed that endosperm had the highest saponin and protein content. As against this, husk contains higher total polyphenols[9]. Seeds also contain the saponin (fenugrin B)[9]. Fenugreek seeds have been found to contain several coumarin compounds as well as a number of alkaloids (e.g., trigonelline, gentianine, carpaine). The major bioactive compounds in fenugreek seeds are believed to be polyphenol compounds, such as rhaponticin and isovitexin.

Methodology

Phytochemical test are performed. Extract is prepared then test for carbohydrate, protein amino acids, alkaloids, tannins, flavonoids, saponin, polyphenols are performed.

Materials and Methods

The fresh leaves of Fenugreek were collected. Collected fresh leaves were washed and used for the study of microscopic characteristics. The dried leaves and seeds of the plant were powdered and stored in an airtight container for further use.

Extraction and Isolation-

Near about 500gm leaves of Fenugreek dried and pulverized to powder using pestle and mortar in the laboratory. The plant material was macerated with hexane/methanol at room temperature and the extract store in refrigerator until the need of further study.

Phytochemical screening–

The chemical tests were performed for testing different chemical groups present in n-hexane and methanolic extract of leaves & Seeds of test plants Fenugreek.

Table 1: Qualitative Analysis of Phytochemicals

Sr.No	Test	Observation
1	**Test of Alkaloids**	
	1.0ml of plant extract was taken and then adds 1.0 ml of saturated solution of picric acid was added.	Yellow colour appears
2	**Test of Steroid**	
	About 0.5 g of the extract with few drops of acetic acid anhydride boil and cool .Then conc. H2SO4 was added from the side of the test tube.	Brown ring is formed at the junction two layers and upper layer turns green
3	**Test of Saponins**	
	0.5g of extract was added in 5ml of distilled water in a test tube. The solution was shaken vigorously. The frothing was mixed with 3 drops of olive oil and shaken vigorously.	Stable persistent froth appears. Formation of an emulsion
4	**Test for Flavonoids**	
	5 ml of dil. Ammonia solution were added to a portion of the crude extract followed by addition of conc. H2SO4.	Yellow coloration occurs.
5	**Test of Tannins**	
	About 0.5 g of the extract was boiled in 10 ml of water in a test tube and then filtered. A few drops of 0.1 fecl3 was added	Brownish green or blue- black coloration.
6	**Test for Polyphenol**	
	2 ml of extract was taken and add 2 ml of Folin's reagent.	Appearance of violet or Brown colour.
7	**Test for Amino Acid**	
	2 ml of extract was taken and boiled with 0.5 mL of a 0.1% solution of ninhydrin	Appearance of blue colour.
8	**Test of glycosides**	
	1 ml glacial acetic acid few drop of ferric chloride solution and conc. Sulphuric acid added	Appearance of reddish brown colour at the junction of liquid presence of deoxy sugar.

Conclusion

The preliminary phytochemical screening of Trigonella foenum gracum gives good results in the presence of flavonoids, alkaloids, phenolic compounds, tannins, saponins, carbohydrates and proteins. These phytochemical showed that Trigonella foenum gracum (fenugreek) seeds have good medicinal and therapeutic compounds. By observing the recent research studies it can also be used to reduce the level of glucose levels and can be used as one of the best anti-diabetic component.

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Overview of Recent Advances in Solar Cell Technologies

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Abstract

Earth will be facing the problem of energy crisis in near future. Use of renewable energy sources is the only way to tackle it efficiently. Solar energy is the important aspect of it. This paper reviews the different types of solar cells. Further, with different types of materials' utilization, study is done that how the performance of solar cells is enhanced. This paper consists of comparison between efficiencies of different types of solar cells with different materials. The future technologies in the solar cell technologies are studied briefly. The performance attained by the new technologies is also studied.

Keywords: Solar Cell, Solar Photovoltaics

Introduction

The sunlight which we get from the Sun is directly available to us as a renewable source of energy and it is non-vanishing also in nature. The energy derived from sunlight is also free from the pollutants of environment and noise. It can be easily used to compensate the energy which we draw from other sources like non-renewable sources of energy viz. fossil fuels, petroleum products and deposits found under the earth. To fabricate solar cells with high efficiency it has been put under large number of improvement stages from a long time. Earlier solar cells were developed by fabricating them on a single crystal of Si wafer. Those were regarded as the first generation solar cells. After that due to the development of thin films, organic materials as substitute to silicon, and dye sensitized solar cells the efficiency of conventional solar cells has been increased. The development and progress in the field of solar cell fabrication is generally hindered due to cost and efficiency factors.

The sun provides us daily with a tremendous and huge amount of energy which is in the form of heat and also the radiations known as solar energy. The energy received from the sun is available free of cost and is limitless in nature. It also has numerous advantages as solar energy can be easily harvested and used over other available conventional sources of power generator. The solar energy can be used by harvesting the sunlight in the form of solar energy by using the photovoltaic device called solar cell. The sun is basically a huge mass of gases made up of helium and hydrogen atoms. The hydrogen nuclei combine by emission of huge amount of energy by process called nuclear fusion. During the process of fusion, four of the H atoms unite and release energy to form one He atom. This energy which is released from the fusion reaction is pollutant- free, free from gases or any by product from the reaction.

The solar energy is utilized in two ways 1) photothermal and 2) photovoltaic. In first case the heat from solar radiation is either directly used for applications such as drying, water heating, space heating etc. or is converted into electricity. In photovoltaic conversion, the devices called as solar cells directly convert the solar radiation falling on them into electricity. Increasing the efficiency of solar cells and limiting the production cost is the key factors on which most of the research in this area are based upon.

Different Solar Cell Technologies And Other Efficiencies

Solar cells represent the building block and main component of PV systems. A solar cell is defined as an electrical device that directly converts the energy of photons into direct current (DC) electricity through a chemical/physical phenomenon called the photovoltaic effect. Photons with energy exceeding the cell material band-gap are absorbed causing excitation of charge-carriers and thus electric current and voltage. The conversion efficiency (η) is calculated as the percentage of the incident light power on the cell surface that is converted into electrical energy under standard conditions.

Solar cell technologies can be broadly divided as 1) solar cells based on Silicon 2) thin film solar cells 3) multijunction solar cells and 4) next generation solar cells.

Theoretical maximum solar cell efficiency value for homojunction cells can be about 29% (Sukhatme, S. P. &Nayak, J. K., 2018) assuming incident global radiation to be AM1.5 under a clear sky (1000W/m2) and with band gap energy in the range 1.1eV to 1.7eV. Many semiconductors like Si, GaAs, CdTe have band gap in this range. However, even with sustained research and development the highest reported values (2) from laboratories for solar cells and PV modules can barely reach the maximum theoretical values.

The efficiency values (Green, M.A. et al, 2016; Sukhatme, S.P. &Nayak, J. K., 2018) attained in laboratory with some first generation and second generation solar cells are listed in Table I for comparison purpose.

A. Crystalline Silicon Solar Cells

Single-junction c-Si is currently the dominant cell technology in the global PV market. The wafer-based conventional cells are classified according to their crystalline structure into four main types: Mono-crystalline, Poly-crystalline (i.e. multi-crystalline), Heterojunction with Intrinsic Thin layer (HIT), and Microcrystalline. Both single crystal and multicrystalline, are widely popular because silicon is abundant and non-toxic. With increasing production of solar PV cells and with need to reduce their cost, multicrystalline Silicon is used for commercial modules, though its efficiency is lower.

Due to high cost of making crystalline silicon, thin film cells based on a hydrogenated alloy of amorphous silicon (denoted by a-Si:H) have been commercialized.

Table I. Efficiency values attained in laboratory with some first generation and second generation solar cells. Measurements under global AM1.5 spectrum (1000 W/m2) and at cell temperature 250 C (Green, M.A. et al , 2016; Sukhatme, S. P. &Nayak,J. K., 2018)

Type of Solar Cell	Area (cm2)	Efficiency (%)
Silicon (single crystal)	143.7	**25.6**
Silicon (multicrystalline)	242.74	**21.3**
Silicon (amorphous)	1.001	**10.2**
Gallium arsenide GaAs (multicrystalline)	4.011	**18.4**
Thin Film:		
Cadmium telluride CdTe	1.0623	**21.0**
Copper indium gallium diselenide CIGS	0.9927	**21.0**
Gallium arsenide GaAs	**0.9927**	**28.8**

B. Thin Film Solar cells

To avoid the high economic and environmental cost of c-Si cells (in terms of material and energy) , a second generation of technology has been introduced since 1970s. Thin-film PV cells are manufactured by depositing thin layers of photovoltaic materials (thickness < 2 μm) to form a heterojunction barrier. Due to the direct and wide bandgap of most thin-film semiconductor materials (1.5-1.8 eV), 2G cells have better temperature coefficients as well as a good performance in indirect light. Furthermore, the main advantage of thin-film cells stems from their very small thickness. Accordingly, they can be deposited on flexible substrate materials, they can be connected into modules during the manufacturing process of the cells through laser cutting, and they can be vertically stacked to form the 3G tandem (multi-junction) cells.

Technology has helped to reduce the cost as compared to Silicon wafer based technology due to less material requirement. Other advantages of thin film modules are, they can be made in large sizes and can be mounted on curved surfaces with use of suitable substrates. However, the efficiencies of thin film solar cells are lower as compared to wafer based cells.

C. Multijunction Solar Cells

Based on amorphous silicon as well as compound semiconductors from group III and V elements of periodic table have shown greatly improved efficiencies. However, their manufacturing is expensive. An efficiency of 40.7% has been reported (King, R. R. et al., 2007) for a three-junction GaInP⁄ GaInAs⁄ Ge cell under the standard spectrum for terrestrial concentrator solar cells at 240 suns (24.0W/cm2, AM1.5D, low aerosol optical depth, 25°C). Multijunction cells based on III-V compounds are primarily used with solar concentrators, mainly providing power in space applications.

Gallium arsenide (GaAs) is a compound semiconductor which has replaced silicon in many applications due to high efficiency. GaAs solar cells have been made in various forms: thin film, single crystal, multicrystalline and multijunction. The thin film GaAs single junction solar cells have shown efficiency of 28.8% in laboratory and multicrystallineGaAs solar cells have shown 18.4 %. Thin film GaAs solar cell modules have shown 24.1% efficiency in laboratory (Green, M.A. et al, 2016). Multijunction solar cells with GaAs have shown efficiency of 31.6 % (Green, M.A. et al, 2016). Other advantages of GaAs are: its bandgap 1.42eV is close to ideal value for PV applications, its high performance in high temperature environment and better resistance to radiation. All these characteristics make it suitable for use in space applications and solar concentrators (Sukhatme, S. P. &Nayak,J. K. ,2018).

D. Emerging technologies

1) Pervoskites Solar Cell

Perovskites are a group of compounds having crystal structure similar to a mineral called perovskite which is composed of calcium titanate (CaTiO3). Perovskite solar cells are based on organometallic halides.

They have been recently reported with efficiency 25.5 % in single-junction architectures and 29.1% in silicon-based tandem cells (https://www.nrel.gov/pv/cell-efficiency.html). Perovskite solar cells are the fastest-advancing solar technology with the potential of achieving even higher efficiencies at low production costs. However, the commercialization of this technology faces certain issues, like stability against moisture and oxygen, heating under applied voltage (Yuan, Y., et al, 2016), photo-unstability , mechanical fragility (Rolston, N., et al, 2016) and environmental concerns due to toxicity of lead halides used in perovskite solar cells.

2) Organic Solar Cell

Organic solar cell or plastic solar cell is thin film cells which use organic semiconductors. The advantages of this type of cell are: they are inexpensive, flexible, light weight and involve solution based processing. But these cells suffer from low efficiency. Various architectures and different materials have been tried with organic solar cells. Recently efficiency for organic photovoltaics of 17.3% was reached via tandem structure (Chen, Y., et al, 2018).

3) Dye Sensitised Solar Cells (DSSC)

Dye sensitised solar cells (DSSC) or Gratzel cells are photoelectrochemical cells. The cell consists of photoanode, sensitizer, electrolyte and counter electrode. The sensitizer can be an organic dye, inorganic dye or metal-organic dye. The DSSC has attracted the attention mainly because it is simple to make using conventional roll-printing techniques and most of the materials used are low-cost. Conversion efficiencies of over 11% and 15% have been obtained with single junction and tandem cells, respectively, in the laboratory (Nazeeruddin Md. K., et al, 2011).

4) Kesterite Solar Cells

Kesterite solar cells are based on two synthetic compounds copper zinc tin sulphide (Cu_2ZnSnS_4) (CZTS) and copper zinc tin selenide ($Cu_2ZnSnSe_4$) (CZTSe). The optical and electronic properties of CZTS and CZTSe are similar to CdTe and CIGS. However, the advantage with CZTS and CZTSe is they do not contain toxic or rare earth elements like cadmium and indium respectively. Efficiency of 7.6% has been reported with CZTS cell and 9.8% CZTSe cell (Green, M.A., et al, 2016). Some loss mechanisms limiting the performance of these cells are dominant interface recombination, high series resistance and low minority carrier lifetime .

5) Quantum Dots

Quantum dots are a special class of semiconductors, which are nanocrystals, composed of periodic groups of II-VI, III-V or IV- VI materials. Quantum dot solar cells (QD) are structures with tunable bandgap to match the spectral distribution of solar spectrum, which reduces cost/ watt ratio of solar electricity. QDs offer the advantages like: they can be moulded into a variety of different types, in two-dimensional (sheets) or three-dimensional arrays; they can be processed to create junctions on inexpensive substrates such as plastics, glass or metal sheets; they can easily be combined with organic polymers and dyes. Recently scientists at the University of Queensland achieved 16.6% efficiency by synthesizing a quantum dot solar cell from a halide perovskite. U.S. National Renewable Energy Laboratory (NREL) set the previous record for quantum dot cell efficiency in 2017 at 13.4%, working with a similar lead halide perovskite (Sanehira, E. M. et al, 2017).

Future Trends

Continuous research and development in the field of solar photovoltaics is providing innovative materials to harvest maximum solar energy. Not only the materials but design of the products also plays important role in commercial application of the technology. Many interesting applications have been realised and some are expected in near future like : floating solar farms, where photovoltaic panels floating on reservoirs, dams and other water bodies save on large land area occupied by solar panels (Choi, Y. K., et al, 2016) ; building integrated photovoltaics (BIPV) blend into building architecture in the form of roofs, canopies; photovoltaic glasses act as energy generating device as well as allow natural light inside houses and offices; anti-solar panels working exactly opposite to conventional solar panels i.e. by using heat radiated from earth's surface so that energy can be generated around the clock (Deppe, T. &Munday, J. N., 2020) and perhaps the most promising would be solar paint with quantum dot solar cells and perovskite solar cells.

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Per formic acid: Effective reagent for preparation of Carene diol from Δ^3-Carene

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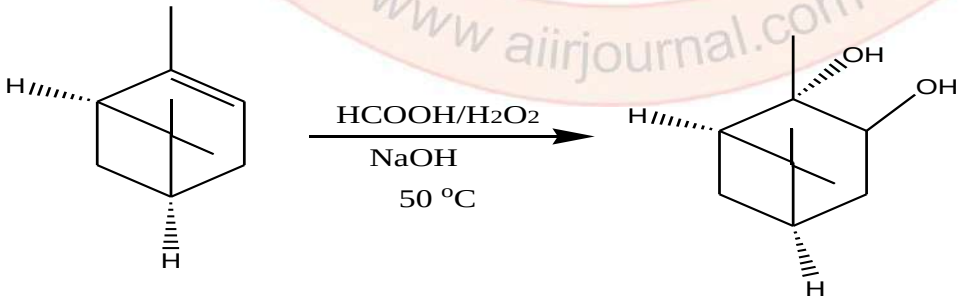
Abstract:
In the natural product, terpenoids are important because of its valuableimportance in various sectors. The terpenoids occur only in the volatile oils and they are normally colourless liquids or solids with pleasant smell and insoluble in water. They are soluble in organic solvents,alcoholand fixed oils. These terpenoids are very sensitive to prepare its various different derivatives. Terpenes are one of that terpenoids which can gives oxygenated derivatives like alcohols, ketones, aldehydes etc. Monoterpene is one of the terpenoids having molecular formula $C_{10}H_{16}$ used to prepare various derivatives. (+)3-Carene is one of the monoterpene which on oxidation by using oxidising agent performic acid which gives epoxide as intermediate product, (epoxidation of carene). Which on hydrolysis, it gives carene diol as final product.
Keyword: *terpenoids, volatile oils, Δ^3-Carene, α- pinene, carene diol.*

Introduction:

In the natural product, terpenoids are valuable natural product because of its importance in various sectors. The terpenoids occur only in the volatile oils they are normally colourless liquids [1] or solids with pleasant smell and are insoluble in water. They are soluble in, organic solvents,alcohols and fixed oils. Terpenoids normally contains one or more double bonds and forms additive compounds with halogens[2-3], nitrosyl chloride[4], and nitrosyl bromide. They are readily volatilise in stem and most of them are optically active [5].Then get oxidized by oxidizing agent. Terpene [No. of isoprene units two, M.F. $C_{10}H_{16}$] by virtue of their pleasant flavour the compounds of terpene [6] used in several industries specially perfumery, cosmetics, soaps, foods, pharmaceuticals [7], beverages and many others. Apart from flavour in food and pharmaceutical industries they are also used as mosquito repellents [8], insecticides, pesticides and deodorant [9] Antibacterial and Antifungal Properties [10]. Therapeutically they owe their action due to several compounds and find applications as antiseptic [11], stimulant, and diuretic, analgesic [12] and for several other purposes.

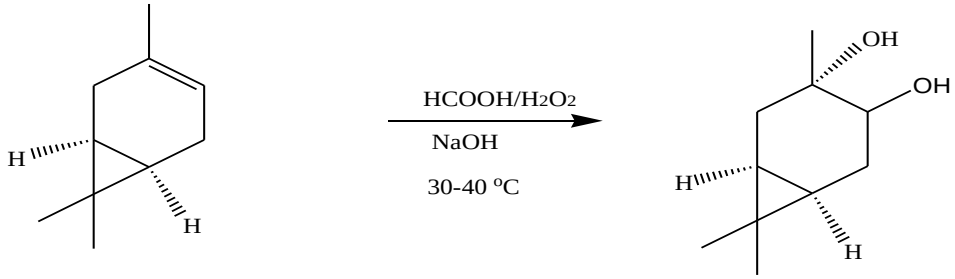
Terpenoids are classified on the basis of no. of isoprene units (C_5H_8).In that monoterpenes or terpene contains two units of isoprene ($C_{10}H_{16}$). Terpene or carene is present in (+) and (-) form. (-) form is isolated from root oil of kaempferia galangal [13-14] and from cedrus deodar oil and (+) form is wide spread plant product found specially in abies, citrus and janipenus oil with pleasant odour B.P.$_{200}$ =123-124°C and $\{\alpha\}_D^{30}$ =5.72, The (+) form of Δ^3-Careneis obtained from geranyl diphosphate[15]. Already recorded reaction of peracid such as Performicacidonterpene such as α-pinene epoxidation [16]takes place andepoxideofα- pinene is obtained. Which on hydrolysis, This epoxide is converted into 2α, 3β-pinenediol [17].The present work was done as same procedure given above on Δ^3-Carenewhich gives final product is 3α, 4β-carenediol.

Scheme I



α- pinene 2α, 3β- pinenediol

Scheme II



Δ^3-Carene3α, 4β-carenediol

General Experimental Procedure:

In the 150 ml three necked round bottom flask,equipped with a mechanical stirrer and dropping funnel was placed formic acid (90% 26 ml) and freshly distilled Δ^3-Carene (10gm)was added with stirring through a dropping funnel H_2O_2(30% 15ml) was then added drop wise maintaining the temperature of the reaction mixture between 30-40°C (2hrs) stirring was continued at that temperature for 6 hrs. And reaction was allowed to stand overnight. The solution of sodium hydroxide (8 gm in 20 mlH_2O) was added slowly to the mixture under stemming keeping the temperature around 25°C(1hrs) the reaction mixture was transpired to 150 ml separating funnel and the layer s were allowed to separate the upper oily layer approximately 13 gm was transferred back to the reaction flask and further amount of solution of sodium hydroxide (2 gm in 40 mlH_2O)was added slowly under vigorous stemming maintaining the temperature at 25°C to 30°Cafter stemming of one half hours and cooling to 5°Cto 10°C the solid diol separate out. It was filtered the residue washed with cold water and dried yield was 7 gm (64%) melting point 68°C. The crude diol was crystallized from pet ether + 5% ethyl acetate to give about 4 gm of diol (45%). Themelting point was87°Cto 88 °C

2.1*Spectral data of obtained compound:*
3,4-Hydroxy-3,7,7-Trimethyl-1- Bicyclo-(4,1,0)-Heptane.
IR(KBr):3448,2900,1460, 1375, 1058, 945 & 815 cm^{-1}

Result and Discussion:

Already recorded reaction of peracid such as Performic acid with terpene such as α- pinene epoxidation of reactant was takes place and epoxide of α- pinene is obtained as intermediate. Which on hydrolysis, This epoxide is converted into 2α, 3β-pinenediol of yield 40% .Whensuchreaction is carried out on Δ^3-Carene by using same reagenti.e.performic acid which is obtained from formic acid (90%, 26 ml) and with constant stirring through a dropping funnel H_2O_2 (30% 15 ml) was then added drop wise maintaining the temperature of the reaction mixture between 30-40°C (2 hrs) stirring was continued at that temperature for 6 hrs. And reaction was allowed to stand overnight. Then solution of sodium hydroxide (8 gm in 20 ml H_2O) was added slowly to the mixture. This mixture then cooling to 5°C to 10°C the solid diol separate out dried yield was 7 gm (64%) melting point 68°C. crude diol was crystallized from pet ether + 5% ethyl acetate to give about 4 gm of diol (45%). the melting point was 87°C to 88 °C

Table- 1

Sr. No.	Terpene			Yield (%)
1	α- pinene			40
2	Δ^3-Carene			45

In the present study preparation of carene diol from Δ^3-Careneby using simple & same procedure, Per formic acid in presence of base as same reagent and maintaining temperature between 30 to 50°C. Which is used for preparation of diol of α- pinene. The yield of product is also nearly equal in range i.e. between 40 to 45 %.

Conclusion:

We have been able to introduce an efficient procedure for preparation of terpene diol by using easily preferable, more efficient catalyst which gives good yield, easy to work up, purification of compounds by simple method are the key advantages of this method.

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Synthesis And Physicochemical Studies of Chalcone

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Abstract:
Chalcone compound is synthesized and its characterization was done byspectroscopic techniques such as IR, NMR and mass spectrometry.Some physicochemical properties such as melting point, density, viscosity, refractive index, etc. have been studied for newly synthesized chalcone in different solvents, different concentration and different temperature.
Keywords- Chalcones, Density, Viscosity, Refractive Index, Concentration, Temperature etc.

Introduction:

Chalcones are one of the most important compounds.The framework 1,3-diphenylprop-2-en-1-one is well known by the generic term ‘‘chalcone,’’ a name coined by Kostanecki and Tambor[1]. It is also known as benzalacetophenone and benzylidene acetophenone. The chalcones has most important properties like anticancer [2], antimalarial[3], antimicrobial[4] and antiinflammatory[5]etc. 2-Hydroxy chalcones are a group of naturally occurring compounds and are used as the intermediates for the synthesis of various other flavanoids[6,7]. The unsaturated carbonyl system in chalcones makes them biologically active[8].Indeed,chalcones constitute an important group of natural compoundsthat are especially abundant in fruits (e.g., citruses,apples), vegetables (e.g., tomatoes, shallots, bean sprouts,potatoes) and various plants and spices (e.g., licorice),many of which have been used for centuries in traditionalherbal medicine.[9]

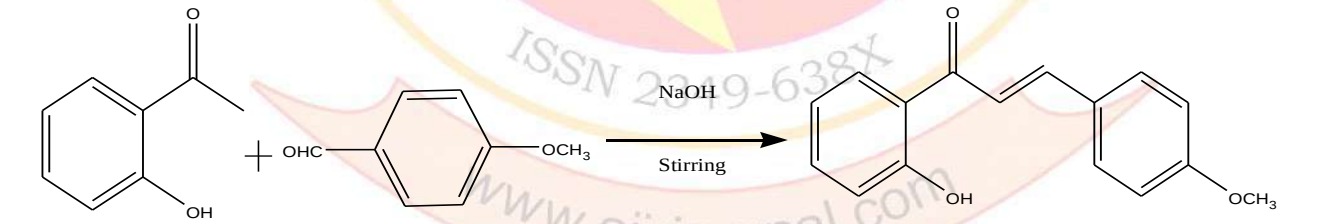
The physicochemical properties has lot of applications. The refractive Index ,density, molecular mass and viscosity are very useful in the evaluation of variousthermodynamics properties of chemical materials. The solubility is a main key factor in pharmaceutical industries.The crystallization process is also helpful in purifications and increases in crystal size.[10-12]

Thus, the present work was undertaken to synthesized new chalcone derivative and study of its physicochemical properties such as density, viscosity, refractive index etc. in different solvents, different concentrations and different temperatures.

Experimental

1. Synthesis

The chalcone was obtained by Claisen-Schmidt Condensation process.It contain equimolar quantity of aromatic ketones that is acetophenone derivatives and aromatic aldehyde as benzaldehyde derivatives will combine together in presence of base like NaOH to produce chalcone derivatives[13-20]. The structure of synthesized chalcone was confirmed by IR, 1H NMR and mass spectral data.



1-(2-hydroxyphenyl)ethanone 4-methoxybenzaldehyde (*E*)-1-(2-hydroxyphenyl)-3-(4-methoxyphenyl)prop-2-en-1-one

Table 1 shows the physical parameters of synthesized chalcone

Sr. No.	Compound	Substitution	Molecular Formula	Molecular Weight	Yield
1	Chalcone	OH & OCH_3	$C_{16}H_{14}O_3$	254	76%

2. Physicochemical studies:

The chlacone is recrystallized with DMF. All physicochemical properties were studied in dimethyl formamide (DMF) and dimethyl sulfoxide (DMSO) solvents.The different concentration of synthesized clacone prepared in DMF and DMSO. The selection of solvents for physicochemical properties on the basis of solubility.

2.1 Density and Viscosity:

The different concentrations of synthesized chalcone were made in DMSO and DMF solvents.The density of different concentration solutions were measured by using pycnometer while viscosity were measured by Ostwald viscometer at differenttemperatures**.**

2.2 Refractive Index:

The different concentrations of synthesized chalcone were made in DMSO and DMF solvents. The Abbe's refractometer was used for the measurement of refractive index of solutions of synthesized chalcone.

Results and discussion

1) Density and Viscosity of synthesized chalcone:-

The experimental values of density (ρ), and viscosity (η), at different temperature and different concentration are mention in fallowing tables

Table-2 Temperature:303.15 K

Conc.	DMSO Solvent		DMF Solvent	
(M).	Density (ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise	Density (ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise
0.05	1.202	13.2924	0.9710	8.3102
0.04	1.1190	13.2507	0.9698	8.2964
0.03	1.1188	13.1962	0.9690	8.2845
0.02	1.1178	13.1626	0.9681	8.2202
0.01	1.1168	13.1104	0.9678	8.1626

Table-2 Temperature: 308.15 K

Conc.	DMSO Solvent		DMF Solvent	
(M).	Density (ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise	Density(ρ) (g.cm^{-3})	Viscosity (η.10^{-3}) poise
0.05	1.206	11.3022	0.9626	7.9422
0.04	1.1194	11.2824	0.9610	6.9125
0.03	1.1186	11.2268	0.9572	6.8947
0.02	1.1174	11.1917	0.9555	6.878
0.01	1.1160	11.1364	0.9518	6.8262

Table-3 Temperature: 313.15 K

Conc. (M).	DMSO Solvent		DMF Solvent	
	Density (ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise	Density(ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise
0.05	1.1190	10.4612	0.9662	7.1522
0.04	1.1184	10.2643	0.9654	6.5844
0.03	1.1180	10.1107	0.9646	6.5005
0.02	1.1152	9.8215	0.9638	6.3863
0.01	1.1138	9.6276	0.9602	6.2084

The density of newly synthesize chalcone is higher in DMSO solvent than DMF solvent. The density decreases by decreasing concentration of solution because density is depend on the amount of substance present in solvent.The density in the two solvents is different.The different values in different solvents suggest that interactions of solute and solvent particles play an important role. In solutions, molecular interactions exist which differ in different solvents. Further, these interactions differ due to different concentration of solute insolution. Due to these interactions, there may be somechanges in mass and volume, which affects density

The viscosity of solution is depends on the interaction between solute and solvent particles, temperature, concentration etc. The viscosity in DMSO solution is higher than DMF due to strong solute solvent interaction in DMSO solvent. Viscosity in each solvent decreases as concentration decreases.

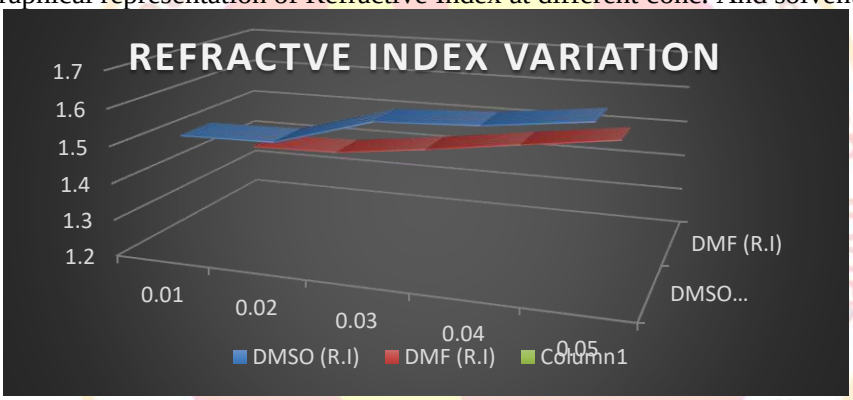
2) Refractive Index of synthesized chalcone:-

The experimental values of refractive index atdifferent concentrations and different solvents are mention in fallowing tables

Table-4

	DMSO	DMF
(M)	R.I.	R.I.
0.01	1.5126	1.3894
0.02	1.5168	1.3946
0.03	1.5914	1.4262
0.04	1.6021	1.4623
0.05	1.6322	1.4975

Graphical representation of Refractive Index at different conc. And solvents



It is observed that refractive index ofcompounds are different in each solvent as well as different concentrations . This again proves that in different solvents, inter molecular interactions are different which affects these parameter. In some solvents, aggregation or hydrogen bonding takes place whereas inothers, breakage of bonds takes place. As refractive index depends not only upon atomic refraction but also on single, double or triple bonds, these parameters are affected by the type of interactions taking place in solution.

Conclusion

It is concluded that physicochemical properties of a compound depends on concentration, temperature, solvents etc. The physicochemical properties play important role to explain the interaction between solute and solvent.

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A Biomonitoring of Plankton And Physico Chemical Properties of Kapileshwar Dam, Ashti, Dist-Wardha

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Abstract

The present study deal with biomonitoring of plankton and physico-chemical parameters of Kapileshwar dam. To cover the whole dam area the study area was divided into five sampling stations, comprehensively during the June 2017 to July 2018. The physico-chemical parameters were observed Temperature, Transparency, pH, Turbidity, Total Dissolved Solid, Total alkalinity, DO, Total hardness, Nitrate, Sulphate and Phosphate during the study. Water temperature exhibited feeble positive correlation with zooplankton. Transparency played an important role in flourishing population of phytoplankton as it established a positive correlation at 1% level of significance (r =0.729).The dissolved oxygen in water of the dam ranged from 5.00mg/l to 9.10mg/l at station I and II characterized as good level of water body. Nutrients like nitrates and phosphate present in the water body were found in the permissible limits as prescribed by WHO, BIS for drinking water quality which confirm that the water is unpolluted and safe for drinking purposes. At present the Kapileshwar dam is of mesotrophic nature.

***Key words**: Physico-chemical parameters, Kapileshwar dam, Plankton and Mesotrophic.*

Introduction

It is necessary that the quality of water should be checked periodically because due to use of contaminated water biotic fauna may suffer from a variety of water born diseases Sunkund and Patil (2004). In recent times limnological studies are often related to fisheries, biodiversity conservation, pollution assessment and rejuvenation of degraded inland freshwater ecosystems (Arlinghaus et al., 2008). Zooplankton diversity is one of the most important ecological parameters in water quality assessment. In many areas,the ecological impacts from human activities will far exceed the impacts from climate change, Scholze et al., (2006) have worked on a climate-change risk analysis for world ecosystems, Islam (2007) in a pond of Rajshahi University, has investigated the effects of abiotic parameters on the variations of zooplankton population. Zooplankton is good indicator of the changes in water quality because they are strongly affected by environmental conditions and respond. Nelson et.al.,(2009)carried out a detailed study on the combined effects of urbanization and climate change on stream ecosystems: from impacts to management options. Similarly, Durance and Ormerod (2009) have investigated existing trends in water quality and the consequent discharge confound long – term warming effects on river macroinvertebrates. The study of plankton and physico-chemical property of water was carried out by various people like

Mishra and Saksena (1991), Kuashik and Saksena (1995). Patel et al., (2013), Vasanthkumar and Vijay Kumar (2011), Garg et al., (2010). The water of Kapileshwar dam is utilized for drinking, irrigation and for fisheries activity. The present study was aimed to evaluate water quality and occurrence of zooplankton and phytoplankton with reference to physico-chemical parameters in a Kapileshwar dam.

Material And Methods

The Kapileshwar dam is a man made reservoir constructed on a river. It is at 780-17'-00" E longitude and 200-12'-00"N .The length of dam is 589 mtrs. and 7.31 meters high with a catchment area of 6.68 square km situated near Ashti Tahsil of Wardha District.Gross storage capacity of the reservoir is about 1.720 Mm3.The study area was divided into 5 sampling sites .Water samples were collected regularly on monthly basis in between 8 a.m. to 10 a.m. Water pH,DO,and TDS observed at sampling site using water analysis kit(Systronic make) while other abiotic components were analyzed at laboratory condition using the method prescribed by APHA(1989).

Result And Discussion

It is fact that maintenance of healthy aquatic ecosystem is dependent on the physico-chemical properties of water. Station wise mean values of physico-chemical parameters are summarized in Table 1.

Water Temperature(WT)

Temperature is one of the most important ecological factors, which controls the physiological behavior and distribution of organisms. In present study, lowest value of water temperature found in January190C and

highest in Jun 31.100C with the mean values 26.110C.that shows the optimum ranged for growth of aquatic fauna and flora. This result agrees with the reported by Swaranlatha and Rai (1998) in Banjara Lake. Salve(2006)also reported similar trends in Wan Prakalp reservoir, Nagpur.

pH

pH regulated most of biological processes and bio-chemical reactions. pH value ranged from minimum 6.05 to maximum 7.48 at station-I. The pH of water tends towards alkaline nature.Minimum pH was found in the month of April(summer) and reached to the maximum in the month of December (winter).This is in agreement with the findings of Manjare et al.,(2010) who studied the Vadgaon tank of Kolhapur.Mean and range pH value of all the five stations observed was 6.98 ± 0.10.

Transparency

Fresh water body in the present investigation showed no typical trend.Average mean value of water transparency evaluated is 47.68 cm. The lower values of transparency during rainy season may be attributed due to the rains which might have brought silt and mud from the catchment area making the water turbid. This is in the conformation with the observation made by Zafar (1966); Kaur et al., (2008). Mwara, (2006) also observed low transparency during rainy season in manmade reservoirs in Kenya.It was found higher in the summer season which might be due to suspended particles accumulated during summer months or may be attributed to human activity like washing and bathing.Jaybhaye (2009) also reported similar trends in Parola dam of Hingoli district.

Total dissolved solids (TDS)

TDS is measure of all the dissolved substances, both organic and inorganic in water. Higher TDS attributes to high dissolved and suspended particles in to the water.At station-I the total dissolved solid was found higher 400mg/l with the mean value considering all five station was 315.71 mg/l. It is in the range of permissible limit. Similar results were also reported by Chaturbhuj et. al.,(2004) in the Jamwa Ramgarh Lake, Jaipur.

Turbidity

The water was less turbid as observed during study period. Monsoon months particularly showed turbid water which is attributed to the surface runoff in the rainy season from the catchment area; recently Manjare et.al.,(2010) have reported higher turbidity in summer season. Average mean turbidity values of the entire sampling site calculated to 39.95 NTU.

Total alkalinity

Total alkalinity of water is the quality of water and kinds of components present in water such as bicarbonate, carbonate and hydroxide. Total alkalinity was in the ranged from 106mg/l to 330mg/l at sampling station –II and sampling station-V (Table-1) respectively. The maximum value recorded in the month of January(winter) and minimum in the month of August(monsoon).The alkaline water was found productive.Spence (1967) classified the lake into three categories based on alkalinity. On the basis of this classification, Kapileshwar dam considered as a nutrient rich dam.

Dissolved oxygen(DO)

Dissolved oxygen is an important limnological parameter indicating level of water quality , organic production and reflects the physical , biological processes prevailing in the dam water. It ranged was 5.00mg/l to 9.10 mg/l. The level of DO was found less during the month of may(summer). This is because of the low solubility of gases at high temperature Hynes,(1978); similarly during summer water volume also decreased and became more concentrated with the pollutants, Decreased DO in summer correlates with the higher solubility of oxygen at lower temperature. This is in agreement with the recent findings of Garg et al.,(2010) who found that dissolved oxygen was less during summer season. Average DO in the present study also exceeded the limit of 5mg/l as per European Environmental Commission Chapman (1997) and mean value observed in the present investigation was 7.91 mg/l. Therefore, it can be concluded that water is safe for human consumption.

Total hardness

The hardness of water is mainly governed by the content of calcium and magnesium which largely combine with bicarbonates & carbonates (temporary hardness) and with sulphate, chlorides and other anions of minerals (permanent hardness).In the present study,mean value of total hardness of five different stations was observed as 127.17 mg/l . The minimum and maximum evaluated was 86 mg/l and 226 mg/l respectively. It was found in permissible limit.

Nitrates

Nitrate is basic nutrient, which is determined the productivity of lake. In the fresh water nitrate content is meager. In the present study the average values of nitrate of all the sampling stations were observed to be 0.48 mg/l. there was no seasonal trend in the concentration of nitrates and minimum concentration was found

0.19mg/l at station-I while maximum 0.87 mg/l at station-IV.Nitrates were estimated more in winter season. This is in agreement with the findings of Islam(2007).

Sulphate

Most of the sulphate ions are probably derived from the solution of calcium & magnesium ions. Sulphate is naturally occurring ion found in all types of water and wide ranges in nature. Occurrence of sulphate in water is due to influx of runoff and leaching process. The average mean of water sulphate content was found to be 12.46 mg/l which is in permissible limit. Bhagat (2008) have also observed minimum sulphate content in Ambadi dam, near Akot Dt.Akola.

Phosphate

The lower and higher values fluctuated from 0.02 mg/l to0.60 mg/l at station- V and station-II respectively. Average mean of all the five stations calculated 0.25 mg/l. Winter months contribute higher concentration as compared to monsoon and summer seasons. Higher values may be due to accumulation of surface agricultural runoff and washing activities that contributed to the inorganic phosphate contents.

Conclusion

The pollution indicators phytoplankton and zooplankton were less in number at all the stations similarly As no industrialization has taken place in the surrounding areas, menace of effluent discharge and subsequent pollution is not evident in the dam. Abiotic components are found in the safe limit which confirms that the water is safe for drinking and also for healthy fish culture. The present status of water body is mesotrophic and unpolluted hence, the water can be utilized for irrigation, drinking and fishery activities.

Table 1 : Physico chemical quality of Kapileshwar dam during June 2017 to July 2018

Parameters	Sampling stations				
	I	**II**	**III**	**IV**	**V**
Water temperature(^{0}c)	25.82	25.36	25.66	26.11	25.76
Transparency(cm)	43.95	70.64	61.29	27.11	25.76
Total Dissolved Solid (mg/l)	251.43	264.29	260.00	315.71	282.86
pH	6.95	6.93	6.82	6.98	7.05
Turbidity(NTU)	41.57	32.40	38.17	44.40	43.20
Total alkalinity(mg/l)	153.00	163.57	158.14	185.14	208.29
DO (mg/l)	7.41	6.47	6.20	7.91	7.12
Total Hardness(mg/l)	128.57	128.57	126.29	117.43	135.00
Nitrate (mg/l)	0.43	0.45	0.49	0.49	0.52
Sulphate (mg/l)	9.68	9.27	13.69	19.89	9.75
Phosphate (mg/l)	0.31	0.29	0.16	0.32	0.18

Table - 2 : Numerical abundance of zooplanktons (org/l) at different stations June2017-July2018

S.No.	**Zooplankton**	**Stations**					Total	**%**
		I	II	III	IV	V		
1	Protozoa	8542	5670	9205	7437	8468	**39322**	15.09
2	Rotifera	14801	13917	14654	15316	14138	**72826**	27.95
3	Cladocera	9646	9204	10383	7878	6185	**43296**	16.61
4	Copepoda	8026	9205	6480	9205	7511	**40427**	15.51
5	Ostracoda	8247	8395	6185	5913	5913	**34653**	13.30
6	Worms & Larvae	5766	6775	4345	7585	5596	**30067**	11.54

Table- 3: Variation in the abundance of Planktons at different during June2017-July2018

Sr..no.	**Zoo planktons**	**Stations**				
		I	II	III	IV	V
1	Acantholeberis	+	+	+	+	-
2	Bosmina	++	+	+	+	-

3	Ceriodaphnia	+	-	-	-	+
4	Chydorrus	+	+	+++	+	+
5	Daphnia	+++	++	+	++	-
6	Diaphanosoma	-	-	+	-	+
7	Disparalona	+	+	++	++	+
8	Graptoleberis	+	-	+	+	+
9	Holopedium	+++	++	+++	+	+
10	Leydigia	+	+	-	+	+
11	Moinodaphnia	-	+	-	-	+
12	Polyphemus	++	+++	+++	+	+
13	Sida crystallina	++	+++	+	+++	++
14	Simocephalus	+	++	++	++	+
	(+)Denotes 500 org/l , (-) Denotes Absent, ( ) Pollution indicator species					

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Green Chemistry and Environment: A need of Current Era

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Abstract:

It is broadly accepted that there is an emergent need for more environmentally acceptable processes in the chemical industry. This tendency gives rise to Green Chemistry. It dictate a exemplar shift from traditional concepts of process efficiency, that focus largely on chemical yield, to one that assigns financially viable value to eliminating waste at source and avoiding the use of toxic and/or hazardous substances. The paper describes the need of Green chemistry and its effect on the environment.

Introduction:

Green chemistry is the design of chemical products and processes that reduce or eliminate the use or generation of hazardous substances. Green chemistry applies across the life cycle of a chemical product, including its design, manufacture, use, and ultimate disposal. Green chemistry (Anastas PT, *et. al*, 2000) is also known as sustainable chemistry. Over the past decade, green chemistry has convincingly demonstrated how fundamental scientific methodologies can be devised and applied to protect human health and the environment in an economically beneficial manner. Significant progress has been made in key research areas, such as atom economy, alternative synthetic route for feedstock's and starting materials, biocatalysis, green solvent, biosorption, designing safer chemicals, energy and waste management.

Role of Green Chemistry in the current Scenario:

Green chemistry addresses the environmental impact of both chemical products and the processes by which they are produced. Green chemistry eliminates waste at source, i.e. it is primary pollution prevention (Anonyms, 2009) rather than waste remediation. There is no doubt that, in the twentieth century, organic synthesis has achieved a high level of sophistication with almost no molecule beyond its capabilities, with regard to chemo-, regio- and stereo selectivity, for example. However, little attention was focused on atom selectivity and catalysis was only sporadically applied. Hence, what we now see is a paradigm change: under the mounting pressure of environmental legislation, organic synthesis and catalysis. It is probably true to say that nowhere is there a greater need for green catalytic alternatives (McKenzie LC, *et.al, 2005*) in fine chemicals manufacture than in oxidation reactions. In contrast to reductions, oxidations are still largely carried out with stoichiometric inorganic (or organic) oxidants such as chromium (VI) reagents, permanganate, and manganese dioxide and periodate. There is clearly a definite need for catalytic alternatives employing clean primary oxidants such as oxygen or hydrogen peroxide. The key to waste minimization is precision in organic synthesis, where every atom counts.

Basic Principals of Green Chemistry:

1. **Prevention:** It is better to prevent the production of waste than to treat or clean up waste after it has been generated.
2. **Atom Economy:** Synthetic methods should be designed to maximize the incorporation of all materials employed in the process into the final product i.e. Reduce waste at the molecular level.
3. **Less Hazardous chemical synthesis:** Wherever possible, synthetic methods should be designed to use and create substance that possesses little or no toxicity to human health and environment.
4. **Designing Safer Chemicals:** Chemical products should be designed to perform their desired function while minimizing their toxicity and environmental destiny throughout the design of the process.
5. **Solvents and auxiliaries:** Safest available solvents must be selected for any given step and organic solvents must be avoided whenever possible.
6. **Design for energy efficiency:** Choose the least energy demanding chemical method. Ambient temperature and pressure are ideal.
7. **Use of renewable feed stocks:** Use chemicals which are made from renewable (i.e. Plant based) resources rather than chemicals obtained from depleting resources.
8. **Reduce derivatives**: Minimize the route of temporary derivation such as blocking group, protecting groups.
9. **Catalysis:** Use catalytic reagents rather than stoichiometric reagents in reactions.
10. **Design for degradation:** Design chemicals that degrade and break down into innocuous substances which do not persist in environment at the end of their function.

11. **Real time pollution prevention:** Monitor chemical reaction in real time, in process and control before the formation of hazardous substance.
12. **Safer chemistry for accident protection:** Choose and develop chemical techniques and substances that are safer and minimize the potential for chemical accidents, explosions and fires.

From the above Principles (Anastas PT, Warner JC., 1998), It is clear that the challenge for the future chemical industry is based on safer products and processes designed by utilizing new ideas in fundamental research. It has been said that the revolution of one day becomes the new orthodoxy of the next Green Chemistry is applied and must involve the successful implementation of more environmentally friendly chemical processes and product design.

Result and Discussion:

In country like India (Kidwai M. 2001), there is a great need of improvement in industries from the environmental point of view. Most of the industries are mainly confined to cost effectiveness rather than being eco effective. Some collaborative work has been done by the academic institutes and some industries to bring the eco friendly lab technologies to the industrial plants (J.H. Clark, D.J. Macquarrie, 2002). The best examples are the applications of enzymes in various industries ranging from drugs to leather. The textile industry (R. A. Sheldon, 1992) is one of the highly revenue generating industries in India, and they are now switching over to microbial Decolorization and degradation. Government can do a lot of good for the cause of green chemistry by increasing public awareness and by bringing and enforcing strict environmental legislations. One of the recent examples of government initiative is the conversion of diesel vehicles to compressed natural gas (CNG) and use of Electric vehicles (EV) in order to reduce pollution in the Country.

Conclusion:

Green Chemistry is new philosophical approach that through application and extension of the principles of green chemistry can contribute to sustainable development. Great efforts are still undertaken to design an ideal process that start from non-polluting materials. Though many exciting green chemical processes are being developed but there is far greater number of challenges lies ahead. A lot of efforts are being undertaken to design nonpolluting starting materials and to get safer products without side products. Development of better machines and fuels which produce lesser amount of polluting exhaust gases such as CO, CO2, SO2, nitrogen oxides etc. leading to air pollution and ultimately ocean acidification, has been proposed. Use of good fuel and modified green processes will also reduce the addition of heavy toxic metals and other toxic substances to the environment. Solvent free chemical processes or replacement of organic solvents by water reduces the addition of volatile organic compounds (VOC) in the environment. Use of microwave for chemical processes has reduced reaction time as well as amount of heat energy. Reduce, reuse and recycling, the principles of green chemistry will result in decrease of marine debris also in addition to pollution in surrounding environment. The greatest challenge is too incorporate the green chemistry in industrial, laboratory and day to day processes in order to control environmental pollution and hence ocean pollution at source. Many successful efforts have been made but still a lot has to be done. This can be achieved by training and educating new generation of chemists. Green chemistry has to be introduced in the syllabus of the students at all levels, so that each individual is made aware to choose greener ways in his or her life. Most importantly we need the relevant scientific engineering so, we can say that this approach in chemistry is helpful in protecting human health and environment and it represents a significant departure from the traditional methods previously used.

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GC-MS Analysis of *Colebrookeaoppositifolia* stem in acetone extract

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Abstract

The Lamiaceae (Labiatae) is one of the most important angiospermic aromatic families with wide application in term of traditional knowledge. The family is represented by 236 genera and 7,200 species with 256 endemic species, the members of family found in temperate regions worldwide. Colebrookea is an important genus in the Lamiaceae, first described in 1806. It includes only one known species Colebrookeaoppositifolia Smith. The plants are commonly known as Indian Squirrel Tail (English). The indepth phytochemical examination of stem extracts revealed the presence of phytoconstituents in stemsnamely Resorcinol,Octanenitrile, Acetone extract

Key words :*Colebrookeaoppositifolia, GC-MS analysis,*

Introduction

The *Lamiaceae (Labiatae)* is one of the most important angiospermic aromatic families varying greatly in terms of ethno-medicine (Sarac*et al.*, 2007). The family is represented by 236 genera and 7,200 species with 256 endemic species, the members of family found in temperate regions worldwide (Cantino 1992).The members of this family are well known as aromatic species, as they contain large quantities of the essential oils (Kremer*et al.*, 2012). *Colebrookeaoppositifolia* is a monotypic genus of *Lamiaceae,* first described in 1806. The plant is evergreen, densely woolly shrubs or small tree, 1.2 to 3.6 m distributed mostly in subtropical regions of the world such as India, Pakistan, Nepal, Myanmar, Thailand, South west, China and in India widely in Northern and Southern slopes of the Himalayan range of Sikkim at elevation ranging between 3000-5000 ft. It also grows wild on hills and plains throughout India mainly occupying subtropical Madhya Pradesh and Deccan Peninsula (Rana*et al.*, 2009).It has been extensively used in the traditional system of Indian medicine for the treatment of various ailments such as headache, fever, dysentery, peptic ulcer, dermatitis, wounds, haemostatic, antifungal, as anti-fertility agent and the roots of the plant has been most widely used for the treatment of epilepsy (Kritikar*et al.*, 2007).

Collection of plant material

Collection of plant material was carried out from Chikhaldaraforest locality in the month ofSeptember. Frequent visits were made throughout the season to know the phenological events and collect the plant parts. Collected plant parts separated and washed with tap water followed by distilled water. Stem of plant grinded and converted to the fine powder and this stem powder used for the soxhlet extraction.

Preparation of Extract

5 gmair dried powder was extracted with four solventsnamely Petroleum ether, Acetone, Benzene and Water respectively. The extract so obtained was concentrated at room temperature and carried out preliminary phytochemical analysis. It revealed that, acetone solvent shows more positive results as compared to other solvents. Due to this reason acetone solvent was chosen for GC-MS analysis.

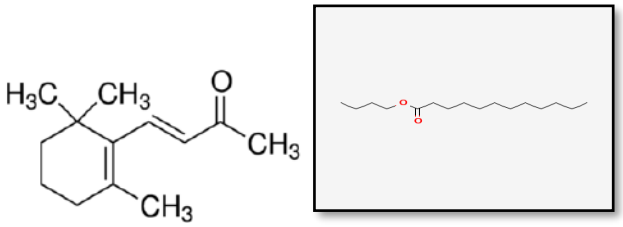
Gas Chromatography-Mass Spectroscopy (GC-MS) analysis.

The GC-MS analysis of stemin acetone extract was carried out using gas chromatography-high resolution mass spectrophotometer. 2 µl of sample was employed for GC -MS analysis. Analysis was carried out using AlegentHp 7880 with Colum 25m. Helium gas was used as carrier gas at constant flow rate.

Observation table

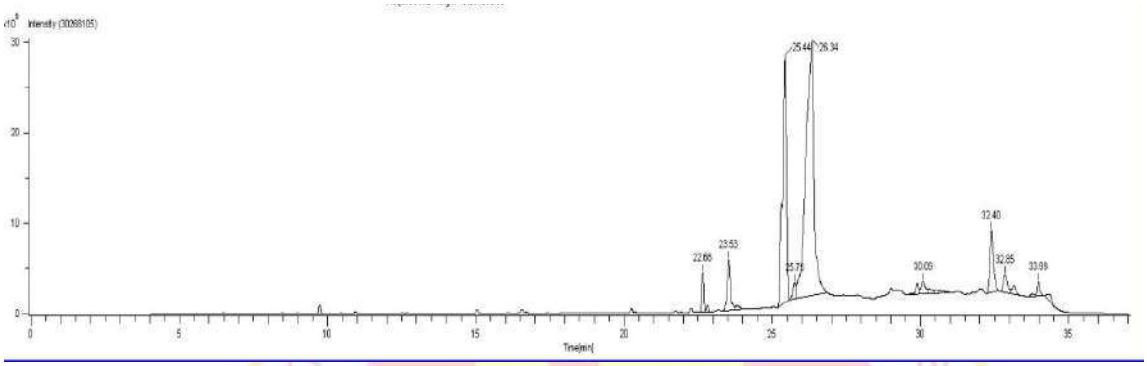
Sr. No.	R. T.	Compound	Percentage (%)	Mass	MF
1.	9.73	Resorcinol	0.48	110.10	$C_6H_6O_2$
2.	15.03	B-Ionone	9.66	192.15	$C_{13}H_{20}O$
3.	20.25	Octanenitrile	7.24	125.13	$C_8H_{15}N$
4.	23.53	n-Butyllaurate	2.41	256.24	$C_{16}H_{32}O_2$

Identified compounds in sample of*Colebrookeaoppositifolia*stemin acetoneextract

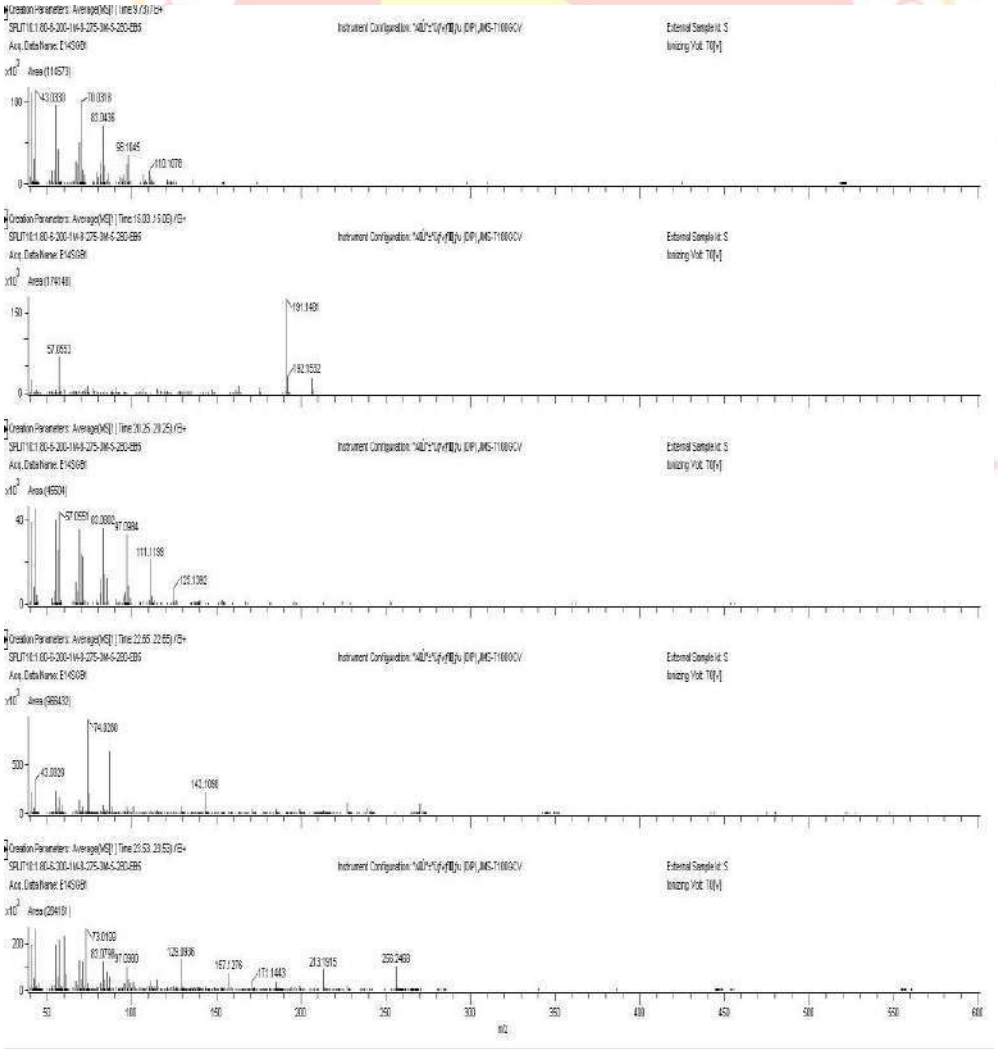


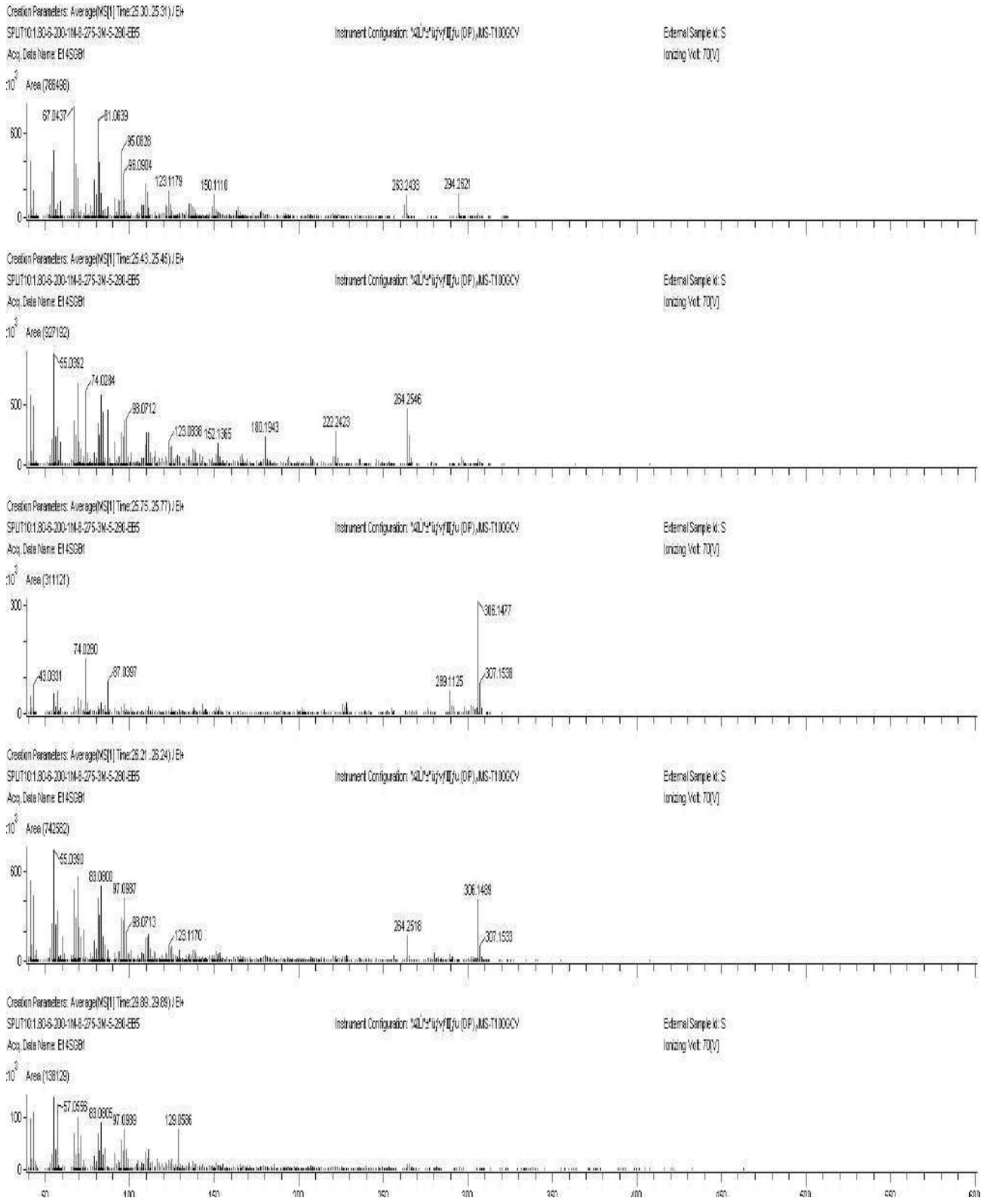
Resorcinoln-Butyl laurate

Fragmentation patterns of identified compounds



Chromatogram of *Colebrookeaoppositifolia* stem in acetone extract




Creation Parameters: Average(MS[1] Time:25.30..25.31) ,El+
SPLIT10:1.80-6-200-1M-8-275-3M-5-280-EB5
Instrument Configuration: %ÃÙ"ÿ°ÿ¡ÿ'ÿ¶ÿ[]ÿ¡ÿu (DP),MS-T100GCV
External Sample Id: S
Acq. Data Name: El+SGBf
Ionizing Volt: 70[V]
Area (766498)
67.0437
81.0639
95.0826
96.0904
123.1179
150.1110
263.2433
294.2821
Creation Parameters: Average(MS[1] Time:25.43..25.45) ,El+
Area (927192)
55.0392
74.0284
88.0712
123.0838
152.1365
180.1943
222.2423
264.2546
Creation Parameters: Average(MS[1] Time:25.75..25.77) ,El+
Area (311121)
74.0280
43.0331
87.0397
289.1125
305.1427
307.1538
Creation Parameters: Average(MS[1] Time:26.21..26.24) ,El+
Area (742552)
55.0390
83.0600
97.0397
88.0713
123.1170
264.2518
306.1498
307.1533
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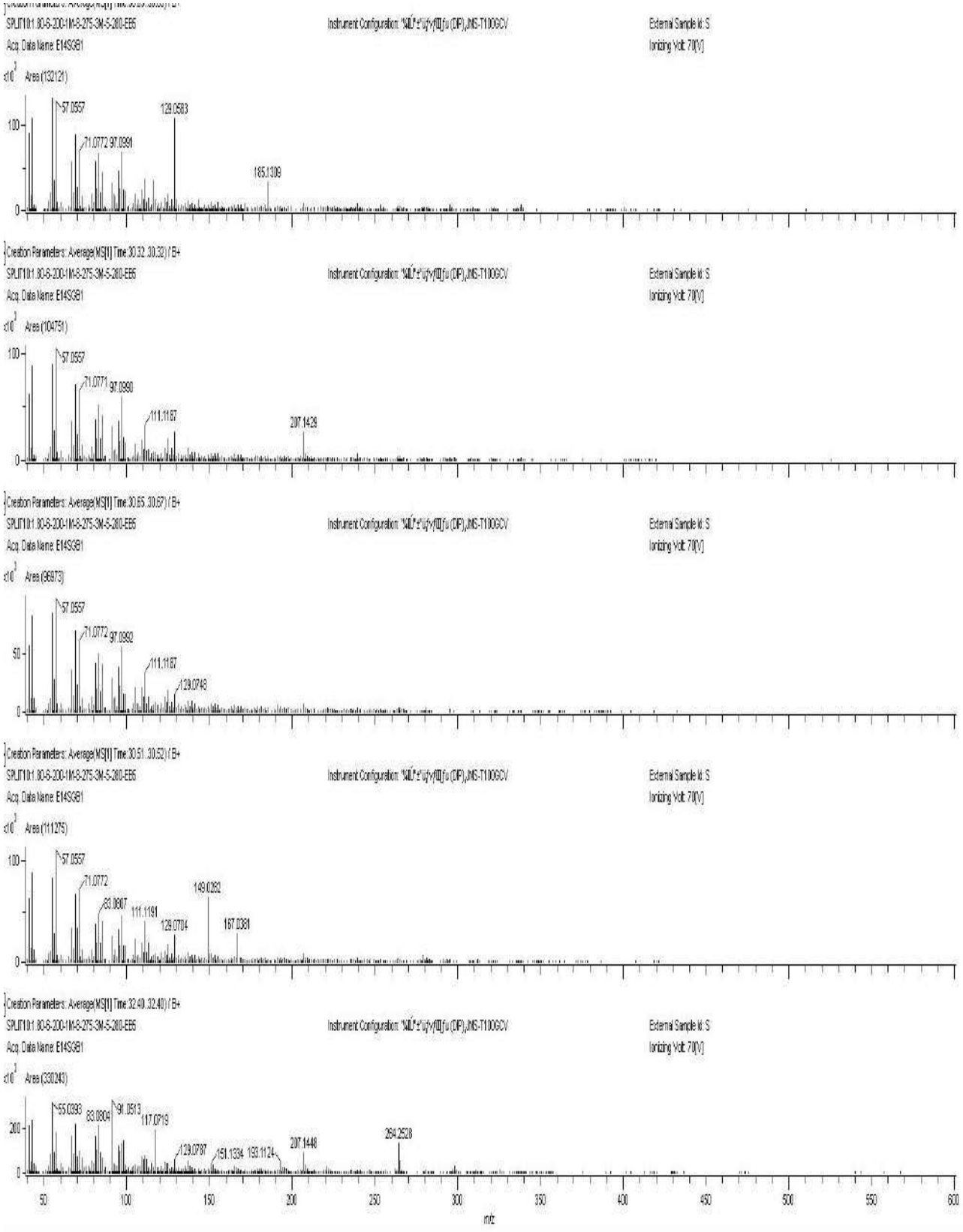
128.0536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Acq. Data Name: E14S681
External Sample Id: S
Ionizing Volt: 70[V]
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57.0557
129.0583
71.0772
97.0991
185.1309
Creation Parameters: Average(MS[1] Time:30.32..30.32) / B+
Area (104751)
57.0557
71.0771
97.0990
111.1167
207.1429
Creation Parameters: Average(MS[1] Time:30.65..30.67) / B+
Area (96973)
57.0557
71.0772
97.0992
111.1187
129.0748
Creation Parameters: Average(MS[1] Time:30.51..30.52) / B+
Area (111275)
57.0557
71.0772
83.0607
111.1191
129.0704
149.0282
167.0381
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Area (330243)
55.0393
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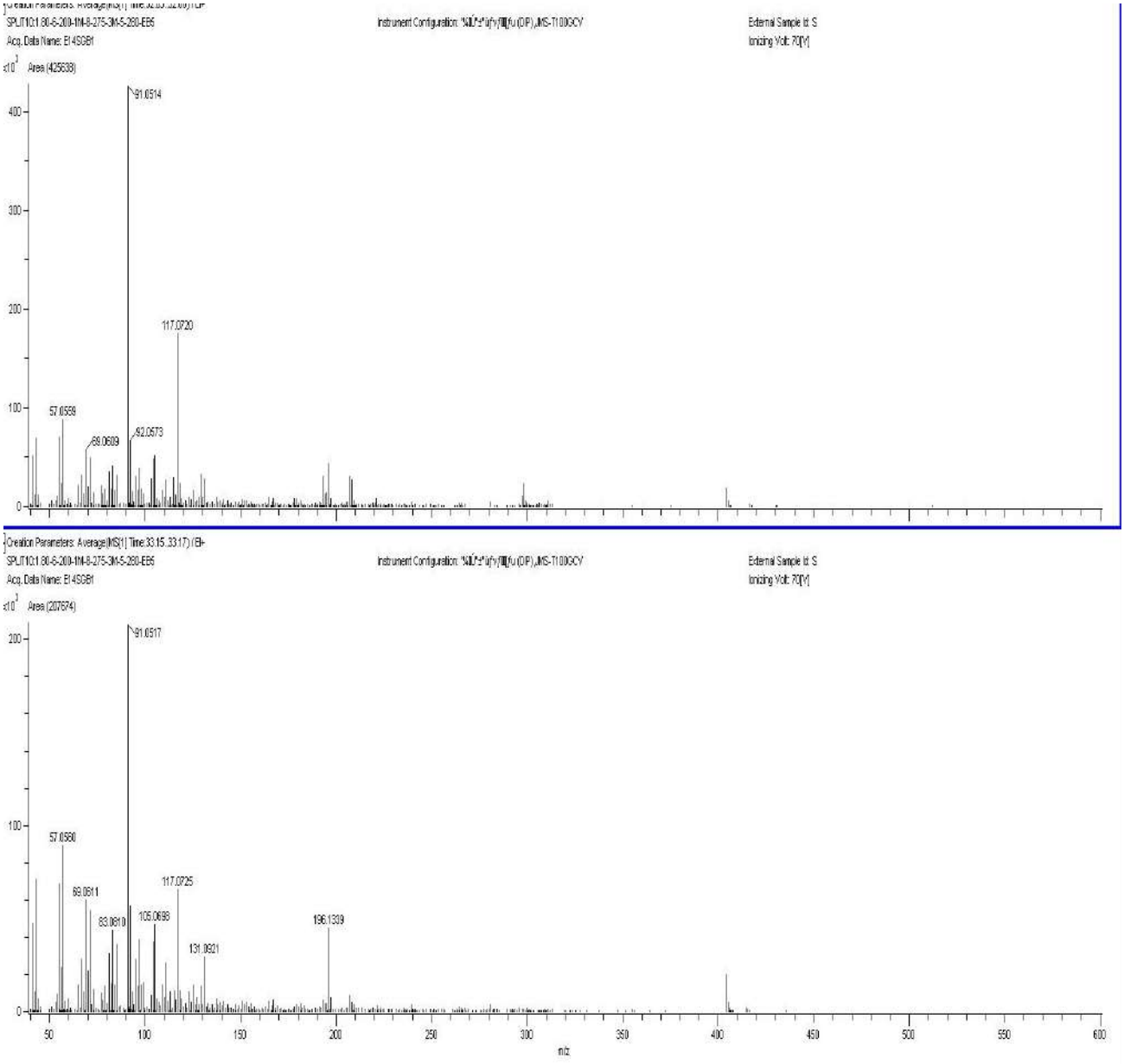

Mass-Spectra *Colebrookeaoppositifolia*stem in acetone extract

Result and Discussion

GC-MS analysis of stem of *Colebrookeaoppositifolia* in acetone extract revealedvarious compounds. These compoundswere confirmed on the basis of base peak and mass peak and compared with NIST mass spectrum. The percentage of various compounds was calculated by the use of gas chromatogram and mass spectra. Stem contain Resorcinol (0.48%), B-Ionone (9.66%), Butyl laurate (2.41%) and Octanenitrile (20.25%).

Resorcinol does not appear to occur naturally in the Free State. It is used for topical acne treatments at 2% or less concentration (Lander *et al.*, 1945). In most of the hospitals resorcinol paste applied directly to the skin for chronic acne.**B-Ionone** (9.66%) is aroma compounds found in a variety of essential oils, including rose oil. B-Ionone is a significant contributor to the aroma of roses, it is an important fragrance chemical used in perfume. The combination of α-ionone and β-ionone is characteristic of the scent of violets and used with other components in perfumery and flavouring to recreate their scent (Baldermann*et al.*, 2010).Butyl butyratealso called butyl butanoate,is an organic compound that is an ester formed by the condensation of butyric acid and n-butanol. It is a clear, colorless liquid that is insoluble in water, but miscible with ethanol and diethyl ether. Like other volatile esters, butyl butyrate has a pleasant aroma. It is used in the flavour industry to create sweet fruity flavours that are similar to that of pineapple. It occurs naturally in many kinds of fruit including apple, banana, berries, pear, plum and strawberry (CINF 2018)

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Assessment of Physico-chemical Properties of Farmland Soil From Different Village of Umarkhed, Dist. Yavatmal (Maharashtra) India

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Abstracts

Soil is a main source of nutrients needed to plants for growth.Soil provides structural stability for plants and retains and relinquishes water and the nutrients necessary for plant growth.Soil analysis provides information which is important for maximizing nutrient use efficiency and agricultural productivity. Soil properties that are sensitive to change in the management can be used as indicator. In the present study it was preferred to analyse the nutrients contain in soil sample of UmarkhedTahsil. The five samples were collected from different sites of the study area of UmarkhedTahsilin December 2021. The analysis of soil was carried out for the study of various parameters like Nitrogen, Potassium, Phosphorous, Magnesium, Calcium, Moisture, pH, EC, &Organic Carbon.

The study revealed that all the five samples of selected area of UmarkhedTahsilare medium to high in mineral content. The pH of the soilsamples were on slightly alkaline side, ranged from 7.80 to 8.21 but within the limit of 6.5-8.5 which is optimum for crops. OC contentall the samples were of medium rating ranged from 0.32% to 0.47%. Available nitrogen ranged from 559 kg/ha to 710kg/ha; available phosphorous ranged from 18.96 kg/ha to 36.12 kg/ha. Potassium ranged from 340 kg/ha to 589 kg/ha and twosamples were rich in potassium.

***Key words**: UmarkhedTahsil, Soil quality, Micronutrients, Physico-chemical parameters.*

Introduction

Soilis main and fundamental component of agricultural activityso that it is important and necessary to understand the basicneeds of soil.Soil productivity encompasses soil fertility plus the inherent and management-related factors affecting plant growth and development.The productivity of soil is mainly depending upon physico-chemical properties and nutrient content in it. Soil provide medium for many of the ecological processes that improve water and air quality and that promote plant growth. The physic chemical properties ofsoil play an important role in activities of microorganism in soil.Soil filters water, decomposes waste, stores heat and exchanges gases and hence has great bearing on environmental balance.The quality and health of soil is important for both agricultural sustainability and environmental quality which connected to the plant, animal and human health.

Soil analysis is well recognized as a sound scientific tool to assess the status of available micronutrients in soils and their relationship with various physico-chemical properties Considerable research work has been done regarding the study of Nutrients and Physico-Chemical assessment of various types of soil in Maharashtra as well as in India have been attempted by several investigators[3,4,5]. Khadake P.A. reportedsoil analysis and its environmental impact on Nanded city of Maharashtra State [6].

The status of micronutrients in soils district Bhimber and their relationship with various physico-chemical properties were investigated by WajahatNazif,et.al[7].It is a real time to carry out the physico chemical analysis of soil because as with the increasing use of chemical fertilizer to the soil, it is difficult to control the adverse effect of the chemical fertilizer to the soil, land, animal and the human being.[1,2]Soil fertility and productivity are the key pillars for food production and soil quality is of equal significance in the background of soil degradation caused by many factors.Soil is a naturally occurring porous medium that supports thegrowth of plant and roots by retaining air, heat, water andnutrients and provides mechanical support to the plant.[12] Factors that affect the availability of soil nutrients include leaching. Soil erosion, soil pH, denitrification , volatilization, nitrogen immobilization and crop nutrient uptake. Crop growth is influenced by aerial and soil environment.

Suitable environment is necessary for better germination, growth and yield of crops. The soil is a complex organization being made up of some six constituents' namely inorganic matter, organic matter, soil organisms, soil moisture, soil solution and soil air. Roughly, the soil contains 50-60%mineral matter, 25-35% water, 15-25% air and little percentage of organic matter.[11]The higher nutrient availability is favorable when soil has higher water holding capacity, proper aeration and less soil strength or mechanical resistance. The six elements nitrogen, phosphorous, potassium, magnesium, calcium and sulphurwhich are required in large quantities are labeled as macronutrients. Most of the soils supply enough calcium, magnesium and sulphurhence thesoil scientists called these elements as secondary nutrient elements. The other three elements nitrogen, phosphorous and potassium are called as primary nutrients and are not usually available in large amounts which is enough for best growth and therefore are added through fertilization.It is well known fact that the periodical analysis of soil provides the up-to date information about the nature and the composition of the

soil.Considerable research work has been done in Maharashtra as well as in India, regarding the study of Nutrients and Physico-Chemical assessment of various types of soil,A.A.Patil[8], R.P.Ganorkar[9],R.P.Ganorkar.[10]Therefore, the present work was undertaken for the study of impact of physic chemical properties of soil on soil quality and its productivity.

Material And Methods

Study Area

Soil sample iscollected from five different village ofUmarkhedTahsil in Yavatmal District of Maharashtra State, India; which is shown in Fig.-1. It belongs to Vidarbha RegionAmravatiDivision. Moderate rain fall in this region and well known for cotton,soya bean, Tur, SugerCaneand other rabi crops. The sources of water for this area is Penganga river, well water and tube wellwater.

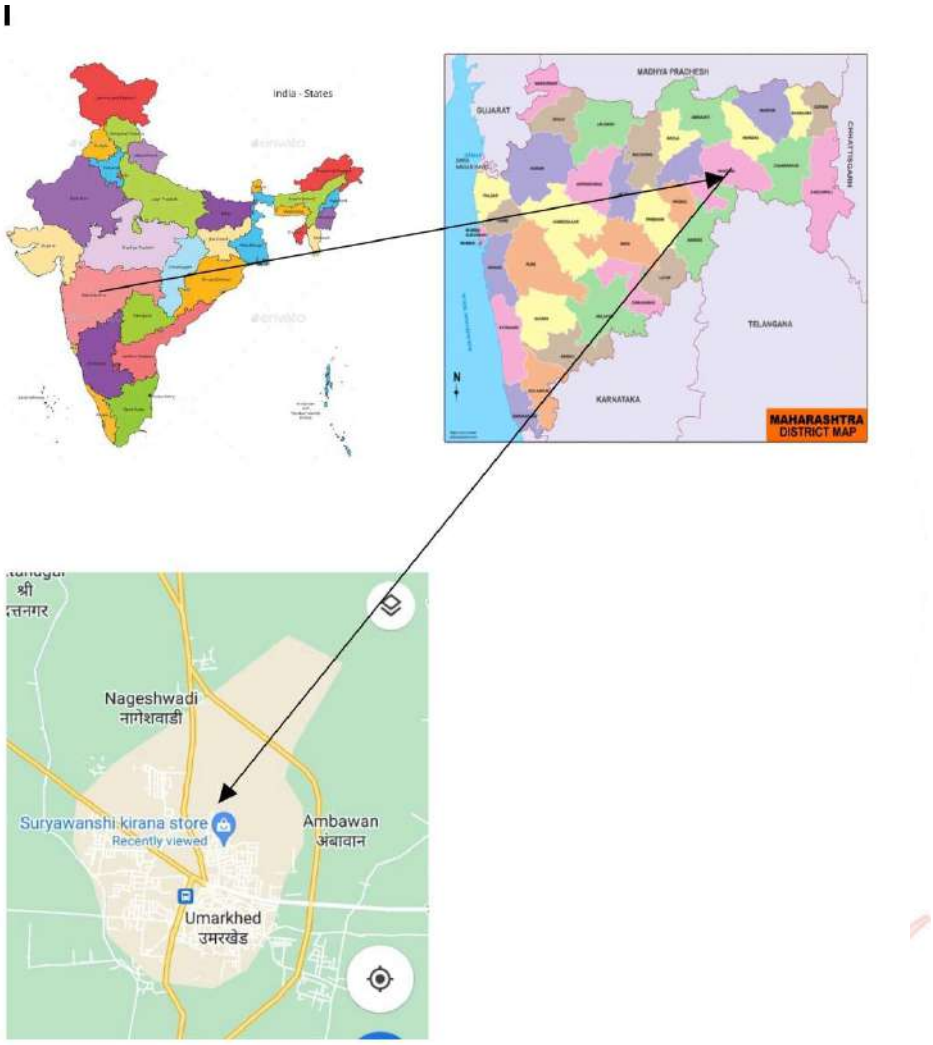


Figure1:-Location map of Study area UmarkhedTahasil District Yavatmal.

Sample Collection

Five samples were collected from the study area (farmer's field) in the month of December2021. Soil samples were collected randomly at 5 to 15 cm depths with five plots, in well sterilized polythene pouches. Soil sample were collected from following Village fields-

Sample-1 collected from VidulVillage.
Sample-2 collected from PophaliVillage.
Sample-3 collected from DahagaonVillage.
Sample-4 collected from Marlegaon.Village.
Sample-5 collected from Chili Village.

Physicochemical Analysis Of Soil Samples

The soil sample were Collected and dried for about 24hrs.Grinded more finely.Methods use for estimation of various parameters is as fallows, like Determination of pH by Digital pH Meter, EC by Conductometer, OC, Ca, N,P,by Titration Method, Determination of Mg was done by EDTA Titration Method.Determination of Potassium (K) by FlamePhotometry.

Result And Discussion

Color of Soil

The soil sample S1, S2, S3 and S4 were Black and S5 Faint Black in color.

pH

The range of pH is found in between 7.80 – 8.21. The sampleS1,S3 and S5 are slightly alkaline sample as compare toS2 and S4 soil sample which is in medium alkaline nature.

Organic Carbon

Organic carbon were recorded in the range of 0.32-0.47 %.The soil sample S2,S4, has high percentage of organic carbon. Sample S1,S5 have moderateandsample S3 has less organic carbon.

Nitrogen

Nitrogen content in the soil ranged from 710-559 kg/hector. The sample S3 & S5 has highnitrogen content as compared to other sample.

Phosphorous

The amount of Phosphorous content in the soil sample ranged between 18.96- 36.12 kg/hector. The soil sample S1 hasmore and soil sample S2 has very low phosphorous content.

Potassium

Potassium content in the soil sample ranged between 340 – 589kg/hector. The soil sampleS1havemore potassium content as compared to other samples.

Magnesium

The Magnesium content in the soil sample ranged from 8.75 – 11.45 %. It is seen in sequenceS1<S5<S3<S4<S2.

Electric Conductance

The Electric Conductance values varies from 0.090 – 0.242ms. It is seen that soil sample S2 have more value ofElectric Conductance as compared to other sample.

Calcium

The Calcium content in soil sample ranges from 49.10 – 60.90 %.It is seen in sequence S5<S3<S1<S2<S4.

Sodium

The Calcium content in soil sample ranges from 7.65 – 8.21 %.It is seen in sequence S5<S4<S2<S3<S1.

W.H.C.

The water holding capacity was observed in the sequence S5<S4<S2<S3<S1.

Calcium Carbonate

The Calcium Carbonate content in soil samples ranges from 6.02-8.35 %.It is seen that soil sample S1have more amount of Calcium Carbonate as compared to other soil samples.It is seen in sequence S2<S4<S5<S3<S1.

Density

The density of soil samples ranges from 1.45-1.63 %.It is seen that soil sample S2 &S4 have more density as compared to other soil samples.It is seen in sequence S4<S1<S3<S4<S2.

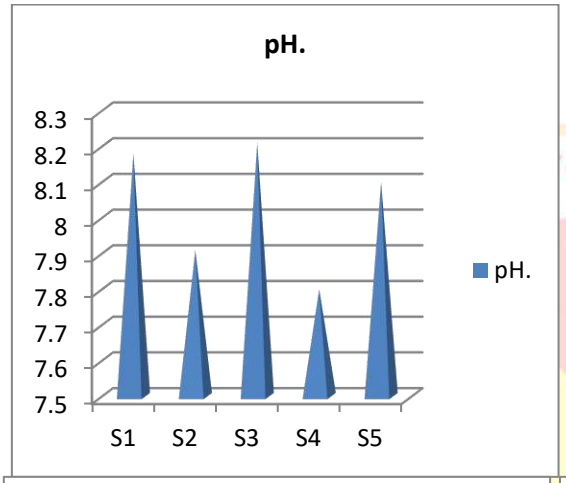
Conclusion

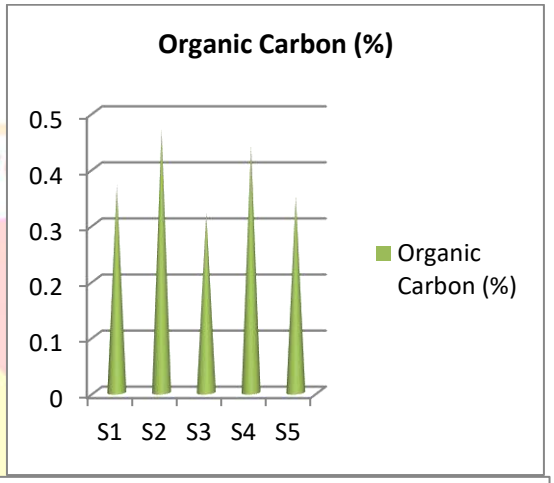
The physico chemical analysis of soil provides necessary information to set the target of nutrient application. The soil samples are slightly alkaline and the pH is in S4<S2<S5<S1<S3 order hence the Suggestion to use of compost manure.All the soil sample is low to modaret in organic carbone. In the soil sample S1 and S2 the Potassium is high as compare to other sample.

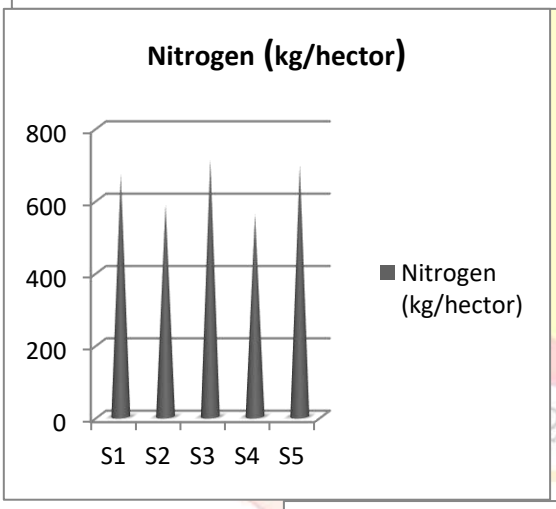
Table 1 :Physico chemicals parameters of soil samples

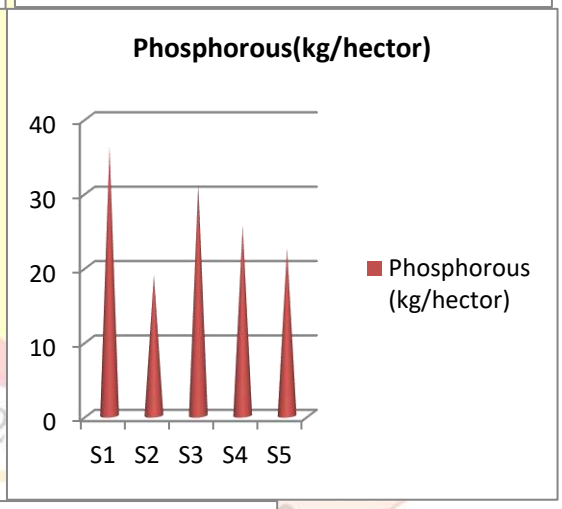
S. No.	Parameters	S1	S2	S3	S4	S5
1	Color	Black	Black	Black	Black	**Faint Black**
2	pH.	8.18	7.91	8.21	7.80	**8.1**

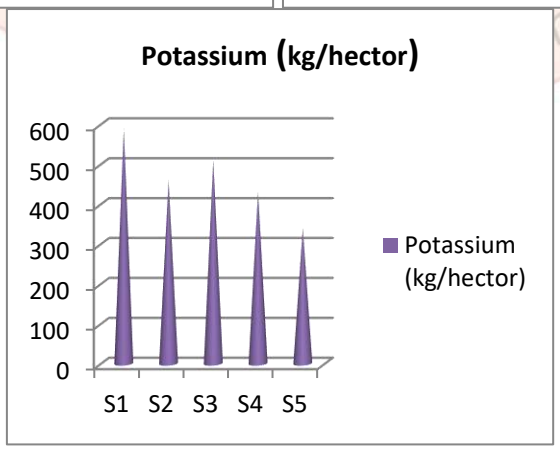
3	Electro Conductance(ms)	0.096	0.132	0.090	0.242	**0.112**
4	Organic Carbon (%)	0.37	0.47	0.32	0.44	**0.35**
5	Nitrogen (kg/hector)	670	585	710	559	**695**
6	Phosphorous(kg/hector)	36.12	18.96	31.20	25.60	**22.54**
7	Potassium (kg/hector)	589	460	510	430	**340**
8	Magnesium (%)	8.75	11.45	9.15	10.30	**9.10**
9	Calcium (%)	54.91	59.08	52.90	60.90	**49.06**
10	Sodium(%)	8.21	7.91	8.15	7.83	**7.65**
11	CaCo3(%)	8.35	6.02	8.26	6.35	**6.90**
12	M.W.H.C.	52.90	45.5	49.0	43.6	**42.50**
13	**Density**	**1.51**	**1.63**	**1.55**	**1.61**	**1.45**











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An Assessment of Water Sample for its Physico-Chemical Parameters of Umarkhed Tahsil, District Yavatmal (MH)

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Abstracts

Study of physico chemical parameter of water is very important to get exact idea about the quality of water and we can compare results of different physico-chemical parameter values with standard values and show present status of water.The Physico-Chemical parameter like pH, EC, TDS, Alkalinity, Mg&Ca have been analyzed.

The range of pH of water sample was found that 7.5-8.6.The range of EC was 354-642.TDS of tap water was law as compare to hand pump &Borewell water. Alkalinity varies between 135-565.Concentretion of Mg was found slight high in borewell water and Concentration of Ca was found in an average range.

***Key words**:Physico-chemical parameters, Tap water, Hand Pump, Borewell Umarkhed Tahashil.*

Introduction

Water is one of the most important and abundant compounds of the ecosystem.Groundwater is an important source of drinking water supply throughout the world[1-2] Urbanization and the unregulated growth of the population have altered the surface and sub-surface terrains of the many areas. Changes in local topography and drainage system directly affect both quality and quantity of the ground water. Groundwater quality depends on the quality of recharged water, atmospheric precipitation, inland surface water and sub-surface geochemical processes.[3]

As per WHO, any change in the physical, chemical and biological properties of water that has a harmful effect on living things is termed as water pollution. Rapid growth of population, urbanization and industrialization exerts pressure on water resources and unregulated or illegal discharge of effluents results in water pollution.The quality of water is characterized by a range of physical, chemical and biological parameters, which arise from a variety of natural and human influences.[4-7]

The quality of ground water depends on various chemical constituents and their concentration, So Study of physico-chemical parameter of water is very important to get exact idea about the quality of water and we can compare results of different physico-chemical parameter values with standard values and show present status of water.

Material And Methods

Study Area

The Six Water sample were collected in January month. The S1 and S2 sample were collected from tap water, S3 and S4 sample from hand pump and S5,S6 fromBorewell in UmarkhedTahsil in Yavatmal District of Maharashtra State, India; which is shown in Fig.-1. It belongs to Vidarbha RegionAmravati Division, The sources of drinking water for this area is Municipal tube water system,Bore well water, well water,and dam water.

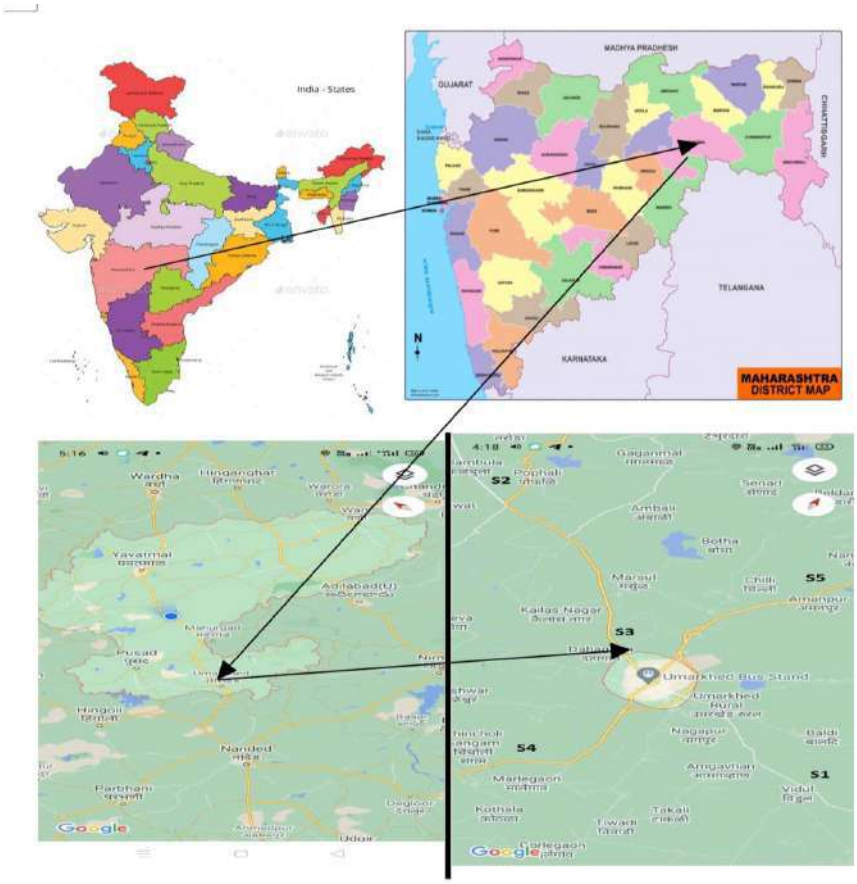


Figure1:-Map of Study area Umarkhed Tehsil

Sample Collection

Six samples were collected randomly from the study areaUmarkhedTahsil in Yavatmal District of Maharashtra State, India in the month of January 2022. Water sample ware collected in sterilized plastic bottle. Water sample were collected from following Source-

Sample-1 collected from Tap Water.
Sample-2 collected from Tap Water.
Sample-3 collected from Hand Pump.
Sample-4 collected from Hand Pump
Sample-5 collected from Bore well
Sample-6 collected from Bore well

Physicochemical Analysis of Water Samples

The Water sample ware collected in sterilized plastic bottle.Methods use for estimation of various parameters is as fallows, like Determination of, pH by Digital pH Meter, EC by Conductometer, TDS by TDS meter,Alkalinity , Mg and Ca, by Titration Method.

Result And Discussion

pH

The rangee of pH is found in between 7.5 – 8.140. The sample S4,S6 are slightly alkaline sample as compare toS1,S2,S3,S5 soil sample which is in medium alkaline nature.

Electric Conductance

Electric Conductivity were recorded in the range of 345 – 642 The watersample S5,S6 show high EC as compare to other sample.

TDS

TDS were recorded in the range of 220-660 The TDS was found that in water sample S1,S2 low as compare to other and it is seen in the sequence S2<S1<S5<S3<S4<S5.

Alkalinity

Alkalinity ware recorded in the range of 135-565. The water sample S1 and S2Showlow alkalinity it is seen in the sequence S2<S1<S6<S5<S3<S4

Magnesium

Magnesium content in the Water sample rangedbetween 10 – 35. The Water sampleS1has low and S4 hasmore concentration of Mg as compared to other samples.

Calcium

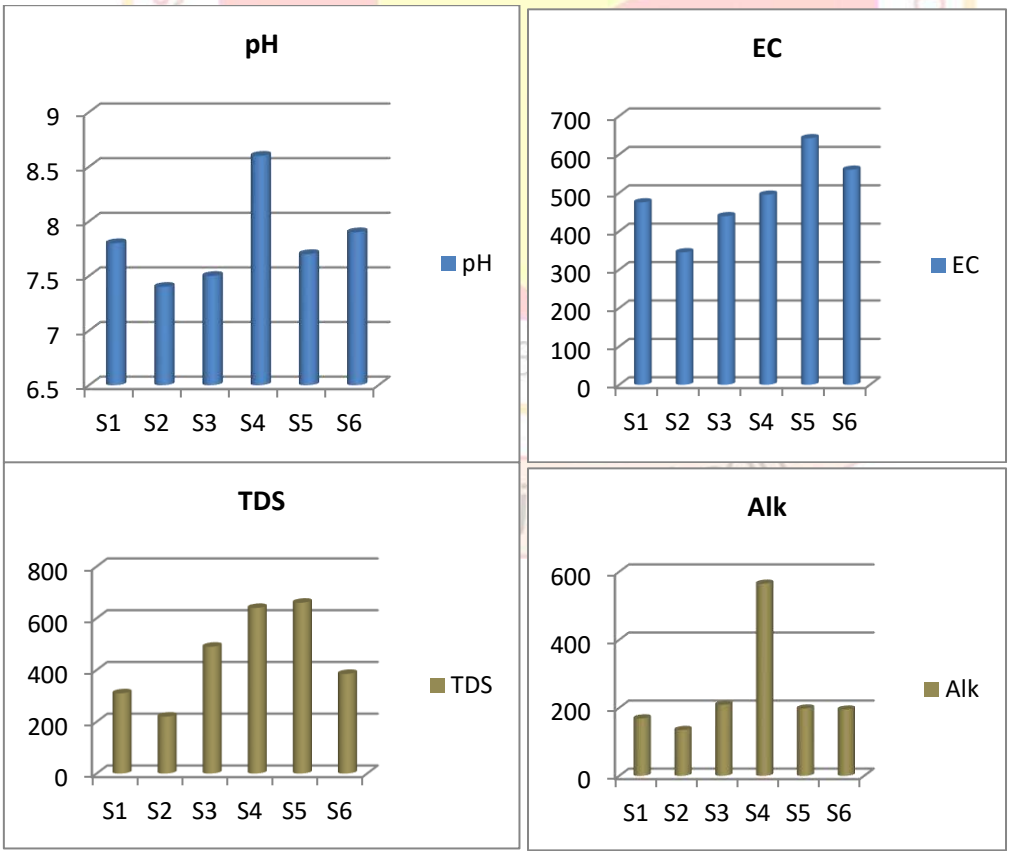
Calcium content in the Water sample ranged between 35 – 64. The Water sample S3 has low and S4 has more concentration of Ca as compared to other samples.

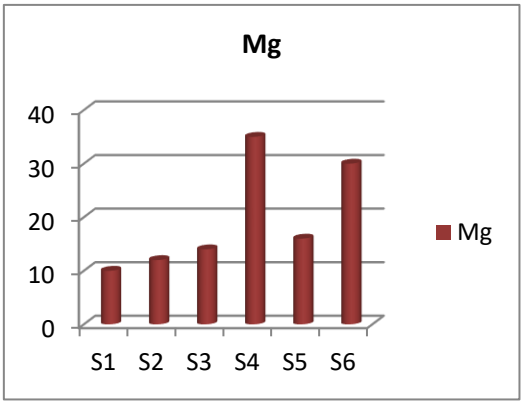
Conclusion

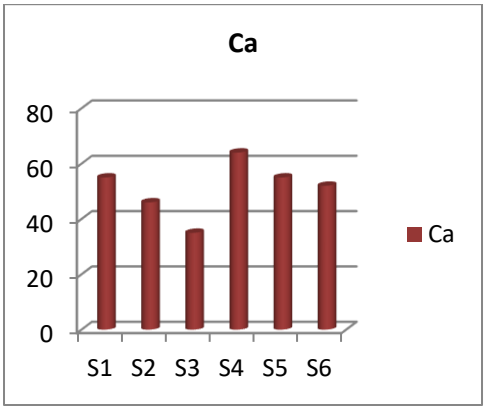
The physico chemical analysis of Water provides necessary information about quality of drinking water which gave idea to set the target of water treatment. The water samples are slightly alkalineand the pH is in S2<S3<S5<S1<S6<S4 order hence do not require special treatment to control pH.TDS of water is the most important properties to measure the quality of water and affected by other parameter like Hardness, EC, Alkalinity of water sample.

Table 1 :Physico chemical parameters of Water samples

Sample	S1	S2	S3	S4	S5	S6
pH	7.8	7.4	7.5	8.6	7.7	**7.9**
EC	475	345	439	495	642	**560**
TDS	310	220	490	640	660	**385**
Alk	169	135	209	565	198	**195**
Mg	10	12	14	35	16	**30**
Ca	**55**	**46**	**35**	**64**	**55**	**52**







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Induced frequency of chlorophyll chimeras in M_1 generation of kidney bean

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Abstract

Healthy and dwell dried seeds of kidney bean (Phaseolus vulgaris L.) were treated with various doses of chemical mutagens EMS and SA. The treated seeds were sown to raise the M_1 generation following randomized block design. The M_1 generation was screened for various chlorophyll chimeras. The plants carrying chlorophyll chimeras were counted and frequency of chlorophyll chimeras was determined.

Key Words: *Kidney bean, EMS, SA, chlorophyll chimeras*

Introduction

Kidney bean botanically described as *Phaseolus vulgaris* L. It is also called as haricot bean, common bean and navy bean (Singh, 1999; Pandey 2003). It comprises a good source of protein and also contains large quantities of complex carbohydrates, fibers and isoflavonoids (Anderson *et al.*, 1999). Mutagenesis is simple, relatively cheap to perform, applicable to all plant species and equally usable on small and large scale and therefore used to induce genetic variability in a great number of crops (Swaminathan 1995; Siddiqui and Khan, 1999). The objective of present studies was to study the effect of Ethyl methanesulphonate and Sodium azide on induction of chlorophyll chimeras in M_1 generation of kidney bean.

Materials And Methods

Healthy and uniform seeds of kidney bean variety HPR-35 were surface sterilized with 0.1% mercuric chloride solution for about one minute and washed thoroughly with distilled water. The seeds were presoaked in distilled water for 6 hours. Then seeds were later immersed in the mutagenic solution for 5 hours and treatment was given with intermittent shaking. All the treatments were given at room temperature of 25±2 °C. Seeds soaked in distilled water for 13 hours served as control. The different concentrations used for chemical mutagenic treatment were 0.05%, 0.10% and 0.15% for Ethyl methanesulphonate and 0.01%, 0.015% and 0.02% in case of Sodium azide. Immediately after the completion of treatment, the seeds were washed thoroughly under running tap water to remove excess of mutagens. Later on treated seeds were post soaked in distilled water for 2 hours. The post soaked seeds were dried in folds of filter paper. 360 seeds were used for each treatment, 60 seeds from each treatment were kept on moist blotting paper in petriplates to record germination percentage. Remaining 300 seeds of each treatment were sown in the field following randomized block design (RBD) with three replications each. M_1 generation was thoroughly screened for induced chlorophyll chimeras. Plants carrying chlorophyll chimeras were counted. Frequency of chlorophyll chimeras was determined.

Results And Discussion

Different types of chlorophyll chimeras were observed in mutagenic population. The chlorophyll chimeras could be detected in all the treatments. The different types of chlorophyll chimeras observed were *xantha* (yellow), *chlorina* (yellow green) and *viridis* (dull green). Among all concentrations the highest frequency of the various types of concentration the highest chlorophyll chimeras was observed in 0.15% concentration. And very least number of chlorophyll chimeras could be recorded in 0.10% concentration.

In present investigation three types of chlorophyll chimeras were noted sin M_1 generation of kidney bean after mutagenic treatments. Frequency of such chlorophyll chimeras was more at higher concentration. Motto *et al.*, (1975) also reported chlorophyll chimeras in kidney bean after EMS treatments. According to Gaul (1958) differential response of the embryonic cells to mutagen causes chimerism.

Table-1: Effect of mutagens on frequency of plants carrying chlorophyll chimeras in M_1 generation of kidney bean variety HPR 35.

Sr. No.	Treatment	Frequency of plants carrying chlorophyll chimeras (%)	± SE
1	**Control**	**-----**	**-----**
2	**0.05%**	8.00	3.0
3	**0.10%**	05.00	2.8
4	**0.15%**	16.00	0.3

Conclusion

Both the mutagens EMS and SA were effective in inducing chlorophyll chimeras in kidney bean at all concentration treatments with varied frequencies.

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Comparative Study On Total Dissolved Solids (Tds) Of Groundwater Of Arni Town, District-Yavatmal (Ms) India For Period Of 2 Year During Covid-19 Pandemic

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Abstract-

Water is life. Groundwater is considered as purest and majorly available source of water. It is used to fulfill 50% urban and 80% ruler water demand in India besides irrigation. Total Dissolved Solids, also known as TDS, are inorganic compounds that are found in water such as salts, heavy metals and some traces of organic compounds that are dissolve in water. Total dissolved solids (TDS) are a measure of the combined total of organic and inorganic substances contained in a liquid. This includes anything present in water other than the pure H_2O molecules. These solids are primarily minerals, salts, and organic matter that can be a general indicator of water quality. Arni is a town (Taluka) with (Administrative Division) & Tahsil in Yavatmal district of Maharashtra State in India. As groundwater is prominently used to fulfill domestic demands hence quality of groundwater must be checked time to time in order to supply safe drinking water. In this paper, one attempt has been made to study of variation in total dissolved solids of water of Arni Town, District-Yavatmal (MS) India over a period of 2 year during covid-19 pandemic.

Keyword- *total dissolved solids, groundwater, variation in total dissolved solids of water of Arni Town, District-Yavatmal (MS) India, period of 2 year during covid-19 pandemic.*

Introduction-

Water is colourless, odourless and transparent substance. Water is the important, precious and indispensable natural resources of the earth, covering approximately three-forth of the earth surface. Water is life. Water is an essential element of human being. Approximately 60-65% of human body is composed of water (1). Groundwater has excellent natural quality, usually free from pathogens, color and turbidity and can be consume directly without treatment. It does not require large storage, treatment and distribution system, can be frequently developed incrementally at point near water demand. Generally, groundwater is mostly chemically and microbiologically non-polluted so it is safe for drinking and cooking in addition to agriculture or industrial use. Groundwater is used to irrigate around two fifth of India's total agricultural land. Groundwater is considered as purest and majorly available source of water. It is used to fulfill 50% urban and 80% ruler water demand in India besides irrigation (2).

Total Dissolved Solids, also known as TDS are inorganic compounds that are found in water such as salts, heavy metals and some traces of organic compounds that are dissolve in water. Excluding the organic matters that are sometimes naturally present in water and the environment, some of these compounds or substances can be essential in life. But, it can be harmful when taken more than the desired amount needed by the body. The total dissolved solids present in water are one of the leading causes of turbidity and sediments in drinking water. When left unfiltered, total dissolved solids can be the cause of various diseases.

Arni is a town (Taluka) with (Administrative Division) & Tahsil in Yavatmal district of Maharashtra State in India. It is situated on the banks of the Arunavati River. It Connected with National Highway-361. Nearest Railway Station is a Dhamangaon which is located 90 km approximately & Nearest Airport is a Dr. Babasaheb Ambedkar International Airport, Nagpur is around 187 km from Arni. Location of Arni in Maharashtra, India Coordinates: 20°07′40″N 77°55′39″E. In Arni town, main source of drinking water is groundwater. As groundwater is prominently used to fulfill domestic demands hence quality of groundwater must be checked time to time in order to supply safe drinking water (3).

In this paper, one attempt has been made to study of variation in total dissolved solids of water of Arni Town, District-Yavatmal (MS) India over a period of 2 year during covid-19 pandemic.

Methodology – Water samples were collected from different location of Arni town during investigation period of June 2020 to May 2021. Sample is collected in polyethylene bottle. Within 10 minute total hardness is measured. For measurement of hardness of the sample, used Tds meter whose details are as follows:

Brand	: HM
Model Number	: AP-1
Type	: Digital
Range	: 0-5000 ppm
Temperature Range	: -5+50 degree C degree C
Accuracy	: +-2%
Battery Life	: 1000
Power Features	

Power Requirement : 3v

Dimensions
Width : 3 cm
Height : 15 cm
Weight : 0.1 kg
Manufacturer : HM DIGITAL PVT LTD SOUTH KOREA
Importer : HM DIGITAL INDIA PVT LTD DELHI

Source-www.Flipkart.com

For the study purpose, we had selected six different groundwater sources of Arni. Water samples are collected every month and Tds is measured with the help of digital Tds meter. Following table shows details of the water sample source:

Sr. No.	Sample	Area of sample	Groundwater source	Depth
1.	Sample 1	Madhav Nagar	Borewell	125 ft
2.	Sample 2	Old Tahsil Area	Borewell	100 ft
3.	Sample 3	Datta Nagar	Borewell	125 ft
4.	Sample 4	Mathura Nagar	Borewell	110 ft
5.	Sample 5	Sambhaji Nagar	Borewell	150 ft
6.	Sample 6	Swami Samarth Nagar	Borewell	200 ft

Following table shows Tds of different samples under study-

Sr. No.	Month	Sample 1 TDS (in ppm)	Sample 2 TDS(in ppm)	Sample 3 TDS (in ppm)	Sample 4 TDS (in ppm)	Sample 5 TDS (in ppm)	Sample 6 TDS (in ppm)
1	March 2019	565	833	681	503	484	363
	June 2020	545	803	621	453	444	343
2	April 2019	568	890	658	536	580	380
	July 2020	535	800	566	485	526	406
3	May 2019	555	790	690	594	520	394
	August 2020	511	721	620	522	499	394
4	June 2019	634	750	620	520	603	406
	September 2020	604	720	598	499	600	410
5	July 2019	675	843	540	497	637	396
	October 2020	500	705	510	506	605	346
6	August 2019	605	867	530	457	702	384
	November 2020	611	854	524	455	600	400
7	September 2019	535	830	526	502	664	419
	December 2020	505	730	476	456	624	401
8	October 2019	528	750	495	535	634	399
	January 2021	508	700	455	505	604	319
9	November 2019	528	651	510	504	558	409
	February 2021	508	601	500	458	498	380
10	December 2019	480	608	504	507	512	320
	March 2021	508	600	413	503	495	312
11	January 2020	402	605	470	498	375	377
	April 2021	431	522	355	500	446	301
12	February 2020	407	600	431	436	325	309
	May 2021	400	565	421	411	380	396

According to World Health Organization (WHO) and Bureau of Indian Standard some parameter are as follows:

Sr. No.	Water quality parameter	Bureau of Indian Standard (IS-10500:1994)	WHO International Standard (1983)
1.	pH	6.5-8.5	7.0-8.5
2.	Total Dissolved solids (ppm)	500-2000	500
3.	Total hardness (ppm)	300-600	100

TDS- The mineral constituents dissolved in water constitute total dissolved solids. The concentration of dissolved solids in natural water is usually <500 ppm while water with more than 500 ppm is undesirable for drinking and industrial use. It is reported that TDS value of 500 ppm is desirable limit and 2000 ppm is the maximum permissible limit and that water containing more than 500 ppm of TDS causes gastrointestinal irrigation (4). High value of TDS influences taste, hardness and corrosive property of water (5, 6). Drinking water should contain sufficient minerals to keep you healthy and should not contain excess minerals that become overloaded in the body. In this article, we will provide details about the acceptable minimum and maximum TDS (Total dissolved solids) Limits for drinking water.

Variation in hardness and minimum, maximum hardness of sample over a period of 2 year during covid-19 pandemic are summarized in the following table:

Sr. No.	Sample	Maximum TDS		Minimum TDS		TDS Range (in ppm)	Variation in TDS (Max.-Min)		Average TDS variation Range in ppm	
		Before Covid-19	In Covid-19	Before Covid-19	In Covid-19		Before Covid-19	In Covid-19		
1.	Sample 1	675	611	402	400	400-675	63	2	9-78	2-78
2.	Sample 2	890	854	600	522	522-890	36	78		
3.	Sample 3	690	621	431	355	355-690	69	77		
4.	Sample 4	594	522	436	411	411-594	72	25		
5.	Sample 5	702	624	325	380	325-702	78	55		
6.	Sample 6	419	410	309	301	301-419	9	8		

Conclusion-

From the variation of hardness table over a period of 2 year during covid-19 pandemic it is observed that the minimum TDS of groundwater Arni city is 301 ppm and maximum is 890 ppm. In period of covid-19 pandemic Tds is found to be decreases by 100-200 ppm. Average TDS variation Range of groundwater arni is found to be same. These samples Tds range have acceptable value according to Bureau of Indian Standard (IS-10500:1994) which has range 500-2000 ppm. Sample which has value below 500 ppm which has acceptable value according to WHO International Standard (1983). TDS range of groundwater in Arni city is found to be acceptable and fair over a period of 2 year during covid-19 pandemic.

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Assesment of Plastic pollution awareness and impact of Plastic Pollution on Environment among peoples

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Abstract-

Plastic pollution has become one of the biggest environmental issues. Understanding the knowledge and attitudes of peoples about plastic pollution and its impact on Environment is very important to battle against plastic pollution. This study set out to investigate knowledge and attitudes towards plastic pollution awareness. This was a mixed study approach, where both qualitative and quantitative data were derived. Data were collected using a questionnaire asking about participants' plastic pollution knowledge, behaviors, and opinions about plastic usage. Data collected from group discussion and interviews gives idea about peoples knowledge about environmental impact of Plastic pollution and plastic waste management. The majority of participants understood how harmful plastic pollution is to the environment. Our results revealed that participants' knowledge and awareness were at high levels about plastic pollution. The most common current actions toward reduction in plastic pollution reuse, reduce, recycle, educate and replacement of plastic with sustainable alternatives

Keywords- Plastic pollution, awareness, plastic waste management, reuse, recycling of Plastic.

Introduction

Plastic waste arises from our homes and offices to dustbins, landfills and bodies of water, causing contamination. Plastic pollution is the accumulation of plastic objects and particles in the Earth's environment that adversely affects humans, wildlife and their habitat Plastics come in a variety of shapes and sizes, and they are commonly used in our everyday lives. Today, it's difficult to find a substance that isn't made of plastic. Plastics are inexpensive, simple to manufacture, and extremely durable and very adaptable for different uses. Due to these qualities of plasic manufacturers choose to use plastic over other materials.

There are three major forms of plastic that contribute to plastic pollution: micro-, macro-, and mega-plastics. Plastic pollution has also greatly negatively affected our environment. "The pollution is significant and widespread, with plastic debris found on even the most remote areas. Plastic pollution on land poses a threat to the plants and animals – including humans who are based on the land. Plastic pollution has several negative effects on our climate, but the three most important are air pollution, water pollution, ocean pollution, land pollution and food pollution.

For the sake of health and the environment, it is important to properly dispose of such plastic waste and to reduce its widespread use.

Need of present study

Plastic pollution is a major global issue aries from last few decades. Plastic pollution really requires a global and comprehensive solution . There is need to rethink about production, usage and plastic waste management system. Increasing awareness about plastic pollution is important in todays situation. Many peoples are not much aware about the Plastic pollution and Plastic pollution management. So present study is the attempt to find out awareness of peoples towards Plastic pollution and Plastic waste management and impacts of plastic pollution on environment..

Objectives of research

To find the knowledge of peoples about Plastic Pollution.
To find the knowledge of peoples about impact of Plastic Pollution on environment.
To find the peoples attitude towards Plastic waste management.

Material and method:-

The purpose of present paper was to study Plastic Pollution and Plastic waste management awareness among peoples. For this random sample of 100 peoples of different sex, different age group and different educational qualification were selected. The area which is selected to study Plastic Pollution awareness is mainly restricted to Pandharkawada dist Yavatmal Maharashtra. This was a mix study approch. Collection of data was done through self developed questioner, group discussion and interviews of different age group peoples. Both qualitative and quantitative data was colected. Self developed questioner is mainly consist of questions about knowledge of peoples about use of plastic, Plastic Pollution, impact of Plastic Pollution on environment and peoples attitude towards Plastic waste management. Raw data is collected and after processing

data final conclusions are drawn. Questioner consist of questions having answers in rating scale and yes/no type questions.

Results and discussion-

Demographic Details of Respondents.

The demographic details regarding age, gender, highest level of education were collected from the respondents and they are as given below

Table 1

Age Group	No. of respondres	Percentage
18-28	67	67 %
29-38	14	14 %
39-48	13	13 %
49-58	06	06 %
Male	56	56 %
Female	44	44 %
Education of the respondents		
Below Graduation	11	11 %
Graduation or pursuing graduation	73	73 %
Post Graduation and above	16	16 %

In present study 94 % of study participants responded plastics causes the pollution to environment. 0 % responders respond that plastic will not cause pollution and 6 % responded that they don't know about plastic causing pollution to environment.

Table 2

According to responders the main source of plastic pollution are

Food Wrappers & Containers	**26 %**
Bottle & Container Caps	22 %
Plastic Bags	20 %
Plastic cups and Plates	11 %
Takeout Containers	09 %
Straws and Stirrers	05 %
Toys	04 %
other	03 %

Table 3

Number of participant aware about different types of pollution caused by Plastic waste are as follows

Air Pollution	**92 %**
Water Pollution	84 %
Soil Pollution	73 %
Marine Water Pollution	39 %
E Pollution	32 %

85 % participants responded burning of plastic will cause lung problem and 15 % were not aware about that. Among the study participants 73 % participants replied plastic can cause cancer, and 27 % were not aware about that. 64 % participants answered plastic using in food package will cause health problem and 10 % are not agreed with packing of food in plastic causing any health hazards. 26 % were not aware about packing of food in plastic causing any health hazards.

Number of participant responded to following options to control Plastic Pollution

Table 4

Recycle when possible	**43 %**
Use alternative packaging	07 %
Avoid single-use plastics	21 %
Find reusable options	11 %
Carry own cloth bag to market	18 %

From group discussion and interviews of responders following information is collected

Responders are aware about following impacts of Plastic Pollution such as Plastic Pollution disturbs the natural ecosystem, it disturbs the food chain, it affects the water supply. Plastic Pollution can be harmful to human health, It is harmful to animals and Clearing areas of plastic waste is difficult and expensive. From study it is observed that many responders have no clear idea about plastic waste management and recycling of plastic.

Findings –

From the study following major findings are obtained about Plastic Pouution

- Many responders were well known about plastic pollution and its impact on Environment.
- Awareness about Plastic waste management yet not properly developed among the responders.
- They are unknown about proper Plastic waste management and recycling of Plastic waste.
- As compared to air , water and soil pollution caused by Plastic, many responders are unknown about the impact of Plastic pollution on marine pollution and E pollution.
- Responders are familiar to adverse health effect of pastic on human health.
- Many Responders are well known about Reduce and Reuse of Plastic abut the are not much aware about recycling of pastic.

Conclusion -

Present paper highlights the plastic pollution and its impact on Environment among 100 peoples of different sex, different age group. It focus on Present condition of plastic pollution awareness, From the findings which are obtained about plastic pollution and its impact on Environment it is observed that Many responders were well known about plastic pollution and its impact on Environment. Many Responders are well known about Reduce and Reuse of Plastic abut the are not much aware about recycling of pastic. Peoples are unknown to many environmental consequences of plastic pollution. So there is a need of proper education to make aware peoples about plastic pollution and its impact on Environment. Reduce , Reuse, Recycle and Educate are the best ways to control the plastic polltion.

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Study of Water Quality Parameters of Pimpalkhuti Dam in TalukaRalegaon, District-Yavatmal

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Abstract:

Water resources are essential and equally important for natural eco system and human development. All eco system on earth depends on the water. Fresh water is finite, critical, renewable, vulnerable the resource on the earth plays as important role in living environment without its life is impossible. Thepresent study is focus on the determination of Physico- chemical parameter such as hardness, chlorides, alkalinity, DO, BOD, COD, temperature, pH, TDS, phosphate, and sulphate of water sample. Where analyzed for periods of twelve months from 1st February 2021 to 31st January 2022. All parameter where within the permissible limits. The result indicates that the corresponding dam is non-polluted and can be used for irrigation, fishculture, and domestic purpose.

***Keywords**: Physico- chemical parameters, permissible limits, living environment.*

Introduction:

Water is most indispensable requirements for all living organism. Unsafe drinking water is one of the main concerns in developing countries. In order to deal with this problem, physico- chemical parameters were determined in order to identify the contamination problems and suggest appropriate solution. The good quality of water is essential for living organism. The quality of water can be assessed by studying its physical and chemical characteristic. Because of vast population[1] highly used fertilizers[2], pesticides, insecticides, and negligence of human being [3], the quality of water is being deteriorated day by day. Regarding the quality of drinking water, microbiological contamination is primary concern of developing countries[4]. In addition, inorganic contaminants[5], concerning both health and aesthetic aspect can be present in the water. Fluoride and arsenic are a great health problem worldwide [6,7].The natural aquatic resources are causing heavy and varied pollution in aquatic environment leading to water quality and depletion of aquatic Biota. It is there for necessary that the quality of drinking water should be checked at regular time interval because due to use of contaminated drinking water. In present study includes the analysis of water quality in terms of physico- chemical parameters of Pimpalkhutidam talukaralegaon district,Yavatmal (Maharashtra). The dam water is basically used for Domestic, Agriculture purpose, Fisheries activity and Various Animal water drinking purpose. In Yavatmal region still now several researchers have done study on physicochemical parameters of various water resources [8, 9, 10].

Materials and Methods:

Surface water sample were collected from pimpalkhutidam. Water sample from all site were collected in sterile glass bottles in the morning Hours between 9 to 11 am, regularly for every month, brought to the laboratory, processed within 1-3 hrs for the estimation of various physico- chemical parameters like water temperature, pH, and Total Dissolved Solids were recorded at the time of sample collection by using Thermometer, pocket Digital pH meter and pocket Digital TDS meter. Transparency was measured with the help of Secchi Disc. While other parameters such as DO, Free CO_2, Hardness, Chlorides, Alkanity, Phosphate and Nitrate were estimated in the laboratory.

Result and Discussion: The monthly variation in physico-chemical parameters are represented in following table

Months	Temperature ^{0}C	TDS	pH	Turbidity NTU	Total Hardness mg/l
January	24	722	7.8	9.40	81.0
February	24.5	701	8.1	11.90	90.5
March	27	648	8.3	11.93	160
April	27	645	8.3	11.92	160
May	27.5	652	8.4	11.02	157
June	25	958	8.0	10.5	150
July	25.5	965	7.3	1.35	73

August	25	961	7.2	2.3	84
September	25.5	940	7.1	2.2	100
October	24.5	810	7.2	0.5	67
November	23.5	760	7.5	1.45	106
December	23.5	743	7.6	1.90	83

Table No. 2

Months	DO	Free Co_2 mg/l	Chloride	Alkalinity	Transparency Cm
January	8.90	0.0	42.32	118.25	14.3
February	9.10	0.0	33.08	122.50	6.9
March	12.32	0.0	42.06	182.50	6.8
April	15.5	0.0	55.08	160.25	6.6
May	15.4	3.5	55.59	205	6.7
June	12.08	7.6	41.18	169.0	9.4
July	10.02	8.4	43.32	153.25	60.1
August	9.08	7.3	48.59	191.0	61.4
September	9.15	21.0	37.12	192.0	57.2
October	7.96	15.7	41.09	173.25	92.0
November	6.55	25.3	43.57	150.50	92.4
December	6.40	25.3	47.61	141.25	66.25

Water Temperature:

Water temperature can exert great control over aquatic communities. Temperature of water may not be as important in pure water, but in polluted water, temperature can have profound effects on dissolved oxygen (DO) and biological oxygen demand (BOD). The fluctuation in dam water temperature usually depends on the season and sampling time. In this present study of the water temperature ranges from 23.5 ^{0}C to 27.5^{0}C. The maximum (27.5 ^{0}C) temperature was recorded in the month of May (summer) and minimum (23.5 ^{0}C) in the month of December (winter). It shows that higher temperature in summer and relatively lowers in winter. Similar study has done at Kapileshwar Dam AshtiDist- Wardha [11], observed that water temperature was high during summer season due to low water level, and clear atmosphere.

Total Dissolved Solid (TDS): The TDS in water consist of inorganic salts of calcium, magnesium, sodium etc. Small amount of organic matter and dissolved material present in the water. In this study TDS fluctuate from 645 ppm to 965 ppm. The maximum value of TDS was found to be 965 ppm in the month of July. It is due to heavy rainfall in rainy season and the minimum value of TDS 645 ppm was recorded in the month of April. Similar result reported by IoryueIjah Silas et al [12]

pH: The pH is an indicator of the existence of biological life. The pH of dam water was found to alkaline character throughout the study period. Were most of the water samples collected in different months of the year, tested in the present study were found to be in permissible range of pH value recommended by several health and pollution control organization eg. WHO, (the permissible value of pH is 6.5 to 8.5). The maximum pH value (8.4) was recorded in the month of May (summer season) and minimum pH value (7.1) was recorded in the month of September. pH of water directly affect the biochemical and chemical reaction as well as pH of water is increased by reducing the percentage of $Co_2$and biocarbonate which is happened due to photosynthetic activities. Apart from above some other factors such as air and temperature bring about changes the pH of water. K. Bheemappa et al [13] reported that the maximum value of pH was found in pre- monsoon season.

Turbidity: Turbidity may be due to the organic or inorganic constituents. The turbidity of water fluctuates from 0.5 NTU to 11.93 NTU during the year. The maximum values (11.93 NTU) was recorded in month of March

(summer) it is mainly due to the decrease in the water level and suspended particulate matter and minimum value of turbidity (0.5 NTU) was founded in the month of October.

Total Hardness: The amount of dissolved salts of calcium and magnesium in the water is generally known as hardness of water. Hardness of water is an important consideration to determining the suitability of water for industrial and domestic uses. The value of the hardness fluctuates from 67 mg/l to 160 mg/l. the maximum value (160 mg/l) was recorded in the month of March to April (summer) and minimum value (67 mg/l) in the month of October. Similar result were reported by H. V. Vyas and V. A. Sawant [14]

Dissolve oxygen (DO): Thedissolved oxygen content is essential for aquatic life. Its deficiency directly affects the ecosystem of dam or river low dissolved oxygen (less than 2 mg/l) would indicate poor water quality. The value of DO is generally average from 6.40 mg/l to 15.5 mg/l.

The maximum values of DO (15.5 mg/l) was recorded in month of April (summer) and minimum values of DO (6.40 mg/l) was recorded in month of December (winter).

Free CO_2: The value of free CO_2 ranges from 0.0 mg/l to 25.3 mg/l. The maximum value (25.3 mg/l) was found in the month of November to December (winter) and minimum value (0.0 mg/l) was found in the month of January to April.

Chloride: The value of chloride ranges from 33.08 mg/l to 55.59 mg/l. The maximum value (55.59 mg/l) was found to be in the month of May (summer) and the minimum value (33.08 mg/l) in the month of February.

Alkalinity: Due to increase in the percentage of bicarbonates in the month of March to May (summer) alkalinity was found to be maximum. Total alkalinity ranges from 118.25 mg/l to 205 mg/l. The highest value of alkalinity (205 mg/l) was recorded in the month of May (summer) and lowest value of alkalinity (118.25 mg/l) in the month of January (winter).

Transparency: Transparency of water fluctuates from 6.6 cm to 92.4 cm. The maximum water transparency 92.4 cm was recorded in the month of November (winter) and minimum 6.6 cm in the month of April (summer).Similar result were reported by Rachel M. Pilla et al [15]

Conclusion:

The thermal decomposition of the complexes is not simple and involves different stage decomposition. It is assumed that dehydration of the complexes containing water occurs within an active reaction interface. The compensation effect of thermal decomposition of the complexes indicating the change of sample mass on the estimated values of activation energy. The structural changes of all complexes have marked effect on the sensitivity and sensitivity varies with organisms.

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Study of Some Chemical Parameters of Water From Shahanoor Dam.

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Abstract-
Water is the most important or vital factor for the existence of all living organisms. Reservoirs are also the main sources of drinking water supply. Man has used water bodies as most convenient and cheapest refuse disposal system for domestic and industrial waste which leads to pollution. So its necessary to know chemical parameter of the water. In the present investigation chemical parameters of water from shahanoor dam was studied to assess the quality of water for, irrigation, fishing, industrial processing and so on. In the present study an attempt has been made to detect the Ph, Alkalinity and Acidity , Conductivity, Dissolved Oxygen, Carbon-di-oxide, Hardness, Calcium, Phosphate, Nitrate, Fluoride etc. water samples were collected per season from Shahanoor dam. Samples were analysed regularly for 3 years in the laboratory from Jan. 2011 to Dec. 2013. The observations were recorded. The pH turbidity were recorded at the site. All the chemical parameters of the dam are within permissible limit of World Health Organization (WHO) standards. This means chemical status of the dam is suitable for biodiversity of life. It showed that there are some, physical, chemical and biological processes which self-purify the dam.
Keywords- Shahanoor dam, Chemical Parameters, Oxygen, Carbon-di-oxide, Hardness, Calcium, Phosphate, Nitrate, Fluoride.

Introduction-

Human activities have the great impact on the environment, ecosystems, and economical sensitive areas. Medudhula. T. *et. al*. (2012). Environmental monitoring studies provided the information about any damage to the ecosystem. Harney, N. V., et. al. (2013). It assesses how affected ecosystems changes over time and thus determine the best means of prevention. Hulyal, S.B. (2011),

Environmental monitoring describes methods and processes to monitor the quality of the environment. It provides information about changes in structure and function of ecosystems which can be used in environmental protection or management, as well as in many circumstances in which human activities carry a risk of harmful effects on the natural environment. Ahangar I. A. *et. al*. (2012). From ancient time, civilizations depend on fresh water bodies like lakes, reservoirs, rivers and wetlands. Fresh water is essential not only to sustain human life but also to support the activities that form the basis for thriving economies. At the same time water resources are essential to human societies and the activities of these societies can pollute and degrade water resources. Barot C. , et. al. (2014). Water has unique property of dissolving large amount of substances in it. (Choudhari, 1995) This property of water brings about changes in its physical as well as chemical properties and ultimately the pollution. (Kaushik and Saksena 1999) It has long been recognized that regular monitoring of the physical, chemical and biological parameters characterizing water quality in river, lakes and reservoirs used for water supply is essential for protecting public health and assuring the long term reliability of these substances. (Banerjee, K., *et. al*. (2006).

Freshwater becomes a critical natural resource due to number of reasons . India receives about 1400-1800 mm of rainfall annually. It is estimated that the 85% of water is used for agriculture ,10% for industries and 5% for domestic use. Analysis conducted in 1982 revealed that about 70% of all available water in our country is polluted. (Chandrashekhar and Kodarkar, 1996) Dams are the major part of freshwater resources. A dam is manmade reservoir have been constructed for irrigational needs ,drinking purposes ,industrial and domestic use etc. Gopalkrishna, M.H. (2011).

Shahanoor dam selected in the present study is situated at a site nearly 10 km towards North-West from Achalpur Tahsil and 85 km from Amravati. It is build up on the Shahanoor river. It is an earthen dam with 6.9 km length and is situated in the midst of Satpuda hills.

Aquatic pollution thus brought about by human activities causing alteration in the chemical properties of water. APHA (1998). Water get polluted due to the discharge of chemical water pollutants such as mercury from mining activity, certain nitrogen compounds used in agriculture and chlorinated organic compounds arising from sewage water treatment plants. (Richardson *et al.* 2007) There for evaluation of physico-chemical parameters of water is essential to assess the quality of water for, irrigation, fishing, industrial processing and so on. (Rajgopal *et al.*,2010)

Chemical Paramaters -

Ph, Alkalinity and Acidity -

Alkalinity, acidity and buffering capacity are the important characteristics of water. pH is defined as the intensity of acidic or basic characters of a solution. pH of water affects its suitability for biota and also influence chemical reactions. Bade, B. B., *et. al.* (2009)**.** The largest variety of freshwater aquatic organisms prefer a pH range between 6.5 to 8.0.

- **Conductivity :**

Conductivity is a measure of a solution such as water of lake, dam or stream to pass an electric current. This is an indicator of dissolved electrocytes ions in the water.

- **Dissolved Oxygen :**

The presence of dissolved oxygen is essential to maintain the higher forms of biological life and to keep the proper balance of various populations thus making the water body healthy.

- **Carbon-di-oxide :**

Free carbon-di-oxide in the waters accumulates duo to microbial activity and respiration. This impart the acidity to the water because of the formation of carbonic acid. In an aquatic ecosystem sources of CO2 are commonly respiration and decomposition.

- **Hardness :**

Hardness is the property of water which prevents the lather formation with soap and increases the boiling point of waters. The major cautions imparting hardness are calcium and magnesium. Ecologically temporary hardness plays a key role in buffering capacity and this has a great effect on biotic diversity and biomass in an ecosystem

- **Calcium :**

Calcium is one of the most abundant elements found in the natural water. It is an important ion in imparting the hardness to the waters. At high pH much of its quantity get precipited as caco3.

- **Phosphate :**

The phosphates is generally considered as the critical nutrient for the growth of algae in water. The enrichment of this nutrient leads to the process of eutrophication. The most important sources of phosphates are discharge of detergents and agricultural run-off.

- **Nitrate :**

Like phosphorus nitrate is also one of the critical nutrient for the growth of algae and helps accelerating the eutrophication. Domestic sewage, natural run-off and agricultural wastes are the important sources of it. The determination of nitrate in drinking water is of prime importance because of the disease methamoglobonebia caused by its excessive presence.

- **Fluoride :**

Fluoride originates from weathering of fluoride containing minerals and enters surface waters from run-off and ground waters. Significant sources of fluoride are found in coke, glass and ceramics, electronics, pesticides, and fertilizer manucturing, steel and aluminium processing and electroplating industries.

Material And Methods

Description of the study area :

- **Shahanoor Dam :**

Shahanoor dam selected for the present study is situated near Anjangaon Surji, Amravati district, state of Maharashtra, India. This dam was constructed as a part of irrigation projects by the Government of Maharashtra in the year 1990. It is an earthfill dam built using soil and stones with a capacity of 45 MCUM on the Shahanoor river.

The dam is located in the hill ranges of Satpuda. Human activities like washing of clothes and vehicles, bathing are rare as the dam is far away from the adjoining villages. Water from the dam is used for irrigation and hydroelectricity. The net irrigation area is 7455 hectors. Water from the dam is supplied for drinking for 156 villages and 2 towns in Anjangaon Surji, Daryapur, and Bhatkuli Talukas of Amravati district.

Morphometry of the catchment area :

Shahanoor dam is located at latitude 21.15’21” and longitude 77.19’30”. The total catchment area of the dam site is 53.74 sq. miles (139.187Km^2). All the catchment area is through hill ranges of Satpuda and lies in Maharashtra state only. The length of the dam is 795 meters and height of the dam is 56.45 meters. An ogee type waste weir of 57 meter length having 4 radial gates on the left

bank saddle. The live storage capacity of the reservoir is 46.04 Km^3 and gross storage capacity is 47.85 km^3.

The drainage area receives rainfall 781.81 mm mainly from the southeast monsoon from June to October. The monsoon precipitation generally commences in the 2nd week of June and continues throughout the year. The soil in the area varies from grayish black to deep black.

chemical Analysis :

Water samples were collected once per season in well labeled, polythene sampling bottles which were tightly stoppered and brought to the laboratory for analysis.

pH - The determination of pH is important due to its effect on chemical and biological properties of liquids. On field pH was recorded with the help of standard pH paper strips. The paper was dipped in a sample water and colour developed was compared with standard colour code given. In the laboratory pH was recorded with the help of pH meter.

- **Free Carbon dioxide : (Titration Method)**

Free CO_2 was determined by titrating the sample using a strong alkali to pH 8.3. At this pH all the free CO_2 is converted into bicarbonates.

- **Total Hardness : (EDTA Method)**

Hardness is generally caused by the calcium and magnesium ions present in water. Hard water is unsuitable for cooking, washing and bathing.

- **Calcium : (EDTA method)**

Calcium is the major cation present in natural waters, its main source being leaching rocks in the catchment. Its concentration restricts water use while it is an important component in the exoskeleton of Arthropod and shells in Molluscs.

- **Chlorides : (Argenometric Method)**

Natural water normally has a low chloride content.

- **Total Phosphates : (Photometric method)**

The presence of phosphates in water is due to detergents, fertilizers.

- **Nitrates : (Phenoldisulphonic acid method)**

Nitrate is normally the most common form of combined inorganic nitrogen in aquatic system.

- **Fluoride : (SPADANS Method)**

Fluorides have dual significance in water supplies. High concentration causes dental fluoris and lower concentration (< 0.8 mg/l) causes dental caries. A fluoride concentration of approximately 0.1 mg/l is recommended. They are frequently found in certain industrial processes resulting in fluoride rich waste waters. It was calculated by SPADANS method.

- **Dissolved Oxygen : (Winkler's Method)**

Oxygen dissolved in water is very important parameter in water analysis as it is an indicator of the physical, chemical and biological activity. Generally high DO is found in the ecosystem which is free from pollution, while its values are negligible in case of polluted water due to the presence of NH_3, H_2S, Nitrites etc.

- **Bicarbonates (HCO_3) :**

Bicarbonates imparts the alkalinity to the natural waters. In natural waters CO_2 is responsible for alkalinity.

- **Magnesium : (EDTA Method)**

Magnesium is dominant cation in natural water which added in the ecosystem by the leaching of rocks in the catchment. Potable water got an unpleasant taste due to the high concentration of Mg.

RESULT

In the present study, seasonal variation of the physico-chemical paramaters of Shahanoor dam for the period of Jan. 2017 to Dec 2019 were studied. Water samples were analysed for 3 years at regular interval and the obtained data is presented in tables.

pH :

pH plays important role in the life of aquatic animals. During the present study pH ranges obtained were between 7.12 to 7.52 in 2017. In the year 2018 pH was highest 7.26 during monsoon and minimum during winter. In 2019, it was maximum 7.65 in monsoon and minimum 7.09 in winter. Seasonal variation in pH shows that it was maximum during monsoon followed by summer and winter for the successive two years 2018 and 2019. (Table 2-3)

Dissolved Oxygen :

Dissolved oxygen is the most important parameter of the aquatic ecosystem which can directly affect the survival and distribution of aquatic organisms.

In the present study, dissolved oxygen (mg/l) in water from dam varies from 6.81 to 9.07 mg/l. The maximum value 9.07 was recorded during winter and minimum value 7.8 recorded during summer in the year 2017. In the winter season of the year 2018 and 2019 it was maximum (8.72,9.07) respectively. But was minimum in the summer of 2018 and monsoon of 2019. (Table 2-3)

Free carbon-oxide :

In an aquatic ecosystems free CO_2 is essential for the photosynthetic activities. Free CO_2 of the water from Shahanoor dam varies from 0 to 0.51. The free CO_2 was absent during summer and monsoon season in the 2017. In winter of 2017, it was recorded 0.51mg/l. (Table 1) Again it was totally absent during summer in 2018 and during monsoon and winter in 2019. Its values were 0.51 during winter in 2017, 0.12 and 0.19 mg/l during during monsoon and winter in 2018 and 0.13 during summer of the year 2019. (Table 2-3)

Total Hardness :

Hardness of water is mainly imported by alkaline earth metallic cations mainly calcium and magnesium present in it.

Total hardness of Shahanoor dam was determined seasonally during the present study. The range of total hardness was found between 68 to 152 mg/l. Total hardness was found to be more (150, 152) during winter, followed by summer (132, 150) and minimum during the monsoon(88,188) respectively in the year 2017 and 2018 . While in 2019 total hardness was more than 148 mg/l in summer followed by monsoon and minimum during winter.

Total Alkalinity :

Total alkalinity of Shahanoor dam was found to vary in different seasons. The minimum and maximum values were noted as 24 mg/l and 150 mg/l respectively. In the year 2017 it showed highest 44 mg alkalinity in summer and lowest 32 mg/l in monsoon. Similar seasonal variation was found in the year 2018 and 2019 i. e. highest alkalinity during summer (52, 64mg/l) and lowest during monsoon (24,36) respectively (Table 2-3)

Bicarbonates :

The carbon-di-oxide that is dissolved by naturally circulating water appears a21s carbonates and bicarbonate ions. Seasonal variation was recorded in bicarbonate of the dam water throughout the study period. Bicarbonate values were maximum 40 mg/l during monsoon and minimum 26 mg/l during summer, for the year 2017. (Table 1) In 2018, 2019 higher carbonate occurred in monsoon 51, 65 and 29, 35 mg/l during winter season and moderate in summer. (Table 2-3)

Chlorides :

Chloride concentration from the studied dam ranged between 10 to 18 mg/l. The maximum chloride values were found to be 13, 14, and 18 mg/l found in monsoon season of the year 2017, 2018, and 2019 respectively. While the minimum value in the winter season of the year 2011 and 2013 was found to be 10 mg/l. The seasonal trend throughout the study was maximum in monsoon season. (Table 1-2-3)

Calcium :

Calcium is an important ion which impart hardness to the water. Calcium ion concentration in the water of the Shahanoor dam varied from 9mg/l to 30mg/l during the study period 2017 to 2018. Calcium values recorded were more in the monsoon season, followed by summer and winter seasons. (Table 1-2-3)

Magnesium :

Magnesium is an important cation which gives hardness to the water. High value of magnesium 15mg/l was found in summer season, while low value i.e. 9 mg/l was found in winter season in the year 2017. Similar pattern of seasonal variation was found in 2018 and 2019 i.e. maximum Mg in summer and minimum in winter season. Data of the study is presented in tables (Table 1-2-3)

Nitrates :

Nitrate content of the water from the Shahanoor dam was studied for the period 2017 to 2019. The nitrate content ws found to be maximum 5.17 mg/l during monsoon season and minimum 2.14 mg/l. in summer season. The nitrate value 2.68 mg/l and 7 mg/l were during winter season respectively. (Table 1-2) During the year 2017 and 2018, the nitrate values were found to increase from that of 2019, as recorded as 11.4 mg/l and 15.16 mg/l during summer season.

Phosphates :

Phosphates of Shahanoor dam was calculated seasonally during the present investigation period. Phosphate values were recorded as 0.03 mg/l during summer, 0.05 mg/l during monsoon season and 0.06 mg/l during winter season in the year 2017. In the year 2018, 0.06 mg/l during summer, 0.01 mg/l during monsoon season and 0.03 in winter season. (Table 1-2-3)

Fluoride :

The Fluoride values of Shahanoor dam were recorded as 0.20 mg/l and 0.11 mg/l in the monsoon and winter season of 2017 respectively. It was absent during the summer. 0.16mg/l,0.20mg/l and 0.07mg/l fluoride was found respectively during summer, monsoon and winter season in 2018. In the year 2019, 0.163mg/l, 0.112mg/l and 0.07mg/l fluoride were found during summer, monsoon and winter season respectively. All the data is presented in the table (Table 1-2-3)

Table 1
Seasonal Variation And Mean ± Se Of Chemical Parameters Of Shahanoor Dam.
JAN 2017 – DEC 2017

Sr. No.	Parameters	anges	Seasons		
			Summer	Monsoon	Winter
1.	pH	7.4 - 8.1	7.14 ± 0.15	7.16 ± 0.27	**7.52 ± 0.19**
2.	Dissolved Oxygen (mg/l)	5.30 - 9.00	6.81 ± 1.7	7.40 ± 1.11	**8.90 ± 0.5**
3.	Carbon dioxide (mg/l)	0 – 0.60	-	-	**0.51 ± 0.7**
4.	Total Hardness (mg/l)	120 - 155	132 ± 10.62	88 ± 5.12	**150 ± 9.36**
5.	Total Alkalinity (mg/l)	30 – 45	44.66 ± 4.1	32.19 ± 1.16	**36.71 ± 5.6**
6.	Total dissolved Solids (mg/l)	155 - 195	162 ± 9	180 ± 8.1	**168 ± 6.1**
7.	Bicarbonate (mg/l)	2.02 - 45.6	26 ± 5.8	40.08 ± 1.42	**32.21 ± 4.3**
8.	Chlorides (mg/l)	9.5 - 16.2	11.03 ± 1.02	13.16 ± 2.03	**10.47 ± 1.07**
9.	Calcium (mg/l)	11.6 - 35.09	18.09 ± 4.69	25.13 ± 3.1	**14.1 ± 5.49**
10.	Magnesium (mg/l)	7.06 - 18.65	15.01 ± 3.30	1.5 ± 1.69	**9 ± 5**
11.	Nitrates (mg/l)	1.67 - 13.5	11.14 ± 0.42	9.5 ± 0.16	**2.68 ± 0.54**
12.	Phosphates (mg/l)	0.01 - 0.08	0.03 ± 0.01	0.05 ± 0.03	**0.06 ± 0.01**
13.	**Fluoride (mg/l)**	**0.08 - 0.25**	**---**	**0.20 ± 0.01**	**0.01 ± 0.02**

Table 2
Seasonal Variation And Mean ± Se Of Chemical Parameters Of Shahanoor Dam.
JAN 2018 - DEC 2018

Sr. No.	Parameters	Ranges	Seasons		
			Summer	Monsoon	Winter
	pH	7.1 - 7.9	7.25 0.31	7.26 ± 0.26	**7.6 ± 0.39**
	Dissolved Oxygen (mg/l)	4.6 - 11.2	7.54 ± 2.09	8.09 ± 1.01	**$8.^{1/2}$ ± 2.2**
	Carbon dioxide (mg/l)	0.09 - 0.25	-	0.12 ± 0.01	**0.19 ± 0.05**
	Total Hardness (mg/l)	95 - 146	150 ± 5.8	118.05 ± 72	**152 ± 8.7**
	Total Alkalinity (mg/l)	20.55	52 ± 5.7	24 ± 2.4	**39 ± 4.17**
	Total Dissolved Solids (mg/l)	250 - 420	240 ± 10.1	404 ± 14.6	**243 ± 6.9**
	Bicarbonate (mg/l)	33.6 - 52.8	39.2 ± 2	51.8 ± 0.23	**29.9 ± 3.07**
	Chlorides (mg/l)	9.6 - 175	11 ± 1.6	14 ± 3	**12 ± 1.27**
	Calcium (mg/l)	18.8 - 36.5	19 ± 3.8	30 ± 6.5	**17 ± 1.18**
	Magnesium (mg/l)	4.6 - 18.90	13 ± 4.4	9 ± 2.9	**8.5 ± 3.5**
	Nitrates (mg/l)	4.9 - 17.01	15.16 ± 1.4	8.20 ± 0.89	**7 ± 2.1**
	Phosphates (mg/l)	0.01 - 0.09	0.06 ± 0.02	0.01 ± 0.02	**0.03 ± 0.01**
	Fluoride (mg/l)	**0.03 - 0.30**	**0.16 ± 0.03**	**0.20 ± 0.04**	--

TABLE 3
Seasonal Variation And Mean ± Se Of Physico-Chemical Parameters Of Shahanoor Dam.
JAN 2019 - DEC 2019

Sr. No.	Parameters	Ranges	Seasons		
			Summer	Monsoon	Winter
1.	pH	6.86 - 7.95	7.20 ± 0.35	7.65 ± 0.13	**7.09 ± 0.67**
2.	Dissolved Oxygen (mg/l)	6.8 - 13.6	8.8 ± 2.3	9.2 ± 0.34	**9.07 ± 3.93**
3.	Carbon dioxide (mg/l)	0.00 - 0.15	0.13 ± 0.01	-	-
4.	Total Hardness (mg/l)	67.13 - 53.2	148 ± 4.2	114 ± 8.65	**6.8 ± 0.13**
5.	Total Alkalinity (mg/l)	122 - 157	64 ± 10.59	36 ± 11.04	**56 ± 3**
6.	Total dissolved Solids (mg/l)	154.8 - 465.7	163 ± 8.8	163 ± 4.07	**216 ± 6.6**
7.	Bicarbonate (mg/l)	34.19 - 77.71	49 ± 3.05	65 ± 4.77	**35 ± 0.18**
8.	Chlorides (mg/l)	27.7 - 20.6	12 ± 0.094	18 ± 1.9	**10 ± 2.6**
9.	Calcium (mg/l)	7.4 - 26.5	20 ± 21	23 ± 3.4	**9 ± 2.4**
10.	Magnesium (mg/l)	8.00 - 24.09	19 ± 4.46	17 ± 1.89	**9 ± 1.01**
11.	Nitrates (mg/l)	0.26 - 5.92	2.14 ± 1.87	5.17 - 0.22	**3.03 ± 2.9**
12.	Phosphates (mg/l)	0.06 - 0.20	0.5 ± 0.5	0.09 ± 0.002	**0.12 ± 0.20**
13.	**Fluoride (mg/l)**	**0.04 - 164.9**	**0.163 ± 0.09**	**0.112 ± 0.06**	**0.07 ± 0.03**

Summary And Conclusion

In the present study chemical parameters was investigated.

pH ranged between 7.6 to 7.65. pH was maximum during monsoon and minimum during winter for 2012 and 2013. For 2011 pH was highest during monsoon and lowest during summer season.

Dissolved oxygen (mg/l) was found more (9.07) in the winter season throughout the 3 years, but it was minimum during summer season of 2011 and 2012 and monsoon of the year 2013.

Free CO2 of Shahanoor dam varied from 00 to 0.51 mg/l. The free CO2 was absent from the Shahanoor water during summer season of 2011 and 2012. Again it was absent during monsoon of the year 2011 and 2013. In the winter of the year 2011 and 2012 CO2 was recorded 0.51 mg/l and 0.19 mg/l respectively and 0.12 mg/l during monsoon of 2012.

Total hardness was found to be more (150, 152) during winter and minimum during the monsoon (88, 118) respectively for the year 2011 and 2012.

Total alkalinity varied between 24 mg/l during monsoon of 2012 and 64 mg/l during summer of 2013. Seasonal trend for alkalinity of Shahanoor dam was maximum during summer and minimum during monsoon throughout the study years.

Total dissolved solid of the dam ranged from 162 mg/l to 404 mg/l, and showed maximum values during monsoon seasons for the three year study.

Bicarbonate values of studied water body was maximum (40) during summer and minimum (26) during monsoon of the study years.

Maximum chloride values were recorded during monsoon season throughout the study years.

Maximum calcium content of the Shahanoor dam were recorded in the monsoon seasons for the three study years and minimum in the winter season.

Magnesium values of the dam were recorded higher in summer and lower in winter season for the year 2012 and 2013.

Nitrates values for the year 2011 and 2012 was found to be more during summer season and less during winter season.

Phosphate content of the Shahanoor dam varied between 0.03 mg/l and 0.06 mg/l maximum phosphate values recorded during winter season.

Fluoride values of Shahanoor dam was found to very between 0.07 and 0.163mg/l.

Conclusion :

From the present investigation of the dam following conclusions were drawn.

All the chemical parameters of the dam are within permissible limit of World Health Organization (WHO) standards.

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Aurone : Synthesis of Active Compound And Experimental Study In Physical Aspects.

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Abstract:

Aurones, constitute a subclass of naturally occurring compounds which are structurally isomeric to flavones, biogenetically related to chalcones, and are responsible for imparting beautiful yellow colors to some of the flower petals[1-4].Recent investigations have shown that these compounds have potent and promising biological activities, in some cases even more potent than chalcones and flavones[5-7] .

This paper aims to study physical properties with experimental data such as density, refractive index and viscosity of Aurone.

Keywords:Aurone,Density.Viscocity,Refractive index etc.

Introduction:

Actually,to date, the chemical structures of more than 100 different aurones have been identified, characterized by distinctive hydroxylated, methoxylated, and glycosylated substitution patterns. Moreover, their effective potential to predict viable therapeutic uses has begun to be unveiled[8-11] .Therefore, they represent a worth deepening class of natural compounds intended to provide bioactive compounds in the near future.

The first examples of aurones were characterized in 1940 in Asteraceae[12],the family of sunflowers, which synthesize the most common 4-deoxy-derivatives of the family including sulfuretin , maritimetin , leptosidin and their corresponding glycosides. The species *variabilis* and *sulphureus* mainly express sulfuretin and its glycosylated counterparts in leaves and petals. In the *bidens* species, maritimetin has been isolated while, in the genus Coreopsis, compounds such as sulfuretin, maritimetin, but also leptosidin may be found.

The chalcone are accessed through synthesis by the Claisen-Schmidt reaction of 2-hydroxyacetophenone and benzaldehyde or their derivatives in the presence of aqueous NaOH, KOH or Ba(OH)2[12-16].This chalcone further cyclized in various solvent to get desired substituted aurone . Aurone provides intense yellow pigmentation to some fruits and flowers [17].Aurones are found in flowers of Scrophulariaceae and Compositae family. However, they are also found in leaves, barks, seeds and woods of various plants. Aurone derivatives show various range of pharmacological activities such as antiviral, antifungal, antioxidant, anticarcinogen, antidiabetes[18,19].

Experimental

I.Synthesis :

Substituted Aurone have been synthesized by cyclization of substituted chalcone in presence of various solvents and their general structures were confirmed by IR, 1H NMR and mass spectral data. Table 1,Table 2, and Table 3 shows the various physical parameters of synthesized Aurone.

II.Physicochemical studies:

The synthesized Aurone was recrystallized from DMF. The solvent A.DMF and B.DMSO were used for the physicochemical studies.

III.Density and Refractive index:

Abbe refractometer was used to determine the refractive index of all the solutions. Table 1 shows the refractive index of synthesized Aurone at various temperatures and various concentrations.

Results and Discussions:

I. Refractive Index of synthesized Aurone:

Table 1 : shows the dynamic values of refractive index.

Concentrations	R.I. in solvent A	R.I. in Solvent B
0.05	1.492	1.553
0.04	1.485	1.541
0.03	1.469	1.534
0.02	1.458	1.531
0.01	1.453	1.529

II. Density and Viscosityof synthesized Chalcone:

The table below shows the dynamic experimental values of density (ρ), and viscosity (η), at different temperature and different concentrations.

Table:2 (Temperature: 303.15 K)

Conc.	Solvent A Density(ρ) ($g.cm^{-3}$)	Solvent A Viscosity Centipoise	Solvent B Density(ρ) ($g.cm^{-3}$)	Solvent B Viscosity Centipoise
0.05	1.1410	1.2754	0.9779	0.8510
0.04	1.1406	1.2601	0.9772	0.8478
0.03	1.1403	1.2522	0.9768	0.8398
0.02	1.1401	1.2497	0.9766	0.8257
0.01	1.1398	1.2453	0.9764	0.8201

Table:3 (Temperature: 313.15 K)

Conc.	Solvent A Density(ρ) ($g.cm^{-3}$)	Solvent A Viscosity Centipoise	Solvent B Density(ρ) ($g.cm^{-3}$)	Solvent B Viscosity Centipoise
0.05	1.1352	1.2455	0.9557	0.8212
0.04	1.1349	1.2398	0.9553	0.8191
0.03	1.1345	1.2342	0.9550	0.8129
0.02	1.1341	1.2292	0.9541	0.8087
0.01	1.1340	1.2231	0.9538	0.8002

Conclusions:

From above experimental values it is concluded that densities,viscosities and refractive index of solution are changes by changing temperatures and by changing the solvent due to solute-solvent interaction.

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Studies on Assessment of Physico-chemical Parameters of Drinking Water in Schools of Akola District

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Abstract:

Water is essential in every stage of life for any living organism. The quality of water is of vital concern for mankind since it is directly linked with human welfare. The water resources now days as consequences of population explosion coupled with industrialization, urbanization and green revolution. Water related diseases have remained a major concern in much of the developing world. The World Health Organization (WHO) estimated in the 2000 assessment that there are four billion cases of diarrhea each year in addition to millions of other cases of illness associated with the lack, of access to clean water. Therefore, this study is focused on analysis of physico-chemical parameters of water is essential for all living organisms.

Keywords: Water, Hardness, pH, COD, BOD, Chloride, Conductance, Acidity, Alkanality etc.

Introduction

Water:

Water is the most abundant compound on Earth's surface, covering about 70 percent of the planet. In nature, water exists in liquid, solid, and gaseous states. It is in dynamic equilibrium between the liquid and gas states at standard temperature and pressure. At room temperature, it is a tasteless and odorless liquid, nearly colorless with a hint of blue. Many substances dissolve in water and it is commonly referred to as the universal solvent. Because of this, water in nature and in use is rarely pure and some of its properties may vary slightly from those of the pure substance [1]. However, there are also many compounds that are essentially, if not completely, insoluble in water. Water is the only common substance found naturally in all three common states of matter and it is essential for all life on Earth. Water usually makes up 55% to 78% of the human body [2].

Clean, fresh drinking water is essential to human and other lifeforms. Access to safe drinking water has improved steadily and substantially over the last decades in almost every part of the world. However, some observers have estimated that by 2025 more than half of the world population will be facing water-based vulnerability. A recent report (November 2009) suggests that by 2030, in some developing regions of the world, water demand will exceed supply by 50%[3,4].

Forms of water:

Like many substances, water can take numerous forms that are broadly categorized by phase. The liquid phase is the most common among water's phases (within the Earth's atmosphere and surface) and is the form that is generally denoted by the word "water." The solid phase of water is known as ice and commonly takes the structure of hard, amalgamated crystals, such as ice cubes, or loosely accumulated granular crystals, like snow[5]. The gaseous phase of water is known as water vapour (or steam), and is characterized by water assuming the configuration of a transparent cloud. (Note that visible steam and clouds are, in fact, water in the liquid form as minute droplets suspended in the air.) The fourth state of water, that of a supercritical fluid, is much less common than the other three and only rarely occurs in nature, in extremely uninhabitable conditions. When water achieves a specific critical temperature and a specific critical pressure (647°K and 22.064°MPa), liquid and gas phase merge to one homogeneous fluid phase, with properties of both gas and liquid.

Contamination of Water :

Water is a chemical substance with the chemical formula H_2O. Its molecule contains one oxygen and two hydrogen atoms connected by covalent bonds. Water is often co-exists on Earth with its solid state ice, and gaseous state, water vapour or steam. According to researchers, water covers 70.9% of the earth's surface, and is vital for all known forms of life. On Earth, it is found mostly in oceans and other large water bodies, with 1.6% of water below ground in aquifers and 0.001% in the air as vapour, clouds (formed of solid and liquid water particles suspended in air), and precipitation. Research also claims that oceans hold 97% of surface water, glaciers and polar ice caps 2.4%, and other land surface water such as rivers, lakes and ponds 0.6%. A very small amount of the Earth's water is contained within biological bodies and manufactured products. Water on earth moves continually through a cycle of evaporation or transpiration (evapotranspiration), precipitation, and runoff, usually reaching the sea. Over land, evaporation and transpiration contribute to the precipitation over land.

Drinking water is never pure. Water naturally contains minerals and microorganisms from the rocks, soil, and air with which it comes in contact. Human activities can add many more substances to water. But drinking water does not need to be pure to be safe. In fact, some dissolved minerals in water can be beneficial to health. For example, the National Research Council (National Academy of Sciences) states that drinking water containing dissolved calcium and magnesium generally contributes a small amount toward calcium and magnesium human dietary needs. Fluoride, either naturally occurring or added to the water supply, can help protect against tooth decay. Whether or not drinking water is safe will depend on which substances are present and in what amounts.

Water Is Essential to Life:

Water is second to oxygen as being essential for life. People can survive days, weeks, or even longer without food, but only about four days without water. The average adult consumes and excretes two or more quarts of water each day. Some of this water is supplied through foods but most is consumed through beverages. It is generally recommended that adults consume 6 to 8 cups (48 to 64 ounces) of liquids daily. Some beverages, such as coffee, tea, soda with caffeine, and alcohol are diuretic and increase urine excretion. These beverages, if consumed in large quantities, can upset the body water balance [6].

Water is essential in every stage of life for any living organism. The quality of wateris of vital concern for mankind since it is directly linked with human welfare. The waterresources now days as consequences of population explosion coupled with industrialization, urbanization and green revolution. Water related diseases have remained a major concern in much of the developing world. The World Health Organization (WHO) estimated in the 2000 assessment that there are four billion cases of diarrhea each year in addition to millions of other cases of illness associated with the lack, of access to clean water. Therefore, analysis of physico-chemical parameters of water is essential for all living organisms [7].

Sources of water Supply:

Water resources are of critical importance to both natural ecosystem and human development. It is essential for agriculture, industry and human existence. The healthy aquatic ecosystem is depended on the physico-chemical and biological characteristics. The quality of water in any ecosystem provides significant information about the available resources for supporting life in that ecosystem. Good quality of water resources depends on a large number of physicochemical parameters and biological characteristics [8].

To asses that monitoring of these parameters is essential to identify magnitude and source of any pollution load

Sources of fresh water

a) Surface water

Surface water is water in a river, lake or fresh water wetland. Surface water is naturally replenished by precipitation and naturally lost through discharge to the oceans, evaporation, evapo-transpiration.

Human activities can have a large and sometimes devastating impact on these factors. Humans often increase storage capacity by constructing reservoirs and decrease it by draining wetlands. Humans often increase runoff quantities and velocities by paving areas and channelizing stream flow[9,10].

Nevertheless, over the long term the average rate of precipitation within a watershed is the upper bound for average consumption of natural surface water from that watershed.

Natural surface water can be augmented by importing surface water from another watershed through a canal or pipeline. It can also be artificially augmented from any of the other sources listed here; however in practice the quantities are negligible. Humans can also cause surface water to be "lost" (i.e. become unusable) through pollution [11,12].

b) Under river flow

Throughout the course of a river, the total volume of water transported downstream will often be a combination of the visible free water flow together with a substantial contribution flowing through sub-surface rocks and gravels that underlie the river and its floodplain called the hyporheic zone [13].

c) Ground water

Sub-surface water, or groundwater, is fresh water located in the pore space of soil and rocks. It is also water that is flowing within aquifers below the water table. Sometimes it is useful to make a distinction between sub-surface water that is closely associated with surface water and deep sub-surface water in an aquifer (sometimes called "fossil water").

The natural input to sub-surface water is seepage from surface water. The natural outputs from sub-surface water are springs and seepage to the oceans[14].

d) Desalination

Desalination is an artificial process by which saline water (generally sea water) is converted to fresh water. The most common desalination processes are distillation and reverse osmosis. Desalination is currently expensive compared to most alternative sources of water, and only a very small fraction of total human use is satisfied by desalination.

e) Frozen water

The Himalayas, which are often called "The Roof of the World", contain some of the most extensive and rough high altitude areas on Earth as well as the greatest area of glaciers and permafrost outside of the poles. Ten of Asia's largest rivers flow from there and more than a billion people's livelihoods depend on them [15].

Material And Methods: In proper Akola district, numbers of different schools are there such as primary schools, high schools, Junior colleges, convents etc. The drinking water samples were collected from different schools. The various physico-chemical parameters of these samples were assessed.

Ten such samples were collected from following schools

Table 1 : Names of schools from which water samples were collected.

Sr. No.	Names of Schools from which samples collected	Area
1	Shri. Shivaji Vidyalaya, Akola	Deshmukh Peth, Akola
2.	Jubilee English Convent, Akola	Ramdas Peth, Akola
3	Savitribai Phule Kanya School, Akola	Santoshi Manta Mandir, Akola
4	New English School, Akola	Ramdas Peth, Akola
5	B. R. High School, Akola	New Bus Stand, Akola
6	Jagruti Vidyalaya, Akola	Ranpise Nagar, Akola
7	Aadarsh Vidyalaya, Akola	Aadarsh Colony, Akola
8	D. R. Patil Vidyalaya, Akola	Sahakar Nagar, Akola
9	Jyoti Vidyalaya, Akola	Azad Colony, Akola
10	Swami Vivekanand Vidyalaya, Akola	Gurukul Nagar, Akola

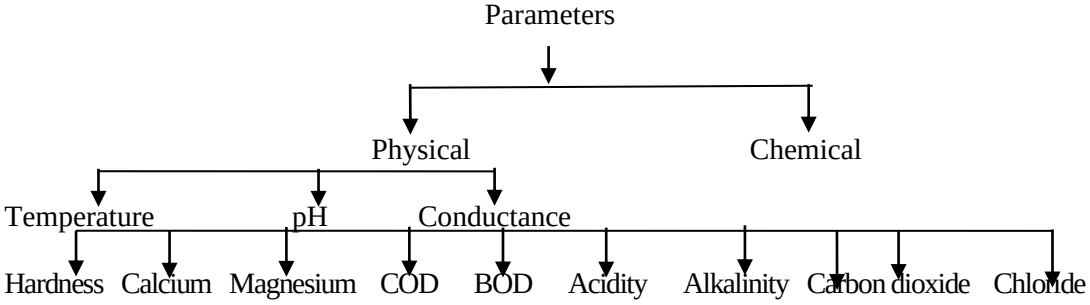
The water samples were collected from handpump, cement tank, plastic tank (PVC), Rajans from ten different schools. Drinking water samples collected in 250 ml sterilized glass bottle.

The standards (Maximum permissible limits) of physico-chemical parameters for drinking water as recommended by World Health Organization (WHO) are given in following table.

Sr. No.	Physico-chemical parameters	Limits
1	Colour	--
2	Odour	--
3	Taste	--
4	Temperature	10 – 15.6°C
5	Conductance	300 – 600 mg/lit.
6	Hardness	300 mg/lit.
7	Chloride	Not to exceed 600 mg/lit
8	Calcium	75 – 100 mg/lit.
9	Magnesium	50 – 150 mg/lit.
10	Alkalinity	200 mg/lit.
11	Acidity	--
12	Free CO_2	--
13	COD	Not to exceed 250 mg/lit.
14	BOD	Not more than 8 mg/lit.
15.	pH	6.5 – 8.5

Analysis of Water

Following are the parameters which are to be analyzed for the water samples.



Physical Analysis

1) Temperature

In wastewater various chemical reactions occur. The rate of chemical reactions increases with increasing temperature provided the higher temperature does not affect the reactant or catalyst. The temperature was recorded with the help of thermometer.

2) pH

pH of different sample was measured by pH meter. This measurement provides a very quick and easy obtain appraisal of the acid base equilibrium in an ecological system. It indicates the acidic and basic character of samples.

As per the standards set by Indian Council of Medical Research (ICMR, 1975), Drinking Water Protection Act (USA, 1973) p^H should be within 6-8.0 units. The standards set by other agencies are 6.5 – 8.5 units.

Importance of pH measurement

It may be evident from the forgoing discussion that pH of unpolluted natural waters occur within a narrow range of values and major deviations from that range caused by natural or anthropogenic sources, may have very strong impact of the aquatic ecosystems[16]. Physical, chemical and biological processes associated with water supply and sanitary engineering are also strongly pH dependent. Besides practically every analytical procedure associated with aquatic ecology and water pollution studies requires determination of pH.

pH Measurement

Connect the calomel and glass electrodes to the pH meter. Clean the electrodes with distilled water and dry it. Dip the electrodes in the 4.00 pH buffer solution. Adjust the temperature knob. Push the p^H button of function switch panel. Adjust the display to 4.00 p^H with calibration knob. Now pH meter is thus calibrated.

Wash the electrode, dry it and put in the solution whose pH is to be determined. Take the reading of pH.

3) Conductance

Electrical conductance is the ability of a substance to conduct the electric current. In water, it is the property caused by the presence of various ionic species.

The term specific conductance is also used in place of electrical conductivity, but it is an absolute term. The unit of conductivity measurement is Siemens. The older unit mhos/cm is now rarely used.

Importance of Conductivity Measurement

1. Conductivity is used to estimate total dissolved solids in water/wastewater.
2. It is useful in the rapid assessment of the salinity of water.
3. It is useful to assess the degree of mineralization of distilled and deionised water.
4. It is useful in checking the performance of water deionized and other ion-exchange resins.
5. It is useful to determine the amount of ionic reagent needed in certain precipitation and neutralization reactions and to determine end points in titrimetry.

4) COD

The amount of chemical oxidation required converting organic matter in water and wastewater to carbon dioxide in water and waste water is called as Chemical Oxygen Demand (COD). This test involves measuring the amount of oxidizing agent such as permanganate i.e. consumed when the organic matter in a water sample is oxidized completely to carbon dioxide. Organic matter in a sample also can be reacted directly with oxygen at a high temperature produce carbon dioxide. Too much organic matter addition to the lentic and lotic systems increases the levels of COD and changes the composition of oxygen requiring organisms. Variation in the organic matter in turn. Changes COD levels show diversity in the autotrophic and heterophic populations and decreases the productivity status. The energy budgets of the aquatic bodies also directly related to the levels of chemical oxidation in prescribed periods.

Procedure

50 ml of wastewater sample was taken and a mixture of added 10 ml of $KMnO_4$ and 10 ml H_2SO_4, H_2O was added into in to it then it was incubated for 4 hours, a few crystals of KI was added which turned the entire solution to yellow colour. After addition of few drops of starch indicator to above prepared solution until it turns colorless. Simultaneously distilled water bland was prepared and analyzed COD[12] (mg/L) using the formula.

$$COD(mg/L) = \frac{8\,xCx\,(B-A)}{Sx\,1000}$$

Where,

C = Concentration of titrant (N/80)

A = Volume of titrant used for blank (ml)

B = Volume of titrant used for sample (ml)
S = Volume of water sample taken (ml)

5) Biochemical Oxygen Demand (BOD)

Biochemical Oxygen Demand (BOD) is the measure of the degraded organic material present in a water sample, and can be defined as the amount of oxygen required by the microorganisms in stabilizing the biologically degradable organic matter under aerobic condition. Hence, BOD approximates the amount of oxidizable organic matter present in the solution and the BOD value can be used as a measure of waste strength. It is highly important to know the amount of organic matter present in the waste treatment system and that the quantity of oxygen required for its stabilization.

It can be determined by BOD bottles after five days.

BOD = (Do – Ds) x Dilution factor mg/lit.

6) Alkalinity

Reagents

A. Hydrochloric acid, 0.1 N
B. Methyl orange indicator, 0.05%
C. Phenolphthalein indicator
D. Sodium carbonate 0.1 N.

Procedure

1. Take 100 ml of sample in a conical flask and add 2 drops of phenolphthalein indicator.
2. If the solution remains colourless, PA = 0, and total alkalinity is determined as described in step 4.
3. If the colour changes to pink after addition of phenolphthalein titrate it with 0.1 N HCl until the colour disappears at end point. This is phenolphthalein alkalinity (PA).
4. Now add 2-3 drops of methyl orange to the same sample and continue the titration further, until the yellow colour changes to pink at end point. This a total alkalinity (TA).

Calculation

$$PA\ as\ CaCO_3, mg/L = \frac{(A \times Normality) of HCl \times 1000 \times 50}{ml\ of sample}$$

$$TA\ as\ CaCO_3, mg/L = \frac{(B \times Normality) of HCl \times 1000 \times 50}{ml\ of sample}$$

Where,

A = ml of HCl used with only phenolphthalein
B = ml of total HCl used with phenolphthalein and methyl orange
PA = phenolphthalein alkalinity
TA = Total alkalinity

7) Acidity

Reagents

A. Sodium hydroxide, 0.05 N
B. Methyl orange indicator
C. Phenolphthalein indicator

Procedure

1. Take 100 ml of colourless sample in a conical flask and add 2-3 drops of methyl orange indicator.
2. If the solution turns yellow, the methyl orange acidity is absent. In case the content turn pink, titrate it with 0.05 NaOH. At the end point colour changes from pink to yellow.
3. Now add few drops of phenolphthalein indicator to the same sample and titrate further with NaOH until the content turn to pink.

Calculation

$$Methyl\ orange\ acidity\ mg/L\ as\ CaCO_3 = \frac{A \times N of NaOH \times 1000 \times 50}{ml\ of sample}$$

$$Phenolphthalein\ acidity\ mg/L\ as\ CaCO_3 = \frac{B \times N of NaOH \times 1000 \times 50}{ml\ of sample}$$

Where,

A = Volume of NaOH used with methyl orange in titrating the sample to pH 3.7
B = Volume of NaOH used with phenolphthalein in titrating the sample to pH 3.7 to pH 8.3

8) Carbon Dioxide

Reagents

A. Sodium hydroxide, 0.05 N
B. Phenolphthalein indicator

Procedure

1. Take 100 ml of sample in a conical flask and add few drops of phenolphthalein indicator.
2. If the solution turns pink, free CO_2 is absent. If the sample remains colourless, titrate it against 0.05 N NaOH. At the end point pink colour appears.

Calculation

$$Free\ CO_2\ mg/L\ = \frac{(ml \times N)\ of\ NaOH \times 1000 \times 44}{ml\ of sample}$$

9) Chloride

Reagents

A. Silver nitrate, 0.02 N
B. Potassium chromate, 5%

Procedure

1. Take 50 ml of sample in a conical flask and add 2 ml of K_2CrO_4 solution..
2. Titrate the contents against 0.02 N $AgNO_3$ until a persistent red tinge appears.

Calculation

$$Chloride\ mg/L\ = \frac{(ml \times N)\ AgNO_3 \times 1000 \times 35.5}{ml\ of sample}$$

9) Hardness

Reagents

A. EDTA solution, 0.01 N
B. Buffer solution
C. Ferrochrome Black T (Solo chrome Black T) indicator
D. Sodium sulphide solution.

Procedure

1. Take 50 ml of sample in a conical flask. If sample is having higher calcium takes a smaller volume and dilute to 50 ml.
2. Add 1 ml of buffer solution.
3. If the sample is having higher amounts of heavy metals add 1 ml of Na_2S solution.
4. Add 100-200 mg of Eriochrome Black T indicator, the solution turns wine red.
5. Titrate the contents against EDTA solutions; at the end point colour changes from wine red to blue.

Calculation

$$Hardness\ as\ mg/L\ CaCO_3\ = \frac{ml\ EDTA\ used \times 35.5}{ml\ of sample}$$

10) Calcium

Reagents

A. EDTA solution, 0.01 M
B. Sodium hydroxide, 1 N
C. Murexide indicator.

Procedure

1. Take 50 ml of sample in a conical flask. If sample is having higher alkalinity, use smaller volumes diluted to 50 ml.
2. Add 2.0 ml of NaOH solution in the sample.
3. Add 100-200 mg of murexide indicator a pink colour develops.
4. Titrate against EDTA solutions until the pink colour changes to purple. For better judgement of end point, compare the purple colour with the distilled water blank end point.

Calculation

$$Calcium, mg/L\ = \frac{x \times 400}{ml\ of sample}$$

Where,

x = Volume of EDTA used.

11) Magnesium

Reagents

A. EDTA solution, 0.01 M
B. Buffer solution
C. Eriochrome Black T indicator

Procedure

1. Find out the volume of EDTA used in calcium determination.

Calculation

$$Mg^{++}, mg/L = \frac{y - x \times 400.8}{Volume\ of\ sample\ x\ 1.645}$$

Where,
y = EDTA used in hardness determination.
x = EDTA used in calcium determination for the same volume of the sample

OBSERVATIONS AND RESULTS

Observations

Water analysis Report

Table 1 : Quality Index of Drinking water of different schools in Akola district

Sr. No.	Samples ID	pH	Temp.	Colour	Odour	Taste
1	1	6.92	23°C	Clear	Odourless	Tasteless
2	2	6.77	24°C	Clear	Odourless	Tasteless
3	3	6.86	25°C	Clear	Odourless	Tasteless
4	4	7.00	23°C	Clear	Odourless	Tasteless
5	5	7.22	24°C	Clear	Odourless	Tasteless
6	6	7.33	25°C	Clear	Odourless	Tasteless
7	7	7.21	23°C	Clear	Odourless	Tasteless
8	8	7.23	24°C	Clear	Odourless	Tasteless
9	9	7.21	24°C	Clear	Odourless	Tasteless
10	10	7.37	23°C	Clear	Odourless	Tasteless

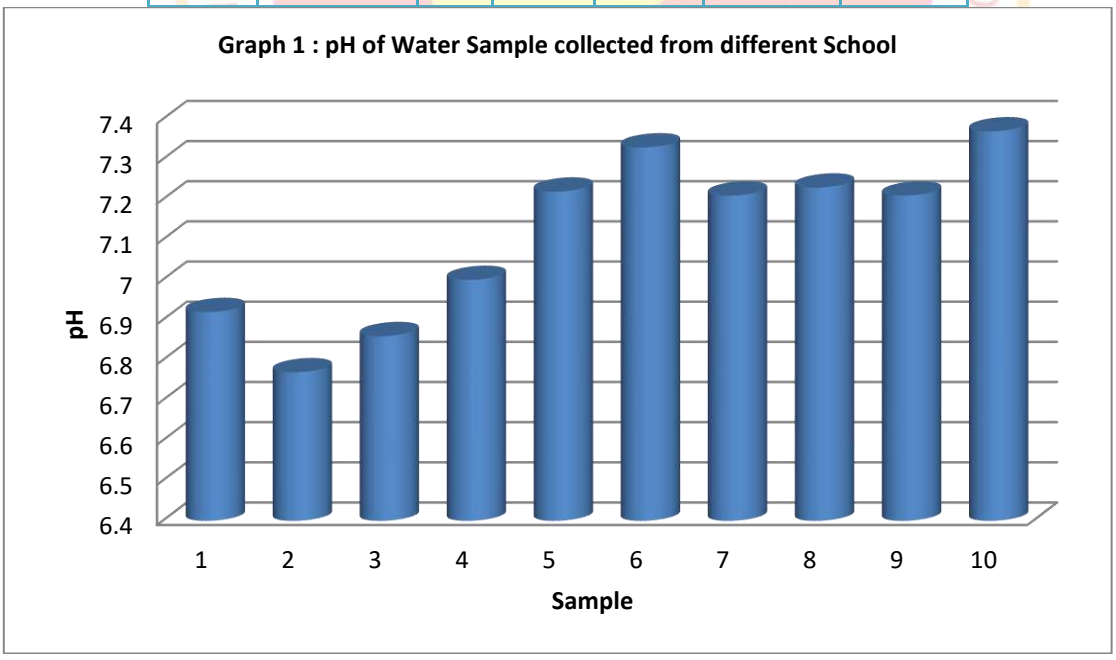


Table 2 : Conductance of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Conductance mg/l
1	1	415
2	2	310
3	3	310
4	4	425
5	5	305

6	6	417
7	7	610
8	8	306
9	9	504
10	10	425
11.	Standard by WHO	300-600

Graph 2 :- Conductance of Drinking water of different schools in Akola district

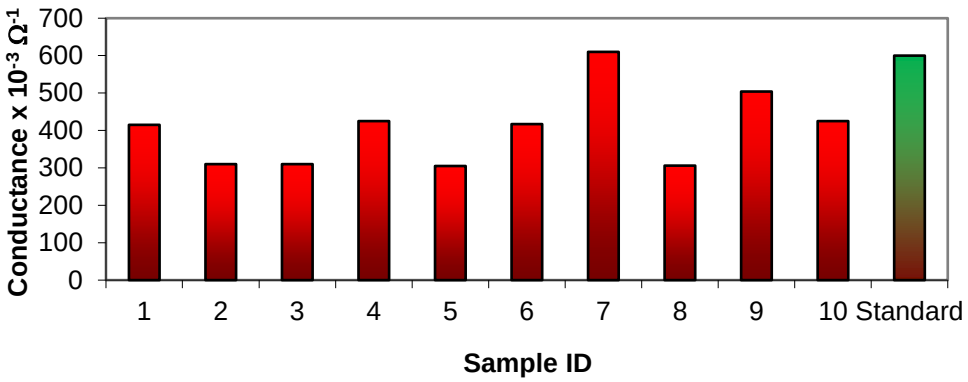


Table 3 : Hardness of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Hardness ppm
1	1	304
2	2	380
3	3	684
4	4	516.8
5	5	684
6	6	668.8
7	7	760
8	8	212.8
9	9	349.6
10	10	212.8
11	Standard by WHO	300

Graph 3 :- Hardness of Drinking water of different schools in Akola district

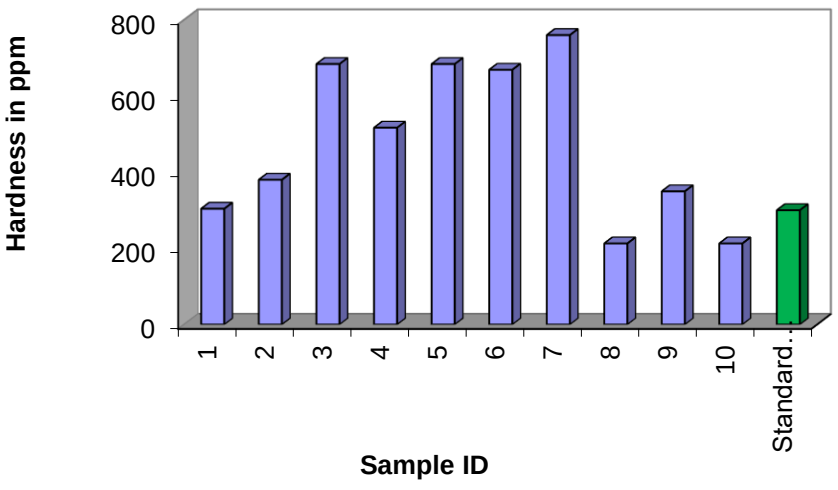


Table 4 : Calcium of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Calcium ppm
1	1	45.6
2	2	136.8
3	3	121.6
4	4	106.4
5	5	152
6	6	152
7	7	167.2
8	8	60.8
9	9	30.4
10	10	15.2
11	Standard by WHO	75 – 100

Graph 4 : Calcium of Drinking water of different schools in Akola district

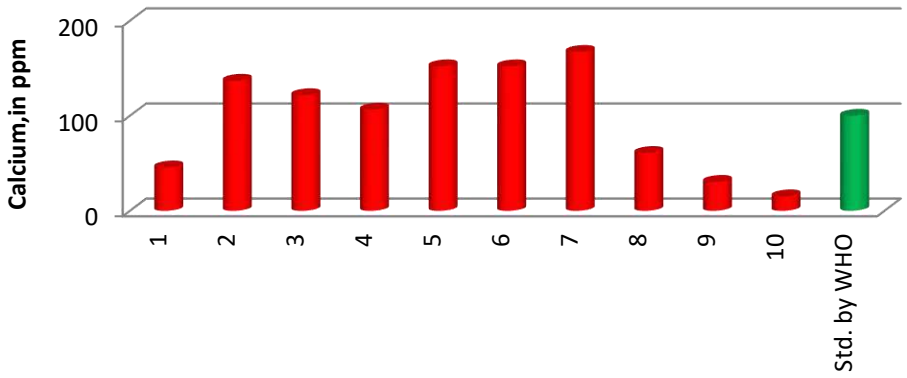


Table 5 :Magnesium of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Magnesium ppm
1	1	258.4
2	2	243.2
3	3	562.4
4	4	410.4
5	5	532
6	6	516.8
7	7	592.8
8	8	152
9	9	319.2
10	10	197.6
11	Standard by WHO	50 – 150

Graph 5 :- Magnesium of Drinking water of different schools in Akola district

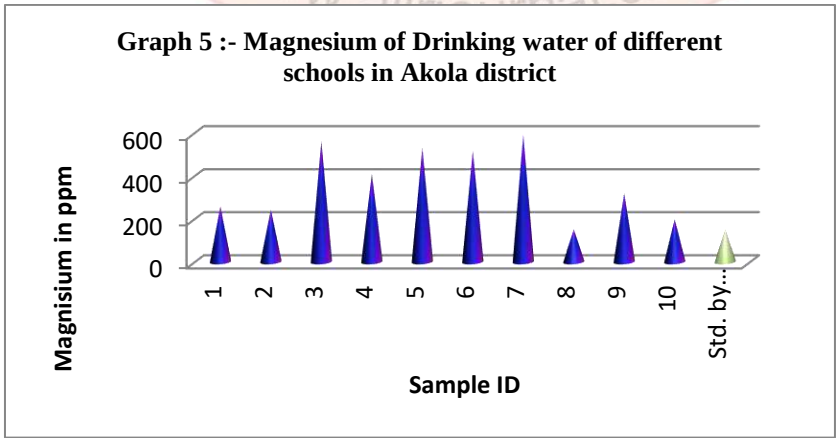


Table 6 : Chloride of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Chloride mg/l
1	1	183.18
2	2	140.438
3	3	134.332
4	4	702.19
5	5	106.855
6	6	100.749
7	7	131.279
8	8	146.544
9	9	732.72
10	10	427.42
11	Standard by WHO	Not to exceed 600

Graph 6 : Chloride of Drinking water of different schools in Akola district

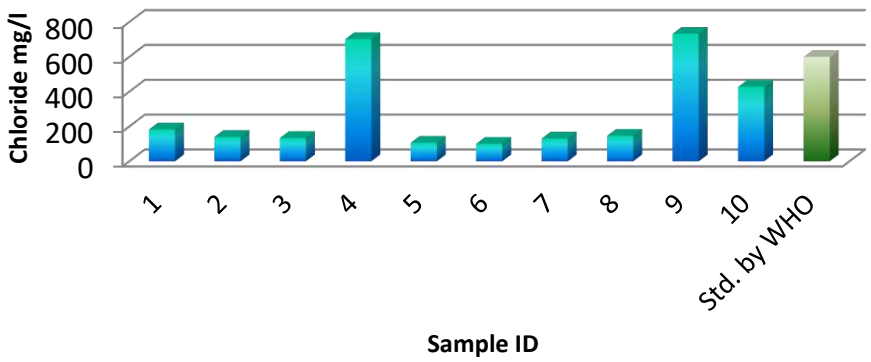


Table 7 : Alkalinity of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Alkalinity mg/l
1	1	300
2	2	400
3	3	350
4	4	350
5	5	500
6	6	650
7	7	1000
8	8	400
9	9	250
10	10	200
11	Standard by WHO	200

Graph 7 : Alkalinity of Drinking water of different schools in Akola district

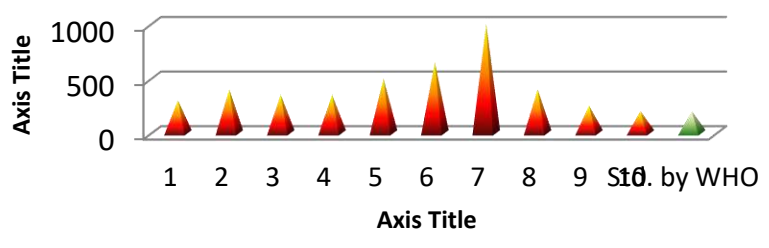


Table 8 : Acidity of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Acidity mg/l
1	1	50
2	2	125
3	3	175
4	4	125
5	5	150
6	6	225
7	7	250
8	8	100
9	9	75
10	10	50

Graph 8 : Acidity of Drinking water of different schools in Akola district

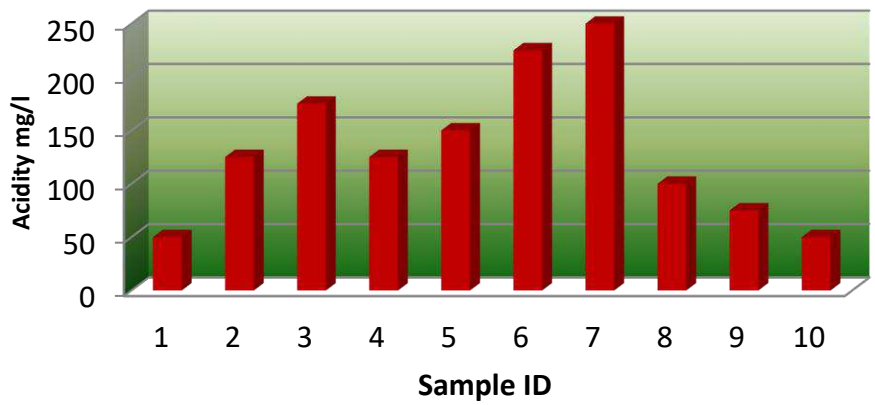


Table 9: Free CO_2 of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Free CO_2 mg/l
1	1	110
2	2	44
3	3	22
4	4	44
5	5	44
6	6	44
7	7	66
8	8	22
9	9	22
10	10	44

Graph 9 : Free CO_2 of Drinking water of different schools in Akola district

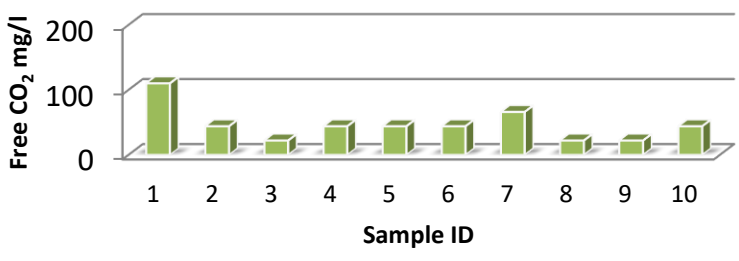
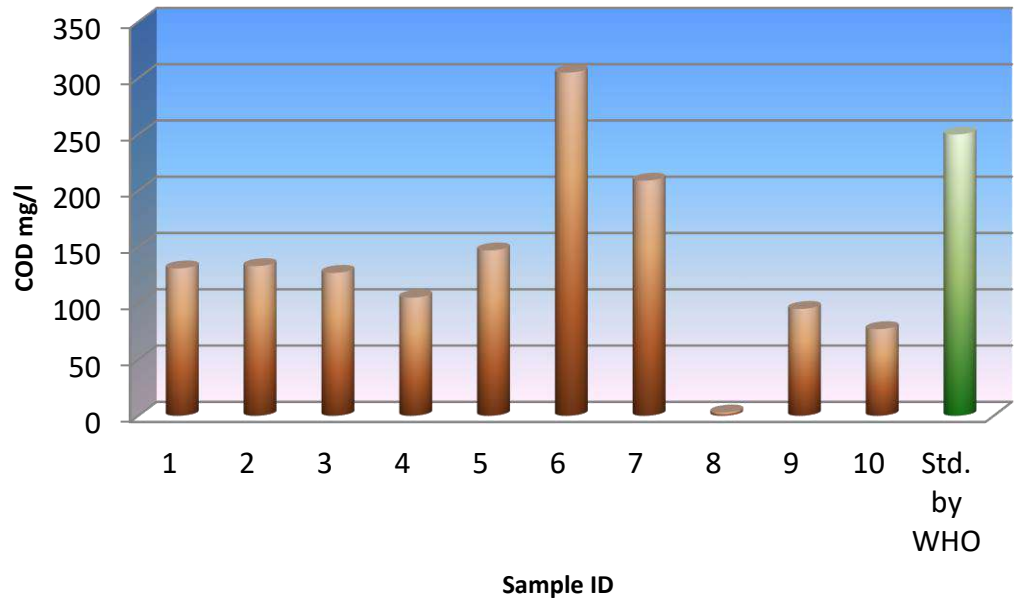


Table 9: COD of Drinking water of different schools in Akola district

Sr. No.	Samples ID	COD mg/l
1	1	131
2	2	133
3	3	127
4	4	105
5	5	147
6	6	305
7	7	209
8	8	3
9	9	95
10	10	77
11	Standard by WHO	Not to exceed 250

Graph 9 : COD of Drinking water of different schools in Akola district



CONCLUSION AND SUGGESTION

Conclusion

1) The study shows that better class and reasonably better quality water should provided at school and maintain its hygienic condition properly.
2) Storage of drinking water in Rajan and Drum was highly contaminated due to its direct contacts of hands and fingers.
3) The study also indicates that daily washing of storage means least coliform count. So we have low contamination in water.
4) The study shows that poor hygienic condition, improper method of storage, improper handling of drinking water makes drinking water more contaminated.
5) Hazen (1998) studied on drinking water and diarrhea diseases due to *E. coli* and reported that, prevention of fecal, contamination prevents water born outbreaks.

Suggestions

1) It is important to maintain the hygienic conditions of children's health.
2) Personal hygiene conditions
   a) Students should wash hands properly before drinking the water.
   b) Regular washing of water tanks/storages in schools.
   c) Water tanks/Rajan should be placed at the hygienic conditions.

d) Good quality purifier should be used in school.
e) Children should be guided serve drinking water properly from water storage (rajan, etc)
f) Children should aware about hygienic conditions related to drinking water.

3) Prevention from water born diseases
a) Regular checkout the pipeline leakage of water supply.
b) Water chlorination is the best and ultimate method of purification. Because chlorine reduces the germ and bacterial growth from water. Ferrous ions, magnesium ions and hydrogen sulphide from water oxidized by chlorine and it reduces the taste and odor from water.
c) Keep surrounding clean and animals away from the sources of water.

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Synthesis And Antimicrobial Activity Of 3, 5, 7 Trisubstituted -1, 2, 4-Triazolo-[3, 4-*B*] Benzothiazoles

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Abstract

4-Methoxy acetanilide on treatment with bromine in acetic acid, followed by hydrolysis with dil. HCl/NaOH solution, yielded 2-bromo-4-Methoxy aniline (1) which on treatment with sodium thiocyanate in acetic acid afforded 2-amino-4-bromo-6-Methoxy benzothiazole (2). Compound (2) in ethylene glycol was heated at 150 ^{0}C with 80% hydrazine hydrate to get 4-bromo-6-Methoxy-2-hydrazino benzothiazole (3). This hydrazino compound (3) on heating with 2-hydroxy-3-methoxy-benzaldehyde/4-methoxy benzaldehyde/4-hydroy-3-methoxy benzaldehyde/ 2-hydroxybenzaldehyde /4-hydroy benzaldehyde /4-dimethyl aminobenzaldehyde to obtain corresponding hydrazones (4a-4f). [4-bromo 2(substituted phenyl)-6-methoxy benzothiazolyl hydrazone]. These hydrazones (4a-4f) in unhydrous benzene independently were refluxed on water bath for three hours with Attenburrow's MnO_2[14] to obtain corresponding 3-substituted phenyl- 5-bromo-7-methoxy-1 ,2, 3-triazolo benzothiazoles (5a-5f). All these newly synthesized compounds were screened for antimicrobial activity against E.Coli (Gram –ve), B. subtilis (Gram +ve), E. Carotovara and xanthomonas citri using Ampicillin, Streptomycin and penicillin as a standard for comparison.

***Key Words** : Hydrazone, triazolobenzothiazole, biological screening*

Introduction:

1,2,4-triazole and their derivatives are important class of organic compounds with diverse agriculture, industrial and biological activities[1-3], including antimicrobial[4-5] anti-convulsant[6-7] and antiinflamatory[8]. Similarly benzothiazoles are known to posses different activities such as anticancer[9],anthelmintic activity[10], antitubercular activity[11].

A survey of literature reveals such fused substituted tricyclic triazoles are prepared by different methods[12 13] but little work is carried out on bromo methoxy derivative of such fused tricyclic triazoles. Hence it was thought worthwhile to synthesize 5-bromo-7-methoxy as a substituent on benzene moiety in the 1,2,4-triazolo-[3,4-*b*]-benzothiazole system by following series of reactions and study the chemistry and biological activity of these compounds.

As the first step, 2-bromo 4-methoxy aniline (1) was prepared by treating 4-methoxy acetanilide with bromine in acetic acid, followed by hydrolysis with dil. HCl / NaOH solution.To the solution of sodium thiocynate in glacial acetic acid, 2-bromo-4- methoxyyl aniline (2) was added .The mixture was stirred well and bromine in glacial acetic acid was added drop by drop action maintaining the temp. below 5 ^{0}C. The obtained residue filtered, dissolved in hot water and neutralized by 20% alkali. The obtained product 2-amino-4-bromo-6-methoxy benzothiazole (2) was recrystlised by using ethanol.

On the basis of elemental analysis and spectral data the obtained product (2) has assigned the structure 2-amino-4-bromo-6-methoxy benzothiazole. The I.R. spectrum showed absorption bands at 3440 cm^{-1} and 3340 cm^{-1} due to asymmetric and symmetric stretching of -NH_2 group respectively. The PMR spectrum exhibited singlet at δ 3.4 due to -OCH_3, broad peak of δ 6.0 due to -NH_2 protons and two singlets in the region δ 7.0 - 7.5 due to two Ar-H protons. The mass spectrum reveals molecular ion peaks at 260 (M+2, 98%) and 258 (M^+, 100%). It also confirmed the presence of one bromine atom.

2-Amino-4-bromo-6-methoxy benzothiazole (2) in ethylene glycol as solvent was heated with 80% hydrazine hydratehydrochloride for three hours by using oil bath and maintaing temp. at 150°C to 160°C to get 4-bromo-6-methoxy-2-hydrazino benzothiazole (3). The I.R. spectrum of compound (3) showed absorption bands at 3320 cm^{-1} and 3203 cm^{-1} due to -NH_2 asymmetric and symmetric stretching respectively. The mass spectrum exhibits molecular ion peaks of equal intensity at 275 (M+2) and 273(M^+) which also confirming the formation of product with one bromine atom.

Compound (3) in ethanol was heated with 2-hydroxy-3-methoxy-benzaldehyde/4-methoxy benzaldehyde/4-hydroy-3-methoxy benzaldehyde /2-hydroxybenzaldehyde/4-hydroxybenzaldehyde /4-dimethyl aminobenzaldehyde sperately on water to obtain corresponding hydrazones (4a-4f). The I.R. spectra of hydrazones showed stretching absorption bands in the region 3450-3100 cm^{-1} due to –N-H stretching. The presence of broad singlet in their PMR spectra in the region δ 2.5 to δ 4.5 confirmed the presence of -NH proton. The mass spectrum of the compound (4a) shows molecular peak at 377 (M^+.) which corresponds to molecular weight of the compound.

These hydrazones (4a- 4f) in benzene were refluxed on water bath for three hours with Attenburrow's MnO_2[1] independently to obtain 3-(2'-hydroxy-3'-methoxy phenyl/4'-methoxy phenyl / 4'-hydroxy-3'-methoxy phenyl /2'-hydroxy phenyl/ 4'-hydroxy phenyl /4'-dimethyl amino phenyl-5-bromo-7-methoxy-1,2,4-triaz-

olo[3,4-*b*]-benzo- thiazoles respectively (5a-5f). The I. R. spectra of these triazolo benzothiazoles observed the absence of strong bands in the region 3450cm^{-1} - 3100 cm^{-1} due to -NH stretching , however the absence of broad singlet in PMR spectra of these triazolo benzothiazole in the region δ 2.5 - δ 4.5 confirms the formation of cyclised products.

The mass spectrum of compound (5f) exhibits molecular peak at 403 which corresponds to its molecular weight. It confirms the formation of 5-bromo-3-(4'- dimethyl amino phenyl)-7-methoxy 1,2,4-triazolo-[3,4-*b*]-benzothiazole products

Experimental:

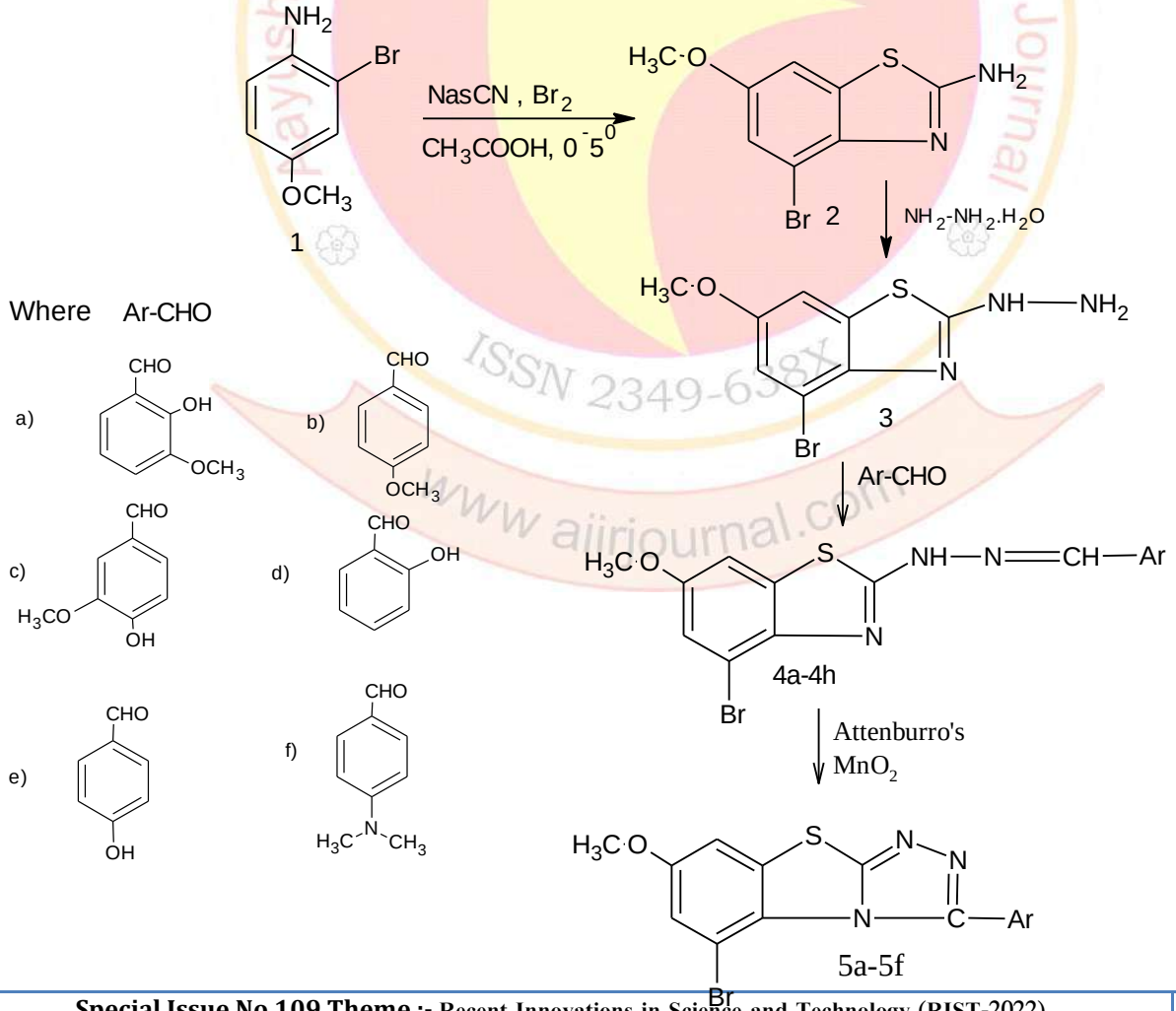
Melting points were determined in open capillaries and are uncorrected. Infrared spectra were recorded in Nujol / potassium bromide pellets on Bomen MB 104FT infrared spectrophotometer. ^{1}HNMR spectra were obtained on a Gemini 200 Mz specrtometer with TMS as an internal standard and mass spectra on FT VG-7070H mass spectrometer using the GI technique at 70 ev. Elemental analysis was carried out on a Heraeus CHN-O Rapid analyser. Purity of the compound was checked by TLC.

Synthesis of 2-Amino-4-bromo-6-methoxy benzothiazole (2)

2-Bromo-4-methoxy aniline (10.8 gm, 0.1 M) and sodium thiocynate (8 gm, 0.1 M) were dissolved in glacial acetic acid (75 ml). The solution was cooled in freezing mixture. Bromine (16 gm, 5 ml, 0.1 M) in glacial acetic acid (20 ml) was added with stirring and maintaining temperature below 25°C. The mixture was allowed to stand for overnight at room temp. The resulting hydrobromide was dissolved in hot water and neutralized with 20 % NaOH to obtain base. The amine thus obtained was filtered, washed with water and recrystallized in aq. alcohol to get the product 6.5 gm.

(60 %), M.P 160 °C., IR (KBr): 3440 cm^{-1} (Asymmetric stretching of -NH_2), 3340 cm^{-1}(N-H Symmetrical stretching of -NH_2), 3052cm^{-1} (Ar-H stretching), 1630 cm^{-1} (-C=N stretching), 1325 cm^{-1} (Ar–C-O stretching), ^{1}HNMR ($CDCl_3$) : δ 3.4 (singlet, 3H, CH_3) due to -OCH_3, δ 6.0 (broad, 2H, NH_2), δ 7.0-7.5 (two singlet, 2H, Ar-H), m/z 230 (M+2, 98 %), 228 (M^+,100%),

Scheme-1



4-Bromo-2-hydrazino -6-methoxy-benzothiazole (3)

Hydrazine hydrate (80%, 9 ml) was taken in a round bottom flsk, cooled the solution to 5°C and added conc. HCl (6 ml) in dropwise fashion with constant stirring. The flask was kept at room temperature for half an hour. 2-amino-4-bromo-6-methoxy benzothiazole (6 gm) and ethylene glycol (24 ml) was added in portions. The contents of the flask were heated at 150 °C to 160 °C on an oil bath for three hours and then cooled. The obtained product, 4-bromo-6-methoxy-2-hydrazino benzothiazole was filtered, washed with cold water and crystallized from ethyl alcohol to give 3.6 gm (62%), M. P. 172°C, IR (KBr) : 3320 cm^{-1} (asymmetric N-H stretching of $–NH_2$), 3203 cm^{-1} (symmetric N-H stretching of $–NH_2$) m/z: 275 (M+2), 273 (M^+)

General procedure for Synthesis of hydrazone of 2-hydrazino-4-bromo -6-methoxy benzothiazole and substituted aromatic aldehyde (4a-af)

2-hydrazino-4bromo-6-methoxy benzothiazole (0.01 M) and aromatic substituted aldehyde is suspended in ethanol seperatly.the mixture of these suspended solution was refluxed on water bath for three hours. The reaction mixture was cooled and obtained solid filtered by using vaccume pump. The obtained product washed with ethyl alcohol and recrystallised from hot benzene.

4a. 2.5 gm , M. P. : 150 °C, IR(KBr) : 3185 cm-1 (-OH Stretch), 3160 (N-H) stretch), 1584 (C= N Stretch), 1290, (C-N Stretch),

4b. : Yield : 2.4 gm, M. P. : 130 °C. IR (KBr) : 3200 cm^{-1} (-OCH_3 Stretch), 3167 cm^{-1} (N-HStretch), NMR shows 3.4 Singlet due to OCH_3 group.

4c. : Yield : 2.6 gm , M. P. : 115 °C. IR (KBr):3180 cm-1 (-OH Stretch), 3174 cm-1 (N-H Stretch).

4d. : Yield : 2.5 gm, M. P. : 140 °C. I.R. (KBr) : 3389 (N-H stretching) 3053 (= C-H stretch in aromatic ring), 1541 (C=N stretch), 1290 (C-N stretch),

4e. Yield : 2.5 gm , M. P. 182 °C, IR (KBr):3423 cm-1 (O-H) stretching), 3209 cm-1 (N-Hstretching),.

4f. Yield : 2 gm , M. P. : 138 °C, IR (KBr) :, 3200 cm-1 (N-H stretching),

General procedure for synthesis of 3-Substituted-5-bromo-7-methoxy 1,2,4 triazolo [3,4-b]-benzothiazole. (5a-5f)

4-Bromo-2-substituted -6-methoxy benzothiazolyl hydrazone (0.002 M) was taken in dry benzene (50 ml). To this was added Attenbarrow's active manganese dioxide[1] (2.0 gm, 0.016 M) and the mixture was refluxed on water bath for three hours. Contents were poured on hot condition in petridish, benzene solvent was removed by evaporation. Obtained solid product was recrystallized from hot ethanol,

All compound (5a-5f) shows absence of N-H streatching in IR specrum, which confirms the formation of cyclised product. Compound 5a shows absorption signal at 3200 cm^{-1} due to O-H streatching while it is absent in compound 5b and 5f because absence of O-H substituent on aromatic ring.

Table : 1

Sr. No.	Compound	Molecular formula	Molecular formula Weight	Yied In gm	M. P In ^{0} C.
1	5a	$C_{16}H_{12}BrN_3O_3S$	406	1.2	183
2	5b	$C_{16}H_{11}BrN_3O_2S$	390	1.3	170
3	5c	$C_{16}H_{12}BrN_3O_3S$	406	1.5	102
4	5d	$C_{15}H_9BrN_3O_2S$	376	1.0	182
5	5e	$C_{15}H_9BrN_3O_2S$	376	1.2	118
6	5f	$C_{17}H_{14}BrN_4OS$	403	1.4	103

Antimicrobial screening: Result and discussion:

Table-2: Evaluation of antimicrobial activity of 3-substituted 5-bromo 7-methoxy 1,2,4 triazolo [3,4,-b] benzothiazole.

Sr. No.	Comp.	Antimicrobial activity (zone of inhibition)			
		E.coli	***Erwinia cartovora***	***Bacillus subtilis***	***Xanthomo-nas. citri***
1	5a	+++	+++	++	++
2	5b	++	+++	+++	++
3	5c	++	++	+++	+
4	5d	+	-	-	+
5	5e	+	+	+	+
6	**5f**	+++	+++	++	++

The compounds (5a-5f) were tested for their antimicrobial activity by cup plate agar diffusion method against *E.coli* (Gram –ve) *B.subtilis* (Gram +ve), *E. carotovara* and *Xanthomonas citri* using ampicillin, streptomycin. and penicillin as a standard for comparison. The antibacterial screening data of the compounds is presented in table No.1. Dimethyl sulphoxide was used as a control (solvent). Compound 5a and 5f is active against *E. coli* and *E. carotovara* species while 5c compound is more active against *Bacillus subtilis* species. compound 5b active against *Bacillus subtilis* and *E. carotovara* species. Compound 5d and 5e are inactive against all four species tested.

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Role Of Physicochemical Properties in Drugs

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Abstract

A complete knowledge of the relevant therapeutic and physicochemical properties of the drug is required to determine the proper formulation and delivery method of a drug. In pharmacology, a drug is a chemical substance typically of known structure, which when administered to a living organism produce a biological effects. Pharmaceutical drugs also called a Medicine. Medicine which is a chemical substance used to treat, cure, prevent or diagnose a disease to promote well. The drugs were obtained through extraction from Medicinal Plants. Pharmaceutical formulation is the multistep process where the active drug is mixed with all other components by considering the factors of particle size, polymorphism, pH, and solubility and becomes the final beneficial medicinal product, the effect of a drug in the human body is mediated by specific interactions of the drug molecule with biological macromolecules. The present paper is based on the literature survey on the Physiochemical properties of drugs studied by various scientists. Physical properties of drugs are responsible for its action. The drug react extra cellular according to simple chemical reactions like neutralization, chelating, oxidation, etc.

Keywords*: solubility, Pharmaceutical, properties, drugs etc*

Introduction:

Physical properties, solvation properties related to interactions with different media, properties or molecular attributes that define intrinsic chemical reactivity. A drug is a chemical substance that interacts with proteins in the body to affect a physiological function. This is the general idea behind all medicine. Once these substances are absorbed into the systemic circulation they bind with certain proteins changes the functioning of the cell slightly.

Physical and chemical properties of substances are very important in identifying and studying chemical compounds. Physical properties are different from chemical properties of a substance. The main difference between physical and chemical properties is that physical properties can be observed without changing the chemical composition of a substance whereas chemical properties can be observed by changing the chemical composition of a substance [1]. The physical characteristics impact the passage of a drug molecule from the administered dose to the site of action, profoundly influencing its pharmacokinetics and pharmacology [1]. Chemical properties are properties that can be measured by changing the chemical composition of a substance. The chemical composition of a substance is like the identity of that substance

Why to study Physicochemical Properties of Drugs?

A complete knowledge of the relevant therapeutic and physicochemical properties of the drug is required to determine the proper formulation and delivery method of a drug. Avdeef A. etal [2]discuss that in addition to providing a basic understanding of the importance of solubility and stability to drug delivery, methods to enhance solubility and physical and chemical stability are described. They also focus on the processes required for the proper drug formulation. Since most drugs are administered in the solid state, the formulation process for tablets is described in detail. They also discuss on some basic drug delivery methods, with an emphasis on the physicochemical properties that impact those methods [2]. For Example: The various Physicochemical properties of the drug that affect drug dissolution and its rate are solubility, particle size, polymorphism, salt form, pseudo polymorphism, complexation, wettability, etc. Pharmaceutical formulation is the multistep process where the active drug is mixed with all other components by considering the factors of particle size, polymorphism, pH, and solubility and becomes the final beneficial medicinal product. Pharmaceutical drugs are usually categorized into drug classes. A group of drugs will share a similar chemical structure, or have the same mechanism of action, the same related mode of action or target the same illness or related illnesses [3]. The Anatomical Therapeutic Chemical Classification System (ATC), the most widely used drug classification system, assigns drugs a unique ATC code, which is an alphanumeric code that assigns it to specific drug classes within the ATC system [4].

Principle of drug action:

Goldstein A. etal [5] focus on the appearance of a text which is almost completely devoted to the theory of drug action, and in fact covers no particular drug in a systematic fashion, emphasizes the remarkable growth of pharmacology as a science. At a molecular level and in an orderly manner it dissects and demonstrates the logic by which man has attained the ability to control living processes of all types by the use of chemicals

How do Physicochemical Properties affect Drugs Absorption?

Avdeef A. etal [2] studied on solubility and permeability are considered as the major physicochemical factor that affect the rate and extent of oral drug absorption, moreover

other physicochemical properties always show their effects to drug absorption via affecting solubility and permeability [6].

Factors affecting on drugs solubility:

a) Drug solubility & dissolution rate b) Particle size & effective surface area c) Polymorphism & amorphism d) Pseudopolymorphism (hydrates/solvates) e) Salt form of the drug f) Lipophilicity of the drug (pH- Partition-hypothesis) g) pKa of drug & gastrointestinal pH h) Drug stability

Kerns EH. etal [7] focused on all drugs can be administered via number of routes Bolus is the administration of the medication, drug and other compound that is given to raise its concentration in blood to an effective level. Inhaled as an aerosol, vape, inhaler or dry powder. Injection as a solution, suspension or emulsion. Orally as a liquid or a solid, that is absorbed through the intestines. Sublingually, diffusing into the bloodthrough tissues under the tongue. Rectally as a suppository, that is absorbed by the rectum or colon [8].

Physicochemical properties of drugs

The ability of a chemical compound to elicit a pharmacological/ therapeutic effect is related to the influence of various physical and chemical properties of the chemical substances on the bio molecules that is interacted with. Physical properties of drugs are responsible for its action. Chemical properties of drug react extra cellularly according to simple chemical reactions like neutralization, chelation, oxidation, etc.

Types of physicochemical properties of drugs

A. Solubility
B. Partition co-efficient
C. Hydrogen bond
D. Chelation / Complexation
E. Ionization of drugs
F. Surface activity
G. Protein Binding

Solubility:

C. D. Rangel-Yagui. Etal[8] studied on the solubility of the substance at a given temperature. Solubility depends on the nature of solute and solvent as well as temperature, pH of pressure. The solubility of drug may be expressed in terms of its affinity or repulsion for either an aqueous or organic solvent [9]. Kerns EH. and C. D. Rangel-Yagui [8] focused on Solubility is based on the highest-dose strength of an immediate release product. A drug is considered highly soluble when the highest dose strength is soluble in 250 mL or less of aqueous media over the pH range of 1 to 7.5. Solubility improvement techniques can be categorized in to physical modification, chemical modifications of the drug substance, and other techniques. Physical Modifications includes Particle size reduction like micronization and nanosuspension, modification of the crystal habit like polymorphs, amorphous form and cocrystallization, drug dispersion in carriers like eutectic mixtures, solid dispersions, solid solutions and cryogenic techniques. Chemical Modifications includes Change of pH, use of buffer, complexation, and salt formation.

Partition co-efficient

Leo A. etal [10] explained on the chemical and pharmaceutical sciences, both phases usually are solvents. Most commonly, one of the solvents is water, while the second is hydrophobic, such as 1-octanol. Hence the partition coefficient measures how hydrophilic or hydrophobic a chemical substance. Partition coefficients are useful in estimating the distribution of drugs within the body. Hydrophobic drugs with high octanol-water partition coefficients are mainly distributed to hydrophobic areas such as lipid bi layers of cells. Hydrophilic drugs are found primarily in aqueous regions such as blood serum. Edwards MP, etal [11] studied on drug's distribution coefficient and how easily the drug can reach its intended target in the body, how strong an effect it will have once it reaches its target, and how long it will remain in the body in an active form. Log P is an octanol -water Partition co-efficient and measure the degree of hydrophobicity playing vital role in drug absorbtion.

Hydrogen Bond:

Edwards MP, etal [11] studied on the hydrogen bond which is a special dipole – dipole interaction between the hydrogen atom in a polar bond such as N-H, O-H or F-H and electronegative atom O, N, F atom. Dipoles result from unequal sharing of electrons between atoms within a covalent bond. These are weak are capable of forming hydrogen bonding is also soluble in water [1]. A number of motifs, several of which are clearly underutilized in drug discovery are analyzed in more detail by comparing small molecules and protein ligand X-ray structure. The effects on physiochemical properties, sets of closely related structures with and without the ability to form intra molecular hydrogen bonds were designed, synthesized and characterized with respect to membrane permeability, water solubility and lipophilicity [9].

Chelation / Complexation:

Drug complexation can lead abeneficial properties such as enhanced aqueous solubility and stability. In some instances, complexation also can lead to poor solubility or decreases absorption of drug in the body. For some drugs, complexation with certain hydrophilic compounds can enhance excretion.

Ionization of drugs:

Allen R. I., etal studied on the drugs are either weak acids or bases and can exist in either ionized or unionized state. Ionization = Protonation and deprotonation resulting in charge molecules. The ionization of the drug depend its pKa and pH. As the majority of drugs are weak acid and base of the dissociation constant in each case helps in understanding the ionic form a molecule will take across a range of pH values. The pKa of a drug influences lipophilicity, solubility, protein binding and permeability which in turn directly affect pharmacokinetic (PK) characteristics such as absorption, distribution, metabolism and excretion. The association between pKa and PK has also resulted in the requirement for pKa values to be measured for regulatory compliance. Allen R. I., etal [12] focused on the rate of drug adsorption is directly proportional to the concentration of the drug at absorbable form but not the concentration of the drug at the adsorption site. Ionization form imparts good water solubility to the drug which is required of binding of drug and receptor interaction. Unionized form helps the drug to cross the cell membrane **[12]**.

Surface Activity:

Surfactant is defined as a material that can reduce the surface tension of water at very low concentration. Surface active agents affect the drug adsorption which depends on:

- The chemical nature of surfactant
- Its concentration
- Its affect on biological membrane and the micelle formation.

In lower concentration of surfactant enhanced the rate of adsorption because amphiphiles reduces the surface tension and better adsorption. In higher concentration of surfactant reduced the rate of adsorption

Protein Binding:

Haupt V. J, etal [13] explained on the reversible binding of protein with non specific and non functional site on the body protein without showing any biological effect is called as protein binding. Protein + Drug⇌Protein – drug complex. Depending on the whether the drug is a weak or strong acid, base or neutral, it can be bind to single blood proteins to multiple proteins. The most significant protein involved in the binding of drug is albumin, which comprises more than half of blood proteins. The degree of protein binding can greatly affect the pharmacokinetics of drugs acid drugs such as non steroidal anti-inflammatory drugs (NSAIDs) tend to bind predominantly to albumin. Albumin is the most abundant plasma protein and it is critical to maintaining the colloidal entotic pressure in the vascular system. As a negative acute phase protein, albumin concentration decreases during inflammation. Other proteins, including corticosteroid binding globulin are important for binding of some specific drugs but are less important in overall drug protein binding. There is equilibrium between free and bound drug, just like the relationship of ionized and non ionized drug molecule. Protein binding is most clinically significant for antimicrobial therapy. Changes in protein binding caused by drug interactions are assumed to instantaneously change free drug concentrations and have been frequently cited as a cause of adverse drug reaction.

Conclusion:

From literature survey it is concluded that study of physiochemical properties are to be studied before the drugs are provided in market. The physicochemical properties of compounds that determine their interaction with transport proteins and the enzymes involved in drug clearance. Lipophilicity is an important physicochemical property resulting in interaction and, in particular, inhibition of both transport proteins and enzymes. Solubility is one of the important parameters to achieve desired concentration of drug in systematic circulation for achieving required pharmacological response. Partition Coefficient is useful in estimating the distribution of drugs within the body. The partition coefficient measures how hydrophilic or hydrophobic a chemical substance is one of the solvent is water while the second is hydrophobic, such as 1- octanol. Hydrogen bonding plays a crucial role in determining the specificity of ligand binding. Hydrogen bonding holds complementary strands of DNA together, and they are responsible for determining the three dimensional structure of folded proteins including enzymes and antibodies Chelation therapy is the preferred medical treatment for reducing the toxic effects of metals. Complexation is an extensively used technique in the pharmaceutical field to improve solubility of several pharmaceutical ingredients and subsequently the

bioavailability of poorly water soluble drugs. Ionized drugs are not absorbed as efficiently as unionized drugs. A drug that is a weak acid will be adsorbed primarily in acidic environment, whereas, a drug that is a weak base will be absorbed in the alkaline environment of small intestines. The action of surface activity in drug as a liquid membrane hypothesis of drug action for surface active drugs. Protein binding can influence the drugs biological half life. The bound portion may act as a reservoir or depot from which the drug is slowly released as the unbound form. The pKa of a drug influences lipophilicity, solubility, protein binding and permeability which in turn directly affects pharmacokinetic characteristics such as absorption, distribution, metabolism and excretion (ADNE)[1-5]. The modern drug discovery involves the identification of screening hits, medicinal chemistry and optimization of those hits to increase the affinity, selectivity, efficacy and oral bioavailability. The effect of a drug in the human body is mediated by specific interactions of the drug molecule with biological macromolecules, led scientists to the conclusion that individual chemicals are required for the biological activity of the drug.

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Green Chemistry,Nanotechnology,Environmental Chemistry and Synthetic Organic Chemistry.

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Abstract:-

Nano material are important in many diverse areas,from basic research to various application in Electronics,biochemical sensors catalysis energy.Bridge between homogeneous & Heterogeneous catalysis.Close to Homogeneous catalyst.Microwave assisted Nano catalysis in aqueous medium,in last fews years, Microwave assisted chemistry has blossomed in to a matured and useful Technique for a variety of applications. In India, agriculture plays an important role for development in food production. In our country, agriculture are depends on the monsoons which is not sufficient source of water. So the irrigation is used in agriculture field. In Irrigation system, depending upon the soil type, water is provided to plant. In this paper, automatic irrigation system based on GSM module is studied. The developed system is a machine based system, which automates the irrigation of land by combining various software and hardware approaches together to find exact field information and to provide instant across the field. This involves some sensors, LCD display, buzzer, artificial lights and GSM.Here we are using sensors to monitor the field condition. Those are Temperature, humidity, soil moisture, and fire and light sensors. All these devices are connected to the microcontroller.GSM is used for communication purpose only

Key words:- *Nanoparticles synthesis, icrobial synthesis, Phytonanotechnology, UV–visible spectroscopy.*

Introduction:-

Green chemistry is also known as environmentally benign chemistry or sustainable chemistry ,Paul Anastas and John Warner, who defined green chemistry as the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances.Chemical developments also bring new environmental problems and harmful unexpected side effects, which result in the need for 'greener' chemical products. Green chemistry looks at pollution prevention on the molecular scale and is an extremely important area of Chemistry due to the importance of Chemistry in our world today and the implications it can show on our environment. The Green Chemistry program supports the invention of more environmentally friendly chemical processes which reduce or even eliminate the generation of hazardous substances. Anastas and Warner formulated the twelve principles of green chemistry in 1998. These serve as guidelines for chemists seeking to lower the ecological footprint of the chemicals they produce and the processes by which such chemicals are made.The invention, design and application of chemical products and processes to reduce or to eliminate the use and generation of hazardous substances.

Green Chemistry Is About

- Waste Minimisation at Source
- Use of Catalysts in place of Reagents
- Using Non-Toxic Reagents
- Use of Renewable Resources
- Improved Atom Efficiency
- Use of Solvent Free or Recyclable Environmentally Benign Solvent systems

Principles Of Green Chemistry

1. **Prevention of Waste or by-products**
   It is better to prevent waste than to treat or clean up waste after it is formed
2. **Atom Economy**:-
   Atom economy (atom efficiency) describes the conversion efficiency of a chemical process in terms of all atoms involved (desired products produced).

$$Atom\ Economy = \frac{Mol.\ weight\ of\ Desired\ product}{Mol.\ weight\ of\ all\ reactants} \times 100$$

3. Minimization of hazardous products

Wherever practicable, synthetic methods should be designed to use and generate substances that possess little or no toxicity to people or the environment.

4. Designing Safer Chemicals

Chemical products should be designed to effect their desired function while minimising their toxicity

5. Safer Solvents & Auxiliaries

"The use of auxiliary substances (e.g. solvents, separation agents, etc.) should be made unnecessary wherever possible, and innocuous when used"

6. Design for Energy Efficiency

Energy requirements of chemical processes should be recognized for their environmental and economic impacts and should be minimized. If possible, synthetic methods should be conducted at ambient temperature and pressure. Developing the alternatives for energy generation (photovoltaic, hydrogen, fuel cells, bio based fuels, etc.) as well as continue the path toward energy efficiency with catalysis and product design at the forefront.

7. Use of Renewable Feedstock

"A raw material or feedstock should be renewable rather than depleting whenever technically and economically practicable."

8. Reduce Derivatives

Unnecessary derivatization (use of blocking groups, protection/de-protection, and temporary modification of physical/chemical processes) should be minimized or avoided if possible, because such steps require additional reagents and can generate waste. More derivatives involve ,Additional Reagents ,Generate more waste products More Time ,Higher Cost of Products .Hence, it requires to reduce derivatives.

9. Catalysis

Catalytic reagents (as selective as possible) are superior to stoichiometric reagents. e.g. Toluene can be exclusively converted into p-xylene (avoiding o-xylene & m-xylene) by shape selective zeolite catalyst.

10. Designing of degradable products

Chemical products should be designed so that at the end of their function they break down into innocuous degradation products and do not persist in the environment.

11. New Analytical Methods

"Analytical methodologies need to be further developed to allow for real-time, in-process monitoring and control prior to the formation of hazardous substances."

12. Safer Chemicals For Accident Prevention

"Analytical Substances and the form of a substance used in a chemical process should be chosen to minimise the potential for chemical accidents, including releases, explosions, and fires."

Microwave assisted Reaction: An approach to green Chemistry

Microwave assisted organic synthesis is defined as the preparation of desired organic compound from available starting material via some procedure involving microwave irradiation. As it is less hazardous it is a potential tool of green chemistry. Microwave Synthesis opens up new opportunities to the synthetic chemist in the form of new reaction that are not possible by conventional heating. It is an enabling technology for accelerating drug discovery and development processes.

Nanoparticles

Nanoparticles are particles which lie in dimensions between 1-100 nm. Nano derived from the Greek word Nanos which means dwarf or extremely small It can be used as a prefix for any unit to mean a billionth of that unit. For example, nanoseconds (billionth of a second), nanometer (billionth of a meter), nanoliter (billionth of a liter). They consist of micro molecular materials in which the active ingredients (drug or biologically active material) is dissolved, entrapped, encapsulated, adsorbed or attached

Methods For Synthesis Of Nano Particles

Physical method; time and energy consuming, synthesis at high temperature, and pressure.

Chemical method; simple, inexpensive, and low temperature, use of toxic reducing and stabilizing agents make it harmful.

Green method; Easy, efficient and eco-friendly. eliminates the use of toxic chemicals, consume less energy and produce safer products and by products.

Major Limitation Of Microbial Synthesis

Microbial synthesis is of course readily scalable, environmentally benign and compatible with the use of the product for medical applications, but production of microorganisms is often more expensive than the production of plant extracts.

Techniques For Synthesis Of Nano Particles

The methods for making nanoparticles can generally involve either a “top down” approach or a “bottom up” approach

Phytonanotechnology

Phytonanotechnology is actually the synthesis of Nano particles using fresh plants or plant extracts. Plant derived nanoparticles produced by readily available plant materials. The nontoxic nature of plants are suitable for fulfilling the high demand for nanoparticles with applications in the biomedical and environmental areas.Recently, successfully synthesized gold and silver nanoparticles using the leaf and root extract from the medicinal herbal plant Panax ginseng. Additionally, various plant parts, including leaves, fruits, stems, roots, and their extracts, have been used for the synthesis of metal nanoparticles. It has been proposed that proteins, amino acids, organic acid, vitamins, as well as secondary metabolites, such as flavonoids, alkaloids, polyphenols, terpenoids, heterocyclic compounds, and polysaccharides, have significant roles in metal salt reduction and, furthermore, act as capping and stabilizing agents for synthesized nanoparticles.

Phytochemical Screening

It refers to the extraction, screening and identification of the medicinally active substances found in plants. Some of the bioactive substances that can be derived from plants are flavonoids, alkaloids, carotenoids, tannin, antioxidants and phenolic compounds. Color changes or precipitation formation is the indication of presence of these phytochemicals.

Preparation Of Plant Extract For Phytochemical Screening

Take Fresh plant. An ethanol extract of sample can be prepared by milling 50 gram of the desired part of plant in an electric blinder. Then mixed paste of plant with 200 ml ethanol in conical flask by shaking it with hand and placed for three days or by mixing it with magnetic stirrer. Now filter the Ethanoic extract of plant. Placed the filtrate on rotary evaporator at 60 degree centigrade to remove ethanol. The extract will be concentrated by placing it on water bath at 75 degree centigrade. Now the sample is prepared for the phytochemical screening.

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Future aspects of 5G Technology in India- A Review

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Abstract

5G is the fifth-generation digital cellular network which will completely revolutionize digital cellular technology. We have seen from the past several years that how digital cellular network technology changed from 1G to 4G. This technology was widely accepted and spread in our country in a short span of time. As due to increasing dependency on technology we need much more high-speed internet with high data download capacity and low latency. In the future we will see how machine to machine communication, unman machine with artificial intelligence will change our way of life. Already we are using 4G cellular networks which are not enough with growing demand due to vast changing technology. In India very soon department of telecommunication will roll out auction of spectrum for 5G digital cellular network which is likely to be start in the beginning of 2022. Many private players like Reliance Jio, Bharti Artel and Vodafone Idea is ready to provide 5G network. Although department of telecommunication is all ready to go for 5G. But many users still unaware about 5G technologies. It is because due to increasing technology over the years we have seen lot of changes in nature and its effect ultimately on the human body. Hence, there is a palpable sense of fear among users related to its effect on health. This current paper provides comprehensive study of 5G technology, its implementation and myths related to health.

Keywords: 5G, 4G, Frequency, Millimeter wave, Radiation.

Introduction

5G is the fifth-generation digital cellular technology which is having capability of providing high speed internet connectivity, high downloading data with low latency. Although 4G is widely used in our country but it needs to update due to vast increasing and developing technology. It is believed that around 2025 there will be more than 5.7 billion mobile users around the world and 5 billion internet users [1]. We have seen from the last several years how there is an increasing dependence on technology. Today for anything we need internet through cell phones from calling taxi to order meal as well as using GPS for searching location. In the last decade there has been a tremendous increase of internet users. According to recent data there are 4.72 billion people around the world use the internet in April 2021, that's more than 60 percent of the world's total population. Internet users are currently growing at an annual rate of 7.6 percent. The average global internet user spends almost 7 hours online each day [2].

In India the number of smartphone users was estimated to reach over 760 million in 2021 [3]. This figure is growing day by day due to the majority of mobile users are going towards digital. Mostly youngsters are using digital payment option from paying bills for electricity to ordering meals and also for shopping. During covid-19 pandemic lockdown 2020-21 internet usage increased by 60%. From students to employees everyone was using the internet for working at home and to spend some time. This will not stop here we will see in future how our dependency will enhance on internet. Everything will be control by internet through Artificial intelligence such as driver less cars, house appliances, security cameras, smartwatches and machine to machine communication, like a high-speed vehicle on road or highway will communicate with another car on highway and provide safer journey. It will not only save our time but also avoid accidents. Another most significant aspect is its use within the medical field now a days we've seen how this pandemic realized the importance of doctors. Many countries don't have proper medical facility with specialized doctors. This pandemic emphasized the requirement of more specialized doctors. Available statistics show that, as of 2020 over 55% of WHO Member States report back to have but 20 medical doctors per 10000 populations (almost 40 countries within the WHO African region). Medical experts are distributed unevenly across the world. Countries with very cheap relative need have the best numbers of physicians, while those with the greatest burden of disease must manage with a far smaller health workforce. The African Region suffers quite 22% of the world burden of disease but has access to only 3% of medical examiners and less than 1% of the world's financial resources [4].

Even in our country position is additionally not good many remote areas don't have specialized doctors. Most of the specialized doctors are working in cities, only a few doctors are working in rural areas but most of them are not specialized. In such cases patients have to visit a nearby city hospital. The doctor to population ratio in India is 1:1456 against the WHO recommendation of 1:1000 [5]. To solve this problem either we've got to extend no of qualified doctors which isn't possible in less time like current situation of pandemic or we have to

use technology like 5G. Within which 5G digital network allow telemedicine service through which doctors can treat patients at remote area and do surgery from anywhere any time without delaying in time [6]. 5G technology isn't only useful for consumers but also very essential for our growing economy. Due to pandemic 2020-2021 government of India suffered huge loss of revenue. India's growth fell to 3.1 percent within the fourth quarter of the financial year 2020, as per the Ministry of Statistics [7]. The 140 million people lost employment during this lockdown, and others got salaries cut. During the primary phase of lockdown, the Indian economy was expected to lose $4.5 billion on a daily basis [8]. But 5G technologies may well be a game changer it can create lot of revenue to government of India and large no of jobs especially in private sector. Department of Telecommunications (DoT) is expected to auction spectrum for 5G in next year 2022, it delayed because of pandemic. Many companies like Jio, Bharti Airtel, Vodafone, BSNL and MTNL is geared up to go for 5G networks. It is estimated that 5G will deliver $150 billion in additional GDP for India [1].

On the other hand, there are some misconceptions related to 5G technology among the general public. The misperception is related to health, some believe that 5G cellular technology will create lot of radiation due to which it will cause to health. As radiofrequency EMFs at sufficiently high-power levels can adversely affect health. The International Commission on Non-Ionizing Radiation Protection (ICNIRP) published Guidelines in 1998 for human exposure to time-varying EMFs up to 300 GHz, including the radiofrequency EMF spectrum. This commission is regulating 5G network frequency to make sure safety to individual and environment. During this pandemic also some were believed that the second wave of coronavirus has been caused by testing of 5G technology. The ministry of communication issued an announcement they said that there's no relationship between coronavirus and testing of 5G network. They urged public not to believe on such fake news [9]. The study of 5G digital cellular network technology in this paper is to analyse its future aspects on Indian consumers.

Comprehensive information about 5 G technologies

Wireless communication and transmission of data is possible by the use of Radio frequency (RF) waves. It is the electromagnetic wave frequencies that lie in the range extending from around 3 kHz to 300 GHz in the electromagnetic spectrum. We are using this radio frequency from navigation of ship to satellite communication. Some frequency is reversed only for government agencies such as space and research or defence forces in countries. In wireless communication our journey starts from the analog world and now we come to the digital world. The first generation mobile communication start from 1G it had provided bandwidth 2.4 Kbps with frequency 30 KHz, 2G had provided bandwidth 64 Kbps with frequency 1.8 GHz, 3G had provided bandwidth 100 kbps-2 Mbps speed with frequency 2 GHz and 4G currently provided 100 Mbps-1 Gbps speed with frequency 8 GHz and is based on LTE (Long term evolution) Technology [10]. LTE developed by 3Gpp (Third generation partnership project). It was used to speed up the device like cell phone, tablet, Wi-Fi etc. We can observe that how bandwidth and frequency had increased from 1G to 4G with increasing technology and its uses. Following table-1 shows the development in technology [11].

Generation	Year of development	Technology	Frequency	Bandwidth
1G	1982	AMPS, NMT, TACS	30KHz	2Kbps
2G	1992	GSM	1.8 GHz	14.4-64 Kbps
3G	2001	CDMA	1.6-2 GHz	2Mbps
4G	2012	LTE, WiMAX	2 - 8 GHz	2Mbps to 1Gbps

Table-1 (Development of network from 1G to 4G)

5G is the fifth-generation digital cellular technology which will use higher Radio frequency of electromagnetic spectrum for high speed internet, high data downloading with low latency. 5G is technology designed to meet the requirements of IMT-2020 set by the International Telecommunication Union (ITU-R).

IMT-2020 (5G) is meant to supply way more enhanced capabilities than those provided by IMT Advanced (4G). Compare to 4G network its speed will 10 times higher. 5G will provide data speed 1 GB/sec and peak data speed will be 2-20 GB/sec. 5G will provide 1 milli second low latency which is far lesser than 4G having 100 milli second. 5G network uses higher frequency range from electromagnetic spectrum called as millimeter wave (mm Wave). Millimeter waves have a shorter range than microwaves, this millimeter wave is completely new for transmission of signal or data. But due to the use of higher frequency of millimeter wave it

affects the range of network. Hence, 5G network service area is divided into small geographical areas called cells. Small cells are low powered cellular radio access nodes in which it has a range of 10 meters to a few kilometers. These small cells are connected to macro cells or large tower to receive and emit signal See. 5G technology used Multiple bitstreams technique to transmitted data simultaneously. A technique called as beamforming, in which the base station computer will continuously calculate the best route for radio waves to reach each wireless device and will organize multiple antennas to work together as phased arrays to create beams of millimeter waves to reach the device.[13] [14].

To increase its capacity 5G used Massive MIMO (multiple input and multiple output) technique in which large number of antennas employed in transmitter and receiver. Each antenna is individually-controlled and will embed radio transceiver components. All 5G devices in a cell are connected to the internet and telephone network by radio waves through a local antenna in a cell. For wide 5G network service, it operates on three frequency bands-Low, Medium and High. Spectrum requirement for 5G network lies around three key frequencies ranges: Sub-1 GHz, 1-6 GHz and above 6 GHz. The selection of spectrum among these ranges will depend upon the capacity and coverage requirement of the region [17]. Low-band 5G uses the identical frequency range to 4G cell phones, 600–850 MHz, giving download speeds a little higher than 4G: 30–250 megabits per second (Mbit/s).[12] Low-band cell towers have a range and coverage area just like 4G towers. Mid-band 5G uses microwaves frequency from 2.5–3.7 GHz, allowing speeds of 100–900 Mbit/s, with each cell tower providing service up to many kilometers in radius. High-band 5G uses frequencies of 25–39 GHz, near the underside of the millimeter wave band. Since millimeter waves (mm Wave or mm W) have a more limited range, it requires many small cells.[15] Hence, millimeter signal waves could be impeded or blocked by materials in walls or windows [16]. Hence, 5G network service is planning to deploy cells only in dense urban environments and areas where crowds of people congregate like sports stadiums and convention centres. By deploying small cells, operators are able to support significantly higher capacity in dense areas, as well as improve coverage in areas where building blockage otherwise reduces the signal strength. Since 5G capabilities rely on hyper dense network, small cells are going to be required to be deployed at every 200-250 meters on many varieties of infrastructure like electric utility poles, street light poles, bus stands, roof tops, traditional cell towers, etc. [17]. The industry standards group 3GPP chose the 5G NR (New Radio) standard along with LTE as their proposal for submission to the IMT-2020 standard [18][19]. 5G NR include lower frequencies (FR1), below 6 GHz, and higher frequencies (FR2), above 24 GHz.

World position at 5G Technology

South Korea was the first country to adopted 5G network at her own country on a large scale. Swedish telecoms giant Ericsson predicted that 5G internet will cover up to 65% of the world's population by the end of 2025.[20] Also, it plans to invest 1 billion reals ($238.30 million) in Brazil to add a new assembly line dedicated to fifth-generation technology (5G) for its Latin American operations.[21].

India's preparation in the direction of 5G

A 5G High Level Forum (5G HLF) was founded by the Union Government of India in September 2017 to articulate the vision for 5G in India and to recommend policy initiatives & action plans. In August 2018 (5G HLF) released a report ''Making India 5G ready'' suggesting measures within the area of Spectrum Policy, Regulatory Policy, Education and Awareness Promotion Program, Application & Use Case Labs, Development of Application Layer Standards, Major Trials and Technology Demonstration and Participation in International Standards. The Government has launched a program titled 'Building an End-to-End 5G Test Bed' to advance innovation and research in 5G. The program envisages close collaboration between universities and small technology companies. The goal of the program is to make proof-of-concept 5G prototypes that are broadly compliant with the 3GPP standards [17]. On the standards front, the Low Mobility Large Cell (LMLC) use case accepted in the International Mobile Telecommunications-2020 (IMT-2020) requirements. Low Mobility Large Cell (LMLC) is a standard use to provide better coverage of internet in rural areas and other places of country. The base station in rural areas will cover up to 6 km range. According to 5G High Level Forum due to 5G roll out there will be an economic advantage of USD 1 trillion on India by 2035.

The National Digital Communication Policy-2018 (NDCP-2018), released on 26th September 2018 with the target of fulfil the information and communication needs of citizens and enterprises through the establishment of a ubiquitous, resilient, secure, accessible and affordable Digital Communications Infrastructure and Services; within the process, support India's transition to a digitally empowered economy and society. The three mission of NDCP are as following: -

1. Connect India- To push Broadband for All as a tool for socio-economic development, while ensuring service quality and environmental sustainability.
2. Propel India- To harness the facility of emerging digital technologies, including 5G, AI, IoT, Cloud and Big Data to enable provision of future ready products and services; and to catalyse the fourth industrial revolution (Industry 4.0) by promoting Investments, Innovation and IPR.
3. Secure India- To secure the interests of citizens and safeguard the digital sovereignty of India with paying attention on ensuring individual autonomy and selection, data ownership, privacy and security; while recognizing data as an important economic resource.

To support the digital economy and achieving objectives of National Digital Communication Policy there is a need of implementing 5G technology as early as possible. Department of Telecommunication (DoT) most probably in the beginning of 2022 will allow companies to conduct 5G trials and DoT wish to implement 5G technology in urban as well as rural areas. Dot will provide spectrum to companies like Reliance Jio, Bharti Airtel, Vodaphone idea and MTNL for a period of six months to conduct trials of 5G network across the country. Many cities like Delhi, Mumbai, Kolkata, Bangalore, Hyderabad and some part of Gujarat are companies first choice for conducting 5G trials. DoT also allowed Nokia, Samsung, Ericsson and C-DOT [22]. Companies got permission for the frequency 700 MHz, 3.3-3.6 GHz and 24.25-28.5 GHz to conduct trials. The base price for purchasing bandwidth per hertz is 492 crores (Source-media).

Effect of Radiation from 5G tower on Health

In India, there has always been a public concern on possible adverse health effects from the Electro-Magnetic Field (EMF) Radiation from mobile towers. Due to this people oppose the erection of telecom towers on rooftops of houses and in densely populated areas. For clearing the misunderstanding of public on mobile towers emissions, DoT in May 2017, launched Tarang Sanchar. It is a web portal for Information sharing on Mobile Towers and EMF Emission Compliances [12].

The ICNIRP issued some guidelines on Limiting Exposure to Electromagnetic Field are for the protection of humans exposed to radiofrequency electromagnetic fields (RF) within the range 100 kHz to 300 GHz. The rules cover many applications like 5G technologies, Wi-Fi, Bluetooth, mobile phones, and base stations. The rules periodically revised and updated as advances are made in the relevant scientific knowledge [23]. There is no any current evidence to confirm the existence of any health consequences from exposure to low level electromagnetic field [4]

EMF Radiation Norms in India

Department of Telecommunications have prescribed stricter precautionary norms for exposure limit for the Radio Frequency Field (Base Station Emissions) which is 1/10th of the present limits prescribed by ICNIRP and recommended by WHO [24]. The present limits/levels for antennae (Base Station) EMF emissions for general public exposure are detail below

Frequency Range	E-Field Strength (Volt/Meter (V/m))	H-Field Strength (Amp/Meter (A/m))	Power Density (Watt/Sq.Meter (W/Sq.m))
400MHz to 2000MHz	0.434f ½	0.0011f ½	f/2000
2 GHz to 300GHz	19.29	0.05	1

In addition to norms for mobile towers, government of India also released precautionary guidelines for mobile users [25].

1. Keep distance-hold the cell phones faraway from body to the extent possible.

2. Use a headset (wired or Bluetooth) to keep the handset off from your head.
3. Do not press the phone handset against your head. Radio frequency (RF) energy is inversely proportional to the square of the distance from the source.
4. Limit the length of mobile calls.
5. Use text as compared to voice wherever possible.
6. If the radio signal is weak, a mobile phone will increase its transmission power. Find a strong signal and avoid movement, use your phone where reception is good.
7. Let the call connect before putting the handset on your ear or start speaking and listening-A mobile phone first make the communication at higher power and then reduces power to an adequate level. More power is radiated during call connecting time.
8. If you have an option, use a landline (wired) phone. Not a mobile phone.
9. People having active medical implant should preferably keep the cell phone a minimum of 15 cm faraway from the implant.
10. While purchasing a mobile handset check the SAR value of the mobile phone.

Conclusion

As telecom sector is growing tremendously from last several years. Today, India is amongst top three of largest and one of the fastest growing telecom markets in the world. Also, India is very large country and installation of such 5G base stations or network will only be in certain small areas, not everywhere in country at least for some years. Hence, there is a need of large investment in telecom sector to achieve goal of digital India such smart cities, complete digital transaction etc. Adopting 5G technology will also benefit to our economy. According to various reports increase in 10% penetration of mobile broadband leads to more than 1% increase in GDP of country. Public safety is one of the important issues in our country and govt of India must convince to public and make sure that there are no any adverse health effects.

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An overview of study of basics of Artificial Intelligence (AI)

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Abstract

According to McKinsey, AI has the potential to create 600 billion dollars of value in retail bring 50 per cent more incremental value in banking compared with other analytics techniques. In transport and logistics, the potential revenue jump is 89% more. AI automates redundant jobs allowing a worker to focus on the high level, value-added tasks.

Introduction to AI

The new technology Artificial intelligence that can augment human intelligence, amplify human capabilities, and provide actionable insights that drive better outcomes for employees, customers, partners, and communities.[1]

Nowadays, AI is used in almost all industries, giving a technological edge to all companies integrating AI at scale. If an AI uses for its value purpose, it can automate mundane and repetitive tasks, allowing the sales representative to focus on relationship building, lead nurturing, etc. If a company XYZ provides a conversation intelligence service.[2] Each time a Sales Representative makes a phone call, the machine records, transcribes and analyzes the chat. The VP can use AI analytics and recommendation to formulate a winning strategy.
In a nutshell, AI provides cutting-edge technology to deal with complex data that a human being cannot handle. When AI is implemented at scale, it leads to cost reduction and revenue increase.

History of Artificial Intelligence

Artificial Intelligence is a buzzword today, although this term is not new. In 1956, avant-garde experts from different backgrounds decided to organize a summer research project on AI. Four bright minds led the project; John McCarthy (Dartmouth College), Marvin Minsky (Harvard University), Nathaniel Rochester (IBM), and Claude Shannon (Bell Telephone Laboratories).[3]
Here, is tabulated history of Artificial Intelligence:

Innovation	Year
Karel Čapek plays named "Rossum's Universal Robots, the first use of the word "robot" in English.	1923
Foundations for neural networks laid.	1943
Isaac Asimov, a Columbia University alumni, use the term Robotics.	1945
John McCarthy first used the term Artificial Intelligence. Demonstration of the first running AI program at Carnegie Mellon University.	1956
Danny Bobrow's dissertation at MIT showed how computers could understand natural language.	1964
Scientists at Stanford Research Institute Developed Shakey. A robot equipped with locomotion and problem-solving.	1969
The world's first computer-controlled autonomous vehicle, Stanford Cart, was built.	1979
Significant demonstrations in machine learning	1990
The Deep Blue Chess Program beat the then world chess champion, Garry Kasparov.	1997
Interactive robot pets have become commercially available. MIT displays Kismet, a robot with a face that expresses emotions.	2000
AI came into the Business world in the year 2006. Companies like Facebook, Netflix, Twitter started using AI.	2006
Google has launched an Android app feature called "Google now", which provides the user with a prediction.	2012
The "Project Debater" from IBM debated complex topics with two master debaters and performed exceptionally well.	2018

Subsystems of Artificial Intelligence

Here, are some important Subsystems of Artificial Intelligence:

Machine Learning: Machine learning is the art of studying algorithms that learn from examples and experiences. Machine learning is based on the idea that some patterns in the data were identified and used for future predictions. The difference from hardcoding rules is that the machine learns to find such rules.

Deep Learning: Deep learning is a sub-field of machine learning. Deep learning does not mean the machine learns more in-depth knowledge; it uses different layers to learn from the data. The depth of the model is represented by the number of layers in the model. For instance, the Google LeNet model for image recognition counts 22 layers.[4]

Natural Language Processing: A neural network is a group of connected I/O units where each connection has a weight associated with its computer programs. It helps you to build predictive models from large databases. This model builds upon the human nervous system. You can use this model to conduct image understanding, human learning, computer speech, etc.[5]

Expert Systems: An expert system is an interactive and reliable computer-based decision-making system that uses facts and heuristics to solve complex decision-making problems. It is also considered at the highest level of human intelligence. The main goal of an expert system is to solve the most complex issues in a specific domain.

Fuzzy Logic: Fuzzy Logic is defined as a many-valued logic form that may have truth values of variables in any real number between 0 and 1. It is the handle concept of partial truth. In real life, we may encounter a situation where we can't decide whether the statement is true or false.[6]

Types of Artificial Intelligence

There are three main types of artificial intelligence: rule-based, decision tree, and neural networks.

- Narrow AI is a type of AI that helps you perform a dedicated task with intelligence.
- General AI is a type of AI intelligence that can perform any intellectual task efficiently like a human.
- Rule-based AI is based on a set of pre-determined rules that are applied to an input data set. The system then produces a corresponding output.
- Decision tree AI is similar to rule-based AI in that it uses sets of pre-determined rules to make decisions. However, the decision tree also allows for branching and looping to consider different options.
- Super AI is a type of AI that allows computers to understand human language and respond in a natural way.
- Robot intelligence is a type of AI that allows robots to have complex cognitive abilities, including reasoning, planning, and learning.

How AI is different from Machine Learning?

The terms machine learning and artificial intelligence are often used interchangeably, but they don't mean the same thing. Most of our Smartphone, daily device or even the internet uses Artificial Intelligence. Very often, AI and machine learning are used interchangeably by big companies that want to announce their latest innovation. However, Machine learning and AI are different in some ways.[7]

AI- artificial intelligence- is the science of training machines to perform human tasks. The term was invented in the 1950s when scientists began exploring how computers could solve problems on their own.

Artificial Intelligence is a computer that is given human-like properties. Take our brain; it works effortlessly and seamlessly to calculate the world around us. Artificial Intelligence is the concept that a computer can do the same. It can be said that AI is a large science that mimics human aptitudes.

Machine learning is a distinct subset of AI that trains a machine to learn. Machine learning models look for patterns in data and try to conclude. In a nutshell, the machine does not need to be explicitly programmed by people. The programmers give some examples, and the computer is going to learn what to do from those samples.[8]

Machine Learning (ML)

When we talk about machine learning, we're referring to a specific technique that allows a computer to "learn" from examples without having been explicitly programmed with step-by-step instructions. Currently, machine learning algorithms are geared toward answering a single type of question well. For that reason, machine

learning algorithms are at the forefront of efforts to diagnose diseases, predict stock market trends, and recommend music.

Artificial Intelligence (AI)

Artificial intelligence is an umbrella term that refers to efforts to teach computers to perform complex tasks and behave in ways that give the appearance of human agency. Often they do this work by taking cues from the environment they're embedded in. AI includes everything from robots who play chess to chatbots that can respond to customer support questions to self-driving cars that can intelligently navigate real-world traffic.

AI can be composed of algorithms. An **algorithm** is a process or set of rules that a computer can execute. AI algorithms can learn from **data**. They can recognize patterns from the data provided to generate rules or guidelines to follow. Examples of data include historical inputs and outputs (for example, input: all email; output: which emails are spam) or mappings of A to B (for example, a word in English mapped to its equivalent in Spanish). When you have trained an algorithm with training data, you have a **model**. The data used to train a model is called a **training dataset**. The data used to test how well a model is performing is call **test dataset**. Both training datasets and test datasets consist of data with input and expected output.[9] You should evaluate a model with a different but equivalent set of data, the test dataset, to test if it is actually doing what you intended.

Bias Challenges in AI

So far, we've discussed the broad ethical implications of developing technology. Now, let's turn our attention to AI. AI poses unique challenges when it comes to bias and making fair decisions.

Opacity

We don't always know why a model is making a specific prediction. Frank Pasquale, author of *The Black Box Society*, describes this lack of transparency as the black box phenomenon. While companies that create AI can explain the processes behind their systems, it's harder for them to tell what's happening in real time and in what order, including where bias can be present in the model.[10]

Speed, Scale, and Access to Large Datasets

AI systems are trained to optimize for particular outcomes. AI picks up bias in the training data and uses it to model for future predictions. Because it's difficult if not impossible to know why a model makes the prediction that it does, it's hard to pinpoint how the model is biased. When models make predictions based on biased data, there can be major, damaging consequences.

Machine learning techniques have improved since 1979. But it's even more important now, as techniques become more opaque, that these tools are created inclusively and transparently. Otherwise, entrenched biases can unintentionally restrict access to educational and economic opportunities for certain people. AI is not magic; it learns based on the data you give it. If your dataset is biased, your models will amplify that bias.

Developers, designers, researchers, product managers, writers—everyone involved in the creation of AI systems—should make sure not to perpetuate harmful societal biases. (As we see in the next module, not every bias is necessarily harmful.) Teams need to work together from the beginning to build ethics into their AI products, and conduct research to understand the social context of their product. This can involve interviewing not only potential users of the system, but people whose lives are impacted by the decisions the system makes. We discuss what that looks like later in this module.

Why is AI booming now?

Now in this Artificial Intelligence testing tutorial, let's learn why AI is booming now. Let's understand by the below diagram.

A neural network has been out since the nineties with the seminal paper of Yann LeCun. However, it started to become famous around the year 2012. Explained by three critical factors for its popularity are:

1. Hardware
2. Data
3. Algorithm

Machine learning is an experimental field, meaning it needs data to test new ideas or approaches. With the boom of the internet, data became more easily accessible. Besides, giant companies like NVIDIA and AMD have developed high-performance graphics chips for the gaming market.

Hardware

In the last twenty years, the CPU's power has exploded, allowing the user to train a small deep-learning model on any laptop. However, you need a more powerful machine to process a deep-learning model for computer vision or deep learning. Thanks to the investment of NVIDIA and AMD, new generations of GPU (graphical processing unit) are available. These chips allow parallel computations, and the machine can separate the computations over several GPUs to speed up the calculations.[1-3]

For instance, with an NVIDIA TITAN X, it takes two days to train a model called ImageNet against weeks for a traditional CPU. Besides, big companies use clusters of GPU to train deep learning models with the NVIDIA Tesla K80 because it helps to reduce the data center cost and provide better performances.[4]

Data

Deep learning is the structure of the model, and the data is the fluid to make it alive. Data powers artificial intelligence. Without data, nothing can be done. The latest Technologies have pushed the boundaries of data storage, and it is easier than ever to store a high amount of data in a data center.

Internet revolution makes data collection and distribution available to feed machine learning algorithms. If you are familiar with Flicker, Instagram or any other app with images, you can guess their AI potential. There are millions of pictures with tags available on these websites. Those pictures can train a neural network model to recognize an object on the picture without the need to collect and label the data manually.

Artificial intelligence combined with data is the new gold. Data is a unique competitive advantage that no firm should neglect, and AI provides the best answers from your data. When all the firms can have the same technologies, the one with data will have a competitive advantage. To give an idea, the world creates about 2.2 exabytes, or 2.2 billion gigabytes, every day.[7]

A company needs exceptionally diverse data sources to find the patterns and learn in a substantial volume.

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An IoT Enabled Colorimetric Technique Based Soil Fertility Detection System

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Abstract:

Agriculture is a wide economic sector and plays a vital role within the overall economic development of the nation. Technological advancements in the sector of agriculture can ascertain to enhance the ability and quality of assured farming activities. Bad quality crop production is often because of either unnecessary use of fertilizer or insufficient addition of fertilizer. The intend of our developed system is to detect the N(nitrogen), P(phosphorus) and K(potassium) contents of soil and based on the result, farmers will used the necessary fertilizers as per need. For this we proposed IoT enabled colorimetric techniques based soil fertility detection system. Based on a color sensor (TCS 3200) as a soil fertility detection sensor, microcontroller (Arduino Nano V3) and Esp8266 Wi-Fi module for transferring data to cloud.

Keywords: Color Sensor, Soil Fertility, NPK nutrients, ESP8266, Internet of things, Arduino.

I. Introduction:

Agriculture is the only source for crop production. Soil is a valuable resource in agriculture. The physical and chemical conditions of soil play a most important role in the crop production cycle. In addition to this farmers can also add organic or inorganic nutrients to the soil in a precise proportion. Thus soil fertility detection plays a major role for better crop growth as well as yield [1]. Continuous cropping without enough measurement of soil nutrients may lead decrease in soil fertility and yield. Soil nutrient identification is greatly required for proper plant growth and effective fertilization [2], [3]. Farmer's follows traditional techniques still today which commonly make used of approximations i.e. unbalance feeding of fertilizer without knowing the actual necessity of nutrient to a specific crop, results in low productivity [4]. In order to improve the farm meadow, the fertility of soil is an important factor in increasing the crop production. The soil fertility is, amount of nutrients content available in the soil. There are 17 nutrients available in the soil classified into two classes namely macronutrients and micronutrients. Nitrogen (N), Phosphorous (P), Potassium (K) are some of the main macronutrients, which usually required in large quantity in the soil and zinc, copper, iron, boron are some examples of micronutrients which required in comparatively small amounts. The quantity of macronutrients defines the soil fertility [5]. Depending upon the deficiency of a particular nutrient for a particular crop in a given region the amount of fertilizer is determined. Thus the quantity of fertilizer to be used depends upon the soil fertility, crop to be grown and type of soil [6].

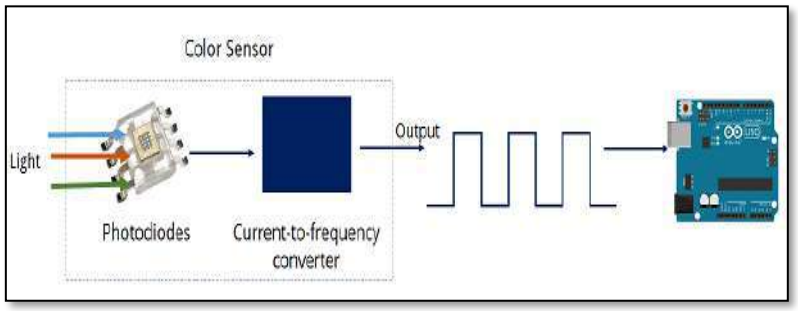
The general soil testing is take place in laboratories which are maximum available at district level also it take a considerable time to generates the results. Hence this process is time consuming and costly too [7]. Moreover the overall soil fertility changes with change in weather conditions. Thus a system required which will detect the soil nutrients in real time.

This system is based on colorimetric technique. In this, color sensor is used as a soil nutrient sensor, an aqueous solution of soil under test has been added different reagents which will eventually change its color depending on the concentration of the present micro nutrients values. Light emitted from a color detecting sensor will fall on the solution and the reflected light is received by color detecting sensor will convert the (R, G, B) values to electrical signals. Further using the threshold values which were earlier saved in the database of the microcontroller helps to detect the levels of micronutrients present in the soil sample.

II. Methodology

As we discuss the above said issue to resolve we design, Colorimetric Technique Based Soil Fertility Detection System. In this system, the color sensor works by illuminating white light on soil aqueous solution sample and measure the intensity of reflected light with the help of 8x8 photo-diode chip available in TCS3200

sensor. The microcontroller helps to uphold the intensity of light which is falling on soil sample, also helps to store the resultant values to cloud with the help of ESP8266 Wi-Fi module.



System Block Diagram

To detect the presence of nutrients in the soil by using colorimetric technique. First we make the aqueous solutions with the help of different chemicals regents. Then using color sensor we detects the nutrients present in the soil.

A. **SYSTEM REQUIREMENT**

Arduino Nano V3:

Arduino NANO V3 is the open source tiniest Embedded Development board launched by Arduino based on Atmega328 SMD Package Microcontroller. Also, is a Surface stand Breadboard Friendly board integrated with Mini USB Port.

Specifications:-

- Operating Voltage: 5 V
- Digital I/O Pins: 14, Analog Input Pins: 08
- DC Current per I/O Pin: 40 mA
- Flash Memory: 32 KB

Color Sensor TCS3200:

The TCS3200, Color Sensor programmable color light-to-frequency converters that comes with silicon photodiodes and a current-to-frequency converter on a single CMOS IC. The output is a square wave and frequency directly proportional to light intensity. [8]

The colors of the visible light spectrum

Color	Wavelength interval	Frequency interval
Red	~ 700–635 nm	~ 430–480 THz
Orange	~ 635–590 nm	~ 480–510 THz
Yellow	~ 590–560 nm	~ 510–540 THz
Green	~ 560–520 nm	~ 540–580 THz
Cyan	~ 520–490 nm	~ 580–610 THz
Blue	~ 490–450 nm	~ 610–670 THz
Violet or Purple	~ 450–400 nm	~ 670–750 THz

Table 1. Pin values for activation of Photodiode filters. [8]

S2	S3	PHOTODIODE TYPE
L	L	Red
L	H	Blue
H	L	Clear (No Filter)
H	H	Green

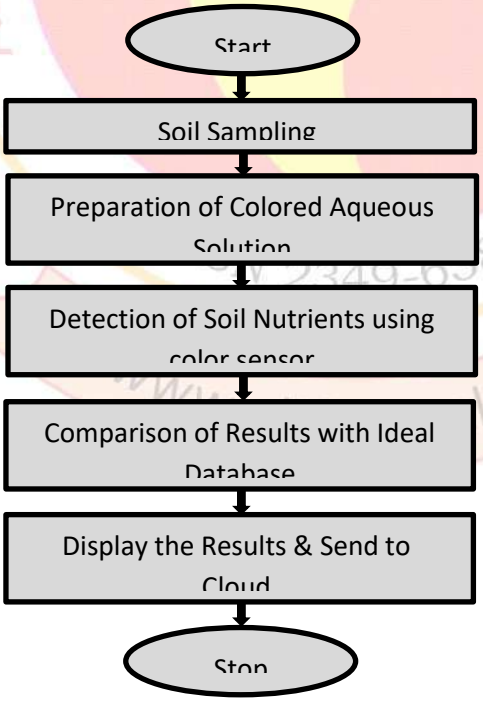
ESP8266 Wi-Fi Module:

The ESP8266 is a low-cost Wi-Fi module, have built-in TCP/IP networking software, and microcontroller capability. Each ESP8266 module comes pre-programmed with an AT command can be change its baud rate by calibrating it with the help of AT commands.

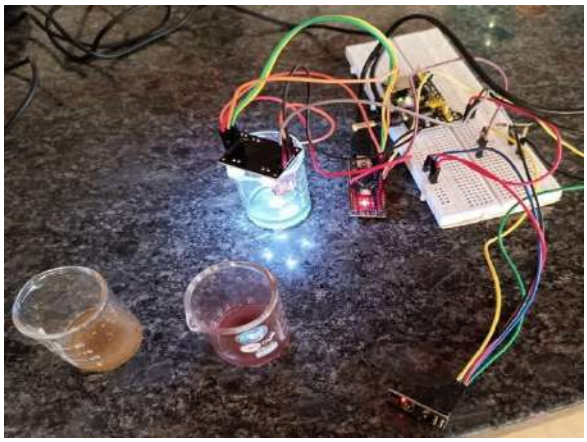
B.**Making Of Aqueous Solutions**

The aqueous solution is made with the help of soil testing kit with standard procedure.

C. WORKING FLOW CHART:



D.CIRCUIT DESIGN

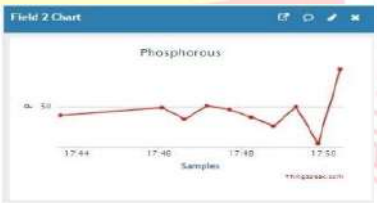


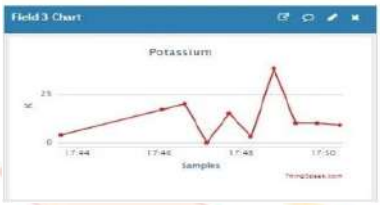
III.Results & Discussion

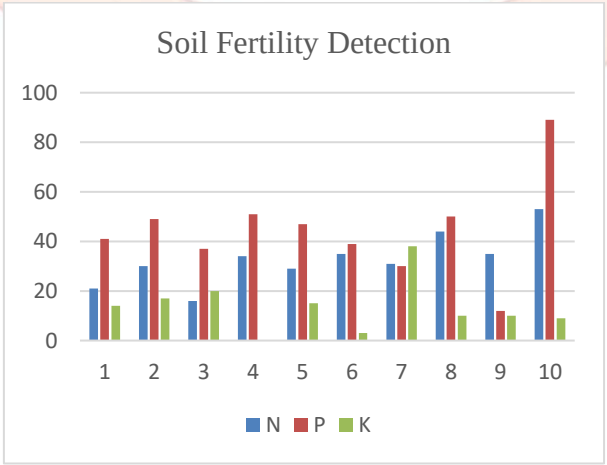
Table 2. Threshold color intensity values. [6]

Nutri.	Low	Medium	High
N	$x < 15$	$15 < x \leq 20$	$20 < x \leq 25$
P	$16 < x \leq 20$	$20 < x \leq 35$	$35 < x \leq 50$
K	$20 < x \leq 25$	$25 < x \leq 40$	$50 < x \leq 60$

By taking all adaptive measures we have used 2cm fixed distance between sensor & solution and we get sample results as below.







The above bar graph shows the different samples we have tested from different areas & found NPK values are changes from one area to another area.

Also the threshold color intensity values for N, P, K contents in the soil are described in Table 2. Which provides the scope of color intensity values in form of low, medium and high for N, P, K.

IV.Conclusions

This research concludes that, we have successfully developed a real time IoT enabled soil fertility detection system. This research will definitely reduce the farmer's time as well as money for soil fertility testing. Also help them to decide amount of fertilizers to be added in the soil according to the real time availability of the nutrients like N, P and K in the soil.

V.Future Scope

By extending this research can be possible to predict suitable crops according the nutrients are available in the soil. Also an atmospheric parameters effect can be observed on soil fertility. Therefore, the farmers can take necessity action towards their crop yield.

VI.Acknowledgement

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A Comparative Analysis on Energy Conservation in Wireless Sensor Networks Using NLP, Naive Bayes, and SVM Classifications

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Abstract:

A fundamental goal in the design of wireless sensor networks (WSNs) is to optimize their lifetime. Designers can use intelligent energy management models to help them reach this goal. These models strive to minimize the number of sensors used to report atmospheric measurements and, as a result, achieve improved energy economy while retaining the appropriate level of measurement precision. We compare three intelligent models based on Naive Bayes, Multilayer Perceptrons (MLP), and Support Vector Machine (SVM) classifiers in this research. For the identical WSNs Lifetime Extension Factor, simulation results prove that Linear-SVM selects sensors that yield higher energy efficiency than MLP and Naive Bayes.

A wireless sensor network (WSN) is a network of sensor nodes that are linked together. These sensors are low-cost, tiny devices with limited functionality. In a typical setting, every node in a sensor network must continuously monitor and gather information such as temperature, sound, and humidity, as well as physical conditions like pressure, vibration, motion, and light. Sensors may collaborate based on the circumstances to meet the sensor network's purpose of performing specific jobs. Furthermore, the information gathered is extremely significant. Because of the vast number of sensors placed, they are interconnected depending upon the nature of the analyzed measures. This paper analyses three smart models based on Naive Bayes, Multilayer Perceptrons (MLP), and Support Vector Machine (SVM)

1. Introduction

Well-known algorithms in the area of machine learning, neural networks, and artificial intelligence include Naive Bayes, Multilayer Perceptron (MLP), and Support Vector Machine (SVM). For starts, MLP can successfully conduct the classification operation [7, 8]. MLP neural network training, on the other hand, is difficult due to its structure's intricacy [7]. In the realm of data mining, SVM is also viewed as a very powerful algorithm.

It's been used successfully in a number of scientific applications [9]networks, for example. artificial intelligence, etc. MLP can, for starters, do the following tasks. A successful classifying operation [7, 8]. On the other hand MLP neural network training, on the other hand, is difficult due to the the structure's complexity [7]. In the area of data mining, SVM is also viewed as a very powerful algorithm.It's been used in a variety of scientific applications [9]networks, for example. artificial intelligence, etc. For beginnings, MLP can meet all the requirements of the classification operation [7, 8]. MLP neural network training, on the other hand, is difficult due to its structure's complexity [7]. In the realm of data mining, SVM is also regarded as a very powerful algorithm. It's been used successfully in a variety of research application.

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Despite the significance of machine learning algorithms for WSN applications [5], there has been little consideration paid to offering comparative studies between different algorithms, particularly when it comes to WSN energy management. Additionally, there have been little contributions to identifying an effective intelligent energy management paradigm for these networks. Except for the one we disclosed in our prior study [11], there is no previous work that supports the usage of a certain intelligent algorithm compared to others for WSNs [10]. We present an intelligent and efficient energy management model for WSNs leveraging MLP rather than Naive Bayes in that paper. MLP and Naive Bayes were compared in order to see how well they performed in terms of performance.

In comparison to Naive Bayes, MLP demonstrates a considerable improvement in selection accuracy when given the same Lifetime Extension Factor. Due to its complexity and the updating process in the sequence of weights, MLP takes longer to train the network. As a result, sensor nodes may use a little more energy during the deployment phase.

Considering the significance of machine learning techniques for WSN applications [5], comparison investigations between these methods have received little attention. Especially as it pertains to WSN energy management. .Furthermore, there have been little contributions to specify a model for intelligent energy management that is appropriate for these interconnections There hasn't been anything like this before, as far as we know.

work that serves to reinforce the application of a particular clever algorithm except for the one we have, comparable to others for WSNs [10]. A paradigm for effective and efficient energy management Instead of Naive Bayes, WSNs use MLP. A comparison is possible to correlate MLP and Naive Bayes, a study was conducted.MLP achieves a higher Lifetime Extension Factor when given the same Lifetime Extension

Bayesian naivety. MLP, on the other hand, takes longer to train.Due to its complexity and the updating procedure in the network a set of weights As a result, sensor nodes may use energy.

First, relying on intelligent machine learning models and algorithms, we have provided a detailed state-of-the-art associated energy management in WSNs. Second, we used three real labeled evaluation metrics to conduct a thorough comparison of three clever neural network classifiers. Third, using a confusion matrix, the effectiveness of these three intelligent classifiers is evaluated. Finally, an intelligent paradigm for enhancing the energy in WSNs has been proposed. We used statistical ranking and selection strategies to address this model not only at the classification level, but also at the processing level. These two strategies, as well as the use of Linear-SVM as an intelligent classifier, are crucial in the development of the model.

The largest Contributions of this work is arranged as follows. Preliminaries are presented in Section 2: which examines the latest advances in the field of intelligent models for energy management in WSNs. The context of the classification methods employed in this study, particularly Naive Bayes, MLP, and SVM, is presented in Section 3.

2. Related Work

In order to achieve energy efficiency of WSNs, several sophisticated models have been developed. Thiemjarus et al. [17] suggested a sensor selection algorithm that can aid in discovering the network's optimum number of sensor nodes. The number of sensors can be reduced without degrading the decision-making process, and the network's lifetime can be enhanced. For sensor selection, the Bayesian strategy was chosen, as this filtering method aids in the detection of the best sensors in the network. A classifier was also employed, which was the Self-Organising Map (SOM). The authors of [18] developed a selection technique for optimizing WSN energy use. Sensors were ranked from most to least important in their scheme, considering the importance of their utilization in WSNs. Thereafter, the Naive Bayes classification approach was utilized to classify the data. This method was put to the test on three well-known real-world sensor datasets. The analysis indicated that as more sensors are employed, more energy is spent, and the sensor network's lifetime is shortened. The lifetime of the sensor network can be prolonged if the sensors are ranked, as the selection algorithm is used first, pursued mostly by intelligent classifier. This is due to the fact that the number of sensors used is limited. Similarly, [19] suggested a method to reduce energy use while extending the sensor network's lifetime. This would be focused on a feature/sensor selection that reduces the number of utilised sensors to the minimum level. It does, however, use a different selection technique by using K-Nearest Neighbor (KNN) method.

The segmentation problem is considered as a classification problem in [20], with clusters being constructed using Least Squares.SVM (LS-SVM) using a hybrid kernel (a blend of SVM and LS-SVM)Kernels with polynomial and Radial Basis Function (RBF) functions. Results demonstrated that combining LS-SVM with hybrid clustering was effective.

When compared to LS-SVM with a single input, kernel produced better results.Kernel was visible in the situation of a multiclass system. In the clustering problem, there is a classification challenge.

CDLSVM, a clustering-based distributed Linear-SVM methodology that varies from previous parallel SVM algorithms in its ability to obtain a global optimal classifier, was developed. The results suggest that the proposed method is effective for large-scale WSNs since it minimizes data interchange and energy usage.

Forero et al. [22] addressed distributed classification by creating techniques for training SVM in a distributed architectural environment where communication between nodes via a centralised processing unit is banned. The distributed forms of operation demonstrated how energy might be preserved.

The DFP-SVM (Distributed Fix Partition SVM) and the WDFP-SVM (Weighted Distributed Fix Part SVM) are two energy-efficient distributed learning techniques for WSN.SVM [23, 24] has been proposed. The aim was to develop an expert in the field.

SVM in a distributed and efficient manner. As a result, it is better. On the test data, classification results were reached with Compared to the standard SVM, it uses the least amount of energy. Several classification techniques based on SVM have recently been proposed. For example, Rajasegarar et al. [25] proposed a Centered Hyperellipsoidal Support Vector Machine (CE-SVM) and a distributed Quarter-Sphere Support Vector Machine to address the problem of anomaly identification in WSNs (QS-SVM). Using four datasets that correlated to wireless sensor datasets, a comparison study using CESVM and QS-SVM was performed. For the evaluation, four datasets were used: GDI, Ionosphere, Banana, and Synth.

In addition, three distinct kernel functions were considered: RBF, polynomial, and linear. When compared to QSSVM, the results showed that CESVM used to have a higher detection accuracy. Zhang et al. [26] introduced two online outlier identification and distribution strategies for WSNs, the key contribution of which is to build livestream intelligent classifying techniques in order to find outliers in the typical behaviour of sensor data in real time. The hyperellipsoid one-class SVM is used in the proposed intelligent approaches. EOOD (ellipsoidal SVM-based online outlier detection) and EOOD (ellipsoidal SVM-based adaptive outlier detection) are the two approaches (EAOD). In order to detect abnormalities in a WSN, both EOOD and EAOD evaluate the correlation between sensor data features. The simulation results suggest that EAOD has a higher detection accuracy than other methods.

Dutta and Terhorst [27] proposed a multisensor fusion and integration strategy based on artificial intelligence. To solve the challenge, the researchers focused on the categorization level of the embedded sensor fusion system.

Most frequent sensor flaws and problems Intelligent people in particular.For aggregate soil moisture estimation, classification approaches are used.To get optimal outcomes, cosmic ray sensors were introduced.Estimations that are fault-tolerant Four classifiers were used in this study.Adaptive Neuro-Fuzzy Inference System was examined. (ANFIS), Probabilistic Neural Network (PNN), Radial Basis Network (RBN), Radial Basis Network (RBN), Radial Basis Network (RBN), Radial Basis The RBF network and the Multilayer Perceptron constitute two types of networks (MLP) network

Experiments were conducted on three datasets, and the results demonstrated that ANFIS exceeds all other classifiers in terms of correct classification percentages. To detect intervals of food intake, Sazonov and Fontana [14] designed a sensor system, as well as signal processing and pattern recognition approaches. The analysis and classification of jaw movements was used in this investigation.

The researchers have chosen the most relevant aspects, which represented sensor signals, using the forward selection method.

The SVM was also employed as the chewing detecting classification technique. Furthermore, the linear kernel activation function was applied (Linear-SVM). The experts were able to attain a high mean accuracy of 80.98 percent for that application by implementing an intelligent classifier.

Furthermore, the linear kernel is the easiest of all the kernel functions for SVM, according to Karatzoglou et al. [28]. Linear-SVM also outperforms other machine learning classifiers, according to Ham et al. [29]. This classifier is now receiving greater attention because to its superior classification accuracy when compared to other machine learning classifiers. As a result, this efficient classifier has been used in a number of applications. A moving human motion detection system was proposed by Yun and Song [30].

Pyroelectric Infrared (PIR) sensors and intelligence classification techniques were used to build the system. The data for this investigation was acquired by recording PIR sensor signals while a person was walking. The dataset's size and memory cost were lowered by extracting and choosing identifiable features from it. In addition, Bayes Net, C4.5, decision table, KNN algorithm, Naive Bayes, MLP, and SVM were employed as intelligent classification methods.

The Linear-SVM was considered for SVM because its kernel needed less computing time than other kernels. Experiments on decreased feature sets indicated that Linear-SVM is the most efficient classifier for this application.

3. Preliminaries

This section gives a quick overview of the classification methods employed in this investigation, as well as the datasets used in the experiment.

3.1 Algorithms for Classification. Below is a brief description of the categorization algorithms employed in this study..

3.1.1 Naive Bayes Classifier. Naive Bayes is a well-known type of classifier that is based on the application of Bayes' theorem with strong independence assumptions. It is considered to be a simple probabilistic classifier that computes conditional class probabilities and then predicts the most probable class [31]. In other words, it will assign a class for an object based on the values of the descriptive attribute probability model.

3.1.2 Multilayer Perception is a type of perceptron that has multiple layers (MLP). MLP is composed of a large number of highly densely interconnected that work together to solve a specific problem. With a feed-forward information flow, it is organised in layers. Signals flow progressively through the several layers from the input to the output layer in the main topology of an MLP network.

3.1.3 Intermediate layers exist between the input and output levels. Because they are not noticeable at the input or output, they are also known as hidden layers. Each unit is used to determine the difference between a weights vector and the vector given by the previous layer's outputs. A transfer function, also known as activation, is applied to the result to produce the input for the following layer.

The following are the main steps in an MLP network's training phase: First, given a dataset's input pattern X, this pattern is forward to all the MLP's output.

second, the network is examined and the desired output is compared; third, the network is evaluated and the desired output is compared.the signal of mismatch between the network's output and the The network is notified of the desired response; and Finally, modifications to synaptic weights are performed [34].

This technique is continued for each subsequent input vector until all of the input vectors have been processed.The network is used to pass on training patterns.Support Vector Machine (SVM) 3.1.3 (SVM). The dataset is segmented into two classes by SVM, which is separated by a linear border between the normal and attack classes that maximises the margin. SVM seeks out the hyperplane with the greatest distance between it and the closest positive and negative samples [35, 36]. The basic construction of an SVM network is similar to that of a regular RBF network, except that the kernel activating function is used instead of the exponential activating function (which is commonly Gaussian). A polynomial kernel, Gaussian radial basis kernel, or two - layered feed-forward neural network kernel can all be used to activate the kernel.

3.2 The three datasets used in this study are briefly described in this section.

3.2.1. Ionosphere.The ionosphere dataset was gathered using radar in Goose Bay, Labrador. Radar signals are divided into two categories: good and bad. The data that reveal indications of some form of construction in the ionosphere are good data. Those returns that do not let transmission signals to penetrate over the ionosphere are considered bad [18]. There are 34 readings and 351 records in this collection.

3.2.2. Forest CoverType is a type of forest cover. At the University of Colorado, the Forest CoverType dataset was created. It's made to estimate the type of forest cover in unknown areas. It's been used in a series of data stream classification studies. There are 581, 012 occurrences and 54 attributes in this dataset [18, 37]. It is regarded as one of the most extensive datasets. Because of restricted memory capacity, the number of features in our sample was reduced to 25000.

Sensor Discrimination (section 3.2.3). This set of data contains 12 numerical values for samples of an unknown chemical.

There are three classifications in this labelled dataset: group A, group B, and false alarm [38]. The receiver node is used to establish which class an unknown sample belongs to after receiving 12 numerical values.

To put it another way, the receiver should say whether this unknown sample belongs in group A or group B. Whenever the sample does not fall into either of the first two groups, it is termed false alarm. There are 12 readings and 2211 records in this collection.

4.Proposed Methodology:

The classification algorithm is used to develop an intelligent neural network architecture for efficient energy management in WSNs in this paper. The selection sensor algorithm used in [18] is utilized in our work. The Ionosphere, Forest CoverType, and Sensor Discrimination datasets were utilised to assess the performance of the three intelligent algorithms in terms of classification accuracy in this work. Furthermore, for all completed experiments, 30% of the dataset is used for training data, with the remaining 70% used for testing. By establishing the shared and common parameters, we can give a fair comparison between the three classifiers, namely Naive Bayes, MLP, and Linear-SVM..

The Lifetime Extension Component is calculated as follows:

LEC=Total Sensor node/Number of sensor consumed

Two key actions were taken in [11] in order to reduce energy usage and increase the lifespan factor. The following are the two steps:

(1) The most prominent sensor nodes in WSNs were chosen after ranking them from most to least important in terms of utilisation, and

(2) Naive Bayes and MLP classification methods were used to classify them. It is important to note that in our research, we introduce an intelligent model for efficient energy management in WSNs utilising a classification approach based on SVM with linear kernel, which would be a polynomial kernel with exponent 1.

The following are the four parts of our proposed method:

(1) Preprocessing
(2) Processing:
  (a) Ranking:
  (i) Determine the feature/relevance sensor's level.
  (ii) Sort the items in ascending order.
(3) Machine Learning
(4) Evaluation of performance

Sensor Discrimination, ionosphere, and Forest CoverType The input dataset must be cleaned and formatted before moving on to the preprocessing stage. In the processing block, On the chosen dataset, two functions are applied. The The first is the Rank function, which ranks the features/sensors in order of importance. The significance level computation process as well as the sorting process are two consecutive procedures included in this function. The independent significance features test is a built-in procedure in MATLAB [39] that is used to calculate the significance level of a feature/sensor. This approach is known as the independent significance features test, according to Weiss and Indurkhya [40]. (IndFeat).

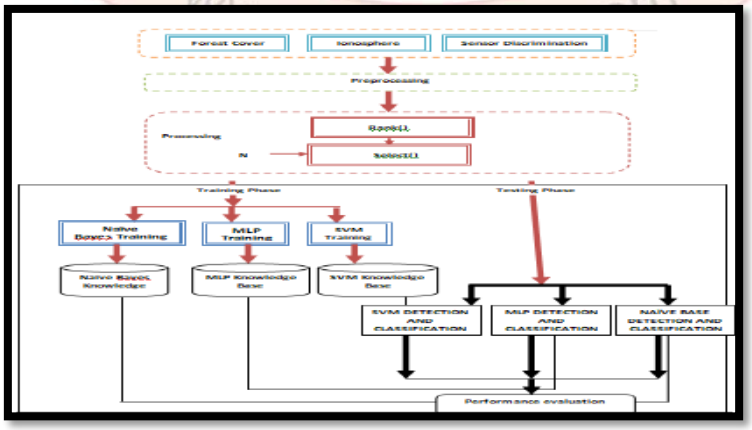

Figure: Structure of Proposed System

This method is commonly used in artificial intelligence engineering applications to quickly detect and remove poor features. To put it another way, the number of inputs that must be considered during the selection procedure will be drastically reduced. As a result, it can be utilised as a preliminary step in the selection process. Furthermore, it cuts down on the amount of time it takes to complete the final selection procedure. The sorting process, on the other hand, sorts the output of the level of significance calculation operations in descending order.

The Rank function returns an array of features/sensors that are organized from most significant to least significant. The Rank function's job is to figure out how significant each feature/sensor is. Then it sorts them in descending order, with the most key features or sensors at the top and the least important at the bottom.

On the Sensor Discrimination dataset, Figure 2 illustrates an example of the output while calculating the significant level procedure and sorting process. The diagram shows how the Ranking function's processes will be carried out in a sequential order. The Select function is then used to choose the first N features/sensors. If N = 10, for example, this method will return the numbers of the first 10 features/sensors.
Similarly, if N = 20, the first 20 features/sensors' numbers are returned, and so on.

The machine learning block is the fourth block, which applies the specified classifier (Naive Bayes, MLP, or Linear-SVM) to the N features/sensors.

Two steps are done in this block: the first is the training or learning phase, which allows the intelligent system to construct the appropriate knowledge base. The intelligent system picks up on existing relationships/correlations in the built environment.

Table 1: Experimental parameters Simply

Factor	Value
%Testing	65%
%Training	35%
Learning rate for MLP	0.35
Number of epochs for MLP	600
Number of hidden layers for MLP	1
Number of hidden neurons for MLP	(# selected sensors + # classes)/2
Kernel for SVM	Linear kernel (polynomial kernel with exponent being 1)

expressed, the training phase is a process of the intelligent system evolving to provide the optimum possible response in the testing phase. The testing phase involves putting the proposed system to the test with test datasets. This phase's output data demonstrate the system's performance and efficacy in terms of classification and computational speed.

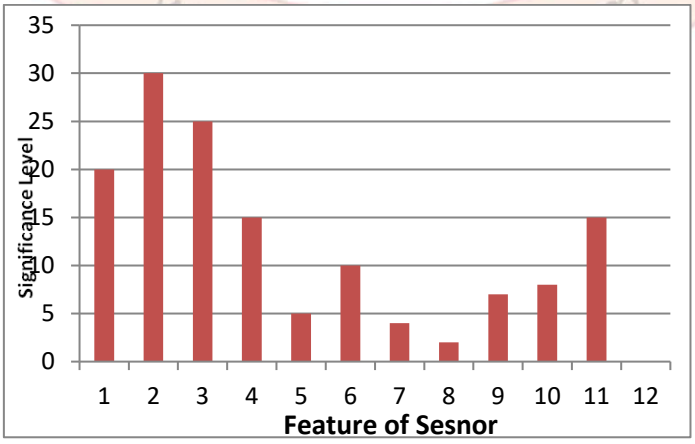

Figure:1 The result of the significance process calculation

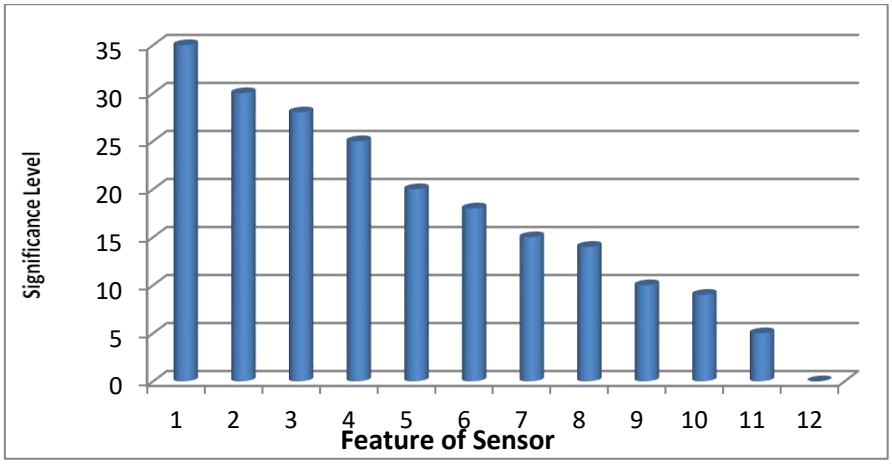

Figure:2 The result of a descending order sorting method

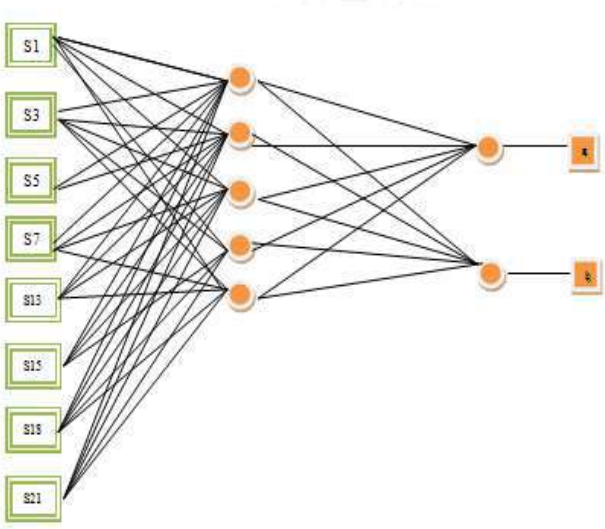

Figure 3: Experiment 1, NN structure for the selection of 10

5. Hands-on Experience:

The Ionosphere dataset, which is a radar dataset collected from 34 widely different sensor nodes, was used in this experiment. The selection algorithm presented in [18] was applied in MATLAB. This algorithm (shown in Figure 3) prioritized the sensors according to the importance of their data.

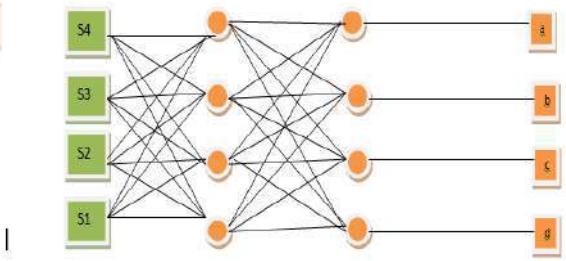

Figure 4: Experiment 3, NN structure for the selection of 4

The Forest CoverType dataset, which was created at the University of Colorado, was used in this experiment. The Forest CoverType of unknown regions, which has 581,012 records and 54 incoming values, can be predicted by studying the received data from the sensors.

6. Results Discussion

The confusion matrix [30, 42] is used to assess the performance of the three intelligent classification algorithms.

False positive (FP), true positive (TP), false negative (FN), and true negative (TN) are the four possible outcomes [42, 43], where (1) FP occurs when the actual class of test sample is negative and is classified incorrectly as positive; (2) TN occurs when the actual class of test sample is negative and is classified correctly as negative; (3) FN occurs when the actual class of test sample is positive and is classified incorrectly as negative; and (4) TP occurs when the actual class of test sample is positive

7. Conclusions

An intelligent model for efficient energy management in WSNs is presented in this paper. It examines the differences between Naive Bayes, MLP, and Linear-SVM. The goal is to figure out which intelligent categorization model is best for efficient energy management in WSNs. Different tests were run on three benchmarking datasets in order to evaluate the performance of the three classifiers.

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Hip Implant by Cluster Analysis of Anthropometry Parameters of Femur

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Abstract:

Background and Objective: A range of research told that there is extensive variations in the sizes and shapes of femur bone across different ethnic groups and geographical locations, thus particular bone-implant fit is challenging to achieve. Prosthesis of mismatched sized can caused serious problems for patients. Thus aim of the study was to design standard hip implant based on anatomical parameter of respective population. Materials and Methods: Eleven osteological parameter of femoral prosthesis of 125 patient (67 male and 59 female) were evaluated, these eleven parameter were grouped to obtain scatter diagram. Then cluster analysis in SPSS software V25 was carried out by using slink clustering method. Results: After studying scatter diagram it was found that 15% population had irregular anatomy then rest of population. So, remaining data put under cluster analysis gives 8 (4 for men and 4 for women) sets of standard anatomical parameter for designing hip implant. Conclusion: These eight standard hip implant satisfy 85% population of Vidarbha region.

Index Terms *- Hip implant, standard anatomical parameter, femoral prosthesis, mismatched sized, cluster analysis, Slink method, osteological parameter.*

I. Introduction

Importance of hip geometry has been well defined in previous studies1-5. Due to wide variation in anatomy of femoral prosthesis, it is difficult to achieve precise bone implant fit. Asians have a smaller distal femur size than that of the western population6,7. But maximum artificial femoral prosthesis are standardize and manufacture in European and North American region8 and currently available western orthopaedic implants do not match the dimensions of the proximal femoral of Indian population. The usage of these over-sized and unsuitable implant affect outcome of the surgery reported with problems such as stress shielding, micro-motion and loosening9-12. This standard hip implant were not useful for population of Vidarbha region because they were not based on anthropometry of respective population13.

The variations in dimensions may need to be considered when designing the appropriate implant14. To eliminate mismatch between femur and implant and to attain suitable fitment, it was necessary to design a few standard implant based on shape and size of proximal femur of respective population. So, objective of the study was to design standard hip implant based on anatomical parameter of Vidarbha region population.

II. Materials And Methods

Present study was carried out since 2014 in Vidarbha region central part of India. An eleven anatomical parameter of femur were identified from X-ray image of 125 patients, in the age group of 50-70 years. Out of total patients 67 were male and 58 were female. Each X-ray image of 125 patients was processed in DICOM Viewer 4.2.1 software. By means of linear and angular measure tool in software all anatomical parameter of femur were measured. The exact position of each anatomical parameter from where its value was measured shown in Fig. 1 and the measured value of each anatomical parameter designated by alphabets in Fig. 1 exposed in Fig. 2. Following were the anatomical measurements used for study:

C Femoral head diameter (FHD): Diameter of femoral head in frontal plane

C Femoral neck diameter (FND): Diameter of femoral neck in frontal plane

C Horizontal offset (HO): The horizontal distance between the centre of the femoral head and the shaft axis in frontal plane.

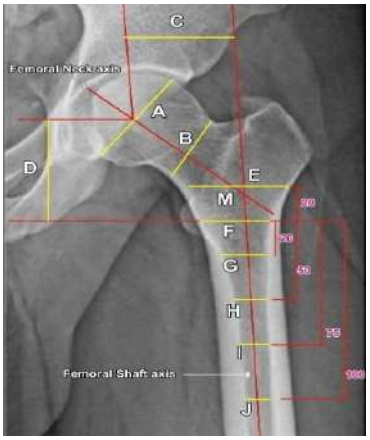

Fig. 1: Anatomical parameter on femur

Fig. 2: Measured value of anatomical parameter on femur

C Vertical offset (VO): The vertical distance between the center of the femoral head and the middle of lesser trochanter level

C Canal width (CW): The CW 20 mm above from lesser trochanter at E in frontal plane of femur

C Canal width (CW): The CW in frontal plane, passing through the middle of the lesser trochanter

C Canal width (CW): The CW 20 mm below from lesser trochanter at G in frontal plane of femur

C Canal width (CW): The CW 50 mm below from lesser trochanter at H in frontal plane of femur

C Canal width (CW): The CW 75 mm below from lesser trochanter at H in frontal plane of femur

C Canal width (CW): The CW 100 mm below from lesser trochanter at J in frontal plane of femur

C Neck-shaft angle (NSA): The angle between the shaft axis and the neck axis

III. Grouping of anatomical parameter: The measured value of anatomical parameter of femur were divided into three groups for prosthesis designing purpose (i) A, B, E, F and G were important for deciding Anterior-Posterior cross section of prosthesis (ii) H, I, J, used for determine distal length and (iii) C, D and M for orientation of neck of the prosthesis.

IV. Finding out dissimilar set of object: Aimed at finding dissimilar set of data a standard deviation of each parameter was calculated and on the basis of standard deviation scatter diagram of each parameter was plot. After examining scatter diagram it was found that some set point were not in range because anatomical parameters of some patients were irregular i.e., there anatomy not in range with rest of patients and they requisite customized hip implant. Such patients were omitted and remaining patient was used for cluster analysis.

V. Cluster analysis: Romesburg defined cluster analysis is mathematical method, can be used to find out which objects in a set are similar. Cluster analysis has an endless list of user because classification (which object in set are similar and dissimilar) are essential building blocks in field of research. Cluster analysis carried out using following six steps: (1) Obtain data matrix, (2) Standardize data matrix, (3) Calculate resemblance matrix, (4) Implement clustering method, (5) Reposition data and resemblance matrix and (6) Compute cophenetic correlation coefficient. In existing study IBM SPSS Statistic software (Version 25) was used to execute hierarchical clustering with slink clustering method for four cluster and standard deviation ranging from -1 to 1. A slink clustering method calculate closest members of two cluster. After completing cluster analysis in SPSS software input data was split on basis of fourth cluster.

Results

The database of the measured values of each anatomical parameters for first 10 patients out of 125 patients were presented in Table 1. To find out dissimilar data base total 22 scatter diagram was obtained, few of them given below in Fig. 3 as a sample. After analyzing scatter diagram it was found that 15% patients (In male category 12 patients out of 67 patients and 7 patients out of 59 patients from female) had abnormal anatomy. These patients were omitted and listed in Table 2.Remaining 85% database of patient was used for

cluster analysis. After completing cluster analysis in SPSS software forecast values of each parameter were summarized in Table 3. Total 8 (4 Male and 4 Female) sets of standard anatomical parameters provide standard sizes hip implant designs, which was found suitable for Vidarbha region population. In this study conventional X-ray technique has been used for understanding the femur bone geometry. The outcome of current study make available eight set of standard anatomical parameter for hip implant design which satisfy maximum population of Vidarbha region. Equally they achieve proper fitment because they were standardize on anthropometry of respective population and reduces chance of revision surgery. It also reduces operating time and achieve successful positioning in hip joint.

Discussion

Surgeon who perform hip replacement surgeries must depend on implant manufacture to provide proper implants

Parameters	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	H (mm)	I (mm)	J (mm)	M (deg)
1	51.1	34.3	47.0	66.4	52.4	32.1	19.6	13.2	11.5	11.5	**131.3**
2	51.6	39.5	51.8	61.8	51.1	31.1	20.4	14.3	13.4	12.9	**120.3**
3	43.7	27.7	46.6	59.0	47.7	30.7	19.8	15.7	15.1	12.0	**125.7**
4	44.7	31.9	43.5	70.3	41.3	27.8	18.8	15.0	14.4	10.5	**134.9**
	40.5	27.1	37.8	48.9	44.4	25.1	18.0	14.0	3.6	11.5	**124.2**
	49.6	29.6	47.6	59.6	51.2	29.6	19.2	14.3	13.6	12.3	**123.5**
	49.3	36.2	34.9	54.6	49.2	30.7	20.6	12.7	11.6	10.4	**141.8**
	51.2	34.1	37.8	53.2	50.5	32.4	22.1	15.7	14.4	13.3	**124.3**
	53.8	35.1	44.4	55.0	60.0	33.7	19.4	15.3	14.9	12.2	**124.0**
	45.4	**28.3**	**40.1**	**41.8**	**51.0**	**34.4**	**23.4**	**18.3**	**15.0**	**14.9**	**132.0**

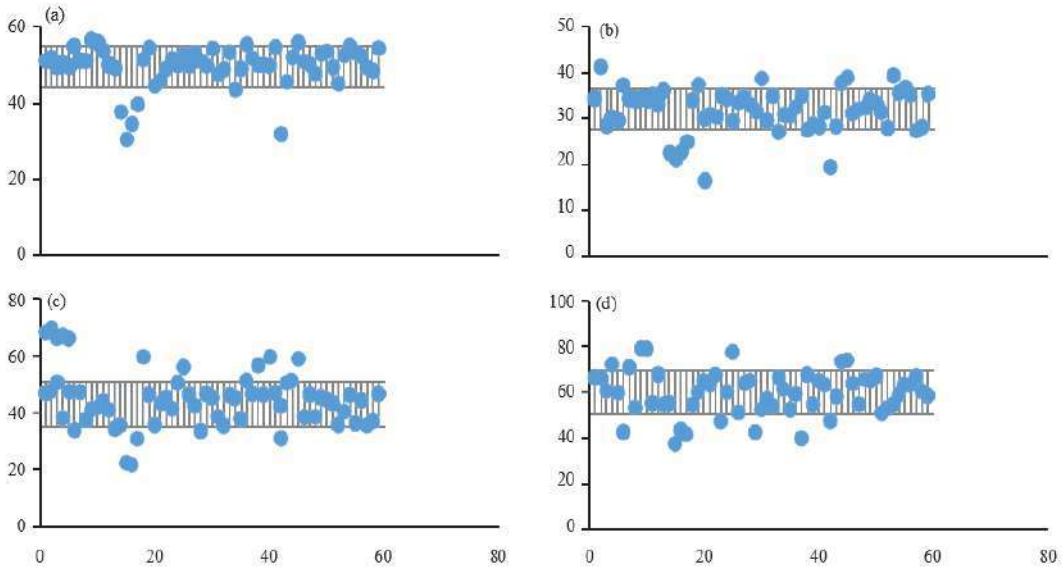

Fig. 3(a-d): Dissimiam of measured anatomical parameter as per, (a) Femoral head diameter, (b) Femoral neck diameter, (c) Horizontal offset and (d) Vertical offset.

Table 2: Irregular anatomical parameter of femur Patients having irregular anatomical parameters

	Male												Female						
AP	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
A (mm)		58	58	38	31	35	40	32	59					40	53	53			**34**
B (mm)	37			23	21	23	25	20	39					23	34	33	23	32	
C (mm)	34				23	22	31	31	59				46	30		33			**30**
D (mm)	43	79	79		38	44	41	47	74	40			37		66	64		43	**37**
E (mm)	37	56		36	35	38	40	36		57		57		34	37		54		
F (mm)	18	40	40	22	17		21	17			42	42		21			36	39	**22**
G (mm)	11	29	29		8	15	14	12		30	32	27		15			28	32	**15**
H (mm)	11	20	19	11	6	9	10	10		20	28	21		12			20	22	**10**
I (mm)		17		10	5	7	9	9		18	25	19		11			17	22	**9**
J (mm)				9	6	7	9	8		18	25			9.5				20	**7**
M (deg)	118					142			117				118			141			

Table 3: Anatomical parameter for designing standard implant

		Male				Female			
AP	N	1	2	3	4	1	2	3	**4**
A (mm)	106	55.7	49.5	47.1	53.4	51.0	45.7	43.1	**48.4**
B (mm)	106	36.5	34.0	31.8	35.2	29.1	27.7	26.0	**26.9**
C (mm)	106	50.2	43.6	40.6	47.6	43.9	41.5	39.6	**43.1**
D (mm)	106	70.3	61.2	56.7	65.8	59.9	57.2	52.7	**54.9**
E (mm)	106	51.0	47.4	43.4	54.4	58.3	54.1	44.6	**49.8**
F (mm)	106	32.3	30.3	27.8	34.8	38.1	35.3	29.0	**32.4**
G (mm)	106	22.3	21.2	19.4	23.4	26.5	24.3	20.2	**22.3**
H (mm)	106	16.2	15.1	13.8	16.9	19.8	18.9	15.1	**17.4**
I (mm)	106	14.3	13.3	12.2	15.2	17.2	16.4	13.1	**14.8**
J (mm)	106	12.3	11.5	10.5	13.2	14.8	12.1	11.4	**13.6**
M (deg)	**106**	**141.0**	**126.0**	**120.0**	**133.0**	**135.5**	**130.5**	**120.0**	**125.0**

Sized but there were limitation in design of implant. The proposed approach for standardize a hip implant was simplest and quite accurate. The proposed implant improve longer term outcome and clinical functionality for Vidarbha region population by reducing loosening rate and complication rate. There was inconsistency in measurement parameter. Thus it was challenging to attain specific bone implant fit. Statistical analysis showed no significant differences between left and right femora but significant differences were found between male and female subjects8,16. Also, the neck shaft angle varies17 from 125-132E. It was noted that Nigerians were taller than average Indians so their femoral heads were bigger than that of Indians18. The femoral neck diameter and neck shaft angle for Hong Kong Chinese population were small when compared with their western counterpart19. The undersized and overhanging hip implant could lead to replace soft tissue and patella20. Improper choice of implant could create serious problem for patient in long period21,22. There is a deficiency of literature relating to the effect of improperly sized implants on patient outcome.

However, forecast result are based on measured anthropometric data, it is some time subject to variation by the system utilized. This study will help medical practitioner in particular and common population in general.

Significance Statement

It was disclosed that the current finding (eight standard hip implant) can provide suitable fitment to the majority of the population. It is innovative step and more purposeful to prevent general complications like prosthetic loosening and dislocation. While a small percentage of population will always be requiring the customized prosthesis for exact fitment. The current outcome will also assist and enhance facts of hip region for the clinicians or thopaedicians and radiologists.

Conclusion

To validate the need of designing a hip implant based on particular location, an effort has been made for collection of data (Anatomical Parameter) of vidhrabha region population and scatter diagram is formed on basis of standard deviation. After examine a scatter diagram it found that 15% population had irregular shape of hip prosthesis. Cluster analysis was carried out on remaining dataset, which offered 8 set of standard anatomical parameter, on this basis 8 standard hip implant could design for population of the study region. These 8 set of standard hip implant serve 85% of population.

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Technical Review on Educational Data Mining

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Abstract-

Importance of education is to develop good society in terms of cultural, social and economic. Educational data mining (EDM) is a new area for knowledge discovering from large amount of educational data. Researchers from the glob are trying to search the outline and elements which give betterment of education. This paper shows the review of data present in the world and methodology used for collecting and clearing them before applying data mining techniques. It represents different techniques used by different research for educational data mining. It gives kind of result for selecting proper technique for proper data mining in educational data.

Keywords: Educational Data Mining, Dropout, Data Mining, Decision Trees

1. Introduction

Education has different meaning as per the situation. Education is very broad term for considering individual. Basically it is a character appearance of a single person known as education. The education reflected from the society of different persons who represent their culture. In education sector the schools, colleges and universities and so on represent education. The newly education system which will be implemented from 2022-2023 by the Indian government for focusing the aim regarding education system by 2040 with equitable access to the highest-quality education for all learners regardless of social or economic background [1]. The system divides the education parts such as Fundamental, Preparatory, Middle, Secondary and Higher education. Education gives the development of the persons or society. It gives good impact on the society and the nation. The development may be attitudes, modern values and economic growth of a person by education due to which equality and social justice is occurring.

Data is important for any sector. We are living around the data, now a days we are using World Wide Web (WWW), Whatsapp, Facebook etc. which having lot of important data around us. The person tries to find out the meaningful data from the huge data by applying knowledge discovery from data or KDD process. Data mining technique can be applied for meaningful data [2]. In educational field, Data Mining is used to understanding of learning process of students. Educational Data Mining (EDM) is growing area for data mining to better understand students [3].

2. Layout For Drop-Out Learner

Different scholars have used different model or layout for drop out learner. The architecture [4] used is based on ETL process. The abbreviation of ETL is Extract, Transform and Load.

It is business oriented system in which author study the operational system to support business. The model [5][6] which predicting students result at school level which are failure. It involved the stages Data collection, Preprocessing, Data mining and Interpretation. Early student success prediction is also layout by the authors by showing the model [7].

Layout of primary involvement of elements, database creation, processing and output of educational data using Data Mining is as follows in Fig. 1.

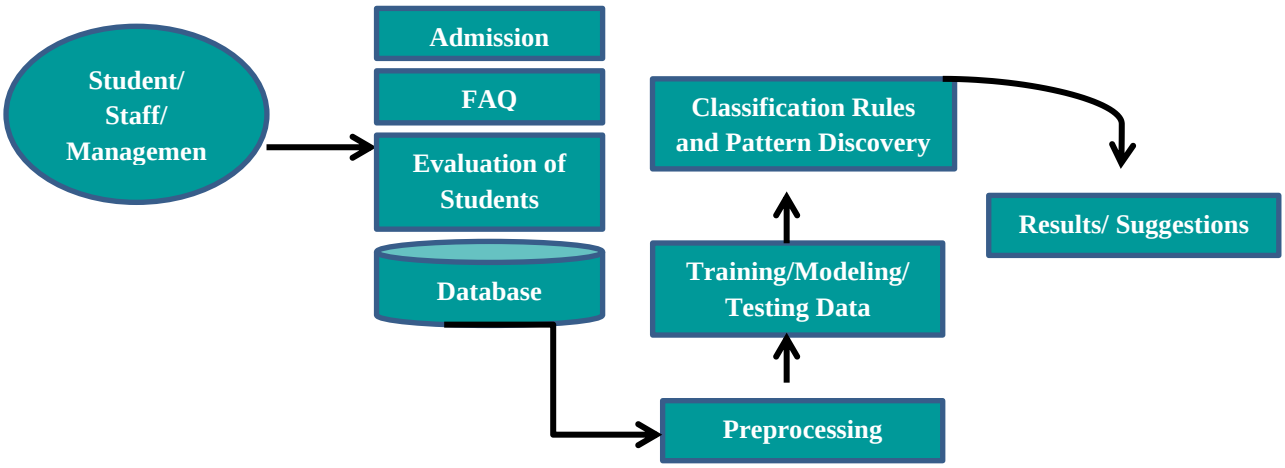

Fig. 1. Educational System Layout

i. Data-Variable-Users

To predict probability of drop out student or performance of student from educational institutional data from different sources are compulsory. Researcher focuses on outcome in particular course such as information system in open polytechnic based on admission data [7]. By using white box data mining technique, researcher predicts student failure in school level [6]. In this study the highly imbalance data is focuses and the students which are on high risk will be detecting so that they can be early guided. The aim [4] study the variables that responsible for the drop out as well as to develop a model of predication which identifying drop out students.

The questionnaire supplied to the three university students for two continuous years from which data is collected [8]. The EDM models and results of the project carried out from the Thailand University. The aim of research is to predicting student performance and dropout based on characteristics before admission, admission details and initial exam performance in the university. Objective of the research is to reduce the number of features, remove irrelevant, redundant data and reduce the size of data set for feature selection algorithm [9]. The less educational qualification [10] decreases possibility of getting good employment in the company or private sectors. Thus dropout students identify as early as possible.

ii. Preprocessing

Pre-processing of data is one of the important steps in data mining process. Generally incomplete, noisy and inconsistent data are received from various sources such as web and social media [2]. The Quality decisions will be taken on quality data. The WEKA software is used to remove noisy data i.e. data cleaning techniques. [11][12][13]. Cleaning process in which missing values will be fill out using data approach. Before applying mining technique the preprocesses data work is done by the researcher [14][15]. Data cleaning and transformation process were manually done by replacing missing values with the standard values.

iii. Data Mining Techniques

Decision Trees, Genetic Algorithm, Artificial Intelligence, Neural Networks, Classification, Clustering, Regression, Association Rules, Nearest Neighbor method etc. are the algorithms and techniques used for knowledge discovery from databases [16]. These techniques are used for Educational Data Mining purpose also. Algorithm [6] are used for feature selection dataset, number of algorithms are applied for features ranking higher in multiple algorithms. 15 important features are selected from original 77 features. Some of the authors also use WEKA for performing out data mining techniques. Association rule mining is used to identify causes of student dropout [11][16].

The researcher [17] constructed a CHAID prediction system in which 7-class response variable by using predictive variable to obtained feature selection technique. In this simple linear regression technique was used to construct a regression model.

The researcher [9] applies feature selection before applying data mining techniques. Researcher uses filter model, hybrid model and wrapper models for features selection. Different studies [18] focus mainly on feature selection like investigating the familiar subset features with little cardinality for gaining good predictive performance with techniques of data mining and calculating better subsets with different cardinality. The basic steps namely subset generation, subset evaluation, stopping criterion and validation are used for feature selection procedure in early days.

3. Conclusion

The major problem for a research is unavailability of global dataset. Various techniques will be applicable for preprocessing of noisy data. Every day Data mining techniques are perform their performance nicely with the EDM and now a days different dimensional and not properly arrange data can also properly arrange. The survey of this paper show that educational data mining is even a large field for research in the education sector which uses more techniques to mining the educational data as well as to plan or develop new education effective for the educator and nation.

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Artificial Intelligence Using Neural Network Based D. S. S. For Iris Detection

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Abstract:-

Neural network-based decision support system, is used for persons identification from IRIS recognition. In this case DECISION SUPPORT SYSTEM (D.S.S.) will work as a classifier estimate non linear and complex decision boundaries between different classes. The neural network configuration using MLP, RBF, SVM. The various parameter of neural network will be varied carefully in order to obtained the optimal configuration in view of minimum mean square error and maximum classification accuracy and simplicity of neural network model, the available data set ratio of these partition will varied gradually. In each of neural network configuration. The variable parameter test and train by neural solution software.

Finally an optimal neural network based D.S.S. will be designed in each category of neural network and then shall be overall comparison among different neural network configuration. In this case of decision support system confusion matrix and classify accuracy are important to identify person iris image.

Keywords: *Iris recognition, neural network-based decision support system, Classify accuracy. MLP ,RBF, SVM*

Introduction:-

Today's E-Security are in critical need of finding accurate, Secure and cost-effective alternatives to passwords and personal identification numbers as financial losses increase dramatically year over year from computer-based fraud such as computer hacking and identity theft. Biometric solutions address these fundamental problems, because an individual Biometric data is unique and cannot be transferred Biometric is automated methods of identifying a person or verifying the identity of a person based on physiological or behavioral characteristic.

For Example, of physiological char. Include hand, finger image and facial characteristic and iris recognition behavioral char. Are trends which can be learn or acquired dynamic signature verification, speaker verification and key stroke dynamic are example of behavioral char. Biometrics system uses a hardware to capture the Biometric information and software to maintain and manage the system in general, the system translates these Biometric profile known as template that templates is stored in a data base the Biometric system then compares this templates to the new image created every time a user accesses system then compares this templates to the new image created every time a user accesses the system for an enterprise Biometric provides value into two ways Biometric adds a unique identification to network authentication, one that is extremely difficult to duplicate smart cards and token also provides a unique identifier but an Biometric has an advantage over these devices a user cannot lose or forget his or her finger print, retina or voice the practical application for Biometric are diverse and expanding and range from healthcare to govt, financial services, transportation and public safety and justice. Such application are on line identification for E-commerce access control of a certain building or restricted area, offline personal identification, financial automated teller machine (ATM), online ticket purchase etc.

Feature Extraction

In order to provide an accurate recognition of an individuals, the most discriminating information present in an iris pattern has been extracted. Only the significant features of the iris have been encoded so that comparison between templates is done. the feature extraction stages.

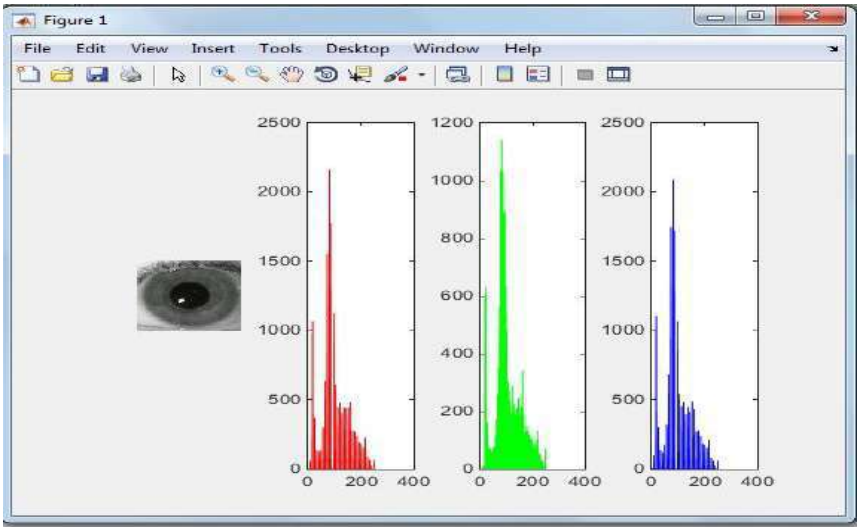


Fig , Histogram of Iris

Problem Formulation :- In this paper preliminary part of the work is given .
Neural network based decision support system, is used for persons identification from IRIS recognition.In this case the D.S.S. (DECISION SUPORT SYSTEM) will work as a classifier estimate non linear and complex decision boundaries between different classes. The neural network configuration to be used for this research work are as

1) Multilayer Perceptron (MLP)
2) Radial based function network (RBF)
3) Self Organizing map (SOM)
4) Support Vector Machine.

The various parameter of neural network will be varied carefully in order to obtained the optimal configuration in view of minimum mean square error and maximum classification accuracy and simplicity of neural network model, the available data set ratio of these partitions will varied gradually. For e.g. 70% training, 20% testing, 10% cross validation and various possible combination like permutation and combination like this will be form. The order of testing and training will be swapped for reverse tagging. The different data partitioning ensures that the trained neural network s not dependent on any specific data partition to produce the best results and the learning is almost independent of data is essential. In each of the neural network configuration. The variable parameters are as Hidden layer, Number of neurons in each hidden layer, Transfer function of neurons output layer, Learning rule or training algorithm to be used such as standard back propagation algorithm, conjugate gradient algorithm, delta algorithm and quick propagation , Number of cluster Centers, Learning rate and value of step size and momentum. All possible Variable parameter of neural network will be varied systematically until the most optimal configuration is reached, where mean square error on the training, testing and cross-validation data set is the lowest regardless of data partitions and classification accuracy for cross validation and testing data set will approach 100% ideally. Finally an optimal neural network based D.S.S. will be designed in each category of neural network and then shall be overall comparison among different neural network configuration. In this case of decision support system confusion matrix and classify accuracy are important to Identify person iris image. In this case mean square error is not very important digestive parameter, it is only used to control and monitor learning algorithm and training of neural network, neural network is trained on the different data partition and it is tested on a separate data partition that was never presented to neural network, while training. This is done for proper generalization and true learning.

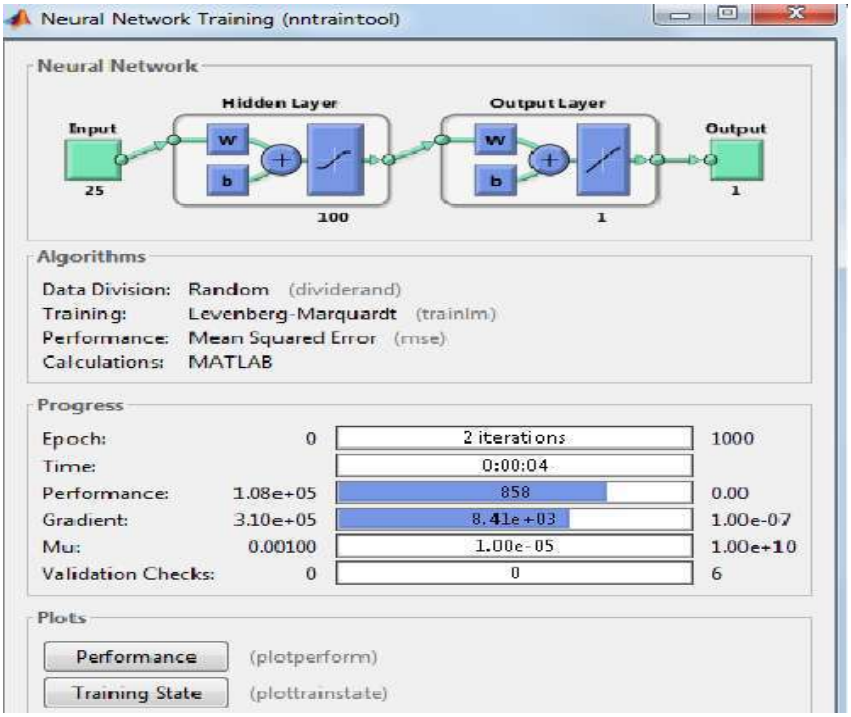
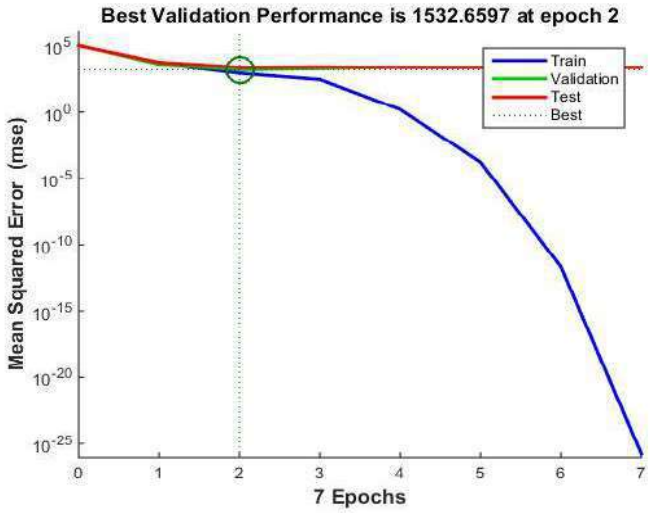


Fig. neural network training

If the train button is pressed on the menu the neural network traing (nntraintool) would be activated from the neural network toolbox. The result of train network is shown in fig 4.1

In this figure the neural network algorithm would be displayed with 25 input two layers with weight and bias .Hiden layer are 100 and one output layer. According to the present result of training system the epoch is 2 iteration for 1000 epochs. Running time is 0.004 hours .The performance is 858 for 1.08e+05 target. The gradient is 8.41e+03 for 1.00e-07 and validation check is 0 for 6 must be displayed on the command window.

According to the fig 4.1 the neural network training system has been accomplished and known by the user neural network toolbox is very useful to simulation of this right iris recognition .



The result is found by the algorithm and we can get the number of epochs used and which epoch gives the best result as shown in fig 4.2.As shown in fig 4.2 a plot fo epochs MSE has been plotted .The epochs gets the best validation performance at epoch no. 2 . The MSEW is the lowest at this point and hereafter no significant changes takes place and no further decrease takes place. Hence this is the best validation performance is 1532.6597 at epoch

Conclusion:-

In this the iris preprocessing steps that includes iris localization, normalization and enhancement and then applied to the small singular program on MATLAB. Software converts that image into the numerical data.

Numerical data then applied to the Neural solution and then trained the Network and classify the images using multilayer perception (MLP), Radial based function Network (PDF) and the images and gives the accuracy of that images. In this work, Iris recognition system based on neural networks base decision support system is used for persons identification from iris images. Multilayer perceptron network is one of the best techniques to identify Iris images of a person.

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Competency Development and Mapping of An Engineering Graduates Employability Skills

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Abstract:

Hiring fresh engineering graduates for Industry has become a crucial task for the industry as well as for the agencies. At the commencement of employment, graduate engineer training is essential, additional training is both time consuming and costly for the industry. Industry work on three main elements man machine and money. Among these three the main element of industry is man i.e., humans. The existing economic globalization demands novel methods to workforce management. Nowadays industry is in need of high skilled workforce, thus the skilled graduates demand is increasing day by day, and low skilled employees demand is increasing and is on declining side. Multi-tasking role are expected by the employees to be performed. More agility is required, proactive, self-disciplined, organized, Creative etc. are the recruiters from the upcoming graduates. The practice of determining critical competencies for a company is called skill mapping or competency mapping. Competency mapping is a growing HR approach that focuses on the characteristics that are necessary for job success and matches them to the skills of the current workforce. Its is expected by the academicians and the Engineering institutes to focus more towards the competency development and mapping of engineering graduate. It can be achieved by imparting various technical and non-technical trainings, providing internship opportunities, conducting workshops, Seminars etc.

Keywords: *Competency mapping, Skill, Employability, Globalization, Gap, Graduates, Engineering.*

Introduction:

Process of identifying key competencies of employees for an organization is termed as Competency mapping of skill mapping. Competency mapping is an evolving HR practice focusing on factors required for success at any job and matching it with skills of workforce available.[1] It Involves various skills which are related and expected to be performed in the job. It reveals the working capabilities, ingenious, adaptability, stress handling capacity, forecasting skills, problem solving abilities, decision making sills and many more. This analysis helps the industry and the perspective candidate to compare suitability of engineer for the respective job. Its also help in reducing the training or the on-job training cost of the industry. More reliable workforce can be developed for future. In order to remain in alive and active in today's competitive environment, every industry is striving for maximum efficiency and effectiveness. Industry is divided into two categories: production and service. They are making every effort to make their system more efficient. All of their strategies and approaches for increasing the performance and efficiency of their operations point to one fundamental factor: "Skill and Competency." As a result, firms that want to improve their performance turn to skills and competencies as a key area. Every sector, particularly those in manufacturing, places a premium on ability and competency.[2] Individuals must have convenient capacities in order to be 'employable.' Employers frequently describe a set of abilities that they expect from an employee, in addition to solid technical understanding and subject knowledge. It's like Team working, Problem solving, Self-management, Knowledge of the business, Literacy and numeracy relevant to the post, ICT knowledge, Good interactive and communication skills, Ability to use own initiative but also to follow instructions and Leadership skills where necessary are some skills needed.[3]

Importance of Competency Mapping:

Using a competency map to drill down to the specific skills, knowledge, abilities, and behaviors required for the job is beneficial. Competency mapping has the advantage of establishing criteria for employee training and development that are especially matched to our company's needs. It involves exploring the skills which are required for particular job position and role while performing duty. The goal of applying competency mapping is to ensure the organization's competitiveness, efficiency, and effectiveness[4]. These ability marking necessities serve as the indicator for employees. Employees' performance assessment forms are properly filled out depending on their degree of talents, which qualifies them for a certain function in the organization. Human resource department is responsible for analyzing the strengths and weaknesses of personnel after they have been assigned based on their competency.[5] The finest organizations always coming up with new methods to interact with their employees on a personal level. Building a more personal relationship with employees is becoming increasingly popular among the greatest places to work. It increases the productivity at workplace, reduces the work pressure, increases the quality of work, workplace environment[6]. Competency mapping has the advantage of establishing criteria for staff training and development that are precisely matched to your company's requirements[7]. It is a rapid and effective process that concentrates on and analyses how workers operate, and it normally takes one or two days to complete. Making a competence map can help you drill down to the specific skills, knowledge, abilities, and behaviors needed for each unit of work[7]. The competence map becomes a very helpful and practical tool for enterprises because of this approach.

Advantage of Competency Mapping for Industry:

- Increased Productivity
- Better workplace environment
- Increased Job Retention
- Better achievement of goal
- Sense of Responsibility

Figure 1 Advantage of Competency Mapping for Industry:

Advantage of Competency Mapping for Employee:

- Performance Excellence
- Improves clarity in work
- Job Satisfaction
- Better appraisal
- Better understanding of Job Role

Figure 2 Advantage of Competency Mapping for Industry

Competency Mapping & Development

Boyatzis(1980) – "A capacity that exists in a person that leads to behavior that meets the job demands within parameters of organizational environment, and that, in turn brings about desired results".[8] Unless the industry is not ready for competency mapping, it would become very difficult to get a better achievement at the workplace. competency mapping is also one of the leading concepts which is accepted worldwide[9]. It has shown

a tremendous increase in the qualitative approach towards achieving the Vision and Mission of any organization. It also gets in line with the organization goal as well as with the individual Goal. it is giving a wider spectrum for a better career enhancement and performance appraisal.[10] A capacity to recognize, interpret, and apply emotional information about oneself that leads to or causes successful or exceptional performance is an emotional intelligence skill[11]. The capacity to notice, analyses, and apply emotional information about others that leads to or causes successful or superior performance is referred to as social intelligence[12]. An intellectual intelligence competence is the dimensions to think critically about and evaluate information and circumstances in a way that leads to or causes successful or exceptional performance.

Figure 3 Competency Mapping & Development

HR Planning: Human resource planning (HRP) it is an incessant progression of disciplined scheduling ahead to ensure that an organization's most important asset—quality employees—is utilized to its full latent. Human resource planning certifies that personnel and occupations are a good match, while preventing manpower shortages or surpluses.

Competencies can be developed

One of the main recompenses of the ability or behavioural tactic to talent is that we reach an area of human talent that may be developed later in life. Although our understanding of skills has grown, one of the most noteworthy advances made in the prior years[13].

- an ageing and increasingly diversified workforce requiring greater employer support to remain productive at work
- increasing levels of chronic disease in the general population
- rising costs of ill-health in the workplace associated with increased absenteeism and reduced performance
- external societal pressures such as growing expectations that employers will promote wellness programmes as a duty of corporate social responsibility[14]
- a need for employers to distinguish their offerings to attract recruits in an increasingly competitive labor market
- attempts by government to reduce public health expenditure

Government is also planning to increase the presence of for universities in a global ranking our country is planning to have almost more than 20 universities and the list of top 200 universities of world. It will definitely attract the focus of top Global recruiters towards India. As when the Global recruiters come out for recruitment they especially focus on the top universities of the world If these top universities are being targeted for the Global recruitment it is a mandatory to make and raise a standard of university to this top level which will ultimately increase the growth[11].

Employability Skill development for Competency Mapping.

Employability skills are those skills which are required by and fresh graduate to start their company in organisation. These are the skills which will help the graduate to attend his or her first employment of their life[15]. Employers for the recruiters are always in search of such skills which are beyond your experience and qualification. When it comes to experience and qualification it has certain limitations because you cannot learn the things beyond your qualification and beyond your expectation it is expected by industry. Employability skill

is something which comes between your qualification and expectations it is more over incline toward the self-initiative, or self-learning, for proactiveness of an individual to learn new skills which will help them for a smooth working at workplace[16]. As your education and your qualification along with your experience will only make you eligible for the recruitment process of any organisation based on your qualification and education you will be able to appear in the recruitment process of an organisation but once you have not cleared the organisation recruitment process you want to be able to get a selection. The selection of a candidate in any recruitment process is purely based on the employability skill which acquired and which is shown to the employer during the screening process[17]. In general company is always ready to train the fresh graduates on the required skills. Skills may vary from organisation to organisation and sector 2 sector. They always are in search for such candidates who initially purchase certain soft skill interpersonal skills before hiring because once they identify that you already possess certain skills which are expected by the recruiter it will help them to train the graduate[18]. On the other hand, the fresh graduates who is not having any of the above-mentioned skills it is very difficult and it is very harder for the industry to train such a graduate on a required skill. Soft skill for employability skills is also considered as the building blocks for your future they will help you to get an acquaint yourself with better career and the candidate having a good command on soft skill definitely will get more opportunities in the state as compared to any other candidate. There are many different employability skills some among them are most important are in the areas of as mentioned below[19]:

- Creating a good Repo with co-workers: it is very important whenever you are working in an organisation you have to create a good rapport with your co-workers. having a good tune with your co-workers will definitely help you to create healthier and more supported work environment.
- Being more trustworthy and independent: following the deadlines and fulfilling the given task in a given set of time definitely makes you more Independent and dependable in organisation. it reflects that the said employee is more reliable when it comes to following the deadlines.
- Proactiveness: proactiveness is an attribute which is expected from every employee nowadays. organizations now are in search of such candidates those who to apply their own logic and skills to get the job done in the set time. employers don't want such candidate who always wait for someone else to instruct them and get the work done from them[20].

Apart from this some of the most important employability skills which are expected in a job market are listed below:

- ✓ Communication skill
- ✓ Emotional intelligence
- ✓ Aptitude skills
- ✓ Team building
- ✓ Negotiation skill
- ✓ Persuasion Skill
- ✓ Influencing skill
- ✓ Conflict Resolution Skill
- ✓ Mediation skill
- ✓ Problem Solving Skills
- ✓ Decision making Skills Etc

Conclusion:

Competency Mapping is a need of hour. Regular assessments and mapping of engineering graduates must be practiced. As a result, skills are a crucial aspect of an individual's personality that should be examined in order to assess their potential. To do so, we'll need to use competence mapping, which is a useful method for identifying an employee's work and behavioural abilities. Various employability skills listed above can be considered as a quality parameter for reference check. All the stake holders of the industry including Employer, Employee and Academician must take initiatives. These initiatives will surely help towards building and developing of knowledge economy for the nation.

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Introduction to the Quantum Computing: A Comparative Study with Classical Computing

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Abstract:

The flow of electrons is referred to as electricity. Because electrons can transport themselves to the other side of a blocked passage through a process called quantum tunnelling, transistors cannot be utilized as switches as their size shrinks to the size of a few atoms. Quantum mechanics is a field of physics that investigates the physical universe at the atomic level. At this level, particles behave differently than in the classical universe, taking on multiple states at once and interacting with particles that are thousands of miles away. Superposition and entanglement are examples of the phenomena. At the crossroads of mathematics, computer science, and physics, quantum computing is a novel and interesting field. It is concerned with the use of quantum physics to improve compute performance. Quantum computing is a novel type of computing that is based on quantum mechanics and interacts with a probabilistic and unpredictable physical reality. Because quantum mechanics is a more general model of physics than classical mechanics, it leads to a more generic model of computing, quantum computing, which has the ability to tackle challenges that classical computing cannot.

Keywords: *Computers, Classical computation, Quantum computing, Bits and Qubits, Quantum computing challenges*

Introduction:

Today's developments in computing are resulting in powerful tiny integrated circuits. The capacity of a chip doubles every two years, according to Moore's law. As we go closer to 10 nm, strange things happen with the electrons, revealing quantum nature, and the laws of classical physics are no longer respected at such scales. As a result, either new semiconductor devices must be developed that can sidestep quantum nature or quantum nature must be embraced. Scientists are currently opting to embrace quantum nature, i.e., to use quantum mechanics principles to develop innovative computers known as quantum computers [1-4].

Any type of calculation that contains both arithmetical and non-arithmetical processes and follows a well-defined paradigm (e.g. an algorithm) is referred to as computation. Computers are mechanical or electronic machines that do computations [1-5]. In today's world, most personal computers calculate 64 bits of data at a time. A 64-qubit quantum computer would be 2 to the 64th power quicker or 18 billion billion times faster. (It's worth noting that billion billion is correct). We wanted to explore the fundamental concepts of computation, how they are achieved using transistors in classical computing, the speed limitations of classical computing, the difference between classical and quantum computing, and the introduction and challenges of quantum computing to a general audience in this paper.

Computation: (Classical approach)

Binary computing is also known as classical computing. Information is stored in the form of classical bits, which are logically represented by either a 0 (OFF) or a 1 (ON) in this traditional approach to computing. It's analogous to turning on an ON or OFF a light switch. All current computers are built around the transistor. We regard this event to represent the 1(ON) when the transistor allows the current to travel through it, and we consider this activity to represent the 0 (OFF) when the transistor blocks the current from passing through it. We can manipulate the state of a bit in traditional computers by employing various combinations of transistors connected to each other. They're known as logic gates. In classical computing, we know that logic gates can perform logical operations. AND, OR, NOT, NAND, NOR, and other logic gates are examples. Transistors are small semiconductor devices that are used to amplify and also switch electric or electronic signals. They were used to manufacture integrated circuits on a piece of silicon (IC). In traditional computers, the number of transistors has a 1:1 connection with power. As a result, in order to enhance computation power, the number of transistors must be raised while the size of the chip must be reduced [2-6].

Limit of Classical computation:

Computers are getting smaller and faster day by day because electronic components are getting smaller and smaller. But this process is about to meet its physical limit.

Gordon Moore, the co-founder of Intel, discovered in 1965 that the number of transistors on a silicon microprocessor chip had doubled every year since its discovery, while the prices had been cut in half. Moore's Law is the name given to this phenomenon. Moore's Law is significant because it indicates that computers are becoming smaller and more powerful with time.

This leads to the concept of creating the tiniest computer by shrinking the circuit down to the size of an atom. Due to the "Quantum tunnelling" phenomenon, an electron can cross the barrier and appear on the other side when the size is lowered at the atomic level. As a result, these circuits will be unable to function as switches. It demonstrates that beyond 5–7 nanometres, the size of the circuits in a traditional computer has hit its limit. As a result, the power of classical computing can only be increased up to a limit [3-5].

Quantum computing: (An introduction)

Quantum computing is a sort of computer that uses the collective properties of quantum states to accomplish calculations, such as qubits, superposition, interference, and entanglement. The devices that perform quantum computations are known as quantum computers. A quantum computer is a machine that performs calculations based on the laws of quantum mechanics, which is the behaviour of particles at the sub-atomic level. Unlike traditional classical computers, which utilize binary bits 0 and 1 independently to store and manipulate the information, they use their own quantum bits, also known as 'Qubits,' to store and manipulate data. The computers using such type of computing are known as ‘Quantum Computers'. Circuits using transistors, logic gates, and Integrated Circuits are not possible in such small computers. As a result, it uses subatomic particles such as atoms, electrons, photons, and ions as bits, together with their spins and states of information. They can be stacked on top of one other to create new combinations. As a result, they may execute in parallel and efficiently use memory, making them more powerful. Quantum computing is the only model that can challenge the Church-Turing thesis, allowing quantum computers to dominate classical computers exponentially faster in speed [7-12].

Quantum Bits (Qubits): Representation of Data

A qubit, or quantum bit, is the fundamental unit of quantum information in quantum computing. The quantum bit can represent 0, 1, or both at the same time. A quantum bit can exist in superposition, which means that it can exist in multiple states at once. A single atom is used to represent a bit of data, and it can be in one of two states: |0> and |1>.

Qubits includes

- An atom in an excited or ground state.
- Polarisation of a single photon, in which the two states are vertical polarisation and horizontal polarisation.
- Spin of the electron, in which the two levels are spin up and spin down.

A linear superposition of a qubit's two orthonormal basis states can be used to represent its general quantum state in quantum mechanics (or basis vectors). |0> and |1> are the most common symbols for these vectors. They are pronounced "ket 0" and "ket 1," respectively, and are written in the traditional Dirac or "bra–ket" notation. The computational basis, which consists of the two orthonormal basis states {|0>,|1>}, is said to cover the two-dimensional linear vector (Hilbert) space of the qubit. In 2^n-dimensional Hilbert space, ‘n’ qubits are represented by a superposition state vector [7-12].

Qubits have unique qualities that enable them to solve complex problems considerably more quickly than traditional bits. Superposition is one of these qualities, which states that a qubit can store a combination of "0" and "1" at the same time. It refers to a quantum system's ability to exist in several states at the same time. A quantum bit can be in superposition, meaning it can be in multiple states at the same time [7-12].

Entanglement is a quantum particle-to-quantum particle correlation that is extremely strong. Quantum systems' ability to display correlations between states within a superposition is known as entanglement. Consider two qubits, each of which is in the state |0> + |1> (a superposition of the 0 and 1). We can entangle the two qubits so that one qubit's measurement is always correlated with the other qubit's measurement [7-12].

Comparison between Quantum computing and classical computing:

Classical Computing	Quantum Computing
1) Conventional computing is based on the classical phenomenon of electrical circuits being in a single state at a given time, either on or off.	1) Quantum computing is based on the phenomenon of Quantum Mechanics, such as superposition and entanglement, the phenomenon where it is possible to be in more than one state at a time.
2) Information storage is bit based on voltage or charge etc.	2) Information storage is Quantum bit based on direction of an electron spin.
3) Classical computers use binary codes i.e. bits 0 or 1 to represent information.	3) Quantum computers use Qubits i.e. 0, 1 and both of them simultaneously.
4) No restrictions exist on copying or measuring signals.	4) Severe restrictions exist on copying and measuring signals.
5) Power increases in a 1:1 relationship with number of transistors.	5) Power increases exponentially in proportion to number of qubits.
6) Can operate at room temperature.	6) Requires ultra-cold environment.
7) It has low error rates.	7) It has high error rates.
8) Circuit behaviour is governed by classical physics.	8) The circuit behaviour is governed by quantum physics or quantum mechanics.
9) Well suited for everyday processing.	9) Well suited for tasks like optimization problems, data analysis, simulation, etc.
10) Information processing is carried out by logic gates e.g. NOT, AND, OR etc.	10) Information processing is carried out by Quantum logic gates. E.g. Hadamard, controlled-NOT, Pauli's X, etc.
11) It is large scale integrated multi-purpose computer.	11) It is high speed parallel computer based on quantum mechanics.
12) CMOS transistors are the basic building blocks of conventional computers.	12) Superconducting Quantum Interference Device or SQUID or Quantum Transistors are the basic building blocks of quantum computers.
13) Logic gates are not reversible.	13) Quantum logic gates are reversible.

Advantages of Quantum computing:

1) **They can tackle complex problems-** Quantum computers, according to researchers, will be able to solve complex mathematical problems that ordinary computers are unable to accomplish in a reasonable amount of time.
2) **They are quick-** In the end, quantum computers may be able to provide processing power on a scale that ordinary computers may never be able to equal. Google, for example, claimed in 2019 that it could perform a calculation in approximately 200 seconds that would take a traditional supercomputer 10,000 years to complete.
3) **Computer power beyond imagination-** It provides computing power capable of processing massive volumes of data (2.5 Exabyte per day, equivalent to 5 million laptops) generated all over the world and extracting meaning from it.
4) **Lower power consumption-** Due to the teleportation phenomena known as 'quantum tunnelling,' it can work in parallel and consume less electricity, reducing power consumption by 100 to 1000 times.
5) **Greatest for simulation-** Quantum computers are the best for simulating data. Many algorithms have been developed to simulate diverse phenomena such as weather forecasts, chemical simulations, and so on.
6) **Medicine creation-** These computers are more effective in the medical industry. They have the ability to detect ailments and formulate drug formulas. These computers can be used to diagnose and test a variety of ailments in scientific laboratories.
7) **High privacy-** These computers have strong encryption capabilities and are adept at cryptography. The security of quantum computers cannot be breached. China just launched a satellite that employs quantum computing, claiming that the satellite cannot be hacked.

8) **Employed in the manufacture of radar missiles-** Quantum computing is also used in the manufacture of radar missiles. This technique can help increase the accuracy of radar weapons.
9) **Used in artificial intelligence-** These computers are excellent at artificial intelligence. They can make more precise judgements than regular computers. These computers will allow scientists to do more effective study.
10) **Machine learning-** Machine learning techniques are an excellent way to apply quantum computing. Users can write less code and rely on machine learning to improve results.
11) **No overheating-** It can handle complex problems without overheating since the quantum system is kept cold up to 0.2 Kelvin for stability.
12) **Optimization-** It can quickly handle problems like determining the optimum route and scheduling trains and aircraft. It would also be capable of processing 1 trillion chess moves per second. Quantum computers will be able to break even the most secure and impenetrable encryption systems. It would, however, create hack-proof alternatives.
13) **Industrial revolution-** It has the potential to revolutionise industries ranging from pharmaceuticals to petroleum. It will be able to develop new medications. Financial institutions' marketing algorithms can be enhanced. Artificial intelligence can be improved in the near future.

Quantum Computing's Drawbacks: (Challenges)

1) **Low security and high mistake rate**- the systems are not very secure, and there is always a threat. Furthermore, the mistake rate is extremely high and must be reduced.
2) **The security of the present Internet of Things (IoT) might fall down** due to quantum computer advancements. Databases of government and commercial large corporations, banks, and defence systems can all be hacked using cryptographic techniques. Given these factors, quantum computers have the potential to be disastrous for humanity's future. ***Considering these facts, quantum computers can be terrible for our future.***
3) Secure communication or any type of internet transaction could be cracked, with the data being misused or resold.
4) Today's quantum computers are mostly prototypes that are still huge, difficult, and costly. At the same time, they continue to have a number of issues that their developers have yet to fully resolve.
5) The Quantum Computer will function as a separate device and will not be able to completely replace traditional computers. Because classical computers are superior at certain tasks to quantum computers, such as email, excel, and so on.
6) It has not yet been fully conceived, as only portions of it are being executed and people are still imagining how it will look.
7) Qubits are unable to disregard noise in their native state. As a result, the quantum system is more prone to errors. It has a problem with decoherence. The most difficult problem is figuring out how to deal with any unwanted deviations or noise in quantum computers.
8) It is extremely delicate and prone to errors. Subatomic particles such as atoms and electrons are affected by all kinds of vibrations. Noise, malfunctions, and even failures are conceivable as a result. It causes "Decoherence," or the loss of quantum coherence.
9) **Algorithm creation-** For each type of calculation, a separate algorithm must be written. Quantum computers cannot function in the same way as traditional computers; they require specific algorithms to complete jobs in their environment.
10) **The low temperature required-** Because the processing in these computers is done at a very deep level, a temperature of minus 460 degrees F is required. This is the universe's coldest temperature, and maintaining it is extremely difficult.
11) **Software development-** In addition to hardware, further software development is necessary to construct.

Applications of Quantum computing:

1) **Healthcare sector:**
   a) Research
   b) Diagnostics
   c) Treatment
   d) Drug Design & Development
   e) Full-speed DNA sequencing and analysis
   f) Developing the ideal decision-making aid
   g) Improving imaging solutions
   h) Creating the safest medical data systems ever

2) Cryptography & Cybersecurity

Due to the increasing number of cyber-attacks that occur daily around the world, the online security environment has become rather vulnerable. Quantum computing, along with machine learning, can aid in the development of various strategies to combat these cyber-threats. Quantum computing can also aid in the development of encryption systems, commonly known as quantum cryptography.

3) Finance and Banking:

a) High-frequency automated trading
b) Fraud detection
c) Big data analytics
d) Business optimization, including risk management and compliance
e) Risk profiling, trading optimization, and targeting and prediction.

4) Weather Forecasting:

Currently, typical computers take longer to analyse weather conditions than the weather itself. However, a quantum computer's capacity to crunch large volumes of data quickly and accurately. Meteorologists will be able to develop and analyse more precise climate models with quantum computers, which will provide more insight into climate change and strategies to mitigate it.

5) Machine Learning and Artificial Intelligence

Quantum computing could bring up new possibilities in artificial intelligence, which frequently includes the combinatoric processing of enormous amounts of data to produce better predictions and choices (think facial recognition or fraud detection). Quantum machine learning is an emerging topic of research that identifies ways that quantum algorithms can speed up AI.

6) Automotive sector
7) Energy
8) Advanced Manufacturing
9) Computational chemistry
10) Entertainment and Quantum gaming industry
11) Logistics optimisation
12) Traffic optimisation
13) Industry specific applications
14) Biotechnological development
15) Defence and security sector
16) Various engineering fields applications

And may there be many more.....

Conclusion:

Quantum computing will spawn a slew of new technical applications, opening up new commercial opportunities and assisting in the resolution of some of the world's most pressing problems. Quantum theory's previously unexplored effects can now be employed as a resource in technologies with far-reaching applications, such as secure communication networks, ultra-precise sensors, pharmacological studies of chemical reactions, innovative materials, and fundamentally new computing paradigms. Governments and organizations all around the world, including Google, Microsoft, Intel, Toshiba, and IBM, have been investing heavily in order to realize this potential in recent years. Despite tremendous advances, quantum computing has a number of hurdles, including the difficulty of manufacturing a large-scale quantum computer, the development of novel quantum algorithms, and the cost of construction. Quantum computers have the potential to transform computation by allowing for the solution of previously unsolvable problems. While no quantum computer has yet been developed to perform calculations that a classical computer cannot, significant progress is being made.

Quantum computing encompasses a wide range of concepts, including quantum physics, superconductivity, nanotechnology, and others. Each of them is a complex field that is still in its early stages of development. As a result, creating a physical system that follows the principles of all of these professions is a

monumental task. Quantum computing has enormous potential, allowing us to achieve things that were previously thought to be unachievable with traditional computers.

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Sports Results Prediction Using Supervised Learning

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Abstract-

Different Machine Learning techniques are used to predict the score and outcome of various sports. We have analyzed different model design hypotheses to assess our model's performance which helped us choose the best algorithm to predict the winner of the match. The main algorithm used is logistic regression however, for collating, Support VectorMachine (SVM) and Naïve Bayes has been used.

Predictive analysis has enforced the prediction of success rate of each team depending on the statistics of previous matches or tournaments which would help others to see where they stand andwho their competitors are. Sports managers are striving to model appropriate strategies that can work well for assessing the opponent's potential in a match. The challenge of predicting sports results is based on several parameters and it differs from sport to sport. So, it is important to consider all the essential ones in order to increase the accuracy rather than just focusing on the score to predict the outcome. Also, this area has always been something interesting for sports fanatics, magazine makers and others who are interested in approximating the odds of a game in advance. This system would aid in easy generation of results, display of ranking and regulating the selection of the tournament dates.

Keywords- Logistic regression, Support Vector Machine (SVM), Predictive Analysis

I. Introduction

A system for predicting the results of various sports matches that are based on previous results ofthe team's performance and conduct. We also strive to find accurate probabilities for a home win,a draw, or an away win for each match.

A particularly important element of Data Science in sports like football and cricket is the ability to evaluate a team's performance in games and use that information to attempt to predict the resultof future games based on this data. Outcomes from sports matches can be difficult to predict, withsurprises often popping up. Football is an interesting example as matches have fixed length. It alsopossesses a single type of scoring event: goals that can happen an infinite amount of times duringa match, and which are all worth 1 point. The possible outcomes for a team taking part in a footballmatch are win, lose or draw. Similarly, in cricket, the possible outcomes are same as football. Butthere are many parameters for consideration like teams, runs per over, overall runs, run rate etc. Normally, predictions are done based on goals or runs for respective sport and it can therefore seem quite straightforward to predict the outcome of a game. Traditional predictive methods havesimply used match results to evaluate team performance and build statistical models to predict theresults of future games. For instance, a team with many scoring opportunities could be unlucky and convert none of their opportunities into goals or runs, whereas a team with a single scoring opportunity could score a point. This makes match results an imperfect measure of a team's performance and therefore an incomplete metric on which to predict future results.

Our primary goal is to create a model that predicts outcome of a sports match with sufficient accuracy. This accuracy can be determined by attaining 70% precision when predicting results of the match. More specifically, every match consists of characteristics of the players and thematch and based on these features our algorithms predict the outcome. The outcome is, for example in tennis where zero bit (0) corresponds to a win for Player 1 and one bit (1) a win for Player 2. No draw is possible here. In sports where a draw is possible, other representationsare necessary. In contrast to tennis, a draw is possible in football and cricket, and we have shroud both the scenarios.

Proposed System:

Deliberating the existing system, we have come up with the idea of using multiple classification and regression techniques namely Logistic Regression, SVM, Naïve Bayes, etc and with the helpof few technologies like Weka to anticipate the results. We have considered the factors like scores,home and away team (for any sport), strategies used, time, location (city and country) etc. Using such methods, we have compared as to which

algorithm gives efficient results. As we used previous data sets to train it, the methods would help us easily identify trends and patterns as it understands behavior and historical data. There is no human intervention(automation) in this approach. There is continuous improvement as the algorithm learns to make more accurate predictions faster. It can also handle multi-dimensional and multi-variety of data, and they can dothis in dynamic and uncertain environment. Our research will hopefully be informative and use tothose performing future research in this application area.

Challenges

The following are several challenges on the path to achieving the objectives:

- Data availability & quality.
  Finding a public database of the sports data with the necessary statistical depth to generate expected goals metrics is an essential part of the project. However, the leading sports data providers do not make their information publicly available. We did scour various public databasesto find one that is suitable for us to use. The alternative approach in the case where we do not finda suitable database would be to find websites displaying the required data and using web scrapingtechniques to create our own usable database.
- Research and understanding of prediction landscape.
  In order to design our models and test different hypotheses, we undertook a thorough backgroundresearch of prediction techniques and develop a mathematical understanding of various Machine Learning algorithms that have been used for our predictions.
- Testing different models and parameters.
  An important challenge has been to make the model training and testing tasks as quick and easy as possible, in order to test and compare different models. A robust pipeline will have to be builtto enable us to find the best possible models.

II. Literature Survey

Machine learning (ML) is one of the intelligent methodologies that have shown promising resultsin the domains of classification and prediction. One of the expanding areas necessitating good predictive accuracy is sport prediction, due to the large monetary amounts involved in betting. In addition, club managers and owners are striving for classification models so that they can understand and formulate strategies needed to win matches. These models are based on numerousfactors involved in the games, such as the results of historical matches, player performance indicators, and opposition information.

One of the common machine learning tasks, which involves predicting a target variable in previously unseen data, is classification. The aim of classification is to predict a target variable (class) by building a classification model based on a training dataset, and then utilizing that modelto predict the value of the class of test data. This type of data processing is called supervised learning since the data processing phase is guided toward the class variable while building the model. Some common applications for classification include loan approval, medical diagnoses, email filtering, among others. Sport prediction is usually treated as a classification problem, with one class (win, lose, or draw) to be predicted.

In sport prediction, large number of features can be collected including the historical performanceof the teams, results of matches, and data on players, to help different stakeholders understand theodds of winning or losing forthcoming matches. The decision of which team is likely to win is important because of the financial assets involved in the betting process; thus bookmakers, fans, and potential bidders are all interested in approximating the odds of a game in advance. Once a predicted result for the match is obtained, an additional problem is to then decide whether to bet on the match, given the bookmaker's odds. In addition, sport managers are striving to model appropriate strategies that can work well for assessing the potential opponent in a match. Therefore, the challenge of predicting sport results is something that has long been of interest to different stakeholders, including the media. The increasing amount of data related to sports that is now electronically (and often publicly) available, has meant that there has been an increasing interest in developing intelligent models and prediction systems to forecast the results of matches.

In this proposal, a critical survey of the literature on ML for sport result prediction, focusing on the use of Logistic Regression for the given problem is provided. Several studies have used many otherapproaches but using classification model and comparing them with other efficient algorithms likeBayesian networks, K Means, Support Vector Machine, Generalized boosted models(GBM) etc helped us in providing which is the best way to achieve the predicted outcome in order to derive highly accurate classification models in other domain.

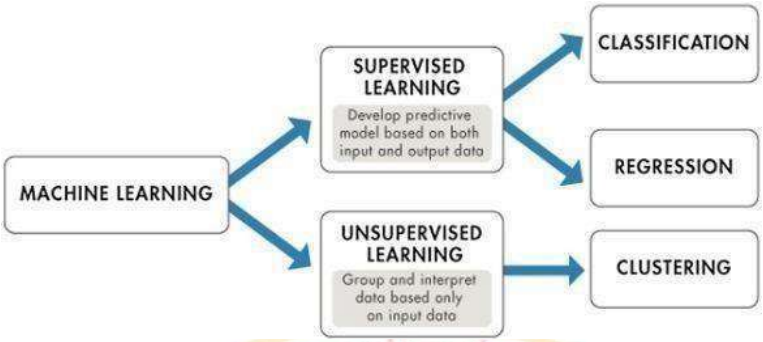


Fig1: Machine learning Algorithms: The above diagram shows different algorithms insupervised learning and unsupervised learning.

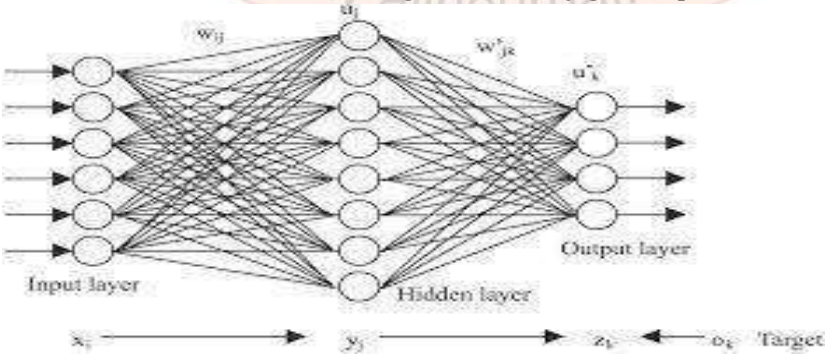
Existing Solutions

This paper's objective by authors Li Yan-Xia, Li Lin, Wang Qiang is to improve the managementlevels of college sports work in the new era, that will proportionally affect the party's education policy, if it is extensively implemented. It also strives to improve the scientific level of college sports management work to achieve maximum operation by providing a useful reference.

Design and development of this system allows us to enter the world of office automation. In the system described above; it is composed of seven modules: sports teaching, physical fitness tests, sports competitions, extra-curricular sports activities, files management, professional team training, venues and equipment management, etc.

Rory P.Bunker and Fadi Thabtah have developed via ANN i.e., Artificial neural networks recentlywhich showed good results. They have used unsupervised learning methods as well to distinguishbetween good and poor teams.

Artificial Neural Networks (ANNs) are perhaps the most applied approach among ML mechanisms to the sport result prediction problem. An ANN usually contains interconnected components (neurons) that transform a set of inputs into a desired output. The power of ANN comes from the non-linearity of the hidden neurons in adjusting weights that contribute to the finaldecision. ANN output often relies on input features and other components associated with the network, such as these weights. Weights associated with interconnected components are continuously changing to accomplish high levels of predictive accuracy. These changes are performed by the ANN algorithm to fulfil the desired model's accuracy given earlier by the user.An appealing feature of ANNs is that they are quite flexible in terms of how the class variable is defined whether it is probability of victory or whether two classes are used with home goals and away goals represented in the two various classes.



(Fig: 2.2.1) Artificial Neural Networks: The above diagram represents a simple artificial neural network with one hidden layer.

Data from the first eight rounds of the competition and five features were used, consisting of yardsgained, rushing yards gained, turnover margin, time of possession, and betting line odds. Unsupervised methods based on clustering were used to distinguish between good and poor teams.An ANN with backward propagation (BP) was then used.

Purucker achieved 61% accuracy compared with 72% accuracy of the domain experts. The BP algorithm was found to be the most effective approach. A limitation of this study is that only a relatively small number of features were used.

Kahn extended the work of Purucker and achieved greater accuracy, performing slightly better than experts in the NFL who were making predictions on the same games. Data on208 matches inthe 2003 season were collected. The features that were used were total yardage differential, rushingyardage differential, turnover differential, away team indicator and home team indicator. There were two classes: away team outcome and home team outcome – a value of1 indicating that the team lost the match, and a value of +1 indicating that the team won the match. The problem was treated as a classification problem. The first 192matches were used as the training data set, and the remaining rounds (week 14 and 15) were used as the test set. Through testing, a network structure of 10-3-2 was found to be optimal. Accuracy of75% was achieved across the week 14 and 15 matches. The results were compared to the predictions of eight sports casters fromESPN.com. Across the same matches, the domain experts predicted an average of 63% of matches correctly.

Related Work Classified by Sport

FOOTBALL

Football is perhaps the World's pre-eminent sport, so it is not surprising that there has been a substantial amount of research on football prediction. Among all sports, football prediction is oneof the most widely and deeply researched area. We thus survey prediction related researches for football, a representative of the sports as our target domain, and categorize them into a few groups. These studies mostly deal with mathematical/statistical models or methods but there are a few researches based on machine learning techniques.

Statistical analysis has been done on football prediction. Many researchers suggested their own models or processes to analyze the results of football matches. They usually showed that their methods represent the results of football matches well. Many models and methods, like Poisson regression models, a logistic regression model using seed positions, and an updating process for the intra-match winning probability, were used to analyze the results of football matches. Most ofthese works also give some predictions as well, but they are more focused on statistical analysis of the results of football matches. The technique was based on a Poisson regression model but wascomplicated by the data structure and the dynamic nature of teams' performances.

The author study multiple techniques in data mining and result prediction to devise a good modelfor predicting matches. They use these major models: GBM (Generalized Boosted Models) and NB (Naive Bayes).

II. Naive Bayes

For Bayesian networks, we handle the uncertainty and formulize the sports strategies using a rule-based reasoner, but at the same time the strategies of a team or a player can be represented by crisplogic rule through which highly scholastic results are obtained.

All these studies relied on previous match results that is win/draw/lose or scores as training data and forecasted the results of a league or tournament matches. The expert NB also relied on information about the playing status of key players and on home ground advantage.

Their results of football prediction using FC Barcelona in 2008- 2009 they split their data set intonon psychological factors such as record of 5 previous matches weather conditions, results for or against team, players mean age, number of key players injured, mean number of goals scored in home and away fixtures.

III.GBM

Using GBM they attain 60% accuracy on an average, while the other models weren't accurate. Tofurther improve the results, more data and statistics can be considered such as opponent's team overall form in that season. Head to Head results and info about each team previous games.

They proposed a logistic regression model in 2016 Barclay's premier league match results with anaccuracy of 40.5. This was developed using4 significant variables: Home defines, home offense, away offense, away defense. The only limitation is only, one team was taken into consideration for predicting the outcomes. The author presents an approach to estimate football match results with neural networks, initially they classified the match into different categories using learning vector quaternization.

Neural Network has been used to determine the strength contrast between two opponents. They used specific Back propagation networks on data that have been designed according to classifyingresult.

We proposed a model to predict outcomes of football matches in English premier league. We trainthe final dataset on various machine learning classifiers and compare the performances of each classifiers and choose the one which yields the best results. We could bring in sentiment analysisand features such as individual player and team performance metrics, studying the trending hashtags on Twitter on match day to further enhance the accuracy of the model.

Statistical analysis forms one of the major strands on football predictions, they generally aim to show that their models or methods represent the results of football matches well; they should fit well. Many models and methods such as Poisson Regression Model, Logistic Regression Model using seed positions were used to analyze and interpret the results. Some of the works in this areatook more statistical approaches in predicting football matches. They use littleknowledge/information and are heavily based on pure statistical models, such as an ordered probity model and Poisson models.

A critical analysis of the literature in machine learning focusing on the application of artificial neural networks is done through this paper. In doing so, we identify the various data sources, learning methodologies, appropriate means of model evaluation and finally the specific challengesof predicting sports results. This is also one of the expanding areas which provide us a good predictive accuracy due to the large monetary amounts involved in betting and gambling.

CRICKET

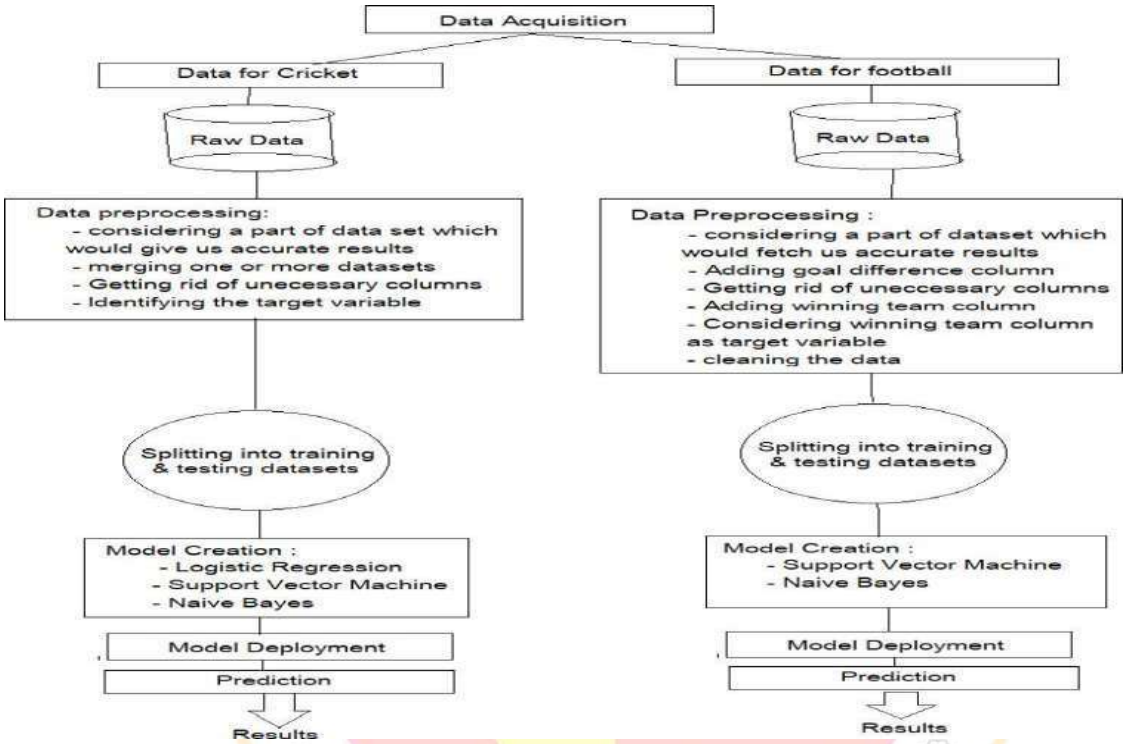
In literature, Duckworth and Louis proposed a solution called DL method to reset targets in rain interrupted matches which was adopted in the international cricket council 1998. It also consists of players performances, optimal batting order, strength of the opponent team and the performanceof their batsmen and bowlers. Various factors affecting the game, including home team advantage,day and night effect, toss etc. uses Bayesian classifier to predict the outcome of the match. We have modern classification techniques- Naive Bayes, Random Forest, Support Vector Machines.

Linear regression and nearest neighboring clustering algorithms conducted a comparative study based on their outcomes and performances. They take both the historical data and instantaneous state of the match while the game is in progress. A separate model for each team is prepared in which each team is analyzed. Random Forest is an ensemble method used for classification, regression and other tasks that operate by constructing many decision trees during training phase in classification, the output is the class which is the mode of the classes predicted by the individualtress. While in regression, mean prediction of individual trees is given as final output. This has anadvantage of correcting the flaw of decision trees which tend to overfit the training set with respectto every other team. The reason behind this is to avoid any duplicate data entry.

III Design Of The Proposed System

System Design (Block Diagram)

We explain the general design of our model and how we attacked the problem, providing a few flowcharts to help simplify the representation. Once the input dataset has been pre- processed, it is split into two features sets; one feature set that concerns features related to thehome ground and another one for the away team features. Once the dataset is split, a numberof different learning algorithms are applied on the two feature sets to derive predictive models for the match result. These models are then compared to seek the one that can be utilized for forecasting upcoming match results.



Data Set Description

Football

We have considered 4 datasets, to predict the FIFA 2018 Tournament match results. Theyare, namely: Fifa_rankings, World Cup 2018 Dataset, Fixtures and the Results datasets. Wehave obtained them from Kaggle, which has an abundant amount of data and resources, and played a huge part in achieving our goal.

i. **Fifa_rankings**: This dataset contains all available FIFA men's international soccerrankings and includes 211 teams. It includes features like the position, team name and the points scored by each team and has a size of 4.23KB with 3 columns and 211 rows.

ii. **World Cup 2018 Dataset**: This is the dataset that contains the history of all previous matches, scores and titles of all participating teams to help us predict whowill qualify and predict who will win. It also has all the participating teams, and thematch schedule with orders of the matches. The dataset contains 32 entries, each team will have 3 matches in the group stage, so each match is mentioned vs whom,the history between those 2 teams with wins minus losses. It has a size of 3KB.

iii. **Fixtures**: This dataset has all the individual match locations, the home team and away team names, the date the match took place and which group they belong to. Ithas 6 columns and 64 rows, amounting to a size of 1MB.

iv. **Results**: This dataset includes 38,903 results of international football matches starting from the very first official match in 1972 up to 2019, totaling up to 2.63MB.The features exists are date, home_team, away_team, home_score, away_score, tournament, city, country, and the matches range from FIFA World Cup to FIFI Wild Cup to regular friendly matches.

Cricket

In the case of cricket, we have reviewed three datasets, to predict the IPL 2016 match results. They are, namely: Matches, Deliveries, and Results. Like football datasets, we haveobtained them from Kaggle.

i. **Matches:** This dataset describes features like city, date, team1, team2, toss_winner, toss_decision, result, winner, win_by_runs, win_by_wickets, venue, and the umpires. It contains 636 rows and 15 columns having a total size of 114 KB.

ii. **Deliveries:** This particular dataset has the innings, batting and bowling team, overs, balls, batsman, bowler, the various kinds of runs scored, and the players dismissed.It has more than 1.5Lakh records with 20 columns and a size of 15MB.

Description of modules

Steps followed to obtain the results are.

i. Importing packages
ii. Loading the dataset
iii. Performing data exploratory analysis for semifinal
iv. Training and Testing the dataset
v. Prediction based on criteria

IV Results

Detailed report of the result going for semifinals

Brazil and Portugal
Winner: Brazil
Probability of Brazil winning:0.348
Probability of Draw: 0.262
Probability of Portugal winning: 0.191

Germany and Argentina
Winner: Germany
Probability of Draw:0.243
Probability of Argentina winning: 0.242
Detailed report of the result going for semifinals
Germany and Brazil
Winner: Germany
Probability of Germany winning: 0.200
Probability of Draw: 0.280
Probability of Brazil winning: 0.519
The winner is predicted as Germany using support vector machine (SVM)

V Conclusion And Future Scope

In this report, we presented a sports data mining approach to predict the winners of various games. Instead of using the traditional approach of comparing the statistics of the two competing teams and projecting the outcome, our approach predicts the outcomes based on the historical results of games. The competing teams are compared to other teams and game results are pulled from thosesimilar teams and used in predicting their winning probability.

In the future, this project can be extended by taking player's statistics for more accurate analysis on the algorithms we have worked on and we can also use many other algorithms and approachesto improve the

accuracy of the prediction like Naive Bayes algorithm with principle component analysis, artificial neural networks, and many other algorithms. We can also improve the performance of the current implementation related to both, feature creation and model training aswell as the prediction. In terms of future addition to the project, this project could be implementedas a web application and the same strategy for predicting the results can be used for other sports as well. In coming years, E-sports will be the biggest sports around, hence, predictions play a major role to keep the audience engaged.

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Compressing and de-noising of Biomedical Signals

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Abstract

Compressing and de-noising signals of ECG (Electrocardiograph), EEG (Electroencephalograph), GSR (Galvanic skin response), EOG (Electrooculography) and EMG (Electromyograph) is important in signal processing. Several steps are involved to process biomedical signals, among which the first step related to pre-processing, in which a noisy signal is processed for generating noise-free signal, which can be utilized for further operations. This work gives a detailed understanding of de-noising techniques those have been used. These techniques utilize the benefits of artificial neural networks (ANN), adaptive filtering, Remez Exchange Algorithm and finite impulse response (FIR) filtering. These techniques have been implemented for de-noising of biosignals, individually as well as combining with other techniques, for better results. The application of the method to simulated and biomedical signals shows its potential.
Keywords : Biomedical signals, anolog, digital, FIR Filters, Remez Exchange Algorithm

1 Introduction:

Biomedical instrumentation is the branch of Medical Sciences where the medical instruments are to be studied. Biomedical instruments are used to record, analyze & process the biomedical signals. Biomedical signals are extracting the information from biological systems like brain, muscles or heart etc, under investigation. The extracting information may be so simple to note the pulse rate of a person from wrist or so complex like analyzing the information from heart by using ECG. There are various sources for extracting signals from the biological system [1-2].

They are:

i. Bioelectric signal:- ECG (Electrocardiograph), EEG (Electroencephalograph), GSR (Galvanic skin response), EOG (Electrooculography) and EMG (Electromyograph) are the bioelectric signals. These signals are generated from the nerve cells or muscle cells. These signals are collecting from the cell membrane potential which may be excited under certain conditions to generate an action potential.

ii. Bioacoustic Signals:- Lung sounds, heart sounds, bowel sounds, and joint sounds are the bioacoustic signals generated from the human body in easy and noninvasive way during its working.

iii. Biochemical Signals:- Neurotransmitters are the chemical messengers from the body that control and regulate the body. These signals are extracted from the chemical measurement of living tissues & samples which are taken from living being.

iv. Biomechanical Signals:- This signals are extracted from some mechanical function of the biological system. The flow of blood & pressure signals, all types of motion & displacement signals are the example of the biomechanical signals.

v. Biomagnetic Signals:- MMG (Mechanomyogram) or MEG (Magneto-encephalogram) are the examples of biomechanical signals which are observed from the surface of muscles when it is contracted. Biomagnetic signals are obtained from the magnetic field produced by electrical currents occurred naturally in the brain of the living things.

vi. Bio-optical Signals:- Bio optical signals can observe either naturally or the signals may be introduced to measure a biological parameter with an external light medium.

vii. Bio-impedance Signals:- An electrical impedance signal can be obtained due to the changes in blood volume or blood resistivity from human being.

The biomedical signals are extracted from the biomedical instruments. Therefore it is useful to study of biomedical instruments.

2. Significance of Biomedical Signals

Biomedical signals are the collection of electrical signals acquired from any organ. This signal is normally a function of time. It may be in terms of its amplitude, frequency and phase. The analysis of these signals is very important for researchers as well as for careful medical diagnosis. It is also essential for proper treatment of

patients. If the signals are not properly diagnosed and analyzed, it will lead to wrong diagnosis and can be dangerous for the lives. Careful analysis of biomedical signals such as ECG, EMG, and EEG are very important for proper diagnosis of disease. These signals are noisy as well as artefacts which have to be removed for proper treatment of a patient. Presently, extensive efforts and research have been done in this area for developing better algorithms, upgrading existing methodologies, improving detection techniques to reduce noise, and to acquire accurate biosignals [3-4].

3. Sources of errors and significance of reduction of noise

Accurate measurement of biomedical signals depends on the properties of electrodes and its interaction with the skin, amplifier design and the conversion and subsequent storage of the biomedical signal from analog to digital form. Biomedical signals are influenced by electrical noise and some other factors.

3.1 Electrical noise and factors influencing biomedical signal:

The amplitude of biomedical signals is very small before being amplified. Biomedical signals collecting from any organ acquire noise while traveling through different tissues or blood vessels. Therefore it is important to understand the characteristics of the electrical noise. The electrical noise, which will be affected biomedical signals, can be categorized into the following types [5-6]:

i. Power line interference
ii. Base line drift
iii. Electrode contact noise
iv. Motion artifacts
v. Muscle contraction
vi. Instrumentation noise generated by electronic devices
vii. Electrosurgical noise

Power line interference and base line drift: This noise could be occurred due to stray effect of the alternating current and loose contact of the electrodes to the patient as well as faulty electrodes. This error can cause due to power line interference or not properly earthen measuring instruments and the patients. This noise is reduced by using notch filter [7].

Inherent noise in electronics equipment: This noise is induced by the electronics equipments and cannot be eliminated. But it can be reduced by using high quality electronic components.

Ambient noise: This type of noise is procreated by the electromagnetic radiation from the surfaces of our body. It is almost impossible to avoid this. The ambient noise may have the amplitude that is one to three orders of magnitude greater than the biomedical signal.

Motion artifact: There are two major sources of motion artifact:

1) The electrode contact with the surface of our body and
2) The cable of electrode.

Motion artifact can be reduced by properly designed set up of the electronic circuitry.

Inherent instability of signal: The amplitude of biomedical signal is random in nature. It is influenced by the firing rate of the motor units. In most of the situation, firing frequency region is of the order of 0 to 20 Hz. This class of noise is considered to be unwanted and therefore there is a need of removal of the noise [4].

Electrosurgical noise: Electrosurgical noise is procreated by different medical equipment present within the patient care environment at frequencies between 100 kHz and 1 MHz, lasting for about 1 to 10 seconds [8]. The electrosurgical noise completely destroys the ECG signal and is presented in large amplitude [5].

The specific requirement of biomedical amplifiers [9];

- ECG amplifier
  - Frequency range is about 0.05- 100Hz.
  - Safety and protection: leakage current below safety standard limit of 10 μA.
  - Electrical isolation from the power line and the (earth) ground.
  - Safety against high defibrillation voltages.

- EEG amplifier
  - Gain must deal with microvolt or lower levels of signals.
  - Components must have low thermal and electronic noise.
  - Other factors are similar to ECG.
- EMG amplifier
  - Slightly improved amplifier BW suffices.
  - Post-processing circuits are always needed (e.g. rectifier and integrator).
- EOG amplifier
  - High gain with very good low frequency or even DC response.
  - DC-drifting electrodes should be selected with great care.
  - Often active DC or drift cancellation or correction circuit may be necessary.

From the above background, it seems that the quality of biomedical signal can be improved by-

a) Design the instrumentation amplifier with increase in Signal to Noise ratio (SNR), high common mode rejection ratio (CMRR), low input referred noise voltage and low dc offset as well as very low power consumption.

b) The distortion of biomedical signal must be as small as possible by avoiding unnecessary filtering, notch filters and distortions of signal peaks.

4. Techniques used for reduction of noise

The amplitude of biomedical signals is very small. Therefore it is easily contaminated by noise. Due to noisy signal, there may be misleading of diagnosis and hence it is necessary to reduce noise from the original signals. Exclusive amplifiers designed with specific features and various filter circuits are used for reduction of noise from the biomedical signals.

***Table 1.1: Electric potentials of biomedical signals* [9]**:

Biopotential	Frequency Range	Signal Amplitude	Electrode
Electrocardiogram (ECG)	0.05 - 100 Hz	1 - 5 mV	Surface
Electromyogram (EMG)	20 - 2000 Hz	0 - 10 mV	Surface, needle
Electroencephalogram (EEG)	0.5 - 40 Hz	0.001 - 0.01 mV	Surface
Electro-oculography (EOG)	DC -10 Hz	0.01 - 0.1 mV	Contact
Action potential of neurons	0 -10 KHz	50 - 90 mV	Glass pipette

4.1 Exclusive amplifiers:

The biomedical signals are extracted from organ of human beings and it is the input to the amplifier. This input consists of five components:

i. The desired biopotential,
ii. The undesired biopotential,
iii. A power line interference signal of 50 Hz (60 Hz in some countries) and its harmonics,
iv. Interference signals generated by the tissue/electrode interface, and
v. Noise.

Essential factors to be considered for measuring equipments [8]:

- High amplification
- High CMRR (High differential gain and low common mode gain)
- High input impedance
- Low Noise
- Stability against temperature and voltage fluctuations
- Electrical safety, isolation and defibrillation protection.

Therefore proper design of the amplifiers is the extensive task. Table 1.2 shows the biopotential amplifiers design consideration for various biomedical signals.

Table 1.2 Biopotential amplifiers design consideration [10].

Biopotential	Exclusive amplifier design consideration	Additional features desired
ECG	Moderate gain, Bandwidth, noise, CMRR, Input Impedance	Electrical safety, isolation, defibrillation protection
EEG	High gain, very low noise filtering	Safety, isolation, low electrode-skin resistance
EMG	Gain and bandwidth of Op-Amps	Post acquisition data processing
EOG	DC and low drift	Electrode-skin junction potential. Artifact reduction

Now many companies are used CMOS technology for designing of high performance amplifiers, which provides increase in gain and CMRR along with low power consumption [4]. Along with high performance amplifiers, various filter circuits are also used for reduction of unwanted signals or noise. These filter circuits are classified in number of ways:

i. Analog or digital Filters
ii. Passive or active filters
iii. Audio (AF) or radio frequency (RF) filters

4.2 Analog filters

Analog filters are designed to processed analog signals, while digital filters are processed analog signals using digital techniques. Op Amp based active filters are called analog filters. Passive filter uses passive elements such as resistors, capacitors and inductors, while active filter employs transistors or operational amplifiers in addition to the resistors and capacitors. RC filters are commonly used for low frequency signals or audio signals, whereas LC or crystal filters are used for high frequency signals or radio frequency signals. The crystal provides more stable operations at high frequency due to high value of figure of merit. In audio frequencies, inductors are not used because it is bulky, expensive and may dissipate more power. It also emits magnetic field [11].

Active filters offer the advantages over passive filters:

a) Gain and frequency adjustment: The operational amplifier is capable of providing desired gain. Therefore input signal is not attenuated. Frequency response of active filter is excellent.
b) No loading problem: The active filter uses Op Amp having high input resistance and low output resistance and therefore it does not cause any loading effect.
c) Cost: Usually active filter is more economical than the passive filter. Because the circuit uses Op Amp which is not expensive and the absence of inductor.

Although active filters are most widely used in communication system and signal processing. Active filters are more extensively used in telephone, radio, television, radar, space satellites and **biomedical instruments**. The most commonly used filters are;

i. Low pass filter
ii. High pass filter
iii. Band pass filter
iv. Band reject filter
v. All pass filter

4.3 Digital Filters

Digital filters are important class of Linear Time Invariant (LTI) digital signal processing (DSP) systems. It is designed to modify the frequency characteristics of the input signal x (n). Digital filters are extensively used because of certain advantages over Analog filters. Digital filters have the potential to achieve much better signal to noise ratio than Analog filters. Digital Filters have emerged as a strong option for removing noise, shaping spectrum and minimizing Inter-Symbol Interference (ISI) in communication architectures.

Digital Signal Processing (DSP) is used in video compression, digital set-top box, cable modems, digital versatile disk, portable video systems/computers, digital audio, multimedia and wireless communications, digital radio, digital still and network cameras, speech processing, transmission systems, radar imaging, acoustic beam formers, global positioning systems, and biomedical signal processing. The field of DSP is always been driven by the advances in DSP applications and in scaled Very-Large-Scale-Integrated (VLSI) technologies [12].
The design of digital filter involves five steps [13]:

i. Filter Specification
ii. Coefficient calculation
iii. Realization
iv. Analysis of Finite word length Effects
v. Implementations

Digital Signal Processing Systems (DSPS) relate input signals x (n) to the output y (n). The relationship between the output sequence of this system and may be represented by the operator as y (n) = F [x (n)]. The Fig. 1.1 shows Discrete-time signal representation.

Figure 1.1: Discrete-time signal representation.

4.4 FIR Filter [14];

FIR filter is a digital filter without feedback. The block diagram of FIR filter is shown in the Fig. 1.2. If x (n) is the input at n^{th} time, and $x\,(n-1)$ is the delayed input then the filter output $y\,(n) = x\,(n) + x\,(n-1)$,

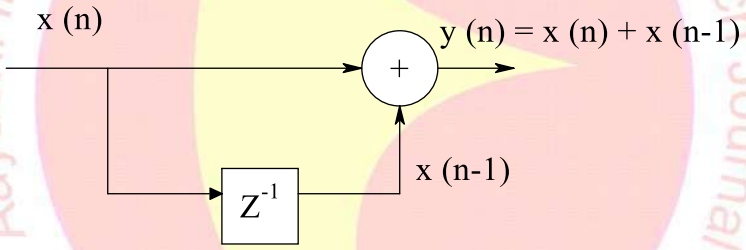

Figure 1.2: *A simple FIR filter*

The general transfer function of an FIR filter in the z transform is given by

$$H(z) = \sum_{l=0}^{M} b_l z^{-l} = H_0 z^{-M} \prod_{l=0}^{M} (z - z_l) \qquad (1)$$

A filter with the above transfer function will be always stable, i.e. an input of finite amplitude will lead to an output that is also finite. This can be inferred from the location of the poles in the z-plane (the two-dimensional plane formed by plotting the real part of z along the abscissa, and the imaginary part along the ordinate). The poles correspond to the points in the z-plane where the denominator of *H (z)* is zero; their counterparts are the zeros, where the numerator becomes zero. For the FIR filters, all poles are at the origin (z= 0), and the zeros are at the z_l in the equation above. When the poles of a transfer function are within the unit circle (i.e. $|z| < 1$), then filter is stable; this clearly stated that the case of FIR filters.
The advantage of FIR filters is that they can be designed to have linear phase. FIR filters have a linear phase response if and only if its impulse response is symmetric or anti-symmetric, that is $h\,(n) = \pm\, h\,(M - n)$. Such filters may introduce delay in the output signal with respect to corresponding input signal, but all frequencies are delayed by the same amount. These filters thus distort the features of the signal that are not linear in their phase-response.

FIR filters can be designed by using optimization packages or by using approximations to the ideal infinite-impulse responses by cutting the finite length using the different types of tapered windows. The main drawback of FIR filters is that in order to satisfy demanding specifications, FIR filters require a relatively high

number of multiplications, additions and storage elements or large memory space. This makes FIR filters potentially more expensive than IIR filters in applications where the arithmetic operations or storage elements are costly, or need to be limited in number. FIR filters has the benefit of achieving linear phase, this motivates the widespread use of it.

4.5 FIR Filter Designing Methods:

Basically FIR Filter has three methods of designing [15] :

i. Window Method
ii. Frequency Sampling Method
iii. Optimal Method (Remez Exchange Method)

4.5.1 Window Method:

The impulse response *h (k)* is related to the inverse Fourier transform of *H (ω)*. In this case, the pair of transformation is used which couples discrete time domain signals (sequence of samples) with a continuous spectral description.

Discrete Time Fourier Transformation is represented by the equation,

$$H(\omega) = \sum_{k=-\infty}^{\infty} h(k) e^{-j2\pi fTk} \qquad (2)$$

There are many types of window functions:

i. Kaiser Window
ii. Hamming Window
iii. Hanning Window
iv. Rectangular window
v. Blackmann window

By using Kaiser Window, it is quite possible to obtain separate control upon length or order of Filter. In Kaiser Window, there are two main parameters, the length of window and the shape parameter β. An important advantage of the window method is its Simplicity. It is simple to understand and simple to apply. It involves a minimum amount of computational efforts. The major disadvantage of it is its lack of flexibility.

The window method uses the Fourier series in conjunction with a class of functions known as window functions.

4.5.2 Frequency Sampling Method [15]**:**

When a desired frequency response has been specified, then the frequency-sampling method for FIR filter design is used which is the simplest and most direct technique. It consists of uniform sampling of the desired frequency response, and an inverse DFT technique is used to obtain the corresponding finite impulse response. But the results are not optimal because the response generally deviates from what is desired between the samples. When the desired frequency-response is under sampled then the resulting impulse response will be time aliased to some extent. It is important to evaluate the final impulse response by the use of a simulated DTFT (FFT with lots of zero padding) comparing to the originally desired frequency response.

4.5.3 Remez Exchange Algorithm [16]:

The Remez Exchange Algorithm is a standard method for filter designing. It minimizes the filter length and error between desired frequency response and actual frequency response. The Error function is defined as the difference between the ideal filter response and the practical filter response.

The magnitude of the error $|E(\omega)| = |W(\omega)[D(\omega) - P_c(\omega)]|$

Where

$D(\omega)$ is the ideal filter response or desired filter response,
$P_c(\omega)$ is the actual or practical filter response and (3)
$W(\omega)$ is the weight function.

The Remez algorithm is not a general linear programming approach, but it is very robust, converges very rapidly to the optimal solution, and is widely used.

Optimal Filter Design Method is used to design a filter, in which filter coefficients are adjusted again and again until a particular error is minimized. The various methods of optimal filter design are as follows:

i. Least square method.

ii. Equiripple method.
iii. Maximally flat.
iv. Generalized equiripple.
v. Constrained band equiripple.

5. Results and discussion

We started working with digital filter like FIR filter. We found that the source of noise doesn't have any fix band of interference, so we were planned for adaptive filtering algorithms. The algorithms differentiate in a way of updating the coefficient (h) of filter sample by sample inputs. After an extensive experimentation over the adaptive algorithms, it is observed that the performance of filters depend on the SNR values of input signal, μ value (Step size), number of taps and other factors. Finally, we choose Artificial Intelligent based filtering algorithms for dynamic solution. These techniques have only two processes- training and testing. Training process based on subset outcomes of adaptive filtering algorithm in initial stages, which may not require in later time even on change of source input as well, called trained filter / smart filter. Such intelligent filters give the freedom of selection of signal with different SNR values; also not bother about number of parameter settings which lead one more step towards the auto filter concept. The goal of our proposed work is to develop an algorithm which will use for removing noise excellently.

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Noise Reduction of Electromyography (EMG) signals by Artificial Neural Network (ANN) Technique

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Abstract

Electromyography (EMG) signals can be used for clinical/biomedical application and modern human computer interaction. EMG signals acquire noise while traveling through tissue, inherent noise in electronics equipment, ambient noise, and so forth. In this paper, it is shown that a Focused Artificial Neural Network ANN can elegantly solve to reduce the noise from EMG signal. It is seen that the performance of the proposed ANN clearly outperforms the best techniques. It is observed that ANN Filters work excellently as compared to adaptive filters and also observed that as the number of testing samples of biomedical signals.

Keywords: EMG, SNR, MSE, MATLAB, ANN

1 Introduction:

Biomedical signals are the collection of electrical signals and analysis of these signals is very important for researchers as well as for careful medical diagnosis. It is also essential for proper treatment of patients. If the signals are not properly diagnosed and analyzed, it will lead to wrong diagnosis and can be dangerous for the lives. Careful analysis of biomedical signals such as ECG, EMG, and EEG are very important for proper diagnosis of disease. These signals are noisy as well as artefacts which have to be removed for proper treatment of a patient. Presently,extensive efforts and research have been done in this area for developing better algorithms, upgrading existing methodologies,improving detection techniques to reduce noise, and to acquire accurate bio-signals [1-4].

The EMG signal is a biomedical signal that measures electrical currents generated in muscles during its contraction representing neuromuscular activities. The nervous system always controls the muscle contraction and relaxation. Hence, the EMG signal is a complicated signal, which is controlled by the nervous system and is dependent on the anatomical and physiological properties of muscles. EMG signal acquires noise while traveling through different tissues. The main reason for the interest in EMG signal analysis is in clinical diagnosis and biomedical applications. So far, research and extensive efforts have been made in the area, developing better algorithms, upgrading existing methodologies, and improving detection techniques to reduce noise and to acquire accurate EMG signals. Noise removal from noisy EMG signal is a filtering problem. Here the Neural Network model is trained to separate known noise from EMG signal. Neural Networks (NNs) have been efficiently used for nonlinear multivariable function approximation [5-7].

The main objective of our research work is to develop artificial intelligent model for reduction of noise from biomedical signal. This paper deals with intelligent removal of noise from the EMG signal using ANN-based Techniques.

2. Experimental : Performance measures by using following two factors**;**

i) Signal to Noise Ratio (SNR):

The output SNR (SNR_{out}), is calculated from power of the input signal x (n) and an noise signal e (n) and is given by,

$$SNR_{out} = 10 \ Log_{10} \left[\frac{\text{Signal Power}}{\text{Noise Power}} \right]$$

Where, SNR_{out} is the ratio of the two powers expressed in decibels.

ii) Mean Square Error (MSE)

The formula for the mean square error is given by,

$$MSE = \frac{1}{N} \sum_{i=1}^{N} \left(\hat{y}_i - y_i \right)^2$$

Where, N = number of samples in the set of data,

y_i = Actual network output, and

$\hat{y}_i$ = Desired network output.

2.1 Experimental Arrangement

i) Database Descriptions:

To design ANN Model, a sufficiently large amount of data is required for training and testing. We have collected standard data bases for biomedical signal from the https://physionet.org, http://www.emglab.net and etc.

ii) Software Specification Requirement: MATLAB:

MATLAB is very rich in command toolbox. Although MATLAB is intended primarily for numerical computing, an optional toolbox uses the MuPAD, symbolic engine, allowing access to symbolic computing capabilities. Matlab for designing artificial intelligent model. MATLAB has enormous Toolboxes. Out of which, we used Signal processing toolbox, Neural network toolbox, Fuzzy logic toolbox, Filter design toolbox, Curve fitting toolbox, and Data based toolbox for design the filters [8-9].

In this paper, we have simulated the MATLAB codes for the data conversion, adaptive filter algorithm, artificial intelligent ANN Model training and its testing.

iii) Software Implementation details:

The GUI has been constructed by using Matlab codes. Other set of codes have been used to run the various algorithms for noise removal in Matlab simulator. The main GUI contains four parts as shown in the following Fig. 1.1.

1] File input and its conversion
2] Adaptive filter algorithm and its Input parameter section
3] Output parameters section
4] Artificial intelligent noise removal section.

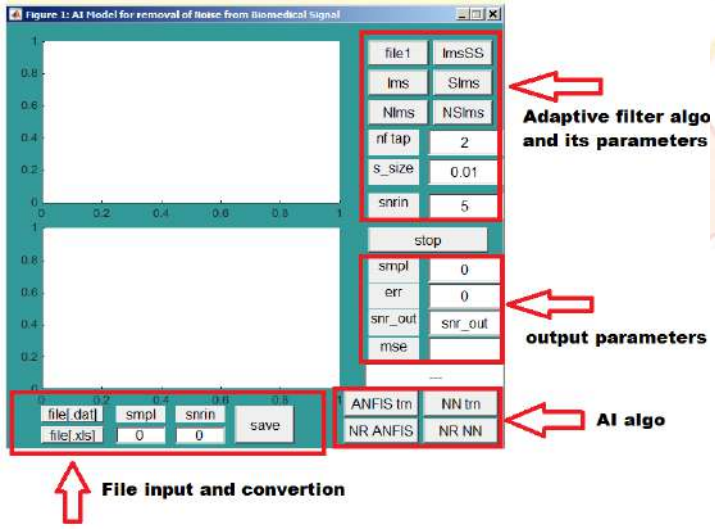


Figure 1.1: Artificial Intelligent Model for reduction of biomedical signal

2.2 Artificial intelligent noise removal algorithm: We have designed an artificial intelligent model for removal of noise from the biomedical signal by using Matlab coding on the basis of Sugeno architecture and run the

programme which creates graphical user interface. The Fig. 1.2 shows the block diagram of proposed artificial intelligent model.

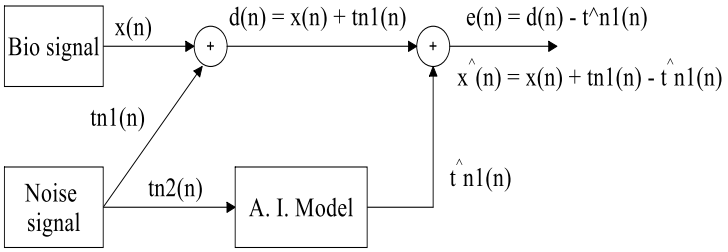


Figure 1.2: Block diagram of proposed A. I. Model

2.3 ANN based Noise Removal Algorithm:

Similar basic steps have been processed for training and weight storage of Neural Network Model as like an ANFIS. First we have trained the Neural Network by processing flowchart shown in Fig. 1.3 using 'allwe' file of relevant algorithm. Then processed the same steps used in ANFIS Model to save the weights, MF and MFT parameters. Once parameters have been saved then network was ready to test. Then we have tested neural network by performing steps as given in Flowchart of Fig. 1.4 on various biomedical signals.

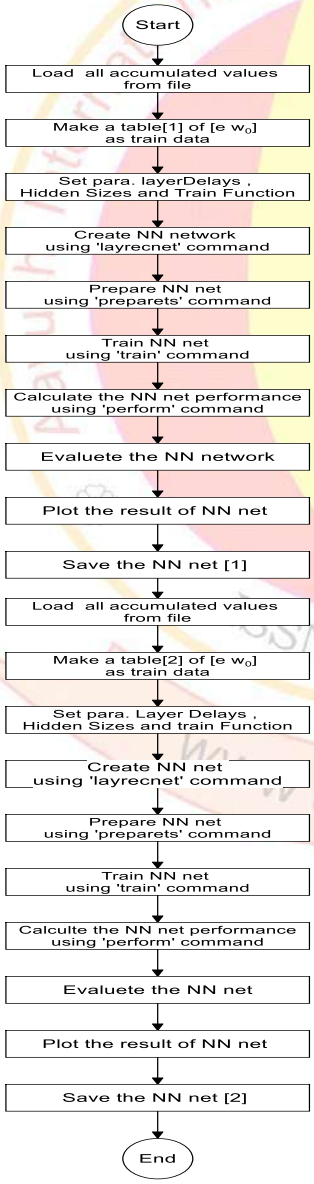


Fig.1.3: Flow chart of training of ANN Model

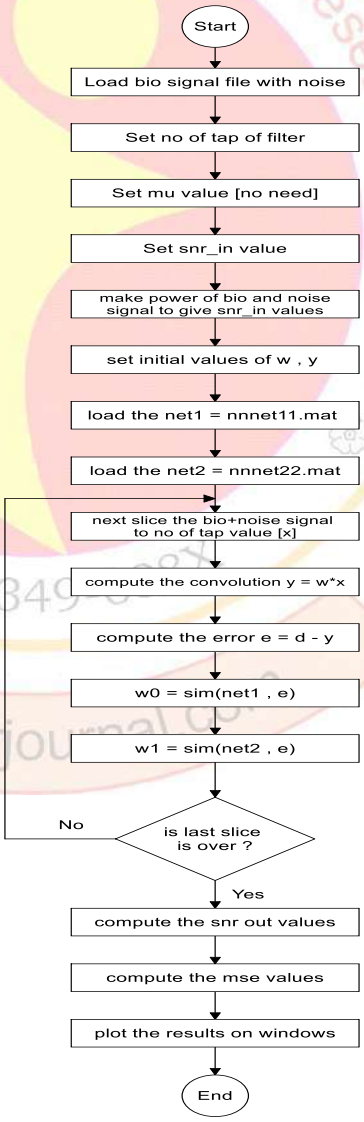


Fig.1.4: Flow chart of testing of ANN Model

2.4 Simulations

The major objective of this study was to investigate a noise removal filters. For this, simulations are carried out on EMG signals. The results are obtained on the output parameter section of MATLAB based GUI for removal of noise from biomedical signals [10-15].

We have taken various data-based files of EMG from cited resources given in database descriptions. First, we have converted these files into MATLAB format file that is .mat format for further processing and saved as .mat files.

Then we processed the adaptive filters on saved files. We have used LMS related algorithms namely LMS, Sign LMS, Sign LMS, Normalized LMS and Normalized LMS Sign for different step sizes, tap values and different SNR in values.

For the illustration of all these simulation process, in shortest way, we have taken the screen snap for LMS related algorithm mentioned above for ANN Model. After application of adaptive filtering process, we have gathered all needful data in the allwe_algo_name .mat file for the further training and testing of artificial intelligent algorithm such as noise removal Neural Network.

During the adaptive filtering, training and testing process, the all information regarding input parameters, output parameters and process status along with plots, etc. have available on the GUI panel. For ready outcome in notable way, we have summarized all the observations in tabular form.

The adaptive Filters based on LMS algorithms have been trained on ECG and EMG (Blue lines) signal (File name- 100.mat) of samples = 500. It is shown in Fig. 1.3

The various biomedical signals having sample size= 500: ECG and EMG (Blue lines) and biomedical signals with noise (Red lines) have been used for testing of Artificial intelligent and ANN model as shown in Fig. 1.4. a,b,c,d,. The performance parameters such as signal to noise ratio and MSE have been observed from GUI for various step sizes using different adaptive algorithms on ECG1 Signal as given in Table 1.1 and Table 1.2.

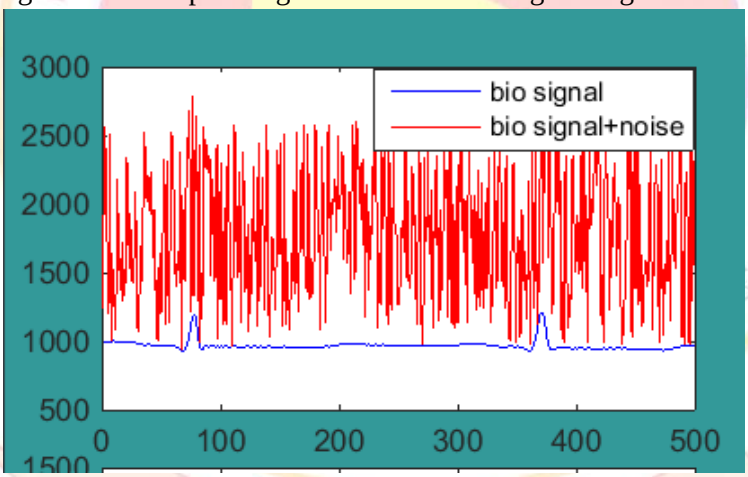
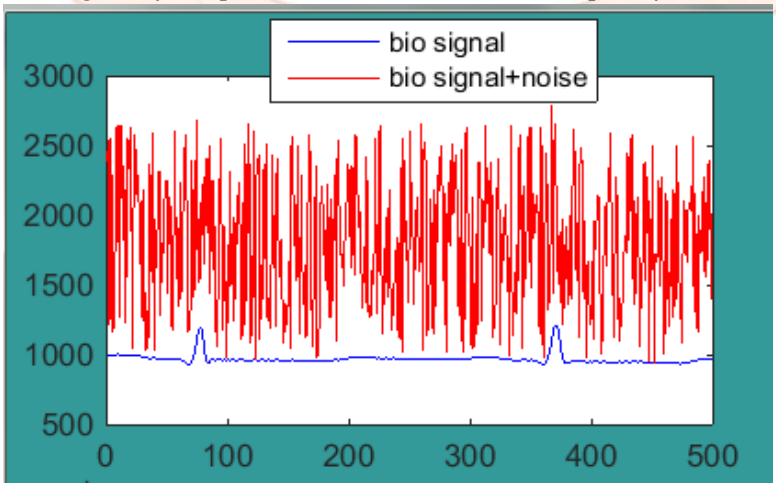


Figure 1.3: ECG signal of Samples= 500 used to train the adaptive filters LMS algorithms



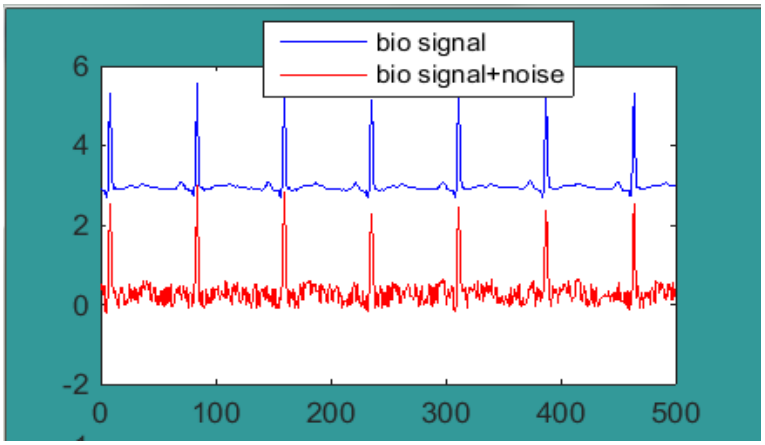


Figure 1.4 .a,b.: Blue line shows biomedical signals (ECGs and EMGs) and Red line shows biomedical signals with noise

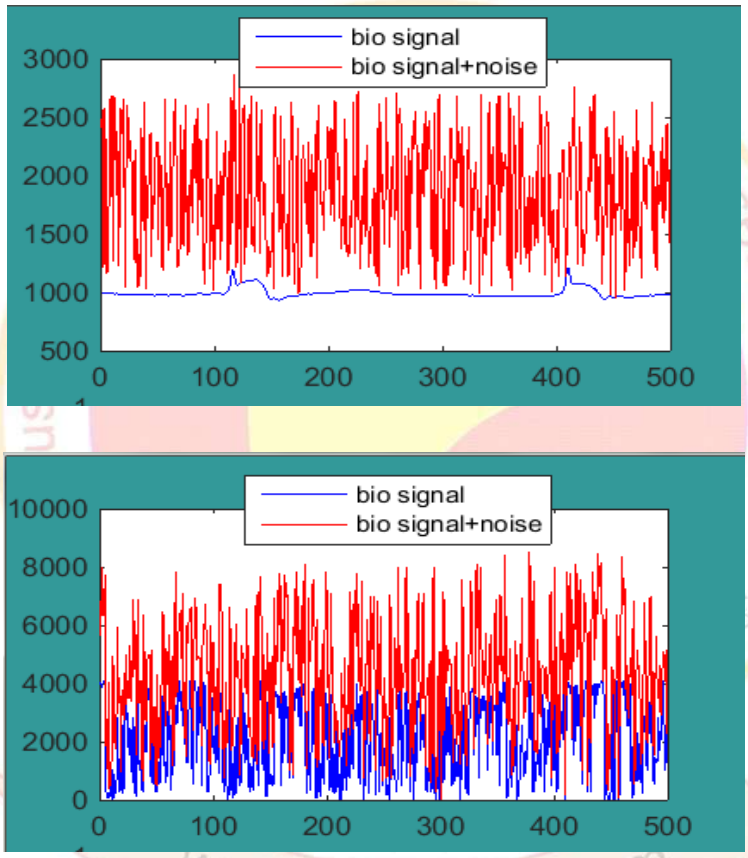


Figure 1.4.c,d: Blue line shows biomedical signals (ECGs and EMGs) and Red line shows biomedical signals with noise

Simulation Result for various Step under Adaptive Filters:

Table 1.1: Signal to noise ratio for various step sizes using different adaptive algorithms (on ECG1 Signal).

Step Size	SNR_out				
	LMS	**NLMS**	**NSLMS**	**SLMS**	**SSLMS**
1e-7	-0.19906	26.7339	26.7339	7.97304	26.7338
1e-8	0.21109	26.7339	26.7339	24.324	26.7339
1e-9	1.23573	26.7339	26.7339	26.7018	26.7339
1e-10	10.2783	26.7339	26.7339	26.7336	26.7339
1e-11	24.5255	26.7339	26.7339	26.7339	26.7339

1e-12	26.7039	26.7339	26.7339	26.7339	26.7339
1e-13	26.7336	26.7339	26.7339	26.7339	26.7339
1e-14	26.7339	26.7339	26.7339	26.7339	26.7339
1e-15	26.7339	26.7339	26.7339	26.7339	26.7339

Table 1.2: Mean square error for various step sizes using different adaptive algorithms

Step Size	**MSE**				
	LMS	**NLMS**	**NSLMS**	**SLMS**	**SSLMS**
1e-7	977169	1980.05	1980.05	148854	1980.09
1e-8	889108	1980.05	1980.05	3448.79	1980.05
1e-9	702247	1980.05	1980.05	1994.74	1980.05
1e-10	87545	1980.05	1980.05	1980.20	1980.05
1e-11	3292.4	1980.05	1980.05	1980.05	1980.05
1e-12	1993.78	1980.05	1980.05	1980.05	1980.05
1e-13	1980.19	1980.05	1980.05	1980.05	1980.05
1e-14	1980.05	1980.05	1980.05	1980.05	1980.05
1e-15	1980.05	1980.05	1980.05	1980.05	1980.05

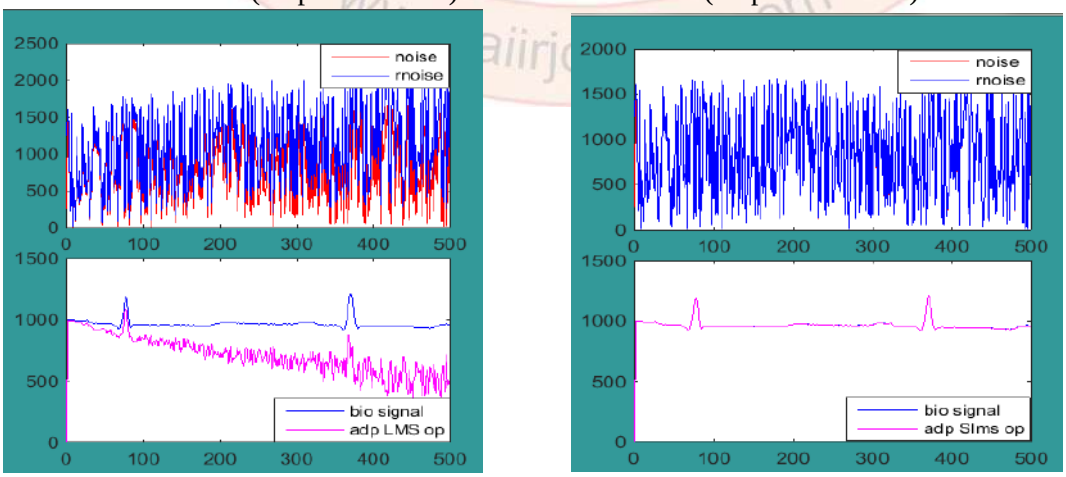
Table 1.1 shows that SNR_out for various step sizes on LMS related algorithms. From this, we have observed that NLMS and NSLMS performed better at step sizes from 1e-07 to 1e-15. But overall, all algorithms have good performance on step size 1e-10, which governs the rate of convergence and speed of tracking ability.
However, use of small step size is to ensure a small steady state error but it may decreases the convergence speed of the adaptive filter. However, increase in step size is to improve the convergence speed of the adaptive filter, but it might cause the adaptive filter to become unstable, so we have to select optimum value of step size [15,16]. The adaptive filter processed on LMS related algorithms using ECG 1 (100.mat file). The outcomes are depicted on GUI in Fig. 1.5.
Number of Samples used for Adaptive filters = 500.

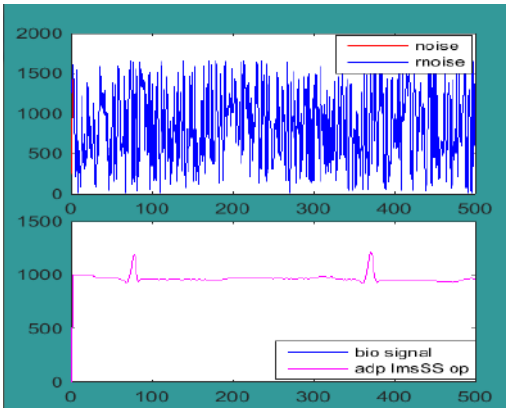
The Percent Root mean square Difference (PRD) indicates the reconstruction fidelity by point wise comparison with the original data. Another definition of error measure is called PRD and is given by:

$$PRD = \sqrt{\frac{\sum_{n=1}^{N}[x[n]-\hat{x}[n]]^2}{\sum_{n=1}^{N}[x[n]-\bar{x}]^2}} \times 100$$

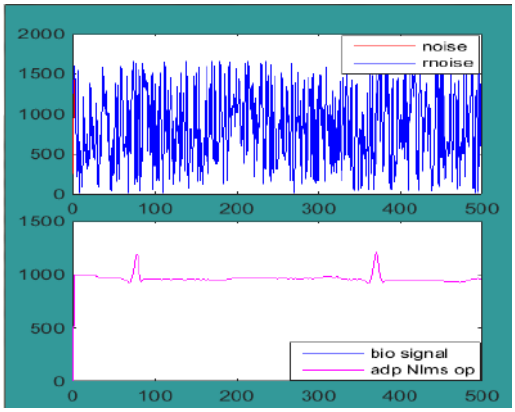
Where x[n] and x [n] are the original and reconstructed signals of length N, respectively and x is the average value of the signal. PRD provides a numerical measure of the residual root mean square (RMS) error and the observed value of prd_val = 0.0461 [10-11].

LMS (Step size=1e-10) SLMS (Step size= 1e-10)





SSLMS (Step size= 1e-10)



NLMS (Step size= 1e-10)

NSLMS (Step size= 1e-10)

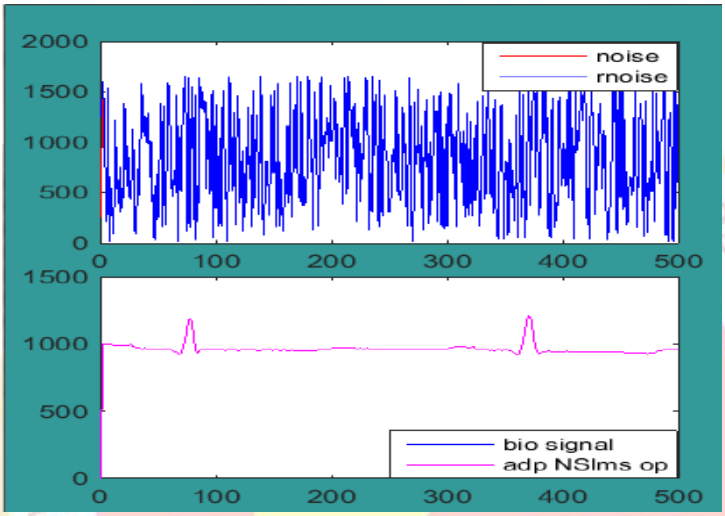


Figure1.5: Simulation Result of Adaptive Filters for the ECG 1 signal (LMS, Sign LMS, Sign Sign LMS, Normalized LMS & Normalized LMS Sign algorithms)

Table1.3: Report of Adaptive filters for various algorithms.(No. of Samples = 500)

Algorithm	**Parameters [μ =1e-10 and No. of Taps= 2]**		
	SNR in	SNR out	MSE
LMS	0	10.333	86450.1
SLMS	0	26.7336	1980.19
SSLMS	0	26.7339	1980.05
NLMS	0	26.7339	1980.05
NSLMS	0	26.7339	1980.05

From the Tables 1.1 and 1.2, we have to select proper value of step size which gives the good SNR out and minimum MSE. Thus we have preferred optimum value of step sizes which shows the best fit of straight line. Then we have developed adaptive filters for various LMS algorithms. The SNR out and MSE of various adaptive filters is shown in the Table 1.3.

3. Results and Discussion

The higher level of noise reduction is possible by performing adaptive noise cancellation techniques, otherwise this level of reduction of noise is difficult to achieve by using conventional filtering methods. As per the simulation results, it is observed that LMS algorithm has some limitations such as instability when the power

of input signal changes or the value of step size varies resulting in change of the rate of convergence. Thus SSLMS, NLMS and NSLMS algorithms are evolved from LMS algorithm to overcome the above-mentioned limitations. From the Table 1.1 and 1.2, it is inferred that the SSLMS, NLMS and NSLMS algorithm shows far greater stability with different step size. This combined with good convergence speed and relative computational simplicity. Thus, the SSLMS, NLMS and NSLMS algorithms are ideal for the real-time adaptive noise cancellation system. The amount of variation in non-stationary signals is difficult to control. LMS and SLMS have relatively poor performance for non-stationary as compared to SSLMS, NLMS and NSLMS and if we have to improve the performance of LMS and SLMS, the step size should have to reduce resulting in long convergence time. It is observed that ANN Filters works excellently as compared to adaptive filter and also observed that as the number of testing samples of biomedical signal (100.mat file) increases then the SNR value increases, while that of MSE decreases.

Thus, from the overall observations, we have concluded that the artificial intelligent networks ANN can be used to reduce noise from various biomedical signals intelligently. The SSLMS, NLMS and NSLMS are more precise and consistence as compared LMS and SLMS algorithms for wide range of step sizes [17-21].

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Adaptive Neural-Based Fuzzy Inference System (ANFIS) : A Survey

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Abstract

The main aim of this study is to develop a flow prediction method, based on the adaptive neural-based fuzzy inference system (ANFIS) coupled with stochastic hydrological models. In comparison with the Mamdani model, the Sugeno model is based on automatic learning from the data and can accurately approximate a function using few rules. It has a stronger and more flexible illustration capability than the Mamdani model.

Keywords: ANFIS, Fuzzy Systems, Mamdani, Sugeno , Membership Function

Introduction: Fuzzy Systems

Fuzzy systems suggest a mathematical system that interprets the subjective human knowledge of the real time processes. This is a way to manipulate practical knowledge with some level of uncertainty. Fuzzy sets theory was introduced by Lofti Zadeh in 1965. The general architecture of a fuzzy system is depicted in Figure 1.1 The behavior of these systems is described by using a set of fuzzy rules such as *IF <premise> THEN <consequent>*. These system uses linguistics variables with symbolic terms. Each term represents a fuzzy set. The terms of the input space compose the fuzzy partition. The fuzzy system consists of three stages [1-4]:

1. The values of numerical inputs are mapped by a function according to a degree of compatibility of the respective fuzzy sets. This operation is called fuzzification.
2. The fuzzy system processes the rules in accordance with the firing strengths of the inputs.
3. The resultant fuzzy values are transformed again into numerical values. This operation is called defuzzification.

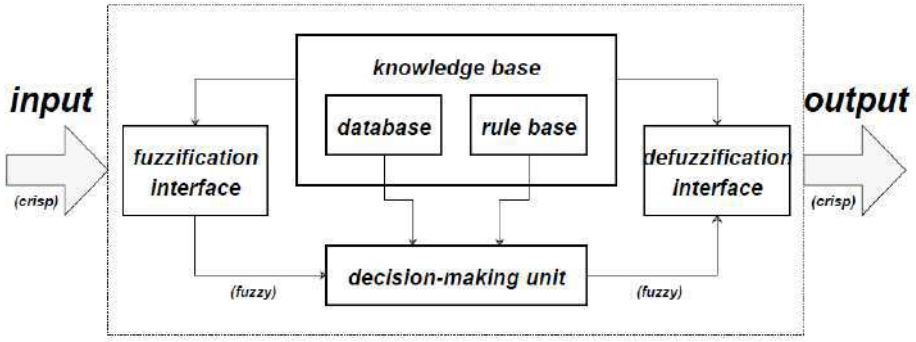

Figure1.1: Basic Components of Fuzzy System

In an FIS, the knowledge base is comprised of the fuzzy rule base and the database. The database contains the linguistic term sets considered in the linguistic rules and the MFs defining the semantics of the linguistic variables, and information about domains. The rule base contains a collection of linguistic rules that are joined by AND/OR operator. Expert can provide his knowledge in the form of linguistic rules *(Hao Yu et al.)*. The fuzzification process collects the inputs and then converts them into linguistic values or fuzzy sets. The decision logic which is called as fuzzy inference which generates output from the input, and finally the defuzzification process produces a crisp output for control action.

Interpretations of a certain rule or the rule base depend on the FIS model. The Mamdani and the Tagaki-Sugeno-Kang (TSK) or simply Sugeno model are two popular FISs. TheMamdani model is a non-additive fuzzy model that aggregates the output of fuzzy rules using the maximum operator, while the Sugeno model is an additive fuzzy model that aggregates the output of rules using the addition operator [1-4].

Mamdani inference model

Fuzzy variables are pasteurized by fuzzy logic rules with MIN and MAX operators. The fuzzy logic can be interpreted as the extended Boolean logic: for binary 0 and 1, the MIN and MAX operators, AND and OR

operators in Boolean logic, respectively. This has been depicted in the Table 1.1 and for fuzzy variables, the MIN and MAX operators [1-4].

Table 1.1: Binary Operations Using Boolean Logic and Fuzzy Logic

A	B	A AND B	MIN (A,B)	A OR B	MAX (A, B)
0	0	0	0	0	0
0	1	0	0	1	1
1	0	0	0	1	1
1	1	1	1	1	1

Table 1.2: Fuzzy Variables Operations Using Fuzzy Logic

A	B	MIN (A,B)	MAX (A, B)
0.3	0.5	0.3	0.5
0.3	0.7	0.3	0.7
0.6	0.4	0.4	0.6
0.6	0.8	0.6	0.8

In Mamdani model, let's assume that we have two fuzzy control rules:
R1: if *x* is *A1* and *y* is *B1* then *z* is *C1* and also
R2: if *x* is *A2* and *y* is *B2* then *z* is *C2*
Fact: *x* is *x0* and *y* is *y0*
Consequence: *z* is *C*
The inference procedure of the Mamdani model with the min (AND) and max (OR) operators and fuzzy inputs is shown in Figure 1.2.

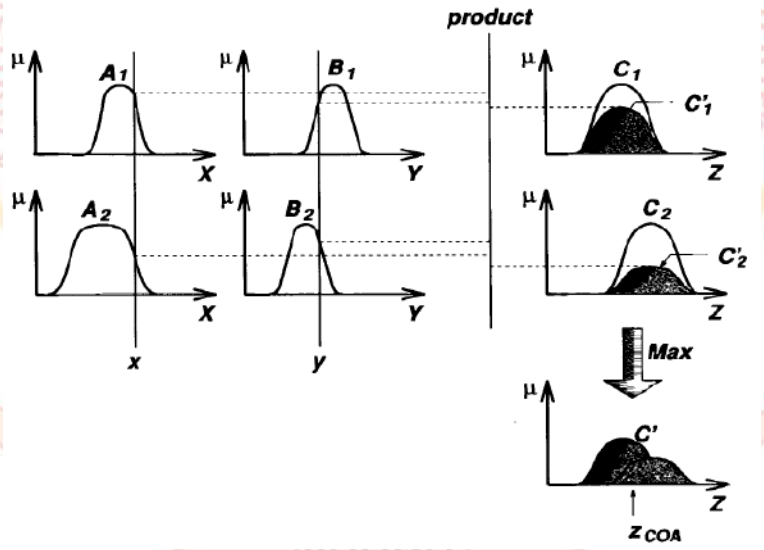

Figure 1.2: Mamdani Inference Model

The fuzzy implication is modeled by Mamdani's minimum operator and the sentence connective is also interpreted as propositions and defined by max operator[4].
The firing levels of the fuzzy rules denoted by α_i, i = 1, 2, are computed by
$\alpha_1 = A_1(x_0) \wedge B_1(y_0)$, $\alpha_2 = A_2(x_0) \wedge B_2(y_0)$
The individual rule outputs are obtained by
$C'_1(w) = (\alpha_1 \wedge C_1(w))$, $C'_2(w) = (\alpha_2 \wedge C_2(w))$
Then the overall system output is computed by the individual rule outputs

$C(w) = C'_1(w) \vee C'_2(w) = (\alpha_1 \wedge C_1(w)) \vee (\alpha_2 \wedge C_2(w))$

Finally, to obtain a deterministic control action, employ any defuzzification strategy. For the instance, defuzzified value of fuzzy set is defined as its fuzzy centroid:

$$Z_o = \frac{\int z\, C(z)\, dz}{\int C(z)\, dz}$$

The Mamdani Model consists of five layers as depicted in Fig. 1.3.

Details are given below*;*

Layer 1: Input layer

Layer 2: Input membership or fuzzification layer

- Neurons represent fuzzy sets used in the antecedents of fuzzy rules determine the membership degree of the input.
- Activation function: The membership function.

Layer 3: Fuzzy Rule Layer

- Each neuron corresponds to a single fuzzy rule.
- Conjunction of the rule antecedents: *product*
- Output: the firing strength of fuzzy rule R_i ,$\mu_{Ri} = \mu_{Aj} \times \mu_{Bk}$
- The weights in layer 3 and layer 4 : the normalized degree (certainty factors) of confidence of the corresponding fuzzy rules.

They are adjusted during training.

Layer 4: Output membership layer

- Disjunction of the outputs: $\mu_{C\,i} = \mu_{Rj} \oplus \mu_{Rj} = \sum \mu_{Rj}$*: sum.*
- The integrated firing strength of fuzzy rule neurons R_j and R_k.
- Activation function: The output membership function.

Layer 5: Defuzzification layer

- Each neuron represents a single output. (Ex.- Centroid Method).

Learning:

- A various learning algorithm may be applied: Back propagation.
- Adjustment of weights and modification of input/output membership functions.
- Sum-Product composition and centroid defuzzification was adopted; a corresponding ANFIS was constructed easily.
- Extra complexity with max-min composition – no better learning capability or approximation power.

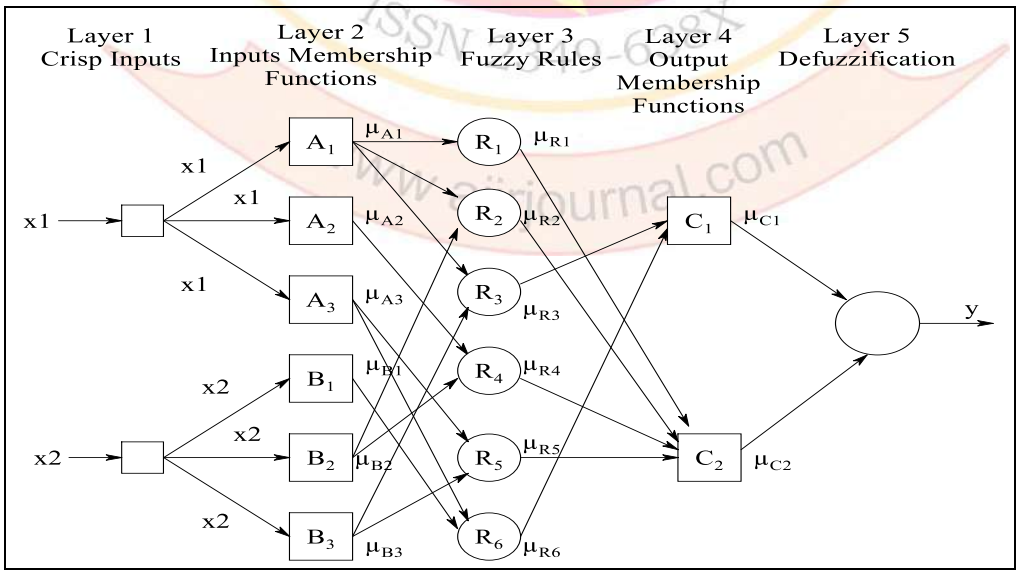

Figure1.3: Neuro Fuzzy Equivalent System

The Mamdani model offers a high semantic level and a good generalization capability. It contains fuzzy rules built from expert knowledge. However, FISs based only on expert knowledge may result in insufficient accuracy. For accurate numerical approximation, the Sugeno model can usually generate a better performance.

Sugeno inference model

However, TSK or Sugeno architecture is more popular than Mamdani architecture where the defuzzification layer was replaced by normalization and weighted average. The TSK architecture does not require MAX operators, but a weighted average is applied directly to regions selected by MIN operators. TSK architecture is actually very straightforward method, in which the output weights are proportional to the average function values at the selected regions by MIN operators. The TSK fuzzy system works as a lookup table. Sugeno and Takagi use the following architecture which is graphically represented in Figure 1.4.

R_1: if x is $A_1$and y is B_1then $z_1 = p_1x + q_1y + r_1$

R_2: if x is $A_2$and y is B_2then $z_2 = p_2x + q_2y + r_2$

Fact: x is $x_0$and y is y_0

Consequence: z

The firing levels of the fuzzy rules are computed by

$w_1 = A_1(x_0) \wedge B_1(y_0)$, $w_2 = A_2(x_0) \wedge B_2(y_0)$

Then the crisp control action is demonstrated as

$$Z_0 = \frac{w_1 z_1 + w_2 z_2}{w_1 + w_2}$$

If we have n rules in our rule-base system then the crisp control action is calculated as

$$Z_0 = \frac{\sum_{i=1}^{n} w_i z_i}{\sum_{i=1}^{n} w_i}$$

Where w_i denotes the firing level of the i^{th} rule, i= 1, 2 . . . , n

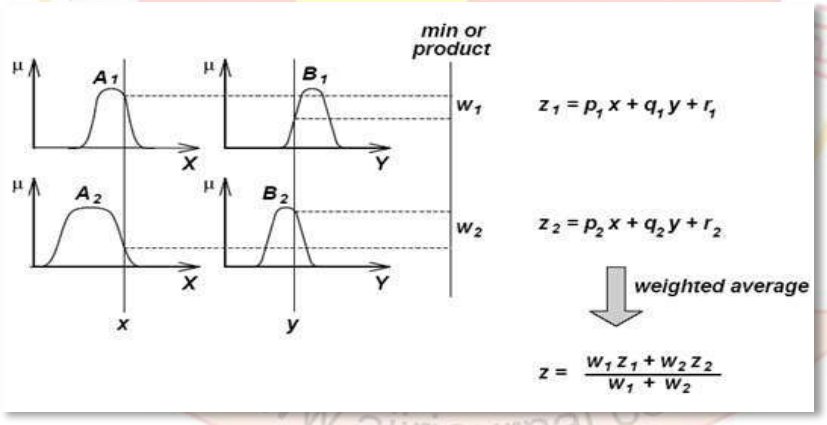

Figure 1.4: Sugeno Fuzzy Model

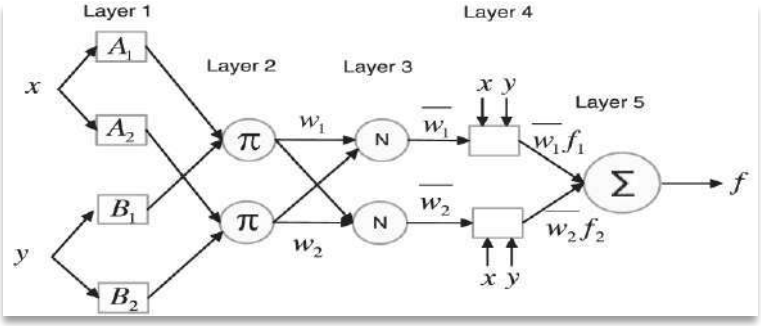

Figure 1.5: Equivalent ANFIS architecture

The TSK model normally selects *z* as first-order polynomial, hence the model is also called the first-order TSK model. When *z* is selected as constant, it is termed as the zero-order TSK model and can be regarded as a special case of the Mamdani model.

In comparison with the Mamdani model, the Sugeno model is based on automatic learning from the data and can accurately approximate a function using few rules. It has a stronger and more flexible illustration capability than the Mamdani model. In the Sugeno model, rules are extracted from the data, but the generated rules may have no meaning for experts. The Sugeno model has found more successful applications in building the fuzzy systems.

The Sugeno Model consists of five layers as depicted in Fig. 1.5, called ANFIS architecture. Details are given below;

Layer 1: Fuzzification layer

Every node I in the layer 1 is an adaptive node with a node function.

$O_{1,I} = \mu_{Ai}(x)$ for i=1,2 or : membership grade of a fuzzy set A1,A2 $O_{1,I} = \mu_{Bi-2}(y)$ for i=3,4.

Parameters in this layer: premise (or antecedent) parameters.

Layer 2: Rule layer

A fixed node labeled as Π where the output is the product of all the incoming signals: $O_{2,I} = w_i = \mu_{Ai}(x)\ \mu_{Bi}(y)$ *for i=1,2….,* firing strength of a rule.

Layer 3: Normalization layer

A fixed node labeled N.

The i-th node calculates the ratio of the i-th rule's firing strength to the sum of all rules' firing strength: $O_{3,I} = \underline{w_i} = w_i / (w_i + w_i)$ for*i=1,2.*

Outputs of this layer are stated as normalized firing strengths.

Layer 4: Defuzzification layer

An adaptive node with a node fn$O_{4,I} = \underline{w_i} f_i = \underline{w_i}\ (p_i x + q_i y + r_i)$ for*i=1,2,……..,* where $\underline{w_i}$is the normalized firing strength from layer 3 and $\{p_i\ ,\ q_i\ \ r_i\}$ is the set of parameter pf this node are called the Consequent Parameters.

Layer 5: Summation neuron

A fixed node which computes the overall output as the summation of all incoming signals.

Overall output = $O_{5,1} = \sum \underline{w_i} f_i = \sum \underline{w_i} f_i / \sum \underline{w_i}$.

ANFIS learning:

A learning algorithm of the least-squares estimator including the gradient descent method.

Forward Pass: adjustment of *consequent parameters, pi, qi, ri.*

Rule consequent parameters are known by the least-square estimator.

Find a least-square estimate of $k=[r_1\ p_1\ q_1 .. r_2\ p_2\ q_2\ ..r_n p_n q_n]$, k^*, that minimizes the squared error $e=|O_d - O|^2$.

$E = e^2 / 2 = (O_d - O)^2 / 2$.

The consequent parameters are adjusted while the antecedent parameters remain fixed.

Backward Pass: adjustment of antecedent parameters.

The antecedent parameters are tuned while the consequent parameters are kept fixed.

(Ex.) Bell activation function: $1/ [1 + ((x-c)/a)^{2b}]$.

Membership Function:

A fuzzy set is wholly characterized by its membership function (MF). Since most fuzzy sets in use have a universe of conversation X consisting of the real line R, it would not be practical to list all the pair defining a membership function. A more convenient and brief way to define an MF is to express it as a mathematical formula *[5].*

1. Triangular MF:

$$traingle\ (x; a,\ b,\ c) = \max \left[\min \left(\frac{x-a}{b-a}, \frac{c-a}{c-b} \right), 0 \right]$$

2. Trapezoid MF:

$$trapezoid\ (x;a,\ b,\ c,\ d) = \max\left(\min\left(\frac{x-a}{b-a}, 1, \frac{c-a}{c-b} \right), 0 \right)$$

3. Gaussian MF:

$$gaussian\ (x;\ 6\ ,\ c) = \exp\left\{ -\left[\frac{x-c}{6} \right]^{2} \right\}$$

1. Generalized Bell MF:

$$bell\ (x;\ a,\ b,\ c) = \frac{1}{1 + \left| \frac{x-c}{a} \right|^{2b}}$$

2. Sigmoidal MF:

$$sigmoid\ (x;\ a,\ b,\ c) = \frac{1}{1 + \exp\left[a\ (x - c\ ) \right]}$$

In the proposed model, we have used Generalized Bell Membership Function. So, brief discussion is given here. Figure1. 7.6 depict the meaning of parameters in Generalized Bell Function. These parameters are referred as premise parameters.

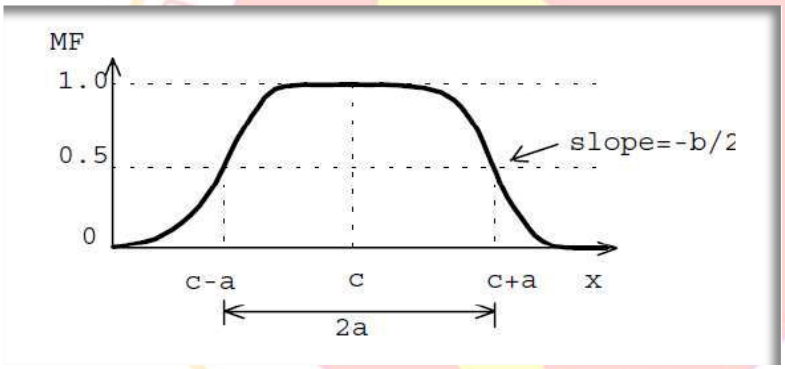

Figure1.6: Meaning of parameters in Generalized Bell Function

The parameter b is usually positive. If it is negative, the shape of this MF becomes an upside-down bell. However, each of these parameters has a physical meaning: *c* determines the centre of the corresponding membership function; *a* is the half width; and *b* (together with *a*) controls the slopes at the crossover points.

Note that this MF is the overview of Cauchy distribution used in probability theory, so it is also referred to as the Cauchy MF. Because of their smoothness and concise notation, Gaussian and bell MFs are becoming increasingly popular for specifying fuzzy sets [2-3].

Advantages and disadvantages of Fuzzy Systems [8-10]:

The advantages of the fuzzy systems are:

- It has capacity to represent inherent uncertainties of the human knowledge with linguistic variables.
- It has ability to interact with the expert of the domain with the engineer designer.
- It represents the natural rules, so it can easily interpret the results.
- It can easily widen the base of knowledge through the addition of new rules.
- It is robust method in relation with the possible disturbances in the system.

Disadvantages of fuzzy system are:

- It is incapable to generalize or answer to what is written in its rule base.
- It is not robust in relation to the topological changes in the system. Topological changes will have to demand alterations in the rule base.
- It has to depend on the existence of a expert to determine the inference logical rules.

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Importance of Artificial Intelligence in Healthcare: A Review

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Abstract

Artificial intelligence (AI) has been developing very rapidly in the various area of biomedical software's algorithms, hardware implementation, and etc. In this review, we summarize the importance of AI, role of AI, in the various branches of biomedical research. The aim of this review is to keep track of new scientific accomplishments, to understand the availability of technologies, to appreciate the tremendous potential of AI. New progress and breakthroughs will continue to push the frontier and widen the scope of AI application, and fast developments are envisioned in the near future.
Keywords: AI, Necessity, Role, Importance

1. Introduction:

Artificial Intelligence (AI), where computers perform tasks that are usually assumed to require human intelligence, is currently being discussed in nearly every domain of science and engineering. Major scientific competitions like Image Net Large Scale Visual Recognition Challenges are providing evidence that computers can achieve human-like competence in image recognition. AI has also enabled significant progress in speech recognition and natural language processing. All of these advances open questions about how such capabilities can support, or even enhance, human decision making in health and health care. Two recent high-profile research papers have demonstrated that AI can perform clinical diagnostics on medical images at levels equal to experienced clinicians, at least in very specific examples [1,2].

Artificial intelligence (AI) is defined as the intelligence of machines, as opposed to the intelligence of humans or other living species. AI can also be defined as the study of ‘‘intelligent agents”—that is, any agent or device that can perceive and understand its surroundings and accordingly take appropriate action to maximize its chances of achieving its objectives. AI also refers to situations wherein machines can simulate human minds in learning and analysis, and thus can work in problem solving. This kind of intelligence is also referred to as machine learning (ML). Typically, AI involves a system that consists of both software and hardware. From a software perspective, AI is particularly concerned with algorithms. An artificial neural network (ANN) is a conceptual framework for executing AI algorithms. It is a mimic of the human brain—an interconnected network of neurons, in

which there are weighted communication channels between neurons . One neuron can react to multiple stimuli from neighboring neurons and the whole network can change its state according to different inputs from the environment [3-9].

The role of artificial intelligence in healthcare has been a huge talking point in recent months and there's no sign of the adoption of this technology slowing down, well, ever really. AI in healthcare has huge and wide reaching potential with everything from mobile coaching solutions to drug discovery falling under the umbrella of what can be achieved with machine learning. That being said, many healthcare executives are still too shy when it comes to experimenting with AI due to privacy concerns, data integrity concerns or the unfortunate presence of various organizational silos making data sharing next to impossible. However, the future of healthcare & the future of machine learning and artificial intelligence are deeply interconnected.

2. The Necessity of Artificial Intelligence:

“Artificial intelligence will be an important tool to help us all end the injustice in the uneven distribution of healthcare, and to make it more accessible and affordable for every person on Earth."

The use of Artificial Intelligence, or AI, is growing rapidly in the medical field, especially in diagnostics and management of treatment. To date there has been a wide range of research into how AI can aid clinical decisions and enhance physicians' judgement. In recent years, AI and machine learning have emerged as powerful tools for assisting diagnosis. This technology could revolutionise healthcare by providing more precise diagnoses.

The importance of AI as a component of the diagnostic process has been steadily increasing since building systems became more practical. There is ongoing enthusiasm for and hype about AI and both researchers and practitioners focus equally on this technology from multiple perspectives. There is no uniform definition for the term AI, but considered as "the ability of a machine to perform cognitive functions that we associate with human minds, such as perceiving, reasoning, learning, interacting with the environment, problem solving, decision-making, and even demonstrating creativity". AI is generally associated with human-like behavior and covers a wide range of research areas, such as natural language processing or robotics. However, current practical applications, including healthcare and disease diagnostics, are narrowed down to a specific task, and are being developed using machine learning. Algorithms exploit medical data to generate predictions and continuously learn and develop over time by constantly processing new and updated data. Algorithms acquire information through different types of knowledge and input or over multiple years of experience. Therefore, AI empowered systems are able to process more knowledge compared with humans, possibly outperforming them for certain medical tasks [10-12].

Role of Artificial Intelligence

The field of healthcare is evolving at an increasing speed, and this is accompanied by a significant increase in the amount of data and challenges in terms of cost and patient outcomes, so AI applications have been used to reduce these challenges. Artificial Intelligence is very useful in solving problematic healthcare challenges and offers a number of advantages over traditional data analytics and clinical decision-making techniques.

The following are the most important examples of the role of artificial intelligence (AI) in healthcare and medicine:

AI in Medical Diagnosis:

Artificial Intelligence has the potential to revolutionize medical diagnostics. Unnecessary routine laboratory testing increases unnecessary financial costs. Therefore, artificial intelligence applications have been used to narrow the circle of laboratory analyzes that the patient may need. AI can detect the presence of early disease as soon as possible as it can automate a large portion of the manual work and speed up the diagnosis process.

Improving Clinical Workflow:

Artificial intelligence is currently being used to efficiently manage workflow and analyze imaging. AI can be used to improve clinical workflow, support better clinical insights, reduce clinical variability, aid in setting study priorities, and minimize physician burnout.

Artificial intelligence has the power to take over the time-consuming task of data input so that clinicians can focus on improving labor utilization, increasing daily productivity and providing the highest quality of care to patients.

Predicting ICU Transfers:

Unplanned transfer of patients to the ICU can have poor outcomes and sometimes even death in patients. Therefore, artificial intelligence has been used to reduce the percentage of these cases, by finding patients with severe cases.As artificial intelligence systems use patients 'medical records, laboratory results, and their vital signs to manage patients' condition before it deteriorates, and forcing them to be transferred to the intensive care unit. Artificial intelligence systems can guide clinicians on where to start treatment.

Predicting Hospital Acquired Infections:

Artificial intelligence can standardize the diagnosis of infections with Infection Prevention and Control (IPC) implications, and facilitate the dissemination of IPC expertise. AI provides opportunities to improve diagnosis through objective pattern recognition. Using AI-driven models, clinicians can monitor high-risk patients, predict which patients are most likely to develop central-line infections and intervene to reduce risk.

Developing the Next Generation of Radiology Tools:

Artificial intelligence can help develop the next generation of imaging tools that will provide accurate information and detailed enough to replace the need for tissue samples in some cases. The next generation of artificial intelligence is expected to be more effective in the healthcare system and there will be further

improvements in performance. All of these developments promise to increase accuracy and reduce the number of routine tasks that exhaust time and effort [13-18].

3. Pros & Cons of Artificial Intelligence

- **Provides Real-Time Data**
  Real-time analytics can help improve physician-patient relationships. Making vital patient data available through mobile devices can engage patients in their treatments. Mobile alerts can inform doctors and nurses of urgent changes in patient statuses and emergencies.
- **Streamlines Tasks**
  For example, intelligent radiology technology is able to identify significant visual markers, saving hours of intense analysis. Other automated systems exist to automate appointment scheduling, patient tracking and care recommendations.
  AI essentially allows hospitals to accept a wide array of plans, benefiting potential and existing patients.
- **Saves Time and Resources**
  As more vital processes are automated, medical professionals have more time to assess patients and diagnose illness and ailment. AI is accelerating operations to save medical establishments precious productivity hours. In any sector, time equals money, so AI has the potential to save hefty costs.
- **Assists Research**
  AI enables researchers to amass large swaths of data from various sources. The ability to draw upon a rich and growing information body allows for a more effective analysis of deadly diseases. Related to real-time data, research can benefit from the wide body of information available, as long as it's easily translated.
- **May Reduce Physician Stress**
  Some latest research reports over half of the primary physicians feel stressed from deadline pressures and other workplace conditions. AI helps streamline procedures, automate functions, instantly share data and organize operations, all of which help relieve medical professionals of juggling too many tasks.

4. Limits of Ai In Medicine

- **Needs Human Surveillance**
  Although AI has come a long way in the medical world, human surveillance is still essential. For example, surgery robots operate logically, as opposed to empathetically. Health practitioners may notice vital behavioral observations that can help diagnose or prevent medical complications.
- **May Overlook Social Variables**
  Patient needs often extend beyond immediate physical conditions. Social, economic and historical factors can play into appropriate recommendations for particular patients. For instance, an AI system may be able to allocate a patient to a particular care center based on a specific diagnosis. However, this system may not account for patient economic restrictions or other personalized preferences.
- **May Lead To Unemployment**
  Although AI may help cut costs and reduce clinician pressure, it may also render some jobs redundant. This variable may result in displaced professionals who invested time and money in healthcare education, presenting equity challenges.
- **Inaccuracies are Still Possible**
  Medical AI depends heavily on diagnosis data available from millions of cataloged cases. In cases where little data exists on particular illnesses, demographics, or environmental factors, a misdiagnosis is entirely possible. This factor becomes especially important when prescribing particular medicine.
- **Susceptible To Security Risks**
  As AI uses data to make systems smarter and more accurate, cyber-attacks will incorporate AI to become smarter with each success and failure, making them more difficult to predict and prevent. Once damaging threats out-maneuver security defences, the attacks will be much more challenging to address [19-22].

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Semi-Static Thermal Stress Analysis of A Medium Thick Disk With A Time- Dependent Heat Source

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Abstract

This paper survey the semi-static thermal stresses of medium thick discs with time-dependent heat source investiture. The lower and upper faces of the plate are kept at zero temperature, while the inner and outer circular curved surfaces are thermally insulated. Laplace transformers have been found to be convenient for obtaining special temperature distribution solutions, which satisfy the time-dependent heat conduction equation.The function of the thermoelastic air and the harmonic potential functions are used to obtain the components of displacement and the stress associated with it. The results are obtained in the form of a basal function. The results of temperature, displacement, and stress are numerically calculated and graphed according to specific functions.

Keywords*: Heat conduction equation, medium thick disk, thermal stress, Laplace transform*

1. Introduction

Many studies have appeared in the literature about the transient response of the plate and its associated thermal stresses. The following references are chosen because they include mathematical methods for deriving the response formulas contained in present description. In classical papers, Nowacki [1] has determined steady-state thermal stresses in a thick circular plate subjected to an axisymmetric temperature distribuion on the upper face with zero temperature on the lower face and the circular edge. Further Roy Choudhuri [2] has succeeded in determining the quasi-static thermal stresses in a circular plate subjected to transient temperature along the circumference of a circle over the upper face with lower at zero temperture and the fixed circular edge thermally insulated.Nasser [3, 4] proposed the concept of heat sources in generalized thermoelasticity and applied to a thick plate problem.In all aforementioned investigations an axisymmetrically heated thick plate has been considered and its results are more useful in engineering problems. Recently, Kulkarni and Deshmukh [5] present paper deals with the determination of a quasi-static thermal stresses in a thick circular plate subjected to arbitrary initial temperature on the upper face with lower face at zero temperature and the fixed circular edge thermally insulated using Lapalce method. Similarly, Kulkarni and Deshmukh [6]has also determinated the transient heat conduction and thermal stresses of a thick annular disc subjected to arbitrary heat flux on the upper and lower surfaces where as the fixed circular edges are at zero temperature, using integral transform technique.Varghese and Lalsingh [7] has determined the thermo-elastic stress in a thick disc due to interior heat generation within the solid, under thermal boundary condition, which is subjected to arbitrary initial temperature on the upper and lower face at zero temperature, and the fixed circular edges with additional sectional heat supply, using unconventional integral transform.Okumura [8] has analysed the thermal-bending stresses in an annular sector by the theory of moderately thick plates.Saidi and Baferani [9] investigated the thermal buckling of simply supported moderately thick functionally graded annular sector plate using first order shear deformation plate theory and obtained the solution by using an analytical method.Hu et al. [10] presented a set of high order partial differential equations for elastic rectangular thick plate with four edges completely clamped support base on Mindlin theory and solved by the double finite integral transform method.Saheb and Aruna [11] developed a simple and efficient coupled displacement field method to study the buckling load parameters of the simply supported moderately thick rectangular plates.Genckal et al. [12] studied the dynamic responses of composite plates on elastic foundation subjected to impact and moving loads by using Galerkin's method, then the equations are solved by using the Runge-Kutta method.However, they did not consider a thermoelastic problem in which a source is generated on the basis of a linear function of temperature that satisfies the time-dependent heat conduction equation. Based on previous literature on moderately-thickness annular disks, the authors observed that no analytical procedure was established in view of the generation of

internal heat sources in the body. Due to the lack of research in this area, the author was motivated to conduct this research. Theoretical calculations have been studied using dimensional parameters, while the graphical calculations are carried out using dimensionless parameters. The success of this novel research lies in new mathematical procedures that have adopted a simpler optimized design approach in terms of material utilization and technical performance, particularly in determining the thermoelastic behavior of moderately-thickness disks engaged as the foundation of pressure container, furnaces, etc.

2. Formulation of the Problem

We consider a moderately thick annular plate occupying the space $D:\{(r,z)\in R^2:\ a<r<b,\ 0<z<l\}$ under unsteady-state temperature field with a time-dependent internal heat sources within it.

2.1 Unsteady-state temperature field

The governing equation for heat conduction in isotropic solids is given as follows

$$\left\{\nabla^2-\frac{1}{\kappa}\frac{\partial}{\partial t}\right\}T(r,z,t)=-q_0\,l\,\Phi(t)[H(r-r_0)-H(r-r_1)],\ r_0<r<r_1 \qquad (1)$$

in which $T=T(r,z,t)$ is the temperature change,

$$\nabla^2\equiv\frac{\partial^2}{\partial r^2}+\frac{1}{r}\frac{\partial}{\partial r}+\frac{\partial^2}{\partial z^2}$$

and

$$\Phi(t)=\begin{cases}(\Phi_0/T_0)\,t, 0\le t\le t_0\\ \Phi_0, \qquad t>t_0\end{cases} \qquad (2)$$

subjected to the boundary conditions

$$T\big|_{t=0}=T\big|_{z=0}=T\big|_{z=l}=\left.\frac{\partial T}{\partial r}\right|_{r=a}=\left.\frac{\partial T}{\partial r}\right|_{r=b}=0 \qquad (3)$$

2.2 Displacement and stress field

Let u_r and u_z be components of displacement is expressed as

$$\begin{aligned}2Gu_r&=\frac{\partial}{\partial r}\left[r\frac{\partial\phi_1}{\partial r}+z\frac{\partial\phi_3}{\partial z}-4(1-\upsilon)\phi_1\right]+\frac{\partial\chi}{\partial r},\\ 2Gu_z&=\frac{\partial}{\partial z}\left[r\frac{\partial\phi_1}{\partial r}+z\frac{\partial\phi_3}{\partial z}-4(1-\upsilon)\phi_3\right]+\frac{\partial\chi}{\partial z}\end{aligned} \qquad (4)$$

in which G and υ denote the shear modulus and Poisson's ration, respectively, and

$$\nabla^2\phi_1=0,\ \nabla^2\phi_3=0,\ \nabla^2\chi=\frac{\alpha E}{1-\upsilon}\tau. \qquad (5)$$

where ϕ_1, ϕ_3 are harmonic functions, χ is a thermoelastic potential function, $\tau=T-T_i$ is temperature change with T_i as initial temperature,respectively.

The components of stress taking account of heat is as follows

$$\begin{aligned}\sigma_{rr}&=2G\left(\varepsilon_{rr}+\frac{\upsilon}{1-2\upsilon}e\right)-\frac{\alpha E\tau}{1-2\upsilon},\ \sigma_{\theta\theta}=2G\left(\varepsilon_{\theta\theta}+\frac{\upsilon}{1-2\upsilon}e\right)-\frac{\alpha E\tau}{1-2\upsilon},\\ \sigma_{zz}&=2G\left(\varepsilon_{zz}+\frac{\upsilon}{1-2\upsilon}e\right)-\frac{\alpha E\tau}{1-2\upsilon},\ \sigma_{rz}=2G\varepsilon_{rz}\end{aligned} \qquad (6)$$

in which

$$\varepsilon_{rr}=\frac{\partial u_r}{\partial r},\varepsilon_{\theta\theta}=\frac{u_r}{r},\varepsilon_{zz}=\frac{\partial u_z}{\partial z},\varepsilon_{rz}=\frac{1}{2}\left(\frac{\partial u_r}{\partial z}+\frac{\partial u_z}{\partial r}\right) \quad (7)$$

$$e=\frac{\partial u_r}{\partial r}+\frac{u_r}{r}+\frac{\partial u_z}{\partial z}$$

where $\sigma_{rr},..,\sigma_{rz}$ are the components of stresses, $\varepsilon_{rr},..,\varepsilon_{rz}$ are the components of strain, α represent the coefficient of linear thermal expansion and E is Young's modulus and e is the cubical dilation, respectively.For thetraction-free surfaces the stress functions

$$\sigma_{rz}\big|_{z=0}=\sigma_{zz}\big|_{z=0}=\sigma_{rz}\big|_{z=l}=\sigma_{zz}\big|_{z=l}=0 \quad (8)$$

The equations (1) to (8) constitute the mathematical formulation of the problem.

3. Solution tothe Problem

3.1 Solution for the temperature distribution

Applying the Laplace transformation in Eqs. (1) and (4)

$$\left\{\nabla^2-\frac{p}{\kappa}\right\}\bar{T}(r,z,p)=-\frac{q_0\Phi_0 l}{p^2 t_0}(1-e^{-pt_0})[H(r-r_0)-H(r-r_1)] \quad (9)$$

$$\bar{T}\big|_{z=0}=\bar{T}\big|_{z=l}=\frac{\partial\bar{T}}{\partial r}\bigg|_{r=a}=\frac{\partial\bar{T}}{\partial r}\bigg|_{r=b}=0 \quad (10)$$

in which the symbol ($\bar{}$) represents a function in the transformed domain and $\bar{T}(r,z,p)$ is the transformed function of $T(r,z,t)$ with Laplace parameter as p.

Now applying the finite Fourier sine transform in Eqs. (9) one obtains

$$\left\{\frac{\partial^2}{\partial r^2}+\frac{1}{r}\frac{\partial}{\partial r}-\beta_m-\frac{p}{\kappa}\right\}\bar{\bar{T}}(r,m,p)=-\frac{q_0\Phi_0 l}{p^2 t_0}(1-e^{-pt_0})[H(r-r_0)-H(r-r_1)] \quad (11)$$

$$\frac{\partial\bar{\bar{T}}}{\partial r}\bigg|_{r=a}=0,\ \frac{\partial\bar{\bar{T}}}{\partial r}\bigg|_{r=b}=0 \quad (12)$$

where $\bar{\bar{T}}(r,m,p)$ is the transform of $\bar{T}(r,z,p)$ with respect to nucleus is $\sin(m\pi z/l)$.

To obtain the expression for the temperature $\bar{\bar{T}}(r,m,p)$ of Eqs. (11)-(12), we assume

$$\bar{\bar{T}}(r,m,p)=\sum_{n=1}^{\infty}A_n J_0(\alpha_n r) \quad (13)$$

Assume

$$H(r-r_0)-H(r-r_1)=f(r)=\sum_{n=1}^{\infty}B_n J_0(\alpha_n r) \quad (14)$$

Putting Eq. (13) and (14) in Eq. (11), one obtains

$$A_n=\frac{\kappa q_0 l(1-e^{-pt_0})}{t_0 p^2(p+\gamma_{mn})}B_n \quad (15)$$

in which

$$\gamma_{mn}=\beta_m^2\kappa+\alpha_n^2\kappa.$$

Taking the theory of Bessel function on Eq. (15), one obtains

$$B_n \int_a^b r[J_0(\alpha_n r)]^2 dr = \int_a^b r\, f(r)\, J_0(\alpha_n r) dr = \int_{r_0}^{r_1} r\, J_0(\alpha_n r) dr \qquad (16)$$

since

$$f(r) = \begin{cases} 1 \text{ for } r_0 < r < r_1 \\ 0 \text{ for } a < r < r_0 \text{ and } r_1 < r < b \end{cases}$$

Hence

$$B_n = \frac{2}{\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} \qquad (17)$$

Using Eqs. (13), (15), (17) we get,

$$\bar{\bar{T}}(r, m, p) = \frac{2\kappa q_0 l}{t_0} \sum_{n=1}^{\infty} \frac{(1 - e^{-pt_0})}{p^2(p + \gamma_{mn})\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} J_0(\alpha_n r) \qquad (18)$$

Now applying the inverse Fourier sine transform to Eq. (18), one yield

$$\bar{T}(r, z, p) = \frac{4\kappa q_0}{t_0} \sum_{n=1}^{\infty}\sum_{m=1}^{\infty} \frac{(1 - e^{-pt_0})}{p^2(p + \gamma_{mn})\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} \qquad (19)$$
$$\times J_0(\alpha_n r)\sin(m\pi z / l)$$

Applying the Laplace inversion theorems on Eq. (19),one yield

$$\tau = T(r, z, t) = \frac{4\kappa q_0}{t_0} \sum_{n=1}^{\infty}\sum_{m=1}^{\infty} \frac{1}{\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} J_0(\alpha_n r)\sin\left(\frac{m\pi z}{l}\right) \qquad (20)$$
$$\times\{\Phi_n(r, z, t) - \Phi_n(r, z, t - t_0) H(t - t_0)\}$$

where

$$L^{-1}\left\{\frac{1 - e^{-t_0 p}}{p^2[p + \gamma_{mn}]}\right\}$$
$$= L^{-1}\left\{\frac{1 - e^{-t_0 p}}{\gamma_{mn}}\left[\frac{1}{p^2} - \frac{1}{\gamma_{mn}}\left(\frac{1}{p} - \frac{1}{p + \gamma_{mn}}\right)\right]\right\}$$
$$= \Phi_n(r, z, t) - \Phi_n(r, z, t - t_0) H(t - t_0)$$

in which

$$\Phi_n(r, z, t) = \frac{1}{\gamma_{mn}}\left(t - \frac{1 - e^{-\gamma_{mn} t}}{\gamma_{mn}}\right)$$

3.3 Solution for potential functions and thermal stresses

Now assume ϕ_1, ϕ_3 are harmonic functions and χ is a thermoelastic potential function that satisfies Eq. (5) as

$$\chi(r, z, t) = \frac{\alpha E}{1 - \upsilon}\frac{4\kappa q_0}{l\kappa t_0} \sum_{n=1}^{\infty}\sum_{m=1}^{\infty} \frac{\gamma_{mn}}{\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} J_0(\alpha_n r)\sin\left(\frac{m\pi z}{l}\right) \qquad (21)$$
$$\times\{\Phi_n(r, z, t) - \Phi_n(r, z, t - t_0) H(t - t_0)\}$$

$$\phi_1(r, z, t) = \frac{\alpha E}{1 - \upsilon}\frac{4\kappa q_0}{l\kappa t_0} \sum_{n=1}^{\infty}\sum_{m=1}^{\infty} \frac{\gamma_{mn}}{\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\}$$
$$\times\{C_1 J_0(\alpha_n r) + D_1(\alpha_n r) J_1(\alpha_n r)\}\sin(m\pi z / l) \qquad (22)$$
$$\times\{\Phi_n(r, z, t) - \Phi_n(r, z, t - t_0) H(t - t_0)\}$$

$$\phi_3(r,z,t)=\frac{\alpha E}{1-\upsilon}\frac{4\kappa q_0}{l\kappa t_0}\sum_{n=1}^{\infty}\sum_{m=1}^{\infty}\frac{\gamma_{mn}}{\alpha_n}\left\{\frac{r_1J_1(\alpha_n r_1)-r_0J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2-a^2[J_0(\alpha_n a)]^2}\right\}$$
$$\times\{E_1J_0(\alpha_n r)+F_1(\alpha_n r)J_1(\alpha_n r)\}\sin(m\pi z/l) \quad (23)$$
$$\times\{\Phi_n(r,z,t)-\Phi_n(r,z,t-t_0)H(t-t_0)\}$$

Using Eqs. (21)-(23) in Eq. (4),onegetsthe required displacement components.The components of stress given in Eq. (6) can be obtained using displacement componentsand strain components given in Eq. (7). Finally C_1, D_1, E_1 and F_1 are the unknown constants which can to be determined using traction free conditions given in Eq. (8) as

$$X_1C_1+Y_1D_1+Z_1E_1+T_1F_1=R_1,\ X_2C_1+Y_2D_1+Z_2E_1+T_2F_1=R_2,$$
$$X_3C_1+Y_3D_1+Z_3E_1+T_3F_1=R_3,\ X_4C_1+Y_4D_1+Z_4E_1+T_4F_1=R_4 \quad (24)$$

where,

$$X_1=-a_1J_1-a_2J_{0,2}+a_3,\ Y_1=(a_1J_{0,2})/2+J_0(a_4-a_3+a_5)-a_6J_{1,13}$$
$$Z_1=-a_1J_1+2\beta\alpha_nJ_1a_3-\alpha_n^2J_2,\ T_1=-a_7J_2+(a_1/2-a_8)J_{0,2},$$
$$R_1=[a_1J_1(a)+J_0(a)/2-a_9][a],$$
$$X_2=-a_1J_1-2\Im_{12}(a_4-a_5)-a_2J_{0,2}C_L+aS_L\alpha_n^2J_{1,13}/2+\Im_{11}[-1+2(1-\nu)$$
$$-3aa_4+aa_5]-\Im_{13},$$
$$Y_2=(a_1C_L/2+a_4S_L-a_5S_L\alpha_n)J_{0,2}+[-a_2C_L/\alpha_n+S_L\alpha_n+2(1-\nu)S_L\alpha_n$$
$$+6\Im_{14}+a_3]J_{1,13}+(1/4+\Im_{14})J_{2,24},$$
$$Z_2=J_1[a_{10}S_L+\Im_{15}-C_L(a_1+La_1/a-2a_8)]-(\alpha_n+\Im_{16})2L\Im_{16},$$
$$T_2=\Im_{16}(2\Im_{14}+a_4-aa_5)-\Im_{15}J_{0,2}-(1/2+\Im_{14})K,$$
$$R_2=a\{a_1J_1C_L+2a_4\Im_{12}+(1+4\Im_{14})K1+a_8(C_L)'+(1/a)[4\Im_{14}(J_0S_L)']$$
$$+(1+4\Im_{14})2(J_1S_L\alpha_n)'+(1+4\Im_{14})(J_1S_L)''\},$$
$$X_3=2\alpha_n\beta[J_{1r}(12-16\nu)-2r\alpha_n(J_{0r}-J_{2r})],$$
$$Y_3=\alpha_n[(-J_{0r}+J_{2r})\beta(12-16\nu)+2r\beta\alpha_n(3J_{1r}-J_{3r})],$$
$$Z_3=8\alpha_n\beta J_{1r},\ T_3=4\alpha_n\beta(-J_{0r}+J_{2r}),$$
$$R_3=8[-\Im_{11}\beta J_{1r}-(1/2)\Im_{11}J_{0r}+(\Im_{11}\beta J_{0r})'][r],$$

$$X_4=2\alpha_n\beta[J_{1r}C_L(12-16\nu)-(2r\alpha_n\beta C_L-4S_L\alpha_n)(J_{0r}-J_{2r})+rS_L\alpha_n^2(J_{1r}-J_{3r})],$$
$$Y_4=\alpha_n[(-J_{0r}+J_{2r})\beta C_L(12-16\nu)+2r\beta\alpha_nC_L(3J_{1r}-J_{3r})+4S_L\alpha_n(3J_{1r}-J_{3r})$$
$$+rS_L\alpha_n^2(3J_{0r}-4J_{2r}+J_{4r})],$$
$$Z_4=4\alpha_n[2\beta J_{1r}(C_L-\beta LS_L)+L\beta\alpha_nC_L(J_{0r}-J_{2r})-4S_L\alpha_n((1-\nu)J_{0r}+(1-\nu)J_{2r})],$$
$$T_4=2\alpha_n[(2L\beta^2S_L+\beta C_L)(J_{0r}-J_{2r})+L\beta\alpha_nC_L(3J_{1r}-J_{3r})-12\alpha_nC_L],$$
$$R_4=8[-\Im_{11}\beta J_{1r}-(1/2)\Im_{11}J_{0r}+(\Im_{11}\beta J_{0r})'][r],$$

$$a_1=\beta\nu\alpha_n/(1-2\nu),\ a_2=a\beta\nu\alpha_n^2/[2(1-2\nu)],\ a_3=2(1-\nu)\nu/(1-2\nu),a_4=\nu/[2a(1-2\nu)],$$
$$a_5=[2(1-\nu)\nu]/[a(1-2\nu)],a_6=a\beta\nu\alpha_n^2,a_7=\alpha_n/[2a(1-2\nu)],a_8=2\beta\nu(1-\nu)\alpha_n/(1-2\nu),$$
$$a_9=\beta\nu J_0'/(1-2\nu),a_{10}=\alpha_n/(1-2\nu),S_L=\sin(L\beta),C_L=\cos(L\beta),$$
$$\Im_{11}=J_{0,2}S_L\alpha_n^2,\Im_{12}=J_1S_L\alpha_n,\Im_{13}=a\nu\alpha_n^2S_LJ_{1,13}/[2(1-2\nu)],$$
$$\Im_{14}=\nu/[4(1-2\nu)],\Im_{15}=L\beta^2\nu\alpha_nS_L/(1-2\nu),\Im_{16}=\beta J_{0,2}C_L\alpha_n,$$

$$J_{0,2}=J_0(a\alpha_n)-J_2(a\alpha_n), J_{2,4}=J_2(a\alpha_n)-J_4(a\alpha_n),$$
$$J_{1,3}=J_1(a\alpha_n)-J_3(a\alpha_n), J_{1,13}=J_1(a\alpha_n)+[J_1(a\alpha_n)-J_3(a\alpha_n)]$$
$$J_{2,24}=-[J_0(a\alpha_n)-J_2(a\alpha_n)]-(1/2)[J_2(a\alpha_n)-J_4(a\alpha_n)],$$
$$J_{(0,2)r}=J_0(r\alpha_n)-J_2(r\alpha_n)$$

Using Cramer's Rule, one obtains constants as

$$C1=\frac{\Delta_2}{\Delta_1};D1=\frac{\Delta_3}{\Delta_1};E1=\frac{\Delta_4}{\Delta_1};F1=\frac{\Delta_5}{\Delta_1} \quad (25)$$

where

$$\Delta_1=\begin{vmatrix} X1 & Y1 & Z1 & T1\\ X2 & Y2 & Z2 & T2\\ X3 & Y3 & Z3 & T3\\ X4 & Y4 & Z4 & T4 \end{vmatrix},\Delta_2=\begin{vmatrix} R1 & Y1 & Z1 & T1\\ R2 & Y2 & Z2 & T2\\ R3 & Y3 & Z3 & T3\\ R4 & Y4 & Z4 & T4 \end{vmatrix},\Delta_3=\begin{vmatrix} X1 & R1 & Z1 & T1\\ X2 & R2 & Z2 & T2\\ X3 & R3 & Z3 & T3\\ X4 & R4 & Z4 & T4 \end{vmatrix},$$

$$\Delta_4=\begin{vmatrix} X1 & Y1 & R1 & T1\\ X2 & Y2 & R2 & T2\\ X3 & Y3 & R3 & T3\\ X4 & Y4 & R4 & T4 \end{vmatrix},\Delta_5=\begin{vmatrix} X1 & Y1 & Z1 & R1\\ X2 & Y2 & Z2 & R2\\ X3 & Y3 & Z3 & R3\\ X4 & Y4 & Z4 & R4 \end{vmatrix}$$

The resulting equation of stresses can be obtained by substituting the unknown constant obtained from Eq. (25). The equations of stresses are rather lengthy, and the same has been omitted here for the sake of brevity but have been considered during graphical discussion using MATHEMATICA software.

4. Numerical Results, Discussion and Remarks

For the interests of simplicity of calculation, we introduce the following dimensionless values

$$\bar{r}=r/b,\ \bar{z}=z/b,\ \bar{\tau}=\kappa t/b^2,\bar{T}=T/T_0, \quad (26)$$
$$\bar{u}_i=u_i/E\alpha T_0,\bar{\sigma}_{ij}=\sigma_{ij}/E\alpha T_0\,(i,j=r,\theta)$$

Substituting the value of Eq. (26) in Eqs. (20) and components of stresses, we obtained the expressions for the temperature distribution and thermal stresses respectively for the numerical discussion. The numerical computations have been carried out formoderately thick diskhavingthe thermo-mechanical properties: modulus of elasticity E = 70 GPa, Poisson's ratio υ = 0.35, thermal expansion coefficient α = 23×10^{-6}/^{0}C, thermal diffusivity κ = 84.18×10-6 m^{2}s^{-1} and thermal conductivity λ = 204.2 Wm^{-1}K^{-1}.The physical parameter for the plate as $a=0.2\,\text{m}$, $b=1\,\text{m}$, $\text{l}=0.08\,\text{m}$ and $T_0=150^0$C.In order to examine the influence of internal heat source on the moderately thick diskplate, the numerical calculations were performed for all the variables, and numerical calculations are depicted in the following figures with the help of MATHEMATICA software. Plotted Figs. 1-2 illustrate the numerical results of temperature distribution and the thermal stresses of the moderately thick disk due to internal heat generation within the solid.From the Fig.1(a) it is noted that the behaviour of temperature trend is decreasing along redial direction in different value of time due to the available internal heat supply.

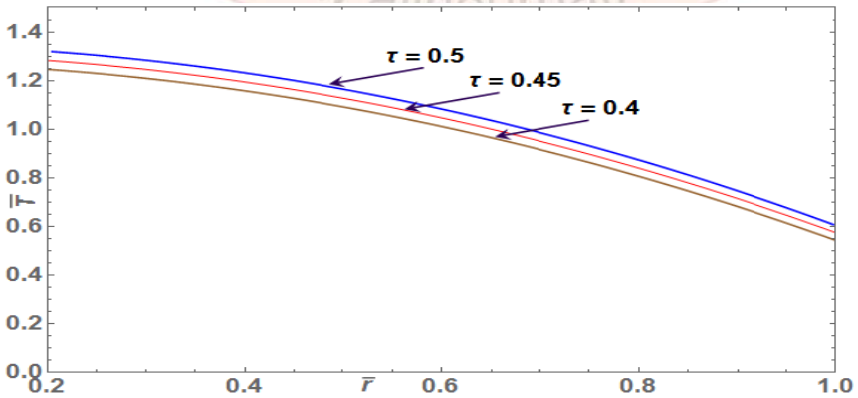

Fig. 1(a): Temperature distribution along $\bar{r}$ -direction for different values of time

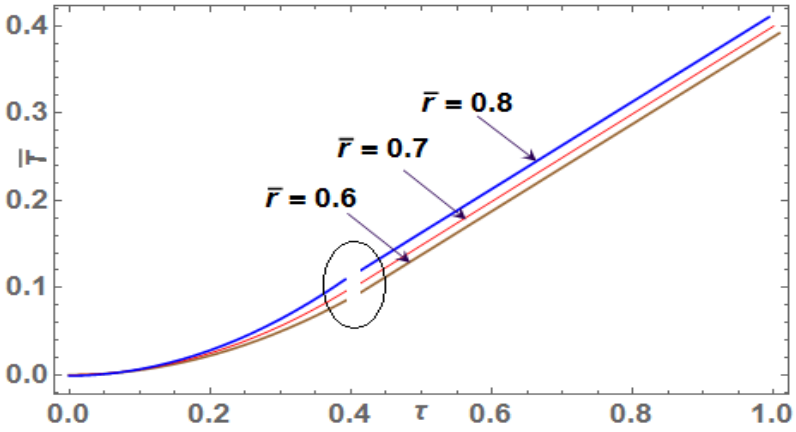

Fig. 1(b): Temperature distribution along time for different values of $\bar{r}$

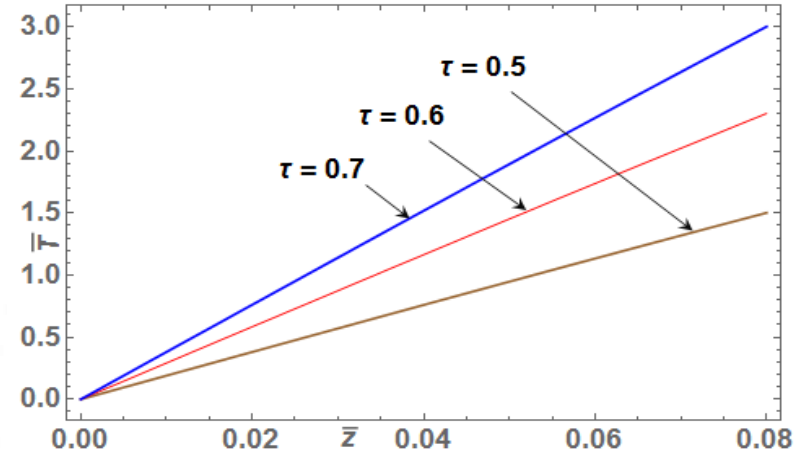

Fig. 1(c): Temperature distribution along $\bar{z}$ *-direction for different values of time*

Fig. 1(b) shows the temperature distribution with increase of time trend for different radius value. In this figure, temperature increases gradually towards the outer end to the internal heat energy, but a discontinuity in temperature was observed at $\bar{\tau} = 0.4$, and it may be due to the fixed time parameter $\bar{\tau}_0 = 0.4$ .In the Fig. 1(c), it is observed that the temperature increaseslinearly along the axial direction for different value of time due to the thickness.

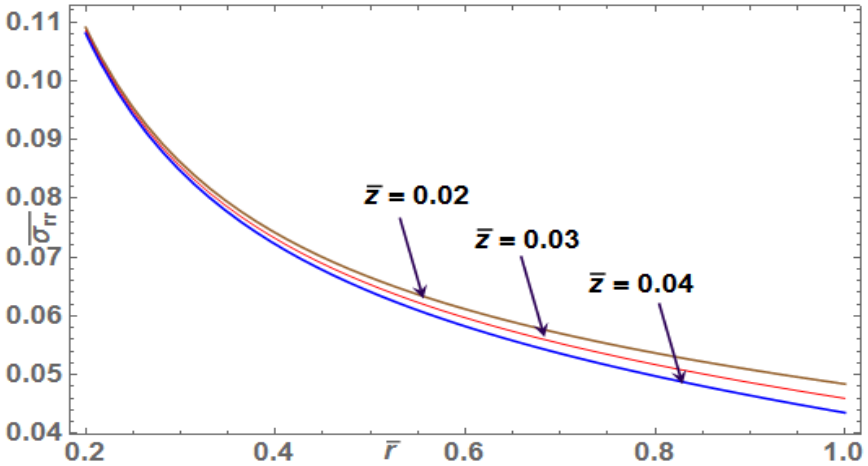

Fig. 2 (a): Radial Stress $\bar{\sigma}_{rr}$ *along* $\bar{r}$ *-direction for different values of* $\bar{z}$

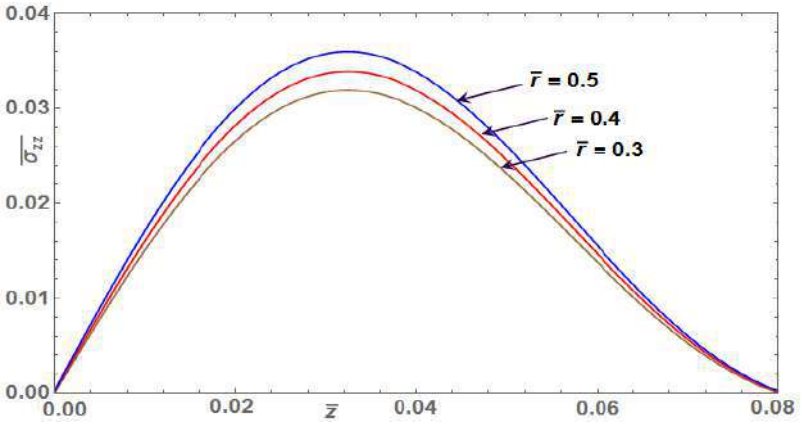

Fig. 2 (b): Axial Stress $\bar{\sigma}_{ZZ}$ along $\bar{z}$ -direction for different values of $\bar{r}$

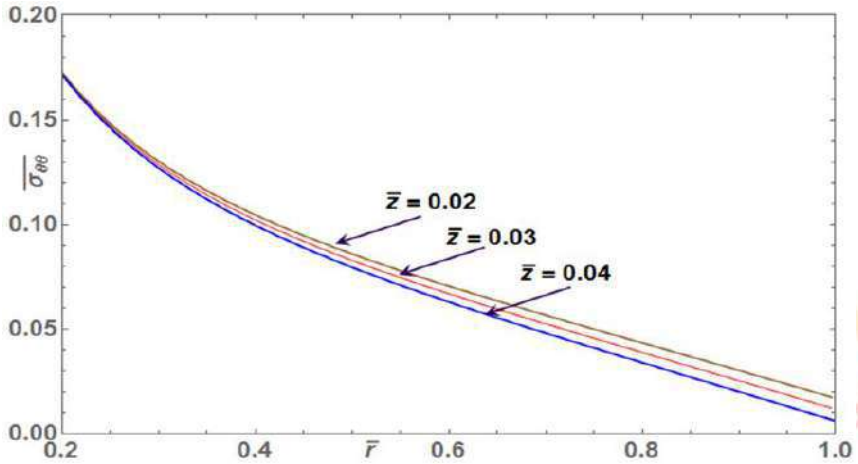

Fig. 2 (c): Tangential Stress $\bar{\sigma}_{\theta\theta}$ along $\bar{r}$ -direction for different values of $\bar{z}$

Fig. 2(a) explains that the stresses are initially on the higher side which goes on decreasing asalong the radial directionat different values of $\bar{z}$. Fig. 2(b) shows the distribution of axial stress along the $\bar{z}$ -direction. It is noted from the figure that the stress along axial direction attains amaximum at centreportion due to the accumulation of heat energy whereas at both boundaries the stress is zero.From Fig. 2(c), it can be concluded that tangential stress will be more at the initial point and gradually decreases along the radial direction.

Conclusion

The proposed analytical solution of the temporal thermal stress of a medium thick plate was stored in a cylinder coordinate system with the presence of an internal heat source. To the best of the author's knowledge, so far there have been very few reports compiling sources according to a linear function of temperature in the medium for a medium-thick plate of finite height with boundary conditions of the Direchletttype.The Using Laplace integral transformation techniques and classical methods, the thermal distribution, thermal stress, is resolved. Compared to other methods proposed by the researchers, the integral transformation technique presented here is relatively simple and widely applicable. This is how our search results can be described astemperature plate is assumed to satisfy the general quasi-static heat conduction equation with a ramp-type internal heat source. The advantage of this method is its versatility and mathematical ability to handle various types of mechanical and thermal boundary conditions.

1. The advantage of this method is its simplicity and its mathematical power to handle a variety of mechanical and thermal boundary conditions.
2. The maximum stress in the region outside the central core may be due to heat, stress, concentration, or internal heat sources available under the region considered.

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Strength of the Singularity in Radiating Dyon Solution on anti-de Sitter Background.

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Abstract:

Here we study the structure of space-time singularities formed during the radial in-fall of a coherent stream of charged "photons"-a piece of the radiating dyon metric. we study the strength of singularities which develop in the space time on the anti-de-sitter background. It is shown that the singularities formed in gravitational collapse of radiating dyon solution in anti-de-sitter background are not hidden inside the event horizon. It is also shown that final outcome of collapse gives naked singularity arising in space-time is gravitationally strong, therefore naked singularities are strong in Tripler's sense.

I Introduction

It would be interesting to study whether the singularity forming at the end of gravitational collapse is observable by external observer. One important conjecture related to the singularities known as cosmic censorship hypothesis (CCH) given by Roger Penrose [1]. This states that the collapse of a physically reasonable initial data yields a space-time singularity which is always hidden inside the event horizon. It has two conjecture , i.e., weak and strong. According to the weak conjucture, singularity formed by gravitational collapse is not visible to a far away observer. The strong cosmic censorship hypothesis states that the singularity cannot be observed even by an observer who is very close to it. Wald [2] discussed some examples to justify the validity of weak form of CCH.

When a massive star is on the verge of completing its nuclear cycle, then the thermonuclear reactions in the interior of the star cannot counter balance the immense gravitational pull of the star. Under most general conditions general relativity predicts that such a collapse must end in a singularity, which may or may not be clothed by an event horizon. A singularity may be physically described as a region in the space-time with extreme curvature, vanishing volume and unbounded gravitational forces. However, general relativity remains silent on the nature (BH or NS) or physical properties of such a singularity. This is basically due to the fact that mathematical structure breaks down preventing analysis at and beyond the singularity. This has triggered extensive research on Gravitational collapse during the past few decades. After all one would always like to know whether, and under what conditions gravitational collapse leads to the formation of a black hole (BH). A few decades back R. Penrose (1969) proposed the cosmic censorship hypothesis (CCH), which states that the singularities formed in gravitational collapse of physically reasonable matter cannot be seen by any distant observer in the universe. It implies that the singularities formed in asymptotically flat space-times are always bounded by event horizons and hence are destined to be black holes. With the announcement of this proposal, study of gravitational collapse has gained special importance, because one would always like to know that whether there exists any physical collapse solutions that lead to naked singularities (NS), which will serve as counterexamples of CCH [3]. Important cases of naked singularities analyzed so for include dust collapse [4-9], radiation collapse [10-17] and strange quark matter [18-19].

A.Chamorro and K.S.Virbhadra have obtained an exact solution of the Einstein- Maxwell equations which are a magnetic charge generalization to the Bonnor-Vaidya solution and describe the gravitational and electromagnetic fields of a non-radiating massive radiating dyon [20]. The paper is based on the composite charges i.e. an electric charge and a magnetic charge bound together by their gravitational interaction. Hence it would be interesting to study the nature of the singularities formed in the gravitational collapse of such composite space-time [21]. In this paper, we study the strength of singularity in Radiating Dyon solution on anti-de-sitter background. We also show that gravitational constant does affect the nature of singularity.
We conclude the paper in V section by some concluding remarks.

II Radiating Dyon Solution in Anti-de-sitter space-time

The metric, which describes the gravitational field of non-rotating massive radiating dyon as found by Chamorro and Virbhadra [20] is

$$ds^2 = -\left(1 - \frac{2m(v,r)}{r}\right)dv^2 + 2dvdr + r^2(d\theta^2 + sin^2\theta d\emptyset^2), \quad (1)$$

Where

$$m(v,r) = f(v) - \frac{\left(q_e^2(v)+q_m^2(v)\right)}{2r} - \frac{\Lambda r^3}{3} \quad (2)$$

Here $f(v)$ is the standard Vaidya mass, $q_e(v)$ and $q_m(v)$ are electric and magnetic charge parameters respectively. These parameters depend on the Eddington advanced time coordinate v.

The model considered in this paper is obtained from an energy-momentum tensor of the form

$$G_i^k = R_i^k - \frac{1}{2}Rg_j^k = 8\pi(E_i^k + N_i^k) \quad (3)$$

Where

$$\{x^\mu\} = \{v,\ r,\ \theta,\ \emptyset\}, \qquad (\mu = 0,\ 1,\ 2,\ 3).$$

E_i^k is related to the electromagnetic tensor F_{ki} in the familiar way

$$E_i^k = \frac{1}{4\pi}\left[-F_{im}F^{km} + \frac{1}{4}g_i^k F_{mn}F^{mn}\right] \quad (4)$$

$$N_i^k = V_i V^k \quad (5)$$

is the energy-momentum tensor of the null fluid. V^k is the null fluid current vector satisfying $g_{ik}V^iV^k = 0$. Electric current vector $J_{(e)}^i$ and magnetic current vector $J_{(m)}^i$ are given by

$$\frac{1}{\sqrt{-g}}\frac{\partial}{\partial x^k}\left(\sqrt{-g}F^{ik}\right) = 4\pi J_{(e)}^i \quad (6)$$

$$\frac{1}{\sqrt{-g}}\frac{\partial}{\partial x^k}\left(\sqrt{-g}\,{}^*F^{ik}\right) = 4\pi J_{(m)}^i \quad (7)$$

Where ${}_{*F^{ik}}$ is the dual of the electromagnetic field tensor F^{ik} and is given by

$${}^*F^{ik} = \frac{1}{2\sqrt{-g}}\in^{iklm} F_{lm}\ , \quad (8)$$

Where $\in^{iklm}$ is the Levi-Civita tensor density.

The non-vanishing components of the Einstein tensor for the above metric are given by

$$G_0^0 = G_1^1 = -G_2^2 = -G_3^3 = \frac{\left(q_e^2(v)+q_m^2(v)\right)}{r^4}\ , \quad (9)$$

$$G_0^1 = k^2\ , \quad (10)$$

Where

$$k^2 = \frac{2(q_e\dot{q_e} + q_m\dot{q_m} - \dot{f}r)}{r^3} \quad (11)$$

Here the over dot denotes the derivative with respect to the retarded coordinate v.

Energy-momentum tensor of the electromagnetic field and null fluids are given by

$$E_0^0 = E_1^1 = -E_2^2 = -E_3^3 = \frac{\left(q_e^2(v)+q_m^2(v)\right)}{8\pi r^4}\ , \quad (12)$$

$$N_0^1 = \frac{k^2}{8\pi} \quad (13)$$

III Nature of the Singularities in Monopole-Radiating Dyon Solution

The physical solution is for < 0 **,** the space-time becomes flat with $f(v) = 0$, $q_e(v) = 0$, $q_m(v) = 0$**.** At $v = T$, Say, the radiation is turned off. For$v > T$, $\dot{f}(v) = \dot{q_e}(v)\,\dot{q_m}(v) = 0$, i.e. $f(v), q_e^2(v)\ and\ q_m^2(v)$ are positive definite . Thus the metric for $v = 0\ to\ v = T$ is radiating dyon solution and for $v > T$ it becomes a static dyon solution [22].

To investigate the structure of the collapse, we need to consider the radial null geodesics define by $ds^2 = 0$. $\left(k^\theta = k^\emptyset = 0\right)$. The equation for outgoing radial null geodesic for metric (1) is given by

$$\left(1-\frac{2m(v,r)}{r}\right)dv^2-2dvdr=0$$

i.e.

$$\frac{dr}{dv}=\frac{1}{2}\left(1-\frac{2m(v,r)}{r}\right).$$

Using the mass function (2) , above equation becomes

$$\frac{dr}{dv}=\frac{1}{2}\left(1-\frac{2f(v)}{r}+\frac{q_e^2(v)+q_m^2(v)}{r^2}+\frac{\Lambda r^2}{3}\right) \quad (14)$$

In general, Eq. (14) does not yield an analytic solution. However, if $f(v)\propto v$, $q_e^2(v)\propto v^2$, $q_m^2(v)\propto v^2$,Eq. (14) becomes homogeneous and can be solved in terms of elementary functions[23].

In particular, we take

$$f(v)=\lambda v, \quad (15)$$

and

$$q_e^2(v)=\begin{cases}0\ , & v\le 0\\ \frac{\mu^2v^2}{2}\ , & 0<v\le T\\ \mu^2T^2(const)\ , & v>T\end{cases} \quad (16)$$

$$q_m^2(v)=\begin{cases}0\ , & v\le 0\\ \frac{\delta^2v^2}{2}\ , & 0<v\le T\\ \delta^2T^2(const)\ , & v>T\end{cases} \quad (17)$$

Where λ, μ^2 and δ^2 are some positive constants. Inserting the expressions for $f(v)$, $q_e^2(v)$ and $q_m^2(v)$ into Eq.(2) we obtain the mass function for monopole radiating dyon solution as

$$m(v,r)=\lambda v-\frac{\mu^2v^2+\delta^2v^2}{4r}-\frac{\Lambda r^3}{6} \quad (18)$$

It follows that with the choice of above mass function, the metric (1) becomes self-similar [1] (a spherically symmetric space-time is a self similar if $g_v(ct,cr)=g_v(t,r)$ and $g_{rr}(ct,cr)=g_{rr}(t,r)$ for every >0) admitting a homothetic killing vector ξ^a given by

$$\xi^a=v\frac{\partial}{\partial v}+r\frac{\partial}{\partial r} \quad (19)$$

and satisfies

$$L_\xi g_{ab}=\xi_{a;b}+\xi_{b;a}=2g_{ab}\ , \quad (20)$$

Where L denote the Lie derivative.

Defining $k^a=dx^a/dk$ as a tangent to radial null geodesics, where k is an affine parameter, it follows that $\xi^a k_a$ is constant along radial null geodesics.

Thus

$$\xi^a k_a=uk_u+rk_r=C, \quad (21)$$

Where C is a constant. Radial null geodesic equations of metric (1), on using the null condition $k^ak_a=0$, takes the simple form

$$\frac{dk^v}{dk}-\left(\frac{m'}{r}-\frac{m^2}{r^2}\right)(k^u)^2=0,$$

$$\frac{dk^r}{dk}+\left(\frac{\dot{m}}{r}-\frac{m'}{r}+\frac{m^2}{r^2}+\frac{2mm'}{r^2}-\frac{2m^2}{r^3}\right)(k^v)^2+2\left(\frac{m'}{r}-\frac{m^2}{r^2}\right)k^vk^r=0 \quad (22)$$

Let

$$k^v=\frac{dv}{dk}=\frac{P(v,r)}{r}, \quad (23)$$

Then from the null condition $k^ak_a=0$ we obtain

$$k^r=\left(1-\frac{2m}{r}\right)\frac{P}{2r},$$

Also

$$k_r=k_1=g_{1j}k^j=g_{10}k^0$$

$$k_r = \frac{P}{r} \tag{24}$$

And

$$k_v = k_0 = g_{0j}k^j = g_{00}k^0 + k^1$$

Therefore

$$k_v = -\frac{P}{2r}\left(1 - \frac{2\lambda u}{r} - 2a + \frac{\mu^2u^2+\delta^2u^2}{2r^2} + \frac{\Lambda r^2}{3}\right) \tag{25}$$

Eq. (21), (24) and (25) yields

$$P = \frac{12C}{12+(12-2\Lambda r^2-6)X+12\lambda X^2-3(\mu^2+\delta^2)X^3} \tag{26}$$

Where X is a self-similarity variable defined by $X = v/r$. The singularity occurring at $r = 0$ is naked if the outgoing radial null geodesic equation has atleast one real positive root [24]. In the case of pure Vaidya space-time it has been shown that for a mass function $m(u) = \lambda v/2$, the central singularity is naked for $\lambda \leq 1/8$, and the collapse ends into black hole if $\lambda > 1/8$ [25].

Hence it would be interesting to investigate whether the gravitational collapse of Vaidya space-time could yield a naked singularity under the influence of the gravitational constant and composite field produced by electric and magnetic charges.

With the help of Eq. (18), the equations of the outgoing radial null geodesics for the metric (1) are given by

$$-\left(1 - \frac{2m}{r}\right)dv^2 + 2dvdr = 0$$

Therefore

$$\frac{dr}{dv} = \frac{1}{2}\left(1 - \frac{2m}{r}\right)$$

i.e.

$$\frac{dr}{dv} = \frac{1}{2}\left(1 - \frac{2\lambda v}{r} + \frac{\mu^2v^2+\delta^2v^2}{2r^2} + \frac{\Lambda r^2}{3}\right) \tag{27}$$

Let

$$X_0 = \lim_{\substack{u\to 0\\ r\to 0}} \frac{v}{r} = \lim_{\substack{u\to 0\\ r\to 0}} \frac{dv}{dr}$$

Hence Eq. can be written as

$$X_0 = \lim_{\substack{u\to 0\\ r\to 0}} \frac{dv}{dr} = \frac{2}{1 - 2\lambda X + \frac{\mu^2}{2}X^2 + \frac{\delta^2}{2}X^2 + \frac{\Lambda r^2}{3}}$$

i.e.

$$X_0 = \frac{12}{6-12\lambda X+3(\mu^2+\delta^2)X^2+2\Lambda r^2}$$

$$3(\mu^2 + \delta^2)X^3 - 12\lambda X^2 + (6 + 2\Lambda r^2)X - 12 = 0 \tag{28}$$

The above equation governs the nature of the singularity. If this equation has at least one real and positive root, then the singularity will be naked. If the equation has no positive root, then the collapse ends into a black hole.

In particular, for $\lambda = 0.1,\ \mu = 0.01,\ \delta = 0.02,\ \Lambda = 0.1,\ r = 0.1$, one of the roots of Eq. (28) is $X_0 = 794.9794$, indicating that the gravitational collapse in this case ends into a naked singularity.

IV Strength of the naked singularity

It has seen the nakedness of the singularity in the previous section; in this section we study the strength of singularity. The Clark and Krolak Criterion the strength of singularities has been analyzed and shown that these naked singularities are gravitationally strong. If the naked singularity is not strong then it cannot be considered as a physically reliable singularity and hence such naked singularities may not be considered as counter examples to CCH. A naked singularity is said to be strong if at least along one radial null geodesic with affine parameter k, with k = 0 at the singularity, one should have

$$\Psi = \lim_{k\to 0} k^2 R_{ab}k^a k^b > 0 \tag{29}$$

Where k^a is tangent to the null g**e**odesics and R_{ab} is the Ricci tensor

using Eq. (22) and (23) we write

$$\Psi = \lim_{k\to 0} k^2 R_{ab}k^a k^b = \lim_{k\to 0} k^2 \frac{2\dot{m}}{r^2}(k^v)^2 \tag{30}$$

$$= [4\lambda - X(\mu^2 + \delta^2) \lim_{k\to 0} \left(\frac{kP}{r^2}\right)^2 \quad (31)$$

as singularity is approached, $k \to 0, r \to 0$ *and* $X \to X_0$ and using L-Hospital's rule, we find that

$$\Psi = \frac{4\lambda - (\mu^2+\delta^2)X_0}{1+\frac{\Lambda r^2}{3} - 2\lambda X_0 + \frac{1}{2}(\mu^2+\delta^2){X_0}^2} \quad (32)$$

Thus the singularity is strong if $4\lambda - (\mu^2 + \delta^2)X_0 > 0$

For our particular case (i.e. λ=0.1, μ=0.01, δ=0.02, Λ=0.1, r=0.1, $X_0 = 794.9794$)

We have $4\lambda - (\mu^2 + \delta^2)X_0 = 0.00251$. Thus the naked singularity arising in the radiating dyon solution in the anti-de-sitter space-time is a strong curvature singularity.

V Concluding Remarks

Here we studied the appearance of singularity that is not hidden by horizon this singularity is called a naked singularity. In the present work we have studied strength of singularity in radiating dyon solution on anti-de-sitter background. It has been shown that the singularities formed in gravitational collapse of radiating dyon solution in anti-de-sitter background are not hidden inside the event horizon. Thus one can argue that composite charged field (electric and magnetic charges) and gravitational constant does not affect to gravity and cannot prevent a naked singularity from forming completely, so that CCH actually violets.

Also, using the clark and krolak criteria [25] the strength of singularities has been analyzed and shown that the naked singularities in the composite solution in anti-de-sitter background are gravitationally strong.

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Fractional Derivative Models for Large Deflection of Beams and Plates: A Review Article

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Abstract:

The article investigates the present review of the fractional order thermoelastic problem for large deflection with homogeneous material properties within a finite length plate. The fractional time derivative heat conduction differential equation is mostly solved using numerical or integral transformation technique. The large deflection of a plate when placed on the elastic foundation is formulated from the potential energy equation neglecting the second strain invariant.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords: *temperature distribution, large deflection, fractional order, thermal stress*

1. Introduction:

Although thermo-mechanical phenomena in the majority of practical engineering applications are adequately simulated with the classical Fourier heat conduction equation, there is an important body of problems that require due consideration of thermo-mechanical coupling: it is appropriate in these cases to apply the generalized theory of thermoelasticity. Serious attention has been paid to the generalized thermoelasticity theories in solving thermoelastic problems in place of the classical uncoupled/coupled theory of thermoelasticity. The absence of any elasticity term in the heat conduction equation for uncoupled thermoelasticity appears to be unrealistic since due to the mechanical loading of an elastic body, the strain so produced causes variation in the temperature field. Moreover, the parabolic type of the heat conduction equation results in an infinite velocity of thermal wave propagation, which also contradicts the actual physical phenomena.

2. Research Background :

The equation of equilibrium for the large deflection of a heated plate as derived by Basuli [1] on the basis of Berger's approximations is givenunder uniform load and stationary distribution [i.e. $T(r,\theta,z) = T_0(r,\theta) + g(z)T(r,\theta)$] as

$$D\nabla^2(\nabla^2 - \beta_1^2)\, w(r,\theta,t) = -\frac{E\alpha\, f(\mathrm{l})}{1-\upsilon}\nabla^2 T \tag{1}$$

where

$$f(\mathrm{l}) = \int_{-1/2}^{1/2} z\, g(z)\, dz$$

and β_1^2 is a normalising constant of integration.

In deriving the large deflection equation of a heated plate, we have generalized the aforesaid equation of equilibrium for the transient temperature distribution, as

$$\nabla^2(\nabla^2 - \beta_1^2)\, w(r,\theta,t) = -\frac{\nabla^2 M_T}{D(1-\upsilon)} \tag{2}$$

where $w(r,\theta,t)$ is the normal transverse deflection along the *z*-direction, ∇^2 indicates the two-dimensional Laplacian operator in (r, θ), the constant υ denotes the Poisson's ratio of the plate, $D = E\mathrm{l}^3/12(1-\upsilon^2)$ is the flexural stiffness of the plate and β_1^2 is to be determined from

$$u_{,r} + u/r + [w(r,\theta,t)_{,r}]^2/2 + v_{,\theta}/r + [w(r,\theta,t)_{,\theta}]^2/2r^2 = \beta_1^2 l^2/12 + (1+\upsilon)\alpha N_T \quad (3)$$

The result of the above heat conduction gives thermally induced resultant moment and resultant force as [2, pp. 381]

$$M_T = \alpha E \int_{-l/2}^{l/2} z\,T(r,\theta,z,t)\,dz \quad (4)$$

$$N_T = \alpha E \int_{-l/2}^{l/2} T(r,\theta,z,t)\,dz \quad (5)$$

with α as the coefficient of linear thermal expansion and *E* symbolize Young's Modulus of the material of the plate, respectively.

Eqs. (5) and (6) have to be solved for heated thin simply supported annular sector plate along the edges for which the boundary conditions are

$$w(r,\theta,t)\big|_{r=a} = w(r,\theta,t)_{,r}\big|_{r=a} = 0 \quad (6)$$

$$w(r,\theta,t)\big|_{r=b} = w(r,\theta,t)_{,r}\big|_{r=b} = 0 \quad (7)$$

3. Literature Review:

The development of this theory was accelerated by the advent of second sound effects observed experimentally. In heat transfer problems involving very short time intervals and/or very high heat fluxes, it has been revealed that the inclusion of second sound effects in the original theory yields results that are realistic and very much different from those obtained with the classical theory of elasticity. Analytical approaches have been developed many decades ago for one-dimensional multilayer heat conduction problems based on variables separation and methods of finite integral transformation [3-6]. De Monte [7] applied the eigenfunction expansion approach to solve the unstable heat conductivity problem on a two-dimensional two-layered isotropic slab with homogeneous boundary condition.Recently, on a three-layered solid aerosol particle heated by laser energy, a series of solution have beenobtained for heat conduction [8]. The concise preliminary study in the review is by no means comprehensive. Considering a few typical examples, Benjeddou and Andrianarison [9] introduced the equivalent of the Reissner's mixed variational theorem for thermoelastic media by introducing the transverse thermal field-temperature increase relationship as a restriction through a Lagrange multiplier. Few classical cases of quasi-static and steady-state that contribute to uncoupled heat transfer and thermal stress analysis were also investigated. Blanc and Touratier [10] studied the Discrete Layer approach for thermoelastic responses in linearly elastic multi-layered composite plates using quadratic Lagrangian interpolations to establish the one-dimensional finite displacement. Pelassa and Massabo [11] derived the generalized displacements and stresses on simply supported multi-layered wide plates and beams subjected to steady-state thermal and mechanical loading and obtained the closed-form solutions using a multi-scale homogenized model. Sayyad et al. [12] used an exponential shear deformation concept to intervene the thermal stress analysis of cross-ply laminated composite plates in which Navier's solutions for simply supported boundary conditions subjected to thermal loads varying linearly across the thickness were considered. Li et al. [13] developed a semi-analytical model to predict the evolution of stress within a multilayered coating system during cyclic thermal loading in which temperature gradient through each layer thickness was obtained using finite element analysis. Darban and Massabo [14] used the matrix method to formulate the problems of two-dimensional thermoelasticity in simple supported multi-layered beams and plates having an arbitrary number of layers that may be in imperfect mechanical and thermal contact. Kreja and Sabik [15] developed their finite element software based on the first-order shear deformation principle, incorporating several modifications including the correction of transverse shear rigidity and the deployment of zig zag-type functions. In all previous studies, the

aim was to maximize the structural support's load-carrying capacity either by locating the supports or by adjusting their stiffness using a numerical approximation.

The best methodologies for solving these problems have been obtained withboth analytical and numerical approaches. Nevertheless, owing to either non-availability or logical complexity of the corresponding exact solutions, numerical solutions are favoured and widespread in practice. Rather, restricted use of analytical solutions should not minimize their value to numerical solutions; because correct solutions, probably, offer insight into the problem's governing physics, which is seldom prevalent in any numerical solution. Rather, it is comparatively easier to evaluate closed-form solutions to achieve optimal design options for any particular task of interest. But it is not always possible to obtain consistent analytical solutions. However, it is much desired sincegreater information can be achieved through the mathematical process of an analytical solution relative to a discrete numerical solution.It can even be used as a guideline to evaluate and verify the numerical algorithms. Even though useful, analytical approaches are rarely seen in several multi-stacked or multi-layered geometries in multi-dimensional transient thermoelastic problems.

Meanwhile, it has also been discovered that fractional calculus is efficiently used to change several existing models of physical processes, see Hilfer [16], Sherief et al. [17], Tenreiro et al. [18]. It can also be stated that the whole theory of fractional derivatives and integrals was developed in the second half of the 19th century.A good overview of the subject can be noticed in Podlubny [19], Kaczorek [20-21], Sherief and El-Latief [22], Siedlecka and Kukla [23], Abbas [24], Xiong and Niu [25], Mahakalkar et al. [26], Mittal and Kulkarni [27], Hussein [28] and so on.

4. Conclusion:

During the literature review, it was noted that most of the papers on thermoelasticity were taken to derive the temperature, displacement, and stresses in different types of solid due to different thermal loading. Here there is ample possibility of introducing an fractional-order derivative still exist. By intorduing fractional order approach to derive the temperature, displacement and stresses in different types of solid will provide a new dimension in thermoelastic world. Few investigations were cited so far for the determination of the temperature, displacements and its stresses for solid or composite multilayered bodies. The theoretical and experimental studies of the heated structural profile are of considerable practical importance in a wide range of fields such as mechanical, aerospace and food engineering fields throughout the past years. The further analysis of such fractional-order problems may, as it seems, stimulate evaluation of methods. Hence it is strongly desired the rigorous study of fractional-order behaviour of homogenous and nonhomogeneous of different bodies in the different coordinate system with or without an internal heat source.

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Thermoviscoelastic media with fractional-order effect: An overview & prospective

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Abstract:

The article investigates the present review of thermoviscoelastic theories with fractional order derivative effects on different objects. The main theme of the thermoviscoelastic problems is to establish operational methods to solve the governing differential equations. In the thermoviscoelastic problems, we have considered a few practical problems of technical interest, taking into account offractional order derivative effect by using numerical or exact procedures.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords:*temperature distribution, thermal stresses, thermoviscoelastic,fractional order, vibration, deflection, integral transform.*

1 Introduction:

Thermoelasticity investigates the relation between a material's elastic properties and temperature or between its thermal conductivity and thermal stress. Another complex problem faced by engineers and applied mathematicians is finding solutions to the fundamental problems in their field of study, partial differential equations in some cases. Using the well-known principles of classical mechanics and thermodynamics, the body's deformation undergoes the resultant stresses under the combined influence of external loads, body forces, and heat conduction is calculated. This relationship of temperature and displacement fields, where mechanical and thermal causes cause deformation, results in 'Thermoelasticity'. Temperature variations allow the material to undergo thermal effects. Some of these are thermal strains, stress, and deformation. Thermal deformation means that as the thermal energy and/or temperature of the material increases, so does the vibration of the atom or molecules and this changes in vibration resulting in the stretching of molecular bonds, which causes the material to expand, of course, if the thermal energy and temperature of the material decrease, the material will compress or contract. Thermal effects produce heat transfer by conduction within an elastic surface, and this distribution of thermal energy produces a temperature field within the material. Many solids undergo a volumetric transition with variance in temperature, and thus the presence of a temperature range typically causes stresses caused by limit or interval constraints. If the temperature variation is high enough, these stresses can reach levels that can lead to structural failure, especially in brittle materials. Therefore, understanding stress analysis can be helpful for several issues, including high-temperature variation.

The classical coupled dynamical theory of thermoelasticity wasdeveloped by Biot [1] by assuming that the elastic changes affect the temperature and vice-versa. However, this theorywasbasedon the Fourierlaw of heat conduction. Therefore whenthis theorywascombined withthelawofenergy conservation, aparabolic type heat conductione quation was obtained and predicted an infinite speed of the thermal signal, which contradicted the physical fact.The generalized theories of thermoelasticity have come into existence and attracted several researchers during the last few decades. The generalized theories were specially formulated to account for the finite speed of propagation of thermal signals, which waster medas a second sound effect. In this respect, wewould like to mention here one of the earliest development of the second sound theory for ther moelasticity by Fox [2], in which heapplied the principles of modern continuum the rmodynamics. Further, the two well established and well-studied generalized ther mo-elasticity the ories were also developed by Lordand Shulman [3] and Green and Lindsay [4]. Sherief [5] obtained the fundamental solution of generalized thermoelasticity with one relaxation time. To review and present generalized theories, one can refer to Ignaczak [6] and Chandrasekharaiah [7]. The uniqueness theorem for generalized thermo-viscoelasticity withone relaxation

timeunder different conditions is proved by Ezzat and El-Karamany [8,9]. El- Karamany and Ezzat [10,11] investigated the propagation of discontinuities of solutions in this theory. Ezzat [12] introduced a new model of the equations of generalized thermo-viscoelasticity for an electrically conducting is otropic media permeated by a primary uniformmagnetic field, considering the volume's rheological properties. Among the contributions tothe generalized theory are Ezzat et al.[13, 14], Othman et al.[15], Lata et al.[16], Kumari and Mukhopadhyay [17], El-Karamany and Ezzat [18] and Abbas and Kumar [19].

Viscoelasticity is the material property that exhibits viscous and elastic characteristics when undergoing deformation. Viscous materials, like honey, resist shear flow and strain linearly with time when stress is applied. Elastic materials strain when stretched and quickly return to their original state once the stressisre moved. Viscoelastic materials have elements of both of these properties and, assuch, exhibittime-dependent strain. At the same time, elasticity is usually the result of bond stretching a long crystallographic plane in anordered solid; viscosity results from the diffusion of atoms or molecules inside an amorphous material [20]. Linear viscoelastic materials are rheological materials that exhibit time-temperature rate-of-loading dependence. When their response is a function of the current input and the current and past input history, the characterization of the viscoelastic response can be expressed using the convolution (hereditary)integral. The mechanical-model representation of linear viscoelastic behaviour results was investigated by Gross [21]. One can refer to Atkinson and Craster [22] to review fracture mechanics and generalizations to the viscoelastic materials. A general review of time-dependent material properties has been exhibited in Refs. [23–26]. A further literature review has been described as 'the foundation and inspiration for substantive, useful research' will be done in later sections.

2 Research Background :

The system of governing equations of the linear theromoviscoelasticity theory with fractional order of heat transfer consists of the following [27]:

i. The equation of motion

$$\sigma_{ji,j} = \rho u_{i,tt} \tag{1}$$

ii. The constitutive equation

$$S_{ij}(x,t) = \int_0^t R(t-\xi)\frac{\partial e_{ij}(x,\xi)}{\partial \xi}d\xi = \hat{R}(e_{ij}) \tag{2}$$

in which

$$S_{ij} = \sigma_{ij} - \frac{\sigma_{kk}}{3}\delta_{ij}, \varepsilon_{ij} = \frac{1}{2}(u_{i,j} + u_{j,i}), e_{ij} = \varepsilon_{ij} - \frac{e}{3}\delta_{ij}, e = \varepsilon_{kk}, x = (x_1, x_2, x_3) \tag{3}$$

and $\hat{R}(t)$ is the relaxation modulus functions such that $R(\infty) > 0$ given by

$$\hat{R}(t) = 2\mu(1 - A\int_0^t f(t)\,dt). \tag{4}$$

The function $f(t)$ is taken in the form

$$f(t) = \exp[-\beta t]t^{a^*-1} \tag{5}$$

where $0 < a^* < 1, \beta > 0, 0 \le A < \Gamma(a^*)$.

iii. The stress-strain temperature relation

Assuming that the relaxation effects of the volume properties of the material are ignored, we have

$$\sigma = K\left[e - 3\alpha_T\left(1 + \frac{\nu^\alpha}{\alpha!}\frac{\partial^\alpha}{\partial t^\alpha}\right)\upsilon\right] \tag{6}$$

iv. The fractional heat equation

$$\kappa\upsilon_{,ii} = \rho C_E\frac{\partial}{\partial t}\left(1 + \frac{\nu^\alpha}{\alpha!}\frac{\partial^\alpha}{\partial t^\alpha}\right)\upsilon + \gamma T_0\frac{\partial}{\partial t}\left(1 + n\frac{\tau^\alpha}{\alpha!}\frac{\partial^\alpha}{\partial t^\alpha}\right)e \tag{7}$$

where n is equal to zero or one, and a comma denotes material derivatives.

3 Literature Review:

Many researchers have studied the development and applications of fractional-order equations. The fascinating and recent applications of fractional differential equations in physics, chemistry, biology, engineering, finance, and other research fields built over the last few decades are now not difficult to find. Some of the applications include: diffusion processes [28,29], mechanics of materials [30,31], combinatorics [32,33], inequalities [34], analysis [35], calculus of variations [36-41], signal processing [42], image processing [43], advection and dispersion of solutes in porous or fractured media [44], modeling of viscoelastic materials under external forces [45], bioengineering [46], relaxation and reaction kinetics of polymers [47], random walks [48], mathematical finance [49], modeling of combustion [50], control theory [51], heat propagation [52], modeling of viscoelastic materials [53] and even in areas such as psychology [54,55]. It is easy to find hundreds, if not thousands, of new applications in which the fractional calculus approach is more than welcome.

Differential equations of fractional order have been the focus of many studies because of their continuous appearance in different applications in fluid mechanics, viscoelasticity, science, material science and building. Ezzat [56] recently established a new fractional heat conduction equation model utilizing the Taylor–Riemann series expansion of time-fractional order. Sherief etal.[57] introduced afractional formula of heat conduction, proved a uniqueness theorem, and derived a reciprocity relation and a variational principle. Onecanreferto Ezzat and Fayik [58]and Ezzatand El-Bary[59] for a survey of fractional calculus applications. Abbas [60] considered the fractional thermoelastic problem in the presence of a constant magnetic field exposed to a moving plane of heat source. Magneto electro-thermoelasticity was studied in the contex to fanewconsiderationoffractional Green–Naghdiheatconduction law without energy dissipation by Hendy et al. [61]. Yu et al. [62] solved a one-dimensional problem in fractional order generalized electro-magneto-thermoelasticity. Boetal.[63] introducedanovelcompactnumericalmethodforsolvingthe two-dimensional non-linear fractional reaction–subdiffusion equations, while Zhangetal.[64]introduced a time-space spectral method for the time-space fractional Fokker–Planck equation and its inverse problem.

A great number of computational techniques may be found in the research of viscoelastic problems in Danyluketal.[65], Vinogradov and Milton[66], Ashishetal.[67],Aldawody etal.[68]and Sheriefetal.[69]. One of the most popular methods is the Laplace transform, which is a viable strategy for viscoelasticity since the equations may be transformed into pseudo-elastic ones. However, this procedure presents some difficulties when viscous parametersvarya longtime or when imposed by complicated time-dependent boundary conditions. Many inverse transforms cannot be solved analytically.Subsequently, the numerical method for the Laplace inverse change is quickly created and connected. De Chant [70]discussed the limitations of the numerical inversion method in the face of discontinuities and asymptotic methods.Syngellakis[71]pointed out that numerical inversions of the Laplace transform by employing the finite-element and boundary element are effective approximate methods.Temel[72]obtained some solutions in the realspacere sorting the Durbin's numerical method of the inverse Laplace transform. Because of the complexity of the constitutive relations, it is challenging to find analytical solutions of viscoelasticity, and the numerical method is taken into accountas of late withth eassistance of the quick advancement of the PC innovation, especially the boundary element method, which is given in El-Karamany and Ezzat [73,74]. WangandAi[75] established an extended precise integration model to analyse the thermo-mechanical behaviour of multi-layered transversely isotropic materials in the Cartesian coordinate system. Aiand Wang[76]introduced ananalytical layer element solution to axisymmetric thermal consolidation of multi-layered porous thermoelastic media containing a deeply buriedheat source.

4 Conclusion:

During the literature review, it was noted that the expected thermal profile addresses thermoviscoelastic media with a fractional-order effect. The literature still fails to provide the exact solution of the fractional heat conduction equation in two or three-dimensional problems using fractional-order derivate. The present work

determines the thermal profile by solving heat conduction equations throughout thermodynamics that provide an exact solution to thermoviscoelastic problems.

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Thermoelastic media with memory-dependent derivative effect: An overview & prospective

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Abstract:

The article investigates the present review of thermoelastic theories with memory-dependent derivative effects on different objects. The main theme of the thermoelastic problems is to establish operational methods to solve the governing differential equations. In the thermoelastic problems, we have considered a few practical problems of technical interest, taking into account of memory-dependent derivative effect by using numerical or exact procedures.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords: *temperature distribution, thermal stresses, memory-dependent derivative vibration, deflection, integral transform.*

Introduction:

In several areas of engineering, solid objects are commonly used as integral structural elements. With thermal loading, such structural elements are likely to be subjected to many forms of static loading or excitation, such as seismic, mechanical, hydrodynamic, blast, aerodynamic, etc. Engineers and scientists worldwide are making unwavering efforts to develop and build economic and productive systems with a very low likelihood of failure. Thermal effects produce heat transfer by conduction within an elastic surface, and this distribution of thermal energy produces a temperature field within the material. Many solids undergo a volumetric transition with variance in temperature, and thus the presence of a temperature range typically causes stresses caused by limit or interval constraints. If the temperature variation is high enough, these stresses can reach levels that can lead to structural failure, especially in brittle materials. Therefore, understanding stress analysis can be helpful for several issues, including high-temperature variation.

Thermoelasticity investigates the relation between a material's elastic properties and temperature, or between its thermal conductivity and thermal stress. Another complex problem faced by engineers and applied mathematicians is finding solutions to the fundamental problems in their field of study, which is partial differential equations in some cases. Using the well-known principles of classical mechanics and thermodynamics, the body's deformation undergoes the resultant stresses under the combined influence of external loads, body forces, and heat conduction is calculated. This relationship of temperature and displacement fields, the situation where mechanical and thermal causes cause deformation, results in the word 'Thermoelasticity'. Temperature variations allow the material to undergo thermal effects. Some of these are thermal strains, stress, and deformation. Thermal deformation means that as the thermal energy and/or temperature of the material increases, so does the vibration of the atom or molecules and this changes in vibration result in the stretching of molecular bonds, which causes the material to expand, of course, if the thermal energy and temperature of the material decrease, the material will compress or contract.

The enormous demand for science and engineering works deals with Fractional-Order Equations' dynamical systems that involve derivatives and non-integer integrals. They explain various substances' memory and hereditary properties and cope with the tremendous demand for science and engineering work. Meanwhile, it is also discovered that fractional calculus is used effectively to modify many current models of physical processes, see Hilfer [1], Sherief et al. [2], Tenreiro et al. [3]. It can also be claimed that the entire theory of fractional derivatives and integrals was established in the second half of the 19th century. A good overview of the subject will be noticed in Podlubny [4], Kaczorek [5-6], Sherief and El-Latief [7], Siedlecka and Kukla [8],

Abbas [9], Xiong and Niu [10], Mahakalkar et al. [11], Mittal and Kulkarni [12], Hussein [13] and so on. The memory effect comes from the convolution operator presented in the most popular Riemann-Liouville fractional integral, which is defined as $I^{RL}_{\alpha,\alpha} f(x) = (1/\Gamma(\alpha))\int_a^x (x-t)^{\alpha-1} f(t)dt = \Phi_\alpha \bigstar f(x)$, where $\bigstar$ denotes the convolution operator, α is the fractional-order and Φ_α is the standard power function given as $\Phi_\alpha(t) = t^{\alpha-1}/\Gamma(\alpha)$. A further literature review has been described as 'the foundation and inspiration for substantive, useful research' will be done in later sections.

Research Background :

The classic heat conduction theory is based on the Fourier law [14,15]

$$q(x,t) = -k\nabla T(x,t) \qquad (1)$$

in which $q(x,t)$ is the heat flux vector, x denotes the point in the considered region, t is the time, k is the thermal conductivity of the material, ∇ is the gradient operator, and $T = T(r,t)$ is the temperature, respectively.

Introduction of single-phase-lag to evade discrepancy between the mathematical model and the observations [16-18]

$$q(x,t+\tau) = -k\,\nabla T(x,t) \qquad (2)$$

in which τ is the phase lag of the heat flux or so-called relaxation time.

Expanding the left-hand side of Eq. (2) into the Taylor series with respect to the variable τ, one obtains [19] as

$$q(x,t) + \frac{\tau^\alpha}{\Gamma(1+\alpha)}\frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\,\nabla T(r,t), 0 < \alpha \le 1 \qquad (3)$$

where α is introduced to keep the dimension in order.

The fractional generalization [20,21] of the classical Cattaneo model by introducing fractional Taylor formula [22] as

$$q(x,t) + \tau^\alpha \frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\,\nabla T(x,t), 0 < \alpha \le 1 \qquad (4)$$

where without losing the generality $\Gamma(1+\alpha)$ appearing in Taylor series is merged in τ^α terms, Γ is the gamma function, α is introduced to keep the dimension in order and $\partial^\alpha / \partial t^\alpha$ is the fractional time derivative based on Caputo fractional definition [23].

For the limiting case of $\tau = 0$ (or $\alpha = 0$), Eq. (4) reduces to classical Fourier heat conduction and the standard Cattaneo heat conduction equation for $\alpha = 1$ as

$$q(x,t) + \tau\frac{\partial}{\partial t} q(x,t) = -k\,\nabla T(x,t) \qquad (5)$$

The heat conduction equation in the context of fractional-order generalized thermoelasticity proposed by Sherief [24] gives

$$q(x,t) + \tau\frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\,\nabla T(x,t), 0 < \alpha \le 1 \qquad (6)$$

Here it should be noted that the estimated ranges [25] of relaxation time (in seconds) usually involves $(10^{-11} : 10^{-14})$ for metals, $(10^{-8} : 10^{-10})$ for gases, and $(10 : 10^{2})$ for porous materials, respectively.

Wang and Li [26] have introduced a memory-dependent derivative (MDD). The first order $(\alpha = 1)$ of function f which is simply defined in an integral form of a common derivative with a kernel function $K(t-\zeta)$ on a slipping interval $[t-\omega, t]$ in the form

$$q(x,t) + \tau D^{(1)}_\omega q(x,t) = -k\,\nabla T(x,t) \qquad (7)$$

where

$$D_{\omega}^{(1)} f(x,t) = \frac{1}{\omega} \int_{t-\omega}^{\omega} K(t-\zeta) f'_{\zeta}(x,\zeta) dx, \ \omega > 0,$$

$D_{\omega}^{(1)} \to \partial / \partial t$, ω is delay time, and $K(t-\zeta)$ is the kernel function.

Heat conduction equation in MDD thermoelasticity introduced by Ezzat [27]

$$q(x,t) + \omega D_{\omega}^{(1)} q(x,t) = -k \nabla T(x,t) \quad (8)$$

By combining Eq. (8) with the energy conservation equation

$$-\Delta \cdot q(r,t) = \rho C_v \frac{\partial T}{\partial t}(r,t) \quad (9)$$

Now combining Eq. (8) and (9) leads to the heat conduction equation as

$$\kappa \nabla T(x,t) = (1 + \tau_{\omega} D_{\omega}) \rho C_v \frac{\partial T}{\partial t}(r,t) \quad (10)$$

where $\kappa = \rho C_v / k$ is the thermal diffusivity, ρ is the density of the material, C_v is the specific heat capacity, and $\Delta = \nabla^2 = \nabla \cdot \nabla$ is Laplace operator is a second-order differential operator.

Literature Review:

Many researchers have studied the development and applications of fractional-order equations. The fascinating and recent applications of fractional differential equations in physics, chemistry, biology, engineering, finance, and other research fields built over the last few decades are now not difficult to find. Some of the applications include: diffusion processes [28,29], mechanics of materials [30,31], combinatorics [32,33], inequalities [34], analysis [35], calculus of variations [36-41], signal processing [42], image processing [43], advection and dispersion of solutes in porous or fractured media [44], modeling of viscoelastic materials under external forces [45], bioengineering [46], relaxation and reaction kinetics of polymers [47], random walks [48], mathematical finance [49], modeling of combustion [50], control theory [51], heat propagation [52], modeling of viscoelastic materials [53] and even in areas such as psychology [54,55]. It is easy to find hundreds, if not thousands, of new applications in which the fractional calculus approach is more than welcome.

Fractional-order derivatives have been successfully used in mechanics to model memory-effect damping forces or to characterize state feedback controllers, as demonstrated by Bagley and Torvik [56]. It is noticed by Wang and Hu [57] that the term fractional-order derivative whose order is between 0 and 2 often acts as a damping force in fractional-order vibration systems with a single degree of freedom. Fractional calculus has therefore been effectively used to change many current physical process models. The first use of fractional derivatives was made by Abel [58], who applied fractional calculus to the solution of the integral equation of the tautochrone problem formulation. Fractional derivatives were used by Caputo [59,60] and Caputo and Mainardi [61,62], and their findings were in substantial agreement with the empirical evidence for describing viscoelastic materials.

Some authors have worked on fractional derivative in the thermoelastic analysis of most recent literature, which can be summarised below: Povstenko [63] proposed a quasi-static uncoupled theory of thermoelasticity based on the heat conduction equation with a time-fractional derivative of order α. Povstenko [64] formulated the theory of diffusive stress based on the time-fractional diffusion equation. Povstenko [65] also obtained the temperature distribution and thermal stresses in an infinite medium with a spherical cavity using the integral transform technique.Youssef and Al-Lehaibi [66] developed a novel theory for the generalized thermoelasticity model based on fractional-order generalized thermoelasticity. Similarly, Youssef and Al-Lehaibi [67] constructed a model of an elastic material with constant parameters in the half-space in the context of the fractional-order generalized thermoelasticity theory. Sherief et al. [68] developed a new theory of thermoelasticity using the methodology of fractional calculus. Ezzat and El-Karamany [69] attempted to generalize these results to include a magnetic field's effects in two-temperature thermoelasticity. Youssef and Al-Lehaibi [70] developed a mathematical model of an elastic material with a cylindrical cavity in the context

of the fractional-order generalized thermoelasticity theory. Povstenko [71] obtained the theory of thermal stresses based on the heat conduction equation with the Caputo time-fractional derivative of order $0 < \alpha \leq 2$. Youssef [72] found a half-space filled with an elastic material taken as constant elastics' parameters in the standard model of thermoelasticity in fractional-order. Sur and Kanoria [73] constructed a new theory of two-temperature generalized thermoelasticity in the context of a new consideration of heat conduction with fractional orders.Youssef [74] considered a half-space filled with an elastic material with constant elastic parameters, and the governing equations were written in the form of the two-temperature generalized thermoelasticity theory of fractional order. Youssef et al. [75] developed a cylindrical nano-beam mathematical model with constant elastic parameters with fractional order heat conduction. Wang e al. [76] studied thermoelastic behaviours involving the effect of thermal inertia during the macro- and micro-scales heat conduction. Bhattacharya and Kanoria [77] obtained the two-temperature thermo-elasto-diffusion interaction inside a spherical shell in the context of fractional order generalized thermoelasticity. Zenkour and Abouelregal [78] determined the thermoelastic displacement, stress, conductive temperature, and thermodynamic temperature in an infinite isotropic elastic body with a spherical cavity based on the two-temperature generalized thermoelasticity theory (2TT). Youssef [79] derived a new theory of thermoelasticity based on the fraction order of strain, which is considered a new modification to Duhamel-Neumann's stress-strain relation. Bachher [80] considered a one-dimensional problem for a homogeneous and isotropic thermoelastic infinite porous material under the dependence of modulus of elasticity and thermal conductivity on reference temperature subjected to periodically varying heat sources in the context of the fractional-order generalized thermoelasticity with one relaxation time parameter. Santra et al. [81] proposed the three-dimensional generalized thermoelastic coupled problem for a homogeneous isotropic and thermally conducting thermoelastic medium under the effect of rotation in fractional context order generalized thermoelasticity.Yadav et al. [82] employed the theory of generalized thermoelasticity with fractional order strain to study the problem of one-dimensional disturbances in a viscoelastic solid in the presence of a moving internal heat source and subjected to a mechanical load. Bassiouny and Abouelnaga [83] investigated the thermoelastic properties of a sandwich structure made of three piezoelectric layers in the context of fractional-order theory two-temperature generalized thermopiezoelasticity. Gupta and Das [84] applied the eigenvalue approach method and Laplace transform, a general solution scheme for the thermoelastic deformation of an unbounded transversely isotropic medium fractional-order generalized thermoelasticity with an instantaneous heat source. Sheoran and Kundu [85] presented a comprehensive review of relevant literature to highlight the role of fractional calculus in thermoelasticity.Abbas [86] investigated the temperature, displacement, and stresses due to thermal shock loading on the inner surface cavity in an infinite medium with a cylindrical cavity in the context of the fractional-order generalized thermoelasticity theory. Bachher and Sarkar [87] studied the theory of generalized thermoelasticity based on the heat conduction equation with the Caputo time-fractional derivative is used to study the magneto-thermoelastic response of a homogeneous isotropic two-dimensional rotating elastic half-space solid. Povstenko et al. [88] studied a control problem of thermal stresses in an infinite cylindrical body in which the time-fractional heat conduction equation defined the temperature distribution with the Caputo derivative of the order $0 < \alpha \leq 2$. Xiong and Niu [89] developed the principle of fractional-order generalized thermoelastic diffusion for anisotropic and linear thermoelastic diffusive media. Chirilă and Marin [90] continued the work on dipolar thermoelastic materials, which are a particular case of multipolar continuum mechanics. The fractional-order derivative effect on a two-dimensional problem with weak, normal and strong conductivity due to thermal shock was examined by Abbas [91].

Conclusion:

The literature reviewed noted that the use of the expected thermal profile addresses thermomechanical problems with the memory response effect. The literature still fails to provide the exact solution of the heat conduction equation in two or three-dimensional problems using memory-dependent derivate. The thermal profile is determined by solving heat conduction equations with memory-dependent derivative effects throughout thermodynamics that provide an exact solution to thermoelastic problems.

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Thermoelastic effect of moving heat source in a hollow cylinder with time-fraction derivatives

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Abstract:

The present analysis comprises the mathematical model designed on thermal response in a thin hollow cylinder by a time-fractional thermo-elasticity of order $0 < \alpha \le 2$ *and confined to a region* $R: a \le r \le b, 0 \le z \le h, 0 \le \phi \le 2\pi$ *. The thin hollow cylinder is further analyzed utilizing an internal moving heat source assumed to be in a circular trajectory of radius* r_1 *, in which* $a \le r_1 \le b$ *around the centre of the cylinder with constant angular velocity* ω *. The mathematical calculation found the solution using integral transform and Greens theorem for the temperature and stress. The resultant of this calculation provides a series form of Bessel function and trigonometric function.*

Keywords*: Thermal stress, hollow cylinder, fractional derivative, internal heat sources, integral transform*

1. Introduction:

The breakdown of classical thermoelasticity countered by Fourier type heat conduction is observed in many physical processes such as medium of amorphous nature materials [1,2] like glass, and having some porosity, colloids etc. The fractional-order derivatives and integral technique are always preferred over the classical approach in constructing a mathematical model. Popovych [3] has discussed a thin thermosensitive plate for making the model on heat fields. Popovych [4] found the solution of the heat conduction equation to deal with the problems of thermo-sensitive bodies with convective heat transfer. Popovych [5, 6] determined solutions of heat-conduction in thermo-sensitive bodies. Youssef [9] established the uniqueness theorem and devised a new construction of analysis of thermoelasticity with respect to a fractional order. Jiang and Xu [10] investigated the time-fractional heat conduction equation with a time-fractional derivative for the general orthogonal curvilinear coordinate.

Meanwhile, Ezzat [11,12] elaborated on the uses of the concept of fractional thermoelasticity for porous asphaltic materials. Kumar and Kamdi [23] worked on finding the temperature distribution and thermal stresses by using the finite Marchi-Zgrablich and Laplace transform technique. An annular fin's two-dimensional thermoelastic problems were designed with the fractional-order derivative. Kumar and Kamdi [24] analyzed a problem on a finite hollow cylinder to evaluate the temperature and thermal stresses in the context of fractional order. Thakare et al. [25] considered nonhomogeneous thick hollow cylinders and obtained time-fractional heat transfer analysis employing internal heat generation and thermal stresses. Thakare and Warbhe [26] attempted to analyze a nonlocal Caputo type time-fractional heat conduction equation with internal moving heat sources and presented a mathematical model of a thin circular plate. The same result and study proof have been depicted in [7, 8, 14-21].

The current article elaborates on thermal behaviour in the thin hollow cylinder by using *h* Robin's boundary condition connected with the internal moving heat source. The solution to the heat conduction equation in the designed problem was obtained with the help of the Integral transform technique and Green's theorem. The resultant solution is found to contain a series form of Bessel function and trigonometric function. This study finds a vital role in an industry where materials are in the vicinity of heat.

2. Formulation:

A thin hollow isotropic cylinder with inner radius *a*, outer radius *b* and thickness *h* is defined in space $R: a \le r \le b, 0 \le z \le h, 0 \le \phi \le 2\pi$. An internal moving heat source along the circular trajectory of the radius r_1 is moving with constant angular velocity ω inside the cylinder. The heat generation by means of moving heat source activity may depend upon position and time in the form $g(r,\phi,z,t)\ w/s^3$. The thermoelastic problem is presented in the form of a time-fractional heat conduction equation of Caputo type of order α . It is defined for the function $f(t)$ by [14] as

$$\frac{d^\alpha f(t)}{dt^\alpha} = \frac{1}{\Gamma(n-\alpha)} \int_0^t (t-\tau)^{n-\alpha-1} \frac{d^n f(\tau)}{d\tau^n} d\tau, \quad t > 0 \ , \ n-1 < \alpha < n, \tag{1}$$

where the Laplace transform rule as given as

$$L\left\{\frac{d^\alpha f(t)}{dt^\alpha}\right\} = s^\alpha L\{\bar{f}(s)\} - \sum_{k=0}^{n-1} f^{(k)}(0^+)\, s^{\alpha-1-k}, \quad n-1 < \alpha < n. \tag{2}$$

in which the transform parameter is *s* and *n* refers to a positive integer.

The equation for temperature distribution in a thin hollow cylinder as a time-fractional differential equation of heat conduction with heat generation term is presented as follows:

$$\nabla^2 T + g_s^i \frac{1}{2\pi k r} \delta(r-r_1)\delta(\phi-\phi')\delta(z-\xi)\delta(t-\tau) = \frac{1}{k'}\frac{\partial^\alpha T}{\partial t^\alpha} \tag{3}$$

where

$$\nabla^2 = \frac{\partial^2}{\partial r^2} + \frac{1}{r}\frac{\partial}{\partial r} + \frac{1}{r^2}\frac{\partial^2}{\partial \phi^2} + \frac{\partial^2}{\partial z^2}$$

and volumetric heat source $g(r,\phi,z,t)$ in cylindrical coordinates is given by

$$g(r,\phi,z,t) = g_s^i \frac{1}{2\pi r} \delta(r-r_1)\delta(\phi-\phi')\delta(z-\xi)\delta(t-\tau)$$

Here g_s^i denotes an instantaneously moving heat source fixed at (r_1, ϕ', ξ) and releasing its energy spontaneously at time τ, $T = T(r,\phi,z,t)$ is temperature distribution, *k* is the thermal conductivity of the material of the cylinder, $k' = k/\rho c_p$ is thermal diffusivity, ρ *is* density, c_p is the specific heat of the material.

Also

$$\phi' = \omega t \tag{4}$$

with initial conditions as,

$$T = f(r,\phi,z) \quad at\ t = 0, r = -\infty;\ 0 < \alpha \le 2$$
$$\frac{\partial T}{\partial t} = 0, \qquad at\ \ t = 0\ , \qquad 1 < \alpha \le 2 \tag{5}$$

and corresponding boundary conditions,

$$k\frac{\partial T}{\partial r} - h_1 T = 0 \quad at\ r = a \tag{6}$$

$$k\frac{\partial T}{\partial r} + h_1 T = 0 \quad at\ r = b \tag{7}$$

$$k\frac{\partial T}{\partial z} - h_1 T = 0 \quad at\ z = 0 \tag{8}$$

$$k\frac{\partial T}{\partial z} + h_1 T = 0 \quad at\ z = h \tag{9}$$

where h_1 denotes the heat transfer coefficient of the cylinder.

The above equations (3) to (9) constitute the mathematical formulation of the problem under consideration.

3. Formulation of thermoelastic Problem

Following [7], on introducing a thermal stress function χwe get

$$\sigma_{rr} = \frac{1}{r}\frac{\partial \chi}{\partial r} + \frac{1}{r^2}\frac{\partial^2 \chi}{\partial r^2} \tag{10}$$

$$\sigma_{\phi\phi} = \frac{\partial^2 \chi}{\partial r^2} \tag{11}$$

$$\sigma_{r\phi} = -\frac{\partial}{\partial r}\left(\frac{1}{r}\frac{\partial \chi}{\partial r}\right) \tag{12}$$

For a traction free surface

$$\sigma_{rr} = 0,\ \sigma_{r\phi} = 0\ at\ r = a\ or\ r = b \tag{13}$$

where

$$\chi = \chi_c + \chi_p \tag{14}$$

in which χ_c and χ_p denotes complementary and particular solutions.

Next,

χ_c Satisfies the equation $\nabla^4 \chi_c = 0$ (15)

χ_p Satisfies the equation $\nabla^4 \chi_p = -\lambda E \nabla^2 \Gamma$ (16)

in which temperature change is given as $\Gamma = T - T_i$, T_i refers for initial temperature. Further, in the case of a thin cylinder, the thickness can be neglected.

We have Laplace operators as

$$\nabla^2 = \frac{\partial^2}{\partial r^2} + \frac{1}{r}\frac{\partial \chi}{\partial r} + \frac{1}{r^2}\frac{\partial^2}{\partial \phi^2}$$

4. Solution

In order to find the solution to the heat conduction equation, we first define the integral transform of $T(r,\phi,z,t)$ as

$$\bar{T}(\beta_m, v, a_n, t) = \int_R T(r,\phi,z,t) R_v(\beta_m r)\cos v(\phi - \phi')\, z(a_n z) dv \tag{17}$$

with its inverse as

$$T(r,\phi,z,t) = \sum_{m,n,v=0}^{\infty} \frac{\bar{T}(\beta_m, v, a_n, t) R_v(\beta_m r)\cos v(\phi - \phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \tag{18}$$

$$R_v(\beta_m r) = J_v(\beta_m r)[\beta_m Y_v'(\beta_m b) + H J_v(\beta_m b)] - Y_v(\beta_m r)[\beta_m Y_v'(\beta_m b) + H J_v(\beta_m b)] \tag{19}$$

where

$$H = \frac{h_1}{k}$$

and

$$z(a_n z) = \alpha_n \cos(a_n z) + H \sin(a_n z) \tag{20}$$

Normalization integral is denoted as

$$N(\beta_m) = \int_a^b r\left[R_v(\beta_m r)\right]^2 dr$$

$$N(\beta_m) = \frac{\frac{2}{\pi^2}\left\{\left[\frac{b^2(H^2+\beta_m^2)-v^2}{\beta_m^2 b^2}\right]\left[\beta_m J_v'(\beta_m a) + HJ_v(\beta_m a)\right]^2\right.}{\left[\beta_m J_v'(\beta_m a) + HJ_v(\beta_m a)\right]^2}$$

$$\left. - \frac{\left[\frac{a^2(H^2+\beta_m^2)-v^2}{\beta_m^2 a^2}\right]\left[\beta_m J_v'(\beta_m \beta) + H J_v(\beta_m \beta)\right]^2\right\}}{\left[\beta_m J_v'(\beta_m a) + H J_v(\beta_m a)\right]^2} \tag{21}$$

Next,

$$N(V) = \int_0^{2\pi}\left[\mathrm{Cos}\, v(\phi - \phi')\right]^2 d\phi = \pi \tag{22}$$

$$N(a_n) = \int_0^h \left[Z(a_n z)\right]^2 dz = \left(a_n^2 + H^2\right)\frac{h}{2} + H \tag{23}$$

where β_m denotes the roots of the transcendental equation

$$\begin{aligned}&[\beta_m J_v'(\beta_m a) + HJ_v(\beta_m a)][\beta_m Y_v'(\beta_m b) + HY_v(\beta_m b)]\\ &-[\beta_m J_v'(\beta_m b) + HJ_v(\beta_m b)][\beta_m Y_v'(\beta_m a) - HY_v(\beta_m a)] \;= 0\end{aligned} \tag{24}$$

and a_n denotes the roots of the transcendental equation

$$\tan a_n h = \frac{2\alpha_n H}{a_n{}^2 - H^2} \tag{25}$$

and $v \in W$, in which W is a set of whole numbers.

By taking the integral transform of equation (3) and using following Green's theorem given in [6], one obtains

$$\int_R \nabla^2 T \varphi_k \, dv = \int_R \nabla^2 T \varphi_k \, dv + \sum_{i=1}^{N}\int_{s_1}\left\{\psi_k \frac{\delta T}{\partial n_i} - T\frac{\delta \psi_k}{\partial n_i}\right\} ds_i \tag{26}$$

$$\frac{d^\alpha \bar{T}}{dt^\alpha} + k'(\beta_m^2 + a_n^2)\bar{T} = \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(a_n \xi)\partial(t - \Gamma) \tag{27}$$

Applying Laplace transform and using its inversion formula to equation (27) by using the initial condition, one obtains

$$\bar{T} = \bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)\left(t-\tau\right)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)\left(t-\tau\right)^\alpha]$$

By taking inverse integral transform, we obtain

$$T = \sum_{m,n,v=0}^{\infty} \frac{R_v(\beta_m r)\cos v(\phi-\phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \quad (28)$$

$$\Gamma = \sum_{m,n,v=0}^{\infty} \frac{R_v(\beta_m r)\cos v(\phi-\phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (29)$$

5. Solution to the thermoelastic problem:

Assume the value of χ_c and χ_c satisfying equation (15), (16), respectively as

$$\chi_c = \sum_{v=0}^{\infty} (Ar^{v+2} + Br^{-v+2})\cos v(\phi-\phi') + (Cr^{v+2} + Dr^{-v+2})\sin v(\phi-\phi') \quad (30)$$

$$\chi_p = \lambda E \sum_{m,n,v=0}^{\infty} \frac{R_v(\beta_m r)\cos v(\phi-\phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (31)$$

using (30), (31) in(14) one obtains

$$\chi = \sum_{v=0}^{\infty} (Ar^{v+2} + Br^{-v+2})\cos v(\phi-\phi') + (Cr^{v+2} + Dr^{-v+2})\sin v(\phi-\phi') + \sum_{m,n,v=0}^{\infty} \frac{R_v(\beta_m r)\cos v(\phi-\phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (32)$$

Using (32) in (10) to (12), one obtains

$$\sigma_{rr} = \sum_{v=0}^{\infty} [A(2+v-v^2)r^v + B(2-v-v^2)r^{-v}]\cos v(\phi-\phi') + (Cr^{v+2} + Dr^{-v+2}) \times\sin v(\phi-\phi') + \lambda E \sum_{m,n,v=0}^{\infty}\left[\frac{\beta_m}{r} R_v'(\beta_m r) - \frac{v^2}{r^2} R_v(\beta_m r)\right] \frac{\cos v(\phi-\phi')\, z(a_n z)}{\beta_m^2 N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (33)$$

$$\sigma_{\phi\phi} = \sum_{v=0}^{\infty} [A(v^2+3v+2)r^v + B(v^2-3v+2)r^{-v}]\cos v(\phi-\phi') + [C(v^2+3v+2r^v) + D(v^2-3v+2)r^{-v})]\sin v(\phi-\phi') + \lambda E \sum_{m,n,v=0}^{\infty}\left[\frac{\beta_m}{r} R_v'(\beta_m r) - \frac{v^2}{r^2} R_v(\beta_m r)\right] \frac{\cos v(\phi-\phi')\, z(a_n z)}{\beta_m^2 N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (34)$$

$$\sigma_{r\phi} = \sum_{v=0}^{\infty}[A(v^2+v)r^v + B(v-v^2)r^{-v}]\sin v(\phi-\phi') + [C(-v^2-v)r^v) + D(v^2-v)r^{-v})]\cos v(\phi-\phi') + \lambda E \sum_{m,n,v=0}^{\infty}\left[\frac{\beta_m}{r}R_v'(\beta_m r) - \frac{v^2}{r^2}R_v(\beta_m r)\right]\frac{\cos v(\phi-\phi')\, z(a_n z)}{\beta_m^2 N(\beta_m) N(v) N(a_n)} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (35)$$

Applying the prescribed condition (13), we have

$$A = \lambda E \sum_{m,n,v=0}^{\infty} \frac{a^{-v-2} z(a_n z)}{\beta_m^2 N(\beta_m) N(v) N(a_n)}\left\{\left(\frac{v+v^2-2-v^2}{2v(v^2-1)}\right)R_v(\beta_m a) - \left(\frac{1}{2v}\right)\beta_m a R_v'(\beta_m a)\right\} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (36)$$

$$B = \lambda E \sum_{m,n,v=0}^{\infty} \frac{a^{-v-2} z(\alpha_n z)}{\beta_m^2 N(\beta_m) N(v) N(\alpha_n)}\left\{\left(\frac{2+v-2v^2-v^3}{2v(v^2-1)}\right)R_v(\beta_m a) + \left(\frac{1}{2v}\right)\beta_m a R_v'(\beta_m a)\right\} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (37)$$

Substituting the above values of *A* and *B* in Eqs. (33) to (35), one obtains

$$\sigma_{rr} = \lambda E \sum_{m,n,v=0}^{\infty} a^{-v-2} r^v \left[\frac{7v^2-3v^4-v^3+v^5-4}{2v(v^2-1)}R_v(\beta_m a) - \frac{2+v\ -v^2}{2v}\beta_m a R_v'(\beta_m a)\right] + \left[\frac{-7v^2-v^3+3v^4+v^5+4}{2v(v^2-1)}R_v(\beta_m a) - \frac{2-v\ -v^2}{2v}\beta_m a R_v'(\beta_m a)\right] + \sum_{m,n,v=0}^{\infty}\left[\frac{\beta_m}{r}R_v'(\beta_m r) - \frac{v^2}{r^2}R_v(\beta_m r)\right]\frac{\cos v(\phi-\phi')\, z(\alpha_n z)}{\beta_m^2 N(\beta_m) N(v) N(\alpha_n)} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (38)$$

$$\sigma_{\phi\phi} = \lambda E\left\{\sum_{m,n,v=0}^{\infty} a^{-v-2} r^v \left[\frac{(v^2+3v+2)(-v^3+2v^2+v-2)}{2v(v^2-1)}R_v(\beta_m a) - \frac{v^2+3v+2}{2v}\beta_m a R_v'(\beta_m a)\right] + a^{v-2} r^{-v}\left[\frac{(v^2-3v+2)(-v^3-2v^2+v+2)}{2v(v^2-1)}R_v(\beta_m a) - \frac{v^2+3v+2}{2v}\beta_m a R_v'(\beta_m a)\right] + \left[\frac{\beta_m}{r}R_v'(\beta_m r) - \frac{v^2}{r^2}R_v(\beta_m r)\right]\frac{\cos v(\phi-\phi')\, z(a_n z)}{\beta_m^2 N(\beta_m) N(v) N(a_n)} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (39)$$

$$\sigma_{r\phi} = \lambda E \sum_{m,n,v=0}^{\infty} a^{-v-2} r^{v} \left[\frac{(-v^5+v^4+3v^3-v^2-2v)}{2v(v^2-1)} R_v(\beta_m a) - \frac{v^2+v}{2v} \beta_m a R'_v(\beta_m a) \right]$$
$$+ a^{v-2} r^{-v} \left[\frac{(v^5+v^4-3v^3-v^2+2v)}{2v(v^2-1)} R_v(\beta_m a) - \frac{v-v^2}{2v} \beta_m a R'_v(\beta_m a) \right]$$
$$+ \left[\frac{\beta_m}{r} R'_v(\beta_m r) - \frac{v^2}{r^2} R_v(\beta_m r) \right] \frac{\cos v(\phi-\phi') z(\alpha_n z)}{\beta_m^2 N(\beta_m) N(v) N(\alpha_n)} \qquad (40)$$
$$\times \left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi) (t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha] \right]$$
$$\times \left\{ E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha] - 1 \right\}$$

6. Numerical calculations:

Dimensions- For the sake of convenience, we choose the inner radius $a = 1m$, outer radius $b = 2.5m$, the thickness of the hollow cylinder $h = 0.2\,m$

Material Properties-

Thermal diffusivity (*m/s*)	Thermal conductivity (*W/mK*)	Density (Kg/m^3)	Specific heat (J/Kg K)	Poisson ratio	CTE (I/K)	Lame's constant
112.34 X 10^{-6}	386	8954	383	0.35	16.5 X 10^{-6}	26.67

Analysis of numerical Solutions

The numerical results and values are summarized and represented by a graph between temperature and stress distribution for weak, normal and strong conductivity. It has been done with MATEMATICA software for the finite hollow cylinder.

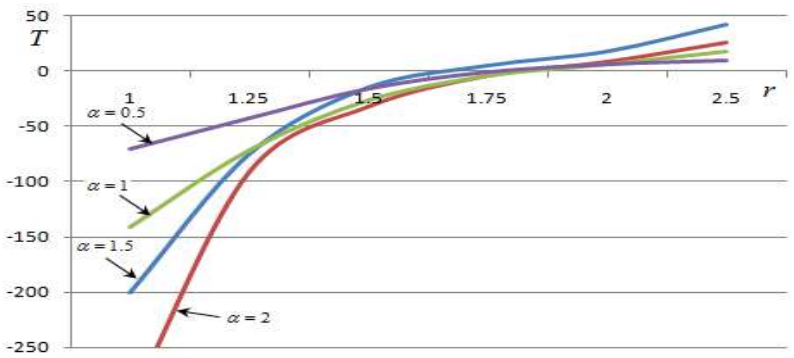

Figure 1: Temperature versus *r* for different values of α

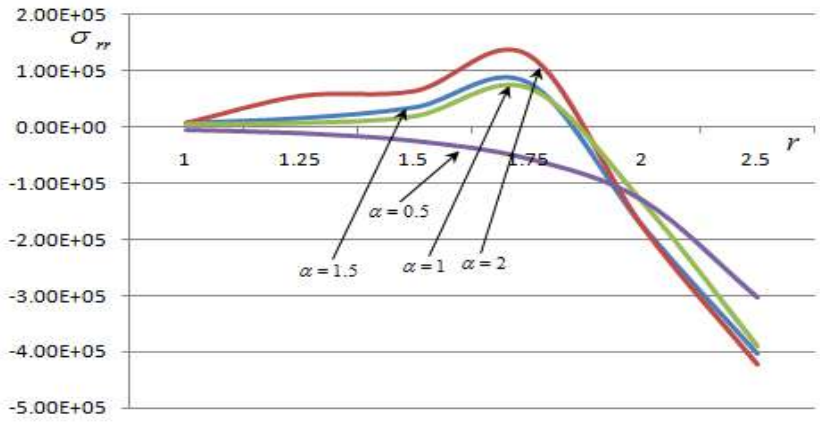

Figure 2: σ_{rr} versus *r* for different values of α

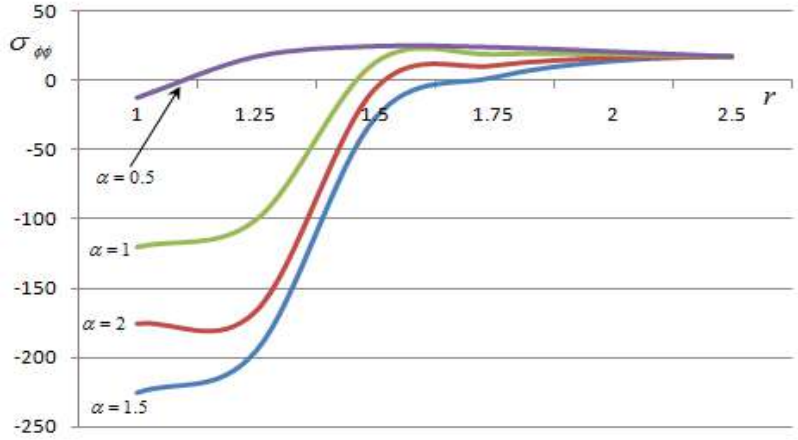

Figure 3: $\sigma_{\phi\phi}$ versus r for different values of α

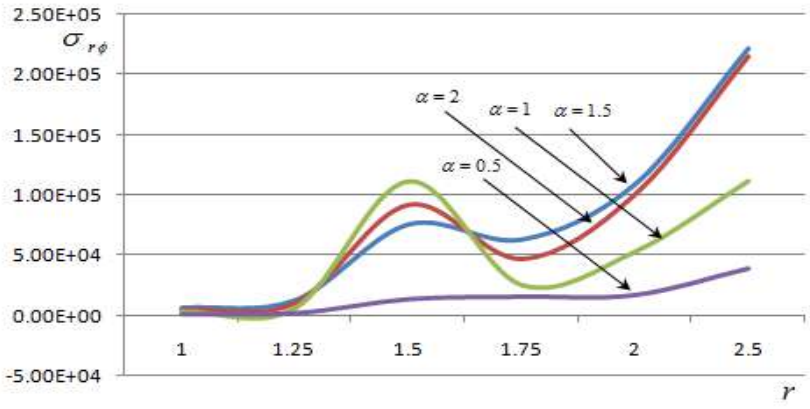

Figure 4: $\sigma_{r\phi}$ versus r for different values of α

Figures 1 to 4: The effect of different values α along the radial direction on temperature and stress distribution variation has been depicted graphically. It indicates the direct impact of the different values of the fractional-order parameter α on the thermal quantities. Studying these parameters helps to understand the properties of any material for domestic and industrial use.

7. Conclusion

In the present analysis, efforts are taken to find a numerical solution to the time-fractional order thermoelastic problem of a thin hollow cylinder that is subjected to an internal moving heat source. The analytical product of temperature change and corresponding stresses has been obtained by using Green's theorem approach and the Integral transform technique. The graphical study established the proportionality relation of wave propagation speed with fraction order. It would provide the base for researchers in thermodynamics and thermoelasticity. This model will be the initial base for designing new materials and applies to real-life situations.

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Hygrothermal Effects On Nanocomposites Objects: A Review Article

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Abstract:

This review article describes the hygrothermal effects on nanocomposite objects. The hygrothermoelastic effects on nanocomposites objects investigation aim to develop operational methods for solving the governing differential equations. In the hygothermoelastic problems, we used numerical algorithms to analyze a few real problems of technical importance while considering the geometry of nanocomposite materials. Few basic equations for hygrothermoelastic problems are discussed.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords:*Hygrothermoelasticity, Nanocomposite objects,Moisture diffusion, Temperature distribution,Thermal stresses.*

Introduction:

Although composites materials are increasingly used in marine, offshore, aeronautics, and civil infrastructures applications, their advantages include lightness, high strength, and high stiffness to weight ratios; however, their durability and long-term integrity are still not comprehensively understood. In such applications, composite materials are exposed to harsh and changing environments ranging from temperature variations and moisture exposure, including elevated temperature immersion and "hot-wet" exposures [1,2,3]. In particular, water diffusion in polymer matrix composite materials may promote material degradation, residual strength reduction, Plasticization, and lowering polymer matrices glass transition temperature, a global decrease in material performance [4, 5]. Thus, it is well known that hygrothermal effects of Polymer Matrix Composites (PMCs) cause degradation of mechanical properties due to the combined effect of moisture and temperature. Given the strong correlation between the rate of deterioration and moisture uptake, the diffusion process in such materials must be understood as a step toward the prediction of long-term durability [6]. Moisture diffusion through polymer or Fibre Reinforced Plastic (FRP) is intrinsically related to its molecular structure, water–polymer interaction, and the degradation processes resulting thereof. The swelling due to moisture absorption leads to the weakening of the fiber/polymer interface and hence affects the long-term durability of the composites [7–11]. Globally research is concentrated on developing PMCs with superior moisture barrier properties. Nanoclay as a filler material in polymers has shown great promise to improve such properties due to increased diffusion path based on tortuosity, which is dependent on the degree of exfoliation in polymers [12]. Thus,the review of the above literature outlines the investigation of the effects of hygrothermal on FRP, and the influence of nano-clay addition on improved mechanical/moisture barrier was well observed.

Literature Review:

The exclusive properties of nanoscale beams are due to their size, and this size plays an essential role in static and dynamic analysis. In front of the difficulties of classical continuum mechanics in considering the size effect in modeling the behaviour of this kind of structure, various size-dependent continuum theories have been developed. These theories include nonlocal continuum theory, strain gradient theory, or a combination of both (nonlocal strain gradient theory), modified couple stress theory, micropolar theory, and the surface elasticity theory.

In this regard, few manuscripts were reviewed like, Karličić et al. [13] used the nonlocal thermoelastic theory to investigate the free banding vibration and stability behaviour of MNBS embedded in Winkler's type of elastic medium and obtained the closed-form solutions for the natural frequencies, and the critical buckling

loads are derived by using the separation of variables method and the trigonometric method. Ebrahimi and Barati [14] developed a nonlocal higher-order beam model for free vibration analysis of magneto-electro-elastic functionally graded nanobeams via Hamilton's principle and solved it using the analytical method. Zarei et al. [15] dealt with the dynamic buckling of a sandwich truncated conical shell composed of polymer–carbon nanotubes–fiber multiphase nanocomposite layers in hygrothermal environments by employing Hamilton's principle. The previously published papers mostly exposed the static and dynamic characteristics of composite or smart material structures to the thermal environment. Recently, a few papers have been published using time-fractional thermoelasticity theory to study the effects of temperature on the material properties under thermal load. For example, Cajić et al. [16] analyzed the free vibration of a nanobeam resting on a viscoelastic foundation using the combined Eringen's nonlocal elasticity and fractional derivative viscoelasticity constitutive equations to model the system and obtained the solution via the Laplace integral transform method. Eyebe et al. [17] studied the nonlinear vibration of a nanobeam resting on the fractional-order viscoelastic Winkler–Pasternak foundation is studied using nonlocal elasticity theory. Thus, several authors (citations are given in the trailing section) have previously investigated the associated hygrothermoelastic problems.

Research Background :

Few basic equations are briefed here are just for reference as

The basic equation for hygrothermoelasticiy:

This subsection summarizes the results of the previous authors' work, namelythe relationship between temperature, dissolved moisture content and vapour concentration, and control equations. As the small variations, σ and ω are related to the mass of absorbed moisture as

$$M = \text{constant} + \sigma C - \omega T \tag{1}$$

Then the equation for moisture diffusion is

$$D''\nabla^2 C = \gamma \frac{\partial M}{\partial t} + \frac{\partial C}{\partial t} \tag{2}$$

and the thermal diffusion is

$$\mathrm{D}''\nabla^2 T = \frac{\partial T}{\partial t} - \varepsilon \frac{\partial M}{\partial t} \tag{3}$$

Now eliminating M from Eqs. (2) and (3) using Eq. (1), one gets

$$D\nabla^2 C = \frac{\partial C}{\partial t} - \psi \frac{\partial T}{\partial t} \tag{4}$$

$$\mathrm{D}\nabla^2 T = \frac{\partial T}{\partial t} - \varphi \frac{\partial C}{\partial t} \tag{5}$$

in which notation is used from the manuscript of Henry [18].

The basic equation for non-simple hygrothermoelasticiy:

Chen and Gurtin [19] propose the classification of real materials into simple and non-simple materials by considering two temperatures viz., thermodynamic and conductive. The respective theory explains that the two temperatures were not identical for non-simple materials, unlike simple materials in which they are identical. The studies were further extended to deformable bodies by Chen et al. [20] and showed that such materials contain an additional term involving the time derivative of the Laplacian of the conductive temperature, and they have shown that the two temperatures are related by

$$\phi = T - b\nabla^2 T,\ b > 0 \tag{6}$$

The key element that sets the two-temperature thermoelasticity theory apart from the classical theory is the material parameter. Therefore, in the case of a non-simple medium, Eq. (2) can be written as

$$D\left(1+\frac{b}{k}\frac{\partial}{\partial t}\right)\nabla^2\phi=\frac{\partial T}{\partial t}-\varphi\frac{\partial C}{\partial t} \qquad (7)$$

The basic equation for hygrothermoelasticiy:

Zhang and Li [21] formulated fractional hygrothermoelasticity theory within the framework of fractional calculus by coupling the classical Fourier's and Fick's laws to anomalous diffusion, which is characterized by the time-fractional diffusion-wave equation

$$D\nabla^2 C=\frac{\partial^\alpha C}{\partial t^\alpha}-\lambda\frac{\partial^\alpha T}{\partial t^\alpha} \qquad (8)$$

$$D\nabla^2 T=\frac{\partial^\beta T}{\partial t^\beta}-\eta\frac{\partial^\beta C}{\partial t^\beta} \qquad (9)$$

Several authors have previously investigated the associated hygrothermoelastic problems. Chang and Weng [22] proposed a linear hygrothermoelastic theory to analyze transient responses in an axisymmetric double-layer annular cylinder subjected to hygrothermal loading using the Hankel transform method. Sugano [23] obtained analytical solutions for the heat and moisture equation and its associated hygrothermal stress in a functionally graded material plate under the prescribed surface temperature and moisture load. Chiba and Sugano [24] analyzed transient heat and moisture diffusion and the resulting hygrothermal stress field in a layered plate subjected to hygrothermal loadings at the external surfaces. Brischetto [25] examined the hygrothermal loading effects in the bending of two-dimensional multilayered composite plates on Carrera's Unified Formulation framework. Ishihara et al. [26] formulated and quantified the hygrothermal field in porous media exposed to heat and moisture, considering nonlinear coupling. Saadatfar and Aghaie-Khafri [27] studied the static behaviour of a functionally graded magnetoelectroelastic hollow sphere subjected to hygrothermal loading in the spherically symmetric state. Ensour [28] presented the interaction of electric potentials, electric displacement, and elastic deformations to describe the hygrothermal responses in inhomogeneous piezoelectric hollow cylinders subjected to both mechanical load and electric potential. Zhao et al. [29] proposed the steady-state solution for three-dimensional hygrothermoelastic media based on the potential theory methodology. Previously published papers exposed the static and dynamic characteristics of composite or smart material structures to the hygrothermal environment. Recently, few papers have been published using time-fractional hygrothermoelasticity theory to study the effects of temperature and moisture concentrations on the material properties under hygrothermal load. Benkhedda et al. [30] evaluated the hygrothermoelastic stress in composite plates during moisture desorption, taking into account the change of mechanical characteristics induced by temperature and moisture variation. Zhang and Li [31] formulated fractional hygrothermoelasticity theory within the framework of fractional calculus by coupling the classical Fourier's and Fick's laws to anomalous diffusion, which is characterized by the time-fractional diffusion-wave equation. Peng et al. [32] presented a hyperbolic diffusion law with different phase lags of thermal and moisture fluxes to simulate coupled heat-moisture diffusion-propagation behaviour and studied transient hygrothermal and elastic response of an infinitely long cylinder subjected to sudden hygrothermal loadings. Zhang et al. [33] proposed a hygrothermal elastic problem within the framework of time-fractional calculus theory for a centrally symmetric sphere subjected to physical heat and moisture flux at its surface by using the integral transform method. Very recently, Zhang et al. [34] investigated the time-fractional diffusion-wave equations introduced to describe the coupled heat conduction and moisture diffusion in a hollow pipe using the separation of variables and the Laplace transform. However, previous researchers have not solved the high-dimensional hygrothermoelastic problems in nanocomposites objects as we know that innovative fibre-reinforced composites have gained extensive use within the region and physical science engineering industries. The benefits of those materials result from their high strength, stiffness, and damping at the side of low concrete weight, though, it is susceptible to hygrothermoelastic stress due to its intrinsic heterogeneity evolving at the microscopic macroscopic level. It reduces construction, operation, and development prices, whereas up structural

responsibility and enhances safety. It's crucial for a decent style of multilayered composite structures to correctly account for hygrothermoelastic stresses; even inside the context of an uncoupled theory, the hygrothermal fields are uncoupled from the strain ones; this task is scarcely unconventional.

Conclusion:

According to the literature study, using hypothesized hygrothermal effects on nanocomposite objects addresses hygrothermomechanical difficulties in many ways. The exact solution of the heat conduction equation in two or three dimensions using memory-dependent derivate has yet to be found in the literature. The thermal profile is determined throughout thermodynamics by solving heat conduction equations with memory-dependent derivative effects that provide a precise solution to thermoelastic problems.

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Thermoelastic problems with fractional order derivative: An overview & prospective

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Abstract:

The article investigates the present review of thermoelastic theories with fractional order derivative effects on different objects. The main theme of the thermoelastic problems is to establish operational methods to solve the governing differential equations. In the thermoelastic problems, we have considered a few practical problems of heat conduction, taking into account of fractional order derivative effect by using numerical or exact procedures.

AMS Subject classifications: 35B07; 35G30; 35K05: 44A10
Keywords:temperature distribution, thermal stresses, fractional order derivative, deflection, integral transform.

Introduction:

In several areas of engineering, solid objects are commonly used as integral structural elements. With thermal loading, such structural elements are likely to be subjected to many forms of static loading or excitation, such as seismic, mechanical, hydrodynamic, blast, aerodynamic, etc. Engineers and scientists worldwide are making unwavering efforts to develop and build economic and productive systems with a very low likelihood of failure.

Thermoelasticity, which is a branch of applied mathematics which specially deals with the study of temperature change and coupling between mechanical deformation and thermal energy calculated in terms of stress. “It can also be defined as it is a branch of science that deals with the analysis of stresses caused by thermally induced strains which are in the elastic range”.It consists of study of heat conduction, thermoelastic displacement and thermal stresses, etc. The most of the material tend to expand if there temperature rises and to a first approximation, the Expansion and Compression is proportional to the temperature change. This temperature changes induced by expansion and compression is based on thermoelasticity.

Thermoelasticity investigates the relation between a material's elastic properties and temperature, or between its thermal conductivity and thermal stress. Another complex problem faced by engineers and applied mathematicians is finding solutions to the fundamental problems in their field of study, which is partial differential equations in some cases. Using the well-known principles of classical mechanics and thermodynamics, the body's deformation undergoes the resultant stresses under the combined influence of external loads, body forces, and heat conduction is calculated. This relationship of temperature and displacement fields, the situation where mechanical and thermal causes cause deformation, results in the word 'Thermoelasticity'.

The convolution operator presented in the most popular Riemann-Liouville fractional integral, which is defined as where denotes the convolution operator, is the fractional-order and is the standard power function given as .

Research Background :

The classic heat conduction theory is based on the Fourier law [27,28] (1)
in which is the heat flux vector, denotes the point in the considered region, is the time, is the thermal conductivity of the material, is the gradient operator, and is the temperature, respectively.

Introduction of single-phase-lag to evade discrepancy between the mathematical model and the observations [29-31] (2)

in which is the phase lag of the heat flux or so-called relaxation time.

Expanding the left-hand side of Eq. (2) into the Taylor series with respect to the variable , one obtains [32] as (3)

where is introduced to keep the dimension in order.

The fractional generalization [20,21] of the classical Cattaneo model by introducing fractional Taylor formula [33] as (4)

where without losing the generality appearing in Taylor series is merged in terms, is the gamma function, is introduced to keep the dimension in order and is the fractional time derivative based on Caputo fractional definition [34].

For the limiting case of (or), Eq. (4) reduces to classical Fourier heat conduction and the standard Cattaneo heat conduction equation for as (5)

The heat conduction equation in the context of fractional-order generalized thermoelasticity proposed by Sherief [35] gives (6)

Here it should be noted that the estimated ranges [36] of relaxation time (in seconds) usually involves for metals, for gases, and for porous materials, respectively.

Literature Review:

fractional calculus is the generalisation of the ordinary differential and integration to non integer order. The fractional order theory of thermoelasticity was derived by Sherief et al [8]. It is a generalisation of both the couple and the generalisation theories of thermoelasticity. Open dimensional problem for a half space was solved by Sherief and Abdellatief in [9]. In this work, a new theory of thermoelasticity is derived using the methodology of fractional calculus. The theories of coupled thermoelasticity and of generalisedthermoelasticity with one relaxation time follow as limit cases.

Biot [10] Formulated the theory of coupled thermoelasticity to eliminate the paradox inherentinthe classical uncoupled theory that elastic changes have no effect of temperature. Lord and Shulman [13] introduced the theory of generalisedthermoelasticity with one relaxation time for the special case of an isotropic body. This theory was extended by Dhaliwal and Sherief [11] to include the anisotropic case. In this theory a modified law of heat conduction including both the heat flux and it's time derivative replaces the conventional Fourier's law. Uniqueness of solution for this theory was proved under different conditions by Ignaczak [24] and Ignaczak [25], Sherief and Dhaliwal [11] and Sherief [23]. The state space approach to this theory was developed by Anwar and Sherief [22], and Sherief. The fundamental solution for this theory was obtained by Sherief [20], Sherief and Hamza [21] have solved some two-dimensional problems. Sherief et al., [8] extended this theory to deal with micropalar materials in .Sherief et al., [18] and Sherief and Saleh [19] developed the theory of Thermoelastic diffusion. Green and Lindsay [12] developed to theory Of generalisedthermoelasticity with two dimensions with two relaxation times which is based on generalised inequality of thermodynamics.

Fractional calculus has been used successfully to modify many existing models of physical processes. The first application of fractional derivatives was given by Abel, who applied fractional calculus in the solution of an integral equation that arises in the formulation of the Tautocrone problem. One can state that the whole theory of fractional derivatives and integrales was established in the second-half of the 19th century. Caputo and Mainardi [2], Caputo [3] found Good agreement with experimental result when using fractional derivative for description of viscoelastic material and established the connection between fractional derivatives and the theory of linear viscoelasticity. Povstenko , [6] determined the solution for cauchy problem for time- fractional quasi-static uncoupled theory of thermoelasticity. Povstenko [7] solved Thermoelastic problems of infinite cylinders with time fractional diffusion-wave equation by applying integral transform technique and several problems with Dirichlrt's equation and Neumann boundary conditions was simplified.

The theory of fractional calculus has been used successfully to model polymers material. In this proposed thesis entitled - " Studies of some thermoelastic problems in context of fractional order theory of thermoelasticity". We will investigate the mathematical model for solving fractional order equations will be presented in a random sequence.

Conclusion:

The literature reviewed noted that the use of thermal profile addresses thermomechanical problems with the fractional derivative effect. The literature still fails to provide the exact solution of the heat conduction

equation in three-dimensional problems using time-dependent fractional derivate. The thermal profile is determined by solving heat conduction equations with fractional derivative effects throughout thermodynamics that provide an exact solution to thermoelastic problems.

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Generalized thermoelasticity with memory-dependent derivative: An overview & prospective

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Abstract:

The article investigates the present review of generalized thermoelastic theories with memory-dependent derivative effects on different objects. The main theme of the thermoelastic problems is to establish operational methods to solve the governing differential equations. In the thermoelastic problems, we have considered a few practical problems of technical interest, taking into account of fractional order derivative effect by using numerical or exact procedures.

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Introduction:

In several areas of engineering, solid objects are commonly used as integral structural elements. With thermal loading, such structural elements are likely to be subjected to various forms of static loading or excitation, such as seismic, mechanical, hydrodynamic, blast, aerodynamic, etc. Engineers and scientists worldwide are making unwavering efforts to develop and build economic and productive systems with a very little likelihood of failure. Thermal effects produce heat transfer by conduction within an elastic surface, and this distribution of thermal energy develops a temperature field within the material. Many solids undergo a volumetric transition with variance in temperature, and thus the presence of a temperature range typically causes stresses caused by limit or interval constraints. If the temperature variation is high enough, these stresses can reach levels that can lead to structural failure, especially in brittle materials. Hence, understanding stress analysis can be helpful for several issues, including high-temperature variation.

Thermoelasticity can be generalized as investigating the relationship between a material's elastic properties and temperature or between its thermal conductivity and thermal stress. Another complex problem faced by engineers and applied mathematicians is finding solutions to the fundamental problems in their field of study, partial differential equations in some cases. Using the well-known principles of classical mechanics and thermodynamics, the deformation that the body undergoes, the resultant stresses under the combined influence of external loads, body forces, and heat conduction is calculated. This relationship of temperature and displacement fields, where mechanical and thermal causesdeformation, results in 'Thermoelasticity'. Temperature variations allow the material to undergo thermal effects. Some of these are thermal strains, stress, and deformation. Thermal deformation means that as the thermal energy and/or temperature of the material increases, so does the vibration of the atom or molecules and this changes in vibration result in the stretching of molecular bonds, which causes the material to expand, of course, if the thermal energy and temperature of the material decreases, the material will compress or contract.

The enormous demand for science and engineering works dealt with Fractional-Order Equations' dynamical systems that involve derivatives and non-integer integrals. They explain various substances' memory and hereditary properties and cope with the tremendous demand for science and engineering work. Meanwhile, it also discovered that fractional calculus is used effectively to modify many current models of physical processes, see Hilfer [1], Sherief et al. [2], Tenreiro et al. [3]. It can also be claimed that the entire theory of fractional derivatives and integrals was established in the second half of the 19th century. A good overview of the subject will be noticed in Podlubny [4], Kaczorek [5-6], Sherief and El-Latief [7], Siedlecka and Kukla [8], Abbas [9], Xiong and Niu [10], Mahakalkar et al. [11], Mittal and Kulkarni [12], Hussein [13] and so on. The memory effect comes from the convolution operator presented in the most popular Riemann-Liouville fractional

integral, which is defined as $I_{\alpha,\alpha}^{RL} f(x) = (1/\Gamma(\alpha))\int_a^x (x-t)^{\alpha-1} f(t)dt = \Phi_\alpha \bigstar f(x)$, where $\bigstar$ denotes the convolution operator, α is the fractional-order and Φ_α is the standard power function given as $\Phi_\alpha(t) = t^{\alpha-1}/\Gamma(\alpha)$. A further literature review has been described as 'the foundation and inspiration for substantive, useful research' will be done in later sections.

Research Background :

The classic heat conduction theory is based on the Fourier law [14,15]

$$q(x,t) = -k\nabla T(x,t) \qquad (1)$$

in which $q(x,t)$ is the heat flux vector, x denotes the point in the considered region, t is the time, k is the thermal conductivity of the material, ∇ is the gradient operator, and $T = T(r,t)$ is the temperature, respectively.

Introduction of single-phase-lag to evade discrepancy between the mathematical model and the observations [16-18]

$$q(x,t+\tau) = -k\nabla T(x,t) \qquad (2)$$

in which τ is the phase lag of the heat flux or so-called relaxation time.

Expanding the left-hand side of Eq. (2) into the Taylor series with respect to the variable τ, one obtains [19] a

$$q(x,t) + \frac{\tau^\alpha}{\Gamma(1+\alpha)}\frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\nabla T(r,t), 0 < \alpha \le 1 \qquad (3)$$

where α is introduced to keep the dimension in order.

The fractional generalization [20,21] of the classical Cattaneo model by introducing fractional Taylor formula [22] as

$$q(x,t) + \tau^\alpha \frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\nabla T(x,t), 0 < \alpha \le 1 \qquad (4)$$

where without losing the generality $\Gamma(1+\alpha)$ appearing in Taylor series is merged in τ^α terms, Γ is the gamma function, α is introduced to keep the dimension in order and $\partial^\alpha / \partial t^\alpha$ is the fractional time derivative based on Caputo fractional definition [23].

For the limiting case of $\tau = 0$ (or $\alpha = 0$), Eq. (4) reduces to classical Fourier heat conduction and the standard Cattaneo heat conduction equation for $\alpha = 1$ as

$$q(x,t) + \tau\frac{\partial}{\partial t} q(x,t) = -k\nabla T(x,t) \qquad (5)$$

The heat conduction equation in the context of fractional-order generalized thermoelasticity proposed by Sherief [24] gives

$$q(x,t) + \tau\frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\nabla T(x,t), 0 < \alpha \le 1 \qquad (6)$$

Here it should be noted that the estimated ranges [25] of relaxation time (in seconds) usually involves $(10^{-11} : 10^{-14})$ for metals, $(10^{-8} : 10^{-10})$ for gases, and $(10 : 10^{2})$ for porous materials, respectively.

Wang and Li [26] have introduced a memory-dependent derivative (MDD). The first order $(\alpha = 1)$ of function f which is simply defined in an integral form of a common derivative with a kernel function $K(t-\zeta)$ on a slipping interval $[t-\omega, t]$ in the form

$$q(x,t) + \tau D_\omega^{(1)} q(x,t) = -k\nabla T(x,t) \qquad (7)$$

where

$$D_{\omega}^{(1)} f(x,t) = \frac{1}{\omega} \int_{t-\omega}^{\omega} K(t-\zeta) f'_{\zeta}(x,\zeta) dx, \ \omega > 0,$$

$D_{\omega}^{(1)} \to \partial / \partial t$, ω is delay time, and $K(t-\zeta)$ is the kernel function.

Heat conduction equation in MDD thermoelasticity introduced by Ezzat [27]

$$q(x,t) + \omega D_{\omega}^{(1)} q(x,t) = -k \nabla T(x,t) \qquad (8)$$

By combining Eq. (8) with the energy conservation equation

$$-\Delta \cdot q(r,t) = \rho C_v \frac{\partial T}{\partial t}(r,t) \qquad (9)$$

Now by combining Eq. (8) and (9) leads to the heat conduction equation as

$$\kappa \nabla T(x,t) = (1 + \tau_{\omega} D_{\omega}) \rho C_v \frac{\partial T}{\partial t}(r,t) \qquad (10)$$

where $\kappa = \rho C_v / k$ is the thermal diffusivity, ρ is the density of the material, C_v is the specific heat capacity, and where $\Delta = \nabla^2 = \nabla \cdot \nabla$ a Laplace operator is a second-order differential operator.

Literature Review:

Many researchers have studied the development and applications of fractional-order equations. The fascinating and recent applications of fractional differential equations in physics, chemistry, biology, engineering, finance, and other research fields built over the last few decades are now not difficult to find. Some of the applications include: diffusion processes [28,29], mechanics of materials [30,31], combinatorics [32,33], inequalities [34], analysis [35], calculus of variations [36-41], signal processing [42], image processing [43], advection and dispersion of solutes in porous or fractured media [44], modeling of viscoelastic materials under external forces [45], bioengineering [46], relaxation and reaction kinetics of polymers [47], random walks [48], mathematical finance [49], modeling of combustion [50], control theory [51], heat propagation [52], modeling of viscoelastic materials [53] and even in areas such as psychology [54,55]. It is easy to find hundreds, if not thousands, of new applications in which the fractional calculus approach is more than welcome.

Fractional-order derivatives have been successfully used in mechanics to model memory-effect damping forces or characterize state feedback controllers, as demonstrated by Bagley and Torvik [56]. It is noticed by Wang and Hu [57] that the term fractional-order derivative whose order is between 0 and 2 often acts as a damping force in fractional-order vibration systems with a single degree of freedom. Fractional calculus has therefore been effectively used to change many current physical process models. The first use of fractional derivatives was made by Abel [58], who applied fractional calculus to the solution of the integral equation of the tautochrone problem formulation. Fractional derivatives were used by Caputo [59, 60] and Caputo and Mainardi [61,62], and their findings were in substantial agreement with the empirical evidence for describing viscoelastic materials.

Some authors have worked on fractional derivatives in the thermoelastic analysis of most recent literature, which can be summarised below: Povstenko [63] proposed a quasi-static uncoupled theory of thermoelasticity based on the heat conduction equation with a time-fractional derivative of order α. Povstenko [64] formulated the theory of diffusive stress based on the time-fractional diffusion equation. Povstenko [65] also obtained the temperature distribution and thermal stresses in an infinite medium with a spherical cavity using the integral transform technique.Youssef and Al-Lehaibi [66] developed a novel theory for the generalized thermoelasticity model based on fractional-order generalized thermoelasticity. Similarly, Youssef and Al-Lehaibi [67] constructed a model of an elastic material with constant parameters in the half-spacein the context of the fractional-order generalized thermoelasticity theory. Sherief et al. [68] developed a new theory of thermoelasticity using the methodology of fractional calculus. Ezzat and El-Karamany [69] attempted to generalize these results to include a magnetic field's effects in two-temperature thermoelasticity. Youssef and Al-Lehaibi [70] developed a mathematical model of an elastic material with a cylindrical cavity inthe context of the fractional-order generalized thermoelasticity theory. Povstenko [71] obtained the theory of thermal stresses

based on the heat conduction equation with the Caputo time-fractional derivative of order $0 < \alpha \leq 2$. Youssef [72] found a half-space filled with an elastic material taken as constant elastics' parametersin the standard model of thermoelasticity in fractional-order. Sur and Kanoria [73] constructed a new theory of two-temperature generalized thermoelasticity in the context of a new consideration of heat conduction with fractional orders.Youssef [74] considered a half-space filled with an elastic material that had constant elastic parameters was considered, and the governing equations were written in the form of the two-temperature generalized thermoelasticity theory of fractional order. Youssef et al. [75] developed a cylindrical nano-beam mathematical model with constant elastic parameters with fractional order heat conduction. Wang e al. [76] studied thermoelastic behaviours involving in the effect of thermal inertia during the macro- and microscales heat conduction. Bhattacharya and Kanoria [77] obtained the two-temperature thermo-elasto-diffusion interaction inside a spherical shell in the context of fractional order generalized thermoelasticity.Zenkour and Abouelregal [78] determined the thermoelastic displacement, stress, conductive temperature, and thermodynamic temperature in an infinite isotropic elastic body with a spherical cavitybased on the two-temperature generalized thermoelasticity theory (2TT). Youssef [79] derived a new theory of thermoelasticity based on the fraction order of strain, which is considered a new modification to Duhamel-Neumann's stress-strain relation. Bachher [80] considered a one-dimensional problem for a homogeneous and isotropic thermoelastic infinite porous material under the dependence of modulus of elasticity and thermal conductivity on reference temperature subjected to periodically varying heat sources in the context of the fractional-order generalized thermoelasticity with one relaxation time parameter. Santra et al. [81] proposed the three-dimensional generalized thermoelastic coupled problem for a homogeneous isotropic and thermally conducting thermoelastic medium under the effect of rotation in fractional context order generalized thermoelasticity.Yadav et al. [82] employed the theory of generalized thermoelasticity with fractional order strain to study the problem of one-dimensional disturbances in a viscoelastic solid in the presence of a moving internal heat source and subjected to a mechanical load. Bassiouny and Abouelnaga [83] investigated the thermoelastic properties of a sandwich structure made of three piezoelectric layers in the context of fractional-order theory two-temperature generalized thermopiezoelasticity. Gupta and Das [84] applied the eigenvalue approach method, and Laplace transform, a general solution scheme for the thermoelastic deformation of an unbounded transversely isotropic medium fractional-order generalized thermoelasticity with an instantaneous heat source. Sheoran and Kundu [85] presented a comprehensive review of relevant literature to highlight the role of fractional calculus in thermoelasticity.Abbas [86] investigated the temperature, displacement, and stresses due to thermal shock loading on the inner surface cavity in an infinite medium with a cylindrical cavity inthe context of the fractional-order generalized thermoelasticity theory. Bachher and Sarkar [87] studied the theory of generalized thermoelasticity based on the heat conduction equation with the Caputo time-fractional derivative is used to study the magneto-thermoelastic response of a homogeneous isotropic two-dimensional rotating elastic half-space solid. Povstenko et al. [88] studied a control problem of thermal stresses in an infinite cylindrical body in which the time-fractional heat conduction equation defined the temperature distribution with the Caputo derivative of the order $0 < \alpha \leq 2$. Xiong and Niu [89] developed the principle of fractional-order generalized thermoelastic diffusion for anisotropic and linear thermoelastic diffusive media. Chirilă and Marin [90] continued the work on dipolar thermoelastic materials, which are a particular case of multipolar continuum mechanics. The fractional-order derivative effect on a two-dimensional problem with weak, normal and strong conductivity due to thermal shock was examined by Abbas [91].

Conclusion:

The literature reviewed noted that the use of the expected thermal profile addresses generalized thermomechanical problems with the memory response effect. The literature still fails to provide the exact solution of the heat conduction equation in two or three-dimensional problems using memory-dependent derivate. The present work determines the thermal profile by solving heat conduction equations throughout thermodynamics that provide an exact solution to generalized thermoelastic problems.

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Thermoelastic vibrations analysis of a thin isotropic solid elliptic cross section

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1.Introduction

The present paper considers the realistic problem of a thin isotropic solid elliptic cross section profile subjected to point-impulsive source on the upper face, zero temperature at lower face, and with simply supported thermally insulated on the curved surface are studied using a typical classical technique. For the theoretical measurements the dimensional parameter was taken, while the dimensionless parameter was used for graphical measurements. In basic equation formulation we have considered the equations of motion, the displacement potential and finally obtained the components of stress in terms of thermoelastic displacement potential function. Finally, by considering a circle as a special kind of ellipse, it is seen that the temperature distribution in a circular solution can be derived as a special case from the present mathematical solution.

2.Formulation of the problem

Taken a thin elliptic isotropic solid assuming the space $D:\{(\xi,\eta,z)\in R^3: 0<\xi<\xi_0, 0<\eta<2\pi, -\ell/2\le z\le \ell/2\}$ in elliptic cylindrical coordinates (ξ,η,z) which is related to the rectangular coordinates (x,y,z) by $x=c\cosh\xi\cos\eta, y=c\sinh\xi\sin\eta, z=z$ (1)

where $c=(a^2-b^2)^{1/2}$ and $2c$ is the length of the interfocal line of the ellipse. The curves $\eta=$ constant denotet a family of confocal hyperbolas while the curves $\xi=$ constant constitute a family of confocal ellipses. Thus, at every point in space, both sets of curves intersect each other orthogonally. Its elliptic cross-section using the semi-major and semi-minor axial lengths a and b, respectively, as shown in Fig. 1. The parameter ξ defines the interfocal line having the range $\xi\in(0,\xi_0)$, and by using Eq. (1), the coordinate ξ_0 of the surface of the elliptic solid is obtained as $\xi_0=\tanh^{-1}(b/a)=(1/2)\mathrm{In}\,[(a+b)/(a-b)]$.

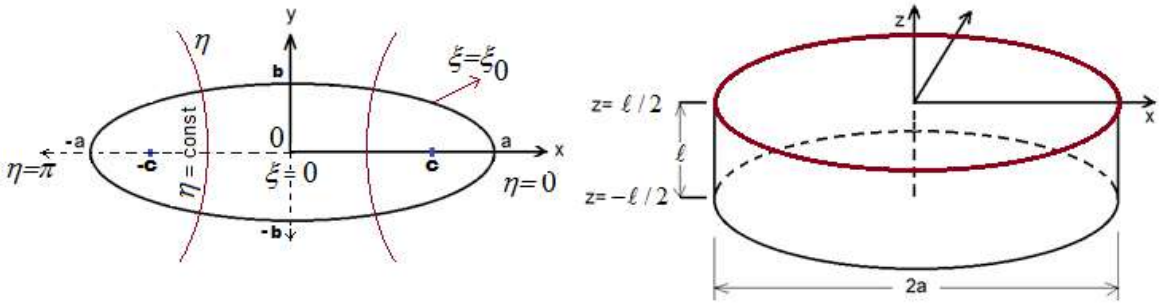

Figure 1: Elliptic solid plate configuration geometry

3. Temperature distribution analysis

We assume that the temperature is given by

$$T(\xi,\eta,z,t)=\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}A_{2n}\,Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\sin\left\{\gamma_{2n}\left[z+\left(\frac{\ell}{2}\right)\right]\right\}e^{-\omega t} \quad (2)$$

in which ω being a constant, $ce_{2n}(\eta,q)$ is the ordinary Mathieu function, $Ce_{2n}(\xi_0,q)$ is a modified Mathieu function, $q_{2n,m}$ is a root of the equation $Ce_{2n}(\xi,q_{2n,m})=0$ and according to McLaclan [26], $ce_{2n}(\eta,q)=\sum_{r=0}^{\infty}A_{2r}^{(2n)}\cos 2r\eta,\ Ce_{2n}(\xi,q)=\sum_{r=0}^{\infty}A_{2r}^{(2n)}\cosh 2r\xi$ (3)

with $A's$ being the functions of q, and the constant A_{2n} can be found from the nature of the temperature prescribed on the upper face. Further assuming that the lower face of the plate is kept at zero temperature as $T(\xi,\eta,z,t)|_{z=-\ell/2}=0$ (4)

while thermally insulated curved surface is expressed as $\frac{\partial}{\partial\xi}T(\xi,\eta,z,t)|_{\xi=\xi_0}=0$ (5)

and the sectional heat supply is impacted over the portion $0 < \xi < \xi_0$ that varying with time according to point-impulsive source as $T(\xi,\eta,z,t)|_{z=\ell/2} = e^{-\omega t}\delta(\xi-\xi_0)f_0(\eta)$ (6)

in which $f_0(\eta) = 1(0 \le \eta \le 2\pi)$ at $\xi = \xi_0$ and $\delta()$ is the Dirac delta function. Now the differential equation governing transient temperature distribution $T = T(\xi,\eta,z,t)$ for an elliptic plate can be defined as $\frac{2}{c^2(\cosh 2\xi - \cos 2\eta)}\left(\frac{\partial^2 T}{\partial \xi^2} + \frac{\partial^2 T}{\partial \eta^2}\right) + \frac{\partial^2 T}{\partial z^2} = \frac{1}{\kappa}\frac{\partial T}{\partial t}$ (7)

where $\kappa = \lambda/\rho C$ is the thermal diffusivity, in which λ is thermal conductivity and heat capacity per unit volume is ρC, with ρ as density and C as specific heat, respectively. Substituting Eq. (2) in Eq. (7), one obtains $\gamma_{2n} = [\alpha_n^2 + (\omega/\kappa)]^{1/2}$ (8)

where $\alpha_n^2 = -4q_{2n,m}/c^2$

Using Eqs. (2), (7) and (8), one obtains

$\delta(\xi-\xi_0) = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\, Ce_{2n}(\xi, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m})\sin\{\gamma_{2n}\ell]\}$ (9)

Here the series quoted on the right-hand side of Eq. (9) is obtained from the well-known theorem of Fourier-Mathieu series [26] for any point within the considered range. Now, multiply Eq. (9) on both the sides by $(\cosh 2\xi - \cos 2\eta)Ce_{2p}(\xi, q_{2p,r})ce_{2p}(\eta, q_{2p,r})$ and integrate with respect to η from 0 to 2π, and with respect to ξ from 0 to ξ_0, then by the orthogonality property [26], all terms vanish except when $p = n, r = m$, therefore, by the theory of Mathieu function, one obtains

$$A_{2n,m} = \frac{\int_0^{\xi}\int_0^{2\pi} Ce_{2n}(\xi,q_{2n,m})\, ce_{2n}(\eta,q_{2n,m})\, \delta(\xi-\xi_0)(\cosh 2\xi - \cos 2\eta)\, d\xi d\eta}{\pi e^{\omega t}\int_0^{\xi} Ce_{2n}^2(\xi,q_{2n,m})[\cosh 2\xi - \Theta_{n,m})\, d\xi} \quad (10)$$

$$\text{Where}\Theta_{n,m} = \frac{1}{\pi}\int_0^{2\pi} ce_{2n}^2(\eta, q_{2n,m})\cos 2\eta\, d\eta$$

Hence inserting the Eqs. (8) and (10) into Eq. (2), one obtains the desired temperature distribution that satisfies the boundary conditions.

At $t = 0$, initial temperature $T_i = T_i(\xi,\eta,z,t)$ is given as

$$T_i(\xi,\eta,z,t) = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\, Ce_{2n}(\xi, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m})\sin\{\gamma_{2n}[z + (\ell/2)]\} \quad (11)$$

Hence the temperature change $\tau = T - T_i$ is obtained as

$$\tau = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\, Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m})\sin\left\{\gamma_{2n}\left[z + \left(\frac{\ell}{2}\right)\right]\right\}(e^{-\omega t} - 1) \quad (12)$$

4. Basic equation formulation

The equations of motion are written as follows

$$\begin{aligned}(\lambda+2\mu)\frac{\partial e}{\hbar\partial\xi} - 2\mu\frac{\partial\tilde{\omega}_z}{\hbar\partial\eta} + 2\mu\frac{\partial(\hbar\tilde{\omega}_\eta)}{\hbar\partial z} - (3\lambda+2\mu)\alpha\frac{\partial\tau}{\partial\xi} &= \rho\frac{\partial^2 u_\xi}{\partial t^2},\\ (\lambda+2\mu)\frac{\partial e}{\hbar\partial\eta} + 2\mu\frac{\partial\tilde{\omega}_z}{\hbar\partial\xi} - 2\mu\frac{\partial(\hbar\tilde{\omega}_\xi)}{\hbar\partial z} - (3\lambda+2\mu)\alpha\frac{\partial\tau}{\partial\eta} &= \rho\frac{\partial^2 u_\eta}{\partial t^2}\end{aligned} \quad (13)$$

in which the scale factor $\hbar$, dilatation e and rotations $\tilde{\omega}_\xi, \tilde{\omega}_\eta, \tilde{\omega}_z$ are represented by

$$\begin{aligned}&\hbar^2 = c^2(\cosh^2\xi - \cos^2\eta) = (c^2/2)(\cosh 2\xi - \cos 2\eta),\\ &\hbar_\xi^2 = \hbar_\eta^2 = c^2\hbar^2, \hbar_z = 1,\ e = \frac{\partial(\hbar u_\xi)}{\hbar^2\partial\xi} + \frac{\partial(\hbar u_\eta)}{\hbar^2\partial\eta},\\ &2\tilde{\omega}_\xi = -\frac{\partial u_\eta}{\partial z}, 2\tilde{\omega}_\eta = \frac{\partial u_\xi}{\partial z}, 2\tilde{\omega}_z = \frac{\partial(\hbar u_\eta)}{\hbar^2\partial\xi} - \frac{\partial(\hbar u_\xi)}{\hbar^2\partial\eta}\end{aligned} \quad (14)$$

and, where λ and μ are the Lame's constants and they are related to Young's Modulus E and Poisson's ratio υ through the equations given below

$$\lambda = \frac{\upsilon E}{(1+\upsilon)(1-2\upsilon)}, \mu = \frac{E}{2(1+\upsilon)}$$

Applying the divergence and curl operation to Eqs. (11), one obtains

$$\begin{aligned}(\lambda+2\mu)\nabla^2 e + \mu\frac{\partial^2 e}{\partial z^2} - (3\lambda+2\mu)\nabla^2\tau &= \rho\frac{\partial^2 e}{\partial t^2},\\ \mu\nabla^2(2\tilde{\omega}_z) + \mu\frac{\partial^2(2\tilde{\omega}_z)}{\partial z^2} - (3\lambda+2\mu)\nabla^2\tau &= \rho\frac{\partial^2(2\tilde{\omega}_z)}{\partial t^2}\end{aligned} \quad (15)$$

in which $\nabla^2 = (1/\hbar^2)(\partial^2/\partial\xi^2 + \partial^2/\partial\eta^2)$

The solution of the previous Eq. (11) without body forces can be expressed by using the displacement potential φ and ψ as

$$\left.\begin{aligned} u_\xi &= \left(\frac{\partial\varphi}{\hbar\partial\xi} - \frac{\partial\psi}{\hbar\partial\eta}\right)\sin\left(\frac{m\pi z}{2\ell}\right)e^{-\omega t} \\ u_\eta &= \left(\frac{\partial\varphi}{\hbar\partial\eta} + \frac{\partial\psi}{\hbar\partial\xi}\right)\sin\left(\frac{m\pi z}{2\ell}\right)e^{-\omega t} \end{aligned}\right\},\ m = 1,3,5,.. \qquad (16)$$

in which the potential functions φ and ψ must satisfy the following governing equations

$$\nabla^2\varphi = K\tau, \nabla^2\psi = 0 \qquad (17)$$

with the initial condition $\varphi = 0 \quad at \quad t = 0, \qquad (18)$

where $K = \alpha\,(1+\upsilon)/(1-\upsilon)$ is restraint coefficient. The components of stress in terms of thermoelastic displacement potential are

$$\begin{aligned} \sigma_{\xi\xi} &= \lambda\left\{\frac{\partial(\hbar u_\xi)}{\hbar^2\partial\xi} + \frac{\partial(\hbar u_\eta)}{\hbar^2\partial\eta}\right\} + 2\mu\left\{\frac{\partial(u_\xi)}{\hbar\partial\xi} + \frac{u_\eta}{\hbar^2}\frac{\partial(\hbar)}{\partial\eta}\right\} - K\tau, \\ \sigma_{\eta\eta} &= \lambda\left\{\frac{\partial(\hbar u_\xi)}{\hbar^2\partial\xi} + \frac{\partial(\hbar u_\eta)}{\hbar^2\partial\eta}\right\} + 2\mu\left\{\frac{\partial(u_\eta)}{\hbar\partial\eta} + \frac{u_\xi}{\hbar^2}\frac{\partial(\hbar)}{\partial\eta}\right\} - K\tau, \qquad (19) \\ \sigma_{\xi\eta} &= \mu\left\{\frac{\partial}{\partial\eta}\left(\frac{u_\xi}{\hbar}\right) + \frac{\partial}{\partial\xi}\left(\frac{u_\eta}{\hbar}\right)\right\} \end{aligned}$$

Eqs. (1) to (19) establishes the mathematical formulation of the problem under consideration.

5.Approach to the problem

5.1 Displacement distribution

By assuming the suitable displacement function φ which satisfies Eqs. (1)-(2) as

$$\varphi = \frac{K\kappa}{\omega}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\, Ce_{2n}(\xi, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m}) \times \sin\{\gamma_{2n}[z + (\ell/2)]\}(1 - e^{-\omega t}) \qquad (20)$$

Now suitable form of ψ satisfying second expression of Eq. (14) is given by

$$\psi = -\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}[C_{2n}\sinh 2\xi + D_{2n}\alpha_n^2\xi\sin 2\eta]Ce_{2n}(\eta, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m}) \times \sin\{\gamma_{2n}[z + (\ell/2)]\}(1 - e^{-\omega t}) \qquad (21)$$

The expressions for displacements may be put as

$$\begin{aligned} u_\xi = \frac{1}{\hbar}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\{K\kappa Ce'_{2n}(\xi, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m}) + \omega[C_{2n}\xi \\ \times Ce_{2n}(\xi, q_{2n,m}) + D_{2n}\alpha_n^2\xi^2]ce'_{2n}(\eta, q_{2n,m})\}\sin(m\pi z/2\ell)e^{-\omega t} \qquad (22) \\ \times \sin\{\gamma_{2n}[z + (\ell/2)]\}(1 - e^{-\omega t}) \end{aligned}$$

$$\begin{aligned} u_\eta = \frac{1}{\hbar}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\{K\kappa Ce_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m}) \\ -\omega\,[C_{2n}\{\xi Ce'_{2n}(\xi, q_{2n,m}) + Ce_{2n}(\xi, q_{2n,m})\} \\ +2D_{2n}\alpha_n^2\xi]ce_{2n}(\eta, q_{2n,m})\}\sin(m\pi z/2\ell)\, e^{-\omega t} \qquad (23) \\ \times \sin\{\gamma_{2n}[z + (\ell/2)]\}(1 - e^{-\omega t}) \end{aligned}$$

5.2 Thermal stresses solution

The expressions for stresses related to displacement as given in Eq. (16) may be put as

(24)

$$\sigma_{\eta\eta} = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\frac{A_{2n}}{\omega\hbar}\Big\langle\frac{1}{\hbar}\Big[[\lambda\{K\kappa Ce''_{2n}(\xi,q_{2n,m})\,ce_{2n}(\eta,q_{2n,m}) - \omega[C_{2n}Ce'_{2n}(\xi,q_{2n,m}) + D_{2n}\alpha_n^2 ce'_{2n}(\eta,q_{2n,m})]\} + (\lambda+2\mu) \times \{\kappa KCe_{2n}(\xi,q_{2n,m})\,ce''_{2n}(\eta,q_{2n,m}) - \omega[C_{2n}Ce'_{2n}(\xi,q_{2n,m}) + D_{2n}\alpha_n^2 ce'_{2n}(\eta,q_{2n,m})]\}\Big] + \frac{1}{\hbar^{3/2}}\Big[\Big[\lambda\sinh 2\xi\{K\kappa\, Ce'_{2n}(\xi,q_{2n,m}) \times ce_{2n}(\eta,q_{2n,m}) - \omega[C_{2n}Ce_{2n}(\xi,q_{2n,m}) + D_{2n}\alpha_n^2\xi ce'_{2n}(\eta,q_{2n,m})]\}\Big]\Big] + (\lambda+2\mu)\sin 2\eta\{\kappa KCe_{2n}(\xi,q_{2n,m})\,ce'_{2n}(\eta,q_{2n,m}) - \omega[C_{2n}\eta \times Ce'_{2n}(\xi,q_{2n,m}) + D_{2n}\alpha_n^2 ce_{2n}(\eta,q_{2n,m})] - K\omega\hbar Ce_{2n}(\xi,q_{2n,m}) \times ce_{2n}(\eta,q_{2n,m})cosec(m\pi z/2\ell)e^{\omega t}\sin\{\gamma_{2n}[z+(\ell/2)]\}\sin(m\pi z/2\ell)\Big\rangle \times e^{-\omega t}\sin\{\gamma_{2n}[z+(\ell/2)]\}(1-e^{-\omega t}) \quad (25)$$

$$\sigma_{\xi\eta} = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\lambda\Big\langle\{K\kappa Ce'_{2n}(\xi,q_{2n,m})\,ce_{2n}(\eta,q_{2n,m}) + D_{2n}\,\omega\alpha_n^2\xi^2 ce'_{2n}(\eta,q_{2n,m})\} + \{\hbar\omega\,[C_{2n}\xi Ce'_{2n}(\xi,q_{2n,m}) + 2D_{2n}\alpha_n^2\xi]ce_{2n}(\eta,q_{2n,m})\Big\rangle\sin(m\pi z/2\ell) \times e^{-\omega t}\sin\{\gamma_{2n}[z+(\ell/2)]\}(1-e^{-\omega t}) \quad (26)$$

6. Special case and numerical calculations

We add the following dimensionless values in order to facilitate the computation

$$\left.\begin{aligned}&\bar{b}=b/a,\ \bar{a}=a/a,\ e=c/a,\ \bar{z}=[z-(-\ell/2)]/a,\ \tau=\kappa t/a^2,\\&\overline{T}(\xi,\eta,t)=T(\xi,\eta,t)/\theta_k,\bar{\phi}(\xi,\eta,t)=\phi(\xi,\eta,t)/E\alpha_t\tau a^2,\\&\bar{\sigma}_{ij}=\sigma_{ij}/E\alpha_t\tau\ (i,j=\xi,\eta)\end{aligned}\right\} \quad (3.27)$$

Substituting the value of equation (27) in equations (12), (16) and (19), we obtained the expressions for the temperature, displacement and stresses respectively for our numerical discussion. The numerical computations have been carried out for Aluminum metal with parameter a = 2.65 cm, b = 3.22 cm, ℓ= 0.08 cm, Modulus of Elasticity $E = 6.9 \times 10^{6}$ N/cm^{2}, Shear modulus $G = 2.7 \times 10^{6}$ N/cm^{2}, Poisson ratio υ = 0.281, Thermal expansion coefficient, $\alpha_t = 25.5 \times 10^{6}$ cm/cm-^{0}C, Thermal diffusivity κ = 0.86 cm^{2}/sec, Thermal conductivity λ = 0.48 cal sec^{-1}/cm^{0}C with $q_{n,m}$ =0.0986, 0.3947, 0.8882, 1.5791, 2.4674, 3.5530, 4.8361, 6.3165, 7.9943, 9.8696, 11.9422, 14.2122, 16.6796, 19.3444, 22.2066, 25.2661, 28.5231, 31.9775, 35.6292, 39.4784 are the positive. The numerical calculations are depicted in the following figures with the help of MATHEMATICA software. Figs.2-11 illustrates the numerical results of dimensionless temperature and stresses of elliptical plate, under thermal boundary condition that are subjected to arbitrary initial temperature on the upper and lower face at zero temperature and boundary conditions. Fig. 2 indicates the angular variation of temperature distribution along radial direction of the plate. Due to extra heat source the optimum amount of temperature is achieved on the outside edge. The distribution of the dimensionless temperature gradient at each time increases towards the heated area of the central part of ellipse boundary.

As shown in Fig. 3, temperature is reached to a minimum at both extreme ends, i.e. at due to more compressive force, while due to tensile force, the temperature at the centre is high, giving an average bell-shaped curve for various values of ξ. Fig. 4 as probable due to less thickness, the temperature along $\bar{z}$ axis for different values of η varies linearly from zero temperature to the highest due to the availability of sectional heat supply at $z = \ell/2$.

Figs. 5 and 7 illustrates that the displacement distribution along η is high due to the sectional heat supply accompanied by the low distribution that exists on the inner centre of the ellipse at the outer side. Fig. 6 shows the displacement distribution beside axial direction and it was observed that with lower angular angle the displacements are little curvy and with higher angle it is following sinusoidal nature.

From Fig. 8, it was noted that the displacement distribution along ξ gets lower value for different values of z. Fig. 9, it was observed that the radial, tangential and shear stresses follows a sinusoidal trend, the large expansion and tensile stress arises at the inner, mid and outer edge, which lies in the axial direction. It was detected from Fig. 10 that the thermal stresses attains zero at ξ=0 and the radial and tangential stresses increases gradually along the radial direction, while the shear stress decreases along ξ direction. But the nature of all stresses behaves oppositely along the time span as observed in the Fig. 11

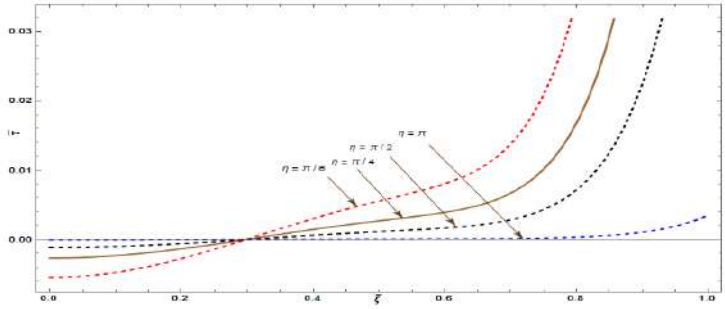

Figure 2: Temperature distribution $\overline{T}$ trending towards ξ for various values of η.

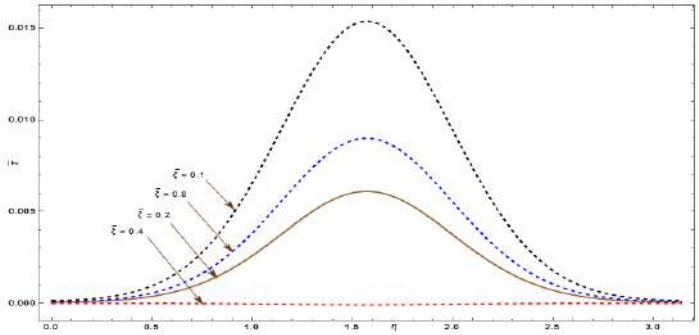

Figure 3: Temperature distribution $\overline{T}$ trending towards η for various values of ξ.

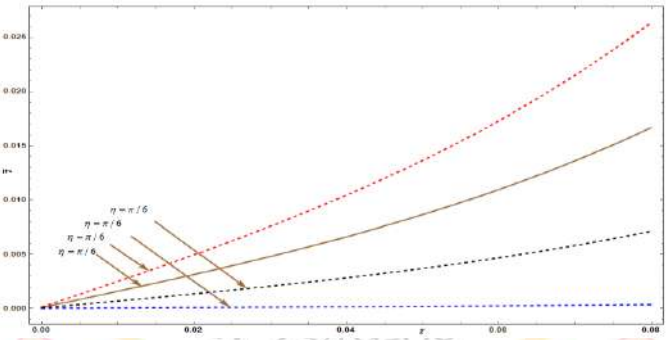

Figure 4: Temperature distribution $\overline{T}$ trending towards z for various values of η.

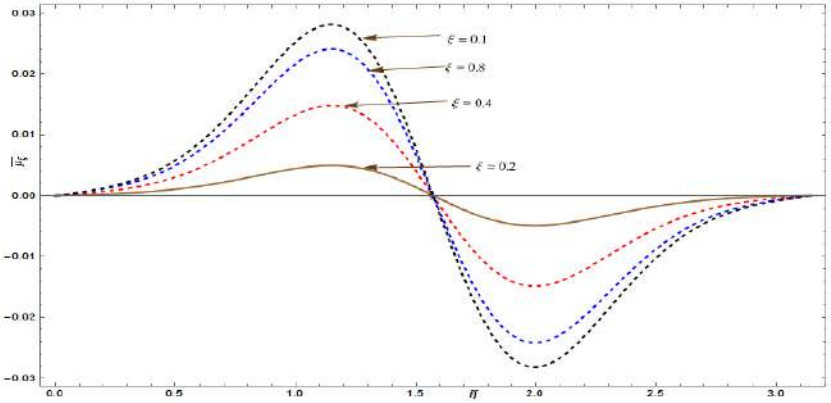

Figure 5: Displacement distribution trending towards η for various values of ξ.

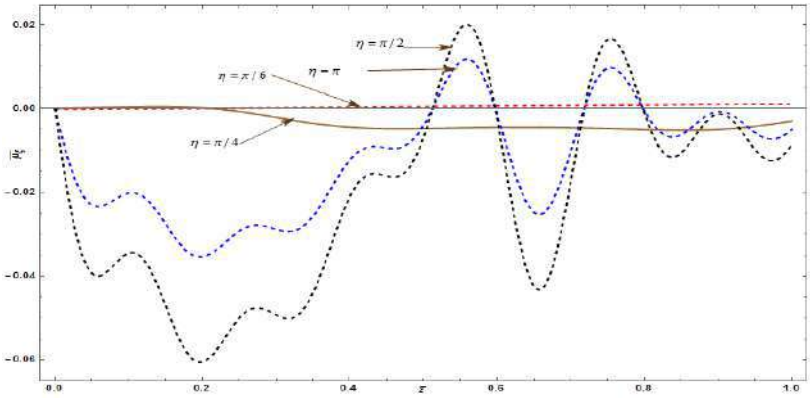

Figure 6: Displacement distribution trending towards z for various values of η.

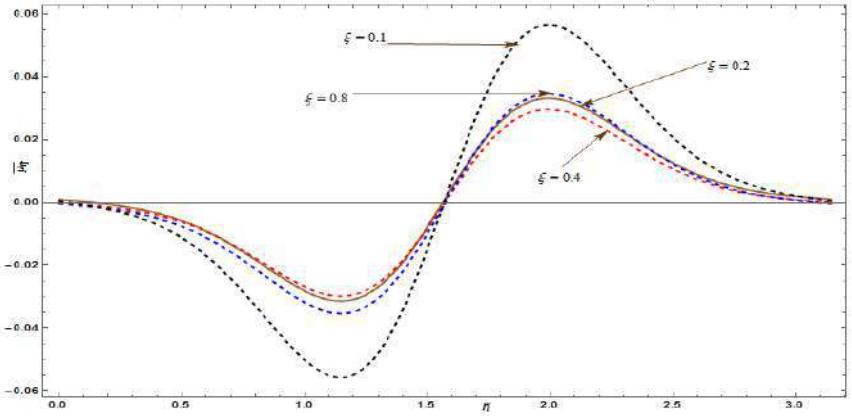

Figure 7: Displacement distribution trending towards η for various values of ξ.

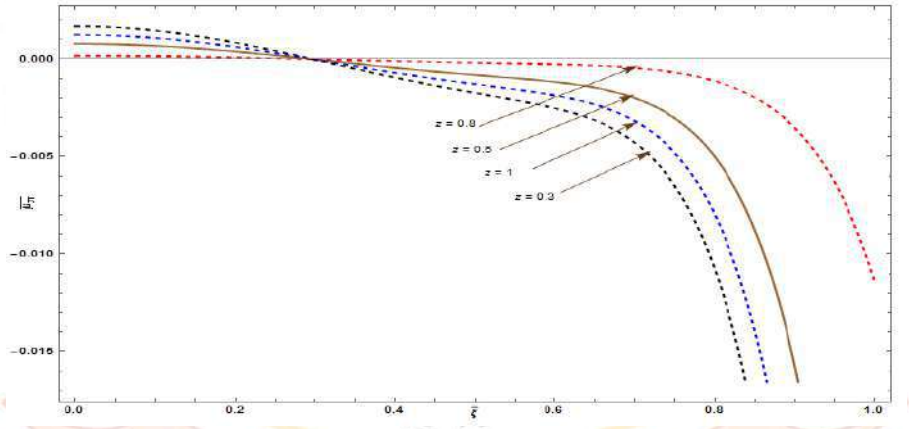

Figure 8: Displacement distribution trending towards ξ for various values of z.

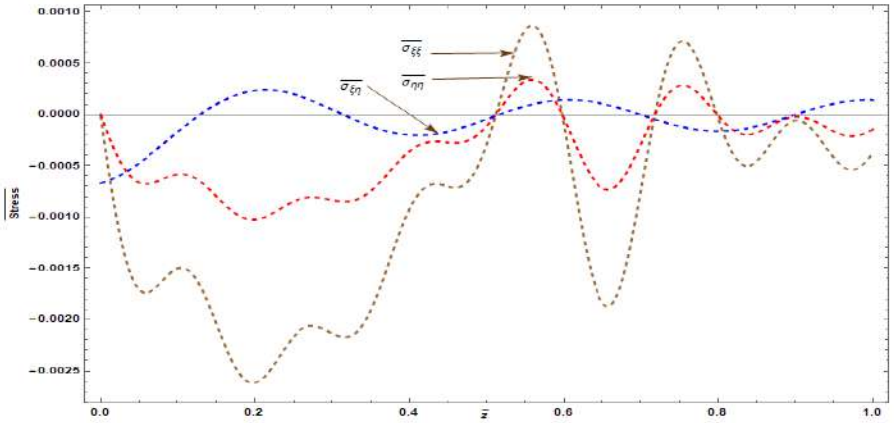

Figure 9: Thermal stresses distribution trending towards z

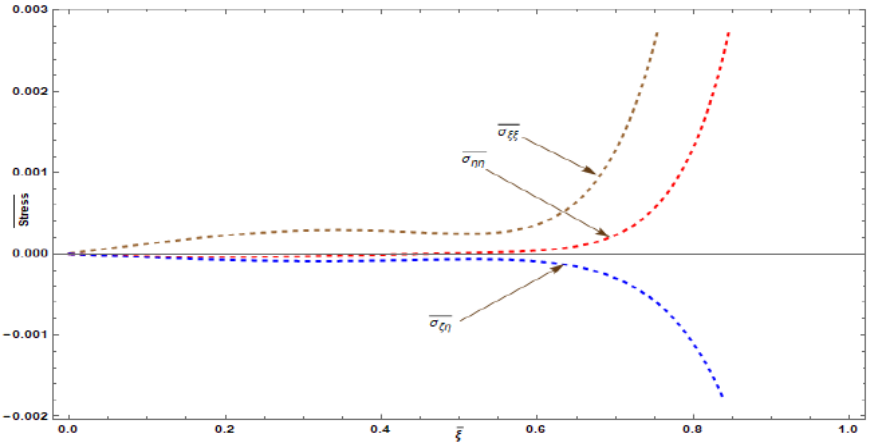

Figure 10: Thermal stresses distribution trending towards ξ

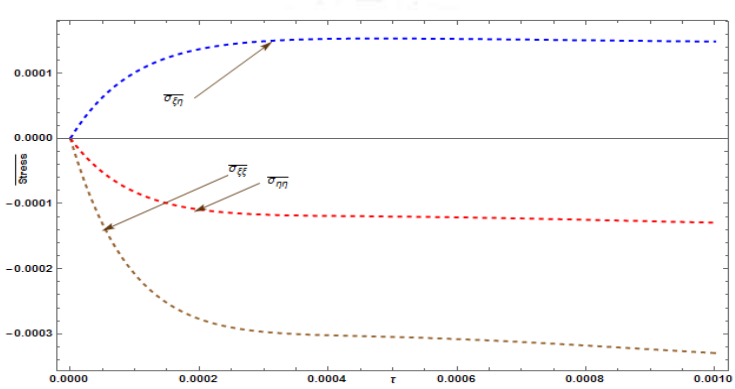

Figure 11: Thermal stresses distribution trending towards τ

7. Conclusion

In this article, we describe the theoretical treatment of thermally induced vibrations and their related stresses. The temperature distribution of the normal and modified Mathieu function forms is used to determine the thermal stress by the proposed classical method. The results obtained during the study are described below.

1. The benefit of this approach is its simplicity and mathematical ability to accommodate various forms of mechanical and thermal boundary conditions in vibration analysis under thermal load.
2. Owing to the maximum expanstion outside the plate, the maximum tensile stress moves from the outer surface and its absolute value increases with radius. This can be due to heat, stress, concentration or available heat source under known temperature fields.

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A short note on Shafer-Fink's double inequality involving Arcsine function

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In this article, we present the very sharp bounds of the form $\left(1-\frac{2}{3}x^2\right)^a$ *for the inverse trigonometric Sinc function* $\frac{sin^{-1}x}{x}$, *which tighten the bounds of this kind in the existing literature, where* a *is some real number.*

Subject Classification: *26A09, 26D05, 33B10.*
Keywords: *Inverse Circular functions, arcsine function, Shafer-Fink type inequality, inverse Sinc function.*

1 Introduction

Shafer introduced the following inequality (1.1), that can be seen in [5]

$$\frac{3x}{2+\sqrt{1-x^2}} < \frac{6(\sqrt{1+x}-\sqrt{1-x})}{4+\sqrt{1+x}+\sqrt{1-x}} < \sin^{-1}x, \ for x > 0. \tag{1.1}$$

The above inequality was generalized by Fink [3] as follows:

$$\frac{3x}{2+\sqrt{1-x^2}} \le \sin^{-1}x \le \frac{\pi x}{2+\sqrt{1-x^2}}, \ for \ 0 \le x \le 1, \tag{1.2}$$

where 3 and π are the best possible constants for (1.2). The above double inequality is termed as the Shafer-Fink's inequality in the literature. The gradual development for the bounds of $\sin^{-1}x$can be seen in [2]-[5] and the references therein.

Recently, Bagul and Dhaigude [2] proved inequality involving simple efficient bounds for $\sin^{-1}x$ as follows:

Theorem 1.1 *[2, Theorem 2] Let* $x \in (0,1)$ *and* $d \in (0,1]$. *Then the function* $f(x) = \frac{ln\left(\frac{sin^{-1}x}{x}\right)}{ln(1-dx^2)}$ *is strictly decreasing if* $d \le 1/2$. *In particular, we have following several inequalities*

$$\frac{1}{(1-dx^2)^{\alpha}} < \frac{\sin^{-1}x}{x} < \frac{1}{(1-dx^2)^{\beta}} \tag{1.3}$$

with the best possible constants $\alpha = 1/6d$ *and* $\beta = \frac{ln(2/\pi)}{ln(1-d)}$.

If we put $d = 1/2$, then 1.3 yields the following inequality

$$\frac{1}{(1-\frac{x^2}{2})^{1/3}} < \frac{\sin^{-1}x}{x} < \frac{1}{(1-\frac{x^2}{2})^{\beta_2}} \tag{1.4}$$

where $\beta_2 = \frac{\ln(2/\pi)}{ln(1/2)} \approx 0.651496.$

Authors in [2] claimed that the inequality given by (1.4) is the sharpest inequality of kind (1.3). Here, in this article, we refine the upper and lower bounds of inequality (1.4) and that will be discussed in the next section.

2 Main Result

This section is dedicated to the main theorem of this article, the statement of which is given below:

Theorem 2.1 *If* $x \in (0,1)$ *and* k *is any real number in* $(0,1)$, *then the following inequality holds good*

$$\frac{1}{(1-\frac{2x^2}{3})^{\eta_1}} < \frac{\sin^{-1}x}{x} < \frac{1}{(1-\frac{2x^2}{3})^{\eta_2}} \tag{2.1}$$

*Corresponding Author

for the best possible constants $\eta_1 = 1/4$ *and* $\eta_2 = \ln\left(\frac{k}{\sin^{-1}k}\right)/\ln\left(1-\frac{2k^2}{3}\right)$.

To prove the above theorem, we need following lemmas:

Lemma 2.2 *([l'Hôpital's rule of monotonicity] [1], [6]) Let* α, β *be two real valued functions which are continuous on* $[a,b]$ *and differentiable on* (a,b)*, where* $-\infty < a < b < \infty$ *and* $\beta'(x) \neq 0$*, for* $\forall x \in (a,b)$*. Let,*

$$r_1(x) = \frac{\alpha(x)-\alpha(a)}{\beta(x)-\beta(a)} \text{ and } r_2(x) = \frac{\alpha(x)-\alpha(b)}{\beta(x)-\beta(b)}.$$

Then

i) $r_1(x)$ *and* $r_2(x)$ *are increasing on* (a,b) *if* α'/β' *is increasing on* (a,b) *and*

ii) $r_1(x)$ *and* $r_2(x)$ *are decreasing on* (a,b) *if* α'/β' *is decreasing on* (a,b).

The strictness of the monotonicity of $r_1(x)$ *and* $r_2(x)$ *depends on the strictness of monotonicity of* α'/β'.

Lemma 2.3 *If* $x \in (0,1)$*, then* $\sigma(x) = 216x^6 - 424x^4 + 190x^2 + 48$ *is positive.*

Proof.

Differentiating $\sigma(x)$ with respect to x and equating to 0, then we get $\sigma'(x) = 1296x^5 + 1696x^3 + 380x = 4x(324x^4 - 424x^2 + 95) = 0$. This implies that either $x = 0$ or $324x^4 - 424x^2 + 95 = 0$. This is quartic equation in x. To solve this equation, we put $x^2 = y$, which gives us $324y^2 - 424y + 95 = 0$ a quadratic equation in y. This can be solved by traditional method. We get $x^2 = y = 0.287$ or $x^2 = y = 1.022$. Now we solve these quadratic equations in x . Finally, we have $\{0, \pm 0.535724, \pm 1.010940\}$, which is the solution set of $\sigma'(x) = 0$.

Now, we check the nature of $\sigma''(x)$ at $\{0, 0.535724, 1.010940\}$, because they all lie in the smallest neighbourhood of $(0,1)$ i.e. the region of investigation. Differentiating $\sigma'(x)$ w.r.t. x, which gives us $\sigma''(x) = 6480x^4 - 5088x^2 + 380$.

$\sigma''(0) = 380 > 0$ $\sigma(x)$ hasminima 48 at 0,

$\sigma''(0.535724) = -546.50516 < 0$ $\sigma(x)$ hasmaxima 72.711763 at 0.535724

and

$\sigma''(1.010940) = 1948.3177 > 0$ $\sigma(x)$ hasminima 29.8 90716 at 1.010940.

From above information, we confirm that the graph of $\sigma(x)$ never touches $x-$axis on $(0,1)$, that means it lies completely inside the strip $(0,1) \times (0,\infty)$ and hence in the first quadrant. Therefore, we conclude that, $\sigma(x)$ is positive on $(0,1)$.

Lemma 2.4 *If* $x \in (0,1)$*, then*

$$\rho(x) = \frac{(24x^6-108x^4+144x^2-45)(\sin^{-1}x)}{\sqrt{1-x^2}} - 48x^7 + 116x^5 - 98x^3 + 45x$$

positive increasing.

Proof. For this, we must show that $\rho'(x) > 0$. First we find the derivative of each term in $\rho(x)$ as follows:

$$\frac{d}{dx}\left(\frac{(24x^6 - 108x^4 + 144x^2 - 45)(\sin^{-1}x)}{\sqrt{1-x^2}}\right)$$

$$= \frac{24x^6-108x^4+144x^2-45}{(1-x^2)} + \frac{(-120x^7+468x^5-576x^3+243x)(\sin^{-1}x)}{(1-x^2)^{3/2}}$$

and

$$\frac{d}{dx}(-48x^7 + 116x^5 - 98x^3 + 45x) = -336x^6 + 580x^4 - 294x^2 + 45$$

With this information, $\rho'(x)$ is given by the following expression

$$\rho'(x) = \frac{(-120x^7+468x^5-576x^3+243x)(\sin^{-1}x)}{(1-x^2)^{\frac{3}{2}}} + \frac{336x^8-892x^6+766x^4-195x^2}{(1-x^2)}$$

i.e.

$$\rho'(x) = \frac{x^2}{(1-x^2)} \cdot \lambda(x),$$

where

$$\lambda(x) = \frac{(-120x^6+468x^4-576x^2+243)(\frac{\sin^{-1}x}{x})}{\sqrt{1-x^2}} + 336x^6 - 892x^4 + 766x^2 - 195$$

Now we use $\frac{\sin^{-1}x}{x} > 1$ and $\frac{1}{\sqrt{1-x^2}} > 1$ in the above expression of $\lambda(x)$, which boils down to

$$\lambda(x) > (-120x^6 + 468x^4 - 576x^2 + 243) + 336x^6 - 892x^4 + 766x^2 - 195,$$

i.e. $\lambda(x) > \sigma(x)$ where $\sigma(x) = 216x^6 - 424x^4 + 190x^2 + 48$. $\sigma(x)$ is a polynomial in x. And we want to show that, $\sigma(x) > 0$ on $(0,1)$. By lemma 2.3, $\sigma(x) > 0$ on $(0,1)$.Therefore, $\lambda(x) > 0$ and hence $\rho'(x)$, because $\frac{x^2}{(1-x^2)} > 0$ on $(0,1)$. So, $\rho(x)$ is increasing and hence positive on $(0,1)$, as $\rho(0) = 0$.

Lemma 2.5 *A real valued function*

$$\mu(x) = \frac{(4x^3-3x)(\sin^{-1}x)}{\sqrt{1-x^2}} + (6-6x^2)(\sin^{-1}x)^2 + 2x^4 - 3x^2$$

is positive increasing on $(0,1)$.

Proof. The first differentiation of $\mu(x)$ with respect to x gives rise to the following:

$$\mu'(x) = \frac{(4x^4-12x^2+9)(\sin^{-1}x)}{(1-x^2)\sqrt{1-x^2}} - 12x(\sin^{-1}x)^2 + \frac{(-8x^5+18x^3-9x)}{(1-x^2)},$$

Again by differentiating w.r.t. x, we get

$$\mu''(x) = \frac{(-28x^5+52x^3-21x)(\sin^{-1}x)}{(1-x^2)^2\sqrt{1-x^2}} - 12(\sin^{-1}x)^2 + \frac{(24x^6-54x^4+33x^2)}{(1-x^2)^2},$$

Another differentiation of above gives us $\mu^{(3)}(x)$, which is given below:

$$\mu^{(3)}(x) = \frac{(24x^6-108x^4+144x^2-45)(\sin^{-1}x)}{(1-x^2)^3\sqrt{1-x^2}} + \frac{(-48x^7+116x^5-98x^3+45x)}{(1-x^2)^3},$$

With slight rearrangement of terms, above equation can be written as

$$\mu^{(3)}(x) = \frac{1}{(1-x^2)^3} \cdot \rho(x),$$

where

$$\rho(x) = \frac{(24x^6-108x^4+144x^2-45)(\sin^{-1}x)}{\sqrt{1-x^2}} - 48x^7 + 116x^5 - 98x^3 + 45x.$$

By lemma 2.4, $\rho(x)$ is positive increasing on $(0,1)$. Also, for $x \in (0,1)$, we have $\frac{1}{(1-x^2)^3} > 0$. This implies that $\mu^{(3)}(x) > 0$, so, $\mu(x)$ is increasing and hence positive. As required.

Proof of Theorem 2.1. Denote,

$$f(x) = \frac{\ln\left(\frac{x}{\sin^{-1}x}\right)}{\ln\left(1-\frac{2x^2}{3}\right)} := \frac{f_1(x)}{f_2(x)},$$

where $f_1(x) = \ln\left(\frac{x}{\sin^{-1}x}\right)$ and $f_2(x) = \ln\left(1-\frac{2x^2}{3}\right)$ with $f_1(0^+) = 0 = f_2(0^+)$.

Differentiating with respect to x, we get

$$\frac{f_1'(x)}{f_2'(x)} = \frac{(2x^2-3)(\sin^{-1}x\sqrt{1-x^2}-x)}{4x^2\sin^{-1}x\sqrt{1-x^2}} = \frac{1}{4}f_3(x) \ say,$$

where

$$f_3(x) = \frac{(2x^2-3)(\sin^{-1}x\sqrt{1-x^2}-x)}{x^2\sin^{-1}x\sqrt{1-x^2}} := \frac{f_4(x)}{f_5(x)} say.$$

Now, we show that $f_3(x)$ is increasing i.e. to show that $f_3'(x) > 0$. For this it is sufficient to show that the numerator $N(x)$ (say) of $f_3'(x)$ is positive.

To get the expression for $N(x)$, we differentiate $f_3(x)$ w.r.t. x

$$\begin{aligned} N(x) &= f_5(x)\cdot f_4'(x) - f_4(x)\cdot f_5'(x) \\ &= \frac{(4x^4-3x^2)(\sin^{-1}x)}{\sqrt{1-x^2}} + (6x-6x^3)(\sin^{-1}x)^2 + 2x^5 - 3x^3 \\ &= x\cdot\mu(x), \end{aligned}$$

where

$$\mu(x) = \frac{(4x^3-3x)(\sin^{-1}x)}{\sqrt{1-x^2}} + (6-6x^2)(\sin^{-1}x)^2 + 2x^4 - 3x^2.$$

By lemma 2.5, $\mu(x)$ is positive on $(0,1)$.

$$\therefore N(x) > 0 \;\; f_3'(x) > 0.$$

This means that $\frac{1}{4}f_3(x) = \frac{f_1'(x)}{f_2'(x)}$ is increasing on $(0,1)$. So, by lemma 2.2 $f(x)$ is increasing on $(0,1)$.

Therefore, for $0 < x < 1$ and some $k \in (0,1)$ we must have $f(0^+) < f(x) < f(k)$, where $\eta_1 = f(0^+) = 1/4$ and $\eta_2 = f(k) = \frac{\ln\left(\frac{k}{\sin^{-1}k}\right)}{\ln\left(1-\frac{2k^2}{3}\right)}$. Hence the result follows.

3 Conclusion

From our findings in this paper depicted in the theorem 2.1, we conclude that the upper and lower bounds in the inequality (2.1) are sharper than that of the inequality (1.4) of kind (1.3).

4 Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical approval This article does not contain any studies involving human participants or animals performed by any of the authors.

Informed consent Informed consent was obtained from all participants in this study.

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Thermoelastic analysis of a semi-infinite cylinder with moving sectional heat supply

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Abstract

The aim of this paper is concerned with the transient thermoelastic analysis of the axisymmetric problem of a semi-infinite solid cylinder having an internal heat source considering a moving boundary. It is assumed that the upper edge of the cylinder is heated with an arbitrary sectional heat supply that moves with a constant velocity. The potential functions, displacements and the associated thermal stress distribution are determined. As an illustration, numerical analysis is carried out for different velocity values of the moving boundary for the temperature and the thermal stresses precisely.
Keywords: *Heat conduction, thermal stresses, homogeneous, potential function, moving heat*

1. Introduction

It is assumed that most materials tend to expand if the temperature rises, and in the first approximation, expansion and compression are proportional to temperature changes. This temperature change caused by expansion and compression is based on thermoelasticity, a branch of applied mathematics specializing in the coupling between temperature and mechanical deformation and thermal energy calculated by stress. It is also assumed that the homogeneous materials and elastic properties are the same at every point in the body and constant during translation. However, the properties do not have to be the same in all directions for homogeneous materials. Isotropic materials have the same elasticity in all directions. Therefore, the material must be uniform and isotropic such that the transverse strain is the same at each point of the particular component. The uniformly loaded homogeneous and isotropic plate has attracted the focus of researchers over the past long time because of its application to various machines and structures.

Some authors have worked on homogeneous materials in the most recent literature, which can be summarised below. Aksoy et al. [1] performed the thermoelastic stress analysis of a cylinder made of laminated isotropic material under thermomechanical loading. Deshmukh et al. [2] investigated the thermoelastic behaviour of circular plates, and the simply supported plates with thermal bending moments caused by moving heat sources and point heat sources were investigated. Janjgava [3] solved the thermoelastic two-dimensional problem by considering the micro-temperature. Kedar et al. [4] discussed the transient heat conduction problem of finite and semi-infinite thick cylinders and determined the thermal stress by the quasi-static method.

Further, it is also noted that the moving heat source is the subject of transient heat transfer and is suitable for engineering problems, especially for welding. At the beginning of the 20th century, welding engineers began to study moving heat sources, both empirically and theoretically [5]. Kim [6] obtained the temperature distribution around a rectangular shape source moving at a constant speed along the axis of a bar using a Fourier series procedure. Shokouhmand and Ghaffari [7] performed the temperature analysis of the nonlinear and transient magneto-thermal coupled problem with moving coils studied by a valid finite element program, which is considered a moving heat source using numerical methods. Deshmukh et al. [2] obtained the most exciting result of dynamic thermal stresses in a circular plate by a moving heat source subject to certain boundary conditions using the integral transform technique. Things become complicated when internal heat persists on the object under consideration and further becomes unpredictable when part of the heat is affected. Both analytical and numerical techniques have proven to be the best way to solve such problems. In previous works, the temperature and stress distributions were analyzed analytically or numerically using a computer code, and this study points out the importance of the topic in a workpiece. This work presents the temperature distributions and associated thermal stresses in a cylindrical profile workpiece with an internal heat source subjected to heated partly-axially from its outer surface by a moving uniform heat source.

Mathematical modelling

For this study, a solid cylinder is heated partly-axially from its outer surface (processed surface) by a moving uniform heat source under stagnant ambient conditions is considered to analyze the transient temperature distributions analytically. As already known, heat is released in a solid subjected to manufacturing processes such as grinding, hardening, cutting, coating, metal forming, etc. Temperature differences occurring in this solid because of non-uniformities of the released heat, cooling and/or thermal properties of the solid material may cause thermal stress. This study also presents the thermal stresses proportional to the temperature differential. The axisymmetric geometric model of the considered cylinder and the coordinate system is shown in figure 1.

2.1 The governing heat conduction equation

The governing equation of temperature distribution is given as follows

$$\frac{\partial^2\theta}{\partial r^2}+\frac{1}{r}\frac{\partial\theta}{\partial r}+\frac{\partial^2\theta}{\partial z^2}+Q=\frac{1}{\kappa}\frac{\partial\theta}{\partial t} \tag{1}$$

subjected to boundary conditions

$$\theta=0 \quad \text{at} \quad t=0 \tag{2}$$

$$\theta=0 \ \text{at} \ \ r=a \tag{3}$$

$$\frac{\partial\theta}{\partial z}-\theta=-\theta_0 \ \text{at} \ \ z=vt \tag{4}$$

in which $\theta(r,z,t)$ is the temperature distribution function, and $\kappa=\lambda/\rho C$, λ is the thermal conductivity of the material, ρ is the density and C is the calorific capacity, assumed to be constant, respectively.

2.2 The governing thermal displacements and stress equations

The Navier's equations without the body forces can be expressed as

$$\begin{aligned}\nabla^2 u_r-\frac{u_r}{r^2}+\frac{1}{1-2\nu}\frac{\partial e}{\partial r}-\frac{2(1+\nu)}{1-2\nu}\alpha\frac{\partial\theta}{\partial r}=0\\ \nabla^2 u_z-\frac{1}{1-2\nu}\frac{\partial e}{\partial z}-\frac{2(1+\nu)}{1-2\nu}\alpha\frac{\partial\theta}{\partial z}=0\end{aligned} \tag{5}$$

where u_r and u_z are the displacement components in the radial and axial directions, respectively and the dilatation e as

$$e=\frac{\partial u_r}{\partial r}+\frac{u_r}{r}+\frac{\partial u_z}{\partial z} \tag{6}$$

The displacement functions represented by the Goodier's displacement potential function $\phi(r,z,t)$ and Michell's function $M(r,z,t)$ is given as

$$\begin{aligned}u_r=\frac{\partial\phi}{\partial r}-\frac{\partial^2 M}{\partial r\partial z},\\ u_z=\frac{\partial\phi}{\partial z}+2(1-\nu)\nabla^2 M-\frac{\partial^2 M}{\partial z^2}\end{aligned} \tag{7}$$

in which Goodier's thermoelastic potential must satisfy the equation

$$\nabla^2\phi=\frac{1+\nu}{1-\nu}\alpha\theta \tag{8}$$

and Michell's function must satisfy the equation

$$\nabla^2\nabla^2 M=0 \tag{9}$$

where

$$\nabla^2 = \frac{1}{r}\frac{\partial}{\partial r}\left(r\frac{\partial}{\partial r}\right)+\frac{\partial^2}{\partial z^2}$$

The component of the stresses can be given as

$$\begin{aligned}
\frac{\sigma_{rr}}{2G} &= \frac{\partial^2\phi}{\partial r^2}-\nabla^2\phi+\frac{\partial}{\partial z}\left(\upsilon\nabla^2 M-\frac{\partial^2 M}{\partial r^2}\right),\\
\frac{\sigma_{\theta\theta}}{2G} &= \frac{1}{r}\frac{\partial\phi}{\partial r}-\nabla^2\phi+\frac{\partial}{\partial z}\left(\upsilon\nabla^2 M-\frac{1}{r}\frac{\partial M}{\partial r}\right),\\
\frac{\sigma_{zz}}{2G} &= \frac{\partial^2\varphi}{\partial z^2}-\nabla^2\phi+\frac{\partial}{\partial z}\left((2-\upsilon)\nabla^2 M-\frac{\partial^2 M}{\partial z^2}\right),\\
\frac{\sigma_{rz}}{2G} &= \frac{\partial^2\phi}{\partial r\partial z}+\frac{\partial}{\partial r}\left((1-\upsilon)\nabla^2 M-\frac{\partial^2 M}{\partial z^2}\right)
\end{aligned} \tag{10}$$

where G is the shear modulus and υ is the Poisson's ratio.

The boundary conditions on the traction free surface are

$$\sigma_{rr}=\sigma_{rz}=0 \text{ at } r=a \tag{11}$$

The equations (1) to (11) constitute the mathematical formulation of the problem under consideration.

2.3 Temperature distribution and its associated stress in dimensionless quantities

For the sake of simplicity, the following dimensionless quantities are introduced as

$$\begin{aligned}
&T=\theta/\theta_0, \tau=\kappa t/a^2, \bar{r}=r/a=\xi, \bar{z}=z/a, \bar{\nu}=\nu a/\kappa,\\
&\bar{M}=\frac{1-\upsilon}{(1+\upsilon)\alpha\theta_0 a^3}, \bar{\phi}=\frac{1-\upsilon}{(1+\upsilon)\alpha\theta_0 a^2}\phi, \bar{u}_i=\frac{1-\upsilon}{(1+\upsilon)\alpha\theta_0 a}u_i\\
&\bar{\sigma}_{ij}=\frac{1}{2G}\frac{1-\upsilon}{(1+\upsilon)\alpha\theta_0}\sigma_{ij}\ (i,j=r,z)
\end{aligned} \tag{12}$$

Substituting the Eq. (12) in Eqs. (1)-(4), (7), (9)-(10) and (11), one obtains the expressions in dimensionless form as

$$\frac{\partial^2 T}{\partial\xi^2}+\frac{1}{\xi}\frac{\partial T}{\partial\xi}+\frac{\partial^2 T}{\partial\zeta^2}+\bar{\nu}\frac{\partial T}{\partial\zeta}+Q=\frac{\partial T}{\partial\tau} \tag{13}$$

$$T=0 \text{ at } \tau=0 \tag{14}$$

$$T=0 \text{ at } \xi=1 \tag{15}$$

$$\frac{\partial T}{\partial\zeta}-T=-1 \text{ at } \zeta=\bar{z}-\bar{\nu}\tau=0 \tag{16}$$

$$\begin{aligned}
\bar{u}_\xi &= \frac{\partial\bar{\phi}}{\partial\xi}-\frac{\partial^2\bar{M}}{\partial\xi\,\partial\zeta},\\
\bar{u}_z &= \frac{\partial\bar{\phi}}{\partial\zeta}+2(1-\nu)\nabla^2\bar{M}-\frac{\partial^2\bar{M}}{\partial\zeta^2}
\end{aligned} \tag{17}$$

$$\Delta^2\bar{\phi}=\bar{T} \tag{18}$$

$$\Delta^2\Delta^2 M=0 \tag{19}$$

$$\bar{\sigma}_{\xi\xi} = \frac{\partial^2\bar{\phi}}{\partial\xi^2} - \Delta^2\bar{\phi} + \frac{\partial}{\partial\zeta}\left(\upsilon\Delta^2\bar{M} - \frac{\partial^2\bar{M}}{\partial\xi^2}\right),$$

$$\bar{\sigma}_{\theta\theta} = \frac{1}{\xi}\frac{\partial\bar{\phi}}{\partial\xi} - \Delta^2\bar{\phi} + \frac{\partial}{\partial\zeta}\left(\upsilon\Delta^2\bar{M} - \frac{1}{\xi}\frac{\partial\bar{M}}{\partial\xi}\right), \qquad (20)$$

$$\bar{\sigma}_{zz} = \frac{\partial^2\bar{\phi}}{\partial\zeta^2} - \Delta^2\phi + \frac{\partial}{\partial\zeta}\left((2-\upsilon)\Delta^2\bar{M} - \frac{\partial^2\bar{M}}{\partial\zeta^2}\right),$$

$$\bar{\sigma}_{rz} = \frac{\partial^2\bar{\phi}}{\partial\xi\partial\zeta} + \frac{\partial}{\partial\xi}\left((1-\upsilon)\Delta^2\bar{M} - \frac{\partial^2\bar{M}}{\partial\zeta^2}\right)$$

$$\sigma_{\xi\xi} = \sigma_{\xi\zeta} = 0 \quad \text{at } \xi = 1$$

$$\sigma_{\zeta\zeta} = \sigma\xi\zeta = 0 \quad \text{at } \zeta = 0 \qquad (21)$$

where

$$\Delta^2 = \frac{1}{\xi}\frac{\partial}{\partial\xi}\left(\xi\frac{\partial}{\partial\xi}\right) + \frac{\partial^2}{\partial\zeta^2}$$

3. The solution to the Problem

3.1 Solution for temperature distribution

In order to solve Eq. (13) under the boundary condition (15), we firstly introduce the integral transform [6] of order $n = 0$ over the variable r, then the integral transform and its inversion theorem are written as

$$H_{0j}\{f(\xi)\} = \bar{f}(\mu_j) = \int_0^1 \xi f(\xi) J_0(\mu_j\xi) d\xi, \; j = 1,2,..\infty$$

$$H_{0j}^{-1}\{\bar{f}(\mu_j)\} = f(\xi) = \sum_{j=1}^{\infty} \bar{f}(\mu_j) J_0(\mu_j\xi), 0 \le \xi \le \xi_0 \qquad (22)$$

in which μ_j are the roots of $J_0(\mu_j\xi) = 0$ and $J_0(\,)$ is the Bessel functions of the first kind of order $n = 0$.

Applying the transform defined by Eq. (22) to the Eqs. (14) and (16), and using Laplace transform, one obtains

$$\frac{\partial^2\bar{T}}{\partial\zeta^2} + \bar{v}\frac{\partial\bar{T}}{\partial\zeta} - (\mu_j^2 + p)\bar{T} + \frac{\delta(\zeta)J_0(\mu_j)}{p+\varpi} = -Q \qquad (23)$$

where $\bar{T}$ is the transformed function of T. The symbol ($\bar{}$) means a function in Hankel transformed domain, ($\tilde{}$) is for the function in Laplace transformed domain and p is Laplace parameter.

The solution of Eq. (23), in conjunction with the condition (16), one finds in the form

$$\tilde{\bar{T}}(\mu_j,\zeta,p) = \frac{Q}{p+\mu_j^2} + \left[1 - \left(\frac{Q}{p+\mu_j^2}\right)\right]\left(\frac{2\exp[-1/2\,\zeta(\nu+\sqrt{4(p+\mu_j^2)+\nu^2})]}{2+\nu+\sqrt{4(p+\mu_j^2)+\nu^2}}\right) \qquad (24)$$

Further taking the inverse transform of Eq. (24) and making use of the convolution theorem, one obtains

$$\bar{T}(\mu_j,\zeta,t) = Q\exp(-\tau\mu_j^2) + 2\exp(-2\zeta(\nu+1)^2)[(-1+\mu_j^2-\nu) \times \int_0^{\tau}\exp[s(1-\mu_j^2+\nu)]ds + Q\int_0^{\tau}\exp[-(\tau-s)\,\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\} \qquad (25)$$

Lastly, by the application of the inverse formulae Eq. (22), one gets the solution of the boundary value problem

$$T(\xi,\zeta,t)=\sum_{j=1}^{0} J_0(\mu_j\xi)\{Q\exp(-\tau\mu_j^2)+2\exp(-2\zeta(\nu+1)^2)[(-1+\mu_j^2-\nu)\times\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[\tau(1-\mu_j^2+\nu)]ds]\} \quad (26)$$

3.2 Solution for Goodier's potential and the Michell's function

Assuming the potential function which satisfies Eq. (18) as

$$\phi(\xi,\eta,\tau)=\sum_{j=1}^{0} A_1 J_0(\mu_j\xi)\exp[-2\zeta(\nu+1)^2]Q\exp(-\tau\mu_j^2)\{\exp[2\zeta(\nu+1)^2]+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (27)$$

Substituting Eq.(25) into Eq. (18), one obtains

$$A_1=8(1+\nu)^2\left[\mu_j^2-\mu_j(\mu_j+1)\frac{1}{\xi}\frac{J_1(\mu_j\xi)}{J_0(\mu_j\xi)}\right] \quad (28)$$

Similarly, assume Michell's function satisfying Eq. () as

$$M(\xi,\zeta,\tau)=\sum_{j=1}^{0}[B_1 J_0(\mu_j\xi)+B_2\mu_j\xi J_0(\mu_j\xi)]Q\exp(-\tau\mu_j^2)\{\exp[2\zeta(\nu+1)^2]+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (29)$$

Substituting Eqs. (27)-(29) into Eq. (20), one obtains

$$\bar{\sigma}_{\xi\xi}=\sum_{j=1}^{0}\{A_1[\mu_j^2(J_0(\mu_j\xi)-\frac{1}{\xi}J_1(\mu_j\xi))-(\mu_j^2J_0(\mu_j\xi)-\frac{\mu_j}{\xi}J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4]-2[B_1+B_2\mu_j]\{\upsilon(\mu_j^2J_0(\mu_j\xi)-\frac{\mu_j}{\xi}J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4-\mu_j^2(J_0(\mu_j\xi)-\frac{1}{\xi}J_1(\mu_j\xi))\}(\nu+1)^2\}\exp[-2\zeta(\nu+1)^2]Q\exp(-\tau\mu_j^2)\{\exp[-2\zeta(\nu+1)^2]+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (30)$$

$$\bar{\sigma}_{\theta\theta} = \sum_{j=1}^{0} \{A_1[-\frac{\mu}{\xi} J_1(\mu_j\xi) - (\mu_j^2 J_0(\mu_j\xi) - \frac{\mu}{\xi} J_1(\mu_j\xi)[\mu+1])4(\nu+1)^4]$$
$$-2[B_1 + B_2\mu_j]\{\upsilon(\mu_j^2 J_0(\mu_j\xi) - \frac{\mu}{\xi} J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4$$
$$+\frac{\mu}{\xi} J_1(\mu_j\xi)\}(\nu+1)^2\}\exp[-2\zeta(\nu+1)^2]Q\exp(-\tau\mu_j^2)\{\exp[-2\zeta(\nu+1)^2]$$
$$+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds$$
$$+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (31)$$

$$\bar{\sigma}_{\zeta\zeta} = \sum_{j=1}^{0} \{A_1[J_0(\mu_j\xi)4(\nu+1)^4 - (\mu^2 J_0(\mu_j\xi) - \frac{\mu}{\xi} J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4]$$
$$-2[B_1 + B_2\mu_j]\{(2-\upsilon)(\mu_j^2 J_0(\mu_j\xi) - \frac{\mu}{\xi} J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4$$
$$-J_0(\mu_j\xi)4(\nu+1)^4\}(\nu+1)^2\}\exp\{-2\zeta(\nu+1)^2\}Q\exp(-\tau\mu_j^2)\{\exp[-2\zeta(\nu+1)^2]$$
$$+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds$$
$$+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (32)$$

$$\bar{\sigma}_{\xi\zeta} = \sum_{j=1}^{0} \{A_1[J_0(\mu_j\xi)4(\nu+1)^4 - (\mu_j^2 J_0(\mu_j\xi) - \frac{\mu_j}{\xi} J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4]$$
$$+[B_1 + B_2\mu_j]\{(1-\upsilon)(-\mu^3 J_1(\mu_j\xi) - 4\mu_j[\mu_j+1](\nu+1)^4$$
$$\times\left[\frac{\mu_j\xi J_0(\mu_j\xi) - J_1(\mu_j\xi)[\mu_j+1]}{\xi^2}\right] + \mu_j J_1(\mu_j\xi)4(\nu+1)^4\}\exp[-2\zeta(\nu+1)^2]Q$$
$$\times\exp(-\tau\mu_j^2)\{\exp[-2\zeta(\nu+1)^2] + (2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)$$
$$\times\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds + Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/4(\nu+1)^4\} \quad (33)$$

Now substituting Eqs. (30) and (33) into Eq. (21), one obtains

$$B_1 = 0$$

$$B_2 = \frac{-A_1[J_0(\mu_j)4(\nu+1)^4 - (\mu^2 J_0(\mu_j) - \mu J_1(\mu_j)[\mu+1])4(\nu+1)^4]}{\mu_j\{(1-\upsilon)(-\mu^3 J_1(\mu_j) - 4\mu[\mu+1](\nu+1)^4\mu\ J_0(\mu_j) - J_1(\mu_j)[\mu+1] + \mu J_1(\mu_j)4(\nu+1)^4\}}$$

4. Numerical Results, Discussion and Remarks

The numerical computations have been carried out for Aluminium (pure) annular sector plate with the thermo-mechanical properties: modulus of elasticity E = 70 GPa, Poisson's ratio υ = 0.35, thermal expansion coefficient α = 23×10^{-6}/^{0}C, thermal diffusivity κ = 84.18×10-6 m^{2}s^{-1} and thermal conductivity λ = 204.2 Wm^{-1}K^{-1}. The physical parameter for the sector plate as $a = 1$m, $b = 1$m, $l = 0.08$ m and $T_0 = 150^0$C. In order to examine the influence of heating on the plate, numerical calculations were performed for all the variables. The numerical calculations are depicted in the following figures with the help of MATHEMATICA software.

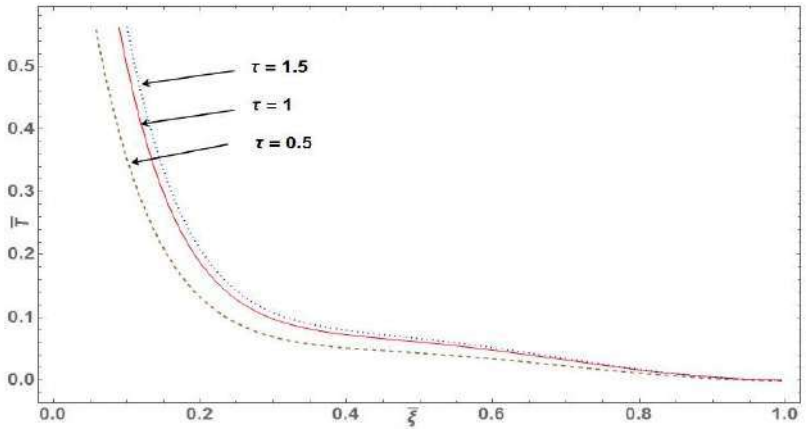

Fig. 1: Temperature distribution along ξ-direction for different time

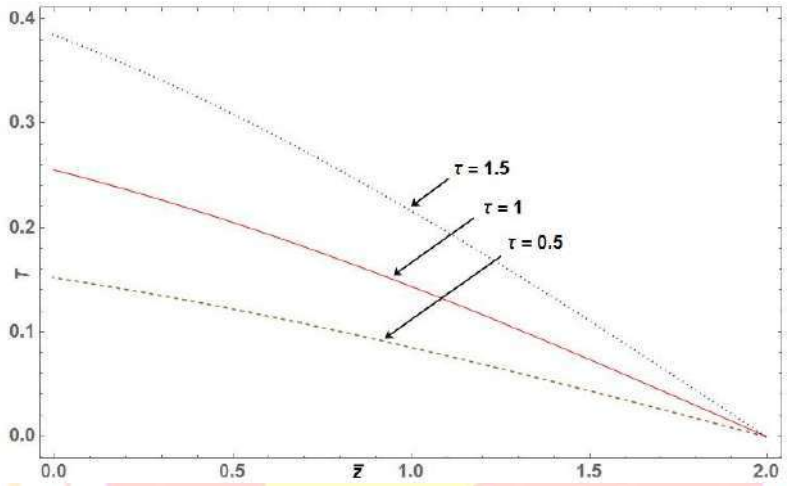

Fig. 2: Temperature distribution along z-direction for different time

Fig. 1 illustrates the temperature distribution along the radial direction for different values of time, and it decreases as the time proceeds along the radial direction but attains its maximum at the inner core. The maximum value of temperature magnitude occurs at the outer edge due to additional heat supply with available internal heat energy throughout the body. Fig. 2 indicates the temperature distribution along the axial direction of the plate for different values of time, but the curve shows a straight line due to the shallowness of the cylinder and the maximum value of temperature magnitude occurring at the edge, that is energized due to sectional heat supply.

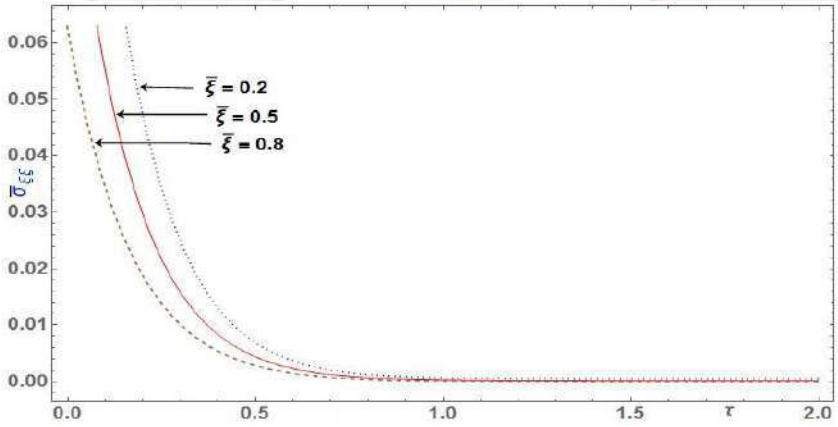

Fig. 3: Radial stress distribution along τ-direction for different ξ

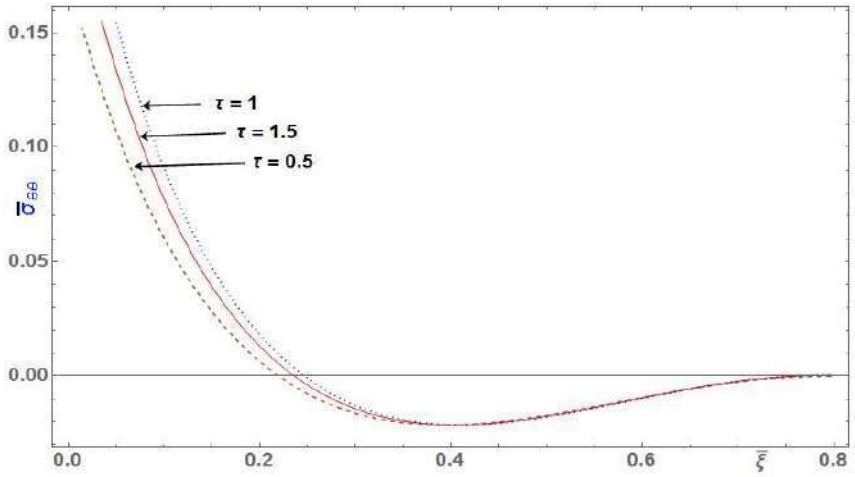

Fig. 4: Tangential stress distribution along ξ-direction for different time

Fig. 3 depicts the thermal radial stress along the axial direction for different values of the time. The expansion occurs, and its magnitude increases at the inner edge; it may be due to compressive force, whereas maximization towards the outer edge may be due to energized heat supply. The tangential stress decreases gradually along the radial direction with the thermal load, as shown in Fig. 4. The stresses attain certain maxima and decrease gradually at the outer edge towards infinity.

1. Conclusion

This study has treated the thermoelastic problem of a semi-infinite cylinder in which sources are generated. We successfully obtained the temperature distribution, displacements and stress functions with additional sectional heating available at the cylinder's edge. Then, the numerical calculations were carried out. We may conclude that the system of equations proposed in this study can be adapted to the design of useful structures or machines in engineering applications to determine thermoelastic behaviour with radiation.

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Magnetized Bianchi Type-III Perfect Fluid Cosmological Model in Brans-Dicke Theory of Gravitation

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Abstract:
In this paper, we investigate the role of relativistic charged perfect fluid in Bianchi type-III cosmological model in Brans-Dicke theory of gravitation. Solutions of the models are obtained by volumetric exponential expansion, power law expansion and power law relation between scalar field ϕ and the scale factor a .Some physical and kinematical properties of the model are also discussed.
Keywords: *Bianchi type-III universe, Brans-Dicke theory of gravitation, electromagnetic field, perfect fluid, constant vector potentials.*

1. Introduction:

Brans and Dicke (BD) theory of gravitation is a well-known modified version of Einstein's theory. (Brans and Dicke 1961) formulated a theory of gravitation in which, besides a gravitational part, a dynamical scalar field is introduced to account for variable gravitational constant and to incorporate Mach's [1]Principle in Einstein's theory. In this theory, the scalar field has the dimension of the universe of a gravitational constant and its role is confined to its effect on gravitational field equations.[2] BD scalar-tensor theory of gravitation is quite important in view of the fact that scalar fields play a vital role in inflationary cosmology. In recent years, there has been a renewed interest of the gravitational constant.[3] The latest inflationary models (Mathiazhagan and Johri 1984),possible "graceful exit" problem (Pimental 1997) and extended chaotic inflations (Linde 1990) are based on BD theory of gravitation.[4-6]

The scalar-tensor theories have been subject of considerable interest in the study of various cosmological models due to their relevance for the inflationary expansion of the universe and to solve many outstanding problems in cosmology. Several aspects of BD cosmology have been extensively investigated by[7] many authors. Bardeen et al. (1983) explored the inflationary universe models which provide a mechanism for galaxy formation by generating small scale density fluctuation in the universe, Banerjee et al.(1990) studied Bianchi type-I string cosmological models with and without a source-free magnetic field, Johri and Desikan (1994) have investigated cosmological models with constant deceleration parameter in Nordtvedt's theory,[8] Bianchi type-III cosmological model with a negative constant deceleration parameter in BD theory of gravity in presence of perfect fluid has been studied by Adhav et al.(2012), Katore et al. (2012) explored plane symmetric space-time filled with dark energy models in BD theory, Bhoyar et al. (2018) studied Bianchi type-III and Kantowski Sachs cosmological model containing magnetic field with variable cosmological constant. [9-11]

Lorenz-Petzold (1982), Kumar et al. (2008), Pawar et al. (2009), Rao et al.(2011), Naidu et al.(2012), Kandalkar et al. (2014),Mete et al. (2018), are some of the authors who have investigated several aspects of BD theory of gravitation.[12-15]

Tikekar and Patel (1992) have obtained some exact Bianchi type-III cosmological solutions of massive string in the presence of magnetic field,[16] Singh and Shri Ram (1996) have presented a technique to generate new exact Bianchi type-II cosmological solutions of massive strings in the presence and absence of the magnetic field, Tripathy et al. (2009) and Pradhan (2007) studied string cosmological models in the presence of the electromagnetic field,[17-20] A detailed discussion of BD cosmology is given by Singh et al. (2010),Singh J. K and Sharma N. K (2010a) have investigated some Bianchi type-II cosmological models in BD theory,

Shamir et al. (2012) explored anisotropic dark energy Bianchi type-III cosmological models in BD theory of gravity, Solanke and Karade (2016,2017) have investigated Bianchi type-I and III universe[21] field with perfect fluid and scalar field coupled with electromagnetic fields in theory of gravity. Recently Katore et al. (2018) have investigated Bianchi type-I dark energy cosmological model with power-law relation in BD theory of gravitation.[22-25]

In this paper, we discuss Bianchi type-III perfect fluid cosmological model with electromagnetic field in BD theory of gravitation.

2. The Metric And Field Equation:

We consider a spatially homogeneous Bianchi Type-III space time in the form

$$ds^2 = -dt^2 + A^2dx^2 + B^2e^{-2mx}dy^2 + C^2dz^2, \quad (1)$$

where A, B and C are functions of t and m is a constant.

Brans-Dicke field equations for the combined scalar and tensor fields are

$$G_j^i = \frac{-8\pi}{\phi}T_j^i - \frac{\omega}{\phi^2}\left(g^{ii}\phi_{,i} - \frac{1}{2}g_j^i\phi_{,k}\phi^{,k}\right) - \frac{1}{\phi}\left(g^{ii}\phi_{i;j} - g_j^i\phi_{;k}^{,k}\right), \quad (2)$$

where G_j^i is Einstein's tensor, ϕ is a dimensionless coupling constant and T_j^i is energy momentum tensor for perfect fluid with conservation equation.

$$\phi_{;k}^{,k} = \frac{1}{\sqrt{-g}}\left[\sqrt{-g}\phi^k\right]_{,k} \quad (3)$$

3. Energy Momentum Sources:

The energy momentum tensor for matter under discussion given by

$$T_j^i = {}^pT_j^i + E_j^i, \quad (4)$$

where ${}^pT_j^i$ is energy momentum tensor for perfect fluid and E_j^i is energy momentum tensor for electromagnetic field is given by

$$E_{ij} = \frac{1}{4}F_{ab}F^{ab}g_{ij} - F_{ai}F_{bj}g^{ab}. \quad (5)$$

Here the electromagnetic field tensor F_{ij} has the expression

$$F_{ij} = \frac{\partial A_i}{\partial x^j} - \frac{\partial A_j}{\partial x^i}. \quad (6)$$

where A_i is a four potential vector.

To achieve the compatibility with the metric (1), we assume electromagnetic vector potential as

$$A_i = [\lambda(x)v_1(t), v_2(t), v_3(t), v_4(t)]. \quad (7)$$

From equations (6) and (7), we deduce

$$F_{14} = \lambda\dot{v}_1,\ F_{24} = \dot{v}_2,\ F_{34} = \dot{v}_3,\ F_{43} = -\dot{v}_3. \quad (8)$$

Using equations (6), (7) and (8), we obtained

$$F_{ab}F^{ab} = -2\left[\frac{\lambda^2\dot{v}_1^2}{A^2} + \frac{\dot{v}_2^2}{B^2e^{-2mx}} + \frac{\dot{v}_3^2}{C^2}\right], \quad (9)$$

The energy momentum tensor for a perfect fluid is given by

$${}^pT_j^i = (\rho + p)u^iu_j - p\delta_i^j, \quad (10)$$

where ρ is the density, p is the pressure of perfect fluid and four velocity u_i is given by

$$g_{ij}u^i u^j = -1.$$

For co-moving coordinate system, we have

$$u_x = 0, \quad u_y = 0, \quad u_z = 0, \quad u_t \neq 0. \tag{11}$$

Accordingly equation (10), provides

$${}^pT_1^1 = {}^pT_2^2 = {}^pT_3^3 = -p, \; {}^pT_4^4 = \rho, \; T_i^j = 0 \quad \forall i, j \tag{12}$$

Using equations (5), (9) and (12), we obtained

$${}^pT_1^1 + E_1^1 = \frac{1}{2}\frac{\lambda^2 \dot{v}_1^2}{A^2} - \frac{1}{2}\frac{\dot{v}_2{}^2}{B^2 e^{-2mx}} - \frac{1}{2}\frac{\dot{v}_3{}^2}{C^2} - p, \tag{13}$$

$${}^pT_2^1 + E_2^1 = {}^pT_1^2 + E_1^2 = \frac{\lambda \dot{v}_1 \dot{v}_2}{A^2}, \tag{14}$$

$${}^pT_3^1 + E_3^1 = {}^pT_1^3 + E_1^3 = \frac{\lambda \dot{v}_1 \dot{v}_3}{A^2}, \tag{15}$$

$${}^pT_2^2 + E_2^2 = -\frac{1}{2}\frac{\lambda^2 \dot{v}_1^2}{A^2} + \frac{1}{2}\frac{\dot{v}_2^2}{B^2 e^{-2mx}} - \frac{1}{2}\frac{\dot{v}_3^2}{C^2} - p, \tag{16}$$

$${}^pT_3^2 + E_3^2 = {}^pT_2^3 + E_2^3 = \frac{\dot{v}_2 \dot{v}_3}{B^2 e^{-2mx}}, \tag{17}$$

$${}^pT_3^3 + E_3^3 = -\frac{1}{2}\frac{\lambda^2 \dot{v}_1^2}{A^2} - \frac{1}{2}\frac{\dot{v}_2^2}{B^2 e^{-2mx}} + \frac{1}{2}\frac{\dot{v}_3^2}{C^2} - p \tag{18}$$

$${}^pT_4^4 + E_4^4 = \frac{1}{2}\frac{\lambda^2 \dot{v}_1^2}{A^2} + \frac{1}{2}\frac{\dot{v}_2^2}{B^2 e^{-2mx}} + \frac{1}{2}\frac{\dot{v}_3^2}{C^2} + \rho. \tag{19}$$

4. Conservation Law:

The Conservation equation is given by

$$\frac{\partial}{\partial x^i}\left(\sqrt{-g}F^{ij}\right) = 0. \tag{20}$$

Equation (20) with different combination of i and j gives following equations

$$\left[\frac{\dot{v}_1}{v_1}\right]^{\bullet} + \frac{\dot{v}_1^2}{v_1^2} + \frac{\dot{v}_1}{v_1}\left[\frac{\dot{B}}{B} + \frac{\dot{C}}{C} - \frac{\dot{A}}{A}\right] = 0, \tag{21}$$

$$\left[\frac{\dot{v}_2}{v_2}\right]^{\bullet} + \frac{\dot{v}_2^2}{v_2^2} + \frac{\dot{v}_2}{v_2}\left[\frac{\dot{A}}{A} + \frac{\dot{C}}{C} - \frac{\dot{B}}{B}\right] = 0, \tag{22}$$

$$\left[\frac{\dot{v}_3}{v_3}\right]^{\bullet} + \frac{\dot{v}_3^2}{v_3^2} + \frac{\dot{v}_3}{v_3}\left[\frac{\dot{A}}{A} + \frac{\dot{B}}{B} - \frac{\dot{C}}{C}\right] = 0, \tag{23}$$

$$\phi^{;k}_{;k} = -\ddot{\phi} - \dot{\phi}\left[\frac{\dot{A}}{A} + \frac{\dot{B}}{B} - \frac{\dot{C}}{C}\right]. \tag{24}$$

From the vanishing components of Einstein's tensor and using (5) and (7), we deduce

$$\frac{\dot{v}_1 \dot{v}_2}{v_1 v_2} = \frac{\dot{v}_1 \dot{v}_3}{v_1 v_3} = \frac{\dot{v}_2 \dot{v}_3}{v_2 v_3} = 0, \tag{25}$$

$$\frac{\dot{v}_1}{v_1} = \frac{\dot{v}_2}{v_2} = \frac{\dot{v}_3}{v_3} = \frac{\dot{D}}{D}, \tag{26}$$

where D is an unknown function of t

Integrating equation (26) with respect to t, we get

$$v_1 = k_1 D,\ v_2 = k_2 D,\ v_3 = k_3 D, \tag{27}$$

where k_1, k_2 and k_3 are constants.

Using equations (25) and (27), we get

$$\left(\frac{\dot{D}}{D}\right)^2 = 0. \tag{28}$$

With an aid of equation (27), we can write the equations (21) to (23) as

$$\left(\frac{\dot{D}}{D}\right)^{\bullet} + \left(\frac{\dot{D}}{D}\right)^2 + \frac{\dot{D}}{D}\left(\frac{\dot{B}}{B} + \frac{\dot{C}}{C} - \frac{\dot{A}}{A}\right) = 0, \tag{29}$$

$$\left(\frac{\dot{D}}{D}\right)^{\bullet} + \left(\frac{\dot{D}}{D}\right)^2 + \frac{\dot{D}}{D}\left(\frac{\dot{A}}{A} + \frac{\dot{C}}{C} - \frac{\dot{B}}{B}\right) = 0, \tag{30}$$

$$\left(\frac{\dot{D}}{D}\right)^{\bullet} + \left(\frac{\dot{D}}{D}\right)^2 + \frac{\dot{D}}{D}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} - \frac{\dot{C}}{C}\right) = 0. \tag{31}$$

We attempt to express the component of T_j^i in terms of T_4^4 already used as in (Solanke and Karade (2016,2017). For this, we consider the expression as

$$\frac{\lambda^2 \dot{v}_1^{\,2}}{A^2} + \frac{\dot{v}_2^{\,2}}{B^2 e^{-2mx}} + \frac{\dot{v}_3^{\,2}}{C^2} = \left[\frac{\lambda^2 v_1^{\,2}}{A^2}\left(\frac{\dot{D}}{D}\right)^2 + \frac{v_2^{\,2}}{B^2 e^{-2mx}}\left(\frac{\dot{D}}{D}\right)^2 + \frac{v_3^{\,2}}{C^2}\left(\frac{\dot{D}}{D}\right)^2\right] = 0 \tag{32}$$

$$\frac{\lambda^2 \dot{v}_1^{\,2}}{A^2} + \frac{\dot{v}_2^{\,2}}{B^2 e^{-2mx}} + \frac{\dot{v}_3^{\,2}}{C^2} = \left[\frac{\lambda^2 v_1^{\,2}}{A^2} + \frac{v_2^{\,2}}{B^2 e^{-2mx}} + \frac{v_3^{\,2}}{C^2}\right]\left(\frac{\dot{D}}{D}\right)^2 = 0 \tag{33}$$

$$T_4^{\,4} = \frac{1}{2}\frac{\lambda^2 \dot{v}_1^{\,2}}{A^2} + \frac{1}{2}\frac{\dot{v}_2^{\,2}}{B^2 e^{-2mx}} + \frac{1}{2}\frac{\dot{v}_3^{\,2}}{C^2} + \rho = \rho, \tag{34}$$

$$T_1^1 = -p = T_2^2 = T_3^3,$$

5. Solution of Field Equations:

Considering the non-vanishing component of Einstein's tensor from equation (3), we derive

$$\frac{\ddot{B}}{B} + \frac{\ddot{C}}{C} + \frac{\dot{B}\dot{C}}{BC} = \frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right), \tag{35}$$

$$\frac{\ddot{A}}{A} + \frac{\ddot{C}}{C} + \frac{\dot{A}\dot{C}}{AC} = \frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right) - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{C}}{C}\right), \tag{36}$$

$$-\frac{m^2}{A^2} + \frac{\ddot{A}}{A} + \frac{\ddot{B}}{B} + \frac{\dot{A}\dot{B}}{AB} = -\frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right), \tag{37}$$

$$-\frac{m^2}{A^2} + \frac{\dot{A}\dot{B}}{AB} + \frac{\dot{B}\dot{C}}{BC} + \frac{\dot{A}\dot{C}}{AC} = \frac{8\pi\rho}{\phi} + \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right), \tag{38}$$

$$\frac{\dot{A}}{A} - \frac{\dot{B}}{B} = 0. \tag{39}$$

Integrating (39) with respect to t, we get

$$A = k_4 B, \tag{40}$$

where k_4 is a constant of integration. Without loss of generality let us assume k_4 as unity so that equation (40) written as

$$A = B. \tag{41}$$

Using equations (41) and (35) to (38), we yield

$$\frac{\ddot{B}}{B} + \frac{\ddot{C}}{C} + \frac{\dot{B}\dot{C}}{BC} = \frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right), \tag{42}$$

$$-\frac{m^2}{B^2} + \frac{2\ddot{B}}{B} + \frac{\dot{B}^2}{B^2} = \frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right), \quad , \tag{43}$$

$$-\frac{m^2}{B^2} + \frac{2\dot{A}^2}{A^2} + \frac{\dot{B}\dot{C}}{BC} + \frac{\dot{A}\dot{C}}{AC} = \frac{8\pi p}{\phi} + \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right). \tag{44}$$

Since the field equations are highly nonlinear with three equations and five unknown. Therefore two extra conditions can be considered to solve the field equations.

Let us choose power law form of metric potential (Katore et al. (2018) given by

$$B = \alpha t^n, \text{ and } C = \beta t^n \tag{45}$$

The power law relation between scalar field ϕ and the scale factor a has already used by Johri and Desikan (2014) in the context of Robertson Walker Brans-Dicke models. Thus the power law relation between ϕ and the scale factor a is $\phi = \eta a^m$, where a is constant of proportionality. The average scalar factor is given by

$$a = (ABC)^{\frac{1}{3}} = k_5 t^n, \tag{46}$$

where $k_5 = \alpha^{\frac{2}{3}}\beta^{\frac{1}{3}}$ is a constant.

Hence scalar field ϕ is obtained as

$$\phi = k_5 t^{mn}$$

$$\phi = k_5 t^s,$$

where $s = mn$ is a constant.

Using equations (24) and (25), we have

$$\frac{\dot{D}}{D} = k_6, \tag{47}$$

where k_6 is a constant of integration.

Integrating equation (47), we deduce

$$D = e^{k_6 t}. \tag{48}$$

Using equations (46) and (27), we have

$$v_1 = k_1 e^{k_6 t}, \tag{49}$$

$$v_2 = k_2 e^{k_6 t}, \tag{50}$$

$$v_3 = k_3 e^{k_6 t}, \tag{51}$$

v_4 remained undetermined.

The metric in (1), with the help of (45), can be redefined in the form

$$ds^2 = \alpha^2 t^{2n}(dx^2 + e^{-2mx})dy^2 + \beta^2 t^{2n} dz^2 - dt^2 . \quad (52)$$

6. Physical and Kinematical Properties of the Model:

The physical and kinematical properties of the model (52) are obtained as follows.

For the investigated model the pressure p and the density ρ are given by

$$p = \frac{k_5 t^s}{8\pi}\left[\frac{2n(n-1)+n^2}{t^2} + \omega\frac{s^2}{2t^2} + \frac{s^2(s-1)}{t^2} + \frac{2sn}{t^2}\right], \quad (53)$$

$$\rho = \frac{k_5 t^s}{8\pi}\left[\frac{4n^2}{t^2} - \frac{m^2}{\alpha t^n} - \omega\frac{s^2}{2t^2} + \frac{3sn}{t^2}\right], \quad (54)$$

where k_5 is a constant of integration.

The physical quantities of observational interest in cosmology are,

The spatial volume is obtained as

$$V = \sqrt{-g} = \left(\alpha^2 \beta t^{3n}\right)e^{-mx}. \quad (55)$$

The expansion scalar become

$$\theta = 3H = \left(2\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right),$$

$$\theta = 3H = \frac{3n}{t}, \quad (56)$$

The shear scalar is given by

$$\sigma^2 = \frac{1}{2}\sum_{i=1}^{3} H_i^2 - \frac{\theta^2}{6} = 0 \quad (57)$$

The mean anisotropic parameter A_m as

$$\Delta = \frac{1}{3}\sum_{i=1}^{3}\left(\frac{H_i - H}{H}\right)^2$$

$$\Delta = 0. \quad (58)$$

The mean Hubble parameter

$$H = \frac{n}{t}. \quad (59)$$

The deceleration parameter is given by

$$q = \frac{d}{dt}(H) - 1 = \frac{1-n}{n} \quad (60)$$

The cosmic Jerk parameter is given as,

$$J = q + 2q^2 - \frac{\dot{H}}{H}$$

$$= \frac{(n-1)(n-2)}{n^2}. \quad (61)$$

7. Conclusion:

In this paper, we have presented Bianchi Type-III charged fluid universe in BD theory of gravitation in presence of perfect fluid with electromagnetic field. The spatial volume V of the model increases with time showing the spatial expansion of the universe. It is observed that Hubble's parameter H vanishes with extremely large value and continue to decrease with time. The scalar expansion and the physical parameters energy density and pressure diverge at $t = 0$ and they all vanish as t approaches to infinity. The scalar field increases with time and at $t = 0$, it vanishes. The recent observations of type Ia supernovae reveal that the present universe is accelerating and the value of deceleration parameter lies somewhere in the range $-1 < q < 0$. It follows that one can choose the value of n in the range $0 < n < 1$ to ensure that the derived model is consistent with observations. It is also seen that the value of the cosmic jerk parameter is positive throughout the entire history of this model. This shows that our model strongly agrees to present day observations.

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The behaviour of Composite Objects Subjected to Hygrothermal Environment : A Review Article

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Abstract:

The article investigates the present review of hyrgrothermoelastic theories with different thermal loading effects on various objects. The main theme of the hyrgrothermoelastic problems is to establish operational methods to solve the governing differential equations. In the hyrgrothermoelastic problems, we have considered a few practical problems of technical interest, considering hygrothermal loading using numerical or exact procedures.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords: *temperature distribution, moisture concentration, thermal stresses, hyrgrothermoelastic, fractional order, deflection, integral transform.*

Introduction:

Compared to usual metal structures, multilayered materials still expertise the amplified application in automobile, marine, aerospace, and civil and mechanical structures because of their higher strength and stiffness to weight ratios. It may be because of material property; analysing and coming up with these materials are a lot of difficult than metallic materials. Most structures, categorically for composite materials, are sometimes subjected to dynamical environmental conditions like temperature and moisture throughout initial manufacture and final practice. The effects of warmth and wetness on the stresses and deformation of those materials and structures are of great interest. Innovative fibre-reinforced composites have gained extensive use within the region and physical science engineering industries. The benefits of those materials result from their high strength, stiffness and damping at the side of low concrete weight, though it is susceptible to hygrothermoelastic stress due to their intrinsic heterogeneity evolving at the microscopic and macroscopic level. It reduces the prices in construction, operation and development, whereas up structural responsibility and enhances safety. A decent style of multilayered composite structures must account for hygrothermoelastic stresses correctly; even inside an uncoupled theory, the hygrothermal fields are uncoupled from the strain ones; this task is scarcely unconventional.

Research Background :

This subsection summarises the previous authors' work results, namely the nonlinear relationship between temperature, dissolved moisture content and vapour concentration, and control equations. Many researchers [1,2] following the alternative microscopic approach proposed by Henry [3] have suggested that slight variations, $\sigma = \partial M / \partial C$ and $\omega = -(\partial M / \partial T)$ are related to the mass of absorbed moisture as

$$M = \text{constant} + \sigma C - \omega T \qquad (1)$$

in a unit mass of solid to the mass of moisture, C, in a unit volume of void space and the temperature, T, and to keep equations readily soluble, we assume σ and ω as constant to avoid mathematical complexity. Now taking the rate of change of C in which mass of moisture is being absorbed or given off by the solid as $\gamma(\partial M / \partial t)$, where $\gamma = [(1-\alpha)/\alpha]\rho_S$, ρ_S is the true density, α is the ratio of the capacities for the diffusing material of equal volumes of the solid and the surrounding medium, D'' is vapour diffusion coefficient under no-absorption condition, respectively. Then the equation for moisture diffusion is

$$D''\nabla^2 C = \gamma \frac{\partial M}{\partial t} + \frac{\partial C}{\partial t} \qquad (2)$$

The rate of evolution of heat per unit volume is $k\rho'(\partial M/\partial t)$, where $\rho' = [(\rho - \rho_p)/(\rho_s - \rho_p)]\rho_s$ is the mass of solid per unit volume of the whole, and the equation for the thermal diffusion is

$$\mathsf{D}''\nabla^2 T = \frac{\partial T}{\partial t} - \varepsilon\frac{\partial M}{\partial t} \tag{3}$$

in which D'' is the thermal diffusion coefficient under the condition of no absorption, $\varepsilon = k/c_v$, with k being the overall thermal conductivity of the material, c_v is the total calorific capacity, and $\kappa = k/c_v\rho$ is representing thermal diffusivity, respectively.

Now eliminating M from Eqs. (2) and (3) using Eq. (1), one gets

$$D\nabla^2 C = \frac{\partial C}{\partial t} - \psi\frac{\partial T}{\partial t} \tag{4}$$

$$\mathsf{D}\nabla^2 T = \frac{\partial T}{\partial t} - \varphi\frac{\partial C}{\partial t} \tag{5}$$

in which ψ is the adiabatic coefficient, φ is isothermal coefficient, D is vapour diffusion coefficient under isothermal condition, D is the thermal diffusion coefficient under the state of constant vapour concentration and it is represented as

$$D = \frac{D''}{\gamma\sigma+1},\ \psi = \frac{\gamma\omega}{\gamma\sigma+1},\ \mathsf{D} = \frac{\mathsf{D}''}{1+\varepsilon\omega},\ \varphi = \frac{\varepsilon\sigma}{1+\varepsilon\omega} \tag{6}$$

Literature Review:

Several authors have previously investigated the associated hygrothermoelastic problems. Chang and Weng [4] proposed a linear hygrothermoelastic theory to analyse transient responses in an axisymmetric double-layer annular cylinder subjected to hygrothermal loading using the Hankel transform method. Sugano [5] obtained analytical solutions for the heat and moisture equation and associated hygrothermal stress in a functionally graded material plate under the prescribed surface temperature and moisture load. Chiba and Sugano [6] analysed transient heat and moisture diffusion and the resulting hygrothermal stress field in a layered plate subjected to hygrothermal loadings at the external surfaces. Brischetto [7] examined the hygrothermal loading effects in the bending of two-dimensional multilayered composite plates on Carrera's Unified formulation framework. Ishihara et al. [8] formulated and quantified the hygrothermal field in porous media exposed to heat and moisture, considering nonlinear coupling. Saadatfar and Aghaie-Khafri [9] studied static behaviour of a functionally graded magneto-electro-elastic hollow sphere subjected to hygrothermal loading in the spherically symmetric state. Ensour [10] presented the interaction of electric potentials, electric displacement and elastic deformations to describe the hygrothermal responses in inhomogeneous piezoelectric hollow cylinders subjected to mechanical load and electric potential. Zhao et al. [11] proposed the steady-state solution for three-dimensional hygrothermoelastic media based on the potential theory methodology. Previously published papers exposed the static and dynamic characteristics of composite or smart material structures to the hygrothermal environment.

Recently, a few papers have been published using time-fractional hygrothermoelasticity theory to study the effects of temperature and moisture concentrations on the material properties under hygrothermal load. Benkhedda et al. [12] evaluated the hygrothermoelastic stress in composite plates during moisture desorption, taking into account the change of mechanical characteristics induced by temperature and moisture variation. Zhang and Li [13] formulated fractional hygrothermoelasticity theory within the framework of fractional calculus by coupling the classical Fourier's and Fick's laws to anomalous diffusion, which is characterised by the time-fractional diffusion-wave equation. Peng et al. [14] presented a hyperbolic diffusion law with different phase lags of thermal and moisture fluxes to simulate coupled heat-moisture diffusion-propagation behaviour and studied transient hygrothermal and elastic response of an infinitely long cylinder subjected to sudden

hygrothermal loadings. Zhang et al. [15] proposed a hygrothermal elastic problem within the framework of time-fractional calculus theory for a centrally symmetric sphere subjected to physical heat and moisture flux at its surface by using the integral transform method. Very recently, Zhang et al. [16] investigated the time-fractional diffusion-wave equations introduced to describe the coupled heat conduction and moisture diffusion in a hollow pipe using the separation of variables and the Laplace transform.

Conclusion:

During the literature review, it was noted that most of the papers on hygrothermoelasticity were taken to derive the temperature, moisture, displacement, and stresses in different types of solid due to hygro-thermal taken for different structures. Few investigations were cited so far to determine the temperature, moisture, displacements, and stresses for composite multilayered bodies. The theoretical and experimental studies of the heated structural profile have been of considerable practical importance in various fields such as mechanical, aerospace, and food engineering throughout the past years. The further analysis of such hygrothermoelastic problems may, as it seems, stimulate the evaluation of methods. Hence, the rigorous study of hygrothermoelastic behaviour of composite homogenous and nonhomogeneous of different bodies with or without an internal heat source is strongly desired.

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Analysis of Thermoelastic Large Deflection Bending in Elliptic Plate on Elastic Foundation due to Thermal Loading

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Abstract

In this paper, the three-dimensional transient asymmetric heat conduction equation comprised of internal source and sectional thermal flux outflow decreasing linearly with time from the surface on an elliptical plate is analysed by means of Laplace integral technique. The associated large deflection of a plate placed on the elastic foundation is formulated from the potential energy equation neglecting the second strain invariant and its expression is obtained in the form of Mathieu functions. The numerical calculations of the distribution of the transient temperature, thermal deflection and the maximum normal bending stress are carried out on the outer elliptical boundary and illustrated graphically. Finally, the corresponding results for circular plates have been presumed when the ellipse degenerates to a circle. The results reveal that the highest tensile stress exists on the major axis of the circular core relative to the elliptical core, which suggests the propagation of low heating due to inadequate heat penetration into the elliptical surface.

Keywords: *Temperature distribution, large deflection, Berger, elliptical, Mathieu function, bending moments, stresses*

1. Introduction

As a result of the increased construction materials are considered in engineering application under server load intensity or thermal environments, the interest in elliptical objects with thermoelastic problems has grown considerably. An extensive investigation has been done on small and large deflections of the plate on an elastic foundation based on the linear theory of elasticity due to its practical interest of their wide applications in structures. The determination of large deflection and its associated bending stress of plates, especially of thin plates, are of vital importance in the design of machine structures, because of excessive deflection may cause undesirable thermal stress. It is well known that the classical large deflection of thin plate problems is very complicated and usually lead to the non-linear differential equation which is difficult to solve exactly.

In this regard, Berger [1] neglected the second invariant from the potential energy equation and was able to furnish a simple fourth-order differential equation. However, there doesn't seem to be any physical justification for this approximation. But in comparison of the outcomes with known solutions indicates that it has a broad scope in simplifying the problem; thus, Berger's approach yields adequately accurate results [2]. Previously also few authors have obtained a large deflection based on the total strain energy concept devised by Berger. Even few reports have been based on the calculus of variation [3], Hamilton's principle [4], and many others have performed large deflection studies for different objects [5, 6] and for various materials [7, 8]. It is also observed that few authors [3, 9] have investigated the large deflection solution when the plates on an elastic foundation are uniformly heated. Recently, Horibe and Asano [10] proposed a solution for the large deflection of beams resting on Pasternak type elastic foundation. Bhad et al. [11,12] have investigated thermoelastic deflection for the elliptic plate, and Dhakate et al. [13] performed thermal stress analysis on an annular sector plate using integral transform techniques.

A brief overview of the theoretical work with the bending analysis on elastic foundations insights of various approximate methods is cited below. Addou et al. [14] used a basic quasi three-dimensional hyperbolic theory to examine the influence of Winkler / Pasternak / Kerr base and porosity on the dynamic behavior of functionally graded plates. Chaabane et al. 2019 [15] used a hyperbolic shear deformation theory to present an analysis of the static and dynamic actions of simply supported functionally graded beams resting on the elastic

base utilizing the method of Hamilton. Mahmoudi et al. [16] derived the governing equations using the principle of virtual displacements, and a refined quasi-threedimensional shear deformation theory has been developed for the thermo-mechanical study of functionally graded sandwiched plates resting on a two-parameter elastic base. Kaddari et al. [17] introduced a new kind of quasi three-dimensional hyperbolic shear deformation theory to address static and free vibration of dynamically graded, elastic-based porous surfaces in which the equations of motion have been derived from the Hamilton principle. Bourada et al. [18] obtained the analytical solutions of the buckling and free vibrational behaviors using the theory of Hamilton and the Navier method. They performed the dynamic and stability analysis of the simply supported single-walled Carbon Nanotubes reinforced concrete beam on elastic-foundation using an integral first-order shear deformationbeamprinciple. Abualnour et al. [19] proposed a novel displacement field to investigate the thermo-mechanical bending action of the antisymmetric cross-ply laminates. Quite recently, few scholars such as Bousahla et al. [20], Bellal et al. [21] and Shariati et al. [22] investigated the structural behaviors of plate resting on elastic foundation using integralfirst shear deformation theory or four variable trigonometric integral plate theory. In the above articles, the aim was to increase the structural support's load-bearing ability either by finding the supports or by adjusting the rigidity. Compared to the freely hinged extreme or simply supported boundaries or point-supported surfaces, the studies on the bending analysis on elastic foundations were limited due to the mathematical difficulties in handling more complicated boundary conditions, and generally, numerical methods have been applied in these studies.

The most recent literature, the research on thermal bending effect was conducted by several scholars, which can be summarized as given below. Eltaher et al. [23] derived the governing equations using Hamilton's principle to study the combined effects of nonlocal elasticity and surface properties on static and vibration characteristics of piezoelectric nano-beams and solved it numerically using the finite-element method. Belbachir et al. [24] used the principle of virtual work to obtain governing equations. They discussed a refined plate theory to explain the reaction of antisymmetric cross-ply laminated plates undergoing uniform nonlinear thermo-mechanical loading. Zarga et al. [25] determined the governing equations based on the principle of virtual work and used the basic theory of quasi-3D shear deformation to study the thermo-mechanical bending of functionally graded material sandwich boards. Belbachir et al. [26] performed the flexural analysis of antisymmetric cross-ply laminated plates under nonlinear thermal loading using a refined plate theory with four variables. Matouk et al. [27] used a novel integral Timoshenko beam theory to analyze the free vibrational action of the functionally graded nano-beams incorporated into the hygro-thermal system and reposed on the elastic base. Refrafi et al. [28] used a novel shear deformation hypothesis to analyze the hygrothermal and mechanical buckling responses of simply supported functionally graded sandwich plate seated on Winkler-Pasternak elastic base. Tounsi et al. [29] proposed a simple four-variable trigonometric integral shear deformation model to study the static behavior of advanced functionally graded ceramic-metal plates supported by a two-parameter elastic foundation. Boussoula et al. [30] developed the governing equations based on the principle of virtual work to perform thermomechanical flexural analysis of functionally graded material sandwich plates. A new principle of refined trigonometric shear deformation is used by Chikr et al. [31] to analyze the buckling nature of material sandwich plates centered on a twoparameter elastic structure under various boundary conditions by applying the theory of abstract displacements. The best approach for solving these problems can be through both theoretical and computational methods. But due to either non-availability or mathematical complexity, numerical solutions are still favored and widespread in practice. It is also noted that previous researchers have not considered the transient distribution of temperature during their thermoelastic bending analysis, captivating the plate mainly in elliptic coordinates.

From the above point of view, this paper is concerned with the analysis for thermalbending maximum stresses of an elliptic plate of uniform thickness, in such a way that the origin coincides with the centee of the plate and the axes are along the major and minor axis of ellipse respectively. In this paper, an elliptical plate placed on the elastic foundation of Winkler type is considered. The foundation is assumed to be such that its reaction is proportional to the deflection. During the problem formulation, we have initially investigated the problem from a different point of view by incorporating inside a thermal source of heat at a rate of

$(\lambda / K)\exp(-\beta t)$ per unit volume in a temperature field differential equation and a thermal flux $(Q_0 / K)(1-\nu t)$ outflow decreasing linearly with time. In the second part following Berger's method, the evaluation of large deflection of a heated clamped plate placed on the elastic foundation has been investigated under transient temperature distribution. Finally, the thermal maximum stress components are obtained based on the concept that bending stresses are distributed linearly over the thickness of the plate. Furthermore, the method is applicable to the bending of the circular plate, which has been deduced when the ellipse degenerates to a circle.

2. Basic thermoelastic deflection formulation

The potential energy obtained taking in account the strain energy due to thermal bending and stretching in mid-surface during transient temperature change is given as

$$V = \frac{D}{2}\iint_s \left\{ \left[(\nabla^2 W)^2 + \frac{12}{l^2} e_1^2 \right] - 2(1-\upsilon)\left[\frac{12}{l^2} e_2 + \frac{\partial^2 W}{\partial x^2}\frac{\partial^2 W}{\partial y^2} - \left(\frac{\partial^2 W}{\partial x \partial y} \right)^2 \right] + \frac{k}{D} W^2 \right\} ds \qquad (1)$$
$$- \frac{E\alpha_t}{1-\upsilon}\iint_s \int_{-l/2}^{l/2} (e_1 - z\nabla^2 W)\,\tau\, ds dz$$

in which W is the lateral displacement, D the flexural rigidity, E Young's modulus, α_t the coefficient of thermal expansion, υ is Poisson ratio, k is the reaction of foundation per unit area per unit deflection, ∇^2 is a Laplacian operator in Cartesian coordinate, s the surface under consideration, e_1 is first invariant and e_2 is second invariant, respectively, and is represented as

$$\nabla^2 = \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}, \qquad ds = dxdy, \qquad e_1 = e_x + e_y, \qquad e_2 = e_x e_y - \gamma_{xy}^2 / 4,$$

$$e_x = \frac{\partial u}{\partial x} + \frac{1}{2}\left(\frac{\partial W}{\partial x} \right)^2, \qquad e_y = \frac{\partial u}{\partial y} + \frac{1}{2}\left(\frac{\partial W}{\partial y} \right)^2, \qquad \gamma_{xy} = \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial W}{\partial x}\frac{\partial W}{\partial y}$$

with u and v is the in-plane displacement in cartesian coordinate (x, y).

By adding potential energy due to the thermal load and of the foundation reaction to the energy expression of Eq. (1) and neglecting the terms containing the second strain invariant, the modified energy expression becomes

$$V = \frac{D}{2}\iint_s \left\{ (\nabla^2 W)^2 + \frac{12}{l^2} e_1^2 - 2(1-\upsilon)\left[\frac{\partial^2 W}{\partial x^2}\frac{\partial^2 W}{\partial y^2} - \left(\frac{\partial^2 W}{\partial x \partial y} \right)^2 \right] + \frac{\kappa}{D} W^2 \right\} dx\, dy \qquad (2)$$
$$- \frac{1}{1-\upsilon}\iint_s [e_1 N_T - \nabla^2 W M_T]\, ds$$

Applying Euler's variational [32] equations to Eq. (2), one yield

$$\nabla^4 W - \alpha^2 \nabla^2 W + \frac{\kappa}{D} W = -\frac{12\alpha}{l^3}\nabla^2 M_T \qquad (3)$$

in which M_T is bending resultant moment, N_T is a resultant force, $\alpha^2 = 12e_1 / l^2$ is a normalised constant of integration.

3. Formulation of the Problem

It is well known that elliptical-cylindrical coordinates (ξ,η) are the most appropriate for elliptic boundary conditions that are expressed in rectangular coordinates which are maintaining the relationship $x+iy=c\cosh(\xi+i\eta)$. into

$$x=c\cosh\xi\cos\eta,\ y=c\sinh\xi\sin\eta,\ z=z \tag{4}$$

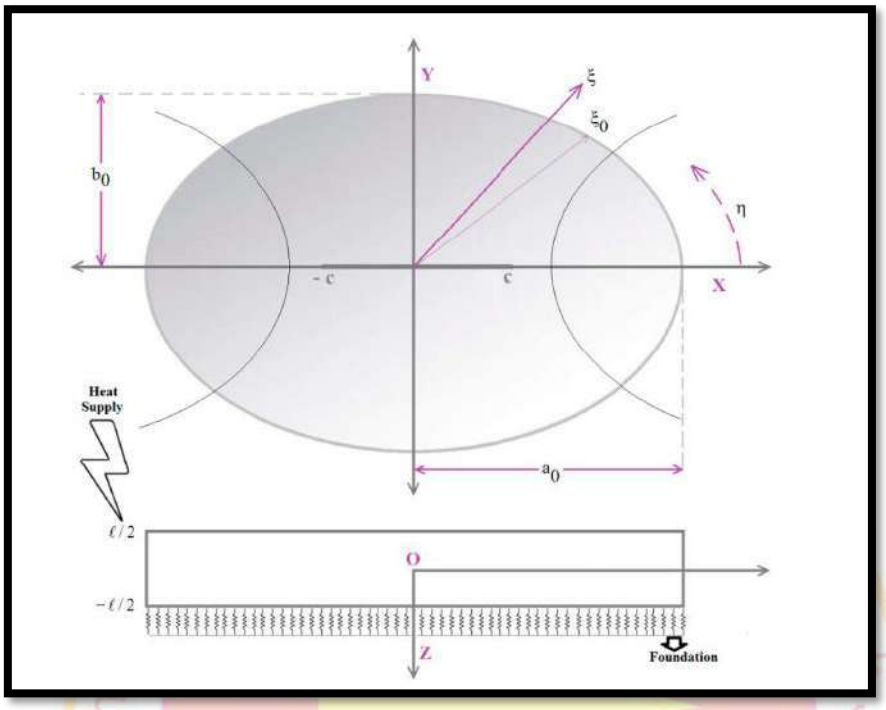

Fig.1 Elliptic plate geometry on an elastic foundation

in which $\xi=$ represents the family of confocal ellipses, $\eta=$ represents the family of confocal hyperbolas and they both in the form of curves interacts each other orthogonally at each instant. Here c being an interfocal distances between two foci of the ellipse and defined as $2c=2(a_0^2-b_0^2)^{1/2}$ with a_0 is the diameter along a semimajor axis and b_0 a diameter along the semiminor axis. The parameter ξ defines the interfocal line having the range $\xi\in(0,\ \xi_o)$, $\xi_o=\tanh^{-1}(b_o/a_o)$ and the parameter η is taken as $\eta\in(0,2\pi)$, as shown in Figure 1.

3.1 Temperature distribution

The modified form of the heat conduction differential equation in the non-simple in accordance with the first law of thermodynamics takes the following form

$$h^2\left(\frac{\partial^2T}{\partial\xi^2}+\frac{\partial^2T}{\partial\eta^2}\right)+\frac{\partial^2T}{\partial z^2}=\frac{1}{\kappa}\frac{\partial T}{\partial t}-\left(\frac{\xi_0}{2\pi l}\right)\frac{\lambda}{K}\exp(-\beta t) \tag{5}$$

subjected to the initial and thermal boundary conditions

$$T\big|_{t=0}=T\big|_{\xi=\xi_0}=T\big|_{z=-l/2}=0 \tag{6}$$

$$T\big|_{z=l/2}=-(Q_0/K)(1-\nu t)h^2(\cosh^2\xi-\cos^2\eta)^{1/2} \tag{7}$$

in which $T=T(\xi,\eta,z,t)$ is the temperature distribution, $\tau=T-T_i$ the temperature change with $T_i=T_i(\xi,\eta,z,t)$ is the initial temperature at $t=0$, $h^{-2}=(c^2/2)(\cosh 2\xi-\cos 2\eta)$ the scalar factor,

$f(\xi,\eta,t) = -(Q_0/K)(1-\nu t)\ h^2(\cosh^2\xi - \cos^2\eta)^{1/2}$ denoted the prescribed surface temperature (i.e. sectional heat supply source) on the upper face, Q_0 is constant heat flux intensity, ν the uniform speed, β represents the surface reflectance, λ is the absorption coefficient of the material, and $\kappa = K/\rho C_V$ representing thermal diffusivity in which K is the thermal conductivity of the material, ρ is the density, and C_V is the calorific capacity, respectively.

3.2 **Transient thermal bending stress**

The resultant bending moments per unit width is given [11] as

$$M_\xi = -Dh^2\left\{\left(\frac{\partial^2 W}{\partial\xi^2}+\nu\frac{\partial^2 W}{\partial\eta^2}\right)-\frac{(1-\upsilon)\sinh 2\xi}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial W}{\partial\xi}+\frac{(1-\upsilon)\sin 2\eta}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial W}{\partial\eta}\right\}-\frac{M_T}{1-\upsilon}$$

$$M_\eta = -Dh^2\left\{\left(\upsilon\frac{\partial^2 W}{\partial\xi^2}+\frac{\partial^2 W}{\partial\eta^2}\right)+\frac{(1-\upsilon)\sinh 2\xi}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial W}{\partial\xi}-\frac{(1-\upsilon)\sin 2\eta}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial W}{\partial\eta}\right\}-\frac{M_T}{1-\upsilon} \quad (8)$$

$$M_{\xi\eta} = D(1-\upsilon)h^2\left\{\frac{\partial W}{\partial\xi}\sin 2\eta+\frac{\partial W}{\partial\eta}\sinh 2\xi-\frac{\partial^2 W}{\partial\xi\partial\eta}(\cosh 2\xi-\cos 2\eta)\right\}$$

The maximum normal bending stresses are distributed linearly over the thickness of the plate is

$$\sigma_{\xi\xi} = \left[\frac{M_{\xi\xi}}{\lambda^2/6}\right]\frac{z}{\lambda/2}, \sigma_{\eta\eta} = \left[\frac{M_{\eta\eta}}{\lambda^2/6}\right]\frac{z}{\lambda/2}, \sigma_{\xi\eta} = \left[\frac{M_{\xi\eta}}{\lambda^2/6}\right]\frac{z}{\lambda/2} \quad (9)$$

The resultant moment and resultant force are represented as

$$M_T = \alpha E\int_{-1/2}^{1/2} z\tau(z)dz,\ N_T = \alpha E\int_{-1/2}^{1/2}\tau(z)dz \quad (10)$$

The boundary condition of the clamped plate is given as

$$W(\xi,\eta,t)\big|_{\xi=\xi_0} = \left.\frac{\partial W(\xi,\eta,t)}{\partial\xi}\right|_{\xi=\xi_0} = 0 \text{ for all } t \quad (11)$$

The Eqs (1) to (11) constitute the mathematical formulation under consideration.

4. **Solution to the problem**

4.1 **Solution for the temperature distribution**

Taking Laplace transform of Eqs. (5)-(7), one gets

$$h^2\left(\frac{\partial^2\bar{T}}{\partial\xi^2}+\frac{\partial^2\bar{T}}{\partial\eta^2}\right)+\frac{\partial^2\bar{T}}{\partial z^2}-\frac{s}{\kappa}\bar{T} = -\frac{\lambda}{K}\frac{1}{s+\beta} \quad (12)$$

$$\bar{T}\big|_{\xi=\xi_0} = \bar{T}\big|_{z=-1/2} = 0 \quad (13)$$

$$\bar{T}\big|_{z=1/2} = -\frac{Q}{K}\left(\frac{1}{p}-\frac{\alpha}{p^2}\right)h^2(\cosh^2\xi-\cos^2\eta)^{1/2} \quad (14)$$

in which $\bar{T}(\xi,\eta,z,p)$ is the transformed function of $T(\xi,\eta,z,t)$ and p the Laplace parameter.

Now to obtain the solution to Eq. (12), we assume

$$\bar{T} = \left(z+\frac{1}{2}\right)\frac{\lambda\kappa}{p(p+\beta)}\sum_{n=0}^{\infty} C_{2n}Ce_{2n}(\xi,q)ce_{2n}(\eta,q) \text{ with } Ce_{2n}(\xi_0,q)=0 \text{ at } \xi=\xi_0 \quad (15)$$

in which $q=\alpha_{2n,m}c^2/4$, C_{2n} will be determined from the nature of sectional heat supply prescribed on the upper face, $ce_{2n}(\eta,q)$ is the ordinary Mathieu function of the first kind of order n and $Ce_{2n}(\xi,q)$ is the modified Mathieu function of the first kind of order n, and denoted [33] as

$$ce_{2n}(\eta,q)=\sum_{r=0}^{\infty}A_{2r}^{(2n)}\cos 2r\eta,\ Ce_{2n}(\xi,q)=\sum_{r=0}^{\infty}A_{2r}^{(2n)}\cosh 2r\xi \tag{16}$$

with A's being the function of q. Now as q has those values $q_{2n,m}$ which makes $Ce_{2n}(\xi_0,q)$ zero and thus $\alpha_{2n,m}$ depends on m and n.

Hence Eq. (15) can be rewritten as

$$\bar{T}=\left(z+\frac{1}{2}\right)\frac{\lambda\kappa}{p(p+\beta)}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m}) \tag{17}$$

which satisfies both boundary condition of Eq. (13).

Now we consider the Eq. (14) using Eq. (17) as

$$\frac{\lambda\kappa l}{p(p+\beta)}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})$$
$$=-\frac{Q_0}{K}\left(\frac{1}{p}-\frac{\alpha}{p^2}\right)h^2(\cosh^2\xi-\cos^2\eta)^{1/2} \tag{18}$$

Using inversion transform of t on Eq. (18), one yield

$$\frac{\lambda\kappa l}{\beta}[1-\exp(-\beta t)]\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})$$
$$=-\frac{Q_0}{K}(1-\nu t)h^2(\cosh^2\xi-\cos^2\eta)^{1/2} \tag{19}$$

Now multiplying Eq. (19) on both sides by $Ce_{2p}(\xi,q_{2p,r})ce_{2p}(\eta,q_{2p,r})(\cosh 2\xi-\cos 2\eta)$ and integrating with respect to η from limits 0 to 2π, and with respect to ξ from 0 to ξ_0. Then by the orthogonal property [33], all terms vanish when $p=n,\ r=m.$

Hence, C_{2n} depends on m as well as on n and further simplifying by taking $h\cosh\xi_0=a$ and $e<1$ as the eccentricity, and considering the theory of uniform convergence, one yield

$$C_{2n}=\frac{-\frac{2a\pi Q}{K}(1-\nu t)h^2\int_0^{\xi_0}Ce_{2n}(\xi,q_{2n,m})\left[A_0^{2n}\left(1-\frac{e^2}{2^2}-\ldots\right)+A_2^{2n}\left(\frac{-e^2}{24}\ldots\right)+\ldots\right]\cosh 2\xi d\xi}{\frac{\lambda\kappa l}{\beta}[1-\exp(-\beta t)]\int_0^{\xi_0}Ce_{2n}^2(\xi,q_{2n,m})[\cosh 2\xi-\Theta_{2n,m}d\xi} \tag{20}$$

Again applying the rules of the Laplace inversion theorem to Eq. (17), one arrives at the required expression for temperature change stated above as

$$\tau=T=\frac{\lambda\kappa}{\beta}[1-\exp(-\beta t)]\left(z+\frac{1}{2}\right)\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m}) \tag{21}$$

4.2 **Solution for the thermal displacement**

Substituting Eq. (21) into Eq. (10), one obtains

$$M_T=\frac{\lambda\kappa l^3}{12\beta}[1-\exp(-\beta t)]\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m}) \tag{22}$$

$$N_T = \frac{\lambda\kappa l^2}{2\beta}[1-\exp(-\beta t)]\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} C_{2n}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \quad (23)$$

Now considering Eq. (3) in elliptic coordinate and taking Eq. (22) in the account, one obtains

$$\nabla_1^4 W - \alpha^2\nabla_1^2 W + \frac{\kappa}{D}W + \frac{\alpha\lambda\kappa}{\beta}[1-\exp(-\beta t)]\nabla_1^2\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} C_{2n}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) = 0 \quad (24)$$

in which ∇_1 is the two-dimensional Laplacian operator in (ξ,η).

In order to find the complete solution of above Eq. (24), one must obtain a solution that comprised of complementary function and the particular integral which satisfies the boundary conditions given in Eq. (11). To obtain the complementary function of Eq. (24) which can be represented as

$$\nabla_1^4 W_c - \alpha^2\nabla_1^2 W_c + \frac{\kappa}{D}W_c = (\nabla_1^2 + \delta_1^2)(\nabla_1^2 - \delta_2^2)W_c = 0 \quad (25)$$

where

$\delta_1^2 + \delta_2^2 = -\alpha^2$

and

$\delta_1^2\delta_2^2 = -\kappa / D$.

Thus, we assume a solution as

$$W_c = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}Ce_{2n}(\xi, q_{2n,m}^1)ce_{2n}(\eta, q_{2n,m}^1) + \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} B_{2n}Ce_{2n}(\xi, -q_{2n,m}^2)ce_{2n}(\eta, -q_{2n,m}^2) \quad (26)$$

in which $q_{2n,m}^i = c^2\delta_i^2/4\ (i=1,2)$, A_{2n} and B_{2n} are constants is determined using boundary conditions given in Eq. (11) as

$$A_{2n} = \frac{1}{2\pi A_0^{2n}\phi_1},\ B_{2n} = \frac{1}{2\pi A_0^{2n}\phi_2} \quad (27)$$

in which

$$\phi_1 = Ce_{2n}(\xi_0, q_{2n,m}^1)C'e_{2n}(\xi_0, -q_{2n,m}^2) - C'e_{2n}(\xi_0, q_{2n,m}^1)Ce_{2n}(\xi_0, -q_{2n,m}^2),$$

$$\phi_2 = C'e_{2n}(\xi_0, q_{2n,m}^1)Ce_{2n}(\xi_0, -q_{2n,m}^2) - Ce_{2n}(\xi_0, q_{2n,m}^1)C'e_{2n}(\xi_0, -q_{2n,m}^2)$$

and the prime dash represents the differentiation with respect to the variable ξ.

The particular integral of Eq. (24) can be obtained as

$$W_p = -\frac{\alpha\lambda\kappa[1-\exp(-\beta t)]}{\beta(\alpha_{2n,m} - \delta_2^2)(\alpha_{2n,m} - \delta_1^2)}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} C_{2n}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \quad (28)$$

Thus, the complete solution of Eq. (24) can be obtained by adding Eqs. (26) and (28).

$$W = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle\{A_{2n}Ce_{2n}(\xi, q_{2n,m}^1)ce_{2n}(\eta, q_{2n,m}^1) + B_{2n}Ce_{2n}(\xi, -q_{2n,m}^2) \times ce_{2n}(\eta, -q_{2n,m}^2)\} - B_{11}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m})\Big\rangle \quad (29)$$

In order to determine the α, the first invariant e_1 is transformed to elliptic coordinates as

$$h_\xi h_\eta\left[\frac{\partial}{\partial\xi}\left(\frac{u_\xi}{h_\eta}\right) + \frac{\partial}{\partial\eta}\left(\frac{u_\eta}{h_\xi}\right)\right] + \frac{h_\xi h_\eta}{2}\left[\left(\frac{\partial W}{\partial\xi}\right)^2 + \left(\frac{\partial W}{\partial\eta}\right)^2\right] = \frac{\alpha^2 h^2}{12} + (1+\upsilon)\alpha_t\tau \quad (30)$$

in which the scale factors is given as $h_\xi = h_\eta = (1/c)(\sinh^2\xi + \sin^2\eta)^{1/2}$, $h_z = 1$.

Here u_ξ and u_η are the displacement in elliptical coordinates with $u_\xi = 0$ at $\eta = \pi/2$, $\xi = \xi_0$ and $u_\eta = 0$ at $\eta = 0$, $\xi = \xi_0$, thus the first term reduces to zero.

Now integrating the reduced Eq. (30), one yield

$$\alpha = \frac{1}{ch}\left\{\frac{6}{\phi_3}\int_0^{2\pi}\int_0^{\xi_0}\left[\left(\frac{\partial W}{\partial \xi}\right)^2 + \left(\frac{\partial W}{\partial \eta}\right)^2\right] d\xi d\eta - 2\phi_3(1+\upsilon)\alpha_t \tau\right\}^{1/2} \tag{31}$$

where

$\phi_3 = \pi \cosh 2\xi_0 \sinh \xi_0$.

4.3 **Solution for the resultant bending moments per unit width**

Substituting Eq. (29) into Eq. (8), one obtains

$$\begin{aligned} M_\xi = -Dh^2 \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle & A_{2n}\{Ce''_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) \\ & + \upsilon Ce_{2n}(\xi, q^1_{2n,m})ce''_{2n}(\eta, q^1_{2n,m}) - A_{11}\{\sinh 2\xi \\ & \times Ce'_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, q^1_{2n,m}) \\ & \times ce'_{2n}(\eta, q^1_{2n,m})\}\} + B_{2n}\{Ce''_{2n}(\xi, -q^2_{2n,m})ce_{2n}(\eta, -q^2_{2n,m}) \\ & + \upsilon Ce_{2n}(\xi, -q^2_{2n,m})ce''_{2n}(\eta, -q^2_{2n,m}) - A_{11}\{\sinh 2\xi \\ & \times Ce'_{2n}(\xi, -q^2_{2n,m})ce_{2n}(\eta, -q^2_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, -q^2_{2n,m}) \\ & \times ce'_{2n}(\eta, -q^2_{2n,m})\}\} - B_{11}\{Ce''_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \\ & + \upsilon Ce_{2n}(\xi, q_{2n,m})ce''_{2n}(\eta, q_{2n,m}) - A_{11}\{\sinh 2\xi Ce'_{2n}(\xi, q_{2n,m}) \\ & \times ce_{2n}(\eta, q_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m})\}\} \\ & - C_{11}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m})\Big\rangle \end{aligned} \tag{32}$$

$$\begin{aligned} M_\eta = -Dh^2 \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle & A_{2n}\{\upsilon Ce''_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) \\ & + Ce_{2n}(\xi, q^1_{2n,m})ce''_{2n}(\eta, q^1_{2n,m}) + A_{11}\{\sinh 2\xi \\ & \times Ce'_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, q^1_{2n,m}) \\ & \times ce'_{2n}(\eta, q^1_{2n,m})\}\} + B_{2n}\{\upsilon Ce''_{2n}(\xi, -q^2_{2n,m})ce_{2n}(\eta, -q^2_{2n,m}) \\ & + Ce_{2n}(\xi, -q^2_{2n,m})ce''_{2n}(\eta, -q^2_{2n,m}) + A_{11}\{\sinh 2\xi \\ & \times Ce'_{2n}(\xi, -q^2_{2n,m})ce_{2n}(\eta, -q^2_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, -q^2_{2n,m}) \\ & \times ce'_{2n}(\eta, -q^2_{2n,m})\}\} - B_{11}\{\upsilon Ce''_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \\ & + Ce_{2n}(\xi, q_{2n,m})ce''_{2n}(\eta, q_{2n,m}) + A_{11}\{\sinh 2\xi Ce'_{2n}(\xi, q_{2n,m}) \\ & \times ce_{2n}(\eta, q_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m})\}\} \\ & - C_{11}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m})\Big\rangle \end{aligned} \tag{33}$$

$$\begin{aligned} M_{\xi\eta} = D(1-\upsilon)h^2 \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle & A_{2n}\{\sin 2\eta Ce'_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) \\ & + Ce_{2n}(\xi, q^1_{2n,m})ce'_{2n}(\eta, q^1_{2n,m})\sinh 2\xi - (\cosh 2\xi - \cos 2\eta) \\ & \times Ce'_{2n}(\xi, q^1_{2n,m})ce'_{2n}(\eta, q^1_{2n,m})\} + B_{2n}\{\sin 2\eta Ce'_{2n}(\xi, -q^2_{2n,m}) \\ & \times ce_{2n}(\eta, -q^2_{2n,m}) + \sinh 2\xi Ce_{2n}(\xi, -q^2_{2n,m}) \\ & \times ce'_{2n}(\eta, -q^2_{2n,m}) - (\cosh 2\xi - \cos 2\eta)Ce'_{2n}(\xi, -q^2_{2n,m}) \\ & \times ce'_{2n}(\eta, -q^2_{2n,m})\} - B_{11}\{\sin 2\eta Ce'_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \\ & + \sinh 2\xi Ce_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m}) \\ & - (\cosh 2\xi - \cos 2\eta)Ce'_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m})\}\Big\rangle \end{aligned} \tag{34}$$

where

$$A_{11}=\frac{1-\upsilon}{\cosh 2\xi-\cos 2\eta},\quad B_{11}=\frac{\alpha\lambda\kappa[1-\exp(-\beta t)]C_{2n}}{\beta(\alpha_{2n,m}-\delta_2^2)(\alpha_{2n,m}-\delta_1^2)},\quad C_{11}=\frac{\lambda\kappa l^3[1-\exp(-\beta t)]C_{2n}}{12(1-\upsilon)\beta}.$$

4.4 Solution for the thermal bending stress

Substituting Eqs. (32)-(34) into Eq. (9), one obtains

$$\begin{aligned}\sigma_{\xi\xi}=&-\frac{12Dh^2z}{l^3}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle A_{2n}\{Ce_{2n}''(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)\\&+\upsilon Ce_{2n}(\xi,q_{2n,m}^1)ce_{2n}''(\eta,q_{2n,m}^1)-A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)-\sin 2\eta Ce_{2n}(\xi,q_{2n,m}^1)\\&\times ce_{2n}'(\eta,q_{2n,m}^1)\}\}+B_{2n}\{Ce_{2n}''(\xi,-q_{2n,m}^2)ce_{2n}(\eta,-q_{2n,m}^2)\\&+\upsilon Ce_{2n}(\xi,-q_{2n,m}^2)ce_{2n}''(\eta,-q_{2n,m}^2)-A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,-q_{2n,m}^2)ce_{2n}(\eta,-q_{2n,m}^2)-\sin 2\eta Ce_{2n}(\xi,-q_{2n,m}^2)\\&\times ce_{2n}'(\eta,-q_{2n,m}^2)\}\}-B_{11}\{Ce_{2n}''(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\\&+\upsilon Ce_{2n}(\xi,q_{2n,m})ce_{2n}''(\eta,q_{2n,m})-A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})-\sin 2\eta Ce_{2n}(\xi,q_{2n,m})\\&\times ce_{2n}'(\eta,q_{2n,m})\}\}-C_{11}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\Big\rangle\end{aligned}\tag{35}$$

$$\begin{aligned}\sigma_{\eta\eta}=&-\frac{12Dh^2z}{l^3}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle A_{2n}\{\upsilon Ce_{2n}''(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)\\&+Ce_{2n}(\xi,q_{2n,m}^1)ce_{2n}''(\eta,q_{2n,m}^1)+A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)-\sin 2\eta Ce_{2n}(\xi,q_{2n,m}^1)\\&\times ce_{2n}'(\eta,q_{2n,m}^1)\}\}+B_{2n}\{\upsilon Ce_{2n}''(\xi,-q_{2n,m}^2)ce_{2n}(\eta,-q_{2n,m}^2)\\&+Ce_{2n}(\xi,-q_{2n,m}^2)ce_{2n}''(\eta,-q_{2n,m}^2)+A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,-q_{2n,m}^2)ce_{2n}(\eta,-q_{2n,m}^2)-\sin 2\eta Ce_{2n}(\xi,-q_{2n,m}^2)\\&\times ce_{2n}'(\eta,-q_{2n,m}^2)\}\}-B_{11}\{\upsilon Ce_{2n}''(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\\&+Ce_{2n}(\xi,q_{2n,m})ce_{2n}''(\eta,q_{2n,m})+A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})-\sin 2\eta Ce_{2n}(\xi,q_{2n,m})\\&\times ce_{2n}'(\eta,q_{2n,m})\}\}-C_{11}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\Big\rangle\end{aligned}\tag{36}$$

$$\begin{aligned}\sigma_{\xi\eta}=&\frac{12D(1-\upsilon)h^2z}{l^3}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle A_{2n}\{\sin 2\eta Ce_{2n}'(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)\\&+\sinh 2\xi Ce_{2n}(\xi,q_{2n,m}^1)ce_{2n}'(\eta,q_{2n,m}^1)-(\cosh 2\xi-\cos 2\eta)\\&\times Ce_{2n}'(\xi,q_{2n,m}^1)ce_{2n}'(\eta,q_{2n,m}^1)\}+B_{2n}\{\sin 2\eta Ce_{2n}'(\xi,-q_{2n,m}^2)\\&\times ce_{2n}(\eta,-q_{2n,m}^2)+\sinh 2\xi Ce_{2n}(\xi,-q_{2n,m}^2)ce_{2n}'(\eta,-q_{2n,m}^2)\\&-(\cosh 2\xi-\cos 2\eta)Ce_{2n}'(\xi,-q_{2n,m}^2)ce_{2n}'(\eta,-q_{2n,m}^2)\}\\&-B_{11}\{\sin 2\eta Ce_{2n}'(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})+\sinh 2\xi Ce_{2n}(\xi,q_{2n,m})\\&\times ce_{2n}'(\eta,q_{2n,m})-(\cosh 2\xi-\cos 2\eta)Ce_{2n}'(\xi,q_{2n,m})ce_{2n}'(\eta,q_{2n,m})\}\Big\rangle\end{aligned}\tag{37}$$

5. Transition to the circular plate

When the elliptical plate tends to a circular plate of radius a, the semi-focal $c\to 0$ and therefore α_m is the roots of the transcendental equation $J_0(\alpha_m)=0.$

Also $e \to 0$ [as $\xi \to \infty$], $\cosh 2\xi\, d\xi \to 2\cosh 2\xi \sinh 2\xi\, d\xi \to 2rdr/l^2$, $\sinh\xi \to \cosh\xi$, $\mathrm{h}\cosh\xi \to r$ [as $h \to 0$], $\cosh\xi\, d\xi \to r\, dr$, $\mathrm{h}\sinh\xi\, d\xi \to dr$.

Using results from [33]

$Ce_0(\xi, q_{0,m}) \to p_0' J_0(\lambda_m r)$, $Ce_0'(\xi, q_{0,m}) \to p_0' J_0'(\lambda_m r)$, $Ce_0''(\xi, q_{0,m}) \to p_0' J_0''(\lambda_m r)$, $ce_0(\eta, q_m) \to 1/\sqrt{2}$, $A_0^{(0)} \to 1/\sqrt{2}, A_2^{(0)} \to 0$, $\Theta_{2m} \to 0$, $\lambda_{0,m}^2 = \alpha_{0,m}^2 / a^2 = \alpha_m^2 / a^2 = \lambda_m^2$, $p_0' = Ce_0(0, q_{0,m})$ $ce_0(2\pi, q_{0,m}) / A_0^{(0)}$.

Eq. (21) degenerates into temperature distribution into a circular plate

$$\tau = T = \left(z + \frac{1}{2}\right) \sum_{m=1}^{\infty} C_m p_0' J_0(\lambda_m r) \tag{38}$$

in which

$$C_m = -\frac{\pi Q(1-\nu t)}{K\mathrm{l}} \left\{ \left[\int_0^a r J_0(\lambda_m r) dr \right] / \left[\int_0^a r J_0(\lambda_m r)^2 dr \right] \right\}$$

The aforementioned degenerated results agree with the results [34].

6. Numerical Results, Discussion and Remarks

Firstly, introduce the dimensionless parameter for numerical computations as follows

$$\left.\begin{aligned} &\bar{\xi} = \xi / \xi_0,\ \bar{z} = [z - (-\mathrm{l}/2)]/\xi_0,\ e = c/\xi_0, \tau = \kappa t / \xi_0^2 \\ &\bar{\theta} = T/T_0, \bar{W} = W/\alpha\theta_0\xi_0, \bar{N}_{ij} = N_{ij}/E\xi_0^3, \bar{F}_{ij} = F_{ij}/E\xi_0^2\theta_0, \\ &\bar{M}_{ij} = M_{ij}/E\xi_0^3,\ \bar{\sigma}_{ij} = \sigma_{ij}/E\alpha\theta_0 \quad (i, j = \xi, \eta) \end{aligned}\right\} \tag{39}$$

The numerical computations have been carried out for an Aluminum elliptic plate with physical parameter as ξ_0 = 1 m, $\lambda = 0.06$ m and reference temperature as 273 K.

The thermomechanical properties[34] take the form as

- Modulus of elasticity E, 70 GPa
- Thermal diffusivity κ, 84.18 m^2/s
- Poisson's ratio υ, 0.35
- Thermal expansion coefficient α, 23 x 10^{-6} / ^{o}C
- Thermal conductivity G, 204.2 W/mK

To study the results of heating on the elliptic plate, numerical calculations for all variables have been performed and the numerical calculations are seen in the following figures with the use of MATHEMATICA software. In Figures (2)-(13) explains that numerical results of the dimensionless temperature distribution, thermal deflection and its associated bending stresses of the elliptic plate under the boundary conditions and that are subjected to sectional heat supply on the upper face, the lower face at zero temperature.

Figure 2 displays the dimensionless temperature field in an elliptic plate along the radial direction for a separate fixed time. The temperature distribution is initially at zero at the right boundary (i.e. $\xi = \xi_0$), and then increases along the radial direction towards the left boundary (i.e. $\xi = 0$). It may be due to the available internal heat generation and sectional prescribed temperature. Initially, the end of the plate is at compressed state, and gradually tensile force increases towards the mid-plate.

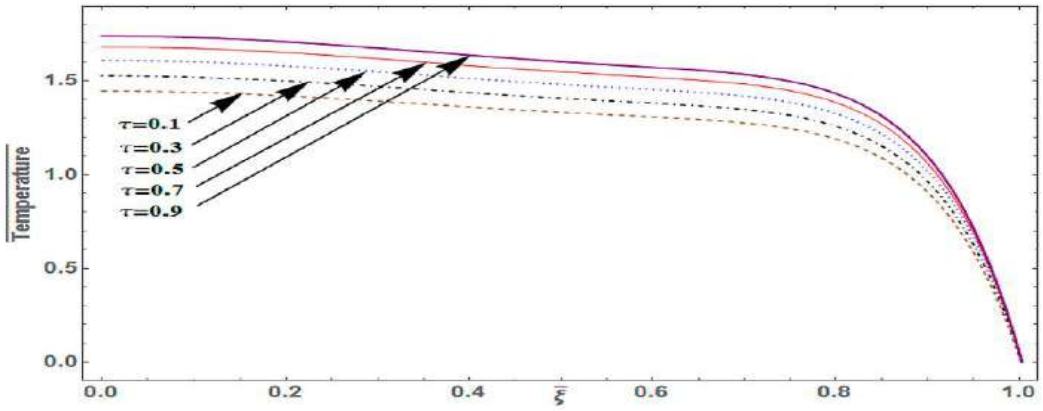

Figure 2. The dimensionless temperature in an elliptic plate along $\bar{\xi}$ *for various locations of* τ.

Figure 3 illustrates the dimensionless temperature distribution along the angular direction for different values of $\bar{\xi}$. In the central part of the elliptic plate, thermal expansion is more significant, thereby giving high tensile force, while at both endpoints, temperature decreases to the minimum. Probably, due to an internal heat source, the temperature variation is more stable, and energy storage is more responsive to the heat sources.
Figure 4 demonstrates the distribution of the temperature along the thickness direction of the plate. Due to the external heat supply, the maximum values of temperature magnitude increase from the upper face and at each instance reduces towards the axial direction; and attains minimum on the lower face at zero temperature.

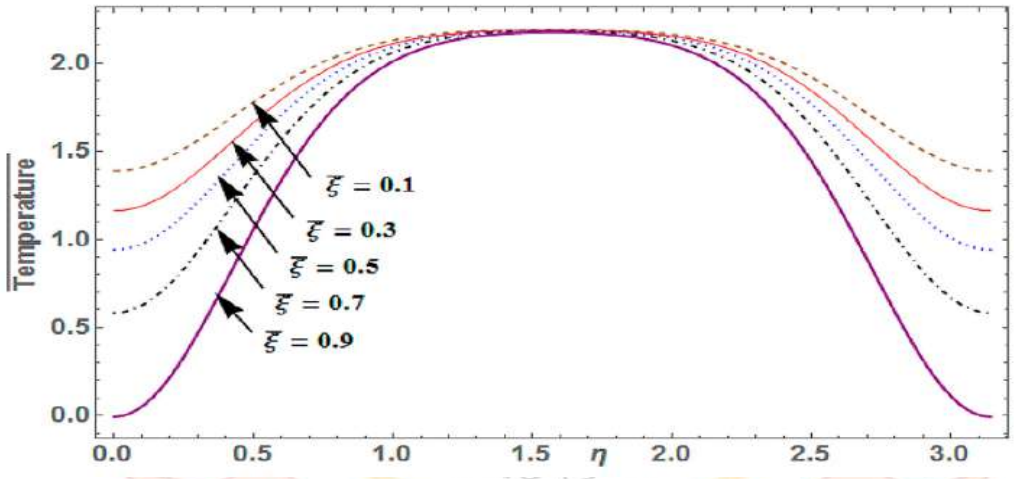

Figure 3. The temperature in an elliptic plate along η *for various locations of* $\bar{\xi}$.

Figure 5 indicates thermal deflection along the $\bar{\xi}$ direction for different values of η and fixed value of $\bar{z} = 0.06$, and reaches the outer limit at zero to satisfy the condition $\overline{W} = \partial\overline{W}/\partial\bar{\xi} = 0$ at $\bar{\xi} = \bar{\xi}_0$. The dimensionless large deflection is maximum at the center of the plate due to accumulation of heat source at the inner core. Figure 6 shows that initially, the deflection is zero at $\tau = 0$ and gradually increases along the timeline up to $\tau = 0.25$, and finally, its uniformity is attained. Figure 7 and 9 depicts the dimensionless radial $\bar{\sigma}_{\xi\xi}$ and tangential stresses $\bar{\sigma}_{\eta\eta}$ in the η direction at fixed $\bar{\xi} = 0.6$ and $\tau = 0.6$. The facts shows that radial and tangential stress achieves its highest possible tensile stress at left and right boundaries while the compressive stress is higher at the central part. The resulting finding shows that the two stress produces the same thermal effect apart from small magnitude variation.

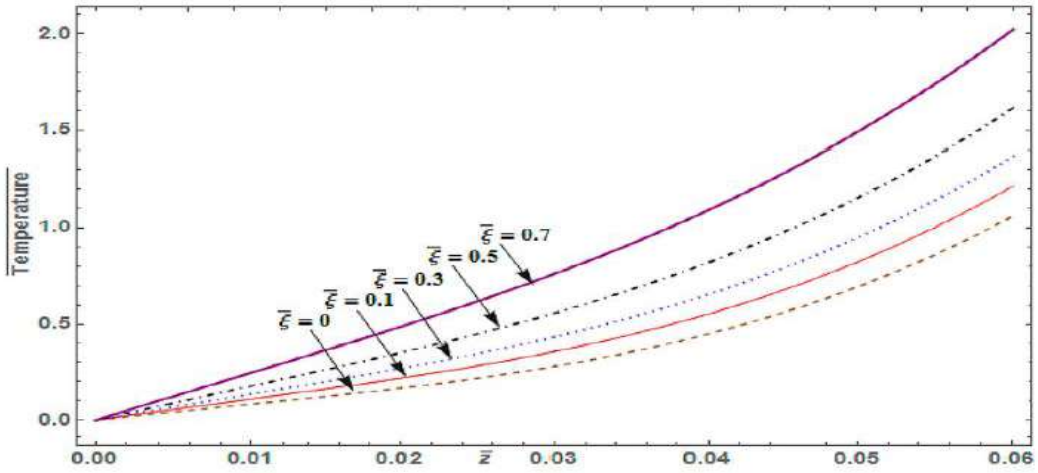

Figure 4. The dimensionless temperature in an elliptic plate along $\bar{z}$ for various locations of $\bar{\xi}$.

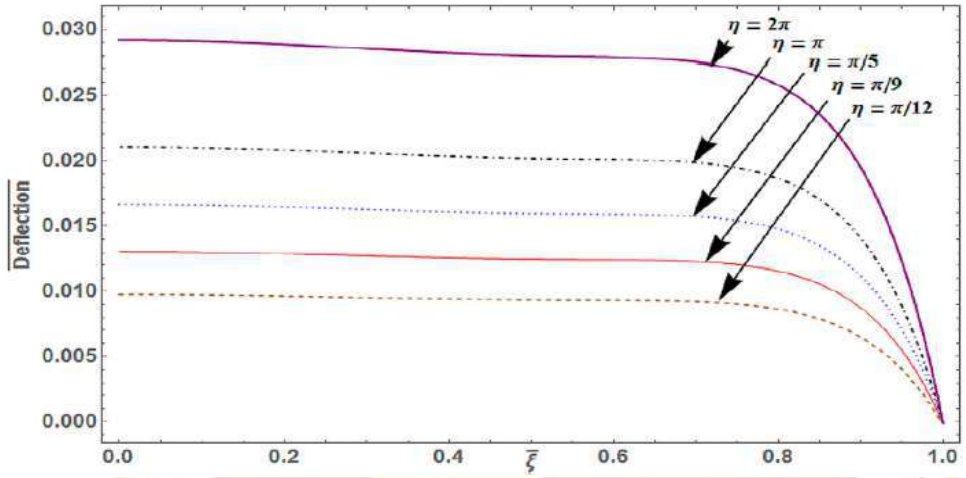

Figure 5. The dimensionless deflection along $\bar{\xi}$ for various locations of η.

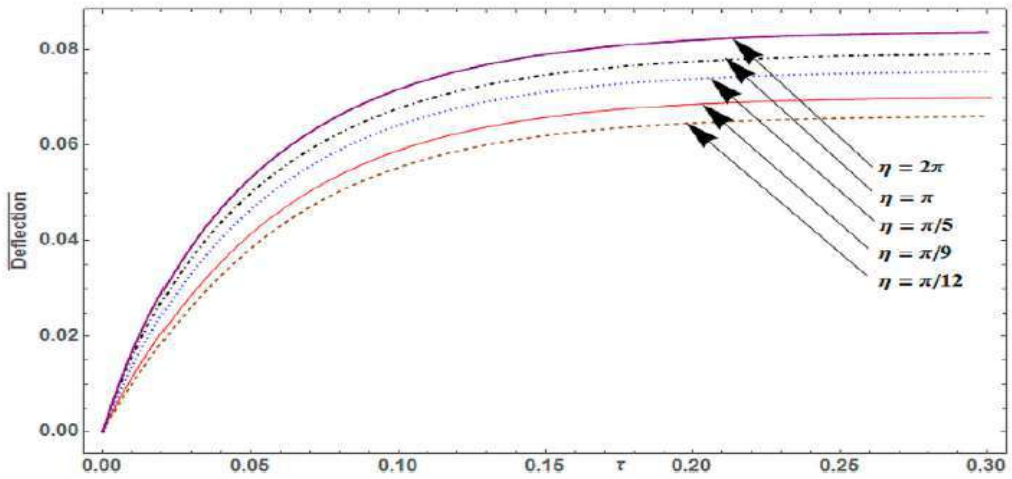

Figure 6. The dimensionless deflection along τ for various locations of η.

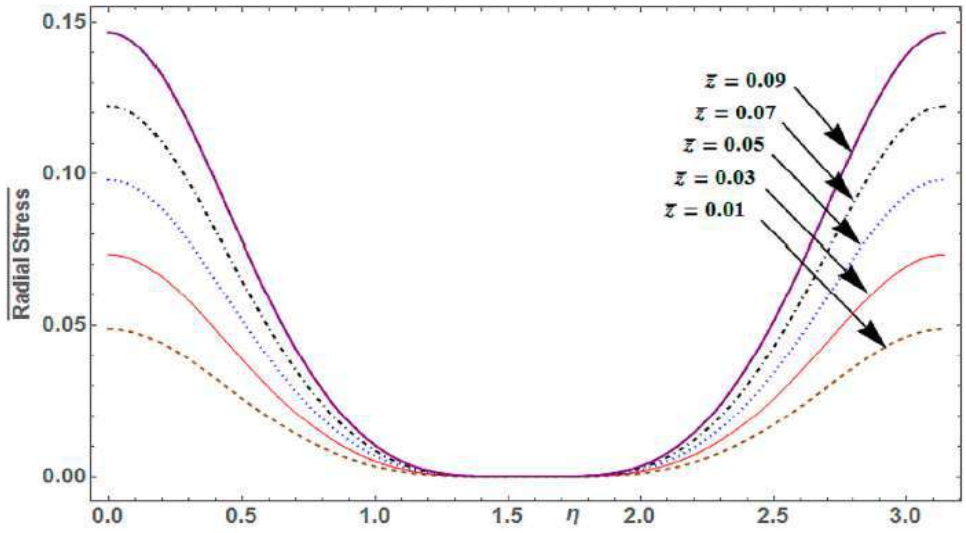

Figure 7. The dimensionless thermal radial stress along η for various locations of $\bar{z}$.

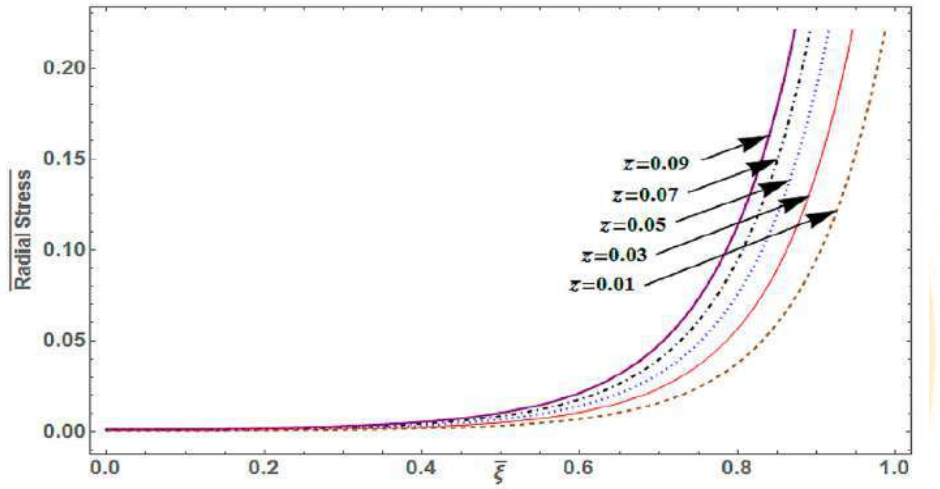

Figure 8. The dimensionless thermal radial stress along $\bar{\xi}$ for various locations of $\bar{z}$.

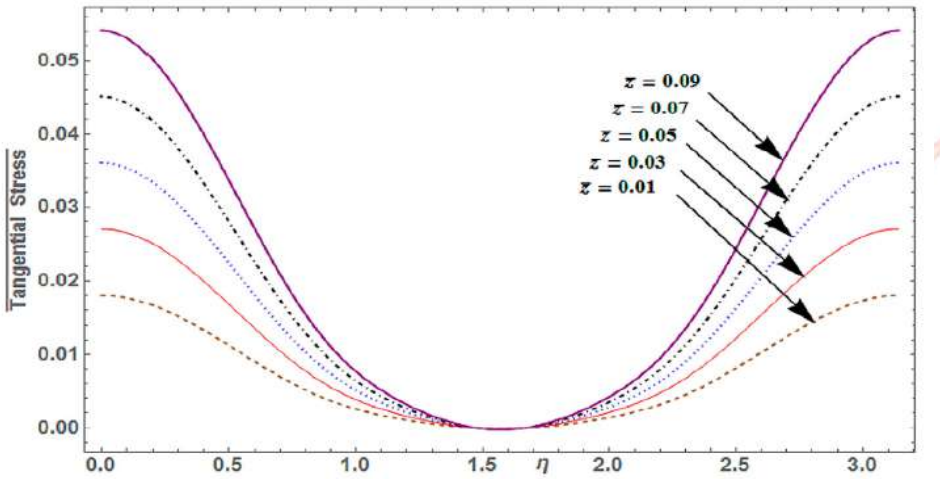

Figure 9. The dimensionless thermal tangential stress along η for various locations of $\bar{z}$.

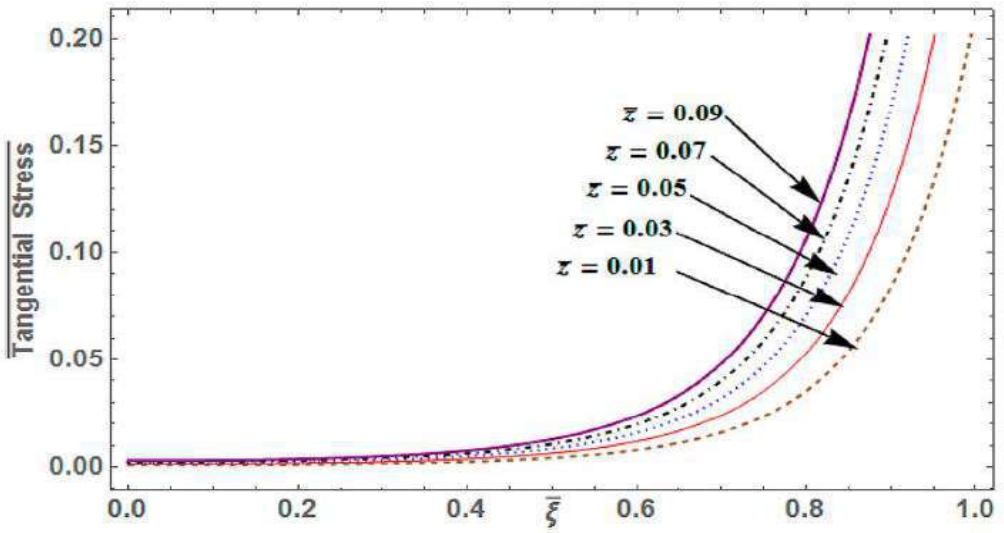

Figure 10. The dimensionless thermal tangential stress along $\bar{\xi}$ for various locations of $\bar{z}$.

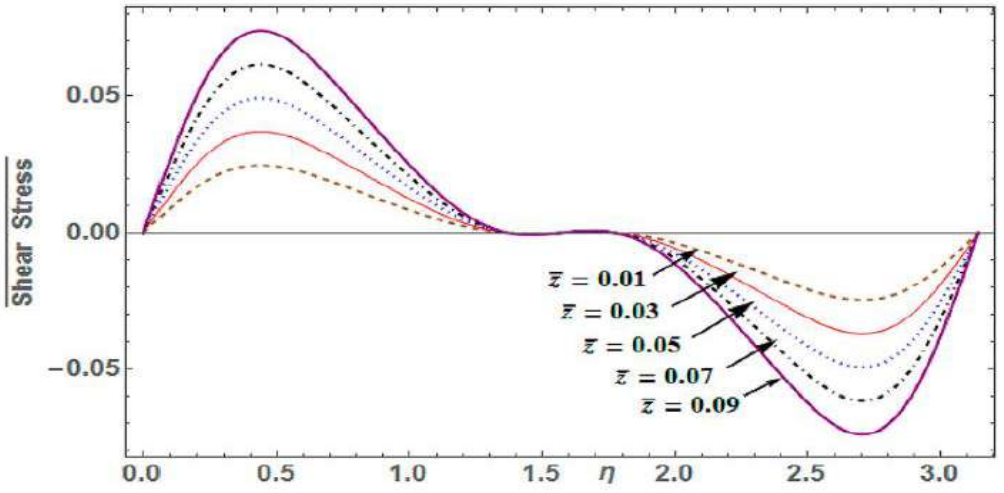

Figure 11. The dimensionless thermal shear stress along η for various locations of $\bar{z}$.

Figure 8 and 10 shows the distribution of radial $\bar{\sigma}_{\xi\xi}$ and normal stress $\bar{\sigma}_{\eta\eta}$ along the $\bar{\xi}$- direction at fixed $\eta = \pi/3$ and $\tau = 0.6$. The nature of stress gradually increases along the radial direction and attains maximum magnitude towards the outer edge. This could probably be due to the sectional prescribed temperature.

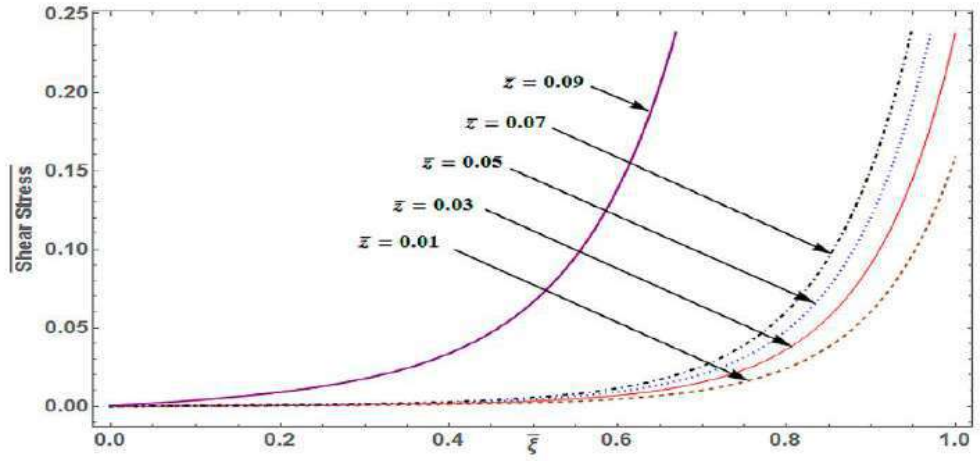

Figure 12. The dimensionless thermal shear stress along $\bar{\xi}$ for various locations of $\bar{z}$.

Figure 11 shows a plane sinusoidal heat propagating along the angular direction, and it attains zero when they are odd. The behavior may be due to the absorption of heat dissipated by sectional heat and internal heat supply. Figure 12 shows the distribution of shearing stress $\overline{\sigma}_{\xi\eta}$ along the $\overline{\xi}-$ direction at fixed $\eta = \pi / 3$ and $\tau = 0.6$. The result demonstrates that the influence of radius on $\overline{\sigma}_{\xi\eta}$ is more than those on $\overline{\sigma}_{\xi\xi}$ and $\overline{\sigma}_{\eta\eta}$. Figure 13 shows that the resulting moment reveal patterns that vanishes in the middle of the plate, but changes its characteristics as $\overline{\xi} \to 1$. This may be due to the distribution of internal heat supply available and the transfer of thermal energy into the outer curve. The residual bending moments ($\overline{M}_{\xi\xi}$, $\overline{M}_{\eta\eta}$) trend is maximum and displays positive values on the outer side, while the resultant moment ($\overline{M}_{\xi\eta}$) drops towards the negative magnitude value. The $\overline{\sigma}_{\xi\xi}$, $\overline{\sigma}_{\eta\eta}$ and $\overline{\sigma}_{\xi\eta}$ has maximum compressive stress inside the plate, whereas, the tensile stress occurs on the outer surface of the plate.

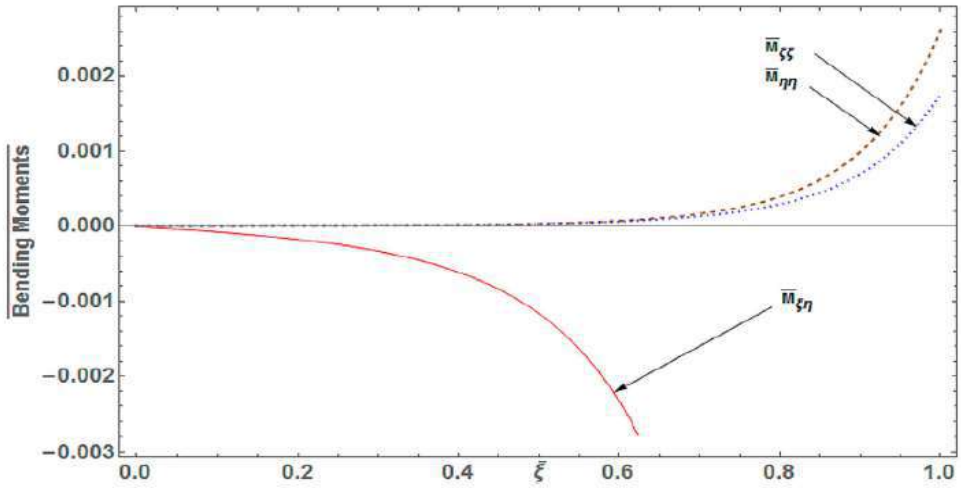

Figure 13. Bending Moments along $\overline{\xi}$ for a fixed value of $\eta = \pi / 4$.

7. Conclusion

In this paper, we have described the theoretical treatment of stress analysis distribution for the thermosensitive elliptic plate with a clamped edge. The temperature distribution and the deflection in the form of ordinary and modified Mathieu functions are used to determine thermal stresses by proposed classical methods. The analytical technique proposed here is relatively simple and widely applicable compared with methods proposed by other researchers. The advantage of this approach is its generality and its mathematical power to handle different types of mechanical and thermal boundary conditions during small deflection under thermal loading. The aforementioned thermo-sensitivity concept can be very well applicable in the field of hybridizing metallurgy, ceramics, solid state physics and chemistry. They have a lot of application in the biomedical field and so forth.

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State-space approach to the thermoelastic problem of a one-dimensional semi-infinite rod

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Abstract

In this paper, a transient of generalised thermoelasticity in an isotropic homogeneous elastic infinite rod which is unstrained and unstress initially and has uniform temperature distribution, is tackled by solving the coupled one dimensioned equation of heat conduction and equation of motion by following the state space approach of modern control theory in Laplace transform domain for small value of time. The subsequent temperature distribution and deformation from which stresses are calculated. The results are explained by numerical calculation and illustrated graphically.
Keywords: *Transient Temperature, Isotropic Homogeneous, Coupled Thermoelasticity, Thermal Displacement*

1. Introduction

Chandrasekharaiah and Srinath [1] explained that the linear theory of thermoelasticity without energy dissipation for homogeneous and isotropic materials is used to study plane waves in a half-space. Abbasi [2] obtained the Finite Element Method (FEM) solution of the vibration behaviour of a Functionally Graded Material (FGM) Timoshenko beam under lateral thermal shock with coupled thermoelastic assumption. Adams and Bert [3] obtained the results using the interaction between the strain and temperature fields and further investigated the effect of accounting for the orthotropic material properties in the governing elastic and thermal equations. Sharma and Grover [4] derived a closed-form expression for the transverse vibrations of a homogeneous isotropic, thermoelastic thin beam under clamped and simply supported conditions based on the Euler-Bernoulli theory. Okumura [5] has analysed the thermal-bending stresses in an annular sector by the theory of moderately thick plates. Kawamura [6] has analysed the equations of motion governing thermally induced vibration of plates with inhomogeneous material properties through the thickness direction are presented. Kar [7] problem deals with the thermo-elastic interaction due to step input of temperature on the boundaries of a homogeneous isotropic spherical shell in the context of generalised theories of thermo-elasticity. This paper deals with the study of waves propagation in an infinite rod by following state-space approaches using the Laplace transform.

2. Formulation of the problem

Consider a bounded isotropic homogeneous elastic material undergoing small temperature variation. The displacement component and the small temperature variation from an equilibrium temperature are connected by following differential equations

$$\mu u'_{j,kk} + (\lambda + \mu) u'_{k,kj} = (3\lambda + 2\mu)\alpha\theta'_{,j} + \rho\ddot{u}_j \tag{1}$$

$$\theta'_{,ii} = \frac{C_v}{k}(\dot{\theta}' + \tau\ddot{\theta}') + \frac{1}{k}(3\lambda + 2\mu)\alpha T_0(\dot{u}'_{i,i} + \tau\ddot{u}'_{i,i}) \tag{2}$$

and the stress is

$$\sigma'_{ij} = E\varepsilon'_{ij} - E\alpha(\theta' - T_0) \tag{2a}$$

where i and j take value $1, 2$ and 3 and few other notations are given below

- λ and μ are Lame's constants.
- α is the coefficient of linear thermal expansion.
- C_v is the specific heat at a constant volume
- κ is the thermal conductivity
- T is the relaxation time

- T_0 is the temperature in the equilibrium state
- , (comma) denote partial differentiation to space coordinates
- . (Dot) denote partial differentiation w.r.to time

Now define the following dimensionless quantities,

$$x_i = \frac{\kappa}{C_v C} x_i' \ , \ u = \frac{\kappa u'}{C_v C} \ , \ \theta = \theta' T_0 \ , \ t = \frac{\kappa}{C_v C} t' \ , \ \sigma_{ij} = \frac{\sigma'_{ij}}{\mathrm{E}\,\alpha(\theta' - T_0)}$$

where

$$C^2 = \frac{(\lambda + 2\mu)}{\rho} \tag{3}$$

Introduction the above quantities in Eq. (1) and (2) and suppressing the primes, one obtains

$$\mu u_{j,kk} + (\lambda + \mu) u_{k,kj} = \eta \theta_{,j} + \rho C^2 \ddot{u}_j \tag{4}$$

$$\theta_{,ii} - \dot{\theta} + m\ddot{\theta} = \beta(u_{\kappa,\kappa} + m\ddot{u}_{\kappa,\kappa}) \tag{4}$$

$$\sigma_{ij} = E\,\varepsilon_{ij} - E\alpha(\theta - \mathrm{T}_0) \tag{5}$$

where

$$\beta = \frac{(3\lambda + 2\mu)\alpha}{C_v} \ , \ m = \frac{T\,C^2 C_v}{\kappa} \ , \ \text{and} \ \ \eta = T_0(3\lambda + 2\mu)\alpha$$

From Eq. (4) and Eq. (5), one deduces the one-dimensional equations as follows

$$(\lambda + 2\mu)\frac{\partial^2 u}{\partial x^2} - \eta \frac{\partial \theta}{\partial x} = \rho C^2 \frac{\partial^2 u}{\partial t^2} \tag{6}$$

$$\frac{\partial^2 \theta}{\partial x^2} - \beta \frac{\partial^2 u}{\partial t\,\partial x} - \beta m \frac{\partial^3 u}{\partial t^2\,\partial x} - m\frac{\partial^2 \theta}{\partial t^2} = \frac{\partial \theta}{\partial t} \tag{7}$$

$$\sigma_x = E\,\varepsilon_x - E\alpha(\theta - \mathrm{T}_0) \tag{7a}$$

In this paper, the general case of wave prorogation in thermoelastic couple half-space is considered, the boundary conditions are expressed as

$$\left.\frac{\partial u}{\partial x}\right|_{x=0} = \exp[-\alpha t] \ , \tag{8}$$

$$\theta(x,t)\big|_{x=0} = 0 \ , \tag{9}$$

$$\sigma_x\big|_{x=0} = 0, \tag{9a}$$

3. Solution to the heat conduction equation

Define Laplace Transform as follows

$$\bar{u}(x,s) = \int_0^\infty u(x,t)\exp[-st]dt \tag{10}$$

$$\bar{\theta}(x,s) = \int_0^\infty \theta(x,t)\exp[-st]dt \tag{11}$$

Taking Laplace Transform of Eq. (6) and Eq. (7), one obtains the resulting equations in the form

$$\frac{\partial^2 \bar{u}}{\partial x^2} = \frac{\rho C^2 s^2}{\lambda + 2\mu}\bar{u} + \frac{\eta}{\lambda + 2\mu}\frac{d\bar{\theta}}{dx} \tag{12}$$

$$\frac{\partial^2 \theta}{\partial x^2} = s(1 + ms)\bar{\theta} + \beta s(1 + ms)\frac{d\bar{u}}{dx} \tag{13}$$

One can write Eq. (12) and Eq. (13) as

$$\frac{d\bar{u}(x,s)}{dx} = \bar{u}', \quad \frac{d\bar{\theta}(x,s)}{dx} = \bar{\theta}', \tag{14}$$

$$\frac{d^2\bar{u}(x,s)}{dx^2} = A\bar{u} + B\bar{\theta}', \quad \frac{d^2\bar{\theta}(x,s)}{dx^2} = C\bar{\theta} + D\bar{u}', \tag{15}$$

The homogeneous matrix form of Eq. (14) and Eq. (15) is expressed as

$$\frac{d}{dx}\begin{bmatrix} \bar{u}(x,s) \\ \bar{\theta}(x,s) \\ \bar{u}'(x,s) \\ \bar{\theta}'(x,s) \end{bmatrix} = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ A & 0 & 0 & B \\ 0 & C & D & 0 \end{bmatrix}\begin{bmatrix} \bar{u} \\ \bar{\theta} \\ \bar{u}' \\ \bar{\theta}' \end{bmatrix} \tag{16}$$

where the prime indicates differentiation w.r.to x and

$$A = \frac{\rho C^2 s^2}{\lambda + 2\mu}, \quad B = \frac{\eta}{\lambda + 2\mu}, \quad C = s(1 + ms), \quad D = \beta Q \tag{17}$$

One can write Eq. (16) as

$$\frac{\partial \upsilon(x,s)}{\partial x} = Q(s)\upsilon(x,s) \tag{18}$$

Substituting $\upsilon(x,s) = \chi(s)\exp[\gamma x]$ in Eq. (18), one obtains

$$\frac{\partial \chi(s)}{\partial x}\exp[\gamma x] = Q(s)\chi(s)\exp[\gamma x] \tag{19}$$

$$Q\chi = \gamma\chi,$$

where γ is a scalar.

Thus, one obtains the eigenvalue problem

$$\chi(s)\exp[\gamma x] = Q(s)\chi(s)\exp[\gamma x] \tag{20}$$

Here $Q\chi = \gamma\chi$, where γ is the eigenvalue and χ is the corresponding eigenvector of Q.

The characteristic equation corresponding to the matrix Q can be written as

$$|Q - \gamma I| = \begin{bmatrix} -\gamma & 0 & 1 & 0 \\ 0 & -\gamma & 0 & 1 \\ A & 0 & -\gamma & B \\ 0 & C & D & -\gamma \end{bmatrix} = 0 \tag{21}$$

$$\text{i.e } \gamma^4 - \gamma^2(A + BD + C) + AC = 0 \tag{22}$$

The eigenvector χ corresponding to the eigenvalue γ can be calculated from $|Q - \gamma I|\chi = 0$

$$\text{i.e. } \begin{bmatrix} -\gamma & 0 & 1 & 0 \\ 0 & -\gamma & 0 & 1 \\ A & 0 & -\gamma & B \\ 0 & C & D & -\gamma \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} \tag{23}$$

$$\text{i.e.} \quad \left.\begin{aligned} -\gamma x_1 + 0x_2 + x_3 + 0x_4 &= 0 \\ 0x_1 - \gamma x_2 + 0x_3 + x_4 &= 0 \\ A x_1 + 0x_2 - \gamma x_3 + B x_4 &= 0 \\ 0x_1 + C x_2 + D x_3 - \gamma x_4 &= 0 \end{aligned}\right\} \qquad (24)$$

Solving Eq. (24) by Cramer's rule, one obtains

$$\chi = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} (C-\gamma^2)/\gamma \\ -D \\ C-\gamma^2 \\ -D\gamma \end{bmatrix} \qquad (25)$$

Eq. (22) is quadratic in γ whose roots are

$$\gamma = \pm\gamma_1 \, , \pm\gamma_2 \qquad (26)$$

$$\gamma_1 = \left[\frac{(A+BD+C)+\sqrt{(A+BD+C)^2-4CA}}{2}\right]^{1/2} \qquad (27)$$

$$\gamma_2 = \left[\frac{(A+BD+C)-\sqrt{(A+BD+C)^2-4CA}}{2}\right]^{1/2} \qquad (28)$$

Hence the matrix of eigen vectors $\chi(s)$ is

$$\chi = \begin{bmatrix} (C-\gamma_1^2)/\gamma_1 & (C-\gamma_2^2)/\gamma_2 & (C-\gamma_1^2)/-\gamma_1 & (C-\gamma_2^2)/-\gamma_2 \\ -D & -D & -D & -D \\ C-\gamma_1^2 & C-\gamma_2^2 & C-\gamma_1^2 & C-\gamma_2^2 \\ -D\gamma_1 & -D\gamma_2 & D\gamma_1 & -D\gamma_2 \end{bmatrix} \qquad (29)$$

and the solution of Eq. (18) is given by

$$\upsilon(x,s) = \chi(s)Y \qquad (30)$$

where

$$Y = \begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \end{bmatrix} = \begin{bmatrix} C_1 & \exp[\gamma_1 x] \\ C_2 & \exp[-\gamma_1 x] \\ C_3 & \exp[\gamma_2 x] \\ C_4 & \exp[-\gamma_2 x] \end{bmatrix} \qquad (31)$$

Substituting Eq. (29) and Eq. (31) into the Eq. (30), one obtains

$$\begin{bmatrix} \bar{u}(x,s) \\ \bar{\theta}(x,s) \\ \bar{u}'(x,s) \\ \bar{\theta}'(x,s) \end{bmatrix} = \begin{bmatrix} (C-\gamma_1^2)/\gamma_1 & (C-\gamma_2^2)/\gamma_2 & (C-\gamma_1^2)/-\gamma_1 & (C-\gamma_2^2)/-\gamma_2 \\ -D & -D & -D & -D \\ C-\gamma_1^2 & C-\gamma_2^2 & C-\gamma_1^2 & C-\gamma_2^2 \\ -D\gamma_1 & -D\gamma_2 & D\gamma_1 & -D\gamma_2 \end{bmatrix} \begin{bmatrix} C_1 & \exp[\gamma_1 x] \\ C_2 & \exp[-\gamma_1 x] \\ C_3 & \exp[\gamma_2 x] \\ C_4 & \exp[-\gamma_2 x] \end{bmatrix} \qquad (32)$$

Applying the physical condition of the problem as in Eq. (6) and Eq. (7), the solution of equation Eq. (18) can be written as

$$\bar{u}(x,s) = C_2[(C-\gamma_1^2)/\gamma_1]\exp[-\gamma_1 x] + C_4[(C-\gamma_2^2)/\gamma_2]\exp[-\gamma_2 x] \qquad (33)$$

$$\bar{\theta}(x,s) = -D\{C_2\exp[-\gamma_1 x] + C_4\exp[-\gamma_2 x]\} \qquad (34)$$

Applying Laplace Transform to Eq. (8) and Eq. (9), one obtains

$$\frac{\partial \bar{u}}{\partial x} = \frac{1}{s+\alpha} \tag{35}$$

$$\bar{\theta}(x,s) = 0 \tag{36}$$

Applying transformed boundary conditions Eq. (35) and Eq. (36) into the Eq. (33) and Eq. (34), one obtains

$$\bar{u}(x,s) = -\left\{ \frac{1}{(s+\alpha)\left(\gamma_1^2 - \gamma_2^2\right)} [(C-\gamma_1^2)/\gamma_1] \exp[-\gamma_1 x] + \frac{1}{(s+\alpha)\left(\gamma_2^2 - \gamma_1^2\right)} [(C-\gamma_2^2)/\gamma_2] \exp[-\gamma_2 x] \right\} \tag{37}$$

$$\bar{\theta}(x,s) = -D\left\{ \frac{1}{(s+\alpha)\left(\gamma_1^2 - \gamma_2^2\right)} \exp[-\gamma_1 x] + \frac{1}{(s+\alpha)\left(\gamma_2^2 - \gamma_1^2\right)} \exp[-\gamma_2 x] \right\} \tag{38}$$

Substituting the value of A, B, C, D, γ_1 and γ_2 from Eq. (17), Eq. (27) and Eq. (28) into the Eq. (37) and Eq. (38), and inverting by Laplace Transform for large value of s (i.e. small value of time t), one obtains

$$u(x,t) = \frac{1}{V_1 V_3}\left[\frac{(t-V_1 x)^2}{2} + (m-V_1)^2 (t-V_1 x) \right] - \frac{1}{V_2 V_3}\left[\frac{(t-V_2 x)^2}{2} + (m-V_2)^2 (t-V_2 x) \right] \tag{39}$$

$$\theta(x,t) = \frac{\beta}{V_3}\left[(t-V_1 x) + mu(t-V_1 x) - (t-V_2 x) \right] - mu\ (t-V_2 x) \tag{40}$$

where,

$$V_1 = \left\{ \frac{[1+(1+B\beta)m] + \sqrt{1+m^2(1+2B\beta)+2m(B\beta-1)}}{2} \right\}^{1/2} \tag{41}$$

$$V_2 = \left\{ \frac{[1+(1+B\beta)m] - \sqrt{1+m^2(1+2B\beta)+2m(B\beta-1)}}{2} \right\}^{1/2} \tag{42}$$

$$V_3 = \sqrt{1+m^2(1+2B\beta)+2m(B\beta-1)} \tag{43}$$

4. Numerical Results, Discussion and Remarks

For the interests of simplicity of calculation, we introduce the following dimensionless values

$$C_V = 383.1, \quad \tau = 10^{-14}, \quad K = 386, \lambda = 9.5\times 10^{10},$$

$$\mu = 4.5\times 10^{10}, \alpha = 17\times 10^{-6}, p = 8954$$

One obtains the expressions for the temperature, displacement respectively for our numerical discussion

corresponding graphs are plotted as follows

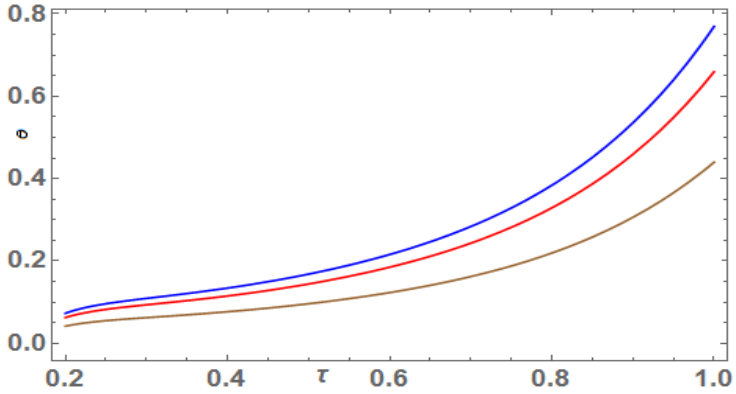

Fig. 2 (b): Temperature distribution along time form not equal to zero

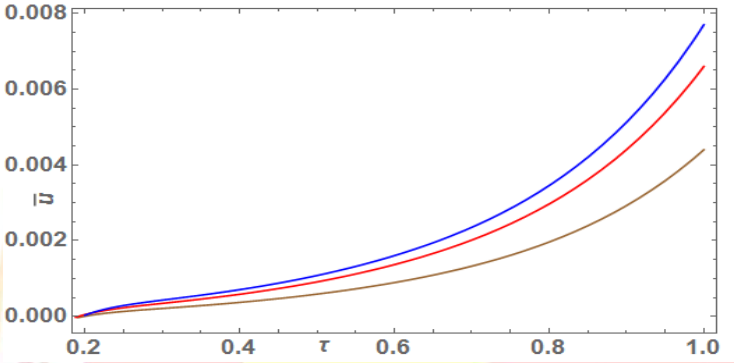

Fig. 2 (b): Temperature distribution along time for m=0

Conclusion

From this study of a transient problem of generalised thermoelasticity in an isotropic homogeneous elastic infinite rod, it is clear that the effect of thermoelastic parameter 'm' for the generalised coupled thermoelasticity of a single parameter as expected is not much pronounced in the displacement and temperature fields. The temperature field has a small oscillatory character about the time axis, while the displacement field decreases as time increases.

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An analysis for thermal stresses in a thin elliptic annulus plate with elastic supports on the curved surfaces

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Abstract

In this study, integral operational methods are used to investigate the thermally induced transverse vibration of a thin elliptic annulus plate with elastic supports at both radial boundaries. The axisymmetric temperature distribution is determined by the heat conduction differential equation and its corresponding boundary conditions by employing a unified integral transform technique by use of Mathieu functions and modified Mathieu functions. The solution of thermally induced vibration of the plate with both ends encased with elastic supports is obtained by employing an integral transform for double Laplace differential equation. The thermal moment is derivedon the basis of temperature distribution, and its stresses are derived based on resultant bending moments per unit width. The numerical calculations of the distributions of the transient temperature and its associated stress distributions are shown in the figures.

Keywords: Thermoelastic vibrations, elliptic annulus plate, elastic supports, heat conduction, thermal stresses, integral transform

1. Introduction

The thermoelastic vibration analysis is necessitated in many engineeringsscience applications such as design and computation of structures and mechanical devices, maintenance or predictions of breakdown. These reasons make the study of thermoelastic vibrations in structures and the control of their behaviour under dynamic loads an interesting study.

A short history of the research investigations associated with the thermoelastic vibrations insights using various operational and approximate methods like the Ritz energy method, Galerkin's method, finite element models and perturbation theory are reviewed that is used to solve the system.For example, Chen et al. [1] introduced three displacement functions to decompose three displacement components so that the three-dimensional equations of motion of a transversely isotropic body are uncoupled. Further expanding these functions in terms of orthogonal series, the equations of free vibration problem of a transversely isotropic cylindrical shell with ends simply supported are simplified to be readily dealtwith. Sato [2, 3] obtained solutions for composite elliptical membrane consisting of confocal elliptical parts under certain conditions during free as well as forced vibration analysis. Hutchinson and El-Azhari [4] use exact series solutions to the exact governing equations and present highly accurate resonance frequencies of stress-free cylinders on the basis of the linear three-dimensional theory of elasticity. Very recently, Bhad et al. [5, 6] and Dhakate [7]determined the thermally induced transverse vibration of a uniform thin elliptical object using few new integral transform methods. The aim of this work is to determine the thermal bending stresses using the exact formal solution of the partial differential equation prevailing the transverse vibration in terms of Mathieu functions and modified Mathieu functions. During problem formulation, we have initially solved heat conduction equation using the integral operation method. Secondly, we shall study the thermoelastic symmetrical vibration with elastic supported boundaries conditions using the theory of integral transform. Finally, the analytical solution for the thermal stress components is obtained based on resultant bending moments per unit width. The results presented here will be more useful in engineering problems particularly in vibrational analysis and in determining the state of strain in elliptical disk constituting foundations for reactors, pressure vessels, furnaces, etc.

2. Formulation of the problem

It is assumed that a thin elliptical annulus plate is occupying the space $D:\{(\xi,\eta,z)\in R^3 : a<\xi<b,\ 0<\eta<2\pi,\ 0<z<\lambda\}$ under transient temperature state having internal heat source within it, while supports at the boundaries as non-rigid. The geometry of the elliptical annulus plate indicates that an elliptic-cylindrical

coordinate system (ξ,η,z) is the most appropriate choices of the reference frame, which are related to the rectilinear coordinate system (x,y,z) by the relation $x=c\cosh\xi\cos\eta,\ y=c\sinh\xi\sin\eta,\ z=z$. The curves $\eta=$ constant represent a family of confocal hyperbolas while the curves $\xi=$ constant constitute a family of confocal ellipses. Both sets of curves intersect each other orthogonally at every point in space. The geometry parameters are given as $\xi\in[a,b],\ \eta\in[0,2\pi)$ and $z\in(0,\lambda)$.

2.1 Temperature distribution analysis

The heat conduction equation and boundary conditions are given as

$$\nabla^2\theta+\frac{\partial^2\theta}{\partial z^2}+\frac{Q(\xi,\eta,t)}{\lambda}=\frac{1}{\kappa}\frac{\partial\theta}{\partial t} \qquad (1)$$

in which $\theta(\xi,\eta,z,t)$ is temperature of the plate at point (ξ,η,z) at t time, ∇^2 denotes the two-dimensional Laplacian operator in elliptical coordinate, $Q(\xi,\eta,t)$ represents an energy generation term, $\kappa=\lambda/\rho C$ represents thermal diffusivity in which λ being the thermal conductivity of the material, ρ is the linear density, C is the specific heat of the material, assumed to be constant and the metric coefficient h is given as

$$h^{-2}=(c^2/2)(\cosh 2\xi-\cos 2\eta). \qquad (2)$$

The heat generation term is assumed in the form

$$Q(\xi,\eta,z,t)=Q_0\delta(\xi-a_0)\delta(\eta-2\pi)\delta(z-\lambda_0) \qquad (3)$$

in which Q_0 is typical value of the internal heat generation per unit time and per unit volume, $\delta(\ )$ is the Dirac delta function specifying the distribution of the internal het generation in which $\xi\neq a_0, a_0\in[a,b]$ and $z\neq\lambda_0$, $\lambda_0\in[0,\lambda]$.

The temperature distribution in the elliptical plate is obtained as a solution of the equation (1) with the following initial and boundary conditions

$$\left.\begin{aligned}&\theta(\xi,\eta,z,0)=0,\\&\theta(a,\eta,z,t)+k_1\frac{\partial\theta}{\partial\xi}(a,\eta,z,t)=0,\theta(b,\eta,z,t)+k_2\frac{\partial\theta}{\partial\xi}(b,\eta,z,t)=0,\\&\theta(\xi,\eta,0,t)=0,\theta(\xi,\eta,\lambda,t)=f(\xi,\eta,z,t)\end{aligned}\right\} \qquad (4)$$

with $f(\xi,\eta,z,t)$ as thesectional heat supply on the lower face, $k_i=k(T/\rho_i),\ i=1,2$ as the surface coefficients linearly related to the corresponding heat transfer coefficients which are supported by elastic supports [8, pp.1343] submerged in a non-viscous medium at the internal and external radial surfaces (i.e. $\xi=a$ and $\xi=b$),whereas T is the tension submitted to the upper face of plate, $\rho_i,\ i=1,2$ are the elastic constants of the supports given by the Hooke's law and they, in general, are different and k is the heat flux.

2.2 Thermal deflections formulation

During the formulation we assume few postulates that (i) the thickness of the elliptical annulus plate is small compared with the other dimensions of theplate, (ii) strain is nil at the middle surface of the plate, (iii) transverse shear and normal strains are neglected during investigation, (iv) shear stress is small compared to other stress, influence of shear and rotary inertia is neglected, and (v) finally the temperature distribution depends upon variable position and time. The differential equation for the transverse displacement in an elliptical annulus plate with small amplitude, in elliptic-cylindrical coordinate system and with the restriction that the transverse displacement on a point on the middle plane can be considered in two parts: the quasi-static solution $\omega_{st}(\xi,\eta,t)$, in which inertia effects and damping are disregarded, satisfying the equation

$$D\nabla^2\nabla^2\omega_{st}(\xi,\eta,t)=-\frac{M\theta(\xi,\eta,t)}{1-\upsilon} \qquad (5)$$

and the dynamic solution $\omega_d(\xi,\eta,t)$ satisfying the equation

$$D\nabla^2\nabla^2\omega_d(\xi,\eta,t)+\frac{1}{\alpha^2}\frac{\partial^2}{\partial t^2}\omega_d(\xi,\eta,t)+\frac{p(\xi,\eta,t)}{T}=-\frac{1}{\alpha^2}\frac{\partial^2}{\partial t^2}\omega_{st}(\xi,\eta,t) \qquad (6)$$

Now putting together both equations (5) and (6), yields the complete solution as

$$D\nabla^2\nabla^2\omega(\xi,\eta,t)+\frac{1}{\alpha^2}\frac{\partial^2}{\partial t^2}\omega(\xi,\eta,t)+\frac{p(\xi,\eta,t)}{T}=-\frac{M_\theta(\xi,\eta,t)}{1-\upsilon} \qquad (7)$$

in which $\omega(\xi,\eta,t)=\omega_d(\xi,\eta,t)+\omega_{st}(\xi,\eta,t)$ is the normal transverse deflection along the z-direction taking into account the effect of inertia, $\alpha^2=T/\rho\lambda$, $p(\xi,\eta,t)$ is the external pressure applied normally to the thin elliptical annulus plate, $D=E\lambda^2/[12(1-\upsilon^2)]$ is the modulus of rigidity of the annulus plate, E is the modulus of elasticity constant υ denotes the Poisson's ratio, and M_θ is the thermally induced resultant moment

$$M_\theta=\alpha E\int_0^\lambda z\,\theta(\xi,\eta,t)\,d\theta \qquad (8)$$

with α and E denoting coefficient of linear thermal expansion and Young's modulus of the material of the elliptical annulus plate, respectively. The Laplace operator in the elliptical coordinates has the form

$$\nabla^2=h^2(\partial/\partial\xi^2+\partial/\partial\eta^2) \qquad (9)$$

If we suppose that the boundaries of the thin annulus plate, $\xi=a$ and $\xi=b$, are supported by elastic supports [9, pp.1343] submerged in a non-viscous medium, then the boundary conditions, expressed in mathematical forms, as

$$\left.\begin{aligned}\omega(\xi,\eta,\lambda,t)+k_1\frac{\partial}{\partial\xi}\omega(\xi,\eta,\lambda,t)\Big|_{\xi=a}&=0,\\ \omega(\xi,\eta,\lambda,t)+k_2\frac{\partial}{\partial\xi}\omega(\xi,\eta,\lambda,t)\Big|_{\xi=b}&=0\end{aligned}\right\} \qquad (10)$$

and the initial conditions as

$$\omega(\xi,\eta,t)\big|_{t=0}=g_1(\xi,\eta),\ \ \omega(\xi,\eta,t)_{,t}\big|_{t=0}=g_2(\xi,\eta) \qquad (11)$$

2.3 Thermal bending stresses

The maximum normal stresses acting on those sections are parallel to ξz or ηz planes. Furthermore, the thermal stress components can be determined using small deflection and resultant moment as

$$\left.\begin{aligned}\sigma_{\xi\xi}&=\frac{6}{\lambda^2}\left\{Dh^2\left[\left(\frac{\partial^2\omega}{\partial\xi^2}+\upsilon\frac{\partial^2\omega}{\partial\eta^2}\right)-\frac{(1-\upsilon)\sinh 2\xi}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial\omega}{\partial\xi}+\frac{(1-\upsilon)\sin 2\eta}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial\omega}{\partial\eta}\right]+\frac{M_\theta}{1-\upsilon}\right\}\\ \sigma_{\eta\eta}&=\frac{6}{\lambda^2}\left\{Dh^2\left[\left(\upsilon\frac{\partial^2\omega}{\partial\xi^2}+\frac{\partial^2\omega}{\partial\eta^2}\right)+\frac{(1-\upsilon)\sinh 2\xi}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial\omega}{\partial\xi}-\frac{(1-\upsilon)\sin 2\eta}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial\omega}{\partial\eta}\right]+\frac{M_\theta}{1-\upsilon}\right\}\\ \sigma_{\xi\eta}&=\frac{6}{\lambda^2}\left\{Dh^2\left[\frac{\partial\omega}{\partial\xi}\sin 2\eta+\frac{\partial\omega}{\partial\eta}\sinh 2\xi-\frac{\partial^2\omega}{\partial\xi\partial\eta}(\cosh 2\xi-\cos 2\eta)\right]\right\}\end{aligned}\right. \qquad (12)$$

The equations (1)-(12) constitute the mathematical formulation of the problem under consideration.

3. Solution to the problem

3.1 Temperature distribution

In order to solve fundamental differential equation (1), firstly we introduce the here a finite transform (refer Appendix) over the variables (ξ,η) as

$$\bar{f}(\pm q_{2m}) = \int_a^b \int_0^{2\pi} S_{2m}(k_1,k_2,\xi,\pm q_{2m})\,(\cosh 2\xi - \cos 2\eta) \times ce_n(\eta,\pm q_{2m})\, f(\xi,\eta)\, d\xi\, d\eta \qquad (13)$$

In this way, we may define the inversion theorem of equation (13) in the form

$$f(\xi,\eta) = \sum_{m=0}^{\infty} \sum_{n=1}^{\infty} \bar{f}(\pm q_{2m}) S_{2m}(k_1,k_2,\xi,\pm q_{2m}) ce_n(\eta,\pm q_{2m}) / N_{2m,n} \qquad (14)$$

in which

$$N_{2m,n} = \pi \int_a^b S_{2m}^2(k_1,k_2,\xi,\pm q_{2m})(\cosh 2\xi - \Theta_n)\, d\xi$$

and

$$\Theta_n = \frac{1}{\pi}\int_0^{2\pi} \cos 2\eta\, ce_n^2(\eta, q_{2m})\, d\eta = A_0^{(n)} A_2^{(n)} + \sum_{r=0}^{\infty} A_{2r}^{(n)} A_{2r+2}^{(n)} \qquad [8, p.177]$$

The notations of the Mathieu functions used in this paper follow those adopted by McLachlan [8]. So, the symbols ce_n and Ce_{2m} denote the Mathieu and modified Mathieu functions of order n and m respectively. The prime $(')$ attached Ce_{2m} and ce_n represent the $\xi-$ and $\eta-$ derivatives respectively. The symbols $A^{(n)}$ is the Fourier coefficients of the Mathieu functions. On applying integral transform to the differential equation (13), and taking into account the boundary conditions (4), the differential equation (1) transformed into

$$\frac{\partial^2 \bar{\theta}}{\partial z^2} - \alpha_{2m}^2 \bar{\theta} + \frac{Q_0}{\lambda}\delta(z-\lambda_0)\exp[\alpha_{2m}^2(a_0 - 2\pi)] = \frac{1}{\kappa}\frac{\partial \bar{\theta}}{\partial t} \qquad (15)$$

with initial and boundary conditions

$$\left.\begin{aligned} &\bar{\theta}(q_{2m},\eta,z,0)\big|_{t=0} = 0 \\ &\bar{\theta}(q_{2m},\eta,0,t)\big|_{z=0} = 0, \bar{\theta}(q_{2m},\eta,\lambda,t)\big|_{z=\lambda} = \bar{f}(q_{2m},z,t) \end{aligned}\right\} \qquad (16)$$

in which $\alpha_{2m}^2 = 4q_{2m}/c^2$, $\bar{\theta}$ is the transformed function of θ respectively.

Applying Fourier sine transform to the eq. (16), using the boundary conditions (16), one yields,

$$\frac{\partial \bar{\bar{\theta}}}{\partial t} + \kappa\left(\alpha_{2m}^2 + \frac{\wp^2\pi^2}{\lambda^2}\right)\bar{\bar{\theta}} = \kappa\left(\frac{Q_0}{\lambda}\right)\sin\left(\frac{\wp\pi\lambda_0}{\lambda}\right)\exp[-\alpha_{2m}^2(a_0+2\pi)] + \kappa\left(\frac{\wp\pi}{\lambda}\right)[(-1)^{\wp+1}\,\bar{f}(q_{2m},\wp,t)] \qquad (17)$$

with initial condition as

$$\bar{\bar{\theta}}(q_{2m},\eta,z,0)\big|_{t=0} = 0 \qquad (18)$$

Applying Laplace transform to the equation (17) and taking into account the condition (18), the equation after mathematical simplification reduce to

$$\bar{\bar{\theta}}^*(q_{2m},\wp,s) = \left\{\frac{Q_0\kappa}{\lambda}\left[\sin\left(\frac{\wp\pi\lambda_0}{\lambda}\right)\exp[-\alpha_{2m}^2(a_0+2\pi)]\right] + \left(\frac{\kappa\wp\pi}{\lambda}\right)(-1)^{\wp+1} \times \bar{\bar{f}}(q_{2m},\wp,s)\right\} \Big/ \left[s + \kappa\left(\alpha_{2m}^2 + \frac{\wp^2\pi^2}{\lambda^2}\right)\right] \qquad (19)$$

Applying inverse Laplace transform on equation(19), one obtains

$$\bar{\bar{\theta}}(q_{2m},\wp,t)=\frac{Q_0\kappa}{\lambda}\exp[-\kappa(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})]\ \bar{g}(q_{2m},\wp)+(-1)^{\wp+1}\left(\frac{\kappa\wp\pi}{\lambda}\right)$$
$$\times\int_0^t \bar{f}(q_{2m},\wp,\tau)\exp[-\kappa(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})(t-\tau)]d\tau \quad (20)$$
$$\text{in which } \bar{g}(q_{2m},\wp)=\sin\left(\frac{\wp\pi\lambda_0}{\lambda}\right)\exp[-\alpha_{2m}^2(a_0+2\pi)].$$

Applying inversion theorem of the finite Fourier Sine transform on equation (20), one obtains,

$$\bar{\theta}(q_{2m},z,t)=\frac{2}{\lambda}\sum_{\wp=1}^{\infty}\left\{\frac{Q_0 k}{\lambda}\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})]\bar{g}(q_{2m},\wp)+(-1)^{\wp+1}\left(\frac{k\wp\pi}{\lambda}\right)\right.$$
$$\left.\times\int_0^t \bar{f}(q_{2m},\wp,\tau)\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})(t-\tau)]d\tau\right\}\sin\left(\frac{\wp\pi z}{\lambda}\right) \quad (21)$$

Applying inversion theorem of the transformed rules defined by equation(14) on equation(21), the temperature is obtained as,

$$\theta(\xi,\eta,z,t)=\frac{2}{\lambda}\sum_{m=0}^{\infty}\sum_{n=1}^{\infty}\sum_{\wp=1}^{\infty}\left\{\left(\frac{Q_0 k}{\lambda}\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})]\bar{g}(q_{2m},\wp)\right.\right.$$
$$\left.+(-1)^{\wp+1}\left(\frac{k\wp\pi}{\lambda}\right)\int_0^t \bar{f}(q_{2m},\wp,\tau)\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})(t-\tau)]d\tau\right) \quad (22)$$
$$\left.\times\sin\left(\frac{\wp\pi z}{\lambda}\right)S_{2m}(k_1,k_2,\xi,\pm q_{2m})ce_n(\eta,\pm q_{2m})/N_{2m,n}\right\}$$

The function is given in equation (22) represents the temperature at every instant and at all points of the elliptic annulus plate of finite height under conditions of radiation type on the surface.

3.2 Thermal deflections analysis

Substituting the equation (22) in equation (8), the thermally induced resultant moment is obtained as

$$M_\theta=\frac{2\lambda\alpha E}{\pi^2}\sum_{m=0}^{\infty}\sum_{n=1}^{\infty}\sum_{\wp=1}^{\infty}\left\{\left(\frac{Q_0 k}{\lambda}\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})]\bar{g}(q_{2m},\wp)\right.\right.$$
$$\left.+(-1)^{\wp+1}\left(\frac{k\wp\pi}{\lambda}\right)\int_0^t \bar{f}(q_{2m},\wp,\tau)\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})(t-\tau)]d\tau\right) \quad (23)$$
$$\left.\times\left(\frac{-\wp\pi\cos(\wp\pi)+\sin(\wp\pi)}{\wp^2}\right)S_{2m}(k_1,k_2,\xi,\pm q_{2m})ce_n(\eta,\pm q_{2m})/N_{2m,n}\right\}$$

In order to solve fourth order differential equation (7), using another integral transformation (refer Appendix) of order *m*and *n*over the variable ξ and η as

$$\bar{f}(q_{2m,n})=\int_a^b\int_0^{2\pi}(\cosh 2\xi-\cos 2\eta)\ Be_{2m}(k_1,k_2,\xi,q_{2m,n})$$
$$\times ce_{2m}(\eta,q_{2m,n})\,f(\xi,\eta)d\xi\,d\eta \quad (24)$$

The inversion theorem of (24) is

$$f(\xi,\eta)=\sum_{m=0}^{\infty}\sum_{n=1}^{\infty}\bar{f}(q_{2m,n})\zeta_{2m,n}(k_1,k_2,\xi,\eta,q_{2m,n})/C_{2m,n} \quad (25)$$

in which

$$\zeta_{2m,n}(k_1,k_2,\xi,\eta,q_{2m,n}) = \grave{B}e_{2m}(k_1,k_2,\xi,q_{2m,n})ce_{2m}(\eta,q_{2m,n})$$

and

$$C_{2m,n} = \pi\int_a^b(\cosh 2\xi - \Theta_{2m,n})\grave{B}e^2_{2m,n}(k_1,k_2,\xi,q_{2m,n})\,d\xi$$

On applying integral transform defined in equation (24) to the differential equation (7), and taking into account the boundary conditions (10), the differential equation transformed into

$$4Dq^2_{2m,n}\,\bar{\omega}(q_{2m,n},t) + \frac{1}{\alpha^2}\frac{\partial^2}{\partial t^2}\bar{\omega}(q_{2m,n},t) + \frac{\bar{p}(q_{2m,n},t)}{T} = \frac{\bar{F}(q_{2m,n},t)}{1-\upsilon} \qquad (26)$$

in which $F(\xi,\eta,t) = -\nabla^2 M_\theta$, $\bar{\omega}(q_{2m,n},t)$ and $\bar{F}(q_{2m,n},t)$ are the transformed function of $\omega(\xi,\eta,t)$ and $F(\xi,\eta,t)$ respectively.

Using Laplace transform on equation (26), the differential equation is reduces to

$$4Dq^2_{2m,n}\,\bar{\bar{\omega}}(q_{2m,n},s) + \frac{1}{\alpha^2}s^2\bar{\bar{\omega}}(q_{2m,n},s) + \frac{\bar{\bar{p}}(q_{2m,n},s)}{T} = \frac{\bar{\bar{F}}(q_{2m,n},s)}{1-\upsilon} \qquad (27)$$

in which $\bar{\bar{\omega}}(q_{2m,n},t)$ and $\bar{\bar{F}}(q_{2m,n},t)$ are the transformed function of $\bar{\omega}(q_{2m,n},t)$ and $\bar{F}(q_{2m,n},t)$ respectively.

Using the inverse Laplace theorem and the inverse theorem defined in equation (25), one obtains,

$$\begin{aligned}\omega(\xi,\eta,t) = \sum_{m=0}^{\infty}\sum_{n=1}^{\infty}\frac{\zeta_{2m,n}(k_1,k_2,\xi,\eta,q_{2m,n})}{C_{2m,n}}\Bigg\{\, & g_1(\xi,\eta)\\ & \times\cos(2q_{2m,n}\alpha\sqrt{D}) + \frac{g_2(\xi,\eta)}{2q_{2m,n}\alpha\sqrt{D}}\sin\left(2q_{2m,n}\alpha\sqrt{D}\right)t \qquad (28)\\ & + \frac{\alpha}{2q_{2m,n}\sqrt{D}}\int_0^t\left(\frac{\bar{F}(q_{2m,n},\tau)}{1-\upsilon} - \frac{\bar{p}(q_{2m,n},\tau)}{T}\right)\\ & \times\sin\left(2\alpha\sqrt{D}\,q_{2m,n}\right)(t-\tau)\,d\tau\Bigg\}\end{aligned}$$

The resulting equation of stresses can be obtained by substituting Eqs. (23) and (28).

4. Numerical Results, Discussion and Remarks

For the sake of simplicity of calculation, we introduce the following dimensionless values

$$\left.\begin{aligned}&\bar{\xi} = \xi/b,\ \bar{z} = [z-(-\lambda/2)]/b,\ e = c/b,\ \tau = \kappa t/b^2,\\ &\bar{\theta} = \theta/\theta_0,\ \bar{h}^2 = h^2b^2,\ \bar{\omega} = \omega/\alpha\theta_0 b,\\ &\bar{M}_\theta = M_\theta/Eb^3, \bar{\sigma}_{ij} = \sigma_{ij}/E\alpha\theta_0\ \ (i,j=\xi,\eta)\end{aligned}\right\} \qquad (29)$$

The mathematical computations have been carried out for Aluminum (pure) elliptic annulus plate with the thermo-mechanical properties are considered as modulus of elasticity E = 70 GPa, Poisson's ratio υ = 0.35, thermal expansion coefficient α = 23×10^{-6} /0C, thermal diffusivity κ = 84.18×10^{-6} m^2 /s^{-1}, density ϱ = 2712 kg/m^3 and thermal conductivity λ = 204.2 Wm^{-1} K^{-1}. The q_{2m} = 0.0989, 0.3987, 0.889, 1.5792, 2.4694, 3.5550, 4.8861, 6.3467, 7.9993, 9.8696, 11.9523, 14.2322, 16.6792, 19.0234, 21.2164, 23.6036, 25.0374, 27.7169, 29.2712, 31.0449are the positive and real roots of the $Ce_{2m}(\xi_o,q)Fey'_{2m}(\xi_i,q) - Fey_{2m}(\xi_o,q)Ce'_{2m}(\xi_i,q) = 0$. The physical parameter as $\bar{a}$ = 0.3 m, $\bar{b}$ = 1 m, $\bar{\lambda}$ = 0.05 m, and reference temperature θ_0 as 150^{0}C. For numerical thermoelastic analysis, we have considered various values of time as $\tau\,(<\tau_0 = 2,$ a fixed value). In order to examine the influence of heating on the plate, the numerical calculations

were performed for all the variables and numerical calculations are depicted in the following figures with the help of MATHEMATICA software.

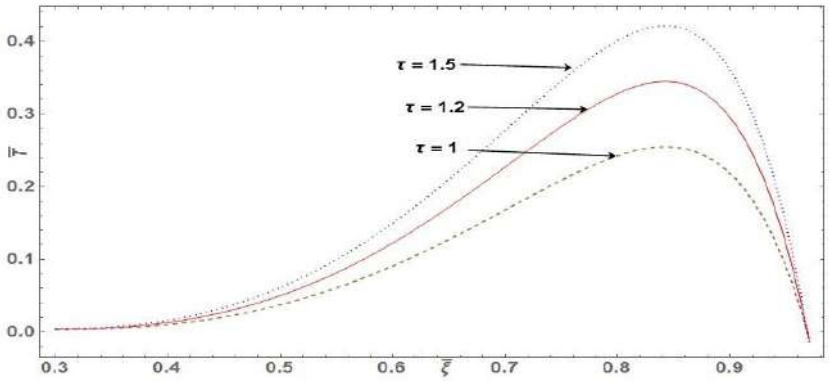

Fig. 1(a): Temperature distribution along radial direction for different values τ.

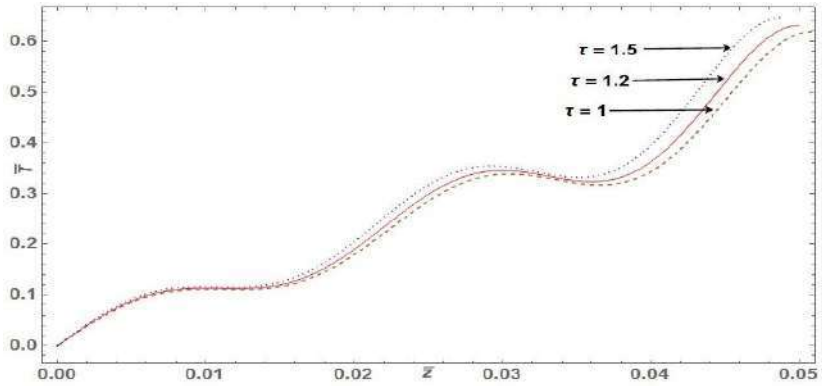

Fig. 1(b): Temperature distribution along $\bar{z}$ - direction for different values τ.

Figs. 1–3 illustrates the numerical results of temperature distribution, thermal deflection and stresses on elliptic annulus plate. As shown in Fig. 1(a), the temperature increases as the time proceeds along radial direction and is greatest at the other edge of the plate due to the combined energy of internal heat generation and known temperature. Fig. 1(b) shows that the temperature distribution along the $\bar{z}$ -direction for different values of time τ , which is maximum towards outer edge due to energized heat supply.

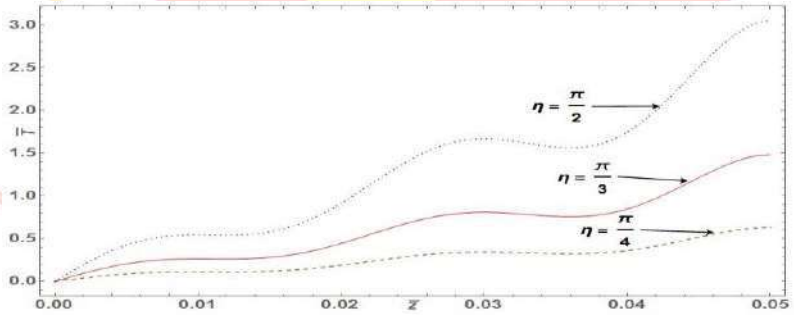

Fig. 1(c): Temperature distribution along $\bar{z}$ - direction for different values η.

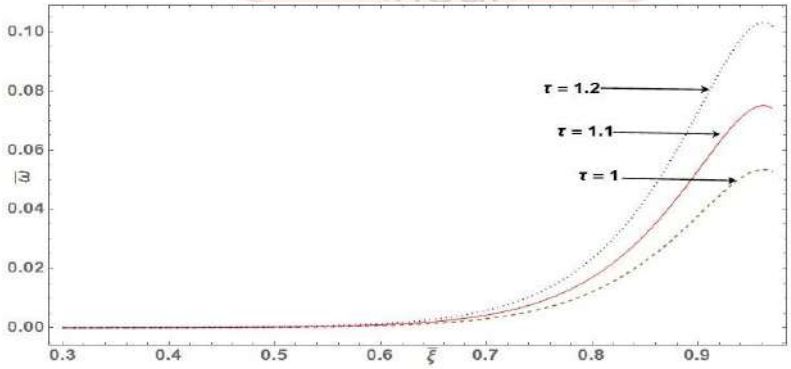

Fig. 2(a): Thermal deflection along radial direction for different τ.

Fig. 1(c) depicts that the temperature distribution along $\bar{z}$ -direction for different values of η attains maximum expansion at its outer core. There is an increment in the rate of heat propagation with thickness which leads to compressive force in the inner part and expands more on the outer surface whenever graph were plotted for temperature distributions, stress functions and deflection.Figs. 2(a) and 2(b) illustrates that the thermal deflection distribution over plate with elastic supported edges. Fig. 2(a) shows that the changes of thermal deflection along ξ-direction for different time parameter. The deflection is highest at the other edge of the plate due to the combined effect of internal and external supplied energy.

Fig. 3(a)-3(c) shows the variation of thermal radial stress $\sigma_{\xi\xi}$, tangential stress $\sigma_{\eta\eta}$ and shear stress $\sigma_{\xi\eta}$ along radial direction for different time parameter τ. From Fig. 3(a), the large compressive stress occurs at the inner edge while the tensile stress occurs at the outer edge which drops along the radial direction.

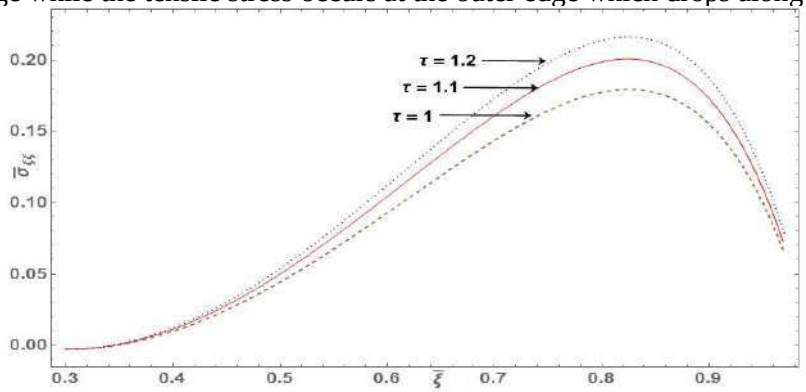

Fig. 3(a): Radial stress $\bar{\sigma}_{\xi\xi}$ along radial direction for different τ.

Fig. 3(b)-3(c) illustrates the thermal radial stress $\sigma_{\xi\xi}$, shear stress $\sigma_{\xi\eta}$ along angular direction for different values of $\bar{\xi}$. it is evident from the fig. 3(d) that at the early stage, radial stress increases gradually and maximum radial stress occurs at the mid-core and suddenly attains minimum value. The similar curve nature was observed for the angular stress along angular direction for different values of $\bar{\xi}$ and has been omitted here for the sake of brevity. It is observed from fig. 3(e) that shear stress has large influence of negative forces at the mid core for η- direction.

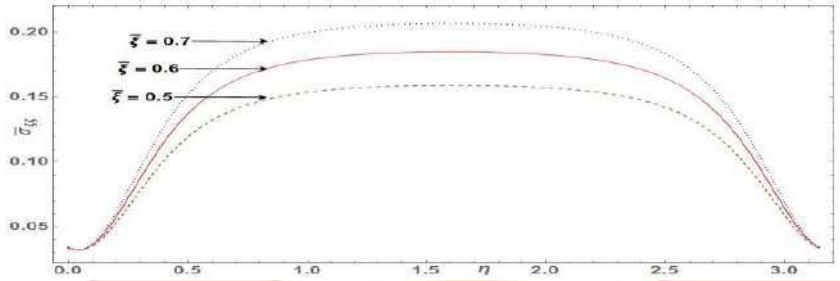

Fig. 3(b): Radial stress $\bar{\sigma}_{\xi\xi}$ along angular direction for different $\bar{\xi}$.

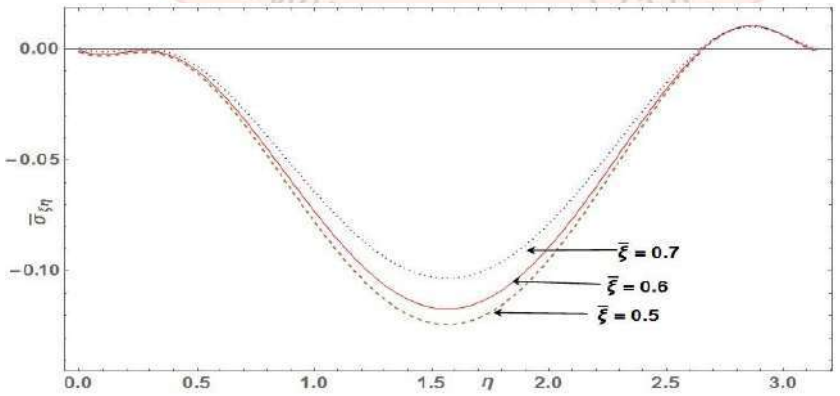

Fig. 3(c): Shear stress $\bar{\sigma}_{\xi\eta}$ along angular direction for different $\bar{\xi}$.

5. Conclusion

In this article, we have described the theoretical treatment of dynamic thermally induced vibration with its deflection and its associated stresses. The analytical technique proposed here is relatively simple and widely applicable compared to the methods proposed by other researchers. The results obtained while carrying research are described as follows

- The maximum tensile stress shifting from the outer surface due to maximum expansion of an outer part of the plate, its absolute value increases with the radius. This could be due to heat, stress, concentration or available internal heat sources under known temperature field.
- The value of radial stress $\bar{\sigma}_{\xi\xi}$ shows discontinuity at the boundaries whereas plateau type curve at the middle part along angular direction.

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Knowledge and Attitude of Health Care Professionals Regarding Placental Stem therapy

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Abstract

Background: The notion of stem cells is a developing concept. Stem cells are undifferentiated cells, capable of self-regeneration and differentiation into specific lineage cells. Self-regeneration can be maintained along many generations, increasing the number of cells.1 Aim: The present study aims to assess the knowledge and attitude of health care professionals regarding placental stem cell therapy. , Objectives: 1. To assess the knowledge of health care professionals regarding placental stem cell therapy. 2. To assess the attitude of health care professionals regarding placental stem cell therapy. 3. To co-relate the knowledge and attitude with various demographic variables. Methods: A descriptive survey approach with Purposive sampling was used to select 150 health care professionals working NMCH, Nellore, Andhra pradesh. Results: Maximum no. of health care professionals (55.3%) had inadequate knowledge and most of them (98%) had positive attitude. Conclusion: The study concluded that, 55.33% of health care professionals had inadequate knowledge and 98% of health care professionals had positive attitude.

Key words: Knowledge, Attitude, Health Care Professionals, Placental Stem Cell therapy.

Introduction

The notion of stem cells is a developing concept. Stem cells are undifferentiated cells, capable of self-regeneration and differentiation into specific lineage cells. Self-regeneration can be maintained along many generations, increasing the number of cells. Umbilical Cord blood (UCB), which is also called "placental blood," is the blood that remains in the umbilical cord and placenta following birth and after the cord is cut. Umbilical cord blood could be considered as a rich source of stem cells.2

The Cord blood is one of the richest and non controversial sources of stem cells. Cord blood is the blood left in the umbilical cord and placenta after the birth of the child and is collected within 10-15 minutes after the cord has been cut off by simple venipuncture, in the umbilical vein followed by gravity drainage in to a sterile anti- coagulant filled blood collection.3

The placenta is one of the most important sources of stem cells, and has been studied extensively over the past period. The placenta fulfills two main desiderata of cell therapy: obtaining of an as high as possible number of cells and use of non-invasive methods for their harvesting. Stem cells in cord blood have exceptional properties that make them desirable, such as high proliferative potential, increased ability for self-renewal, and decreased ability for antigen presentation.4

Need For The Study

During the 1970's researcher discovered that umbilical cord blood could supply the same kind of hematopoietic stem cells as bone marrow donor. And so, umbilical cord blood banking began by collecting and storing umbilical cord blood. Cord blood stem cells are currently used in the treatment of several life-threatening diseases, and play an important role in the treatment of blood and immune system related genetic diseases, cancer and blood disorders.5

The first clinically documented use of cord blood stem cells was in the successful treatment of a six-year-old boy affected by Fanconi anemia in 1988. Since then, cord blood has become increasingly recognized as a source of stem cells that can be used in stem cell therapy.6

Rajeshwari C (2015) conducted a study on knowledge and attitude of health professionals regarding placental stem cell, preservation and utilization. The study concluded that 84% of health professionals had inadequate knowledge and 25% had neutral attitude.7

Perlow JH. (2018) conducted a study to determine the Knowledge on umbilical blood banking among 425 patients. The data were collected by using questionnaire. This revealed that 37% patients had no knowledge regarding umbilical cord blood banking, 2.6% patients had knowledge and 74% patients were minimally informed about umbilical cord blood banking only 14% patients were educated about umbilical cord blood banking by their

nurses, although 90% patients expected their obstetrician to answer their questions on umbilical cord blood banking. This study concluded that patients are poorly informed about umbilical cord blood banking and they are expecting information from the health care professionals.8

Though there are many benefits of cord blood these fascinating stem cells are continued to be discarded as a medical waste even today due to the lack of Knowledge and negative attitude caused by the high cost involved. It is the responsibility of the health professionals to create awareness about Cord Blood Banking and to motivate its utilization by general public to move towards this bio health insurance. 9

Problem Statement

A study to assess the knowledge and attitude of health care professionals regarding placental stem cell therapy at NMCH, Nellore, A.P.

Objectives of The Study

1. To assess the knowledge of health care professionals regarding placental stem cell therapy.
2. To assess the attitude of health care professionals regarding placental stem cell therapy.
3. To co-relate the knowledge and attitude with various demographic variables such as age, sex, work experience, educational status and designation.

Delimitations

The study is delimited to:

1. Health care professionals who are working at NMCH, Nellore, A.P
2. Who are willing to participate in the study.

Materials & Methods:

Research approach: Non-experimental descriptive approach
Research design: Descriptive cross-sectional research design
Setting: The present study was conducted in NMCH, Nellore, A.P
Sample: Health care professionals in NMCH, Nellore, A.P and who fulfilled the inclusion criteria were selected for the study.
Sampling technique: Purposive sampling technique
Sample size: The sample size of the study was 150 health care professionals.
Criteria for sample selection
Inclusion criteria:

- Health care professionals working in NMCH, Nellore, A.P.
- Health care professionals who are present during study period and are willing to participate during the study period.

Exclusion criteria:

- Health care professionals not working in NMCH, Nellore, A.P.

Description of the tool
The tool is divided into three parts.
Part I: This part of tool included demographic information of study subjects such as age, sex, work experience, educational status and designation.
Part II: This part consisted of 20 structured multiple choice questions to assess the knowledge of health care professionals regarding placental stem cell therapy.
Part- III: This part consisted of 12 statements concerning the attitude of health care professionals regarding placental stem cell therapy. The statements were developed for the respondents to respond on five points Likert's scale i.e. strongly agree, agree, uncertain, disagree and strongly disagree.

Results& Discussion:

Table-1: Frequency, Percentage distribution of health care professional's knowledge regarding placental stem cell therapy. (N=150)

Level of knowledge	Frequency (n)	Percentage (%)
Adequate (≥50%)	67	44.66
Inadequate(<50%)	83	55.33

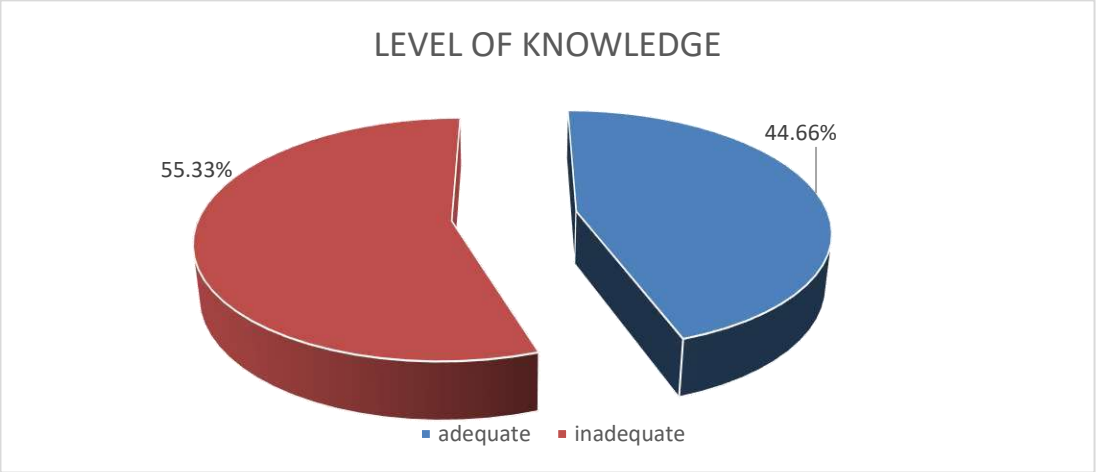

Fig-1: Frequency, Percentage distribution of health care professional's knowledge regarding placental stem cell therapy.

Table-2: Frequency, Percentage distribution of health care professional's attitude regarding placental stem cell therapy. (N=150)

Level of attitude	Attitude	
	Frequency (n)	**Percentage (%)**
Positive (≥50%)	147	**98**
Negative (<50%)	**3**	**2**

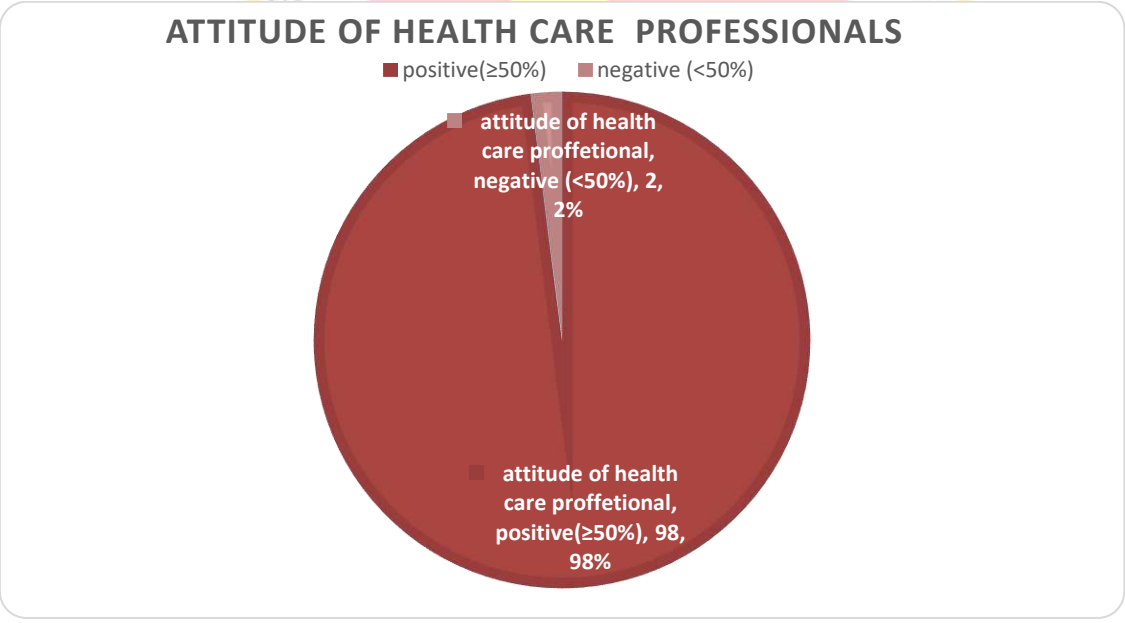

Fig-2: Frequency, Percentage distribution of health care professional's attitude regarding placental stem cell therapy.

Major Findings Of The Study

- The study shows that 44.66% of health care professionals were having adequate knowledge and 55.33% of health care professionals were having inadequate knowledge.
- Majority of health care professionals (98%) had positive attitude and only 2% of them had negative attitude regarding placental stem cell, cord blood banking and its utilization.
- The co-relation of attitude regarding placental stem cell, cord blood banking and its utilization according to age, sex, work experience, educational status and designation was found statistically non significant at ($p<0.05$) level.

Conclusion:

The study concluded that, 55% of health care professionals were having inadequate knowledge and 98% health care professionals had positive attitude regarding placental stem cell, cord blood banking and its utilization.

Recommendations

- On the basis of present findings it is recommended that a large sample should be studied in order to provide better picture of knowledge and attitude regarding stem cell, cord blood banking and its utilization.
- The study may be conducted at different community setting.
- The instrument used for assessing knowledge and attitude towards stem cell, cord blood banking and its utilization can further be developed and field tested for standardizing.
- There should be in- service workshop and seminar to enhance the health care professionals knowledge regarding stem cell, cord blood banking and its utilization.

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A Climate Change : Center of Attention

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Abstract

The rise in CO_2 and Green houses gases (GHGs) originated from fossil fuels emissions and deforestation is only due to human activity. Intergovernmental Panel on Climate Change (IPCC) has measurable scientific evidences in its fourth report on climate change (2007) and they have become clearly accepted universally. Climate change is commonly understood to be one of the drivers of extinction, affecting biodiversity in nearly every corner of the planet. Climate change is one of the major problems and placed in the queue of other hazardous influence which disturbs the earth balance. The rise in average temperature is only one indicator of broader changes also translating into extreme temperatures, drought, flooding, storms, rising sea levels, impacts on food production, and infectious diseases. Although the scientific community has been aware of the link between greenhouse gases (GHGs) and climate change for many years, world leaders have been slow to react and implement measures to mitigate the risks. New research initiatives should focus on collecting high-quality, long-term data on climate-related health outcomes with the dual purpose of understanding current climate–health associations and predicting future scenarios. The global warming issue and challenge has focused on the lightening of greenhouse gases based on international environmental conventions such as IPCC and Kyoto Protocol. The warm effect of global warming affects not only ecological systems but also human life; it has become an important issue both nationally and internationally so need to study.

Keywords : Climate change, health, global warming, Climate Variability

Introduction

Present time climate change concluding both global warming and its consequences on Earth's weather patterns. There have been previous circumstances of climate change, but the rapid changes in climate are rapidly moving and obviously its not due to natural causes.[1] For the years that the international community has engaged on climate change, it has the UN Framework Convention on Climate Change (FCCC)[2] and its Kyoto Protocol,[3] to show for it. The emission reduction commitments made under these agreements are inadequate [4] and inadequately implemented.[5] Instead, they are caused by the emission of greenhouse gases, mostly carbon dioxide (CO2) and methane. Burning fossil fuels for energy use creates most of these emissions. Agriculture, steelmaking, cement production, and forest loss are additional sources.[6] Greenhouse gases are transparent to sunlight, allowing it through to heat the Earth's surface. When the Earth emits that heat as infrared radiation the gases absorb it, trapping the heat near the Earth's surface. As the planet heats up it causes changes like the loss of sunlight-reflecting snow cover, amplifying global warming.[7] Due to its effect the earth temperature rises twice as fast as global temperature resulted into the area of deserts increases so the heat waves and wildfires occurs more common .[8] There is now convincing scientific evidence that human activity is altering the global climate (IPCC 2007). Although questions remains about the timing and impact of climate change, it is already clear that there are risks of significant adverse consequences.[9] Although low- and middle-income countries are responsible for only a small percentage of global greenhouse gas emissions, the adverse health effects associated with climate change will likely fall disproportionately on their populations. This inequity will further exacerbate global health disparities. High-risk areas include those already experiencing a scarcity of resources, environmental degradation, high rates of infectious disease, weak infrastructure, and overpopulation .[10-13] In particular, tropical regions will experience significant changes in human–pathogen relationships because of climate change.[14] Changing temperatures and precipitation patterns linked to climate change will further affect health by changing the ecology of various vector-borne diseases, such as malaria, dengue, chikungunya, Japanese encephalitis, kala-azar, and filariasis. [15-16]

Challenges of Climate Change

Climate change is arguably the most severe challenge facing our planet during the 21st century. The spatial and temporal extent of the climate challenge deeply connects it to ethical questions as well. These arise both from the fact that the poorest people on Earth are not significantly contributing to global emissions, but may well feel the impacts most severely, and from the long-term commitment to future warming and climate change impacts – like sea level or the partial melting of the large ice sheets – which will be felt by future generations. In essence, past and future greenhouse gas emissions seriously affect a large fraction of the still growing human population on our planet and profoundly shape the environment in which our children and grandchildren will have to live in. Humanity therefore has a moral obligation to address the climate challenge. This will have to combine successful negotiations on a binding and effective international climate agreement and bottom-up initiatives from individuals or communities. There is a wide range of global threats that certainly require humanity's urgent attention.(17) But climate change cannot be considered isolated from other challenges. Indeed, climate change is a truly cross-cutting issue affecting many sectors and connected to other global challenges. For example, climate change has the potential to impact global water supplies, agricultural production, human health, and our energy infrastructure. (18) In turn, the way in which we produce our energy and food has a profound effect on the Earth's climate system. Finally, the impacts of policies in one of the fields on the other challenges need to be explored if truly sustainable solutions to global problems shall be achieved. These close connections – and the societal and technical challenges of climate mitigation (IPCC 2014b) and adaptation (IPCC 2014a) – require interdisciplinary and transdisciplinary thinking; we hope that our new journal Global Challenges can serve as a highly visible forum for research bridging classical scientific disciplines, for ideas which have the potential to directly influence future climate policy and for discussions about new research and different policy options.[19] Within the climate change focus of Global Challenges, we therefore invite submissions related to climate change of the highest quality, with a clear focus on the global view of the climate problem and with relevance for (global) climate policy or bottom-up initiatives which are a significant step towards a solution of the climate challenge.[20] Indoor air pollution presents yet another major health threat, with 32% of deaths in South Asia attributable to the burning of solid fuels in poor, small, unventilated houses [21] these health risks will be exacerbated as a result of climate change is yet to be determined, but cobenefit interventions aimed at reducing the health impacts associated with indoor air pollution, decreasing the release of green house gases from the burning of solid fuel, and preventing deforestation by introducing alternative, more efficient stoves and fuels will have serious implications for health and society.

Conclusion

In this paper we were studied the cause of climate change and its adverse effect in all over fields and here we concluded that the climate change is having adverse effect and it collapses number of species which having measurable numbers. It is clear that climate change is a security problem for some states and its due to emission of CO_2 which must be controlled by the countries but, what does it serve us to speak of climate change in these terms and what are the implications of doing so? The rise in the amounts of greenhouse gases cause climate changes. It discusses the evidence that the concentrations of these gases in the atmosphere have increased and are still increasing rapidly and progressively, and thus that most of the recent change is almost certainly due to emissions of greenhouse gases caused by human activities. Untill and unless if we not prohibited the rise in concentration green house gases , their consequences will be uncontrollable. There remains a range of estimates of the magnitude and regional expression of future change, but increases in the extremes of climate that can adversely affect natural ecosystems and human activities and infrastructure are expected. Citizens and governments can choose among several options in response to this information: they can change their pattern of energy production and usage in order to limit emissions of greenhouse gases and hence the magnitude of climate changes; they can wait for changes to occur and accept the losses, damage, and suffering that arise; they can adapt to actual and expected changes as much as possible; or they can seek as yet unproven solutions to counteract some of the climate changes that would otherwise occur. Different nations and communities will vary in their vulnerability and their capacity to adapt. There is an important debate to be had about choices among these options, to decide what is best for each group or nation, and most importantly for the global population as a whole.

The options have to be discussed at a global scale because in many cases those communities that are most vulnerable control few of the emissions, either past or future. Our description of the science of climate change, with both its facts and its uncertainties, is offered as a basis to inform that policy debate. In 2008 India developed the National Action Plan on Climate Change, promising further enhancement of ecological sustainability as part of India's development path, signaling their involvement in the international discussion on climate change. Countries like India have a tremendous opportunity to guide our future trajectory regarding sustainable development and adaptation to climate change, but it will take the combined effort of policy makers and scientists from around the world to address the complex challenges associated with climate change and human health. In conclusion, innovative, multidisciplinary investigations using environmental epidemiologic methods to elucidate health risks posed by climate variability—and subsequent climate change—in regions such as India are possible. However, such work will require expanded partnerships among researchers, governments, and communities to develop a cobenefit strategy that addresses public health challenges and risks associated with climate change. Adoption and implementation of these research initiatives will provide the necessary tools and infrastructure to pose interesting scientific questions and design effective solutions to the complex issues imposed by climate change. Health outcomes of interest, for which such data should be collected, include total morbidity and mortality and noncommunicable diseases such as cardiovascular, respiratory, and circulatory diseases and asthma, as well as infectious diseases such as cholera, malaria, tuberculosis, typhoid, hepatitis, dysentery, tick-borne encephalitis, and other vector-borne and waterborne diseases. Such monitoring also requires the collection of appropriate climatic (e.g., temperature and precipitation) and nonclimatic data (e.g., ozone). And finally if you save your 'EARTH', 'EARTH' will always save you.

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Study of Cyanophyceae Diversity of Mandwa Lake Near Dharni (Melghat) Tahsil, District Amravati (M.S.), India

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Abstract

The Mandwa Lake is principal fresh water body located in Mandwa village of Dharni tahsil in Amravati district of Maharashtra state. Dharni is a tahsil place and it is 148 km north west side of Amravati and 80 km east side from Burhanpur, Madhyapradesh It is situated at about 500 m above the mean sea level. A Study of Cyanophyceae was undertaken during Jan 2021 to Dec 2021 One Year to assess the types of Cyanophyceae present in this water body. The water of this lake is primary used for washing, bathing, fishing activities, agriculture and other domestic purpose but now it is at a transitional state with respect to degradation. The Cyanophyceae is important group of fresh water blue green algae. They include some of the most common species which are important both ecologically and scientifically. During the present study 7 species of Cyanophyceae were found at all three sites A,B,and C of Mandwa Lake

Keywords: Mandwa lake, Cyanophyceae diversity.

Introduction

The cyanophyceae means blue green algae may be unicellular organism or in the form of chain or filaments is called as trichon.

Cyanophyceae one of the most significant algal group among phytoplankton and it is also founded abundance in water bodies. The freshwater blue green algae occur in the unpolluted as well as polluted water body generally it exhibits a characteristic cyclic growth.

In Present investigation Mandwa lake is 4 km south east side from Dharni Tahsil at about 500 m above mean sea level and is at 76°55'49''E longitude and 21°31'28'' N latitude. Mandwa Lake receives the water from the surrounding catchment areas during the monsoon period. The area of Mandwa Lake is spread over 500 acres. The depth of water is 38 feet during the monsoon and 15 feet during the summer season. The water of this lake is primary used for washing, bathing, fishing activities, agriculture and other domestic purpose but now it is at a transitional state with respect to degradation.

Material And Method

Sample for planktonic study were collected monthly from three sites of lake. The samples were collected in the morning hours between

8.30 a.m. to 10.30 a.m. 50 Lt. of water sample was filtrated through the plankton net made of bolting silk number 25 with mesh size 64 lime the collected samples were allowed to settle down by adding Lugol's Iodine. Normally sedimentation requires 24 hrs. after which supernatant was removed and concentrate was made up to 50 ml. depending the number of plankton and preserved in 5% formalin for further studies.

For the quantitative study the concentrated sample was shaken and immediately one drop of sample was taken on a clear micro side with the help of standard dropper the whole drop was then carefully covered with the cover glass and observed. Plankton identification up to genera and whenever possible upto species level was classified according to keys given by Prescott (1954), Edmonsonic (1959), Sehgal (1983), Adoni (1985), and APHA (1985) and standard analysis was undertaken as per Zar (2005).

Quantitative study of plankton was done by Sedgwick – Rafter Cell method

Sedgwick – Rafter Cell Method

The Sedgwick – Rafter Cell is a special kind of slide similar to the Haemocytometer. The cell has a 50 mm x 20 mm × 10 mm rectangular cavity that holds 1 ml. sample. The cell is moved in horizontal direction on the stage of an inverted microscope and plankton species encountered in the field are enumerated.

A number of replicate samples are enumerated to calculate plankton/lit.

Plankton (units/lit) = n x c/v

Where,

n = number of plankton in 1ml c = Volume of concentrate

v = Volume of sample in lit.

Result And Discussion:

In Present investigation a Total 7 species wered recorded the lake under study,

In site A, Cyanophyceae were represented by 6 species in Jan 2021 to Dec 2021 . In site B, Cyanophyceae were represented by 6 species in Jan 2021 to Dec 2021 . and site C, Cyanophyceae were represented by 7 species in Jan 2021 to Dec 2021 .

Shirsat, et.al., (2004) observed 6 species of Cyanophycaea from freshwater pond in Dharmapuri in Beed District, Maharashtra.Tiwari and Chauhan (2006) founded 21 species of Cyanophyceae from Kithan lake of Agra, Uttar Pradesh. Jayabhaye, et.al., (2007) revealed 7 species of Cyanophyceae from Parola dam of Hingoli, Maharashtra. Aijaz, et.al.,(2009) reported Cyanophyceae contributed 10 species from Wular lake. R. Prathap Singh and G.S. Regini Balasingh (2011) observed 14 species of Cyanophyta in Kodaikanal lake of Dindugal District. D.S. Malik and Umesh Bharti (2012) reported 7 species belong to Cyanophyceae in Sahastradhara stream at Uttarakhand. M.R. Abdar (2013) observed seven taxa of Cyanophyceae from Morna lake of Shirala (M.S.), Sachinkumar R. Patil, et.al., (2015) founded 1 species belongs to Cyanophyaceae in major freshwater bodies of Ajara Tahsil in Kolhapur District (M.S.). R. Prathap Singh and G.S. Regini Balasingh (2012) reported 18 species of Cyanophycaea in Kodaikanal of Dindigul District, Tamilnadu. Patil Alaka A. (2015) recored 5 species of Cyanophyceae in Sangli, Maharashtra. Priya Gopinath, T. and Ajit Kumar, K.G. (2015) observed 7 genera belong to Cyanophyceae in the fresh water lake in Thiruvananthapuram.

In Present investigation in site A, during Jan2021 to Dec 2021, 6 species are recorded among which Oscillatoria sp. (122 no./lit) is dominant followed by *Microcystis sp.* (120 no./lit), *Agmenellum quadruplicatum* (55 no./lit), *Nostoc sp.* (51 no./lit), *Anabaena sp.* (43 no./lit) and *Spirulina sp.* (34 no./lit).

In site B, during Jan2021 to Dec 2021, 6 species were recorded among which Microcystis sp. (145 no./lit) is dominant followed by *Oscillatoria sp*. (67 no./lit), *nostoc sp.* (49 no./lit), *Anacystis cyanea* (41 no,/lit), *Agmenellum quadruplicatum* (34 no./lit) and *Anabaena sp.* (34 no./lit).

In site C during Jan2021 to Dec 2021 ,7 species were recorded among which *Microcystis sp.* (198 no./lit) was dominant followed by *Oscillatoria sp*. (196 no./lit), *Nostoc sp.* (143 no./lit), *Agmenellum quadruplicatum* (75 no./lit), *Spirulina sp*. (36 no./lit), *Anabaenasp.* (34 no./lit) and *Rivularia sp.* (12 no./lit).

Among the different species of Cyanophyceae in site A, *microcystis sp*. was dominant followed *by Gleotrichia echinulata, Nostoc sp, Oscillatoria sp, Agmenellum quadruplicatum, Anabaena sp.* and *Spirulina sp.* in site B of lake *Microsystis sp. was dominant followed by Oscillatoria sp Nostoc sp. Anacystis cyanea, Anabaena sp.* and *Agmenellum quadruplicatum* in site C, of lake *Microsystis sp.* was dominant followed by *Oscillatoria sp, Nostoc sp., Angmenellum quadruplicatum, Gleotrichia echinulata and Anabaena sp.*

According to Harris and James (1974) presence of *Microcystic sp.* the toxin producing the blue green algae in abundance is a significant feature of tropical. Parmashivam and Sreenivasan (1981) recorded the polluted water bodies having heavy growth of the blue green algae. M.R. Abdar (2013) observed presence of organic pollution indicator algal species like *Microcystis aeruginosa, Oscillatoria limnetica,* at Morna lake Shirala (M.S.). Mischke and Nixdorf (2003) have observed that the presence of *Anabaena* and *Oscillatoria indicates* beginning of biological pollution.

Kamat, *et.al.*, (2006) was of the opinion that blue green algae occurred continuously in the contaminated tank while occasionally in less unpolluted tank. They reported frequent existence of species like *Microcystic, Oscillotoria* and *Anabaena* in the contaminated tanks of Shimoga District, Karnataka. Jindal and Gusain (2007) founded the presence of *Microcystis sp., Oscillotoria sp.* and the *Spirullina sp.* as a pollution indicator species of Bichorli pond, Rajasthan. Shashi Shekhar, *et.al.,*(2008) and Baruah and Bhaswati Kakati (2012) observed that *Microcystis aeruginosa* is related with highest degree of pollution and may be considered as the best single indicator of the organic pollution in any water bodys.

In the present investigation the Cyanophyceae was maximum during in winter season and minimum during in the monsoon season. Pendse, *et.al.*, (2000) observed the maximum population of in blue-green algae during winter season. Mazher Sultana and Dawood Sharif (2004) noted the maximum of blue-green percentage during winter season and minimum during in monsoon. D. S. Malik and Umesh Bharti (2012) founded that Chlorophyceae were maximum during in winter season and minimum during monsoon season in Sahastradhara stream at Uttarakhand. In the present investigation, the dominant of *Microcystis sp.* and *Oscillotoria sp.* in site A and site B and site C showed the polluted nature of the three sites shows lake is highly polluted.

Conclusion:

In the present investigation, the maximum amount of Cyanophyceae during in winter due to favourable sunlight, increase in domestic sewage, human generated pollution, an minimum quantity during the monsoon season is probably due to increase in water quantity

Table 1: Yearly variation of Phytoplankton from sites of Mandwa Lake during year Jan 2021 to Dec 2021.

Sr. No.	Parameters	A	B	C	Total
1	Cyanophyceae	35.42	30.83	57.33	**45.00**
		±	±	±	±
		37.63	**14.12**	**21.93**	**3.93**

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Ethno medicinal plants used by Munda Tribe for their primary healthcare system and their conseravation in and around Tamar Block of Ranchi District, Jharkhand

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Abstract

The tribal people depend on forests for their livelihood and most of rural people depend on traditional medicine as a primary health care source. Traditional medicines remained as the affordable and easily accessible source of treatment in the primary health care system among Tribes of ***Tamar Block****. The paper highlights' the rich plant resources and the vast wealth of ethno medicinal information available with the Tribes especially* ***Munda Tribe*** *of the* ***fifteen(12) revenue villages*** *of Tamar Block of Ranchi District. This study focus on the comprehensive ethno medicinal investigation in an attempt to safeguard the deteriorating ethno medicinal knowledge. The main objective of present work is to give information and documentation of medicinal plants used by tribal of the study area. The ethno medicinal information was gathered from interviews with living elders, Baidhyas and knowledgeable person belonging to Munda Tribe of the study area. The present work on ethno medicinal plants used in the primary healthcare systems of Tribe (Munda) in 12 villages was carried out from Tamar Block of Ranchi District. These ethno medicinal plants are very useful, hence an essential conservation should be needed.*

Keywords*: --- Ethno medicinal plants, documentation, Tamar Block, Munda Tribe, Conservation etc.*

Introduction

Medicinal plants have great contribution in the primary healthcare system of local communities as the main source of medicine for the majority of the rural population especially Munda Tribe. Out of the total 4, 21,500 flowering plants reported from the world more than 40,000 are used for medicinal purposes. About 60% of the world population &80% of developing countries rely on traditional medicine. According to Bhatt et al. more than 4.5 billion people in the developing world rely on ethno medicinal plants as components of their primary healthcare.

Tamar Block of Ranchi District is very rich in ethno medicinal plants as well as Schedule Tribe population. The Munda Tribe was totally dependent on indigenous medicine for traditional healthcare, but now this is practiced only in the remote rural areas. Where the hospital facilities were available, that region's person were not depends upon the ethno medicinal plants, because they had no more knowledge about this field. The Ethno medicinal studies in various areas of Tamar Block have been carried out. It is believed that such studies can constitute the starting point for the development of new herbal medicines and other useful substances.

The present study was aimed at investigating the traditional utilization of plants of Tamar Block. Tamar Block has eighty one (81) revenue villages. The study area is the richest biodiversity centre and a source of ethno botanical knowledge. There is no any ethno botanical studied has been carried out in this region. The main **Munda tribe** containing villages **are Murpa, Jaradih, Jojodih, Poradih, Kasam Burudih, Agra, Bandu, Sirkadih, Deori, Basukoncha, Birdih and Kubasal**. The main objective of the present study were: - (1) to identify and explore plant species that are used locally for the treatment and presentation of various diseases, (2) to document traditional recipes from medicinal plants including methods of preparation, dosages, and the mode of administration, (3) to point out the main Baidhyas of the area by which suffer person can be treated easily, and (4) to assess the plants conservation issues of the study area.

Materials and methods

Study Area

The present study was carried out in Tamar Block of Ranchi District**.** The Block is with an area of 513.91km² and forest area is 148.71Km ²(29%) and is situated between 23°3`21``N and 85°39`44`` E. The main

Munda containing villages are Murpa, Jaradih, Jojodih, Poradih, Kasam Burudih, Agra, Bandu, Sirkadih, Deori, Basukoncha, Birdih and Kubasal. Many villages are situated on forest top and near forest. All forest areas having many ethno medicinal plants. The Munda Tribe is about 43% and Oraon Tribe is about 7% according to 2011 population census. Climate of this block is subtropical in nature. The annual rainfall is ranges between 230 mm to 1390 mm and the temp. Are ranges between 6-43°c with highest in the month of May and June? The November to January is the coldest months.

The population of the block is 1, 32,702(One lakh thirty two thousand seven hundred two), in which **Munda** Tribe is about 43% and **Oraon** Tribe is about 7%. The livelihood is depends mainly on smallholder agriculture and livestock production.

There are many ethno medicinal as well ethno botanical plants which are used by specific **Munda Tribe** and **Oraon Tribe** for the ailment of different types of diseases. Some of them are ***Abrus precorius, Achyranthes aspera, Acorus calamus, Ageratum conyzoides, Aloe vera, Allium sativum, Asparagus racemosus, Azadirachta indica, Boerhaavia diffusa, Butea monosperma, Calotropis procera, Cassia tora, Curcuma longa, Eclipta alba,Emblica officinalis, Ficus bengalensis, Gloriopsa superba, Holarrhena antidysenterica, Lawsonia inermis, Madhuka longifolia,Ocimum sanctum, Phyllanthus nirurii, Phyla nodiflora, Rauvolfia serpentina,Scleichera oleosa, Shorea robusta, Sida cordifolia, Terminalia arjuna, T. bellirica, T.chebula, Tinospera cordifolia, Tridax procumbens, Vitex negundo etc.***

Data collection methods: ----

The authors have conducted an extensive field survey in the tribal belts and other **Munda** and Oraon Tribe containing villages, adjoining forest area in the Block to collect ethno botanical lore. First hand information was gathered through interactions with tribal and rural knowledgeable person and Baidhyas. The local Baidhyas were invited to tap the information of medicinal plants commonly used by questionnaire. Medicinal properties of plants were learned through in formal interviews. A number of group discussions were also conducted during the period of investigation.

Ethno botanical information was collected from 28 informants (24 male &4 female).Among the 28 informants, 20 informants were selected with the Munda Tribe and 4 informants were selected with the Oraons Tribe. Semi –structured interviews with 28 informants and group discussions (total of 5 groups discussed with average number of 7 per groups) were administered in the local language (Munda) to collect basic information on the local names and traditional description of the medicinal plants species , diseases treated or collected ,parts used conditions and method of preparation , routes of remedial administration , dosages used ,and locally marketable medicinal plants . Besides, practical observations session in preparation of remedies and some observation of traditional

Treatments given to the patient by traditional healers were conducted. To ascertain the uses of these ethno medicinal plants the earlier published scientific literature sources referred to are Sharma et al.(1985-86), Jain (1991), Kirtikar and Basu (1991), Ambasta et al. (1992), Chopra et al.(1996) . Photographic, digital cameras were used for graphic documentation. Specimens were collected and numbered on the spot, later indentified using taxonomic keys in the relevant Book, Hains flora-Bihar and Orissa (vol-I-VI), Flora of Hazaribag etc (BSI).

Results

The data on ethno medicinal plants, which was collected from inhabitants of study areas, Baidhyas and knowledgeable person in and around Tamar Block of Ranchi District were pooled and analysed. The investigation revealed the medicinal plants of 53 species and 47 genera belonging to 31 families, which are commonly used for various ailments by Munda Tribe of different villages of Tamar Block of Ranchi District.

Sl.No	Botanical name of plants	Family	Common name of plant	Therapeutic uses of ethno medicinal plants
1	*Abrus precatorius* L.	Fabaceae	Gunja	Leaves are grind with roots and mixture is given with orally to prevent pregnancy.

2	*Achyranthes aspera* L.	Amaranthaceae	Chirchiti	Leaves are grind & make paste. This paste is applied externally for paralysis. In case of painful delivery the piece of stem may be chewed. Chewing of stem, also gives relief from toothache.
3	*Acorus calamus* L.	Araceae	Vacha	Old ghee processed with Brahmi juice and shankhapuspi alleviates insanity and epilepsy.
4	**Ageratum conyzoides** L.	Asteraceae	Sahadevi	The aqueous extract of leaves exhibits anti fungal and crude plant extract antibacterial properties.
5	*Aloe vera* Mill.	Liliaceae	Ghrikuwari	In syphilis, apply its pulp on the affected area. It cures syphilis. For diabetic patient, give 5 gm pulp of Aloe vera with 500 mg guduchi extract. It cure diabetes. Leaf pulp is given with honey for 7 days to cure irregular menstruation.
6	*Allium sativum* L.	Liliaceae	Lahsun	The bulb is used as a brain tonic in epilepsy and psychic disorders. The Lahsun is also used for upper respiratory tract infections & catarrhal conditions.
7	*Amophophallus campanulatus* (Roxb.) Blume	Araceae	Zamikand,Ol	Zamikand is prescribed in bronchitis, asthma, abdominal pain, dysentery, enlargement of spleen, piles and rheumatic swellings.
8	*Andrographis paniculata* (Nees.)	Acanthaceae	Kalmegh	The powder of Kalmegh is mixed the powder of black pepper and taken to the malarial patient. It controls the malaria completely.
9	*Asparagus racemosus* (Willd.)	Liliaceae	Shatawari	Shatawari powder taken with milk is increases the flow of breast milk. In night-blindness, tender leaves of shatawari cooked in ghee and taken to the patient.
10	*Azadirachta indica* A. Juss.	Meliaceae	Neem	Grind Margosa leaves with half the amount of phitkiri and prepare the tablet of 500mg each. Give one tablet with sugar syrup. It cures all types of fever & is especially beneficial in malarial fever.
11	*Boerhaavia diffusa* L.	Nyctaginaceae	Punarnava	Fresh root powder of punarnava mixed honey should be used as eyes disorder.
12	*Bombax ceiba* L.	Bombacaceae	Semal	Tap root of young plant, barks and flowers are diuretic.
13	*Butea monosperma* (Lamk.) Taub.	Fabaceae	Dhak, Palas	Decoction of root bark is given internally for blood pressure, crushed stem bark with tilt el(sesame oil) is filtered and administered for antifertility.
14	*Calotropis procera* R. Br.	Asclepiadaceae	Akwan. Madar	The root is used for cleaning teeth and for relieving toothache. Latex mixed with cow milk & given orally in rabies. Fresh leaves slightly roasted &pounded are bandaged to painful rheumatic joints, headache and swelling.
15	*Cardiospermum helicacabum* L.	Sapindaceae	Hathisundi	An extract of the leaves is used as an antiseptic to dress wounds.
16	*Cassia tora* L.	Caesalpiniaceae	Chakor	Paste of roots is applied on scabies & ringworm. Decoction of leaves is given to the children having fever while teething.

17	*Calocasia esculenta (*L.) Scott.	Araceae	Kachu	Crushed petiole is applied on fresh cuts and wounds to stop bleeding.
18	*Curcuma longa* L.	Zingiberaceae	Turmeric (Haldi)	Mix 5gm turmeric in butter milk and give to the patient twice a day. Within 5 days, it cures jaundice. Mix 5gm turmeric and 20 gm powder of Neem leaves with butter and apply on the affected are. It makes the skin soft and glowing. It also cures scabies disorder.
19	*Curcuma amada* Roxb.	Zingiberaceae	Amahaldi	A paste is prepared from the rhizome of the plant and dissolved in it water and drink to cure diarrhoea.
20	*Cyperus rotundus L.*	Cyperaceae	Nagarmotha	The rhizome is mainly used in rheumatism, inflammations, dysuria and obesity.
21	*Dalbergia sissoo L.*	Fabaceae	Shisham	In gonorrhoea, give 15 ml juice of its leaves thrice a day, it control gonorrhoea. Prepare squash of 5gm powder and give this to the patient. It cures blood impurities and blood disorder.
22	*Eclipta alba* (L.) Hassk.	Asteraceae	Bhringraj	Take each of Bhringraj, triphala, anantmool and seed of mango. Prepare their paste. Take 10 gm mandoor paste and 500 ml oil. Mix them all and add one litre water and cook the mixture till only oil is left. Strain the oil and apply on the hair. It cures all types of hair disorders.
23	*Emblica officinalis* Gaertn.	Euphorbiaceae	Amla	Take 30 gm of dried amla, 10 gm baheda, 50 gm mango seed and 10 gm iron vashma. Soak all the elements in a vessel overnight. Apply this on hair every day. Prematurely grey hair turns black with this treatment.
24	*Euphorbia hirta* (L.)	Euphorbiaceae	Doodhi	Paste of root is mixed with honey & given nursing mother to increase milk. Latex used in warts and skin diseases like leucoderma spots.
25	*E. neriifolia* (L.)	Euphorbiaceae	Sehund	The latex is used to cure skin diseases and body pain. Luke warm latex and common salt is taken with water for curing whooping coughs and leprosy.
26	*Ficus bengalensis* L.	Moraceae	Banyan Tree	Take 6 pieces of fresh leaves or its aerial roots and grind them with 15 gm of masoor dal. Apply the paste on the face. It cures all types of skin problems. Prepare decoction of its soft leaves and give to the patient with sugar, mixed in it. It controls vomiting.
27	*F.religiosa L.*	Moraceae	Peepal	Give 3 gm powder of its fruits, with milk, thrice a day. It promotes potency and physical strength. Give its ripe fruits to eat. It cures kapha, pitta &blood disorders. It also cures burning sensation and vomiting. In constipation, patient would eaten 7 fruits regularly. After one month constipation cured completely.
28	*Gloriopsa superba* L.	Liliaceae	Vachhnag	Powder of dry leaves is mixed with buffalo's milk (butter milk) & given internally in jaundice. 3 gm paste of tuber of Vachhnag with 1 gm paste of

				peppers is prescribed once a day for twenty one days as a cure for rheumatism.
29	*Guizotia abyssynica* L.	Asteraceae	Surgunja	Equal quantity of roots of surgunja and sarson is crushed & powdered. One pill is made by 10 gm of powder. One pill is taken in empty stomach for five days after menstruation. It is permanent birth control.
30	*Holarrhena antidysenterica* (Roth.) DC.	Apocynaceae	Kutaja, kurchi	In diarrhoea, boil 40 gm of its seeds in water. Give this water with honey, mixed in it to the patient, thrice a day. Grind its 15 gm of the fresh bark in butter milk & give this to the dysentery patient. It immediately controls dysentery.
31	*Lantana camera* L.	Verbenaceae	Putus	15ml, decoction of plant is taken for the treatment of tetanus & there is strict prohibition of taking of sour food during treatment. In malarial fever, the decoction of leaves is taken twice a day for a week after food.
32	*Lawsonia inermis* L.	Lythraceae	Mehendi	Paste of leaves mixed with butter milk &applied externally on face itching during monsoon & wounds for fast healing. Decoction of the leaves is also used as a gargle for sore throat.
33	*Madhuka longifolia* (Koenig)	Sapotaceae	Mahua	Nectary honey collects from flowers &is taken continuously 7 days for cures of piles.
34	*Mangifera indica* L.	Anacardiaceae	Mango, Aam	The juice from the bark is used for diarrhoea and dysentery. Take 2.5 gm of powder made from shade-dried soft leaves of mango, every day. It is very helpful in controlling diabetes.
35	*Mimosa pudica* L.	Mimosaceae	Lajwanti	In piles, give 5 gm powder of its leaves with milk, thrice a day. Give 30 mg juice of its leaves, it cures indigestion. For diabetic patient, they take 100 ml decoction of its roots, regularly up to 15 days & after 15 days; they take 10-15 ml of decoction regularly.
36	*Moringa pterygosperma* Lam.	Moringaceae	Sahjan	Mix 2 gm ginger root in 10 gm juice of its root and give this to the patient every morning and evening, it enhances the digestion power. In intestinal worms- cook its pod and give this to the patient. It kills the intestinal worms.
37	*Ocimum grattissimum* L.	Lamiaceae	Ban tulsi	The leaf juice is used to treat infantile cough, cold, catarrh, dysentery and skin diseases.
38	*O. sanctum* L.	Lamiaceae	Tulsi, Holy basil	Grind tulsi leaves in lemon juice and apply the paste on the affected area of skin. It helps cure eczema, gout, derma toes etc. Take powder of its root or seeds and add equal amount of jiggery in it. Give 2 gm of this mixture with cow's milk regularly. It cures the sexual disorders in one month to six weeks.
39	*Phyllanthus nirurii* L.	Euphorbiaceae	Bhui amla	In jaundice, grind 10 gm of its root and give it with 250 ml milk every morning and evening on empty stomach. In diabetes, give 15 gm whole plant powder with 20 black peppers three times a day. It cures even chronic diabetes.

40	*Phylla nodiflora* (L.) Greene	Verbenaceae	Jalpipal	3 ml decoction of root with un boiled egg (2 mg) is given to women to promote sexual desire.
41	*Psidium guajava* L.	Myrtaceae	Amrud	In vomiting, give 1o gm decoction of guava leaves. It indigestion ,take 10 gm juice of its soft leaves & mix sugar in it .Give this to the patient daily ,once in the morning .It gives relief within 7 days .
42	*Rauvolfia serpentina* L.	Apocynaceae	Sarpagandha	The extracts of roots are valued for to treat intestinal disorders. The leaves extract is also used to control hypertension.
43	*Schleichera oleosa* (Lour.) Oken	Sapindaceae	Kusum	The oil is applied externally in skin eruption. The seed oil is also used for massage in rheumatism & applied in alopecia, inch & acne.
44	*Shorea robusta* L.	Dipterocarpaceae	Sal tree	Fruit paste is prescribed in diarrhoea. In sal resin an essential oil is found, which is antiseptic. This is used for skin diseases.
45	*Sida cordifolia* L.	Malvaceae	Nilatutti, Balaa	Decoction of roots is used for the treatment of rheumatism & neurological disorder (facial paralysis, Sciatica etc). The leaves are demulcent, febrifuge & used in dysentery.
46	*Terminalia arjuna* (Roxb).Wight & Arn .	Combretaceae	Arjuna	In heartbeat, when normal rate of heartbeat increases from 72 to 150 take one glass juice of tomato & add 1 teaspoonful of powder of Arjuna bark in it . Give this to the patient regularly. It normalizes the heartbeat for complete benefit, prepare the decoction in milk. It cures disorder like injured heartbeat, angina pain, and anxiety.
47	*T.bellirica* (Gaertn.) Roxb.	Combretaceae	Beheda	Mix equal amount of beheda and sugar. Take this mixture every day. It improves eye power. Take 4 gm powder of fruit after meals. It enhances digestion power & cures loss of appetite. It also strengthens the stomach.
48	*T. chebula* (Gaertn) Retz.	Combretaceae	Harad, Hartaki	Give 5 gm harad powder with equal amount of sugar candy mixed in it, every morning and evening after meals. It improves the digestion power
49	*Tinospora cordifolia* (Willd.) Hook. F. &Thorns.	Menispermaceae	Giloy, Guduchi	Mix 50 ml bitter oil in 15 gm Tinospora juice and give this to the patient every morning on empty stomach. It cures elephantiasis. In arthritis—give 5 gm of its powder with milk three times a day. It cures arthritis and acidity in urine.
50	*Tridax procumbens* L.	Asteraceae	Jayanti, Akala kohadi	The leaf juice exhibits antiseptic, insecticidal, and parasiticidal properties. It is used to check haemorrhage from wounds, cuts, and bruises, also for restoring hair growth.
51	*Nitex negundo* L.	Verbenaceae	Nirgundi	Oil cooked with the juice of root & leaves of Nirgundi is useful as in take an ointment & filling in sinus, kustha, vatavyadhi, eczema & scrofula.
52	*Withauia somnifera*	solanaceae	Aswagandha	On whom takes powder of Aswagandha roots in late winter mixed with honey & ghee along with milk re gain youthfulness even if old. In bronchial asthma, the ash of Aswagandha should be taken with honey and ghee.

53	*Ziziphus jujuba* L.	Rhamnaceae	Ber	Leaves are astringent and diaphoretic. Stem bark is also astringent and used in diarrhoea. The paste of leaves and twigs are applied to abscesses, boils and carbuncles.

Conclusions:-

In conclusion, Tamar Block has plenty of ethno medicinal plants and the people (especially Munda Tribe) of the region are highly dependent on these plants for their primary healthcare system and other ethno botanical purposes. The people of the region have tremendous traditional knowledge regarding the utilization and preparation of various ethno medicinal remedies. They are using some medicinal plants for multipurpose and posing great pressures on certain medicinal plants like ***Aloe vera, Azadirachta indica*** and ***Dalbergia sissoo***. Hence natives should be educated regarding the sustainable usage of medicinal plants. The persistence of traditional knowledge is more among old people; however as a matter of concern, young people are taking less interest in such knowledge due to multiple reasons. Hence studies on ethno medicinal plants and also documentation may be extended to other areas for protection of traditional knowledge. The Baidhyas or knowledgeable person are giving different types of ethno medicines for curing of different diseases, hence clinical trials are therefore recommended in order to evaluate the authenticity of ethno medicines to scientific standards. Now all these mentioned medicinal plants as well as others plants are very useful for all of us, hence, there should be essential to conserve these all plants.

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Awareness of Globlal Warming And E-Waste Among Urban And Rural School Students.

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Abstract

Global warming means average increase in the earth's temperature and is considered as a major health issue of the 21st century and E-waste is the issu of electronic garbage its also harm of living animals and E-waste is the issu of electronic garbage its also harm of living animals Objectives:1] To find out the awareness and knowledge about global warming among the school students 2]. To find out the awareness and knowledge about E-waste among the school students. Materials and Methods: Self administered questionnaire was used to collect information from 1050 randomly selected school students of three different medium. Statistical analyses were performed with the perceantage of each quetions Ethical clearance, informed consent and assent were obtained. Results: a) 22.9% of the student have high level of about the knowledge of the global warming and e-waste b) 25.9% of the student have high level of awareness about the causes of the global warming and e-waste c) 27.6% of the student have high level of awareness about effect of the global warming and e-waste d) 28% of the student have high level of awareness of global problem. e) 25.1% of the student have high level of awareness of global warming and e-waste in total. Conclusion:. Periodic health education regarding global warming and e-waste is still needed to increase awareness and knowledge among the school students.

Keywords: *Environment,Global warming, E-waste,Awareness, Green House gases, electronic materials, Knowledge, School students.*

Introduction

Global warming means average increase in the earth's temperature and is considered as a major health issue of the 21st century and E-waste is the issu of electronic garbage its also harm of living animals Modern society has been growing concern about global global warming issues. The developing countries are experiencing complex, serious and fast-growing pollution problems of their own. Global warming pollution is more than just a health issue; it is a wider social issue Pollution has the potential to destroy homes and communities. Pollution problems are also closely tied to the mode of development in developing countries Despite this, many developing countries either have not developed global warming pollution control measures or have not provided adequate implementation structures to ensure that policies are effective its also one of the major problems of e-waste that has become an immediate and long term concern as its unregulated accumulation and recycling can lead to major global warming problems such as in air, water, soil and also including physical, chemistry, biology, geology, meteorology, oceanography sociology and human health

In this study, the awareness of electronic waste and global warming are discussed among school students.

Need for the research: -

All living and non-living things. Lives in the atmosphere and chooses air, land and water Uses resources to meet needs. The pressure that comes on the earth.This exceeds the conductivity of the global warming, which can lead to serious global warming degradation The water level in the water is getting higher than the water level, you may think so Can lose. From the very beginning, of the global warming has been called 'Awakening' It needs to be created And potential dangers to all species of living beings.

Understand the underlying causes and consequences

1. To study and find out the problems of population,health etc.The way to solve the problem.
2. Considering the need for sustainable use of natural resources.
3. To develop appreciation of caste and habitat management techniques
4. Understanding the feelings of human beings.

Objectives

1] To find out the level of awareness of e-waste among school students.

2) To find out the level of awareness of global warming among school students

3] Suggetion for the proper implementation of government rule for global warmingal issues

Hypothesis

1. Awareness of global warming among school students.
2. Awareness of E-waste pollution among school students.

Methodology

Since the present research is related to the present time , the survey method will be used.

population and sample of the study

The population for the present study consist of all school students. of Aurangabad District.1050 students from 100 schools, Aurangabad District were selected through Random sampling Technique for the study.The overall response Rate was 82%

Tools Used for the Study

For the presented research, the Author has chosen the survey method as the problem is related to the present time. Questionaries and document will be used among the various tools for the data collection for the survey method. to collect information, school students from aurangabd district were considered. The quetionaries will be filled by the students to get the information. Also the information about the school students. who have aware about the pollution and percentages will be useed to anylyze the information obtained and conclusions will be drawn based on it.

Data Analysis

Percentage,Mean,Standard Deviationand t-test. This statstical dimention will be used to analysis the information in present research

Findings

1.

a) 22.9% of the student have high level of about the knowledge of the global warming and e-waste
b) 25.9% of the student have high level of awareness about the causes of the global warming and e-waste
c) 27.6% of the student have high level of awareness about effect of the global warming and e-waste
d) 28% of the student have high level of awareness of global problem.
e) 25.1% of the student have high level of awareness of global warming and e-waste in total. (From Table no 1)

2.

a) 26.7% of the urban college student have high level of knowledge about global warming and e-waste and 20.1% of the rural student have high level of knowledge about global warming and e-waste
b) 24.7% of the urban student have high level of awareness about the causes of the global warming and e-waste and 26.8% of the rural student have high level of awareness about the causes of the global warming and e-waste
c) 29.8 % of the urban student have high level of awareness about effect of the global warming and e-waste and 26.0% of the rural student have high level of awareness about effect of the global warming and e-waste
d) 31.5% of the urban student have high level of awareness of global problem and 25.4% of the rural student have high level awareness of global problem
e) 27.6 % of the urban student have high level of awareness of global warming and e-waste in total and 23.3% of the rural student have high level of awareness of global warming and e-waste in total.(From Table 2)

3. There is no significant difference between urban student and rural student in their awareness towards global warming and e-waste in total and its dimensions- about the knowledge of the global warming and e-waste, awareness about the causes of the global warming and e-waste, awareness about effect of the global warming and

e-waste and awareness of global problem content, whereas there is significant difference between urban and rural student in the dimension- of awareness of global warming and e-waste in total..(From Table 3)

Table 1. Level of awareness of school students towards global warming and E-waste and its dimensions

Dimensions	Low		Moderate		High	
	N	%	N	%	N	%
Knowledge	257	23.8	576	53.3	247	22.9
Cause	279	25.8	521	48.2	280	25.9
Effect	289	26.8	493	45.9	298	27.9
Global Problem	322	29.8	456	42.2	302	28.0
Awareness of global warming and E-Waste of students in total	278	25.7	531	49.2	271	25.1

Table no 2 Level of awareness of school students towards global warming and E-waste and its dimensions in terms of locality of the school

Dimensions	Locality	Low		Moderate		High	
		N	%	N	%	N	%
Knowledge	Urban	110	24.0	225	49.2	122	26.1
	Rural	147	23.6	351	56.3	125	20.1
Cause	Urban	120	26.3	224	49.0	113	24.7
	Rural	159	25.5	297	47.7	167	26.8
Effect	Urban	116	25.4	205	44.6	136	29.5
	Rural	173	27.8	288	46.2	162	26.0
Global problem	Urban	126	27.6	187	40.9	144	31.5
	Rural	196	31.5	269	43.2	158	25.4
Awareness of global warming and E-Waste of students in total	Urban	121	26.2	210	46.0	126	27.6
	Rural	157	25.2	321	51.5	145	23.3

Table 3 Significant difference between urban and rural school student in their awareness towards global warming and E-waste

Dimensions	Nature of the school	Mean	SD	Calcuiated 't' Value	Remark at 5% Level
Knowledge	Urban	26.13	5.131	1.402	NS
	Rural	25.71	4.806		

Cause	Urban	23.97	5.037	0.343	NS
	Rural	26.08	5.178		
Effect	Urban	20.74	4.676	1.467	NS
	Rural	20.31	4.804		
Global problem	Urban	11.13	2.72	2.056	S
	Rural	10.77	2.803		
Awareness of global warming and E-waste of students in total	Urban	84.02	13.462	1.901	NS
	Rural	82.44	13.559		

Discussion:

The Author selected the study of global warming awareness and electronic waste among school students. in the district of Aurangabad. The problem was thoroughly studied and objectives were set. Collected information through Aadhaar content collection tools related to the problem presented. The information obtained with the help of this statistical technique was analyzed and interpreted Statistical tables were used to study the global warming awareness of in the context of and electronic waste among the school students in the district of Aurangabad and drew conclusions based on that.

Awareness of the students. through the questionnaire regarding the research problem and hence the breadth of the research problem was noticed and thus the need and usefulness of the presented problem was realized in the district of Aurangabad. The problem was thoroughly studied and objectives were set. Collected information through Aadhaar content collection tools related to the problem presented. The information obtained with the help of this statistical technique was analyzed and interpreted Statistical tables were used to study the global warming awareness in the context of and electronic waste among the school students in the district of Aurangabad and drew conclusions based on that.

Awareness of the students through the questionnaire regarding the research problem and hence the breadth of the research problem was noticed and thus the need and usefulness of the presented problem was realized.

Recommendations

1] School administrators should arrange short term training programs for teachers, students and society for global warming awareness and electronic waste awareness.
2] At the primary and secondary level, the issue of global warming should be kept as a separate unit. Therefore, this subject should be included in the syllabus offered by the State of Maharashtra.
3] There is a need to create e-waste awareness program to educate the society on how to manage e-waste
4] Scientists, NGOs, government representatives and corporate bodies. The e-waste disposal system proposed by them can help projects that are successfully implemented

Conclusion

In the present case the Author has summarized the research. And the important part of this case is that the findings obtained by analyzing and interpreting the information from above given. According to that conclusion, the hypothesis has been examined and based on the findings, some difficulties have been noticed and some recommendations have been suggested accordingly. Also the questionnaire and list used for research in the reference section

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Diversity of Macrophytes present in the Vicinity of Kapsi Lake, Kapsi Dist. Akola. M.S. India.

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Abstract:-

The present study has been undertaken in Kapsi lake, Kapsi situated in Akola district, Maharashtra State, India. The main objective of this study is to evaluate the quantitative characters of the aquatic macrophytes viz., frequency, density, abundance, and importance value index (IVI). During the whole study period, a total of 50 macrophytic plants species belonging to 27 families were found distributed in the lake. Aquatic plant species recorded were grouped into different egoriesed viz., submerged (5 species),free floating (8 species) and submerge (33 species) respectively.Hygrophylla auriculata,Ipomoea aquatica ForskIpomea carnea Jacq.Marsilea minuta L, Nymphoides aquatica, Nymphea pubescens,Azolla sp. Typha aquistata,Phyla nodiflora were the dominant species found to occur in all the study sites during the entire study period.and Amarathus species, Gangea maderaspatana, Xanthium, Sphearanthus species, Cassia species, Delonix ragia, Ipomoea species, Cyperus species, Ceratophyllum species, Phylla nodiflora, Commellina benghalensis, Euphorbia species, Phyllanthus amarus, Acalypha indica, Albizia lebeck, Ludwigia species and Polygonum species. The analysis of variance (ANOVA) for all the aquatic macrophytes reported from the lake indicates that there is no significant variation within the four study sites in terms of distribution. However, F-test result indicates significant variation in the quantitative characters between the different macrophytic plant species of the lake.

Keywords:- *Diversity, vicinity, macrophytes, quantitative, Kapsi Lake , India.*

Introduction

Macrophytes usually includes any plants which are observable by the naked eye and always identifiable when observed (Homes & Whitton, 1977). Macrophytes are an important component of the aquatic and terrestrial ecosystem and major changes in the abundance of individual species and community composition usually provide valuable information on the reason on how and why an ecosystem might be changing. Macrophytes are also valued as an important means for indirectly monitoring the water quality for instance, eutrophication can bring about change in the species composition and a loss of species diversity. At the same time, macrophytes also affect the physical, chemical and biological characters of the lake, and are affected by a group of factors such as lake Morphometry, water chemistry and biological characters of the lake (Lacoul & Freeman, 2006).

The Maharashtra state has been included under deciduous diversity of the world along with Kapsi Lake, Dist. Akola, India. The assessments of the Physico-chemical characteristics of the freshwater environment are essential to understand the distribution and productivity of aquatic macrophytes in the freshwater ecosystems. Some of the earlier studies on Phytosociology, Biomass and Primary Productivity, Physico-chemical characteristics of water are not adequate enough to compile a composite ecological database of the freshwater ecosystems of the country. Some of the relevant earlier works which have been carried out by a number of researchers at national and global levels are Devi, (1993), Melzer, (1999), Hanlon, et al., (2000), Devi, (2007), Devi, (2008), Usha & Sharma (2008), Cheruvelil & Soranno, (2008), Nurminen & Horppila, (2009), Mormul, et al., (2010), Usha, et.al., (2010a, 2010b), Singh, et. al., (2010a, 2010b, 2010c), Singh, et. al., (2011), Singh & Sharma, (2012), Singh, K.K. et. al., (2012), Soranno, et. al., (2011), Usha, et. al., (2012), Kanninen, et al., (2012), Singh & Sharma, (2013) etc.

This study would serve as an important prerequisite for assessment of the distribution of the aquatic macrophytes of the lake. The present study has been carried out with the main objectives to evaluate the quantitative characters like frequency, density, abundance, abundance by frequency (A/F) ratios and importance value index (IVI) of the aquatic macrophytes found in the lake at regular intervals during the study periods.

Methods

For the present investigation, the lake was divided into three study sites representing as Site I, II, and III. The aquatic macrophytic plant samples were collected at regular monthly intervals during the period July

2012 to June 2014 from the different study sites. The sampling technique used for diversity of the aquatic macrophytes was the standard method as described by Curtis (1959) and Misra (1968). The quantitative analysis comprises frequency, density, abundance, abundance to frequency ratio, relative frequency, relative density, relative abundance and importance value index (IVI).Assessing of the different quantitative characters were done by using a square quadrat of 25 cm × 25 cm in dimension and in each study site not less than 20 quadrat were sampled randomly.

2.1. Description of the Study Site

Kapsi Lake is one of the oldest lake in Akola district, situated about 20 kms from the district place and existing since the British regime. The lake is one of major drinking water source in the area. The people in the vicinity are also using the lake water for agriculture purposes, household acts, fishing, and other necessary things like washing of animals, clothing etc. Therefore, it is essential to know the water quality parameters to avoid the major hazardous conditions and health hazards. Keeping all this in view, the present investigation was planned to analyze various physiochemical parameters of Kapsi lake with special reference to the algal diversity of the lake.

2.2. Calculation of Quantitative Characters

$$\text{Frequency (\%)} = \frac{\text{No. of quadrats in which the species occurs}}{\text{Total number of quadrats studied}} \times 100$$

$$\text{Density/quadrat} = \frac{\text{Total number of individuals of a species in all the quadrats}}{\text{Total number of quadrats studied}}$$

$$\text{Abundance/quadrat} = \frac{\text{Total number of individuals of a species in all the quadrats}}{\text{Total number of quadrats in which the species occurs}}$$

$$\text{Abundance of a species A/F Ratio} = \frac{\text{Abundance of a species}}{\text{Frequency of the same species}}$$

Importance Value Index (IVI)/300 = Relative Frequency (%) + Relative Density (%) + Relative Abundance (%).

Figure 1.Map of Kapsi Lake, India

FIgure 2.-Google Map of Kapsi Lake

Results:-

A total of 50 aquatic macrophytes belonging to 27 families were found distributed in the lake. Out of total 50 species recorded, Poaceae family has shown the presence of maximum number of species i.e. 12 species contributing to 23.92% which was then followed by families like Cyperaceae, Nymphaceae and Polygonaceae with 3 species each contributing to 4.95%. Other families like Alismataceae, Amaranthaceae, Convolvulaceae, Hydrocharitaceae, Lemnaceae and Salvinaceae had 2 species each contributing to 3.70%. The remaining families viz., Apiaceae, Araceae, Asteraceae, Azollaceae, Characeae, Commelinaceae, Lemnaceae, Marsileaceae, Mimosaceae, Nelumbonaceae, Onagraceae, comprised 1 species each constituting 1.85% . The aquatic macrophytes found in the lake were categorized into four main sub-categories viz., (a) submerged (b) rooted with floating leaves (c) free-floating groups. Under submerged group 5 species (10.67%) were reported. C Hydrilla verticillata, Utricularia exoleta, Utricularia flexuosa were restricted to shallow areas where light is abundantly available upto the bottom and such plants usually have long stems with disLemnaceae sected leaves. Altogether 6 species belonging to rooted with floating leaves were reported viz., Nymphoides cristatum, Nymphaea stellata, Trapa bispinosa etc. In the free-floating category 8 species were recorded viz., Azolla pinnata, Ceratopteris thalictroides, Eicchornia crassipes, Neptunia prostrata, Pistia stratiotes, Salvinia cucullata etc. The maximum numbers of 33 species were recorded under the emergent group viz., Echinochloa stagnina, Enhydra fluctuans, Ludwigia adscendens, Hygroryza aristata, Ipomoea aquatica. Zizania latifolia, Phragmites karka, Pseudoraphis minuta etc. The percentage compositions of the different macrophytic species were found maximum in submerged species (77.42%). the, which was then followed, by the free-floating species (13.47%) and . The lowest percentage (9.21%) was contributed by rooted and floating leaved species

Table 1. ANOVA of Aquatic Macrophytes in the different study sites of Lake Kapsi, Maharashtra, India.

Parameter	Study Site	N	Mean± S.E	95% Confidence Interval Lower Bound	Upper Bound	Minimum	Maximum	F	P-Value
Frequency	1.	50	13 ± 2	9	17	0	51	0.222	0.877
	2.	50	12 ± 2	8	16	0	49		
	3.	50	14 ± 2	10	18	0	51		
	Total	150	13 ± 1	11	15	0	51		
Density	1.	50	15.26 ± 3.15	8.94	21.58	0	111	0.087	0.967
	2.	50	16.00 ± 3.28	9.42	22.59	0	89		
	3.	50	17.00 ± 3.41	10.17	23.84	0	122		
	Total	150	15.76 ± 1.63	12.55	18.96	0	122		
Abundance	1.	50	49.53 ± 8.74	1.99	67.06	0	324	0.233	873
	2.	50	50.05 ± 9.25	31.50	68.60	0	251		
	3.	50	55.13 ± 8.89	37.29	72.97	0	324		
	Total	150	49.81 ± 4.46	41.02	58.60	0	325		
AF/ratio	1.	50	0.09 ± 0.011	0.07	0.11	0	0.26	0.504	0.68
	2.	50	0.08 ± 0.012	0.05	0.10	0	0.27		
	3.	50	0.10 ± 0.012	0.07	0.12	0	0.34		
	Total	150	0.09 ± 0.006	0.07	0.10	0	0.39		
IVI	1.	50	4.60 ± 0.78	3.08	6.12	0	25	0.022	0.995
	2.	50	4.87 ± 0.86	3.15	6.59	0	22		
	3.	50	4.80 ± 0.72	3.35	6.25	0	246.47		
	Total	150	4.74 ± 0.40	3.94	5.53	0	29		

Note: S.E. = standard error; C.I. = Confidence Interval; Units-(Frequency - %; Density and Abundance- Plants m/sq.)

Discussion

The quantitative characters which comprises the estimation of frequency, density, abundance, abundance by frequency (A/F) ratio and importance value index (IVI) of the different macrophytic species in the different study sites of the lake, recorded higher values during rainy season which influenced the growth of the macrophytes and favouring good climatic conditions. The rainy season seems to be most favourable season for the germination of buried seeds of the perennial emergents like Cyperus species and other mud-growing species like Eclipta, Enhydra, Ipomoea, Caesula species etc (Rai & Munshi, 1982). Similarly, high values during the rainy season were recorded from a number of lakes and wetlands viz., Hokarsar wetland, India (Kumar & Pandit, 2005), Manasbal Lake, India (Rather & Pandit, 2006), Awangsoipat Lake, India (Devi, 2007), Oksoipat Lake India (Devi, 2008), Poiroupat Lake, India (Usha, et. al., 2010b) etc. It was observed that the maximum numbers of aquatic macrophytic plant species were recorded at the onset of the summer season and the rainy season due to the favourable warm temperature while the lowest numbers of species were recorded during the winter season. Hogeweg & Brenkert (1969) and Verma et al., (1982) earlier recorded luxuriant growth of the aquatic macrophytes, in the tropics during the rainy season. It is evident from the survey of the aquatic macrophytes distributions in the different lakes and wetlands in record that the Lake Kapsi is comparatively intermixed mats representing heterogeneous composition and distribution. Such heterogeneous compositions of species were also recorded earlier by Swindale & Curtis (1957) and Schmid (1965) in the submerged vegetations of U.S.A. and Seshavatharam & Venu (1982) in the Kolleru Lake, India.

The statistical analysis reveals that there is no significant variation with respect to frequency, density, abundance, A/F ratio and IVI of the different aquatic macrophytes recorded from the lake in the four study sites of the lake. The analysis of variance within the different species of the aquatic macrophytes indicated significant variation with respect to the quantitative characters. Comparable findings were reported from Manasbal Lake, Kashmir Himalaya, India (Rather & Pandit, 2006), Itaipu reservoir, Brazil (Mormul, et al., 2010) and Poiroupat Lake, India (Usha, et.al., 2012).

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A Study Of Global Biodiversity Change With Respect To Biodiversity Loss

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Abstract:

Global biodiversity change the very known and one of the most burning environmental issues of the present time. Inspite of the the various components we are discussing the two important components of biodiversity change—one is biodiversity alterations and the other is biodiversity loss.Here we briefly assess the impacts that modern humans and their ancestors had on biodiversity and discuss the recent declines and the changes in biodiversity. We evaluate the direct pressures on biodiversity change, change in habitat, overexploitation, the exotic species, pollution, and climate change. We discuss the root causes, such as demographic growth and resources used, and review existing scenario projections. We identify successes and impending opportunities in biodiversity policy and management, and highlight gaps in biodiversity monitoring and models. Finally, we have discussed how the ecosystem conceptual framework can be used to identify undesirable biodiversity change and to distribute conservation efforts.

Keywords : extinctions, species, abundance, range, land-use, climate

Introduction:

Biodiversity is commonly defined as the variety of life on Earth in all its forms that includes the diversity of species, their genetic variations, and the interaction of these lifeforms. it is also the sum of all "plants, animals, fungi, and microorganisms on Earth, their variation, (**2**). Biodiversity is multidimensional, and no single measure of biodiversity can capture all its dimensions (**3**). It is responsible for ecosystem services, including nutrient cycling, climate regulation, food production, and the regulation of the water cycle, and it is therefore intimately linked with human well-being(2,3,4). This foundation is now becoming endangered as the human footprint on the planet increases and biodiversity declines. Species are becoming extinct at rates higher than in the fossil record of the past few million years, including the peak extinction rate owing to the mega fauna disappearance at the end of the Pleistocene (**6**). Several other dimensions of biodiversity are also declining, such as the extent of tropical forests and the mean abundance of wild bird species (**7**, **8**). The human appropriation of Earth's natural resources is not only leading to biodiversity loss but also to large alterations of biodiversity distribution, composition, and abundance. In short we can say Biodiversity underpins human life. Halting biodiversity loss and restoring degraded ecosystems is therefore an essential element of sustainable development pathways. Failure to scale up action to address biodiversity loss will come at a significant cost to economies, businesses and more generally to human well-being.

Although biodiversity loss is as great a challenge as climate change, it has received substantially less attention on the political agenda. The focus of the 2019 G7 meeting on biodiversity is a positive step forward. Here, we review our current understanding of global biodiversity change and its underlying drivers. We start by scoping our definition of global biodiversity change, which includes both biodiversity loss and biodiversity alterations. Next, we briefly review human-induced global biodiversity change.

1) **HABITAT DESTRUCTION :** Ever more people need ever more space. Damaging human activity continues to encroach on natural environments, thereby destroying the habitats of countless species. As our numbers rise, cities, infrastructure and cropland (see 'Agricultural Intensification' below) are growing and merging into each other, fragmenting the remaining habitat and leaving isolated "islands" of natural populations of plants and animals too small to survive. According to IPBES, only one quarter of land areas and one third of oceans remain relatively undamaged by human activity.

2) **OVEREXPLOITATION :** Ever more people need ever more things. Humankind's relentless consumption of resources such as timber, oil and minerals is continuing to destroy natural habitats around the globe. We are also putting enormous pressure on populations of wild species, both by bushmeat hunting in the developing world and by large-scale industrial fishing in our seas. Wildlife poaching and trafficking still present a huge threat to many species, including rhinos, tigers and pangolins(13).
3) **CLIMATE CHANGE :** Ever more people produce ever more climate emission . Our planet is on the verge of a climate crisis due to our endless production of greenhouse gases including carbon dioxide and methane. We are headed for a 3-4 °C warmer world by the end of the century if nations' current climate ambitions are delivered on. We are already seeing species decline due to global temperature increase(10). Every half a degree of warming has a huge knock-on effect on ecosystems, with mobile species running out of areas to migrate to and temperature-sensitive organisms like corals undergoing massive die-offs. When keystone species like reef-building corals disappear, the rich and complex ecosystems they support collapse as well.
4) **POLLUTION :** Ever more people produce ever more waste and pollution. As populations increase, the disposal of waste from households, agriculture and industry, becomes an increasingly serious issue. Our oceans are becoming choked with plastic waste which is killing millions of animals, from sea turtles to whales. (**10**)The Ellen MacArthur Foundation estimates that by 2050, there will be more plastic than fish in the sea. As well as affecting the lives of humans, noise, light and chemical pollution all damage the health of wild species.
5) **AGRICULTURAL INTENSIFICATION :** Ever more people need ever more food. Agriculture deserves a special mention here as it is a primary driver of habitat destruction, climate change and pollution. Agriculture takes up 50% of all habitable land on Earth, 80% of extinction threats to mammal and bird species are due to agriculture, and our modern food systems are also the biggest contributor to climate change, responsible for around a third of all greenhouse gas emissions, with more than half of these coming from animal agriculture. In order to meet the unsustainable consumption patterns of the Global North and feed our huge population, humanity has developed agricultural systems which rely on monocultures, artificial fertilisers and pesticides. Monocultures are increasingly susceptible to disease so require widespread pesticide use which destroys insect populations. Intensive farming leads to soil depletion and runoff from farms pollutes water bodies and causes harmful algal blooms and the collapse of fish stocks.
6) **INVASIVE SPECIES :** Ever more people means ever more travel. Human travel across the world has a very large emissions footprint but it has also allowed the spread of invasive species, both accidental and intentional. As a consequence of the introduction of non-native species to some areas, such as rabbits and cats in Australia, goats on St. Helena, and American mink in Great Britain, we have put many vulnerable ecosystems at risk, threatening native species and diminishing biodiversity.
7) **GENETIC DIVERSITY IN DOMESTICATED AND WILD SPECIES :** Of the four biodiversity dimensions analyzed here, we have the least information at the global level for changes in genetic diversity. Studies of loss of genetic diversity can be classified into two categories: studies of genetic diversity of domesticated species and studies of genetic diversity of wild species. Studies of domesticated species can further be divided into plant genetic resources (12) and animal genetic resources (14).

Over the past few decades, the worldwide adoption of modern crop varieties adapted to high-input systems has led to the reduction in the area farmed with local crop varieties (14). This change in agricultural practices has raised concerns: For instance in China, the number of rice breeds in production is reported to have declined since the 1950s from 46,000 to 1,000, and most of the 10,000 traditional corn breeds are no longer in production (9). Still, there are many farm communities that, although exposed to modern varieties, choose to maintain, at least in portions of the farm, traditional varieties (8). The picture of allelic diversity change is also complex. Although

some studies report declines in allelic diversity of modern varieties over the past few decades (9), a meta-analysis of 44 studies has found no significant overall

Solutions to biodiversity loss

Dealing with biodiversity loss is tied directly to the conservation challenges posed by the underlying drivers. Conservation biologists note that these problems could be solved using a mix of public policy and economic solutions assisted by continued monitoring and education. Governments, nongovernmental organizations, and the scientific community must work together to create incentives to conserve natural habitats and protect the species within them from unnecessary harvesting, while disincentivizing behaviour that contributes to habitat loss and degradation. Sustainable development (economic planning that seeks to foster growth while preserving environmental quality) must be considered when creating new farmland and human living spaces. Laws that prevent poaching and the indiscriminate trade in wildlife must be improved and enforced. Shipping materials at ports must be inspected for stowaway organisms.

Developing and implementing solutions for each of these causes of biodiversity loss will relieve the pressure on species and ecosystems in their own way, but conservation biologists agree that the most effective way to prevent continued biodiversity loss is to protect the remaining species from overhunting and overfishing and to keep their habitats and the ecosystems they rely on intact and secure from species invasions and land use conversion. Efforts that monitor the status of individual species, such as the Red List of Threatened Species from the International Union for Conservation of Nature and Natural Resources (IUCN) and the United States Endangered Species list remain critical tools that help decision makers prioritize conservation efforts. In addition, a number of areas rich in unique species that could serve as priorities for habitat protection have been identified. Such "hot spots" are regions of high endemism, meaning that the species found there are not found anywhere else on Earth. Ecological hot spots tend to occur in tropical environments where species richness and biodiversity are much higher than in ecosystems closer to the poles.

Concerted actions by the world's governments are critical in protecting biodiversity. Numerous national governments have conserved portions of their territories under the Convention on Biological Diversity (CBD). A list of 20 biodiversity goals, called the Aichi Biodiversity Targets, was unveiled at the CBD meeting held in Nagoya, Japan, in October 2010. The purpose of the list was to make issues of biodiversity mainstream in both economic markets and society at large and to increase biodiversity protection by 2020.

Loss of Biodiversity Solution

The solutions to Loss of Biodiversity are:

Protection of Species: Hunting of animals and poaching of birds should be restricted. But, unfortunately, to fulfil our greed, we kill animals and ignore the consequences of our actions.

Protection of Habitat: Due to the increase in human population, we need more space to survive and agriculture, which leads to the destruction of natural habitats of many animals and plants. Therefore, we should take measures to control the population to protect the habitat of animals and plants to keep them safe from extinction.

Prevention of Deforestation: Many animals, plants, and tiny organisms stay in tropical rainforests. However, these species are endangered due to deforestation, which will have a negative chain impact. So, we should make sure that we can save our forests and preserve them and keep the species safe.

Controlled Usage of Natural Resources: We should keep control of the usage of natural resources by using alternative options of cooking, fuel, and mineral usage.

Prevention of Species Invasion: We should stop the invasion of species because they will lead to the displacement of local species from their habitat, and this will cause the extinction of many species.

Pollution Control: We should control pollution levels as it affects the biodiversity in adverse and high pollution may lead many species to extinction.

Government Regulatory: Government should make laws that can protect or conserve the natural variety of plants and animals from getting extinct.

Education: People should be educated about the importance of the ecosystem and the preservation of biodiversity. They should also know the consequences of declining biodiversity so people can seriously take part in the growth of healthy biodiversity.

Conservation of Species: Species of the various living organisms should be preserved by In-situconservation by protecting them in natural habitats for growth and Ex-situ conservation by protecting the species outside their natural habitat.

Summary

Biodiversity loss is a significant worry in the present time. It creates a negative impact on the environment. It results in loss of habitat, extinction of species, and increase in natural calamities droughts etc. The present work gives a glance of the causes of biodiversity loss and its consequences. That's why it is necessary to preserve our ecosystem, for this we should find more effective solution to protect all the species and other important biological elements of the ecosystem.

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A brief Study of Forest and Wildlife Conservation

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Abstract :

This Review highlights the major issues about deforestation, wild life extinction and conservation. Forest conservation is the practice of planting and maintaining forest areas for the benefits and Sustainability of further generations. Along with that wildlife conservation is also mandatory. It is necessary to know current scenario about wildlife protection and conservation at national and international level. Habitat conservation is the key solution to conserve biodiversity. Lots of efforts has been done in many areas. Similarly by discouraging the pet trades, over shooting as well as hunting by applying different banes, marine pollution by different lows and regulation. And public awareness are the main concerns.

Introduction :

Forest and wildlife resources are indispensable four the provisions as ecosystem goods and services; as well as spiritual and cultural values in rural area. Now a days, conservation of biodiversity is the great challenge. There is a great need of different planning strategies for protection, conservation and minimizing the loss of natural resources, wildlife and forest cover. Forest may vary significantly in size and have different classifications according to how and of what the forest is composed. Tree forests cover approximately 9.4 % of the Earth's surface (30% of total land area). Forests are central to all human life because they provide a diverse range of resources and multiple benefits too. As we conserve the forest i.e. habitat of wildlife, wildlife conservation also done side by side. Cooney et. al. (2018) state that wild animals are essential part of biodiversity and source of food and recreation. However, forest and wildlife resources are disappearing at an alarming rate, across the globe. The degradation of forests has gradually led to loss in biodiversity, acsthetic view at landscapes and ecological functions including the provisions at goods and services of human needs.

History of forest and wildlife conservation :

The scheme of biodiversity and encompassing unique and representative ecosystems are identified and designated as Biosphere Reserves to facilate conservation in India's immense biological diversity which is estimated to be over 47,000 plant species and 81,000 animal species, respectively about 7 % of world's flora and 6.5% of world's fauna respectively. Nearly 15,000 flowering plants are endemic to country and in case of fauna, the extent of endemism is estimated at about 62 %.

The scheme of biodiversity conservation was initiated during 1991-92 to ensure co-ordination among various agencies with dealing with issues relating to conservation of biodiversity, and to review, monitor and evolve adequate policy instruments for the same. Pursant to ratiflaction of the conservation on Biological Diversity by India on 18th February 1994, several steps have been initiated to meet the commitments under the conservation and to realize the opportunities offered by convention. These efforts aim at bringing the legislative administrative and policy regimes in tune with the tree – fold objectives of conservation.

Methods of conservation :

Ways to conserve forests :

Forests serve as a natural resource and habitat for wide variety of living organisms on the Earth. Millions of animal species take shelter in forests. Conservation of forests is one of major steps to be taken to bring book sustainability in ecosystem. Use of following way can help to conserve forests and promote sustainability.

a) Controlling and regulating deforestation :

Industrialization and urbanization have cause a huge loss to forests and wildlife. One of the ways to conserve forests by controlling and regulating the cutting of forests. Shelter wood cutting, selective cutting, and clear – cutting methods may be employed to regulate the felling at trees.

b) Afforestation :

The most effective and promising way of conserving forests is afforestation. With afforestation, we can not only increase the overall forest cover but also recover the land due to deforestation.

c) Control Forest Fires :

One of the most significant causes of the loss of forests is forest fires. Although forest fires aid in replenishing essential nutrients form deal organic matter. In the soil, they cause a huge loss. The two types of forest are natural and artificial. Artificial forest fires are when complete forest land is set on fire. To convert the land for agricultural purposes. Artificial forest fires should be avoided completely. And, innovative forest fires fighting techniques should be discovered and implemented to stop natural forest fires.

d) Proper care :

Forest trees are also supplied with pesticides to protect them from harmful pests and diseases. This is when most trees get impacted negatively. The use of chemical substances poses a huge threat to the whole forest. Therefore proper care should be taken while safeguarding the plants from harmful pests and diseases.

Various Act of Protection and Conservation of Forest :

The important forest legislation in India are :

1) The Indian Forest Act, 1927
2) The Wildlife Protection Act, 1972
3) The Forest Conservation Act, 1980
4) The Scheduled Tribes and other Traditional Forest Dwellers Act, 2016

Ways to conserve wildlife :

Plants and animals are interdependent to each other. Plants supports animal's existence and vice-versa. some of them are fundamental to maintaining ecological balance. Here is some of the ways to conserve wild life.

a) Prevent deforestation :

Deforestation is one of the leading cause of the loss of wildlife. Wildlife can be protected and conserved with the help of afforestation.

b) Develop Protective areas :

Developing protective areas for animals to live is another promising way to conserve. Wildlife some of the example of protective areas include wildlife sanctuaries, national parks, zoos and so on.

c) Protecting critically endangered species :

Safeguarding the vulnerable and critically endangered animals from becoming extinct is another way of promoting wildlife. There critically endangered or vulnerable species many be brought to safer places such as zoos where they can breed and reproduce.

D) Ban on wildlife hunting :

Introducing strict rules on banning wildlife hunting is critical to stop further loss of wildlife.

Importance of Conservation :

Forest and animal are the most important aspects of our lives. We value them for many reasons, some utilitarian, some intrinsic. This means we value biodiversity both for what it provide to humans and for the value it has in its own right. Utilitarian values include the many basic needs human obtain from forest and also from animals. More than 33% of our drug needs are obtained from wild plants. The forest gives incredible breadth to leap forwards in the field of clinical science and innovation alongside the necessities for the huge scope if assembling anti-infection agents and different medications for medicinal use. A forest keeps up with temperatures universally, accordingly batting against the impact at greenhouse gases. Forests also aid in forestalling the ocean levels to rise strongly. Plat and animals are interdependent on each other.

Plant support animal's existence and vice-versa. Both of them are fundamental to maintaining ecological balance. The Forest is a natural habitat for. Many animal species. Thousands of animal species reside in these immense forests. Micro-organisms in wildlife fix the nitrogen levels, thereby promoting soil fertility. Forest as well as wild animals have importance in human life.

Various Act of Protection and Conservation of Wild Animals :

The important wild life legislation in India are :

1) Wild life Protection Act, 1972
2) Wild Life (Stock Declaration) Central Rules, 1973
3) Wild life (Transactions and Taxidermy) Rules, 1973
4) Wild Life (Protection) Licensing (Additional Matters for Consideration) Rules,1983
5) Wild Zoo Policy, 1998
6) Declaration of Wild Life Stock Rules, 2003
7) National Board for Wild life Rules, 2003
8) National Tiger Conservation Authority (Salaries, Allowances and Other Conditions of Appointment) Rules, 2006
9) Recognition of Zoo Rules, 2009

Conclusion :

In this way, this paper conclude that, individuals as well as governments can do their part in presenting the forests of the world. Knowledge about the importance of forest and wild animals needs to be spread so that people become aware of the danger to everyone and everything on the earth by deforestation and extinction of animals. People's participation in conservation of forests is of vital importance. So that people must get involved in this national task. Methods, strategies and measures mentioned here for the conservation of forests and wild life are very simple so that every individual could follow them and act at their own level in order to achieves the goal of conservation of forest as well as wild creatures. If people starts now and act now, it might get too late for the cause of conservation of forests and wildlife.

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Conservation and Use of Wild Medicinal Plants Problems, Progress, and Prospects

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Abstract:

In India, the research works on wild plants and agriculture is meager as compared to developed countries. There are numerous methods being used to study the agriculture of wild pants and their uses in herbal medicine and cosmetics industry. Therefore, the focus of this article is to explain the methods and their potential utility to the researcher, with a special emphasis on how Indian scientific communities can utilize the simple and feasible methods of collection of wild medicinal plants and explain their uses for the society. Ocimum americanum belongs to the family Lameaceae and have an aromatic and medicinal importance. In application of advanced method like GC-MS computational techniques plays an important role in the development of drug of interest concerning the study of O. americanum contents. Four compounds were identified in aerial parts of leaves of Ocimum americanum. These four compounds identified in ethanolic extract are 3,3-dimethyl-2-(phenylsenyl)-,2,2,2-trifluoro-1-(9-anthracenyl)ethyl ester (Butanoic acid), Diacetato[1,2-bis(diclohexylphosphino)ethane, Osmium dibromi(E) [tetrakis(trimethylphosphine)],10,10'-diselenodi-(Decanoic acid)). It was observed that in the different sites of Nagpur region, the constituents of Ocimum americanum differed in quantity, which may be due to the local geographical differences. Aromatic oil found in 3gm of dry weight of powder of leaves of Ocimum americanum is 5%.

Keywords *- Ocimum americanum (L.), GC-MS, Compounds, Agriculture.*

Introduction

Medicinal plants are valuable sources of new drugs [1–4]. Up to 80 % of people in developing countries are totally dependent on herbal drugs for their primary health care, and over 25 % of prescribed medicines in developed countries are derived from wild plant species [4].According to world health organization (WHO) variety of drugs are obtained from medicinal plants.In developed countries almost 80% of individuals depends on compounds derived from medicinal plant.In this regard properties,saftey & efficiency of them should be investingated.[5]. The study of indigenous food production and local medicinal knowledge may have practical implication for developing sastainble agriculture and discovery of new medicines.Medicinal and herble plants also encourage an awarness of the link between biodiversity and culture diversity as well as a sophisticated understainding of the mutual influence of plants mutual influence of plants and human. The conservation and sustainable use of medicinal plants have been studied extensively [6, 7]. Various sets of recommendations have been compiled regarding their conservation, including the establishment of systems for species inventorying and status monitoring, The Global strategy for Plant consevation is a catalyst for working together at all levels-local national,regional and global-to understrand,conserve and use sustainbly the worlds's immense wealth of plant diversity whilst promoting awareness and building the necessary capcities for its implention.Gas chromatogrphy and Mass spectrum is one of the best method for to identify the plants chemical components. *Ocimum americanum* contain essential oil which is volatile organic strong smell substance and have great importance in pharmaceuticals as well as cosmatics industries.

Fig- *Ocimum americanum*

Methodology

Collection of plant material

Ocimum americanum leaves were collected from Panjabrao Deshmukh Krushi Vidyapeeth (PDKV) forest of Nagpur district. The plant was identified by the Plant systemic laboratory Department of Botany,R.T.M.University Nagpur Maharastra.GC-MS Analysis - The test plant extracts were subjected to GC-MS analysis at laboratory's (IIT Bombay) Sophisticated Analytical Instrument Facility (formerly RSIC), Indian Institute of Technology, Powai, Mumbai.

Result And Discussion

The present investigation was carried out on plant *Ocimum americanum* of Lamiaceae family to study the presence of medicinally active phytochemicals in the leaves.The leaves of *Ocimum americanum* (L.) Poit collected from campus and PDKV forest which experienced different climatic and geographic circumstances, were determined by GC-MS. It has been already reported by various workers. As seen in the table- 1, different compounds were determined from the leaves of *Ocimum americanum*. The present investigations concluded that the leaf *Ocimum americanum* contains chemical compounds. These chemicals are widely used in Ayurvedic traditional and herbal medicines as well as cosmetics industry.Decanoic acid is used in the manufacture of esters for artificial fruit flavours and perfumes. Problematically some wild plant resource is becoming scarce and threatened by over harvesting It needs substantial investment before and during production Uncontrolled harvesting leads to the extinction of ecotype and species. In progressively, the natural way access resource without investment it relieves harvesting pressure on rare and threatened species. It is natural resource and free from pesticides It can keep genotypes being standardized or improved

Ocimum americanum in chemical compounds and herbal ingredients,and it has been said that 70-80% of the world's population relies on some from of non-conventional medicine[4] and around 25-40% of all prescription drugs contain active ingredients derived from plants in theUnited States[5].

Medicinal Importance of *Ocimum americanum*

- In traditional medicine, *O.americanum* holy basil is used for several ailments.
- Decoctions are used for coughs; pounded leaves are placed on the forehead to relieve catarrh or on the chest for respiratory problems.
- The whole plant is used in baths to treat rheumatism, renal colic and calcifications.
- More recently, the plant has been listed as a potential medicine against cancer.
- Aromatic oil is found in 5% in 3gm of dry weight of powder of leaves of *Ocimum americanum.*
- An essential oil can be extracted from plants leaves of *O. americanum* are used in soap and cosmetics. It has been reported to exhibit fungi toxic properties (without phototoxic side-effects).The oil contains camphor, and methyl-cinnamate.
- *O. americanum* has been planted on a large scale in the Common wealth of Independent States, Kenya and Pakistan for the production of camphor, which has medicinal and industrial applications (celluloid, fireworks).
- *O. americanum* used to treat inflammatory and allergic conditions.
- The leaves pest is used in tretment of skin deaseses,it is also appplied on wound and burns that are not healing well.

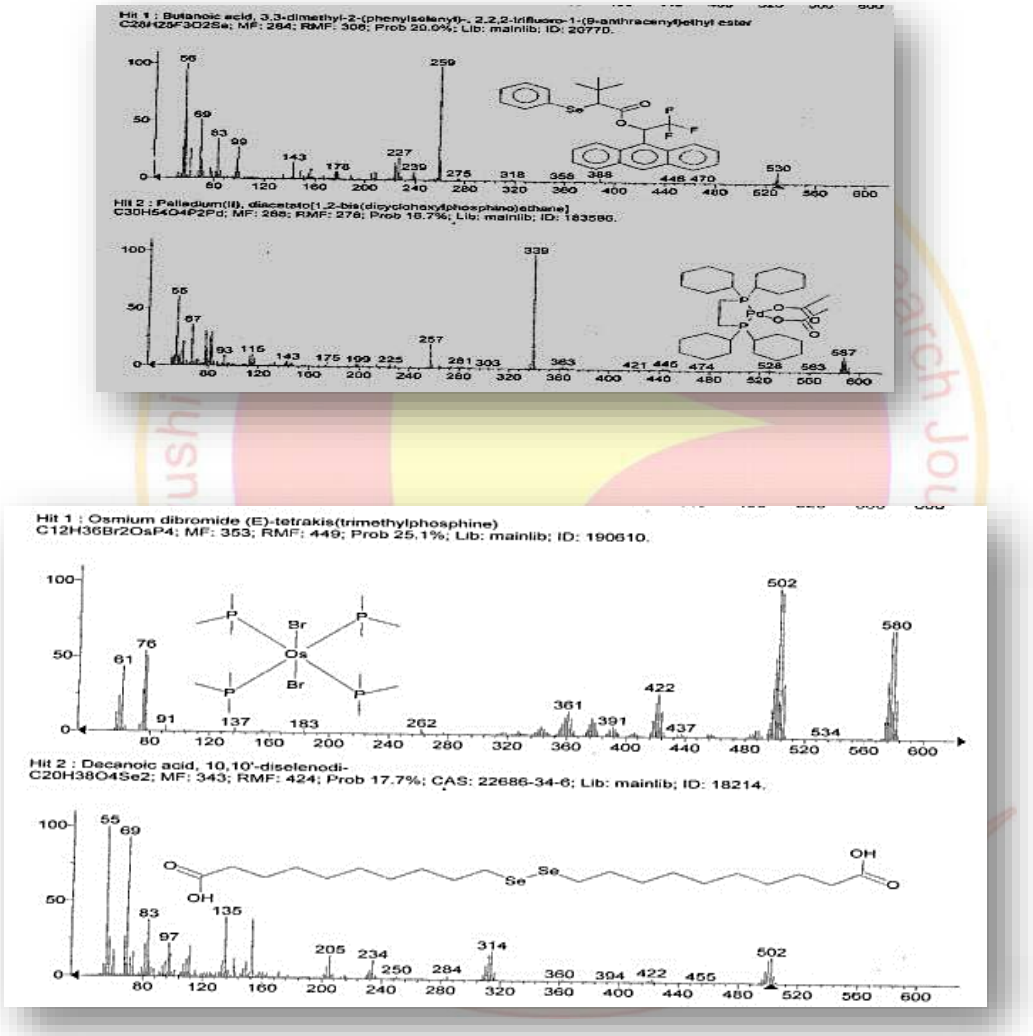
Table 1- Uses of Plants species, life forms and Percentage of plant parts used

Life form	Leave	Flower/bud	Fruit/seed	Bark	Root	Whole plant
Herb	High	High	High	Low	Medium	High

Table No.:2 The Chemical Composition of *Ocimum americanum*

S. N.	Name of compound	Molecular formula	Biological activity	Peak Area
1	3,3-dimethyl-2-(phenylsenyl)-,2,2,2-trifluoro-1-(9-anthracenyl) ethyl ester. (Butanoic acid)	$C_{28}H_{25}F_3O_2$	Antioxidant activity	141200
2	Diacetato[1,2-bis(diclohexylphosphino)ethane]	$C_{30}H_{54}O_4P_2$	----	141200
3	Osmium dibromi(E) (tetrakis(trimethylphosphine	$C_{12}H_{36}Br_2O_4$	Anticancer Compounds	66375
4	10,10'-diselenodi-(Decanoic acid)	$C_{20}H_{38}O_4$	Antioxidant activity	66375

Graphical Representation of *Ocimum americanum*



Conclusion:

The study concluded that *Ocimum americanum* and its habitat less but its own reproductive strategies. In spite of the existence of various sets of recommendations for the conservation and sustainable use of medicinal plants, only a small portion of these have achieved adequate.

Protection of medicinal plant resources through conventional conservation in natural reserves.

Most of the medicinal claims are centered on flowerand inflorescence of the plant. The whole plant and l eaves,are also administered in a few specific clinical conditions.Theanalysis of all the claims clearly indi

cates the,potential of the plant to be an excellent analgesic, antipyretic and anti inflammator drug whi ch needs to,be,validated.The present GC-MS screening are an essential tools for confirmation of the results and it may serve as pavements for the researcher to select a group of plants having similar chemical constituents and their detailed investigation regarding their chemistry and functions is required, so that they can be used in allopathic or in Ayurvedic medicine as well as cosmatics industry.

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Qualitative phytochemical study of Certain Ficus Species from Manora Tehsil.

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Abstract

Family Moraceae (fig family) one of the angiospermic plants family can be found throughout the world bearing about 38 genera and over 1100 species with cosmopolitan distribution. Ficus is a genus of more than 850 species in the Moraceae family. Generally, there are five species of Ficus in Maharashtra's Washim District: Ficus hispida L., Ficus benghalensis L. Ficus glomerata L., Ficus religiosa L.., Ficus benjamina L. are more commonly found having a diversified habitat. The presence of active phytochemicals in various parts of the plants gives these Ficus species their traditional therapeutic use. The present work is focused on the comparative preliminary phytochemical analysis of above selected five Ficus species from Manora tehsil of Washim District, (M.S.) India. It is observed that Ficus species have rich but diverse phytochemicals in their different parts.

Keywords: Moraceae, Ficus, Phytochemicals, traditional medicine, Manora.

1. Introduction

For thousands of years, plant have provided to human beings many basic and important materials required for their day-to-day life. Plants are also considered as biochemical factories, as involved in the production of various chemical components for the utilization of mankind.

Natural products have found use in antiquity as folk remedies, soaps and essences. They include drugs and other medicinal products, dyestuffs, feedstocks for chemical industries (gums, resins, rubber) and a variety of substances used to flavor food and drink. In recent years, however, it has become increasingly evident that many natural products do have significant ecological functions, such as protection against microbial or insect attack. (Hopkins, 1995).

Different traditional literatures are literal witness that *Ficus* are having many ethnomedicinal values. (Babu K, 2010).

In this present work, it was attempted to give a comparative phytochemical from five selected Ficus species i.e. Ficus hispida L., *Ficus benghalensis L. Ficus glomerata* L., Ficus religiosa L.., *Ficus benjamina* L. and their some traditional ethnomedicinal uses.

2. Materials And Method

2.1 Collection of plant materials:

Plants and plant materials selected for the study were collected from different localities of Manora tehsil, Washim district specially from villages, Abhaykheda, Kolar,Kondoli, Dapura, Vitholi, Manora region. Firstly, the plants were spotted in different localities, identified them using different floras like Cook 1907, Dhore 2005, Naik 1989, Yadav and Sardesai 2002. A specimen copies of selected plant is submitted to the herbarium of Department of Botany, M.S.P. Arts, Sci. & K.P.T. Comm. College Manora, Dist. Washim (MS).

Photographs of five Selected *Ficus* Species:

Ficus hispida L. ***Ficus benghalensis L*** ***Ficus glomerata*** **L. Ficus religiosa L.** ***Ficus benjamina*** **L.**

The leaves and stems of the plants were picked and washed with tap water and then distilled water. Then the material is shade dried for 10-15 days and grinded well to obtain homogenous fine grade powder. a 4-gm powdered sample soaked for 1 hour in each of 40 ml Methanol, Petroleum ether, and distilled water, Preliminary phytochemistry was conducted after the solvents were filtered.

2.2 Preliminary phytochemistry: Preliminary phytochemistry was done as method given by Harborne (1973), and Krishnaiah et al, (2009). **..**

Preliminary phytochemistry was done for 11 group of secondary metabolites i.e. Alkaloids, Cardiac Glycosides, Phenolic compounds, Flavonoids, Terpenoids, Saponin, Steroids, Reducing Sugar & Tannins.

3. Result And Discussion:

Table No. 1 - Comparative preliminary phytochemical analysis of five *Ficus* Species (Leaves extract).

Sr. No.	Phytochemicals	Ficus hispida L.	*Ficus benghalensis L.*	*Ficus glomerata L.*	Ficus religiosa L.	*Ficus benjamina* L.
1.	Alkaloids	+	+	+	+	+
2.	Cardiac Glycosides	+	-	-	+	+
3.	Phenol	+	+	+	+	-
4.	Flavonoids	-	+	-	+	+
5.	Terpenoids	+	+	+	+	+
6.	Saponin	+	+	+	+	+
7.	Steroids	+	+	+	+	+
8.	Reducing sugar	+	+	+	-	+
11.	Tannins	+	+	+	+	-

Table No. 2 – Comparative preliminary phytochemical analysis of five *Ficus* Species (Stem extract).

Sr. No.	Phytochemicals	Ficus hispida L.	*Ficus benghalensis L.*	*Ficus glomerata L.*	Ficus religiosa L.	*Ficus benjamina* L.
1.	Alkaloids	+	+	+	+	+
2.	Cardiac Glycosides	+	+	-	+	-
3.	Phenol	+	+	+	+	+
4.	Flavonoids	-	+	-	+	+
5.	Terpenoids	-	+	+	+	+
6.	Saponin	+	+	+	+	+
7.	Steroids	-	+	+	+	+

8.	Reducing sugar	+	+	+	+	-
11.	Tannins	-	+	+	+	-

4. Conclusion:

Methanol, petrolium ether, and distilled water were utilised as solvents for preliminary phytochemistry. Methanolic leaf extracts of Ficus hispida L, *Ficus benghalensis L.*, *Ficus glomerata* L, and Ficus benjamina L contain alkaloids and reducing sugar.

Ficus benghalensis L., Ficus hispida L., and *Ficus benjamina* L. all contain steroids, but *Ficus benghalensis L.*, Ficus hispida L., and *Ficus benjamina* L. do not.

Glycosides were found in the petroleum ether leaf extracts of Ficus hispida L., Ficus religiosa L., and Ficus benjamina L. *Ficus benghalensis L.*, *Ficus glomerata* L., Ficus religiosa L., and Ficus benjamina L. all contain terpenoids, as do *Ficus glomerata* L., Ficus religiosa L., and Ficus benjamina L.

The aqueous leaves extract of Ficus hispida *L*, *Ficus benghalensis L.*, *Ficus glomerata* L. and Ficus religiosa L. shows the presence of Phenol and Saponins, Steroids, while it shows the presence of Flavonoids and Tannin are found *Ficus benghalensis L.*

Alkaloids and phenols can be found in Methanolic stem extracts from all of the plants studied, while Flavonoids can be found in *Ficus benghalensis L.* and Ficus religiosa L.

Glycosides can be found in the petroleum ether stem extracts of Ficus religiosa *L.* and *Ficus benghalensis L.* Reducing sugar is detected in the aqueous stem extracts of *Ficus hispida* L, *Ficus benghalensis L.*, *Ficus glomerata* L, and *Ficus religiosa* L., whereas Phenolics, Terpenoids, Saponin, and Steroids are present in *Ficus glomerata* L and Ficus religiosa L.The phytochemical study of the above plants shows that the plants of the selected *Ficus* species have the common secondary metabolites viz. Alkaloids, Glycosides, Terpenoids, Steroids, Saponins, reducing sugar, Tannins, and a variety of other phytochemicals are found in abundance in almost all members of the family. These phytochemicals are studied for the various medicinal properties and has been probed used again various diseases such as diabetes, fever, tuberculosis, renal tubular disease, malaria, intestinal diseases, etc. These plants' natural phenolic compounds performed an essential part in cancer prevention. (Singla and Pathak, 1993; Munshi et al., 1993; Omale and Emmanual, 1997; Ravichandran et al., 2012).

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Diversity of Selaginella in Melghat forest , Amravati district, Vidharbha region of Maharashtra.

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Abstract

Melghat lies on the Southern shoot of the Satpuda range of hills. This part of Satpuda is known as Melghat; consists of hills and vallies . The most prominent geological feature of Melghat is the Gavilgad range of hills which is abundantly rich in biological diversity.

Forest of Melghat is Dry deciduous type of Forest.The entire area of Melghat is covered by the forest of the Dry deciduous Teak Forest. Tectona grandis is the most important and dominant species distributed in the entire area. The Melghat forest composed of Gugamal national Park with 361.28 sq.km. area, Melghat sanctuary with 788.75 sq.km area and Multiple use area with 526.90 sq.km. area.

In Melghat forest Pteridophytes flourishes naturally very well. Selaginella species well flourishes in Melghat. Key Words – Melghat, Pteridophytes, Selaginella.

Key words- Pteridophytes, Selaginella, Melghat forest.

Introduction

Pteridophytes formed a dominant part of Earth's vegetation in the historic past.Although they been largely replaced by the spermatophytes in the modern day flora.The present day lycopods like Lycopodium, Selaginella and Equisetum are the mere relicts of the mighty lycopsid and sphenopsid group.

Forest of Melghat is Dry deciduous type of Forest.The entire area of Melghat is covered by the forest of the Dry deciduous Teak Forest. Tectona grandis is the most important and dominant species distributed in the entire area. The Melghat forest composed of Gugamal national Park with 361.28 sq.km. area, Melghat sanctuary with 788.75 sq.km area and Multiple use area with 526.90 sq.km. area.

Materials and Methods

Pteridophytes division of vascular plants which do not produce seeds. It include Ferns, Club mosses and Horse tail. In Melghat under shady and damp places, along waterfalls, road sides of Ghats, in association with Angiosperms and Gymnosperms.

The plant specimen of Selaginella was collected in every stage of their growth and habitats and reproduction from different localities of Melghat Forest area. The plants were collected in tin vasculum. The plants are pressed flat, before their wilting. They are pressed after the day's visit.

The Selaginella was pressed between the sheets of news or blotting paper. These sheets were alternated between sheets of news or blotting paper. The plant became dry by transferring their moisture into the blotting papers.

After drying of plant material, the plant specimen were mounted on herbarium sheets of standard size . The specimens are labeled as per all data. The Selaginella specimen were preserved in 4% formaline solution.

Observation –

Selaginella blatteria

Selaginella blatteria found along the road sides in moist condition. It is distributed from August to October. The sporophyte observed from September to October.

The sporophyte herbaceous, dorsiventral prostrate, 6-16 cm long . Stem herbaceous, dichotomously branched, solid, prostrate, green, smooth and glabrous. The hairs unicellular. Leaves microphyllous, heterophyllous. Each leaf traversed by single unbranched mid-rib. The leaf with ligule, ligule arises from the base of each leaf.

Ligule delicate green with entire margine and acute apex, tongue shaped. A mature ligule has a prominent basal portion called the glossopodium. The ligule is a secretary structure which secretes water and mucilage. The leaves from four side of the stem. The larger leaves on the ventral side of the stem in opposite decussate manner.

Rhizophore leaf less, positively geotropic organ bears roots at the swollen end. A single rhizophore comes out downward from the rhizome. A rhizophore is an organ intermediate in structure and function between the stem and root, it is root like in appearance and behavior but has no root cap.

Rhizophores grow down to the soil and true roots emerge from them. Roots adventitious originate from the tips of rhizophores, dichotomously branched. The roots have root cap and bear root hairs.

Strobilus- The spore bearing organ is known as Strobilus. Sporangia bearing organ is sporophyte. The sporangia develop in the axil of leaves called as Sporophylls. The sporophylls are similar to photosynthetic vegetative leaves. There are two types of sporangia. The microsporangia, the sporophyll bearing microsporangia called microsporophyll. The megasporangia, the sporophyll bearing megasporangia called mega-sporophyll. The strobilus always terminal in position. The sporophylls ligulate which are present between the sporangium and the base of sporophylls. The strobilus also called the sporangiferous or the cone.

Selaginella repanda

Sporophyte observed from August to October . The strobilus from September to October.The sporophyte is terrestrial erect, dichotomously branched, 1.4 to 2.0 cm long . Leaves dorsiventral heterophyllous and alternate, leaves are of two kinds in four vertical rows, dorsal two rows are small, ventral two rows are large , ligulate. Ligule arise from the base of leaf, delicate green with entire margin and acute apex. The stem dorsi-ventral , dichotomously branched, solid. The rhizophore white coloured, 0.5 -1.0 cm long.

A rhizophore is an organ intermediate in structure and function between the stem and root; it is root like in appearance and behavior but has no root cap. Roots are adventitious, produced from the ends of the rhizophores.

The spore bearing organ is known as strobilus.Sporophylls are spirally arranged at the tips of the lateral branches forming strobilus. The sporophyll develop in the axil of leaves called as sporophylls. There are two types of Sporangia, The microsporangia, The sporophyll bearing microsporangia called microsporophyll. The megasporangia , the sporophyll bearing megasporangia called megasporophyll. The strobilus always terminal in position. The sporophylls are ligulate which present between the sporangium and the base of sporophylls. The strobilus also called the sporangiferous spike or the cone.

Result and Discussion

The pteridophytes are considered as a first vascular plants that colonized the terrestrial habitat. In the course of evolution they reached upto arborescent habit that has resulted into a gigantic and thick forest in Siluro-Devonian period. Pteridophytes have well developed conducting system. The plants are with feather like fronds.

The living members are represented by living taxa widely distributed over the surface of the global part . In Melghat Forest area Selaginella with two different species distributed in different climatic conditions. *Selaginella blatteri* and *Selaginella rependa*. Selaginella distributed on rock at moist condition with creeping stem, spirally arranged leaves, sporangia arranged in terminal strobilus.

Selaninella shows ecological succession in forest ecosystem.

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Diversity of Insect pest on Banana plant in Pandhari region,Anjangaon surji

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Introduction

Banana is a globally important fruit crop with 97.5 million tons of production. In India, it supports livelihood of millions of people. Banana occupies 20% area among the total area under crop in India and contributes 37% of the total fruit production and ranks second in importance next to mango with a total annual production of 16.91 million tons from 490.70 thousand hectares with national average of 33.5 T/ha. Bananas were originally found in South East Asia, mainly in India.

Banana, the fruit of a plant of the genus -Musa (family- Musaceae) is basically cultivated for food, and secondary for the production of fibers, and also for producing tissue-thin tea bags. Besides this, bananas are also cultivated for some ornamental purposes in various regions of the world. They are also known as Bananier Nain, Canbur, Curro and Plantain. These creamy, rich, and sweet fruits are favourite among the people of all ages right from infants to elders. Bananas consist mainly of sugars (glucose, fructose and sucrose) and fiber. They provide instant energy as they are the rich sources of Vitamin B6.

Origin of Banana

Musa species grow in a wide range of environments and plantains of the tropics to cold-hardy fiber and ornamental plants. These large, perennial herbs, 2-9 m in height, is evolved in Southeast Asia, New Guinea, and the Indian subcontinent, developing in modern time secondary loci of genetic diversity in Africa, Latin America, and the Pacific.

Musa species attained a position of central importance within pacific societies, the plant is a source of food, beverages, fermentable sugars, medicines, flavorings, cooked foods, silage, fragrance, rope, cordage, garlands, shelter, clothing, smoking material and numerous ceremonial and religious use.

Botanical Description

Banana plants are fast-growing herbaceous perennials that grow at 6 to 7.6 meters (20-25 feet) tall, from a corm. The banana has an underground stem with adventitious roots. Below is the brief botanical description of the banana plant.

Plant

They are herbaceous plant with an apparent trunk that bends without breaking. The "trunk" or pseudostem is not a true stem, but only the clustered, cylindrical aggregation of leaf stalk bases. This is the largest of all herbaceous plants having its leaves arranged spirally which can grow 2.7 metres (9 feet) long and 60 cm (2 feet) wide. There are 5-15 leaves on each plant, with 10 considered the minimum for properly maturing a bunch of fruit and approximately 44 leaves will appear before the inflorescence

Flowers

The inflorescence shooting out from the heart in the tip of the stem appears above the last leaves in an upright position, and consists only of a large, purple, tapered bud. As the bud opens, the narrow, nectar- rich, tubular, toothed, white flowers are revealed. They are then clustered in whorled double rows along the stalk, each cluster covered by a thick, purple, bract. The flower stalk begins to droop down under its own weight after opening; the flowers are negatively geotropic, and turn upright during growth

Pollination

Bananas are male sterile, and those of the Cavendish group are female sterile as well; fruit is set parthenocarpically

Fruits

The fruit (technically a berry) turns from deep green to yellow or red, and may range from 2-1/2 to 12 inches in length and 3/4 to 2 inches in width. The flesh, ivory-white to yellow or salmon-yellow, may be firm, astringent, even gummy with latex when unripe, turning tender and slippery, or soft and mellow or rather dry and mealy or starchy when ripe. through the literature we came to know the major and minor pest on banana tree viz.

Spondoptera litura (Cutworm) chaetanaphothrips signipenn (Banana thrips) , Nacoleia octasema (Banana scab moth) Apterona helicoidella (Hard scale)

In present study aimed to collect the data of minor pests of banana from selected banana field.

These minor insect causes the harm to banana tree and damage the banana leaves and some pest spread the diseases.

Thrips- Distinctive reddish brown oval stains on the finger, which can extend the entire length. In severe cases peel splits and the exposed flesh quickly discolors.

Aphids- Banana leaves are bunched into a rosette appearance with leaf margins becoming wavy and upward rolling thereby reducing the growth and vigour of plant. Severely infected plants do not produce bunches and act as a vector of bunchy top disease.

In addition,the climate change exerts a profound effect on the intensity of pest problem. Hence, there is considerable shift in insect pest problem and crop losses(Arora and Dhaliwal,1996;Dowens,et al.,2007 and Ramamurthy et al.,2009).

Banana plantation suffers number of pest: The minor pest and diseases affecting bananas are follows-

Viral diseases-Banana bunchy top virus is also known Banana virus,cucumber mosoic virus.

Fungal diseases-Panama disease,Singatoka diseases caused by fungus: Mycospheaerella musicola, Black Sigatok.

Insect pest-Banana stem weevil, banana pseudo stem borer, Odeoiporus longicollis, Oliver, banana rust thrips, Fruit rust thrips, Hard scale-Aspidiotus destructor, Cut worm. Nematods have been growth and yield through its damage to the roots and corm. The parasitic nematodes feed, multiply and migrate to roots.

Material and Method

There are different types of methods are available for collecting banana pest like pitfall trap method, handpick methods, light trap method, net swapping method, above methods are used for the collection of the banana pest.

In this reserch used the hand-pick methods for the collection of banana pest, firstly selected a specific agricultural land for the collection of banana pest, this agricultural land is in Amravati district in Pandhari village. This agricultural land visited on dated 13/9/2014 for the collection, near about 20 to 30 different types of pest collected and preserved in 70% alcohol. Later took photographs of each and every pest for their identification.

The specific field which were selected for the collection of pest is of 4 hectares. On these agricultural there are 4000 banana trees and each row contains 100 banana trees, having distance between two trees of 2.5 feet and distance between two rows is of 5 feet respectively.

Collection Time : The insects were collected between 11am-5pm. The owner of the land gave lots of information about banana trees and, his agricultural land was fully developed as compared to other farmers land. The survey was carried out 5-6 times for the observation of pests and were observed that there are some pests having an side effect on the banana trees and causing harmful effects on the yield of banana.

The study Area-Anjangoan surji is situated in Amravati district in Maharashtra, selected for study area because in these area more production of banana crop. The agriculture field of this area is developed for banana crop

Observation and Result

Total 40 to 50 individuals of various groups of insects were collected from the selected banana field and stored in70% alcohol later brought to laboratory. After sorting the minor pests are identified through available literature. Five minor banana pests are selected for the study and observed and their biology werestudied .

1) Cut worm - *Spondoptera litura*
2) Banana Scale Moth –*Nacoleia octasema*
3) Hard scale - *Aspidiotus destructor*
4) *Chaetanaphothrips Signipennis*

1) *Spondoptera litura*(Tobacco Caterpillar/ Cut worm)

classification
Kingdom: Animalia Phylum:Arthropod
Class :Insecta
Order :Lepidoptera Division:Ditrysia
Family:Noctuidae
Genus :Spodoptera
Species:litura

It is commonly called the cut worm or tobacco caterpillar and it is the type of Moth.

The lipidopteran pest Sondoptera Litura is a serious pest of banana,it has been recorded on several other crops like tobacco, cotton,mulberry.the full grown caterpillar are the most varacious feeders and cause extensive damage by defolication.

Identification- It having greenish brown with dark making, yellow and purplish spot in the sub marginal areas. It having forewing-stout moth with wavy white marking on the brown. Hind wing-white having a brown patch along margin.

Nature of damage

1)Young larvae feed by scrapping the leaves from ventral surface.
2)Later on feed voraciously at night on the foliag.

Fig-*Spondoptera litura*

Fig-*Spondoptera litura* (larva)

Result and Discussion

In the present study 40 to 50 banana pest were collected from selected agriculture field. The pestswere identified later minor pest were sorted out from collection. The minor banana pests are *Spondoptera litura* known as Banana scale moth, *Aapidiotus destructor*, known as Thrips, Bag worm , these are identified minor banana pest.

Many workers reported works on banana pest. Banana rust thrips(*chaetanaphothrips signipennis)* (Bagnall) (Thysanoptera:Thripidae) are present in parts of Australia and central America ,Brazil, Fiji, sri Lanka ,and India and also established in Florida caused severe damage to banana. The banana rust thrips is similar in appearance to two other introduced *Chaetanaphothrips species* the anthurium thrips,*C.orchidii*(Moulton) (Hara *et al.*,2002) and C.leeuweni (karny),which also share the samehosts,including banana, and anthrium .Banana rust thrips can be differentiated from two species by clear differences in body features. Gold(1998) and Umesh *et al*.,(2002) reported banana weevil and other insect such as moth, bag worm. The banana weevil has been identified as the most important insect pest of banana plantain in Africa.

The major pests found in Sri Lanka are banana weevil , stem weevile, banana aphid, banana thrips and fruit fly. However, diseases are more damaging as they reduced yield of banana more than insect pests. The major virus diseases recorded in Sri Lanka are banana tract mosaic virus, banana steak virus and cucumber mosaic virus.

Ariyarantna and Liyanage , (2002) reported that 82% and 59% of the cultivated banana are infected with banana bract mosoic and banana streak virus, respectively.

Plantain and banana cultivation is constrained by problem of pests and diseases.The minor pests namely banana fruit scarring beetle thrips, bag worm were reported from India. Shivayogeshwara et al.,(1991) reported spondoptera litura is becoming gradually an important insect pest crops including banana in India and many other countries.There have been a number of studies on the biological parameters of S.litura on different host plant under different environmental condition,particularly in India.Seasonal incidence of spondoptera litura on banana under South Gujarat conditions was studied by(patel et al.,1987)

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जैव विविधता : एक अमूल्य धरोहर

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नर्मदापुरम (मध्य प्रदेश)

सारांश

*अंतर्राष्ट्रीय प्रकृति संरक्षण संघ (IUCN) एक विश्वस्तरीय संगठन है जो विभिन्न प्रजातियों के संरक्षण, निगरानी और प्रबंधन **का कार्य** करता है। अंतरराष्ट्रीय प्राकृतिक संरक्षण संघ के अनुसार जीवो को विलुप्त, घोर संकट ग्रस्त, संकटग्रस्त, असुरक्षित और संकट मुक्त जीवो की श्रेणी में बांटा गया है। अंतरराष्ट्रीय प्रकृति संरक्षण संघ के द्वारा संकटग्रस्त प्रजातियों को लाल सूची या रेड डाटा बुक के अंतर्गत सूचीबद्ध किया **जाता** है। अंतरराष्ट्रीय प्रकृति संरक्षण संघ के द्वारा लगभग 40,000 से अधिक प्रजातियां घोर संकटग्रस्त जीवो की श्रेणी में दर्ज की गई है। जिसमें 41% उभयचरी जीव, 21% सरीसृप, 26% स्तनधारी जीव, 13% पक्षियों, 33% कोरल रीफ, 34% कोनिफर, 63% साइकेड है।[1] अगर यह जीव पृथ्वी से विलुप्त हो जाते हैं तो परिस्थितिक तंत्र में धीरे-धीरे असंतुलन बढ़ता जाएगा और एक दिन ऐसा आएगा जिससे मानव का अस्तित्व खतरे में पड़ जाएगा।*

1. प्रस्तावना

जैव विविधता प्राकृति के द्वारा, मानव को दी गई रक्षा कवच के समान है। जो लाखो सालो की प्रतीक्षा के बाद बरदान स्वरूप मिला है। जैव विविधता शब्द जीवन एवं विविधता के संजोग से निर्मित है। जिसका शाब्दिक अर्थ है पृथ्वी पर मौजूद जीवो की भिन्न-भिन्न प्रजातियाँ। हमारी थाली में मौजूद संतुलित आहार चावल, रोटी, दाल, सब्जी और फल इत्यादि जैव विविधता के उत्तम उदाहरण है। **(Figure 1).** जैव विविधता से ही हमारे जीवन की आधारभूत आवश्यकताओं की पूर्ति होती है। चावल, दाल रोटी से हमें ऊर्जा की पूर्ति होती है। तो फल व सब्जियों से हमें विटामिन्स और खनिज की प्राप्ति होते हैं। जिससे **हमारी** शारीरिक और मानसिक शक्ति का विकास होता है और रोग प्रतिरोधक क्षमता बढ़ती हैं। इस तरह हम कह सकते हैं कि जैव विविधता से मानव जीवन की आधारभूत आवश्यकताओं की पूर्ति होती है। जरा सोचिए चावल की प्रजाति में अगर बासमती चावल विलुप्त हो जाए तो क्या हमारी आने वाली पीढ़िया सुगंधित पुलाव खा पाएंगे। फलों का राजा आम की लगभग 1000 किस्में भारत में उगाई जाती है।[2] जैसे मालदा, लंगड़ा, फजली, दसहरी, बैगनपल्ली, नीलम, तोतापुरी, चौसा, केसर, अलफोसो, बादामी, आम्रपाली इत्यादि। अगर इनमे से लंगड़ा और दसहरी आम का पृथ्वी से लोप हो गया होता तो हम लंगड़ा और दसहरी आम का स्वाद कभी नही चख पाते।

दुर्भाग्य की बात है कि हम अपनी इच्छाओं की पूर्ति हेतु जैव विविधता के रूप में प्राप्त अपना सुरक्षा कवच तोड़ रहे हैं। उन्नत किस्म की प्रजाति प्राप्त करने की अभिलाषा में हम जंगली (wild) किस्म की प्रजातियों का संरक्षण नहीं कर पाते हैं। जबकि हम यह भूल जाते हैं कि उन्नत किस्म के पौधों का आधार जंगली (wild) किस्म की प्रजातियां ही होती हैं। जंगली (wild) किस्म की प्रजातियों का पैदावार भले ही कम होता, लेकिन उनमे रोग प्रतिरोधक क्षमता ज्यादा होती है। इसीलिए हमे विकास की दौड़ में आगे बढ़ने के लिए, जैविक संसाधनों का संरक्षण करना पड़ेगा, ना कि जैविक संसाधनों का क्षरण। तभी जीवो जीवस्य जीवनम की संकल्पना सार्थक होगी।

Figure 1. **भोजन की थाली में जैवविविधता का समागम**

2. वन एवं वन्य जीवो का विदोहन के प्रभाव

भारतीय परिदृश्य में वन और वन्य जीव का क्षरण का मुख्य कारण मानव आधारित विकास की दुहाई, प्रदूषण, विदेशी प्रजातियों का समागम, **प्राकृतिक आवास** का विच्छेदन, व्यापारिक विदोहन, ठेकेदारों और वन कर्मियों की मिलीभगत आदि प्रमुख है। हमारी 80% सुविधाओं का भरण पोषण वन और वन्य जीव से ही होता है। लेकिन संसाधनों के आवंटन में वन्य और वन्यजीवों को नीची वरीयता दी जाती है जिसके कारण उनके संरक्षण के किए गए उपाय गौड़ सा प्रतीत हो जाते हैं। मध्य प्रदेश का बैतूल जिला सीताबलड़ी 1818 में दुर्गम वन के रूप में जाना जाता था जहां आवागमन के साधन विकसित नहीं थे। 19वीं सदी के बीच में रेल मार्गों का निर्माण शुरू हुआ तो सरकार और ठेकेदारों की मिलीभगत से इमारती लकड़ियों की मांग पूर्ति के लिए साल और सागौन के पेड़ों की अंधाधुन कटाई की गई। जबकि पहला भारतीय वन अधिनियम 1818 में बन चुका था। इसी तरह की स्थिति देश के अन्य भागों में देखने को मिलती है। जंगलों की अंधाधुंध कटाई से बहु प्रजातियां **वनजीव** विलुप्त होते चले गए और उनका स्थान एक प्रजाति वन**जीव** ले लिए। पशुओं की बढ़ती आबादी का दबाव और मानव की आवश्यकता की पूर्ति के लिए एकल प्रजातीय वन, जैविक दबाव नहीं सह सकते हैं। **जिसके फलस्वरूप,** एक ही प्रजाति के गुणों का विकास **होता है, जो** आग, बीमारी, कीड़े, सूखे का मुकाबला करने में सक्षम नहीं होते हैं **जिससे** पारिस्थितिक संतुलन बिगड़ने लगता है। यह बहुत ही दुख के साथ कहना पड़ रहा है कि वन का हमारी राष्ट्र की जीडीपी में अहम योगदान होते हुए भी वन को आय का साधन नहीं माना जाता है।[3]

दूसरी तरफ स्वास्थ्य सेवा, पशु चिकित्सा और कृषि विज्ञान में सुधार होने के कारण पशुओं और मनुष्य की मृत्यु दर में कमी आती गई जिससे जीवितो की संख्या बढ़ने लगी। इनकी खाद्यान्न पूर्ति के लिए वनों को अनियंत्रित ढंग से काटा गया फलस्वरूप वनों को काट के कृषि योग्य भूमि और रहने योग्य मकान बनाए गए। विकास की परियोजनाओं ने, वनों के संरक्षक आदिवासियों को भी प्रभावित किया। (**Figure 2**). संथाल जिन वनों में रहते थे उन वनों के विनाश से झारखंड आंदोलन पैदा हुआ। चिपको आंदोलन **भारत के उत्तराखंड राज्य में ठेकेदारों द्वारा वनों की कटाई के विरोध में हुआ जिसमे लोग पेड़ो से चिपक जाते थे।**[4]

Figure. 2 **वनों का कटाव और वनों के बीच सड़क बना कर प्राकृतिक आवास का विखंडन**

3. **धार्मिक मान्यताओ के** पीछे **जैव विविधता संरक्षण**

धर्म हमेशा से प्रकृत के मूल सिद्धांत और मनुष्य के बीच सामंजस्य बनाए रखता है। हिंदू धर्म की हर मान्यता के पीछे जैवविविधता संरक्षण का संदेश छुपा रहता है। भगवान विष्णु का मत्स्य (मछली), कूर्म (कछुआ), वराह, नरसिंह (आधा आदमी और आधा शेर) और वामन अवतार सभी जीवो का सम्मान करना सिखाता है। हिंदू धर्म के हर त्यौहार में जीव या पादप का संरक्षण के लिए किसी न किसी रूप में पूजा की जाती है। वातावरण को शुद्ध बनाए रखने के लिए नवमी में आंवले के वृक्ष की पूजा, वट सावित्री बरगद की पूजा, शमी वृक्ष की पूजा और पीपल वृक्ष की पूजा की जाती है। चूहा और हाथियों के संरक्षण के लिए भगवान गणेश की पूजा, शेरों को बचाए रखने के लिए मां दुर्गा की **पूजा**, सर्पों के संरक्षण के लिए भगवान शंकर की माला के रूप में प्रतिनिधित्व **होता** हैं। महाग्रंथ रामायण में भगवान रामचंद्र के 14 साल वनवास के समय जामवंत, जटायु, नल नील वानर एवं हनुमान जी, **हिरन, गिलाहरी,** संजीवनी बूटी, कुंभकरण, देव और दानव का उल्लेख जैवविविधता **को प्रदर्शित** करता है। लेखक का मानना यह है कि भगवान राम की सेना में जैवविविधता होने से ही लंका पर विजय प्राप्त हुई क्योंकि आज का आधुनिक विज्ञान भी इस बात को साबित कर चुका है कि जिस परिस्थितिक तंत्र **में** जैव विविधता ज्यादा होती है वह पारिस्थितिक तंत्र ज्यादा स्थिर **और सफल** होता है। भगवान कृष्ण ने गोकुल वासियों से गोवर्धन पर्वत की पूजा करवा कर जैवविविधता को संरक्षित करने का **उपदेश** दिया था। समुंद्र मंथन के उपरांत प्राप्त सभी रत्नों **का** संरक्षण जैवविविधता को संरक्षित **करने** का संदेश **देता है**। बचपन की कहानियों में वन्य देवता **और** वन्य देवी की पूजा की मान्यता के पीछे वनस्पतियों को संरक्षित करने का **ही उद्देश्य होता** है। आज भी हम **ग्रीष्म**ऋतु में पक्षियों के संरक्षण के लिए जगह जगह पर अन्न और जल का प्रबंध करते हैं। मछलियों को दाना देना, चीटियों को आटा खिलाना, गौ पूजा करना पर्यावरण संरक्षण से ही जुड़ा है। बोधिवृक्ष पीपल के नीचे अमृत्व का ज्ञान प्राप्त करने वाले भगवान बुद्ध और महात्मा गांधी ने हिंसा और बलि प्रथा को जघन्य अपराध माना था। ईसाई धर्म में क्रिसमस ट्री और इस्लाम में खजूर का पेड़ को शुभ माना जाता है।[5]

4. **भारत सरकार का जैवविविधता संरक्षण अधिनियम**

भारत सरकार 2002 में **जैव**विविधता संरक्षण अधिनियम **बनाया गया** जिसका मुख्य उद्देश्य स्थानीय समुदायों के साथ उचित और न्याय संगत तरीके से जैविक संसाधनों का संरक्षण एवं प्रबंधन करना है। अधिनियम को लागू करने के लिए भारत सरकार ने 2003 में राष्ट्रीय जैव विविधता प्राधिकरण (एनबीए) स्थापित किया गया **है**। यह एक वैधानिक स्वायत्त निकाय है जिसका मुख्यालय चेन्नई में है। इसके तहत भारत के 29 राज्यों में जैव विविधता बोर्ड (एसबीबी) और स्थानीय निकाय के लिए 31,574 जैविक प्रबंधन समितियों निर्माण किया गया हैं। कोई भी विदेशी व्यक्ति या गैर सरकारी संस्थान, एनबीए की अनुमति के बिना जैविक संसाधनों पर अनुसंधान या बौद्धिक संपदा संरक्षण के लिए आवेदन नहीं कर सकता है। यदि कोई व्यक्ति अधिनियम के प्रावधानों का उल्लंघन करता है, तो उसे एक से पांच साल तक कारावास या दस लाख रुपये तक का जुर्माना या दोनों एक साथ हो

सकता है। इस अधिनियम के तहत जैव विविधता को नुकसान पहुंचाना गैर-जमानती और संज्ञेय अपराध माना गया है।[6] जैवविविधता संरक्षण अधिनियम के अलावा, भारत सरकार ने पर्यावरण और जीवों के संरक्षण हेतु विभिन्न अधिनियम बनाए हैं जो निम्नवत है

1. मत्स्य पालन अधिनियम 1897
2. भारतीय वन अधिनियम 1927
3. खनन और खनिज विकास विनियमन अधिनियम 1957
4. पशुओं के प्रति क्रूरता की रोकथाम 1960
5. वन्यजीव संरक्षण अधिनियम 1972
6. जल (प्रदूषण की रोकथाम और नियंत्रण) अधिनियम 1974
7. वन संरक्षण अधिनियम 1980
8. वायु (प्रदूषण की रोकथाम और नियंत्रण) अधिनियम 1981
9. पर्यावरण संरक्षण अधिनियम 1986
10. जैविक विविधता अधिनियम 2002
11. अनुसूचित जनजाति और अन्य पारंपरिक वनवासी (अधिकारों की मान्यता) अधिनियम 2006

5. निष्कर्ष

धरती पर मौजूद जल, जंगल, जमीन के संरक्षण से ही मानव का अस्तित्व की कल्पना कर सकते है। मानव को मानवता तभी प्रदर्शित होगी जब मानव जैविक सम्पदा को प्रदूषित और क्षीण होने से बचायेगा क्योकि जल, जंगल, जमीन पर सभी जीवो का अधिकार है। **संरक्षण अधिनियम** और धार्मिक मान्यताये से **जीवो जीवस्य जीवनम** की संकल्पना को संबल मिलता है। मानव का यह उत्तरदायितव है कि जो जैविक सम्पदा को अपने पूर्वजो से प्राप्त कर उपयोग किया है उसे उसी मूल रूप में अपनी संतति हो हस्तांतरित करे।

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Co-relation of BMI with Nutritional Status Observed in Tribal People of Chikhaldara Region (Melghat)

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Abstract

The present cross-sectional study was undertaken among the tribal people of Chikhaldara region (Melghat) Dist. Amravati. This study used to investigate body mass Index (BMI) among male and female tribes of Chikhaldara region. Total 254 males and 288 females were taken for examination commonly used indicators. i.e. weight (wt), height (ht) and body mass index (BMI) were used to evaluate nutritional status. Results also reveal that prevalence of under nutrition among these peoples of both sexes. Tribal people are mostly illiterate and malnourished.
Key words – Body Mass Index (BMI), nutritional status, Tribes, Chikhaldara, India

Women and preschool children are known to be most vulnerable group for under nutrition, adolescents girls are also being recognized as a potential group during which the nutrient requirements are relatively high under nutrition during adolescence, confounded by childhood marriages, leads to higher mortality and morbidity among women and young children. (Studied carried out by National Nutritional monitoring Bureau. (2003)
World Health Organization (1995) has recommended that anthropometry could be used to assess the nutritional and health status of adults. One such measure now in widespread use in Quetel index which is weight (in kg) divided by height in (m^2). Several scholars have emphasized the importance of body mass index as an nutritional assessment (Gupta et al (1979, (Yadav et al (2011) observed that tribal preschool children of Gond community had low Hb% with low BMI due to certain adverse realities like insufficient food intake, adverse cultural practice, micronutrientdeficiency disorders such as anaemia.

It is established fact that body mass index (BMI) is a useful anthropometric indicator of measuring nutritional status of the population (FAO, 1996) and is specifically suitable for large scale surveys (Ulijaszek and Kern 1999, WHO 1995).

The prevalence of chronic energy deficiency (CED) measured through BMI (James et al (1988) Ferro-Luzzi et al (1992), can be used in the standard of living between population groups Nube et al (1998). The appropriateness of using BMI less than 18.5 kg/ m^2 as under nutrition are validated by many authors to predict poor demographic economic, social and environmental conditions of the population (Pryer and Rogers, 2006), Subramanian and Smith (2006) under nutrition reduces physical capacity James (1994) increases mortality (Harris T.B. 1995), morbidity (khongsdier (2002).
In India, the most underprivileged group is the tribal communities both in terms of socioeconomic condition as well as nutritional status (Basu 1994). Several studies shows these reflection as high under nutrition among tribals across India (Adak et al 2006)

Material and Method :

A cross sectional study was performed to evaluate BMI and nutritional status of tribal people of Chikhaldara region Dist. Amravati.

Hight and weight were measured weight was calculated by weigning balance and height by stadiometer. The nutritional status and background information was collected from each individual through questionnaire as well as tribal community informed consent was obtained for carrying out survey. The age groups were distributed into 0-20, 21-40, 41-60 and 61 respectively.

The BMI was computed using the following standard equation.BMI = Weight (kg)/height (m^2).
Nutritional status was evaluated following BMI cut off points to define trimness. The age and sex specific cut-off values were established based oninternational survey.

This classification categories the prevalence of under nutrition according to percentage of population with BMI under 18.5 low, medium and very high critical situation (WHO 1995).

Result and Observation :

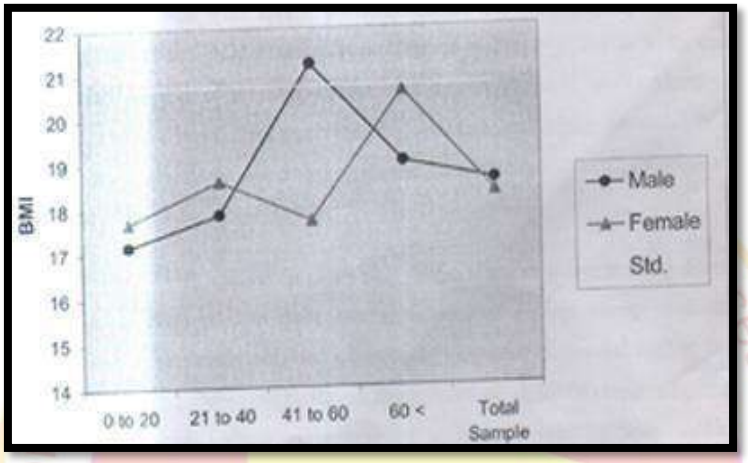
Table 1 BMI observed in male and female tribes of Chikhaldara (Melghatregion)

Age Group		Df	Pm	M	SD	SE	T
0 to 20	Male	54	20.7	17.15	4.596	0.62	**5.74****
	Female	85	20.7	17.68	4.438	0.48	**6.31****
21 to 40	Male	108	20.7	17.86	2.472	0.24	**11.99****
	Female	140	20.7	18.59	2.925	0.25	**8.58****

41 to 60	Male	51	20.7	21.20	3.718	0.52	**0.98**
	Female	45	20.7	17.71	5.074	0.75	**3.99****
61	Male	38	20.7	19.00	4.593	0.74	**2.31***
	Female	15	20.7	20.58	4.407	1.10	**0.11**
Total Sample	Male	254	20.7	18.56	3.889	0.24	**8.77****
	Female	**288**	**20.7**	**18.29**	**3.937**	**0.23**	**10.41****

(*-Significant at 0.05; **-Significant at 0.05 & 0.01 level of significance)

(Critical values for 15 df; $t_{0.05}$ = 1.7530, $t_{0.01}$ = 2.6025, for 38 df; $t_{0.05}$ = 1.6859, $t_{0.01}$ = 2.4286, for 45 df; $t_{0.05}$ = 1.6794, $t_{0.01}$ =2.4121, for 51 df; $t_{0.05}$ = 1.6753, $t_{0.01}$ = 2.4017, for 54 df; $t_{0.05}$ = 1.6736, $t_{0.01}$ = 2.3974, for 85 df; $t_{0.05}$ = 1.6630, $t_{0.01}$ = 2.3710, for 108 df; $t_{0.05}$ = 1.6591, $t_{0.01}$ = 2.3614, for 140 df; $t_{0.05}$ = 1.6558, $t_{0.01}$ = 2.3533, for 254 & 288 df; $t_{0.05}$ = 1.285, $t_{0.01}$ = 1.967)



Result & Discussion : Co relation of BMI with nutritional status observed inTribal Males and Females

The above table-1 reveal that the calculated T values between standard range mean and Obtained BMI mean for various groups i.e. 0-20, 21-40, 41-60, 5.74, 11.99, 0.98, 2.31 and 8.77 respectively, for male. All these values are greater than critical values of 't' at 0.05 and 0.01 level of significance. Hence there is a significant difference in BMI and standard range of male except for age group 41-60. From the table it is also observed that in all the groups BMI range is within 17 to 19, which is quite less than the standard range mean value for men 2C.8 except for age group 41-60 i.e. 20.3 which is above average.

For different groups of female i.e. 0-20, 21-40, 41-60, above 60 and total sample the calculated Y values are 6.31, 8.58, 3.99, 0.11 and 10.41 respectively. All these values are greater than critical values of 't' at 0.05 and 0.01 level of significance except for age group 61 which is non-significant. Hence there is a significant difference in BMI and standard range mean of female. From the table it is also observed that in all the groups BMI range is within! 7.8 to 18.8, which is quite smaller than the standard range mean value for female 20.8 except for age group of 61 i.e. 20.8 which is required value of BMI for females.

Hence from the table and graph it is concluded that, the BMI in both male and female tries of Chikhaldara region is below the standard range mean.

Discussion:

Malnutrition was wide spread phenomenon in tribal area Carlson and Waterlaw (1991) have studied the child malnutrition problem at global, regional as wells country level. (Khandare, et al 2008) studies on tribals of Thane district of Maharashtra, India. The result revealed that majority of population belonging to schedule tribe community were malnourished. Socio-economic factors have been contributory to malnutrition.

Meghadas (2010) studied on nutritional status of Korku tribes in Betul district of Madhya Pradesh observed that there was prevalence of protein energy malnutrition anemia, because Korku tribes obtained mean intake of nutrients. Several studies Sonwal CJ. (2010), Dhore and Joshi (1988), Rajesh Sing, Preeti Singh (2008) reported that tribal children suffered from highest percentage of severe malnutrition with inadequate nutrition.

Sing Bhupinder (1994), Nagdda B.L. (2004), examine and assess the tribal health situation which is related to their economic pursuit, nutritional availability medicines etc. Nutritional anemia is major problem for women in India and so morein rural and tribal belt.

International center for research on women (ICRW) studies sting was highly prevalent in adolescent boys and girls, ranging . In contrast the rate of low body mass indices indicative of current under nutrition under nutrition in early childhood may diminish a person's even tautly body size malnourished children are typically shorter and lighter than their well nourished peers at the end of adolescent growth, s Cameron (1996). Several studies from India (yadav et al (1999), Gogoi and Sengupta(2002) have utilized BMI to study nutritional status of tribal populations. The basic causes of under nutrition in developing countries are poverty, poor hygienic conditions and little access to preventive and health care Mitra(1985), WHO(1990,1995).

Conclusion:

Therefore BMI has strong association with nutritional status in present study low level of BMI and under nutrition was observed which may be responsible for life threating diseases, higher ratio of maternal mortility. Also poverty illiteracy, very less facilities for health, blind beiefs, socio, economic status was affecting each and every as part of tribal people of Chikhaldara region.

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Comparative Preliminary Phytochemical Analysis Of *Capparis Decidua (Forsk.)* And *Capparis Zeylanica Linn.*

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Abstract
The present study was aimed to evaluate the phytoconstituents of the leaf extracts of Capparis decidua Forsk. and Capparis zeylanica Linn. plants of an ethno-botanical importance belonging to the family Cappariceae using ethanolic extracts. The result reveals the presence of bioactive compounds (phytoconstituents) such as anthraquinones, terpenoids, flavonoids, saponins, tannins, alkaloids, and cardiac glycosides. Both the Capparis species have an ethno-medicinal importance such as being anti-inflammatory, analgesic, antioxidant, antipyretic and antimicrobial properties. The results showed the dominantly presence of alkaloids, flavonoids, phenols and saponins in both plants. So, further research is necessary to isolate and determine the identity of the bioactive compounds present in this plants species.
KEYWORDS: *Phytochemistry, Capparis spp. and Medicinal uses.*

Introduction
According to the World Health Organization (WHO), more than 80% of the world's population relies on traditional medicines for their primary health care needs (Trivedi, 2006). These chemical elements of plants can be therapeutically active or inactive and are referred to as phytochemicals or secondary metabolites. Alkaloids, phenolic glycosides, flavonoids, steroids, terpenoids, amino acids, and glycopeptides are some of the phytochemicals found in vegetables, fruits, flowers, leaves, stems, bark, and roots that work with and protect against diseases more effectively (Rangari, 2006). Many species of Capparaceae are used as ethno-medicinal purposes (Bokhad *et. al*., 2013). So, here we select two species of *Capparis* for phytochemical analysis.

The genus *Capparis* comprises 250 species, including shrubs, trees, and woody climbers. *Capparis zeylanica* Linn. (Capparaceae) is a many-branched, thorny, sub-scandent climbing shrub. Plants are 2-3 m in height, armed with 3-6 mm long recurved thorns, branched, leaves are elliptic or broadly lanceolate, base rounded, apex mucronate; flowers are profuse, pinkish-white, later turning pink, berries are globular or ellipsoid, 3-4 cm in diameter, and seeds are globose, embedded in the white pulp. It is medicinally used for snake bites, to cure swelling of testicles, smallpox, boils, cholera, colic, hemiplegia, neuralgia, sores, etc (Chopra *et. al*., 1956; Joshi, 1997 and Satyanarayan *et. al*., 2008). Whereas, *Capparis decidua* (Forsk.) plant height 5 m high, or occasionally a small, branched, Leaves are very minute 2 mm long. Flowers are pink in color and red-veined, in small groups along with the leafless shoots, in the axils of the spines. Fruits are small, many-seeded, ovoid or sub-globulous (Padhan *et. al*., 2010). It shows some medicinal properties like hypercholesterolemic, anti-inflammatory, analgesic, antidiabetic, antimicrobial, antihypertensive, antihelmintic, and purgative activities (Deshmukh *et. al*., 2010 and Bokhad *et. al*., 2013).
Due to these medicinal properties, it is necessary to investigate and compare phytochemical analysis of these plants.

Materials And Methods
A] Identification and Collection:
Frequent field visit were conducted in nearby forest area of Yavatmal and Wardha District (Maharashtra) for the collection of plant materials. The Collected plant specimens were identified using available standard floras (Ugemuge, 1986; Karthikeyan & Kumar, 1993; Naik, 1998 and Singh & Karthikeyan, 2000).

B] Extraction Methods:
The collected plant leaves were dried and made into powder for further analysis. The powder was then subjected to soxhlet extraction with different solvents (petroleum ether, benzene, acetone, chloroform, ethanol and water) according to their increasing polarity. Only ethanolic extract of the plants under study were analysed for the presence of different phytochemical constituents (Kokate *et al*., 2005).

C] Qualitative Phytochemical Analysis:
It involves testing of different classes of compounds. The methods used for detection of various phytochemicals were followed by qualitative chemical test to give general idea regarding the nature of constituents present in crude drug (Wallis, 1990; Harborne, 1998; Kokate, 2005 and Sadashivan & Manickam, 2005). The extracts were analyzed for the presence of phytoconstituents like carbohydrates, alkaloids, anthraquinone, cardenolides, flavonoids, phenolics, steroids, terpenoids and saponin.

Observations

Table-1: Comparative phytochemical study of ethanolic extract of *Capparis spp.* (Leaves)

S.N	Compound / test	*C. decidua*	*C. zeylanica*
1	Alkaloids	+	+
2	Anthraquinone	_	+
3	Cardenolides	_	+
4	Flavonoids	+	+
5	Phenolics	+	+
6	Saponins	+	+
7	Steroids	_	_
8	Carbohydrates	+	_
9	Terpenoids	_	_

Results And Discussion

In the present investigation, there are dominantly presence of alkaloids, flavonoids, phenols and saponins in both plants which having the major applications in medical and pharmaceutical sciences (Kakpure & Rothe, 2012). The ethanolic extract of ***C. zeylanica*** shows dominantly the presence of alkaloids, anthraquinone, cardenolides, flavonoids, phenolic compounds and saponins. Whereas, steroids, carbohydrates and terpenoids were absent. However, ***C. decidua*** shows the the presence of alkaloids, flavonoids, phenolic compounds, carbohydrates and saponins. (Table-1). These types of studies have a vital role because of their commercial uses and research interests. Further research is necessary to isolate and determine the identity of these bioactive compounds for its quality control.

Conclusions

This research work has revealed further potentials of these selected *Capparis* spp. in the area of pharmacology as potential source of useful drugs. This study therefore has provided some biochemical basis for ethno-pharmacological uses of these plants in the treatment and prevention of various ailments. The qualitative phytochemical screening shows that, the leaves of the *C. decidua* and *C. zeylanica* are rich in alkaloids, flavonoids, phenols and saponins which are popular phytochemical constituents.

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Avifaunal Diversity With Relation To Ecology Around Borgaon Dam, India

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Abstract:
This study was carried out around Borgaon Dam in Pandharakawada forest Division of Maharashtra state from June 2020-April 2021. The present study was made to find out the avian diversity with reference to ecology. We estimate the avian fauna in terms of species richness and diversity of Borgaon aquatic habitat. Total 71 birds belonging to 21 families were observed of which 38 was resident, 14 were local migrant and 19 were migrant. The favorable ecological conditions like availability of food, wetland and roosting places were attracting the various birds. There is need to retain a proportion of natural habitat of aquatic ecosystem as to conserve the biodiversity.
Keyword: *Avian diversity, birds, Borgaon*

Introduction:

India has a numerous diversity of plants and animals both domesticated as well as wild in variety of habitats and ecosystems. Biodiversity has central importance in the study of ecology. It is likely to play an important role for ecosystem functioning (Loreau et al., 2001). The change in number of assemblage of species affects the nature of habitat. Recent global changes are likely to have strong negative impacts on biodiversity of terrestrial ecosystem (Sala et al., 2000). Today a greatest threat to wildlife is loss of habitat which is widely recognized by ecologists. Most are primarily endangered by habitat loss and degradation (Sodhi and Smith, 2007). Among all the fauna, birds are use as bio-indicators. The bird species are adapted to a specific plant species, community and use to describe the vegetation condition, consequently the ecosystem situation (Jansen & Roberstrom, 2001). The bird populations are usually limited by limiting factors including food supplies, nest and refuge site, competitors, natural enemies and weather (Andrewartha & Birch, 1984, Begon et.al 2006; Brambilla et al: 2010). There are growing evidences that climate change will become one of the major diverse of species extinctions in the 21 st century. Numbers of published studies have documented a variety of changes attributable to climatic change (1PCC, 2007).

To stop the threats to biodiversity and mass extinction, meaningful information that could contribute to conservation planning and management is needed to maintain or improve the structure of aquatic ecosystem. So we selected aquatic ecosystem which is first ever scientific attempt to study avian diversity with aspect to ecology.

Material and Methods:

Study Site:

The study was carried out around Borgaon dam in Pandharkawada forest division which is situated of Yavatmal district of state Maharashtra adjoing the Adilabad distict of state Telangana Pradesh.

Materials used for study:

For each census, a map and aerial photographs was use to identify sites. So that camera Nikon was used of 45x zoom and 12.6 megapixels. A Tape recorder was also utilized during each survey to record the particular calls, which were later analyzed and used to identify the species. For watching, counting and identifying birds, Binocular (10x50), Telescope (25-40x), Notebook, Pen, pencil, Compass, Observation sheet, metal or wooden stakes, Handheld GPS was used.

Bird Survey:

The bird survey was conducted according to a standard point count method (Reynolds et al., 1980; Bibby et al., 2000).We involved visual and voice hearing methods for bird identification within fixed or variable radius plots (Blondel et al., 1970; Hutto et al., 1986). The data collected from the surveys was used to estimate populations of birds, density, diversity and relative abundance or richness of bird species in different habitats. The bird surveys were carried out from June 2018 to April 2019 for 1 year. We used a 25-m/50-m fixed-radius point count method to census the avifauna at each count station (Hutto et al. 1986). Surveys were conducted four days in a week, either from sunrise to 4 hours after sunrise or from 4 hours before sunset until sunset depending on weather conditions. Each count was conducted for 10 minutes, which was further divided into 3 minutes, 2 minutes and 5 minutes respectively.

Identification, Classification and Data analysis:

For identification and field diagnosis of birds, colored plates of All and Ripley (1983), Ali (1996). Grimrnett et al.,(1998) were used. Classification of birds was made in accordance with lnskipp et.al (1996). We

followed Whittaker (1976) to measure diversity of birds as alpha, beta and gamma diversity. All the diversity of birds was analyzed using biodiversity analysis online software alyoung.

Observation and Result:

The basic factor to be studied in this on avifauna distribution with aspect to ecology is climate, topography and vegetation. Thus Geology, climate, soil and vegetation types with altitude, latitude and surface topography of particular sites were studied.

Finding of birds:

Total 71 birds belonging to 21 families was observed of which 38 was resident, 14 were local migrant and 19 were migrant with family corvidae comprising more bird species following Passeridae and accipitridae.

Diversity of Bird Community:

The species richness Index i.e. Menhinick index (RI) of forest was 1.06 and Margalef richness index (R2) was 15.71. The overall Shannon-Weiner index was found 4.R7 while the Dominance index was 0.017. The two different Evenness measures were calculate namely Shannon evenness (El) and Sheldon evenness (E2) to measure the evenness of species-abundance which is complimentary to the diversity index concept. The Shannon Evenness (El) was found 2.21 and Sheldon Evenness (E2) was 0.083. The Similarity Indices were also calculated between the different habitats of the sanctuary namely Jaccard Index and Sorenson's index which was found 0.03 and 0.06 respectively. The abundances of bird were found higher in July 2020-June as compared to July 2021. The higher diversity of birds (H′) was found (4.87) in first year than in second year (4.45). The Simpson index was found 0.029 and 0.022.

Discussion And Conclusion:

In present study, Bird communities vary among forest types and functional groups. Different vegetation types as well as abundant food resources might be played a greater role in difference in habitat preference by bird species. The rich and high vegetation might be providing heterogeneous and suitable site of nesting, roosting and foraging of bird. Similar finding reported regarding vegetation diversity and richness of wetlands on the bird population richness. Water birds like. Lesser whistling teal, Little cormorant, bite-breasted kingfisher, Black-winged Stilt, Red-wattled Lapwing. Cattle egret and Indian pond-heron were the common species inhabiting the water bodies, while Purple Heron (Ardea purpurea) were rarely sighted. The passage migrant Rosy starling (Sturnus roseus) was found everywhere before and after the winter season. The birds like Demoiselle crane, common crane and Barr headed groose which are generally seen at wetlands were not found or recorded. An important reason for high bird diversity may be the existence of a varied topography coupled with a mosaic of forest types including scrub forest, tall riparian forest hilltop forest and dry deciduous forest. Conversion of the native vegetation-scrub jungle and grasslands to monoculture plantations is detrimental to bird diversity. There is need to conserve the avifauna' bio-diversity of this area by protecting its habit conditions especially, the water bodies, riparian areas, edges and streams. Also there is need to generate awareness about the conservation value and ecological role of avifauna and maintainace of natural habitat conditions and ecological balance of forest. Conservation awareness programmes among the local peoples is required to conserve it for future generations.

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Traditional knowledge of wild edible plants used in the Yavatmal District, Maharashtra State, India.

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Abstract

Use of wild plants as a food source is an integral part of the culture of indigenous people that dwell in the remote forest areas. These people consume wild edible plants as food source and depend on these resources to meet their food needs particularly in periods of food crisis. The wild edible plants are also used as supplements to the cultivated crops and as famine foods.

The diversity in wild species in the district offers variety in edible plants and contributes to household food assurance. The present ethnobotanical explorations conducted in forest areas of Yavatmal resulted in the information on about traditional plant uses of53plants species belonging to 35 Angiospermic families. Moraceae recorded highest number of species (5 species) followed by Amaranthaceae, Caesalpiniaceae, Euphorbiaceae and Cucurbitaceae are (3 species). Information gathered from Yavatmal district indicates that the tribal's and other village people of this region possess good knowledge of wild edibles but their continuous and progressive exposure to modernization may result in extinction of the such rich heritage of knowledge in the course of time. Majority of edible parts are from fruits (29 species), leaves (14 species), seeds (6 species), Flower (2 species) and some are of underground parts like rhizome, tuber, etc.

Key words:*Traditional Uses, Wild edible plants, Yavatmal.*

Introduction

District Yavatmal is situated in the eastern part of the Maharashtra between north latitudes 19º23` and 20º48`and longitudes 77º 19` and 79º 07` It occupies an area of 13,582 Sq. Km with forest cover of 2956 sq. Km. Average rain fall is 1089.7 mm. The district is inhabited by several tribes. These are Andh, Banjara, Bahurupi, Bhil, Chitrakathi, Gond, Gopal, Kolam, Kolhati, Rajgond, Pardhan, Panchal, Tambatkar and Wadar. Kolam tribe is on the verge of extinction; in 2001 the population was only 900. Population of Bhil is also decreasing

Forest Dwellers:

Wild plants even after the availability of variety of food crops constituted an important part of the human diet particularly in remote forest dwellers. Recent regional studies, from the different parts of country[1,2,4,5,6,8,9,10,12,13,14,15,16,17] have shown that the several wild plants have nutritive potential and are being used all over. Now a day's people are giving more attention to wild food plants as the present day food crops are not meeting the need of complete required nutrients.This work is an attempt to provide a data on food plants collected from Yavatmal district.

Methodology

Ethnobotanical studies in Yavatmal with respect to wild food plants were carried out during 2019 to 2021. Different parts of the district were frequently visited, and information on indigenous knowledge about food plants was gathered from knowledgeable people in the district. Data was collected using semi-structured questionnaire and group discussions based on the standard procedures [7]. Detailed information regarding the part eaten and various preparation made was noted. Plants were identified using relevant scientific literature [3,11] Following table gives the detailed information such as, plant name, family name which followed by local name and uses.

Sr. No	Botanical Name / Family	Local Name	Use
1.	*Aegal marmelos* (L.) Corr. (Rutaceae)	Bel	Ripe fruit pulp is eaten. 'Sharbat' is made by fruit pulp during summer.
2.	*Aerva lanata* (L.) Juss. (Amaranthaceae)	Tandula	Curry is made by leaves.
3.	*Alangium salvifolium* (L.f.)Wang.(Alangiaceae)	Ankol	Ripe fruits are eaten.
4.	*Alternanthera sessilis* (L.)R. Br. (Amaranthaceae)	Chibuk Kata	Curry is made by tender stem and leaves.

5.	*Amaranthus spinosus* L. (Amaranthaceae)	Kat e – math	Curry is made by tender leaves.
6.	*Basella alba* L. (Basellaceae)	Mayalu	Curry is made by leaves and 'Pakodi' made by leaves.
7.	*Boerhavia diffusa* (L.)Hook. (Nyctaginaceae)	Punarnawa	Curry is made by leaves.
8.	*Buchanania lanzan* Spreng. (Anacardiaceae)	Charoli	Ripe fruit pulp eaten. Seeds are used in sweet dishes made by using milk.
9.	*Canavalia ensiformis* (L.)DC. (Fabaceae)	Abai	Curry is made by fruits.
10.	*Canthium parviflorum* Lam. (Rubiaceae)	Karbit	Ripe fruits are eaten.
11.	*Capparis zeylanica* L. (Capparaceae)	Waghati	Curry is made by unripe fruits.
12.	*Cassia fistula* L. (Caesalpiniaceae)	Bahava	Curry is made by flowers.
13.	*Cassia occidentalis* L. (Caesalpiniaceae)	Tarwad	'Chutney' is made by tender leaves.
14.	*Cassia sophera* L. (Caesalpiniaceae)	Jangali takla	'Chutney' is made by leaves.
15.	*Chlorophytum tuberosum* (Roxb.) Baker (Liliaceae)	Safed Musli	Tubers are eaten.
16.	*Coccinia grandis* (L.)Voigt. (Cucurbitaceae)	Tondli	Curry is made by unripe fruits.
17.	*Colocasia esculenta* Schott. (Araceae)	Chamkura	Curry is made by leaves and 'Pakodi' made by leaves.
18.	Commelina benghalensis L. (Commelinaceae)	Kena	'Pakodi' made by leaves.
19.	*Cordia dichotoma* Forst. f. (Boraginaceae.)	Bhokar	Ripe fruits are eaten.
20.	*Dioscorea bulbifera* L. (Dioscoreaceae)	Dukkar Kand	Tubers are boiled and eaten, curry is prepared from bulbils.
21.	*Diospyros melanoxylon* Roxb. (Ebenaceae)	Tembhurni	Ripe fruit pulp is eaten.
22.	*Embli ca officinalis* Gaertn. (Euphorbiaceae)	Awala	Fruits are eaten. 'Chutney' is made by fruit s. Murrabba Prepared from fruits.
23.	*Euphorbia heterophylla* L. (Euphorbiaceae)	Nivdung	Curry is made by tender leaves.
24.	*Ficus bengalensis* L. (Moraceae)	Wad	Ripe fruits are eaten.
25.	*Ficus carica* L. (Moraceae)	Anjeer	Ripe fruits are eaten.
26.	*Ficus hispida* L. f. (Moraceae)	Umber	Ripe fruits are eaten.
27.	*Ficus racemosa* L. (Moraceae)	Umber	Ripe fruits are eaten.
28.	*Grewia hirsuta* Vahl. (Tiliaceae)	Dhaman	Ripe fruits are eaten.
29.	*Hygrophila auriculata* (K. Schum.)Heine. (Acanthaceae)	Talim Khana	Curry is made by tender leaves.
30.	*Lablab purpureus* (L.) Sweet.(Fabaceae)	Waal Pawta	Curry is made by pods.
31.	*Leucas aspera* (Willd.) Link. (Lamiaceae)	Gumma	Curry is made by leaves.
32.	*Limonia acidissima* L. (Rutaceae)	Kauth	Ripe fruits are eaten, 'Chutney' is prepared from fruits.
33.	*Madhuca longifolia* (Koen.) Mac Bride. Ver: *latifolia* (Roxb.) Chev. (Sapotaceae)	Moha	Flowers are eaten.
34.	*Merremia gangetica* (L.)Cufod. (Convolvulaceae)	Undirkani	Curry made by leaves.

35.	*Momordica dioica* Roxb. Ex Willd. (Cucurbitaceae)	Kartoli	Curry is made by unripe fruits.
36.	*Morus alba* L.(Moraceae)	Tuti	Ripe fruits are eaten.
37.	*Mukia maderaspatana* (L.) Roem. (Cucurbitaceae)	Bilavi	Unripe fruits are eaten.
38.	*Nelumbo nucifera* Gaertn. (Nelumbonaceae)	Kamal	Tubers are boiled and eaten, curry is also prepared from tubers.
39.	*Olax psittacorum (*Willd.)Vahl. (Olacaceae)	Harduly	Ripe fruits are eaten.
40.	*Opuntia stricta* (How.)How. (Cactaceae)	Phadya Nivdung	Ripe fruits are eaten.
41.	*Emblica officinalis* Gaertn. (Euphorbiaceae)	Awala	Fruits are eaten. 'Chutney' is made by fruits.
42.	*Pithecellobium dulce* (Roxb.) Benth. (Mimosaceae)	Wilayati Chinch	Seed kernels are eaten.
43.	*Semecarpus anacardium* L.f. (Anacardiaceae)	Bibha	Ripe fruits hypocarp and seed s are eaten.
44.	*Solanum nigram* L. (Solanaceae)	Kangani	Ripe fruits are eaten.
45.	*Solanum virginianum* L. (Solanaceae)	Kateringani	Curry is made by unripe fruits.
46.	*Sterculia urens* Roxb. (Sterculiaceae)	Kandol	Fruits are roasted and seeds are eaten.
47.	*Strychnos potatorum* L.f. (Loganiaceae)	Nirmali	Fruits and seeds are eaten.
48.	*Synantherias sylvatica* Schott.(Araceae)	Jangli suran	Curry is made by tuber.
49.	*Syzygium cumini* (L.)Skeels. (Myrtaceae)	Jambhul	Ripe fruits are eaten.
50.	*Terminalia bellirica* (Gaerth.)Roxb. (Combretaceae)	Behada	Seed cotyledons are eaten by Children.
51.	*Trianthema portulacastrum* L.(Aizoaceae)	Wasu	Curry is made by leaves.
52.	*Ziziphus mauritiana* Lam. (Rhamnaceae)	Bor	Ripe fruits are eaten. Fruits are also used to made chutney.
53.	*Ziziphus oenoplia* (L.) Mill. (Rhamnaceae)	Burgi	Ripe fruits are eaten.

Results and discussions:-

As there is increase in demand of food materials, such as, cereals, pulses and vegetables, etc. since several decades emphasis was given increase the yield by using different chemical fertilizers and pesticides. This resulted in the common occurrence of pesticide and chemical residues in food plants. Same time, no attention was given to keep the optimum level of micro and macro nutrient in the plants, which is a requirement of healthy food.

After realization of all these facts the people from developed and developing countries have been choosing the wild edible which may fulfill their requirements, of nutritive foods.

Since the ages the human societies residing in remote areas are using several wild plants for edible purposes. Information gathered from Yavatmal reveals that a treasurer of edible plants remains untouched in these areas.

A total of 53plant species belonging to 35 families were recorded after conducting survey Moraceae recorded highest number of species (5 species) followed by Amaranthaceae, Caesalpiniaceae, Euphorbiaceae and Cucurbitaceae are (3 species).

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Phytochemical Analysis of *Cassia Grandis*

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Abstract:

Plants are recognized in the pharmaceutical industry for their broad structural diversity as wellas their wide range of pharmacological activities. The plant Cassia Grandis is a widely cultivated ornamental plant . The trees is also known as pink showerCaro and stinking toe. It is a plantae- plant belonging to the order- Fabales, family – Fabaceae-Pea, and genus – Cassia L.Cassia. The phytochemical study on the leaf extract of Cassia Grandis is done. Fresh leaves were collected, shade dried, and a crude extract was prepared using soxhlet extraction method and the preliminary phytochemical analysis on the leaf extracts of Cassia grandis were conducted. The solvents used for extraction namely Aqueous, Ethanol and chloroform is chosen based on their increasing polarity. The extractive value is highest with Aqueous. Phytochemical studies revealed the presence of phytochemicals such as carbohydrates, phenols, flavonoids, steroids, saponins, alkaloids, tannins, and cardiac glycosides,Terpenoids.

Keywords:*Phytochemical analysis, Soxhlet extraction, Extraction solvents, Cassia Grandis leaf.*

Introduction

Herbalism is a type of traditional medicine that uses plants and plant extracts to treat ailments. There is a legal duty to maintain track of all traditional medicine research on paper. As a result of this disadvantage, it's vital to verify that the plant and its components that will be employed as medication are uniform.The objective of this work was to evaluate the phytochemical constitution of the Herbal plantcassia gradis.To collect the leaves of the plant and extraction is carried out different solutions like Water, ethanol and chloroform by soxhlet extractio method.To analyse the overall phyto chemicals Present in this plant leaves.

Materials And Methods

Sample Collection

The leaves were collected from near the garden.The leaves were sundried and then finely powdered. The powered leaves were stored in an air tight container for future use.

Pytochemistry

Plant Extraction

The collected materials (leaves) were chopped into small pieces separately, shade-dried, and coarsely powdered using mortar and pestle. 5 grams of of powdered leaves were added into 100 ml of the following extracts like aqueous, chloroform and ethanol. After adding them, they were boiled for few minutes, filtered in whattman filter paper & then stored in a reagent bottle for future use.

Detection of Phytochemicals :

All the extracts were subjected to preliminary phyto chemical tests followed by the methods of Harborneand Evans (2006).

TestforAlkaloids:

Wagner's test: Extract were treated with 3-5 drops of wagner's reagent. (Wanger's reagent – 1.27 g of iodine with 2 g of potassium idodide in 100 ml water. The Formationofbrown/reddishPrecipitateindicates thepresenceof alkaloids

Test for Carbohydrates:

Fehling test : Filtrates were hydrolyzed with diluted HCL, neutralized with Alkali and heated with fehling A & B solution. Formation of red precipitate indicates the presence of reducing sugars.

Test for Cardiac Glycosides:

The extract is treated with glacial acetic acid and also adding few drops of ferric chloride solution underplayed with 1 ml of concentrated sulpuric acid.The brown ring at the interphase indicates the presence of dexoy sugar characteristics.

Test for Flavonoids:

Alkaline Reagent test :Extracts were treated with few drops of 10% sodium hydroxide solution. Formation of intense yellow color which becomes colorless on addition of dilute acid indicates the presence of flavonoids

Test for Phenols:
Ferric chloride test: Extracts were treated with 3-4 drops of 1% of ferric chloride solution. Formation of bluish black color indicates the presence of phenols.

Test for phlobatannins :
The extract is boiled with 1 % of hydrochloric acid. The formation of blue- purple colour indicates the presence of phlobatannins.

Test for Saponins:
Foam test: 0.5 g of extract was shaken with 2ml of water. If foam produced persists for 10 minutes , it indicates the presence of saponins.

Test for Sterols and Triterpenoids:
The extract is treated with few drops of chloroform, acetic anhydride and concentrated sulphuric acid. The formation of reddish pink colour immediately indicates the presence of sterols and triterpenoids.

Test for Tannins:
Gelatin test :To the extract , 1% gelatin solution containing sodium chloride solution was added. Formation of white precipitate indicates the presence of tannins.

Test for quinones:
The extract is treated with concentrated hydrochloric acid, The formation of yellow precipitate indicates the presence of quinones.

Test for oxalates :
The extract is treated with glacial acetic acid. The formation of greenish black colour indicates the presence of oxalates.

Test for Treterpenoids :
Sankowski's test : The extract is treated with 1 ml of chloroform and concentratedSulphuric acid.The formation of reddish brown precipitate indicates the presence of treterpenoids.

Extraction Results :

Extract	Colour under visible light	Colour under UV light	Texture
Water + Powdered leaves	Mustard Yellow	Light gray	Dry, Shiny appearance
Ethanol + Powdered leaves	Peacock Green	Dark Pink	Completely Dry
Chloroform + Powdered leaves.	Brown	Dark Pink	Sticky

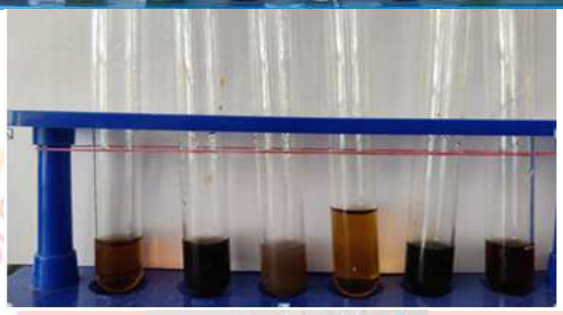
Phytochemical Screening Tests And Results :

TESTS	DIFFERNET SOLVENTS		
PHYTOCHEMICALS	**AQUEOUS**	**ETHANOL**	**CHLOROFORM**
ALKALOIDS	-		-
CARBOHYDRATE	+++	++	-
CARDIAC GLYCOSIDES	+++	++	-
FLAVANOIDS	-	+	-
PHENOLS	+++	+++	-
PHLOBATANNINS	+	+	-
STEROLS AND TRETERPHENOIDS	+	++	-
TANNINS	+++	++	-
QUINONES	-	+	-
OXALATES	+	-	-
SAPONINS	+	-	-
TERPENOIDS	+++	+	-

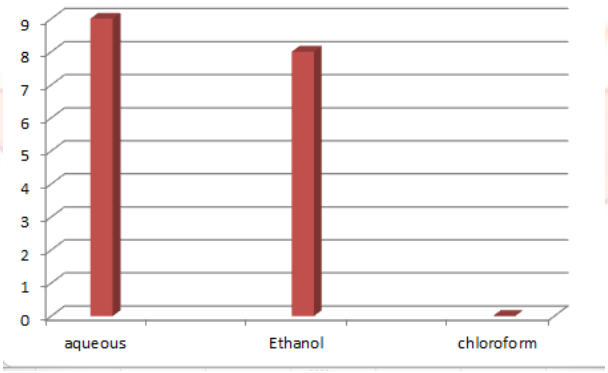
(" +++ ") : Phytochemicals present in high quantity.
("++ ") : Phytochemicals present in medium quantity.
(" + ") : Phytochemicals present in low quantity.
(" – ") : Absence of Phytochemicals.

Results:

The results for preliminary phytochemical screening of various extracts of the leaves are given in the table such as alkaloids, Carbohydrate, Cardiac Glycosides, Flavanoids, Phenols, Saponnins, sterols and triterpinoids, Tannis, Terpenoids, Quinones, Oxalates and phlobatannins. The extract were carried out phytochemical screening process. Based on the results the yield calculations was made and the percentage of yield was significantly high Aqueous > Ethanol> Chloroform. The phytochemical screening was conducted for twelve phytochemicals.Carbohydrate, Cardiac glycosides, Phenols, Strerols, Tannins and Terpenoids were found in high quantites. The presence of phytochemicals always nil in chloroform extract. The oxalates are completely absent. Flavonoids, Alkaloids, Saponins, Quinones are present in few amounts.



Grphyical Representation of Phytochemical Tests:



In Aqueous extract : High amount of phytochemicals are present.
In Ethanol extract : Medium amount of Phytochemicals are present
In chloroform extract : Absence of Phytochemicals

Discussion:

Phytochemical screening of medicinal plants is very important in identifying newsources of therapeutically and industrially important compounds. Kamboj (2000) stated that the bioactive extract should be standardized on thebasis of phytochemical compounds. It is imperative to initiate an urgent step forscreeningofplantsforsecondarymetabolites.Theresultsofpreliminaryphytochemicalscreening of leaves showed the presence of alkaloids, carbohydrate, cardiac glycoside, flavonoids, phenols ,paleobotanies, Sterols, terpinoids, tannins, quinones, saponins, terpenoids. Many of these phytochemical have different medicinal properties and it is used for making anti-inflammatory agents, anti-microbial agents, antiseptic, etc. Due to the presence of these compounds, the extracts revealed itsmedicinal potential to develop novel therapeutic agents.

Conclusion:

From the phytochemical screening results the carbohydrate, Cardiac glycosides, Phenols, Sterols, Tannins andTriterpenoids are present with high quantitates phytochemicals are consist high anti- inflammatory agents and prevent heart failure also. Anti – Inflammatory agents can reduce redness, swelling and pain in our body and also block certain substances in the body that cause inflammation. So, we can prefer this for making anti-Inflammatory ointment or ayurvedic drugs against inflammation.

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Isolation And Identification Of Bacteria From Local Market Fresh Water Crab *Paratelphusa Jacquemontii* From Amravati District, Maharashtra, India

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Abstract
The present study was conducted to evaluate the hygienic quality and freshness of crab Paratelphusa jacquemontii (Rathbun) through the investigation of the occurrence of bacteria which is an indicator for crab quality. Crabs were collected every week from local crab market. Carapace and gills of the crab was examined. Escherichia coli, Proteus vulgaris, Bacillus subtilis, Klebsiella pneumonia, Pseudomonas aeruginosa, Vibrio parahaemolyticus and Staphylococcus aureus were identified by Biochemical tests (IMViC Tests). The result of this study revealed that raw crab sold in local crab market has high contamination of human pathogenic bacteria, so strongly suggested that there is need for innovative measures to discourage the local population from eating improperly cooked crabs.
Keywords: *P. jacquemontii, Bacterial isolation, Fresh water crab.*

Introduction
Fresh water crab provides high quality protein and it also contains Omega-3 fatty acids that afford potential health benefits. Crab meat contains several essential vitamins and minerals, such as vitamin B12, which is necessary for proper nerve function. These crustaceans are rich in the minerals, zinc and copper, which are important for various vital bodily functions. Consumption of infected crab may cause diseases due to infection or intoxication. Some of these diseases are caused by the microorganisms present on the external surfaces including carapace, gills and the gut of the crab. In water microorganisms are kept away from invading by the normal defense mechanism of crab, when they are alive. Outside the water or on death, the microorganisms or the enzymes they secrete are free to invade or diffuse into the body parts where they react with complex mixture of natural substances present resulting in a well- defined sequence of changes in odoriferous and flavourous compounds. The bacteria present on the crab are normally associated with those found in their natural environment and influenced by the season and the harvesting conditions (ICMSF 2007). The outlined and discussed the hazards and challenges associated with handling crab during farming, capture and the environmental contaminants in seafood that may pose a risk to human health (Yagoub 2009). The quality of the raw crab (fresh or iced) at markets varies so widely that there is an obvious need for developing quality standards. There is no study on Microbial identification of these crabs. Therefore this study was carried out to identify certain microbial analysis to assess the quality and freshness of raw crab (*P.jacquemontii*) sold at a market in Amravati, Maharashtra, India.

Materials and methods
Laboratory analysis
Crab samples
Crabs (P.jacquemontii) were collected from a local crab market in Amravati. Totally 10 numbers of sample animals were collected every week from November 2019 to February 2020. The collected samples were aseptically and immediately transported in a thermal bag to the laboratory and processed within 3 h of acquisition, and samples were kept in the refrigerator (4–8 °C).

Sample preparation
The 10 g of the crab body parts sample was cut with a sterile knife. The cut body parts were crushed into small pieces in a sterile mortar with about 10 ml sterile water. From the crushed sample, 1 ml aliquot volume was measured out and homogenized in a clean, dry sterile beaker containing 9 ml of distilled water giving a 1:10 dilution. This was done for the 10 crab samples.

Isolation and identification bacteria form crab body sample of *P.jacquemontii*
The collected samples were processed in the laboratory according to the standard microbiological methods under complete aseptic conditions. The swabs were inoculated on nutrient agar and incubated at 37 °C under aerobic condition. The isolated bacterial colonies were identified on the basis of their morphological, physiological and biochemical characters. These culture were subjected to various biochemical tests such as gram staining, motility, indole, methyl red, voges proskauer, citrate, Triple sugar ion, oxidase, carbohydrate fermentation, hydrogen sulfide production tests for identification of phosphate solubilizing bacteria using

Bergey's manual of systematic bacteriology (Holt et al.1994). The bacteria such as *E. coli, K. pneumonia, P. vulgaris, B. subtilis, P. aeruginosa, Vibrio parahaemolyticus* and *S. aureus* were isolated from the crab samples.

Results and discussion

In bacteria, bio-oxidation reactions are very important. These reactions help bacteria to provide energy by oxidation of organic substances or by fermentation. Based on these reactions, the bacteria were identified and the results were presented in (Tables: 1, 2, 3, and 4)

Table-1: Bacteria isolated from fresh water crab *P.jacquemontii* purchased on first week of November 2019.

Testing	Microorganisms			
	Escherichia coli	*Vibrio parahaemolyticus*	*Klebsiella pneumonia*	*Pseudomonas aeruginosa*
Gram staining	−	-	−	+
Motility	+	+	−	−
Indole production	+	+	−	+
Methyl red	+	-	−	−
Voges-Proskauer	−	-	+	−
Citrates	−	+	+	+
Triple sugar iron	−	+	−	−
Oxidase	−	+	−	D
Carbohydrate fermentation	+	+	D	D

+: Positive, −: negative, D: different

Table-2: Bacteria isolated from fresh water crab *P.jacquemontii* purchased on first week of December 2019.

Testing	Microorganisms				
	Escherichia coli	*Vibrio parahaemolyticus*	*Klebsiella pneumonia*	*Proteus vulgaris*	*Bacillus subtilis*
Gram staining	−	-	−	−	+
Motility	+	+	−	+	−
Indole production	+	+	−	+	+
Methyl red	+	-	−	+	−
Voges-Proskauer	−	-	+	−	−
Citrates	−	+	+	+	+
Triple sugar iron	−	+	−	+	−
Oxidase	−	+	−	D	D
Carbohydrate fermentation	+	+	D	D	D
Catalase	+	+	+	+	+

+: Positive,−: negative, D: different

Table-3: Bacteria isolated from fresh water crab *P.jacquemontii* purchased on first week of January 2020.

Testing	Microorganisms			
	Escherichia coli	*Vibrio parahaemolyticus*	*Klebsiella pneumonia*	*Proteus vulgaris*
Gram staining	−	-	−	−
Motility	+	+	−	+
Indole production	+	+	−	+
Methyl red	+	-	−	+
Voges-Proskauer	−	-	+	−
Citrates	−	+	+	+

Triple sugar iron	−	+	−	+
Oxidase	−	+	−	D
Carbohydrate fermentation	+	+	D	D
Catalase	+	+	+	+

+: Positive, −: negative, D: different

Table-4: Bacteria isolated from fresh water crab *P.jacquemontii* purchased on first week of February 2020.

Testing	**Microorganisms**				
	Escherichia coli	*Vibrio parahaemolyticus*	*Klebsiella pneumonia*	*Pseudomonas aeruginosa*	*Staphylococcus aureus*
Gram staining	−	-	−	+	+
Motility	+	+	−	−	−
Indole production	+	+	−	+	−
Methyl red	+	-	−	−	−
Voges-Proskauer	−	-	+	−	−
Citrates	−	+	+	+	+
Triple sugar iron	−	+	−	−	−
Oxidase	−	+	−	−	−
Carbohydrate fermentation	+	+	D	D	D
Catalase	+	+	+	+	+

+: Positive, −: negative, D: different

In this study, *E. coli, Vibrio parahaemolyticus ,K. pneumonia, P. vulgaris, B. subtilis, P. aeruginosa* and *S. aureus* were identified from the crab. *E. coli, Vibrio parahaemolyticus* and *K. pneumonia* were found in all the monthly samples (Tables: 1, 2, 3, and 4) Whereas, *B. subtilis* (Tables: 2) and *P. aeruginosa* (Tables: 1 and 3) were identified two times. *P. vulgaris* (Tables: 2 and 3) and *S. aureus* (Tables: 4) was identified. The crabs are highly consumable and prone to vast variations in quality due to differences in species, environmental habitats, and feeding habits. They can also function as carriers of several microbial and other health hazards. Therefore maintenance of quality is most important in production and trade of crab products. Although only a few infectious agents in crab are able to infect humans, some exceptions exist that may result in fatalities. However, the greatest risk to human health due to the consumption of raw or insufficiently processed crabs and crab products. In this study, *E.coli., Vibrio Parahemolyticus,* and *Klebsiella pneumonia* sp. were isolated from all of collected crab samples is of highly importance because this bacterium plays a considerable role as potential pathogenic bacteria for human and as an indicator of food quality as spoilage organism. The consumption of these disease or infected crabs possesses greater health risks than the consumption of apparently healthy ones. The general public and consumers of crabs should therefore ensure that they do not buy or consume disease or injured crabs. Organic materials of any type are suitable foodstuffs for bacteria growth. A case of cholera occurred in a patient in Maryland, who had eaten crab harvested commercially along the Texas coast in October 1984. Findings of *Vibrio sp.* in the tissue of crabs of present studies are considered to be correlated with the epidemiology and transmission of cholera in the aquatic environment.

This is previously mentioned by (Jeyasekaran *et al*. 2006, and Koutsoumanis and Nychas 2000). In this study seven bacterial species were isolated form *P.jacquemontii.* Among the seven bacterial species *E. coli. V. parahaemolyticus* and K. *pneumonia* were found in all the samples and others were not found. Apart from the enteric- organisms, *S. aureus* encountered in this study are known enterotoxin producing agent and a microorganism which is poisonous. This is in agreement with the previous study by some authors in Nigeria and outside Nigeria (Okonko et. al.2008, 2009).

The results from this study and according to published microbiological guidelines as cited by (Gilbert et al.1996) suggest that the microbiological quality of the crab examined is unacceptable and pose a potential risk to public health. The diversity of potential pathogens from the samples of crab is of concern particularly at a time when many in our communities are immunologically compromised as a result of various illnesses (Mhango et al.2010). From this investigation, it can be concluded that these characteristics of water bodies are influenced by seasonal variations. It is recommended that the proper maintenance of the captured crabs is

necessary. Proper sanitation measures and environmental education to public care essential to keep these water bodies clean and safe. There is need for innovative measures to discourage the local population from eating improperly cooked crabs.

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Spider's Diversity in Agro-ecosystems of Murtizapur Tahsil, District Akola (Maharashtra State)

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Abstract

Spiders are widespread and diverse predators that are part of terrestrial Arthropod. Spiders are one of the most diverse animal groups in the World. Spiders play an important role as stabilizing agents or regulators of insect populations in agro, forest and other terrestrial ecosystems. Thus their presence in an ecosystem may well influence the population dynamics of other arthropods present. They mostly feed on insects, even though they may also feed on various other kinds of prey. Spider's predatory capacity can have an effect in decreasing densities of insect pests, when they are used to balance the effect of insecticides and Pesticides. If pesticides are avoided, spiders can invariably take shelter in the fields, feed on the pests and increase the productivity. The role of spiders as generalist predator in an agroecosystems is well recognized.

Spider species abundance in agro-ecosystem can be high as undisturbed natural ecosystem. Spiders act as pest control creature, which feeds on crop destructive insects. Spiders are beneficial bio-control agent of insect pest in agro-ecosystem. A survey of Spiders was carried out in Agro-ecosystems of Murtizapur, District Akola, during November 2020 to November 2021 in the present study I have reported 148 species of Spiders belonging to 13 Families and 65 genera. Spiders of Families ARANEIDAE, CLUBIONIDAE, ERESIDAE, GNAPHOSIDAE, LYCOSIDAE, OECOBIIDAE, OXYOPIDAE, SALTICIDAE, SPARASSIDAE, TETRAGNATHIDAE, THERIDIIDAE, THOMISIDAE, and ULOBORIDAE were recorded during the investigation.

Keywords: *Diversity, Agro-ecosystems, Spider, Murtizapur.*

Introduction

Spiders are among the most abundant insectivorous predators of Terrestrial ecosystem. Biodiversity can be simply defined as the variety of all types of living organism. Spiders are among the most diverge group on earth, which received the sixth ranking in global diversity after the sixth largest insect orders. Spiders belonging to the order Araneae, which is one of the major group of creature Spiders are one of the most important Arthropods group in agroecosystems. They colonize almost all habitats and have great ability in resisting to adverse ecological conditions. Spiders are carnivorous creature. Spiders are among the most abundant predators of insects of terrestrial agro-ecosystem.

Spider species abundance in agro-ecosystem can be high as undisturbed natural ecosystem. Spiders act as pest control creature, which feeds on crop destructive insects. Spiders are beneficial bio-control agent of insect pest in agro-ecosystem. A survey of Spiders was carried out in Agro-ecosystems of Murtizapur Tahsil, district Akola. Spiders act as natural biological control agent in ecosystem. Some recent workers on Indian spiders include Majumdar and Tikader (1991), Reddy and Patel (1992), Biswas and Biswas (1992), Sadana and Goel (1995), Biswas et al. (1996), Gajbe, U. A. (1999), Biswas and Majumdar (2000), Biswas B. and K. Biswas (2003).

Material and Method:

Study Area:

Murtizapur is located between N20.73° and E77.51° with an elevation on 308 meters. Summer is hot temperate as compared to other Vidarbha regions. The annual rainfall averages 700 mm. The area receives rainfall during southwest monsoon. Average temperature of the district ranges from minimum of 10°C in winter to a maximum of 45°C in summer with the relative humidity varying from 10-17% to 60-90%.

The spider inventory studies were conducted from November 2020 to November 2021 in the ten different localities of Murtizapur, Akola district from Maharashtra state. I have selected Ten microhabitats for observations in the study area viz; agricultural land.

Sampling methods:

Spider Inventory work was conducted at the agro-ecosystems by different groups of workers. Four surveys were conducted per season at all study sites. Five 30 x 30 m quadrates were taken for extensive surveys. All surveys were conducted in the morning hours between 7:00 am to 9:00 am Spiders were collected by adopting standard sampling techniques as described below.

1. Sweep netting: Spiders from herbaceous-shrub-small tree vegetation were collected using standardized insect-collecting net. This method is used to collect the foliage spider by this method from herbs and shrubs.
2. Active searching: Spiders from all three layers were collected using this method. In this method spider specimens were actively searched for 30 minutes per quadrat for active searching.

3. Beating sheets: Spiders from trees and woody shrubs were dislodged and collected on a sheet by beating trees and shrubs with a standard stick 10 beats per tree or shrub were employed in each quadrat.
4. Litter Sampling: Litter i.e. deciduate from the ground was collected by hand and was put in big tray. Litter sampling involved in sorting of spiders.
Collected spiders were photographed in life and later preserved in 70% ethyl alcohol. Identification: Spiders were observed using dissecting stereo zoom microscopes for studying identification keys. All specimens were initially separated from other material and identified to the family level. Spiders were identified upto species level using the standard monographs, Majumder S.C. and Tikader B. K. (1991).

Result:

During the present survey, I have reported 148 species of Spiders belonging to 13 Families and 65 Genera. Spiders of Families ARANEIDAE, CLUBIONIDAE, ERESIDAE, GNAPHOSIDAE, LYCOSIDAE, OECOBIIDAE, OXYOPIDAE, SALTICIDAE, SPARASSIDAE, TETRAGNATHIDAE, THERIDIIDAE, THOMISIDAE and ULOBORIDAE were recorded during November 2020 to November 2021 in my investigation.

Table 1: Checklist of Spider fauna from Agro-ecosystems of Murtizapur in Akola district of Maharashtra State

Sr. No.	Family	Species	Common Name of Spiders	Habitat
01	ARANEIDAE(42)	*Araneus cucurbitinus* ♀	Orb Weaver	Cotton Field
02		*Araneus cucurbitinus* ♂	Orb Weaver	Cotton Field
03		*Araneus mitifica* (Simon) ♀	Orb Weaver	Cotton Field
04		*Araneus mitifica* (Simon) ♂	Orb Weaver	Cotton Field
05		*Araneus pachganiensis* ♀	Orb Weaver	Cotton Field
06		*Araneus pahalgaonensis* ♀	Orb Weaver	Cotton Field
07		*Argiope aemula* ♀	Orb Weaver	Cotton Field
08		*Argiope aemula* ♂	Orb Weaver	Cotton Field
09		*Chorizopes anjanes* ♂	Orb Weaver	Cotton Field
10		*Chorizopes anjanes* ♀	Orb Weaver	Cotton Field
11		*Chorizopes calciope* ♀	Orb Weaver	Cotton Field
12		*Chorizopes calciope* ♂	Orb Weaver	Cotton Field
13		*Cyclosa bifida* (Doleschall)♀	Orb Weaver	Cotton Field
14		*Cyclosa bifida* (Doleschall)♂	Orb Weaver	Cotton Field
15		*Cyclosa confraga* (Thorell)♀	Orb Weaver	Cotton Field
16		*Cyclosa confraga* (Thorell)♂	Orb Weaver	Cotton Field
17		*Cyclosa fissicauda Simon* ♀	Orb Weaver	Sunflower Field
18		*Cyclosa fissicauda Simon* ♂	Orb Weaver	Sunflower Field
19		*Cyclosa insulana* (Costa) ♂	Orb Weaver	Sunflower Field
20		*Cyclosa insulana* (Costa) ♀	Orb Weaver	Sunflower Field
21		*Cyclosa moonduensis* ♀	Orb Weaver	Sunflower Field
22		*Cyclosa moonduensis* ♂	Orb Weaver	Sunflower Field
23		*Cyclosa mulmeinensis* ♀	Orb Weaver	Sunflower Field
24		*Cyclosa mulmeinensis* ♂	Orb Weaver	Sunflower Field
25		*Cyclosa neilensis* Tikader ♀	Orb Weaver	Papaya Field
26		*Cyclosa neilensis* Tikader ♂	Orb Weaver	Papaya Field
27		*Cyclosa simoni* ♀	Orb Weaver	Papaya Field
28		*Cyclosa simoni* ♂	Orb Weaver	Papaya Field
29		*Cyrtophora bidenta* ♀	Orb Weaver	Cotton Field
30		*Cyrtophora bidenta* ♂	Orb Weaver	Cotton Field
31		*Cyrtophora cicatrosa* ♀	Orb Weaver	Cotton Field
32		*Cyrtophora cicatrosa* ♂	Orb Weaver	Cotton Field
33		*Cyrtophora citricola* ♀	Orb Weaver	Tur Field
34		*Cyrtophora citricola* ♂	Orb Weaver	Tur Field
35		*Larinia chloris* (Audouin) ♀	Orb Weaver	Tur Field
36		*Larinia chloris* (Audouin) ♂	Orb Weaver	Tur Field

37		*Neoscona achine* ♀	Orb Weaver	Tur Field
38		*Neoscona achine* ♂	Orb Weaver	Tur Field
39		*Neoscona bengalensis* ♀	Orb Weaver	Tur Field
40		*Neoscona nautica* ♀	Orb Weaver	Jawar Field
41		*Neoscona theis* ♀	Orb Weaver	Jawar Field
42		*Zygiella indica* Tikader ♀	Orb Weaver	Jawar Field
43	CLUBIONIDAE(3)	*Clubiona acanthochemis* ♀	Sac Spider	Cotton Field
44		*Clubiona analis* Thorell ♀	Sac Spider	Cotton Field
45		*Clubiona analis* Thorell ♂	Sac Spider	Cotton Field
46	ERESIDAE(2)	*Stegodyphus sarasinorum* ♀	Colonial Spider	Lemon Field
47		*Stegodyphus sarasinorum* ♂	Colonial Spider	Lemon Field
48	GNAPHOSIDAE(8)	*Drassodes lubrica* Simon ♀	Ground dwelling	Cotton Field
49		*Drassodes sagarensis* ♀	Ground dwelling	Cotton Field
50		*Gnaphosa poonaensis* ♀	Ground dwelling	Jawar field
51		*Gnaphosa poonaensis* ♂	Ground dwelling	Jawar field
52		*Sosticus nainitalensis* ♀	Ground dwelling	Jawar field
53		*Sosticus nainitalensis* ♂	Ground	Jawar field
54		*Zelotes poonaensis* ♂	Ground	Cotton Field
55		*Zelotes sajali* Tikader♀	Ground dwelling	Cotton Field
56	LYCOSIDAE(25)	*Hippasa greenalliae* ♀	Wolf Spider	Cotton Field
57		*Hippasa greenalliae* ♂	Wolf Spider	Cotton Field
58		*Hippasa partida* ♂	Wolf Spider	Tur Field
59		*Hippasa pisaurina* Pocock ♀	Wolf Spider	Tur Field
60		*Hippasa pisaurina* Pocock ♂	Wolf Spider	Tur Field
61		*Lycosa barnesi* Gravely ♀	Wolf Spider	Cotton Field
62		*Lycosa bistriata* Gravely ♀	Wolf Spider	Cotton Field
63		*Hippasa partida* ♀	Wolf Spider	Cotton Field
64		*Lycosa choudhuryi* ♀	Wolf Spider	Cotton Field
65		*Lycosa fuscana* Pocock ♀	Wolf Spider	Cotton Field
66		*Lycosa poonaensis* ♀	Wolf Spider	Cotton Field
67		*Lycosa poonaensis* ♂	Wolf Spider	Cotton Field
68		*Lycosa prolifica* Pocock ♀	Wolf Spider	Jawar Field
69		*Pardosa birmanica* Simon ♀	Wolf Spider	Jawar Field
70		*Pardosa birmanica* Simon ♂	Wolf Spider	Jawar Field
71		*Pardosa timida* (Simon) ♀	Wolf Spider	Jawar Field
72		*Pardosa timida* (Simon) ♂	Wolf Spider	Jawar Field
73		*Pardosa minutus* Tikader ♀	Wolf Spider	Cotton Field
74		*Pardosa minutus* Tikader ♂	Wolf Spider	Cotton Field
75		*Pardosa timida* (Simon) ♀	Wolf Spider	Cotton Field
76		*Lycosa fuscana* Pocock ♂	Wolf Spider	Cotton Field
77		*Lycosa barnesi* Gravely ♂	Wolf Spider	Cotton Field
78		*Lycosa bistriata* Gravely♂	Wolf Spider	Cotton Field
79		*Lycosa prolifica* Pocock ♂	Wolf Spider	Cotton Field
80		*Lycosa choudhuryi* ♂	Wolf Spider	Cotton Field
81	OECOBIIDAE(2)	*Oecobius* marathaus ♀	Tiny Spider	Jawr Field
82		*Oecobius* marathaus ♂	Tiny Spider	Jawr Field
83	OXYOPIDAE(13)	*Oxyopes bharatae* Gajbe ♀	Lynx Spider	Cotton Field
84		*Oxyopes biharensis* Gajbe ♀	Lynx Spider	Cotton Field
85		*Oxyopes burmenicus* ♀	Lynx Spider	Cotton Field
86		*Oxyopes chittrae* Tikader ♀	Lynx Spider	Cotton Field
87		*Oxyopes elongatus* Biswas.♀	Lynx Spider	Cotton Field
88		*Oxyopes pankaji* Gajbe ♀	Lynx Spider	Cotton Field

89		*Oxyopes pankaji* Gajbe ♂	Lynx Spider	Cotton Field
90		*Peucetia viridana* ♀	Lynx Spider	Cotton Field
91		*Peucetia viridana* ♂	Lynx Spider	Cotton Field
92		*Oxyopes burmenicus* ♂	Lynx Spider	Jawar Field
93		*Oxyopes chittrae* Tikader ♀	Lynx Spider	Jawar Field
94		*Oxyopes elongatus* Biswas.♀	Lynx Spider	Jawar Field
95		*Oxyopes pankaji* Gajbe ♀	Lynx Spider	Jawar Field
96	SALTICIDAE(23)	*Phidippus pateli* ♂	Jumping Spider	Cotton Field
97		*Marpissa decorata* Tikader♂	Jumping Spider	Cotton Field
98		*Marpissa decorata* Tikader♀	Jumping Spider	Cotton Field
99		*Marpissa dhakuriensis* ♀	Jumping Spider	Tur Field
100		*Myrmarachne maratha* ♀	Jumping Spider	Tur Field
101		*Myrmarachne maratha* ♂	Jumping Spider	Tur Field
102		*Phidippus pateli.* ♀	Jumping Spider	Tur Field
103		*Phidippus paykulli* ♀	Jumping Spider	Tur Field
104		*Plexippus paykullii* ♀	Jumping Spider	Tur Field
105		*Plexippus paykullii* ♂	Jumping	Cotton Field
106		*Rhene indicus* Tikader ♀	Jumping Spider	Cotton Field
107		*Telamonia dimidiata* ♀	Jumping	Cotton Field
108		*Telamonia dimidiata* ♂	Jumping Spider	Cotton Field
109		*Phidippus paykulli* ♂	Jumping Spider	Jawar Field
110		*Rhene indicus* Tikader ♂	Jumping Spider	Jawar Field
111		*Marpissa dhakuriensis* ♂	Jumping Spider	Cotton Field
112		*Phlegra dhakuriensis* ♀.	Jumping Spider	Cotton Field
113		*Salticus ranjitus* Tikader ♂	Jumping Spider	Cotton Field
114		*Thiania* sp. nov. ♂.	Jumping Spider	Cotton Field
115		*Euophrys* sp. nov. ♀.	Jumping Spider	Cotton Field
116		*Harmochirus* sp. nov. ♂.	Jumping Spider	Cotton Field
117		*Harmochirus* sp. nov. ♀.	Jumping Spider	Cotton Field
118		*Salticus ranjitus* Tikader ♀.	Jumping Spider	Cotton Field
119	SPARASSIDAE(2)	*Heteropoda venatoria* ♀	Giant Crab	Cotton Field
120		*Heteropoda venatoria* ♂	Giant Crab	Cotton Field
121	TETRAGNATHIDAE (4)	*Leucauge decorata*♀	Water orb weaver	Tur Field
122		*Leucauge fastigata* ♀	Water orb weaver	Cotton Field
123		*Tetragnatha mandibulata*♀	Water orb weaver	Cotton Field
124		*Tetragnatha mandibulata*♂	Water orb weaver	Cotton Field
125	THERIDIIDAE(4)	*Argyrodes gouri* ♀	Cob web Spider	Papaya Field
126		*Argyrodes gouri* ♂	Cob web Spider	Cotton Field
127		*Theridion manjithar* ♀	Cob web Spider	Cotton Field
128		*Theridion manjithar* ♂	Cob web Spider	Cotton Field
129	THOMISIDAE(17)	*Thomisus pugillis* ♀	Crab Spider	Sunflower Field
130		*Thomisus pugillis* ♂	Crab Spider	Sunflower Field
131		*Thomisus whitakeri* ♀	Crab Spider	Sunflower Field
132		*Tmarus pachpediensis* ♀	Crab Spider	Sunflower Field
133		*Tmarus pachpediensis* ♂	Crab Spider	Sunflower Field
134		*Xysticus jayantius* ♀	Crab Spider	Sunflower Field
135		*Xysticus minutes* ♀	Crab Spider	Sunflower Field
136		*Xysticus minutes* Tikader ♂	Crab Spider	Sunflower Field
137		*Synaema decorata* ♀	Crab Spider	Sunflower Field
138		*Synaema decorata* ♂	Crab Spider	Sunflower Field
139		*Thomisus elongates* ♀	Crab Spider	Sunflower Field
140		*Thomisus elongates* ♂	Crab Spider	Sunflower Field
141		*Thomisus memae* ♀	Crab Spider	Sunflower Field
142		*Thomisus beautifularis*♀	Crab Spider	Sunflower Field

143		*Thomisus pooneus* ♂	Crab Spider	Sunflower Field
144		*Thomisus projectus* ♀	Crab Spider	Sunflower Field
145		*Thomisus projectus* ♂	Crab Spider	Sunflower Field
146	ULOBORIDAE(3)	*Uloborus danolius* ♀	Feather leg Spider	Cotton Field
147		*Uloborus danolius* ♂	Feather leg Spider	Cotton Field
148		*Uloborus khasiensis* ♀	Feather leg Spider	Cotton Field

♀- Female, ♂- Male.

Table 2: Checklist of Spider fauna from Agro-ecosystems of Murtizapur in Akola district of Maharashtra State

Sr. No.	Family	Genera	Species
01	Araneidae	19	42
02	Clubionidae	01	03
03	Eresidae	01	02
04	Gnaphosidae	03	08
05	Lycosidae	12	25
06	Oeceobiidae	01	02
07	Oxyopidae	04	13
08	Saltisidae	11	23
09	Sparassidae	01	02
10	Tetragnathidae	02	04
11	Theridiidae	02	04
12	Thomisidae	07	17
13	Uloboridae	01	03
Total		**65**	**148**

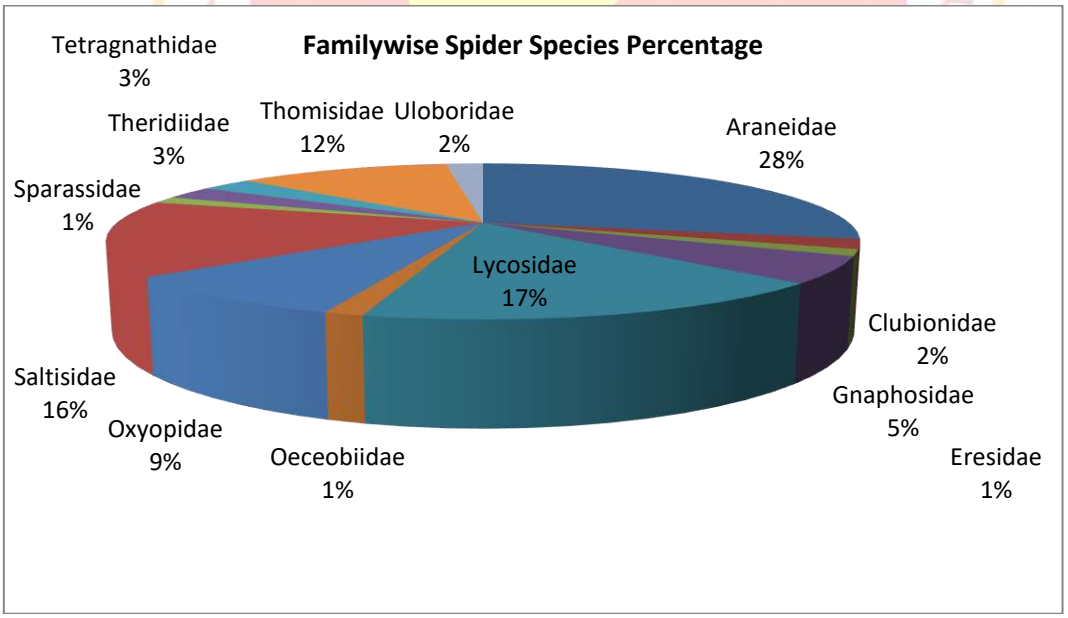

Fig.1. Graph showing Family wise Spider Species Percentage of Agro-ecosystems from Murtizapur, District Akola

Discussion:

In the present study, 148 species of spiders belonging to 65 genera of 13 families in agro-ecosystem of Murtizapur, district Akola collected and identified. These spiders were belonging to the family Araneidae, Clubionidae, Eresidae, Gnaphosidae, Lycosidae, Oecobiidae, Oxyopidae, Salticidae, Sparassidae, Tetragnathidae, Theridiidae, Thomisidae, and Uloboridae. In this study two species of spiders were observed,

one is web weaver and another one is non web weaver. The web weaving spiders were belonging to the family Araneidae, Eresidae, Oecobiidae, Tetragnathidae, Theridiidae, and Uloboridae. The non web weaving spiders were belonging to the family Clubionidae, Gnaphosidae, Lycosidae, Oxyopidae, Salticidae, Sparassidae and Thomisidae. The increase in the spider density suggests that spider density in influenced by the increase in prey density. In particular, the interaction of prey and predator shows a constant numerical interaction about these relationships which is fundamental to biological control.

OrbWeaver(ARANEIDAE)>WolfSpider(LYCOSIDAE)>JumpingSpider(SALTICIDAE)> Crab Spider(THOMISIDAE)> Lynx Spider(OXYOPIDAE)

On the basis of Family wise Spider Species the abundance of the Spider Family are represented respectively. In my investigation I have seen that the abundance of Five Family Spiders species were more. The Orb waver spiders of Family Araneidae and Wolf spiders of Family Lycosidae are widely distributed. The Orb waver spiders of Family Araneidae form web and the insect pest entangled in web spiders feeds on them. The members of family Lycosidae and Salticidae spiders they directly capture the insect pest and feeds on it.

Conclusion:

In my investigation I have studied 148 species belonging to 65 genera of 13 Spider Families during November 2020 to November 2021, on the above result and discussion it is clear that the Spiders are very much important creature. Species abundance of spider in agro-ecosystem can be high. The present work includes the Taxonomic position and list of diversified species of spiders. The major families abundant in this agro-ecosystem are ARANEIDAE 42(28%), LYCOSIDAE 25(17%), SALTICIDAE 23(16%), THOMISIDAE 17(12%) and OXYOPIDAE 13(9%). Spiders are act as good Pest controller. Avoid the regular use of pesticides in agricultural fields which decreases the spider populations, so species abundance of spider in agro-ecosystem can be high. Spiders are beneficial bio-control agent of insect pest in agro-ecosystem.

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Flowering Phenology and Histochemical Analysis of Cotton Varieties

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Abstract:

Phenology is the study of timing of vegetative activities, flowering and fruiting and their relationships to environmental factors."Flowering Phenology" refers to the seasonal timing of flowering. Another event under phenology is opening of flower, anther dehiscence, pollen presentation and stigma receptivity. Flower opening in all cotton varieties starts during 06.45 to 09.45 hours followed by anther dehiscence, which starts, from 07.00 hours depending on the weather conditions. In all selected varieties of cotton, it is observed that the flowering starts during 1st to 19th of September and full blooming was from 9th October to 28th November. In histochemical test, Pollen grains of all the varieties of cotton studied showed the presence of both starch and lipids. Thus the Pollen grains of all cotton varieties belong to the class of starchy pollen as in all varieties it showed positive test.

Keywords: *Cotton varieties, flowers, starch, lipids, phenology.*

Introduction:

Cotton is one of the most commercial crops playing a key role in economic, political and social affairs of the world. Cotton is a tropical and subtropical crop grown on a variety of soil. The predominant types of soil on which the crop is grown are the black cotton soil and red sandy loams to loams found in the state of Gujarat, Maharashtra, Madhya Pradesh, Andhra Pradesh, Karnataka and Tamilnadu. The sowing season of cotton varieties differs considerably in different regions for obtaining maximum yield of cotton. The crop yield is depending on reproductive success of the plant. During the process of reproduction the pollen grains plays very important role. Therefore, the Palynological investigations of cotton varieties H-8, NHH-52, BT-162, LRA-5166, Kaveri Kurnel, Ankur-216, Binni and Ajeet-11 were proposed to undertake for the investigations on flowering phenology, pollen histochemistry. Phenology is the study of timing of vegetative activities, flowering and fruiting and their relationships to environmental factors (Mori and Prance, 2005). "Flowering Phenology" refers to the seasonal timing of flowering.

A phenological record depends on parameter chosen by the various investigators and depends on the research levels, the aim of the research, and the type of analysis. The main events are the timing, duration, sequence, intensity and timing of flowering, which can determined by the physical environment factors like temperature, rainfall and day- length (Dafni, 1992). Plants reproductive characteristic can affect the flowering phenology, mode of seed dispersal and fruiting seed set efficiency. A wide variety of environmental factors may select for one or more reproductive characteristic in plant population (Smith *etal*, 1986) and such factors include seasonal climatic events (Schemske, 1977).

Pollen histochemical analysis are carried out for the following reasons i) possible relation between the pollen content and the mode of pollination ii) study of pollinator foraging behavior, nutritional demands, pollination mode, pollen content and iii) composition in relation to phylogeny (Dafni, 1992). Lipids and starch are important constituents of the pollen grains to establish the relations with flower foragers.

Materials and Methods

For the collection of phenological data of selected cotton varieties, field trips were undertaken daily or on alternate days. Events and the changes of the single flower are recorded to study the flowering phenology in relation to geographical (latitudinal and altitudinal) and climatic variables, the time and duration of pollen exposure and the interrelations among environmental variables (temperature and humidity) and flower development were noted.

Plants were observed from the beginning of flowering stage up to the opening of last flower. Flowering period was taken as the period from the opening of first flower up to the opening of last flower. The timing of onset, progress, termination and blooming of selected varieties under study were noted.

For the histochemical tests fresh and mature pollen grains were collected from freshly dehisced anthers. For the test of starch method proposed by Baker and Baker (1979) was followed. Pollen samples were immersed in to IKI solution and examined under the microscope for the change in colour. Dark bluish-black color indicates the presence of starch. For the estimation of lipids pollen sample were kept in freshly prepared stock solution of Sudan IV and treated pollen sample was observed under microscope within 2-3 minute to note the change in colour. A red color indicates the presence of lipid (Baker and Baker, 1983).

Observation:

In all selected varieties of cotton, it is observed that the flowering starts during 1st to 19th of September and full blooming was from 9th October to 28th November. Full blooming in all cotton varieties was observed when the temperature was in the range of 23^0C to 30^0C The range of % humidity during full bloom period was 74.6 to 82.0 and 55.4 to 87.7. In all varieties the flowering stands to terminate towards the end of month of December .

Flower opening in all varieties starts during 06.45 to 09.45 hours depending on the weather conditions. During cloudy and rainy days flowers starts to open after 07.30 hours depending on prevailing temperature. The anther dehiscence in all varieties was observed during 07.00 to 08.30 hours. The stigmas become receptive before anther dehiscence. The stigmas were viscid and shiny and remained receptive for about 8 hrs. After 03.00 hours it become blackish in colour indicating loss of receptivity. The opened flowers start to withered by the evening on same day.

At the full bloom time the plants of cotton variety Ajeet-11 were with maximum height of 111 cm having up to 150 leaves per plant, however, in Ankur-651 height was 72 cm with 80 leaves. The number of leaves, more or less correlates with the height of plant. For each variety parameters like height, number of leaves, number of balls, number of flowers open per day, and number of anthers per flower showed variations for each parameter.

From the histochemical tests it was noted that the pollen grains of all cotton varieties contains starch and lipids.

Conclusions:

In all selected varieties of cotton, it is observed that the flowering starts during 1st to 19th of September and full blooming was from 9th October to 28th November. Full blooming in all cotton varieties was observed when the temperature was in the range of 23^0C to 30^0C. The range of % humidity during full bloom period was 74.6 to 82.0 and 55.4 to 87.7 In all varieties the flowering stands to terminate towards the end of month of December.

Flower opening in all varieties starts during 06.45 to 09.45 hours depending on the weather conditions. During cloudy and rainy days flowers starts to open after 07.30 hours depending on prevailing temperature. The anther dehiscence in all varieties was observed during 07.00 to 08.30 hours. The stigmas become receptive before anther dehiscence. The stigmas were viscid and shiny and remained receptive for about 8 hrs. After 03.00 hours it become blackish in colour indicating loss of receptivity. The opened flowers start to withered by the evening on same day.

From the observations on flowering phenology, it is noticed that the flowering phenology is related with seasonal variations and environmental conditions and has an impact of different environmental factors.

From the histochemical tests it was noted that the pollen grains of all cotton varieties contains starch and lipids. Pollen histochemistry is possibly related to pollination mode, pollinator foraging behavior and phylogeny. The nutritive value of pollen also influences the behaviour of flower visitors.

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Phytochemical Screening for Secondary Metabolites from Medicinal Plants of Wan Sanctuary, Akot Wildlife Division,(M.S.)

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Abstract

Phytochemical screening of secondary metabolites in some selected medicinal plants of Wan Sanctuary of Akot Wildlife Division was carried out for to know the presence of medicinally important chemical compounds in the plants. The conventional medicines involve the leaf extracts of various plants having different bioactive compounds which work in the curing of various health problems. Qualitative phytochemical screening of these selected medicinal plants helps to know the presence of different chemicals like phenols, alkaloids, tannins, saponins, anthocyanin,leuco-anthocynin and steroids. By knowing the presence of such different secondary metabolites in plants, these plants will be used for the extraction and isolation of phytochemicals which is use in the curing of various health problems.

Key words- *Phytochemical screening; Bio-active compounds; Medicinal plants; Secondary Metabolites*

Introduction:

From the ancient time Phytomedicenes are extracted from different parts of Plant are popularly used by local communities for cure from various health problemsin last few years our interest has been increases in the study of conventional medicine in all over the world. So that the countries have look around for cooperation in investigation and identification of safe positive components used in conventional medicine. [1]

According to World Health Organization (WHO), medicinal plants would be the best source to obtain variety of medicines. About 80% of individuals from developed countries use traditional medicines, which has compounds derived from medicinal plants. However, such plants should be investigated to better understand their properties, safety, and efficiency [2]almost 95% of the prescriptions in our India have been reported to be plant based phytomedicines in the traditional systems of Unani, Ayurveda, Homeopathy and Siddha. [3-4]

Plants can produce different kind of natural products also known as primary metabolites and secondary metabolites they induced effects on other organisms. The primary metabolites are amino acids, simple sugars (glucosides), proteins and lipids are involved in cellular processes. Secondary metabolites are chemically active compounds i.e. (Phenols, flavonoids, alkaloids, steroids, terpenoids, saponins, etc.), which are produced in the response of various kind of stresses with complexity in structure and distributions are more restrictedly than the primary metabolites.[5]

From the ancient time Phytomedicenes are extracted from different parts of Plant are popularly used by local communities for cure from various health problems. These can be obtained from different parts of the plant like bark, stem, leaves, flowers, fruits, seeds, etc. i.e. the bioactive compounds are present in any part of the plant. Such phytochemical screenings of different plants or from the different regions are reported by many researchers and determine the presence of primary and secondary metabolites in plants. They explore the plants in nature for the search of novel medicines, the number of plant having the medicinal components which are therapeutically used in the curing of various health problems. [6 - 7]

Materials And Methods:

Collection and Identification: The dust free and microbes free fresh leaves of 15 different plant species were collected from Wan Sanctuary, Akot Wildlife Disvision (M.S.). Taxonomic identification of plants was carried out by using publishedfloras.

Extraction: The leaves of 15 selected Plants listed in Table 1 were thoroughly washed 3-4 times in running tap water, and then the leaves are shade dried. After complete shade drying, the leaves were grinded in mixer; the powder was stored in small polyethene bags. The powdered material of 5gm was taken by weighing balance and crushed in 50 ml of distilled water then boiled at 50-60˚ C for 30 – 40 minutes in water bath and filtered through Whatman No. 1 filter paper. The filtrate was centrifuged at 2800 rpm for 10 minutes then the filtrate was stored in sterile bottle in deep freezer at 5ºC for further use. The plants studied are listed below in Table 1.

Table 1: Selected Medicinal Plants for Phytochemical Screening.

Sr. No.	Botanical Name	Family	Common Name
1.	*Alstoniascholaris* L.	Apocynaceae	Devil tree
2.	*Oxalis corniculata* L.	Oxalidaceae	Yellow wood sorrel
3.	*Vitexnegundo* L.	Verbenaceae	Five leaved chaste tree

4.	*Polyalthialongifolia* (Sonn)	Anonaceae	Thwaites False ashoka
5.	*Terminalia catappa* Linn.	Combretaceae	Indian almond leaf
6.	*Sizygiumcuminum* L.	Myrtaceae	Jamun
7.	*Achyranthisaspera* L.	Amaranthaceae	Chaff-flower
8.	*Murrayakoenighii* L.	Rustaceae	Curry leaf
9.	*Wedelleawallichi* L.	Asteraceae	Wedellea
10.	*Lantana camara* L.	Verbenaceae	Lantana or wild saga
11.	*Ficusreligiosa* L.	Moraceae	Peepal tree
12.	*Cassia fistula* L.	Caesalpinaceae	Golden shower
13.	*Vernoniacinerea* L.	Asteraceae	Dandotapala, sadodi
14.	*Tinosporacardifolia* (Willd.) Miers.	Menispermaceae	Giloy
15.	*Catharanthusroseus* L.	Apocynaceae	Sadabahar

Phytochemical screening: Preliminary phytochemical screening (qualitative) was carried out by using following methods:

Terpenoids: 2ml of leaf extract was added to 2ml of acetic anhydride and concentrated H2SO4. The blue, green ring is form which shows the presence of terpenoids.[8]

Tannins: 2ml of the leaf extract was added a few drop of 1% lead acetate. A yellowish colour precipitate is formed which shows the presence of tannins.[9]

Saponins: 5ml of leaf extract was mixed with 20 ml dist. water and continuously shake it for 15 min. the foam is form which shows the presence of saponins.[10]

Anthocyanins: 2ml of leaf extract is added to 2 ml of 2N HCL and ammonia. The pink-red colour change to blue-violetcolor which showsthe presence of anthocyanins.[11]

Leucoanthocyanins: 5ml of leaf extract added to isoamyl alcohol. Formation of red colour Upper layer shows the presence of leucoanthocyanins.[11]

Steroids: 1ml of leaf extract was dissolved in 10ml of concentrated sulphuric acid and equal volume of chloroform was added by sides of the test tube. The upper layer turns red in colour and sulphuric acid layer showed the yellow with green fluorescence. Which shows the presence of steroids.[12]

Results And Discussion:

Preliminary Screening of Secondary Metabolites (Qualitative) - The phytochemical screening and qualitative analysis of 15 selected medicinal plants showed the presence of Terpinoides, Tannins, Saponins, Anthocyanins, Leucoanthocyanins and Steroids in leaves (Table 2).

Table 2: Result of the Phytochemical Analysis of 15 Selected Medicinal Plants

Sr. No.	Name of plant	Terpinoi-des	Tannins	Saponins	Antho-cyanins	Leucoantho-cyanins	Steroids
1.	*Alstoniascholaris* L.	-	-	-	-	-	+
2.	*Oxalis corniculata* L.	-	+	-	-	-	-
3.	*Vitexnegundo* L.	-	+	+	-	-	+
4.	*Polyalthialongifolia* (Sonn)	+	-	-	-	-	+
5.	*Terminalia catappa* Linn.	-	+	+	-	+	+
6.	*Sizygiumcuminum* L.	+	+	+	-	-	+
7.	*Achyranthisaspera* L.	+	+	+	+	-	+
8.	*Murrayakoenighii* L.	+	+	+	+	-	+
9.	*Wedelleawallichi* L.	-	-	-	+	-	+
10.	*Lantana camara* L.	-	+	+	-	-	+
11.	*Ficusreligiosa* L.	+	+	+	-	-	-
12.	*Cassia fistula* L.	-	+	+	-	-	-
13.	*Vernoniacinerea* L.	+	-	-	-	-	+
14.	*Tinospora cardifolia* (Willd.) Miers.	+	-	-	-	-	+
15.	*Catharanthusroseus* L.	+	+	+	-	+	+

(+ = Present and - = Absent)

Terpenoids are found in 8 plants and Tannins are found in 10 plants out of 15 selected plants. Terpenoids and tannins are mostly used foranti-inflammatory and analgesic activities. Tannins contribute property of astringency i.e faster the healing of wounds and inflamed mucous membrane also inhibited the growth of many bacteria and fungi, viruses and yeast[13 – 14]. Saponins are present in 9 plants out of 15 plants. Saponins have industrial uses as serface active and foaming agent also use in detergent and pesticides and it have many helpfull health effects. Anthocyanins are present in 3plants out of 15 plants and it is use against bacterial and viral infections also it increases the immunity.Leucoanthocyanins are found in only 2 plants out of 15 plants. Steroids are found in 12 plants out of 15 medicinal plants. Steroids are mostly use in pharmaceuticals as aphrodisiac. In most of the plants Terpenoids, tannins, saponins and Steroids are found in the present study.
The presence ofveriuos bioactive compounds shows the medicinal value of those plants.The antioxidants,antibacterial and antifungal properties of various plant extracts have increasing interest in both research and the food industry as they are better than the synthetic components.
The traditional medicinal knowledge is restricted to only few communities so that the phytochemical screenings of medicinal plants are very important in identifying novel sources of therapeutic phytomedicines and industrially important compounds also use in nutraceuticals and pharmaceutical industries.

Conclusions

The plants which are rich source of secondary metabolites are the medicinal plants are widely used in traditional medicine as phytomedicines to cure various ailments. The different extracts of leaves of medicinal plants contained many bioactive chemical constituents including Terpinoides, Tannins, Saponins, Anthocyanins, Leucoanthocyanins and Steroids. The anti-inflammatory, antimicrobial effects can be attributed to the high steroids, tannins, terpenoids, and saponins and present in medicinal plants. It has been used as aphrodisiac, liver tonic, neuroprotecter, astringent, and to treat bronchitis, ulcers, asthma, and insomnia.
While medicinal plants are used in Ayurvedic medicine form ancient time, more clinical and laboratory trials should be conducted to help and support its therapeutic use,which provide strong evidences in search of novel phytomedicines.

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Cestodes Infection In Species *Mastacembelus armatus.*(Histopathological Study) From Nilona Dam, Yavatmal District, M. S.(INDIA)

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Abstract

*The present paper is discussion on histopathological study of cestode infection in species **Mastacembelus armatus** from Nilona Dam, Yavatmal District, M. S. India .Nilona Dam is situated in Akola Bazar road, Sawargaon, Yavatmal, District, Maharashtra 445002. The size of the area is about 5.99 square kilometer. The fish **Mastacembelus armatus** [Lecepede, 1800] Examined for gastrointestinal Ptychobothridian cestode parasitic infections. The histopathological study of the fish tissues shows huge damages caused by the tapeworm .loss of host include destruction and extrusion of the intestinal villi, fibroblast cell and plasma cell. Farther observation shows in T.S. of intestinal tissue showed that cestodes attached to mucosal, sub-mucosal and muscularis mucosa of intestine with scolex and damaged host intestinal villi, invaded deep forming cyst. Cestode Parasite derives nutritive material, required for growth, from host tissue by causing damage to it. Tape worm have also been found to infect many other freshwater fishes and cause pathological effects on the host as irritation, injury or atrophy of tissues and occlusions of alimentary canal, blood vessels or other ducts. Hence author has been needed to study on parasitism.*

***Keywords**: - Histopathology, Mastacembelus armatus, Nilona Dam, Tape worm, Parasitism.*

Introduction

Fishes are playing an important role in nation's economy. As a nutritional point of view, fishes give high content of proteins to us, it said to be Gold in water, earlier study the pathogenicity of cestode adjacent various order described by (Rees, G. in 1967) study of host parasite relationship described in fishes (Mcvicar 1972) Acanthobothrium, Phllobothrium, Echinobothrium, (Murlidhar and Shinde 1987) observed histopathology of ***Acanthobothrium uncinathum*** from the fish ***Rhynchobatus ajeddensis*** (Borucinska and Caira, 1993) Subsequently described the histopathogenicity of two adult Trypanorhynchs from the muscosa of the nurse shark. Never the less quit of few reports on the pathogenicity of cestode on fishes are available i.e. (Sinde1970, Bylund 1972).

The present research work deals with the study of histopathology of Ptychobothridian cestode *Circumoncobothrium chandrabhagae* n.sp. Intestinal tape worm of host ***Mastacembelus armatus.*** Parasites affect the productivity of the fish in the systems through mortalities, by decreasing growth rate, reducing the quality of the flesh and making the hosts more susceptible to more pathogens. It is concluded that the ***Circumoncobothrium chandrabhagae*** **n.sp.** Cestode contact with host tissue and utilize the nutritive material to the favorable for its nourishment and growth from the host tissue and make host weak affecting the growth of host causing damage to intestinal tissue of host.

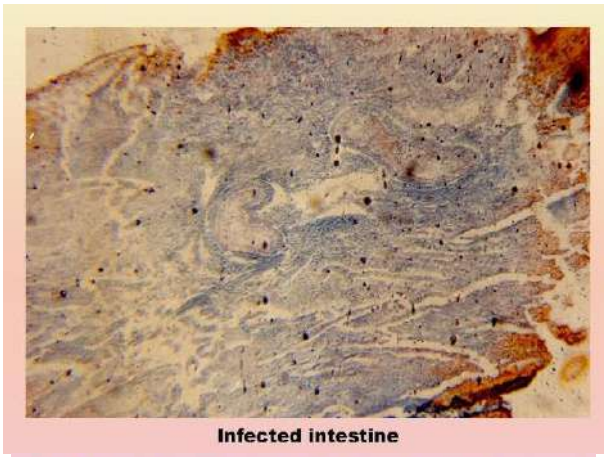
Material And Methods

The histopathological study, ***Mastacembelus armatus*** of freshwater fishes were collected from local fisherman of Nilona Dam, Yavatmal District. M. S. India. These fishes were brought to the laboratory, dissected out the intestine, examined for the cestode infections. Some fishes were found to be infected whereas few were not. Both infected and normal hosts intestine were cut and fixed in **Bouin's fluid** to study histopathological changes. The fixative inhibits the post mortem changes of the tissues. Then tissues were washed, dehydrated through alcoholic grades, cleared in **xylene** and embedded in **paraffin wax** (58-62°C). The blocks were cut at **7µ** and slides were stained in Eosin and **Haematoxylin** double staining method. Best slides or sections were selected and observed under the microscope for histopathological study. The photomicrographs were taken with the help of camera. These slides were identified by using keys "Systema Helminthum" (Yamaguti, 1956[8]).

Results And Discussion

After histopathological observational study indicate that some of the intestines were found to be infected with cestode parasite. The (Photograph - A) Shows the healthy intestine, in which villi and all layers are clearly observed, While in (Photograph - B) Infected intestine shows that the worm attached to the mucosal layer of intestine and slowly invades to the deeper layers of the host tissue.

A **B**



The tape worm ***Circumoncobothrium chandrabhagae*** **n. sp**. is having

1] Scolex large, triangular.
2] Hooks 26-30 in numbers, arranged in single circle.
3] Neck absent.
4] Mature Segment broader than long, with slightly convex margin
5]Testes 120-130 in numbers, Oval in shape, unevenly distributed.
6] Ovary distinctly bilobed transversely placed at posterior margin of the segment.
7] Vitellaria follicular, small, oval in shape, arranged in two rows on each lateral side of the segment.
Host:- *Mastacemballus armatus* (Lacepede, 1800)
n.sp *C. chandrabhagae* n.sp.

Conclusion:-

The present research work deals with the study of histopathology of Ptychobothridian cestode ***Circumoncobothrium chandrabhagae*** n .sp. Intestinal tape worm of host ***Mastacembelus armatus.*** Parasites affect the productivity of the fish in the systems through mortalities, by decreasing growth rate, reducing the quality of the flesh and making the hosts more susceptible to more pathogens. It is concluded that the ***Circumoncobothrium chandrabhagae*** **n.sp.** Cestode contact with host tissue and utilize the nutritive material to the favorable for its nourishment and growth from the host tissue and make host weak affecting the growth of host causing damage to intestinal tissue of host.

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Spider Fauna from the Cotton Fields of Vitala Village Near Wardha River Pulgaon, India

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Introduction;-

In a faunistical investigation in the Indian cotton fields, the most abundant species were belonged to Clubionidae, Lycosidae, Theridiidae, Thomisidae, Heteropodidae, Araneidae, Oxyopidae and Filistatidae families too. The most population of spiders was in September and October. They were one of the important predators in these fields and they play an important role in cotton pest's control.

Before attempting to assess the role of spiders in suppressing pest populations in a given agricultural situation, there must be available sufficient information on their taxonomic diversity and abundance habitat preferences in space and time, hunting strategy, body size of species, predators and prey items and the rate of their consumption, and reproduction. Information on these aspects is essential for the formulations of ecological concepts and conclusions (Berry, 1970; Horner & Starks, 1972).

Because of their high abundance and predominantly insectivorous feeding habits, spiders are suspected to play an important predatory role in agroecosystems, woodlands, and other terrestrial ecosystems (Nyffeler and Benz, 1987; Nyffeler, 2000a,b). They are one of the major groups of generalist predators that are needed in the development of efficient, sustainable, low- input agricultural systems (Ekschmitt et al., 1997).

The population densities and species abundance of spider communities in agricultural fields can be as high as in natural ecosystems. Spiders are important predators of pests on cotton, rice, apple, banana, citrus, soybean, and various other crops and plantations. The use of spiders as biological control agents depends mainly on the conservation and increases in numbers through the use of agricultural practices such as selective spraying rather than on mass rearing and release. The extent, to which spiders can contribute to agricultural pest control, is however limited by the disruptive effect of insecticide applications. The selective use of pesticides to prevent elimination of natural enemies; restricting insecticide usage during crucial periods in the life cycle of the pest; limiting spray application to midday when spiders are less active and shelter; application of pesticides as spot treatments to permit spiders to recolonize in treated areas immediately are important to conserve the predator spiders.

Materials and Methods: Study Area:

In the district Wardha, a village Pulgaon is located at 20°43′34″N to 78°19′01″E at an elevation of 935 ft. A village Pulgaon is well associated with many small villages with dry deciduous forest area. A Pulgaon is well known for the Wardha River which passes through the Pulgaon village and provide suitable environment for the cotton based agricultural field. Vitala village is one of the nearer villege from pulgaon with abundant number of Spiders.

Study Period, sampling and identification

The current study was carried out for a period of eight months from August 2018 to March 2019. Sampling was conducted in six months at the randomly selected cotton field.

Spiders were collected by various methods like insect nets, pitfall trap, visual searching, beating, sweeping, and stroking sticks. Sampling was done in each month by plotting the quadrates method i.e. (1sq. m × 1sq.). Attempts were made to carefully scan the leaf litter surface, tree bark, foliage (Including the under – surface of leaves when traces of webs were found) twigs, and branches of the vegetation (up to 1.5m height) along the transect. Specimens from each quadrate were preserved in 75% alcohol in the field and observed under a stereozoom microscope in the laboratory.

Methodology:

To document spider diversity of agriculture ecosystem:

The detailed descriptions of the collection techniques are as follows.

1) Pitfall Trapping -- Pitfalls will be used to trap the ground dwelling spiders. The pitfall traps consists of a 9 cm wide by 10 cm deep plastic jar, one-third filled with 30% ethyl acetate and a few drops of liquid soap/detergent. The pitfall traps will be left open for a period of one week, as this allows maintaining the spider specimens in good condition before processing in the laboratory for their identification.
2) Visual Observation – This method of sampling is used to collect the spiders by visual observation.
3) Ground Hand Collecting – Ground Hand collection involves the collection of spider samples from ground to knee level. This method of sampling is used to collect the spiders, which are found to be visible in the ground, litter, in broken logs, rocks etc.

4) Aerial Hand Collecting – Aerial Hand collection involves the collection of spiders samples from knee level to arm length level. This method accesses web-building and free-living spiders on the foliage and stems of living or dead shrubs, high herbs, tree trunks etc.
5) By visual observation of small webs
6) Preservation and Identification of specimens - Collected adult mature specimens will be photographed, analyzed and then will be transferred to 70% alcohol. All adult specimens will be identified at family, genus and species level. Species will be distinguished by examination of external genitalia. Sexes will be matched by colour pattern and somatic features. Identification will be done on the basis of morphometric characters of various body parts.

Results And Discussion

Collected data representing 10 families, 31 genera and 60 species were recorded from agricultural lands adjoining to the Wardha river. Family Araneidae and Thomisidae forms the dominant group (Table 1). i.e. 17 species in both families with 8 and 6 genera respectively. The large number of Thomisidae and Araneidae species found in this region is due to the availability of flowering plants with the deep vegetation at the border of agricultural and forest area. The Saltisidae represent 12 species and 7 genera. Lycosidae and Tetragnathidae also found in decreasing species number which is due to their specific habitation. The analysis of guild structure (Uetz, et al.,1999) revealed six feeding guilds i.e. orb web weavers, Foliage hunters, Sheet web weavers, Ground runners, Stalkers and Ambushers (Table 1). Orb web weavers constituted the dominant feeding guild representing 33% of the total collection. Stalkers and ground runners represent 20% and 17% respectively.
This study brought out the fact that agricultural fields adjoin to the forest has the potential to maintain the richness of spider diversity in the agricultural fields. This rich diversity of spiders indicate useful indicator for the species richness related to agro-ecosystem (Noss, 1990).

SR. NO.	FAMILY	NUMBER OF GENERA	NUMBER OF SPECIES	GUILD	HABITAT
1	Aranaidae	08	15	Orb web weavers	**Tropical forest, foliage, dry forests, ground.**
2	Clubionidae	01	02	Foliage hunters	**Under stones**
3	Eresidae	01	02	Sheet web weaver	**Tree trunk**
4	Gnaphosidae	03	03	Ground runners	**Stones**
5	Hersiliidae	01	01	Foliage hunters	**Under stones**
6	Lycosidae	04	04	Ground runners	**Dunes**
7	Miturgidae	01	01	Foliage hunters	**Foliage**
8	Oxyopidae	1	6	Stalkers	**-Grass land**
9	Saltisidae	7	10	Stalkers	**Tropical forest**
10	Tetragnathidae	2	5	Orb web weavers	**Low**
11	**Thomisidae**	**2**	**11**	**Ambushers**	**Forest grass, Flowering plants**

Table 1. Total number of families, genera and species of spiders with their guild and habitat collected from agriculture lands of Pulgaon, Maharashtra-India.

Family	Genus/ Species
Araneidae	***Aranus mitifica*- male** ***Aranus cucurbitinus*- female** ***Argiope pradhani*-female *Argiope aemula* -Female** ***Cyclosa hexatubulata*- female *Cyclosa mooduesis*-female *Cyclosa spirifera* -Female *Cyclosa insulana* -Male *Cryptophora citricola*-female *Leucange decorate*-female *Neoscona theis*-female *Neoscona excelsus*-male *Neoscona mukergai*-male *Neoscona rumpfi*- Female *Neoscona nautica* –Male** ***Poltys nagpurensis* -Tikader *Female Zygeilla indica*-female**
Clubionidae	***Clubiona drassodes* Cambridge male**

Eresidae **Gnaphosidae**	***Clubiona tikaderi* female *Callilepis rukminiae* female *Stegodyphus sangivani*- female** ***Stegodyphus mirandus*- Pocock Female** ***Gnaphosa pauriensis* Tikader female**
	***Megamyrmecion ashae* Tikader female *Zelotes chandosiensis* Tikader female *Zelotes mandlaensis* Tikader female**

Table 2. Checklist of spiders collected from agriculture lands of Vitala, Maharashtra-India

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Gymnanthemum amygdalinum (Delile) Sch. Bip. ex Walp (Asteraceae): A new distributional record to Adilabad District of Telangana state, India.

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Abstract

The present paper deals with an addition of new taxa of flowering plant to the Adilabad District of Telangana State. Updated information on nomenclature, correct description and locality is provided. This is a new distributional record for this area.

Key Words:*Gymnanthemum amygdalinum Asteraceae, new distributional record, Adilabad District, Telangana.*

Introduction

The genus *Gymnanthemum* was described by Cassini in 1817 and was transferred to *Vernonia* by Candolle in 1836. Many of the taxonomists *viz*., Bentham (1873), C.B.Clarke (1876), Hook.f. (1881) and Gamble (1921) followed the Candolle treatment since 1986. Later, Robinson and Kahn (1986) and Robinson (1999) resurrected the genus based on the studies of pollen grains, chromosome numbers and chemical compounds. At present the genus is distributed in sub-Saharan Africa, Madagascar, Southern Asia with more than 43 species (Robinson & Funk 2014). Of which 2 species *viz*., *G. extensum* (Wall. ex DC.) Steetz and *G. pectiniforme* (DC.) H. Rob. are distributed in India.

Materials and Methods

During the floristic survey of Adilabad district, collection of an interesting specimen belonging to the family Asteraceae has been collected while going through the cross examination with the other species of *Gymnanthemum,* the specimen identified as *G. amygdalinum*. Scrutiny of literatures revealed that this species has been so far reported from Bihar, Madhya Pradesh, Odisha and West Bengal of North India, **Bhattacharjee *et al.* 2013**, from Warangal district of South India, **Swamy. *et al.* 2015** and **Apurba Kumar Das and C. Sivaperuman,2020.** The critical revise of this specimen and pertinent literatures **(Santapau, 1948, Pullaiah *et al*., 1992;** Martínez's**, 1993; Pullaiah and Chennaiah, 1997; Almeida, 1998; Reddy *et. al*., 2001, Singh & Karthikeyan ,2001, Singh *et. al*., 2001; Raju *et. al*., 2007,**) exposed that the identity of the specimen as *G. amygdalinum.*

The authors concluded it as *Gymnanthemum amygdalinum* which has reports new distributional record for the Adilabad district of Telangana State.

A concise taxonomical description along with phenology, distribution, nomenclature and photographs are provided here. The processed specimen (Voucher No. 289) of the plant is deposited in the Department of Botany, Baliram Patil Arts, Commerce and Science College, Kinwat, Nanded District, Maharashtra, India.

Result and discussion

Taxonomic Description:

The genus *Gymnanthemum* comprises 49 species in the world, genus is commonly distributed in tropical Africa, America, and tropical Asia. In mainland India, the genus is represented by three species *G. extensum* (Wall. ex DC.) Steetz, G. pectiniforme (DC.) H. Rob.

Gymnanthemum amygdalinum(Delile) Sch. Bip. ex Walp., Repert. Bot. Syst. (Walpers) 2: 948. 1843. *Vernonia amygdalina* Delile, Cent. Pl. Afr. Voy. Meroe: 41. 1826; Bhattacharjee *et al.*, Zoo's Print 28(5): 18. 2013. *Keringa amygdalina* (Delile) Raf. Sylva Tellur. 144. 1838. **(Figure-1).**

Large shrubs or small trees to 3-5 m high; branches terete, densely glandular pubescent. Leaves alternate, elliptic, elliptic-lanceolate, ovate, obovate, higly variable, 5-20 x 2-6 cm, cuneately attenuate at base, acuminate, mucronulate rarely obtuse at apex, serrate or entire along margins, adaxial surface dark green when

dry, sparsely puberulent; abaxial surface pale green, glandular, densely puberulent and hairy along veins; lateral veins 5-15 pairs, slightly curved; petioles up to 4.5 cm long, densely puberulent. Inflorescence terminal corymbose panicles, 20 x 15 cm; peduncles densely puberulent and glandular. Heads homogamous, many, 13 x 11 mm; bracteoles 1 or 2, densely puberulent. Involucre campanulate, 6-7 x 6 mm; phyllaries imbricate, 5-seriate, yellowish green with purple tip, concave, 1.2-4 x 0.6-1.2 mm, outer most very short, the inner ones longest, elliptic-oblong, obtuse or rounded at apex, hairy along margins, puberulent above, glabrous- puberulent beneath. Receptacle 2 x 2 mm, flat, foveolate, brown. Florets 16-17 in each capitulum, up to 2 cm long. Corolla creamy-white, 7- 8.5 x 1-1.2 mm, tubular, 5-lobed; lobes 3 x 0.8 mm, rounded at apex. Stamens 5, 5 mm long; filaments glabrous, 2 mm long; anthers 3 x 0.2 mm, sagittate at base, rounded to subacute at apex. Gynoecium 10.5 mm long; ovary 1.5-1.8 x 0.2-0.4 mm, hairy; style 5 mm long, glabrous at base, hairy at apex; stigma subulate, unequal, 3-3.5 mm long, hairy. Achenes 3 mm long, oblong, slightly cuneate at base, 10-ribbed, glandular between the ribs, numerous spreading hairs on the ribs; pappus in 2-series of bristles, white, persistent, outer ones few, *c*. 2 mm long, inner ones *c*. 7 mm long.

Figure No.1*Gymnanthemum amygdalinum.* Habit.,Flowering twigs and Inflorescence.

Flowering & Fruiting: November-April.
Specimens Examined: Old housing board colony, Adilabad District, Telangana State, India.
G.P.S.Location: N "19039'54.91836", E 78031'54.45948"
Collected by: E. Srinivas Reddy and S. R. Shinde on dated 15 December 2020.(Voucher No. 289).
Ethnomedicinal Uses
Two spoons of leaf powder in one glass of milk orally taken for the treatment of diabetes.
The plant is traditionally used in the treatment of diabetes in Africa (Atangwho *et al*. 2012). The plant is also used by the traditional medical practitioners to cure malaria, helminth, laxative, digestion, wounds, appetizer and febrifuge (Ijeh & Ejike 2011).

Acknowledgement

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Investigation on study of wild relatives of grasses and their importance for grazing habitat of wild Herbivores in Tadoba Andhari Tiger Reserve Maharashtra State

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Abstract:

Wild Relatives of grasses are naturally distributed in the grasslands of TadobaAndhari Tiger Reserve, the wild relatives are the parental genera of cultivated crops, the diversity of wild relatives of grasses variable with the change in soil texture and soil ecology , soil physical properties. The important wild relatives of grasses reported fromTadobaAndhari Tiger Reserve are Setariapumilla , Setariaitalica , Sorghum halpens , Panicumscorbiculatum , Oryzaruphipogon , Elusineindica , Panicummilliaceum , Paspalumcanare , Panicumnotatum , PaspalumPaspalodes , Panicumsumatrense , Saccharumspontanium , Sorghum contraversum , Sorghum deccanense , Urochloapanicoides.wild relatives of grasses identification and conservation by seeds collection and enrichment useful to maintain composition of grasslands in Protected Areas. Wild relatives of grasses are nutritive and having good forage value with reference to grazing habitat of wild herbivores and play vital role in grasslands management.

Key Words: *Wild relatives of grasses ,TadobaAndhari Tiger Reserve , grasslands Management and conserve diversity of wild relatives.*

Introduction:

Grasses are one of the largest and most valuable groups of flowering plants, consisting of 610 genera and 10,000 species (Cope, 1982). Clayton and Renvoize (1986) put the total number of grasses in the world about 10,000 species, 651 genera were recognized and assigned numbers indicating their phylogenic status based upon various evidences. It ranks third in number of genera after the Compositeae and Orchidaceae and fifth in number of species after the Compositeae, Orchidaceae, Leguminoseae and Rubiaceae (Good, 1953). Grasses are widespread than any other family of flowering plants. The great adaptability of different species has enabled them to thrive under the most varied conditions. They form the climax vegetation of the semiarid prairies of the American continent, the steppes of Asia and the savannas of Africa. Grasses exceed all other in the importance of its products. It provides food in the form of cereals for man and forage for most animals. Many species of native and introduced grasses are utilized in improved pastures (Salter, 1952).

A grass is taxonomically defined as any species within the large family (Gramineae or Poaceae) of monocotyledonous plants having narrow leaves, hollow stems, and clusters of very small, usually wind-pollinated flowers. Grasses include many varieties of plants grown for food, fodder, and ground cover (Grass 2014). Grasses are often confused with sedges (Cyperaceae family) and reeds (Restionaceae family. However, sedges do not have a leaf sheath and their leaves are attached directly to the culm—a diagram of grass anatomy is provided in Appendix C. The culms of sedges are also angular, while grass culms are circular. The grass family is the fifth largest plant family on earth with over 700 genera and 9700 species. About ten percent of the grass species worldwide can be found in southern and tropical Africa; the major genera of which are Eragrostis, Pentaschistis, Panicum, Sporobolus, Aristida, Digitaria, Stipagrotis, Setaria, Brachiaria, and Hyparrhenia (Van Oudtshoorn 2009).

Almost all animal species and food chains depend on grass because grass occurs across the world and is almost always edible. The groups of animals that depend most directly on grass for food are birds, insects, rodents, and grazers. There are many bird species, such as Quelea finches, the most common bird on earth with a population of over 1.5 billion in Africa alone, that solely eat grass seeds. Grass provides the only food source for seed-eating birds, and the birds play an integral role in seed dispersal. Insects use grass for both food and shelter. Disruption of these grassland ecosystems can cause a dangerous under or overabundance of insect species. Rodents consume grass seeds or the base of the plant where the most nutrients are stored. Grazers have the largest impact on grasslands and typically graze in large herds which makes spatially expansive impact.. Grazers remove old plant material, stimulate new growth, and provide nutrients in the form of manure. Although predators and decomposers are also ultimately dependent on grass species, it is primary consumers- specifically herbivores- that have the biggest causal relationship with grass species. Herbivores and grass species composition are highly interdependent.

Evaluating a Grassland There are four main measures to evaluate a grassland: grazing value, ecological indicator status, succession stage, and perenniality. Several factors that can help conservation managers determine whether their area is providing valuable grazing material. By identifying grass species in the area, grazing value can be determined. Grazing value is defined as the quality and quantity of material from an individual available for grazing (Van Oudtshoorn 2009).

Grasses inhabit the earth in greater abundance than any other comparable group of plants. Some are adapted to warm, humid and tropical climate while others are established in the polar regions, where the growing season is two months or less and direct sunlight is absent for many months of the year. Some are important elements of marsh and swamp vegetation, and other inhabit desert regions where the annual precipitation is 5 inches or less. Even before the time of recorded history, the grains of grasses provided a staple food supply or the human race (Gould, 1968). The members of this group are present in all the conceivable habitats, suitable for growth of plant communities (Mitra and Mukherjee, 2005). Grasses are used as forage for domesticated, wild animals and soil conservation (Gould, 1968).

TadobaAndhari Tiger Reserve Forest Diversity :

"Tadoba" is taken from the name of the god "Tadoba" or "Taru", worshipped by the tribes who live in the dense forests of the Tadoba and Andhari region, while "Andhari" refers to the Andhari river that meanders through the forest.

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.Tadoba National Park and Andhari wildlife sanctuary together form the Tadoba-Andhari Tiger Reserve. The total area of the Tadoba-Andhari tiger reserve is about 1,727 km^2.

Tadoba National Park was established in the year of 1955. Total area of the park is 116.55 Km^2.The Andhari Wildlife Sanctuary was formed in the year 1986. Total area of the Andhari Wildlife Sanctuary is 508.85 Km^2.

Total core area of the tiger reserve is 625.40 Km^2. Total buffer area of the tiger reserve is 1101.60 Km^2. The reserve also includes 32.51 Km2 of protected forest and 14.93 Km2 of other areas.
The monsoon season begins in June; the area receives heavy rainfall during this season (approx.1275 mm) and humidity around 66-70%.

TadobaAndhari TigerReserve is a predominantly southern tropical dry deciduous forest with dense woodlands comprising about eighty seven per cent of the protected area. Teak is the predominant tree species. Other deciduous trees found in this area include ain (crocodilebark), bija, dhauda, salai, semal and tendu. Beheda, hirda, karayagum, mahuamadhuca (cr epe myrtle), palas (flame-of-the-forest, Buteamonosperma) and Lanneacoromandelica (wodier tree). Axlewood (Anogeissuslatifolia, a fire-resistant species), black plum and arjun are some of the other tropical trees that grow in this reserve.

Aside from the keystone species, the Bengal tiger, Tadoba Tiger Reserve is home to ther mammals,including: Indianleopards,sloth bears, gaur, nilgai, dhole, striped hyena, small Indian civet, jungle cats , sambar,barking deer, chital, chausingha and honey badger . Tadoba lake sustains the marsh crocodile,which was once common. Indian star tortoise, Indian cobra and Russel's viper also live in Tadoba.The lake contains a wide variety of water birds, and raptors. 195 species of birds have been recorded, including three endangered species. The grey-headed fish eagle, the crested serpent eagle, and the changeable hawk-eagle are some of the raptors seen in the park.

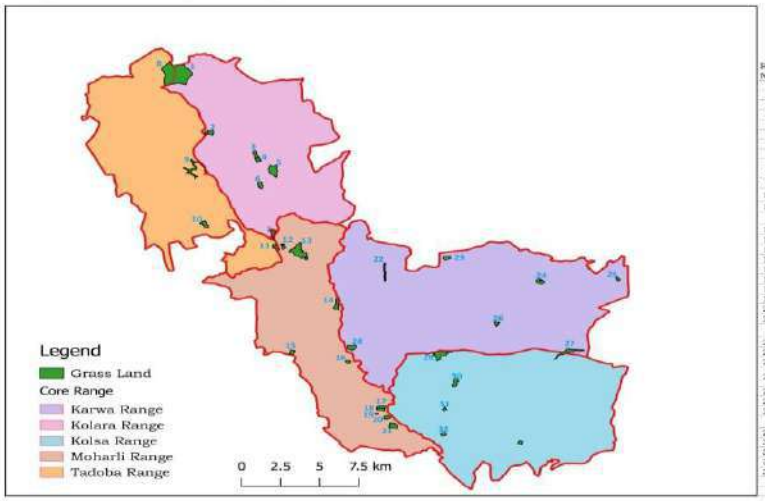
Poaceae is the one of the largest family among the monocotyledons in the world .The grass vegetation broadly divided into two types depending upon their life-span, Ephemeral vegetation consisting mainly of the grasses that complete the life cycle during rainy season or after rainy season. Grasses autumn or long lived vegetation with species that grow with the rains but complete their life-cycle after rains. The species like *Arthraxonlancifolius ,Arundenellapumila, Sporoboluscoromondelianus , Digitariaternata,* are the chief components of farmers category. On the conterary the species like *Heteropogoncontortus ,Andorpogonpumulus , Chrysopogonfulvus , Dicanthiumcaricosum , Setariaforbesiana , Pennisitumhohenackeri* which form the autumn vegetation are either perennial vegetation forming large tufts.

Tadoba-Andhari National Park/Coordinates 20.2484° N, 79.3607° E

Sr. No.	Name of grassland	Area in Hectares
	Kolara Range grasslands	
1	**Navegaon part 1 (Rehabilated Site)**	235 Hectare
2	Kosekanar	10 Hectare
3	Pandharpauni	30 Hectare

4	Jamni**(Rehabilated Site)**	47 Hectare
5	Samadhi	08 Hectare
6	Rampur	12 Hactre
7	Saradh	10 Hectare
	Tadoba Range Grasslands	
1	Navegaon part 2	40 Hectare
2	Tadoba beat Comp. No. 90	33 Hectare
3	Khatoda	10 Hectare
	Mohrli Range Grasslands	
1	Palasgaon (**Rehabilated Site**)	95 Hectare
2	Girghat	58 Hectare
3	Astkoni Com. No. 146	20 Hectare
	Karwa Range	
1	Sukdobodi	10 Hectare
	Kolsa Range Grasslands	
1	Botezari	41 Hectare
2	Kohapari	11 Hectare
	Doni	65 Hectare
	Kolsa (**Rehabilitated village**)	150 Hectare

Map Showing Campa Work Year 2020- 21 in TATR Core area



Sl. No.	Grass Land Name	Area	Actual work done
1	Navegaon Grass Land	235 Ha.	235 Ha.
2	Pandharpauni G. Land	30 Ha.	30 Ha.
3	Saradh Grass Land	10 Ha.	10 Ha.
4	Samadhi Grass Land	8 Ha.	8 Ha.
5	Jamni Grass Land	47 Ha.	47 Ha.
6	Rampur Grass Land	12 Ha.	12 Ha.
7	Kaschmar Grass Land	10 Ha.	10 Ha.
	Kolara Range- Total	**352 Ha.**	**352 Ha.**
8	Navegaon Grass Land Part- 2	40 Ha.	34 Ha.
9	Tadoba beat C.No. 90	33 Ha.	33 Ha.
10	Ghosari Beat C.No. 114	17 Ha.	17 Ha.
11	Khatoda Grass Land	10 Ha.	10 Ha.
	Tadoba Range- Total	**100 Ha.**	**94 Ha.**
12	Palsgaon C. No. 128	10 Ha.	10 Ha.
13	Palasgaon Grass Land	85 Ha.	85 Ha.
14	Astkoni C. No. 146	20 Ha.	20 Ha.
15	Andhari C.No. 150	10 Ha.	10 Ha.
16	Andhari C. No. 151	7 Ha.	7 Ha.
17	Girghat C.No. 157	13 Ha.	13 Ha.
18	Girghat C. No. 157	11 Ha.	11 Ha.
19	Girghat C.No.158	2 Ha.	2 Ha.
20	Girghat C.No.158	12 Ha.	12 Ha.
21	Girghat C.No.158	20 Ha.	20 Ha.
	Moharli Range- Total	**190 Ha.**	**190 Ha.**
22	Karwa-II C.No. 251	10 Ha.	
23	Amanlgaon C.No. 254	10 Ha.	
24	Piparheti-II C.No. 260	15 Ha.	
25	Pandharwani C.No. 267	5 Ha.	32 Ha.
26	Ramtalidhi-I C.No.284	7 Ha.	
27	Sukadi Bodi G. Land	10 Ha.	
28	Zingonal-I C. No. 299	20 Ha.	
	Karwa Range- Total	**146 Ha.**	**32 Ha.**
29	Botezari Grass Land	41 Ha.	
30	Kohapari C.No.311	11 Ha.	
31	Pulsari Lelec G. Land	5 Ha.	32.50 Ha.
32	Panghat Hut Road	6 Ha.	
33	Belan Square C.No.342	6 Ha.	
	Kolsa Range- Total	**69 Ha.**	**32.50 Ha.**
	Grand - Total	**857 Ha.**	**700.5 Ha.**

Objectives :

- Identification and Enumeration of Wild Relatives grasses plants.
- To identify the wild grasses plants from open grasslands with the help of morphological study by using regional floras.
- Exploration of plants from forest areas.
- To determine diversity of wild grass plants and its ecological significance in forest ecosystem.
- Floral association in grassland ecosystem and its role in forest Ecology.
- Phenological study of the wild grasses plants.
- Conservation and propagation of plants.
- In-situ conservation of plants , seed collection and enrichment in grasslands
- Ecological and morphological study of plants

Methodology

- To select the sites /area for the study of wild grasses plants present in forest and grasslands ecosystem of Madhya Pradesh State.
- To arrange the regular field visits in three different seasons of the year, Rainy season , Winter season and Summer season.
- To observe the open grassland with special reference to phytosociology .
- G.P. S. study of grasses plants of Madhya Pradesh.
- Grasses distribution and their ecological and environmental study.

- Ecological significance of grasses in forest ecosystem.
- To prepare the photographic album of wild grasses plants.

Recognising the morphology of plant species

By using regional, local and national floras, the data from the herbarium specimens, the accounts on morphological details, diagnostic characters and range of variation studied. The grasses plants are observed at different stages vegetative and reproductive stages of the plants. The roots are observed from morphological point of view , to study the role of grasses in forest ecology and to modify the texture of soil. Observation of morphological characters under dissecting microscopes and magnifying lens. Study of root, stem , leaf and flowers morphology of the plants in specific season. Identification of grasses plants by using regional floras or national floras. To take the GPS coordinates of the plants at the different sites.

Their identity requires a skill in systematic botany. This is perhaps the reason why wild relatives are meagrely represented in the germplasm collections. The wild relatives of crop plants by and large, occur as component of disturbed habitats within the major vegetation types. The information on their occurrence is available from different herbaria floristic accounts, floras, etc

Use of herbaria

Herbaria with large collections of plant genetic resources including wild relatives of grasses assist the explorers in having an idea about the species diversity of a region. Herbarium field notes and associated data such as root , stem , leaf , flowers , fruits morphology and ecological characters with GPS coordinates seed maturity of wild relatives from the locality of collection help in planning the duration of exploration. Since the herbarium specimens are generally collected during flowering, this information can be considered to be optimal for seed collection.

Collection and Conservation of plants

Observations and collection of plants before approaching for the field collection directly. On spot identification of target species and seed collection, drying storage and broadcasting in different grasslands for the insitu conservation purposes in forest ecosystem or new species to the collection ofvaluablegermplasm of wild species for gene bank conservation.

Collection of Wild Relatives

The collection missions are primarily aimed at tapping germplasm variability in Plant Genetic resources of different agri-horticultural Wild relatives of Grasses in the entire genepool. The germplasm is collected on the basis of priority for collection from targeted regions, and of species. The information on ecological distribution with precise location of species helps in collection of targeted gene pool

Study area : Core area grasslands of TadobaAndhari Tiger Reserve .

1. Palasgaon grassland 2. Navegaon grassland 3. Jamnigrassland 4. Pandharpauni grassland 5. Botezari grassland.

Observations:

Finger Millet (EleusineCoracana (L.) Gaertn.)

Finger millet is commonly known as Ragi . It is a staple food for many people. There are two sub species - E. africana and E. coracana. Eleusine having only one wild relative in Madhya Pradesh Eleusineindica (L.)Gaertn. E. indica is the only wild species widely occurring which is morphologically and cytologically similar to E. coracana (Krishnaswamy,1951). E. indica is of Indian origin and may be the immediate ancestor of finger millet (Mehra, 1963)

Prosomillet (Panicummilaceum L.)andLittleMillet (PanicumSumatrense Roth. ex RoemetSchult.)

Prosomillet is commonly called kodo. It is supposed to be one of the oldest grain crops and is grown extensively in India. It is a quick growing drought resistance crop. It has two sub-species psilopodium and sumatrense.It is classified as race- nana and robusta, sub races-laxa,erecta and compacta. In Madhya Pradesh, Panicum maximum Jacq., P. milare L., P. notatum Retz., P. psilopodiumTrin (related to P. milare), P. repens L., are present. Out of these species, P.psilopodium which is similar to the wild forms of P.sumatrense from which the later species might have originated (Anonymous, 1966).

Kodo Millet (Paspalumscrobiculatum L.)Kodo millet is locally called kodokutki. It has three races viz.,regularis, irregularis and variables. In Madhya Pradesh wild related species, Paspalumcanarae (Steud.) Veldk.,P. paspaloides (Michx.) are present

Foxtail Millet (Setariaitalica (L.) P. beauv)

Foxtail millet is considered to be sweet, is used as a sedative to the gravid uterus.The grain is said to possess heating properties and when taken alone sometimes causes diarrhoea. The grain is astringent, diuretic and laxative and is useful externally in rheumatism. It is a popular remedy for alleviating the pains of

parturition (Kirtikar and Basu, 1935). Foxtail millet is locally called as wild baara. It is also known as Italian millet. Cultivation of foxtail millet dated back to the third millennium BC. S. italica is not known in the wild state except as a weed which escapes from cultivation. S. italica is divided into sub species viridis and italica. S. italica is further classified into three races moharia, maxima and indica, viridis is the ancestral form of S. italica on the basis of chromosome number.

Sugarcane (Saccharumofficinarum L.)

Sugarcane is derived from the sanskrit word shakkara.This crop from the east provides a linguistic evidence of Indian origin of sugarcane. In Madhya Pradesh, many sweet based products are prepared from sugarcane. There is only one wild relative Saccharumspontaneum L. is present in TATR.

Echinochloacolona(L) Link , hort. Berol.2: 209. 1833: Blatt. &McC. Bombay Grass.148.1935; Bor, Grass.Ind.308.1960. *Panicumcolonum* L. Syst. Nat. ed. 10.2:870.1759; Hook.f.Fl.Brit.India 7:32. 1896; Cooke, Fl. Pres. Bombay 3: 447.1958 (Repr. ed.).wildnachanigrass.

Herbs, annual, decumbent- ascending; culms 40-90 cm long, rooting at base. Leaves 3-30 x 0.4-2.0 cm, linear – lanceolate, scabrid,apex acute to acuminate. Racemes spiciform, distant, 5-10, 1.5-2.0 cm long.Spikelets c 0.3 cm long ovoid; lower glume ½ as long as lower lemma, broadly ovate; upper glume cuspidate, hairy; lower lemma ovate, hairy;upper lemma polished. (Plate VI, Fig. 35)

- Palatable grass
- Flowering Season : September – November.
- Fruiting Season : December
- Ecological data : Common weed, best soil binder grass in forest.

Soil pH range required – 7.2 – 7.6

- Rainfall range : 950 mm – 1078 mm.
- Temperature range : 26 ^{o}c – 39 ^{o}c.
- Humidity required : 51 % - 67%.

EleusineGaertn. Fruct. Sem.Pl.1:7.1788

Eleusineindica(L) Gaertn. Fruct.1:8. 1789: Hook.f. Fl. Brit. India 7: 293. 1896; Cooke, Fl. Pres. Bombay 3:560.1958 (Repr.ed.); Blatt.&McC. Bombay Grass. 259. 1935; Bor,Grass. Ind. 493. 1960. *Cynosurusindicus* L. Sp.Pl.72.1753. '*Nachni'*.(WILD NACHANI)

Herbs, annual, erect, tufted c 25 cm high; culms slightly compressed. Leaved 8-12 x 0.2-0.3 cm, linear, flat.Spikes 2-7 or more, 4.0.5-5 cm long.Spikelets c 0.3 cm long, ovoid or oblong, green. Grains oblong or globose.

- Palatable grass
- Flowering Season : September – November.
- Fruiting Season : December
- Ecological data : Sporadic annual grass grows in cultivated soil.

Soil pH range required – 7.2 – 7.6

- Rainfall range : 950 mm – 1078 mm.
- Temperature range : 26 ^{o}c – 39 ^{o}c.
- Humidity required : 51 % - 67%.

Field Note – Grass of dry soil ,non palatable grass found in smaller grasslands.

ORYZA L.Sp. Pl.1:333.1753

OryzarufipogonGriff.Notul.3: 5.1851; Bor, Grass.Bur. Cey.Ind. Pak. 605.1960; Laxmi.in Sharma *et al.* (eds.), Fl. Maharashtra, Monocot. 545. 1996; 151 Moulik, Grass. Bam. India 1: 47. 1997; Naik, Fl. Marathawada 2: 1065. 1998.

Annual, culms 30-70 cm tall, tufted, terete, erect or decumbent, spongy, rooting at lower nodes, nodes glabrous.Leaf sheath 6-09 cm long, tereteorcompressed, keeled, glabrous, smooth. Ligule 15-31 mm long, membranous, Leaf blade 15-30 x 0.6-1.6 mm, flat, linear to ovate, keeled,scabrid on nervesand margins, apex acuminate. Panicles 10-22 cm long.

- Palatable
- Flowering Season : October.
- Fruiting Season : November
- Uses : Seeds edible grass.
- Ecological data : Common in marshy places.

Soil pH range required – 7.1 – 7.5

- Rainfall range : 950 mm – 1180 mm.
- Temperature range : 26 ^{o}c – 39 ^{o}c.

- Humidity required : 68 % - 71%.

PanicumantidotaleRetz. Obs. Bot. 4:17. 1786.Hook.Fl.Brit. India 7: 52. 1896; Cooke , Fl. Pres. Bombay 3:453.1958 (Repr.ed); Blatt.&McC.Bombay Grass.163.1935. Bor,Grass.Ind.322.1960.

Annual erect , diffusely branched, 1-2 mtr tall , creeping , grass. Leaves 10-40 cm long , linear – lanceolate . Panicle 15-22 cm long , Spikelets ovoid.

- Palatable
- Flowering Season : Septeber – November.
- Fruiting Season : December
- Uses : Seeds edible, Best soil binder grass.
- Ecological data : Common in marshy places.

Soil pH range required – 7.1 – 7.5

- Rainfall range : 950 mm – 1000 mm.
- Temperature range : 26 ^{o}c – 39 ^{o}c.
- Humidity required : 68 % - 71%.

Panicum maximumJacq. Ic. Pl.Rar.1:2, t. 13. 1781-86 7 Coll. Bot. 1:76.1786. Hook.Fl.Brit. India 7: 52. 1896; Cooke , Fl. Pres. Bombay 3:453. 1958 (Repr.ed); Blatt.&McC.Bombay Grass.163.1935. Bor,Grass.Ind.322.1960.

Perennial denslytufted , erect , branched, 1-2 mtr tall , grass. Leaves 10-40 cm long , linear – lanceolate . Panicle 30-55 cm long , Spikelets oblong.

- Palatable cultivated grass.
- Flowering Season : November.
- Fruiting Season : December
- Uses : Fodder grass,
- Ecological Data : Common in marshy places.

Soil pH range required – 7.1 – 7.5

- Rainfall range : 950 mm – 1000 mm.
- Temperature range : 26 ^{o}c – 39 ^{o}c.
- Humidity required : 68 % - 71%.

Saccharumspontaneum L. Mant. Alt. 2: 183. 1771. Hook. f. Fl.Brit. India 7: 118. 1896; Cooke , Fl. Pres. Bombay 3:465. 1958 (Repr.ed); Blatt.&McC.Bombay Grass.45.1935. Bor,Grass.Ind.214.1960. **Kans grass Wild relative of Sugarcane**

Perennial rhizomatous tall tufted , 1-2.5 m tall, erect grass. Leaves narrow linear , sheath smooth , ligule ovate.Panicle large , silvery , Spikes with silver hairs, spikelets sessile.

- Palatable grass.
- Flowering Season : October.
- Fruiting Season : December
- Uses : Soil binder grass
- Ecological Data : Distributed in moist, marshy soil along the bank of river.

Soil pH range required – 7.5 – 7.8

- Rainfall range : 950 mm – 1000 mm.
- Temperature range : 28^{o}c – 39 ^{o}c.
- Humidity required : 68 % - 71%.

Field Note – Grass indicator of wet soil with more water holding capacity.

Setariapumila(Poir.) R. & S. Syst. Veg. 2:481.1817; T. A. Cope in Nasir Ali, Fl. Pak.143:181. 1982. Panicumpumilum Poir.in Lam. Encycl. 4:273.1816. Setaria pallid-fusca (Schumach.)Stapf& C.E. Hubb.in Kew Bull.1930: 259.1930; Bor,Grass.Ind.363.1960.S. glauca non (L.)P.Beauv.1812;Hook.f.Fl.Brit.India 7: 78.1960; Cooke,Fl.Pres.Bombay 3: 435.1958 (Repr.ed.); Blatt.&McC.Bombay Grass.172.1935;bor,op.cit.360. 'Kolu'.

Herbs,20-60 cm high,tufted;culmsmany,spreading,ascending.Leaves 3-10 X 0.2-0.5 cm , linear. Spikes 1.5-5.0 X 0.3-0.7 cm. Spikelets 0.2-0.3 cm long, ovoid or ellipsoid, subacute;upper lemma rugose. Grains plano-convex.)

- Palatable grass
- Flowering Season : August – October
- Fruiting Season : December
- Uses : Fodder grass

- Ecological data : Soil pH range required – 7.5 – 7.8
- Rainfall range : 950 mm – 1270 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 68 % - 71%.

Field Note – Annual , palatable grass , grains are edible , grass of smaller grassland , distributed in acidic soil.

Setariaverticillata (L.) P. Beauv. Ess. Agrost.51,178.1812; Hook. f. Fl. Brit.India 7:80.1996; Cooke, Fl.Pres. Bombay 3:436 .1958 (Repr.ed.); Blatt.&McC. Bombay Grass .174.1935; Bor, Grass. Ind. 365.1960. PanicumverticillatumL.Sp.Pl.ed. 2:82.1762. (Chiktnagawat)

Annual herbs, 1m high, erect, rooting at lower nodes.Leaves 8-20 X 1.2-4.0 cm, linear or linear-lanciolate .panicals 2.5-9.5 cm long. Spikelets c 0.2 cm long, ovoid, sub acute ; upper lemma finely rugose. Grains 0.2-0.23 cm long, ellipsoid.

- Palatable grass.
- Flowering Season : August – October
- Fruiting Season : December
- Ecological data : Soil pH range required – 7.5 – 7.8
- Rainfall range : 950 mm – 1270 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 68 % - 71%.

Setariaitalica(L.) P. Beauv. Ess. Agrost.51,170,178.1812; Hook .f.Fl.Brit.India 7:78.1896; Cooke,Fl.Pres.Bombay 3:437.1958 (Repr.ed.); Blatt.&McC. Bombay Grass.175.1935;Bor,Grass.Ind.362.1960.Panicum italicum L.Sp.Pl.56.1753.

Erect annuals,60-100cm tall. Leaves 15-30 X 0.4-2.5 cm, Linear-lanceolate, minutely scaberulous on both sides and along margin.Panicles 8-12 cm long, compact.Spikelets 0.25 cm long, ellipsoid; lower glumes c 0.05 cm long, ovate,1- nerved, upper glumes c 0.15 cm long, ovate, glabrous,rounded**.**

- Palatable grass.
- Flowering Season : August – October
- Fruiting Season : December
- Ecological data : Soil pH range required – 7.5 – 7.8
- Rainfall range : 950 mm – 1270 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 68 % - 71%.

SORGHUM Moench. Methodus207.1794

Sorghum halepense (L.)*Pers.Syn.Pl.1:101.1805;Blatt.&McC.Bombay Grass.5.1953;Bor,Grass.Ind.222.1960; T.A.Cope in Nasir& Ali, Fl. Pak.143: 295.1982. Holcushalepensis L.Sp.Pl.1047.1753. Andropogonhalepensis(L.) Brot.Fl.Lusit.1:89.1804; Hook.f.Fl.Brit. India 7: 182. 1896; Cooke,Fl.Pres. Bombay 3: 502.1958 (repr.ed.).Sorghum miliaceum (Roxb.)Snowden in J. Linn.Soc. 55:207.1955; Bor, op.cit.223. S. miliaceumvar.parvispiculum Snowden,op.cit.209; Bor,op.cit. 'Boru'.(Ran Jawari)*

- Perennial, 3 m high,erect; culms simple or branched, solid.Leaves 10-45 x 1.5 cm, linear-lanceolate; sheaths striate; ligules short,membranous, ciliate.panicles 15-35 cm long,decompounds. Sessile spikelets 0.4-0.5 cm long,ovoid-lanceolate; pedicelledspikelets as long as sessile but narrower.Grainsterete,dark brown.
- *Flowering Season : August – October*
- *Fruiting Season : December*
- *Ecological Data : Soil pH range required – 7.5 – 7.8*
- *Rainfall range : 950 mm – 1270 mm.*
- *Temperature range : 26 °c – 39 °c.*
- *Humidity required : 68 % - 71%.*

Conservation of wild relatives of crops is the most important task to match the challenges of erosion of species. The existence of these wild relatives are shrinking fast due to various bio-edaphic factors and disturbed habitats. In the present rate of threat of genetic erosion, we must collect all requisite information of the wild relatives to make use of their wider adaptability/tolerance/resistance to diseases and insect-pests, yield, quality attributes and other biotic and abiotic characters. In comparison to the cultivated land races, conservation and utilization.

Wild Relatives of Grasses of TadobaAndhari Tiger Reserve

Sr. No.	Botanical Name	Common Name	Vernacular Name	Flowering Season	Fruiting Season
1	Brachiariareptans	Sawa/ sama	Ran Sama	August	Sept. –Oct.
2	Brachiariadistachya	Sama grass	Ran Sama	August	October
3	Setariaintermedia	Chikta	Ran Bajara	August	October
4	Setariaverticellata	Chikta	Ran Bajara	August	October
5	Sorghum halpens	Wild Jawar	Ban Jawar	September	November
6	Echinochloacolona	Wild sama	Ban sama	August	October
7	Elusineindica	Wild Nachani	Ban Nachani	September	November
8	Panicumsumatrense	Wild kutki	Ban Kutki	August	November
9	Panicumnotatum	Wild Kutki	Ban Kutki	September	November
10	Oryzaruphipogon	Wild Rice	Ban Dhan/ Chawal	August	November
11	PaspalumPaspalodes	Wild Kutki	Ban Kutki	kutki	October
12	Paspalumcanare	Wild kodo	Ban Kodo	August	October
13	Saccharumspontanium	Wild Sugarcane	Ganna origin	September	November
14	Setariapumilla	Wild Bajara	Ban Bajara	August	September
15	Urochloapanicoides	Wild Kutki	Ban Kutki	August	October

Diversity in Wild Relatives

- Finger Millet (*Eleusinecoracana*) – *Eleusineafricana*
- Barley (*Hordeumvulgare*) – *Hordeumarizonicum*
- Rice (*Oryzasativa*) – *Oryzarufipogon*
- Pearl Millet (*Pennisetumglaucum*) – *Pennisetumpurpureum*
- Sorghum (*Sorghum bicolor*) – *Sorghum halepense*
- Broom millet (*Panicummiliaceum*) – *Panicumfauriei*

Results and discussion :

Findings of research work in grasslands of TATR :

In the current exploration of wild relatives of grasses from the different grasslands of TadobaAndhari Tiger Reserve the genetic and species diversity is in the following manner.

Sr. No.	Name of grass genera	Number of spesies
1	*Brachiariareptans* *Brachiariadistachya*	Two species
2	*Setariaintermedia* *Setariaverticellata* *Setariapumilla*	Three species
3	*Panicumsumatrense* *Panicumnotatum*	Two species
4	*PaspalumPaspalodes* *Paspalumcanare*	Two species
5	*Urochloa*	One species
6	*Echinochloa*	One species
7	*Elusine*	One species
8	*Oryza*	One species
9	*Sorghum*	One species

In the present research study it is observed that the species diversity of wild grass genera depends upon the soil texture,moisture , humidity , water holding capacity. The composition and association of grasses also determines the wild relatives of grasses diversity. Generally it is found that the wild relatives of grasses are associated with soft palatable grasses with high percentage of fibre , ash , protein and moisture. The associates of wild relatives of grasses are :*Dicanthiumannulatum* , *Digitariastricta* , *Digitariaabludens* , *Iselimalaxum* , *Cynodondactylon* , *Ischemumindicum* .

The herbivores depend on soft palatable grasses as a primary consumers, Spotted deers , Barking deers , Chousinga , Black bucks mostly feed on soft palatable grasses which play an important role in grazing habitat of soft feeding herbivores.Grazing habitat of soft feeding herbivores associated with composition of grasslands, the grasslands are of three types ; smaller , intermediate and taller grasslands. Wild relatives of grasses shows distribution in smaller and moist grasslands.

Threats to wild relatives of grasslands are : loss of natural habitats due to soil degradation , fragmentation of grasslands , loss of soil moisture due to climate change , changes in composition of grassland , invasion of woody species in grasslands , soil microbial composition and associates which grasses i,e soil mychorhiza and microorganisms which promotes the growth of grasses.

Conservative measures for wild relatives of grasses :

Loss of habitat: Many of the accessions currently held ex situ are from regions that have undergone significant land-use change over the past 50 years. The urban expansion in South and Central America has seen forests, grasslands and savannahs replaced by urban space. The expansion of agriculture, especially in Brazil, has resulted in vast areas of natural forests and grasslands being substituted by intensive production of crops such as soybean and improved monospecific pastures. There are ~ 60 million ha of Brachiariabrizantha cv. Marandu in Brazil, which is a dangerously narrow genetic base highlighting the importance of germplasm diversity. Similarly development and population growth in many parts of Africa have resulted in expansion of cropping and overgrazing of rangelands with associated loss of biodiversity. The changes in the economies and populations across the tropics have made the TSTF germplasm already held ex situ extremely valuable (sometimes irreplaceable) and in need of a particular focus on conservation.

Conservation of wild relatives of grass genetic resources

Secure conservation is at the heart of the Centres' stewardship of their collections and depends on the application of technical practices of high standard, based on an accurate assessment and appropriate management of risks.

The adequacy of the conservation technologies in use is key to meeting the objectives of long-term conservation of genetic diversity:

- As more land is coming under intensive cultivation, much of the natural diversity of species will be lost.
- Demand for use of forage genetic resources for increasing livestock production, as well as to maintain a more sustainable agricultural system, is expected to increase.
- The further study of the conserved germplasm will allow the easier identification of genotypes with potential for livestock feed for specific environments, as well as adequate germplasm to be re-established in degraded areas and also adapted to future climate changes.
- The adequate long-term conservation of germplasm will allow the preservation of essential forage biodiversity for current and future generations as global public goods.

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Diversity Of Diatoms Inwater Reservoirs of Washim District of Maharashtra in India

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Abstract
Present paper deals with the study of members of Bacillariophyceae collected from different water reservoirsofWashim district, Maharashtra state, India viz. DevTalaw, Narayan Baba Talaw, Ekburji DamandPadmtirthTalaw. This study has shown Identification and presence of eightdifferent diatoms up to genus level. These diatoms are being reported for the first time from the study areas.
Keywords: Biodiversity, algae, diatoms, etc.

Introduction:
Diatoms (Division Bacilliarophyta), one of the largest groups of photosynthetic eukaryotic micro-organism. They occur in almost all wet/damp places with a diverse range of habitats across continents. Diatoms grow as single cells, or form simple filaments or colonies. They form the base of aquatic food webs in marine and freshwater habitats. Diatom communities respond directly to physical and chemical changes in the environment. Diatoms are a very important group of algae as they are the most common producers of organic matter in water bodies. Diatoms are used to track the effect of climate (1). They also often dominate the algal communities in many freshwater systems. During the 19th century, diatoms were studied for the first time in India by Ehrenberg [2]. Subsequent notable works were made by Skvortzow [3], Biswas [4], Krishnamurthy [5],Venkataraman [6], and Sarode and Kamat [7]. The work on Indian fresh water diatoms is still in an early stage.
The main purpose of this study was to examine the diatomdiversity

Materials And Methods:
The study area covered small four different sites viz. *DevTalaw, Narayan Baba Talaw, Ekburji Dam and PadmtirthTalaw* in Washim district in Maharashtra, India. Study area is situated at 20.099928◦N latitude and 77.13338◦E longitude, 20.099899◦N latitude and 77.133352◦E longitude, 20.048256◦N latitude and 77.1014◦E longitude and 20.107783◦N latitude and 77.126652◦E longitude, respectively. Diatom materials were collected in the month of March, 2022 and preserved in 70% ethanol.
Identification of Diatoms upto genus level were made with the help of monograph and relevant literature(8, 9, 10, 11).

DevTalaw

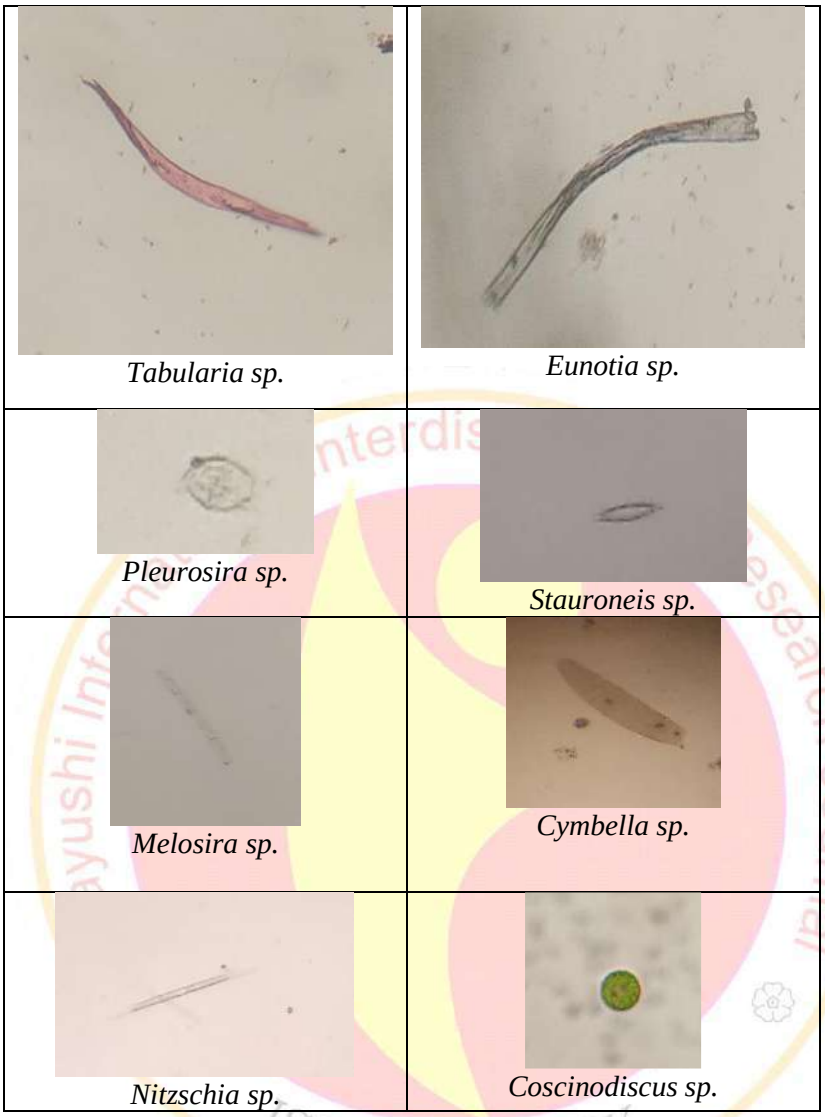
Narayan Baba Talaw

Ekburji

PadmtirthTalaw

Results:

The present investigation is the outcome of Biodiversity of diatoms. Such taxonomical study of diatoms is basically useful to taxonomists and researchers of algae for future research work. Present study also useful for science and society to know what type of diatoms are available from this area. The available diatoms areenlisted in following table.



Disscussion:

The present investigation is the outcome of Biodiversity diatoms. Such taxonomical study of diatoms is basically useful to taxonomists and researchers of algae for future research work. Present study also useful for science and society to know what type of diatoms are available from this area. As diatoms are concerned with pollution it certainly helpful to environmental scientists.

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Economic Interest Of Lac Culture In India – An Overview

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Abstract:
Lac culture is the systematic rearing of lac insects on their host plants for sustainable production of commercial lac. The lac harvested from host plants is then processed by using various techniques to produce different kinds of lac resins, lac dye and lac wax. There are versatile applications in many fields of lac resins and lac byproducts generated while processing raw lac. India is among the topmost country in the world for lac production. Comparatively less investment is required for lac culture, and it provides economic benefit to farmers and livelihood to tribal people. lac processing techniques, products and by-products produced by lac culture and their applications, Indian institutes involved in research and development of lac culture, current research for applications of lac.
Keywords: lac culture, host plants, raw lac, lac resin, lac dye, lac wax, etc.

Introduction:

Lac insects are reared systematically on their host plants to produce resin is called lac culture. Lac insects are found throughout the tropical and subtropical regions of the world. However, they are found abundantly in the tropical forest of India, Thailand, China and Vietnam. In European countries, these insects are not found due to the very cool climate during winter[9]. India is among the topmost countries in lac production and contributes about 80%. The production of raw lac in India is near about 20,000 metric tons and earns a huge amount through export about Rs. 120-130 crores of foreign currency per year[7].According to 2018-19 statistics, Jharkhand is the topmost state in lac production followed by Chhattisgarh, Madhya Pradesh, West Bengal, Maharashtra, Odisha and Assam[13]. Lac culture requires comparatively less investment and provides good economic return if it is carried out systematically and scientifically. It is the source of livelihood for tribal people and farmers, it is a side income source with good economic returns.

Lac insects belong to the family Tachardiidae (Kerriidae) and are from the order Hemiptera[8]. Lac insects are parasitic they feed by sucking juices of various plants called host plants. A particular type of lac insect species feeds on the particular host plant. Some species of lac insects in India are listed in the table with the region of occurrence and their host plants. In India, there are 16 species under the genus Kerria and 6 under the genus Paratachardina are recorded[5,7].*Kerria lacca* (Kerr) is the most widely occurring species in India, which produces the bulk of commercial lac. [8]

Sr. No.	Species in India	States	Host trees
1.	*Kerria chmaberlini*	Gujarat West Bengal	*Flemingia religiosa* (Pipal) *Butea monosperma* (Palas)
2.	*Kerria fici*	Panjab	*Adansonia digitata* (Imli)
3.	*Kerria indicola*	Andhra Pradesh	*Peltoforum ferrugineum* (Peela Gulmohar)
4.	*Kerria brancheata*	Jammu & Kashmir Jharkhand	*Ziziphus mauritiana* (Ber) *Schleichera oleosa* (Kusum)
5.	*Kerria lacca*	Rajasthan Gujarat Maharashtra Jharkhand West Bengal	*Flemingia religiosa* (Pipal) *Ziziphus mauritiana* (Ber) *Acacia arabica* (Babool) *Peltoforum ferrugineum* (Peela Gulmohar) *Butea monosperma* (Palas)
6.	*Kerria sharda*	Orissa	*S. Oleosa* (Kusum)
7.	*Kerria nagoliensis*	Maharashtra	*Schleichera oleosa* (Kusum)
8.	*Paratachardina lobata*	Andhra Pradesh	*Peltoforum ferrugineum* (Peela Gulmohar)
9.	*Kerria communis*	Goa	*Acacia catechu* (Khair)

Lac insects feed by sucking juices from host plant tissues. Lac is secreted by lac insects through specialized glands, to get protected from their predators. Lac resin is viscous at the time of secretion and gets hardens after coming in contact with air formingencrustations around the body of insects. The encrustations on the branches of a tree are then removed by scrapping this lac is known as stick lac, crude lac, or raw lac. It

contains resin, wax, dye, insect body, the bark of host trees as well as other impurities[14]. Stick lac is then processed in various ways to obtain pure lac and different by-products.

This paper provides an overview of lac processing techniques, products and by-products produced by lac culture and their applications, Indian institutes involved in research and development of lac culture, and current research for applications of lac.

Lac processing techniques / Products by- produced

First, the stick lac (raw lac) that is obtained by removing lac encrustations from host plants is processed to obtain seedlac. For this sticklac is dried first to remove moisture. Sticklac cannot be stored for a long time as it contains moisture along with other impurities it forms lumps and hence lowers the crop quality. Followed by drying stick lac is sieved and crushed to obtain sand and dust this process removes sand, dust. This powdered form of crude lac is then washed to remove embedded insect bodies and host trees debris. Decaying bug bodies impart a red color to water this is processed to obtain a by-product that is lac dye. The remaining resin is dried, thresh to gain seedlac. Seedlac is a commercial variety product and can be stored for a long duration. From seedlac by hot filtration purified lac is obtained called shellac. Seedlac is processed by country process or in mechanized factories to obtain shellac. Shell lac obtained by country process (Bhatta) process is called button lac whereas processed from mechanized factories is called machine-made shellac [15].

Fig.1 - Lac processing to different products and by products

Seedlac is processed by solvent method to obtain dewaxed decolorized lac (DDL) and bleached lac. For making dewaxed decolorized wax, seedlac is dissolved in cold alcohol to render wax insoluble and filter through a filter press to remove wax and impurities. The color may be removed to any required standard by charging with the activated carbon and then alcohol is recovered. The molten shellac is stretched with a roller. This form of lac has high demand in the western market. For obtaining bleached lac many methods are available but the most commercially adopted method is sodium hypochlorite (NaOCl) with some recent modifications [13,15]. Bleached lac is white. It has specialized demand and is manufactured commercially in two grades- Dewaxed bleached shellac and Waxy bleached shellac. The commercial grades of seedlac, button lac, shellac, dewaxed decolorized lac (DDL) and bleached lac available on market are listed in table 2 [13,15].

Sr. No.	Type of lac	Commercial grades
1.	Seed lac	Ordinary/ Genuine bysakhi, Fine bysakhi, Golden bysakhi, Golden kusumi, Golden bysakhi – bold grain, Golden kusumi – bold grain, Golden kusumi seedlac – Medium, Manbhum fine seedlac.
2.		Lemon one shellac, Lemon tow shellac, Standard one shellac, Superior shellac, Superior kusumi lemon, Kusumi button lac,

	Shellac	Button lac	superior kusumi button lac, light pure button lac, Pure one button lac
		Machine-made shellac.	Orange shellac, Lemon one shellac, Lemon two shellac, standard one shellac, Black T.N. shellac, Kusumi lemon shellac, Orange fine shellac
3.	Dewaxed decolorized lac (DDL)		Dewaxed platina, Dewaxed blonde Dewaxed super blonde, Dewaxed lemon, Dewaxed orange, Dewaxed Garnet
4.	Bleached lac		Dewaxed bleached shellac and Waxy bleached shellac

Applications

Lac is the only resin of animal origin, and it is Nature's gift to mankind. At present, its importance has been raised in industries, pharmaceuticals, food processing, and textiles being an eco-friendly, biodegradable, and self-sustaining natural material. In India lac is used since ancient times for medication. It is profusely used in ayurvedic treatment for treating various illnesses. It is widely used on open wounds for quick healing and tissue generation.A slurry of lac paste in water mixed with butter oil and milk was commonly taken orally by sick or wounded persons. For controlling blood pressure Lac resin was used for oral administration with fresh goat's milk. It forms one of the main ingredients of a medicated oil known as Lakshadi taila which is reputed to bring down chronic fever and cure rheumatic pain. In modern pharmacy, it is commonly employed as a demulcent in preparations which is designed to treat diarrhea, dysentery, coughs, throat irritation and fevers. It serves as an emulsifying agent and gives viscosity to powdered drug materials.

Lac has innumerable applications in various fields. More than 50% consumption of shellac is in the surface coatings in paints and varnishes due to its properties such as forming UV resistance of the film, smooth, decorative and durable films formation in alcoholic solutions, which dry rapidly as well ability to form solution in alkaline medium. Applications of shellac in the various field are enlisted in the table [13].

Fieldof application Specific application area	**Field of application Specific application area**
Pharmaceuticals	Coating for tablets; enteric (digestive fluid proof) coating for tablets, pills, etc. Removing agent for medicinal odor. Enteric pills for sustained release medication
Electronics	Lamps, fluorescent lamps, insulating agent for parts, insulating varnish, PCB coating.
Polishes	Fruits, furniture, floors, shoes, stain sealer, wallboard primer, knot and sap sealer on wood
Food	Chestnuts, healthy foods, glazing agent for chocolates and sweets, protective coating for oranges, lemons, apples, etc. Binding agent for stamp inks for lemons, eggs and cheese. Barrier coating for feeds and seeds. Protective candy coating or glazes on candies. Coating of apples and other fruits. Coating of food materials
Printing ink	Felt pen inks, binder for flexographic inks for paper, cardboard, non-toxic printing ink for food packaging
Paint and varnishes	Wood finishing, metal foil, sealers, leather, rubber, car tyre.
Cosmetics	Additive and binder for manicure, mascara, eye shadow and conditioning shampoo for personal care. Setting agent for hairspray, microencapsulation for perfumes for longer stay
Rub stones	Grinding wheel
Others	Felt hats, pyrotechnics, gunpowder, strippable paints, cards, stiffening felt in hat manufacture and also in textile industries

Lacbyproduct	**Applications**	**Referenceused**
Lac dye	Food grade lac dye in manufacture of skin creams, food and drug manufacturing and technical grade lac dye in textile industries for coloring silk and wool.	5, 8, 13,14
Lac wax	Electrical industry, shoe creams, floor and car polishes, food, confectionery and tablet finishing, lipsticks, crayons and tailor's chalk	8,13
Isoambrettolide	Perfumery industry	5,14
Mollama	For production of standard quality bleached lac	5

Indian institutes involved in research and development of lac culture

Indian Institute of Natural Resins and Gums (IINRG) was formerly known as Indian Lac Research Institute (ILRI)) is a nodal Institute at the national level for research and development in arid, semi-arid, plateau and hilly regions of the country that help to improve the livelihood of local communities[2].It was established at Namkun Ranchi in 1924 with the prime motto of research on lac in India and to increase lac production. Indian Institute of Natural Resins and Gums (IINRG) is then handed over to the Indian Council of Agricultural Research, New Delhi in 1966 [3]. This institution is fully devoted to the research and development of lac and succeed in increasing enormous lac production in India. Institute entailvarying objectives such as lac and other natural gums & resins (excluding production) such as harvesting/ tapping, processing, product development, training, information repository, technology dissemination and national/international cooperation. There is an increase in lac production in several regions of the country through training programs, capacity building programs run by this institution throughout India to make skilled individuals who can do scientific lac cultivation[4]Scientific cultivation with integrated pest management, enhancing exploitation of unexploited host plants, and cultivation through 'Joint Forest Management' program helps cultivars in raising production and gaining good economic returns. This institute also supports by providing financial assistance to lac cultivars. [2]

Current lacresearch

Yan, X., *et al.*, prepared color-changing and self-repairing dual-function paint film with Lac Resin microcapsules and Fluorane microcapsules They found that paint film with lac resin microcapsules had a better crack inhibition effect. The results obtained are useful as a manufacture reference for multifunctional wood coatings[16].

Lu, J et al., et al., extracted Shellolic esters and Lac dyes from methanol extract of the secretions of *Laccifer lacca* and studied their biological activity. They found some of the compounds considerable active against *Bacillus subtilis, Escherichia coli* and *Streptococcus aureus* microorganisms.[6]

Chowdhury, S.,put forth the concept of establishment of Brood Lac bank in Chhattisgarh, inspiredbyan idea of preserving and maintaining local biodiversity along with enhancing forest-based livelihoods. The idea of the Brood Lac Bank has been further extended to envision "Lac Clusters" which would not only sustainably produce lac but also add value though local processing, enabling rearers to produce raw industrial lac through local lac-based networks to directly engage with the market [1].

Mohanasundaram, A. *et al.*, evaluated chemical communication between the lac insect-associated products and the lac predators under the laboratory condition. They found that *Eublemma amabilis* showed a great response to lac insect whole-body extract. Another lac insect predator *Pseudohypatopa pulverea* also showed higher response to lac insect whole body extract than resin, wax, crawler and lac insect female extracts. [10] Along with this much research about lac cultivation, pest management, marketing and application based research has been taking place contributing enormous fruitful knowledge to this area [11,12,18].

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Preliminary phytochemical analysis of *Iphigenia indica*

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Abstract:

Present study was carried out to determine the presence of various phytochemical compounds from Iphigenia indica corm. Ethnomedicinal information was obtained from tribal people as well as traditional healers and confirmed the used of plant for various purposes such as, corm used as food, eaten as raw, to get relief from colic and headache. Phytochemical analysis was performed by using a series of solvents such as petroleum ether, chloroform, ethanol and acetic acid by soxhlet extractor. Qualitative phytochemical analysis confirmed the presence of alkaloids, carbohydrates, glycosides, saponins, proteins, phytosteroids and terpenoids, flavonoids, fixed oil and fats, etc. Presence of various phytochemicals strongly support the medicinal properties of this plants. Hence further investigation is required for isolation, characterization and structural determination of new natural bioactive compounds from this medicinal crude drugs.

Key words: *Qualitative phytochemical, Iphigenia indica, Ethnomedicinal, soxhlet extractor, crude drugs.*

Introduction:

Human beings have been dependent on plants for medicine to complete their health care needs from the beginning of civilization [(1)]. Medicinal plants naturally contain certain chemical constituents having therapeutic properties [(2)]. Traditional and folklore medicines have a significantly participates in health care practices around the world. Ethnic medicines are highly suitable and comparatively having very less side effects [(3)]. Phytochemical constituents derived from plants are advantageous as such data become valuable for the production of different complex chemical substances [(4)].

Iphigenia indica (L.) belongs to Liliaceae family is mostly occurs on hillside among grassland area. Flowering and fruiting mostly occurs during july to september months. It is an erect herb, which grows up to 10-18 cm tall in height. Its corms are mostly ovoid, subglobose or tunicated shape with presence of brownish sheaths. Leaves are alternately arranged, sessile or subsessile, having linear or linear- lanceolate shape with coriaceous or subcoriaceous texture. Flowers are brown, purple or pale purple in color, axillary and extra-axillary in position on terminal zigzag stems. Fruit is capsule type with elliptic-oblong shape along with presence of groove. Seeds are many, brown in color and globose or subglobose.

Peoples of some tribal communities located in Buldana district use corm of this plant as food and eaten as raw. They also used it to get relief from colic and headache. Hence present investigation was focused on preliminary phytochemical analysis of *Iphigenia indica.*

Materials and Methods:

Collection of plant material:

Plant material of *Iphigenia indica* was collected from rural area of Buldana district, Maharashtra, India. Plant was identified by using various floras [(5,6)] and also from the experts of region. Plant material was brought to the laboratory, thoroughly washed with water to remove foreign matter, shade dried and then grind into fine powdered by using mechanical grinder.

Extraction of plant material:

Grinded fine powder of *Iphigenia indica* corm was subjected to solvent extraction by using series of different solvents such as petroleum ether, chloroform, ethanol and acetic acid by soxhlet apparatus. Each time before extracting with next solvent, the powder residue was dried properly. Extract obtained in each solvent was concentrated, solidified, determined yield percentage and used for preliminary phytochemical analysis.

Phytochemical evaluation:

For preliminary phytochemical analysis, each extract of corm was subjected to various qualitative test and determine the presence of different phtoconstituents.

Preliminary phytochemical analysis was carried out of all the extracts as per the standard methods of Brain and Turner, (1975); Harborne, (1994); Trease and Evans, (1996); Khandelwal, (2006) and Kokate *et al*, (2010).

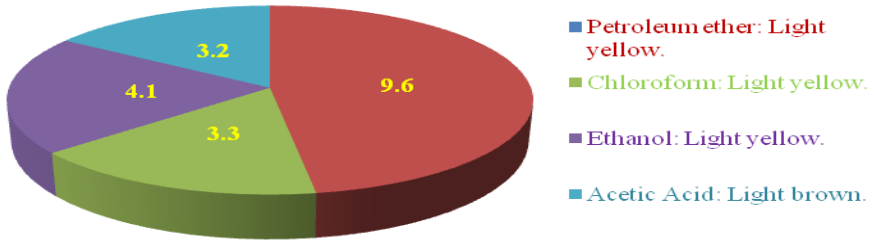
Results and Discussion:

Crude extract of medicinal plants is biologically more active than isolated compounds due to their synergistic effects. Hence phytochemical analysis is very useful in identifying new sources of important compounds like alkaloids, flavonoids, phenolic compounds, saponins, steroids, tannins, terpenoids, amino acid, etc. During phytochemical analysis, yield percentage of successive solvent extracts of *Iphigenia indica* corm were found as; petroleum ether extracts: 9.6%, chloroform extract: 3.3%, ethanol extract: 4.1% and acetic acid extract: 3.2% (as shown in table 1. and fig.1).

Table 1: Successive solvent extracts of *Iphigenia indica* corm

Sr. No.	Solvent extract	Color	Yield percentage
1	Petroleum ether	Light yellow	9.6%
2	Chloroform	Light yellow	3.3%
3	Ethanol	Light yellow	4.1%
4	Acetic Acid	Light brown	3.2%

Fig. 1 Successive extractive values of *Iphigenia indica* corm



Preliminary phytochemical analysis of *Iphigenia indica* corm was carried out in petroleum ether, chloroform, ethanol and acetic acid extracts. Phytochemical screening was revealed the presence of alkaloids, carbohydrates, glycosides, saponins, proteins, phytosteroids and terpenoids, flavonoids, fixed oil and fats, etc. as shown in table 2.

Table 2: Phytochemical analysis of *Iphigenia indica* corm extracts

Sr. No.	Test For Phytochemical	Test	Pet. ether extract	Chloroform extract	Ethanol extract	Acetic acid extract
I	Alkaloids					
1		Dragandorffs Test	+	+	+	+
2		Hager's Test	+	+	+	+
3		Mayer's Test	+	-	+	-
4		Wagner's Test	+	+	+	+
II	Carbohydrates					
1		Fehling's Test	+	+	-	-
2		Molisch's Test	-	+	+	+
3		Benedicts Test	+	-	+	-
III	Glycosides					
1		Borntrager's Test	+	+	+	-
2		Legal's Test	-	+	+	-
IV	Saponin					
1		Foam Test	+	+	+	+
V	Tannin and Phenolic compound					
1		5% Ferric chloride Test	-	-	-	-
VI	Proteins					
1		Millon's Test	-	-	+	+
2		Biuret's Test	-	-	-	-
VII	Amino Acid					

1		Ninhydrin Test	-	-	-	-
VIII	Phytosteroids and Terpenoids					
1		Lieberman-Burchards Test	-	+	-	-
2		Salkowski Test	+	+	+	+
IX	Flavonoids					
1		Alkaline reagent test	-	+	+	+
X	Gums and Mucilage					
1		Alcohol test	-	-	-	-
XI	Fixed oil and fats					
1		Stain test	-	-	+	-

Conclusion:

Presence of various phytochemicals strongly support the medicinal properties of this plants. Hence further investigation is required for isolation, characterization and structural determination of new natural bioactive compounds from this medicinal crude drugs.

Where, **+** = present, **-** = absent.

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Studies on Benthic Macroinvertebrate of Lower Wardha Project, Shahanur Dam, and Ghoddev Dam, Amravati District, (MS), India

Dr. K. E. Landge

Abstract:-

The present communication is aimed at studies of some benthic fauna at Lower Wardha project, Shahanur dam, Ghoddev dam, District Amravati for one year from August 2015-July 2016.The benthic organisms are reported as main components of the food chain. It was therefore, thought worth benthic species diversity. The present study is focused on biodiversity of the benthic community of lower Wardha project, Shahanur dam, and Ghoddev dam. The present investigations deals with the population density and species diversity of aquatic benthic macro-invertebrate fauna.

Key Words:- Benthic Fauna, Biodiversity, Species diversity, Population diversity.

Introduction:-

Fresh water macro-invertebrate are animals without backbone that live near the bottom of freshwater. The concept of biodiversity includes the entire biological hierarchy from molecule to ecosystem, or the entire taxonomic hierarchy from Allele to Kingdom. The current textbook definition of "biodiversity" is variation of the life at all levels of biological organization (Kevin et al., 2004). Benthic macro-invertebrates are best indicators for Bio-assessment (Kumar 2003). The abiotic environment of water body directly affect in the distribution, population density and diversity of the macrobenthic community (Zweig and Rabeni 2001; Sharma and Rawat 2009, Sharma and Choudhary 2011). Benthic fauna are especially of great significance for fisheries that they themselves act as food of bottom feeder fishes (Sharma et al., 2013). The mollusca component an important component of the macrobenthic invertebrate community of the stream (Bangotra 2012) freshwater macro-invertebrates are generally group by two characteristics; how they feed and how they move within the aquatic environment. The present studies deals with the population density and species diversity of aquatic macro-invertebrate fauna have been discussed.

Materials and Methods:-

Benthic communities along the lower Wardha project Shahanur dam, and Ghoddev dam were sampled collected monthly from August 2015-July 2016. The sample were collected by a bottom kick net (500 µm mesh). The samples were taken from an area of nearly 100 m2 in order to include all possible microhabitats. All the animals collected were immediately fixed in formaldehyde (4%) in the field and then transferred to 70% ethyl alcohol. Collection and identification of Benthic macro-invertebrate with the help of standard books Needham (1969), Pennak (1989), Tonapi (1980), Welch (1998). The organisms were identified from standard taxonomics keys (e.g. Pennak 1989).

Result and Discussions:-

. Benthic macro-invertebrates biodiversity recorded in Lower wardha project(I), Shahanur dam, Ghoddev dam during August 2015 to July 2016. A total of forty six (46) species recorded of Benthic macro-invertebrates fauna belonging three (3) phylum- Mollusca, Arthropoda, ,Annelida 7 (seven) classes-Gastropoda, Bivalvia, Crustacea, Arachnida, Insecta, Oligochaeta, Hiradinea.

In the present study total 46 species of Benthic macroinvertebrate were identified. Out of 46 species Phylum- Mollucans represents 20 species from two classes as Gastropoda, and Bivalvia. Phylum-Arthropoda encompassing 24 species from three classes as Crustacean, Arachnida, and Insecta while 2 species belonged to Phylum- Annelida representing a two class Oligochaeta, and Hiradinea. The dominants class was Insecta representing 13 species and Gastropoda 12 species.

20 species of **Phylum-Mollusca** 12 species **Class-Gastropoda** [Lymnea accuminata, Lymnea auricularis, Lymnea peregra, Lymnea palustris, Lymnea luteola, Melanoides tuberculata, Bellamya bengalensis(Lamark), Gyraulus ladacensis, Thiara tuberculata(Mueller), Gabbia orcula, Pila globosa, Dwarf pond snail(Galba truncatula)]. 8 species **Class-Bivalvia** [Lamellidens corrianus(Lea), Lamellidens marginalis(Lamark), Parreysia cylindrica (Lea), Parreysia favidens(Benson), Parreysia Khadakvaslaensis, Parreysia shurtleffiana, Parreysia corrugate(Mueller), unio] was found.(Table 29).

24 species of **Phylum-Arthropoda** 4 species **Class-Crustacea** [Cancer(Crab), Daphnia, Nauplius,Cyclops]. 7 species **Class-Arachnida** [Araneus, Hydracarina sps., Neoscona sps., Zygeilla sps, Leucage sps., Stegodyphus sps., Hippasa sps.].

13 species **Class-Insecta** [*Notonecta sps,* Orthetrum sps, Chironomus Sp., Dragonfly larvae, Damselfly nymph, Soldiar fly larvae, Mayfly larvae, Anopheles larva, Cybister tripunctatus, Cybister confuses, Erectes sticticus, Hydaticus fabricii, Dineutus indicus] was found.
2 species of **Phylum-Annelida** 1 species of **Class-Oligochaeta** [Pheretima posthuma]. 1 of species **Class-Hiradinea** [Hirudinaria] was found.

Analysis of numerical superiority of macroinvertebrates of all three dams are revealed that Mollusca was dominant [68.40%] followed by Arthropoda [27.82%] and Annelids [3.77%] (Table No 24) (Figure No 17) Dominant species were reported to be the most important ecological indicators as they received the full impact of the habitat for the over longer period and manifest different level of sensitivity. The present investigation is well in agreement with the study Sharma et al., (2013).

Their abundance fluctuation depending upon environmental conditions and physico-chemical parameter of water.

The insect are having the capability of various adaptive habitates due to their extra ordinary structural organization Vinson (1998), Merrites and Cummines (2008) and Tali (2013). Most of the Insect larval forms have been reported to be tolerant too wide range of Physico-chemical parameters (Sarkar -2012). The benthic macro-invertebrates population of Insect was dominated by diptera and Ephemeroptera.

The mollusca fauna of Kishanpura Lake include genera out of which T. Scabra, P. Clarknum, L. Aluminat, vivapora bengalensis dominated the population (Sharma et al, 2007). Sharma (2003) reported 11 genera of mollusca from sirpur Lake Indore. Similar also reported to Oomachan and Belsare (1985); Rosenberg and Resh (1993) and Sharma (2009), and Sharma(2013).

Conclusion :-

This study help in studing aquatic Macro-invertebrate i.e. biodiversity of macro-invertebrates. Biomonitoring is good tool for the assessment of our body.

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Phytochemical Analysis, Antioxidant and Tyrosinase Inhibition Potential of Aqueous Extract of *Lepidiumsativum* L. Seeds.

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Abstract:
The present study was to evaluate the phytochemical constituents, antioxidant and tyrosinase inhibition activities of aqueous extract of LepidiumsativumL. seeds. Phytochemical screening revealed the presence of alkaloids, carbohydrates, flavonoids, glycosides, amino acids, reducing sugars, saponins etc. Antioxidant activity was evaluated by using an in-vitro antioxidant assay model like DPPH assay and percentage of activity of plant sample was calculated. The present study was revealed that LepidiumsativumL.shows significant antioxidant activity. The tyrosinase inhibition activities were also done by using the modified dopachrome method with L-DOPA as a substrate. Assay was conducted in a 96-well microtitle plate and a plate reader was used to measure the absorbance at 417 nm. This study of tyrosinase inhibition assay was clear that seeds of LepidiumsativumL. were shown inhibition activity against tyrosinase. The phytochemical composition of these plantseeds were tyrosinase inhibition activities due to busting the inclusion of an antioxidant composition.
Keywords:*Phytochemical, Antioxidant Assay, Tyrosinase, L-DOPA.*

INTRODUCTION:

*Lepidiumsativum*L. is a yearly herb locally known as halim in India but commonly known as cress. Cress, otherwise known as garden cress, garden pepperwort or garden cress pepper weed, in India in Hindi it is called Halim, Chandrashoor or Asalu. It's a fast growing herb belonging to the family Brassicaceae that is native to Egypt and west Asia but is widely cultivated in temperate climates throughout the world for various culinary and medicinal uses (Gokavi, S. S.et. al, 2004). *Lepidiumsativum* L. Since old times in India, seeds have been used in traditional medicine (McConnell et al., 2007). Numerous studies on plant derivatives suggest that diets rich in phyto constituents and antioxidants have protective roles against various health troubles and diseases (Lampe JW, 1999). Herbal drugs are the oldest form of health care known to mankind (De-Smet and PGAM, 1997). Plants are a rich source of natural antioxidants. Natural antioxidants or phytochemical antioxidants are the secondary metabolites of plants (Sofowora, 1993). These plant derived antioxidants might play an important role in combating oxidative stress associated with many degenerative diseases such as cardiological diseases, diabetes, cancer, Alzheimer's disease, diabetes and aging (Wong SP et.al., 2006; Naczk M and Shahidi F,2006.) In India, the plant is regarded as a cure for asthma, dysentry, bleeding piles, as a diuretic, and to enhance sexual desire (Dymock, Warden and Hooper, 1890; Chopra, Nayar and Chopra, 1956). Herbal drugs are the therapeutic herbs used to prevent and treat diseases and ailments or to support health and healing (Gossell et al., 2006).

Materials And Methods:

Collection of plant material:

The*Lepidiumsativum*L. seeds under investigation were collected from the local villages of Nanded during 2015. The collected seeds were washed thoroughly first in tap water and then rinsed with distilled water. After this, it was sterilized by using absolute alcohol and dried completely in shade at room temperature. The plant seeds were crushed and blended to fine powder in an electronic grinder and stored in a polythene bag till further use.

Preparation of extract:

The seeds of the *Lepidiumsativum* L. were collected, dried, powdered and did soxhlet extraction successively with distilled water. The extract was evaporated to near dryness in a water bath, weighed and kept at 4 °C in the refrigerator until further use.

Phytochemical screening:

The presence of various phytochemicals in the plant extract was determined by preliminary phytochemical analysis as per Thimmaiah (2004).

DPPH radical scavenging activity:

The antioxidant activity of the extracts was measured in terms of hydrogen-donating or radical scavenging ability, using the DPPH method (Brand-Williams *et al*., 2007) with slight modification. Briefly, 2 mL of DPPH solution (0.1mM in methanol) was incubated with 1mL of extract at concentration of (20 mg/ mL). The reaction mixture was shaken and incubated for 30 min.in dark condition and at room temperature. The control was

prepared as above without plant extract. The absorbance of the solution was measured at 517 nm against a blank. The free radical scavenging activity was measured as a decrease in the absorbance of DPPH and was calculated.

Scavenging effect (%) = $[(A_{control} - A_{sample}) / A_{control}] \times 100$.

Ascorbic acid (0.1mM) was used as a reference standard.

Results And Discussion:

Phytochemical screening:

Preliminary phytochemical screening revealed the presence of alkaloids, flavonoids, glycosides, carbohydrates, reducing sugar, saponins and amino acids in aqueous extracts of*Lepidiumsativum*L. seeds. These results exposed that the plant has quite a number of chemical constituents, which may be responsible for the many pharmacological actions. Although their specific roles were not investigated in this study, it was reported that most active components in plants are mostly flavonoids, saponins, glycosides and alkaloids. Further work will be possible to investigate the specific phytoconstituents responsible for these activities (Table- 1).

Table 1: Preliminary phytochemical screening of aqueous seed extract.

Sr. No	Phytochemical test	Aqueous extract	Mucilage extract
1	Alkaloids	++	++
2	Carbohydrates	++	--
3	Flavonoids	++	++
4	Glycosides	++	++
5	Reducing sugars	++	--
6	Saponins	--	--
7	Steroids	--	--
8	Tannins	--	--
9	Amino acids	--	++

++ Presence of constituent; -- Absence of constituent.

DPPH radical scavenging activity (Antioxidant activity):

The DPPH radicals scavenging assay were used for preliminary screening of the aqueous seed extract for the antioxidant activity. The free radical scavenging activity is known as an important mechanism of antioxidants. These results indicated towards the seed extract were found to interact with the stable free radical DPPH, which indicates their potent radical scavenging ability. The aqueous extract exhibited antioxidant properties (71.17%), whereas, Mucilage extract showed (60.84%) and the standard used ascorbic acid showed (86.12%) (Table- 2).

Table 2: Percentage of antioxidant activity of seed extracts.

Sr. No.	Plant Name	% Antioxidant Activity
1	*LepidiumSativum*L. (Aqueous extract)	71.17±0.31
2	*Lepidiumsativum*L. (Mucilage extract)	60.84±0.28
3	Ascorbic Acid (Standard)	86.12±0.22

Values are expressed in means ± S.D. of two separate experiments.

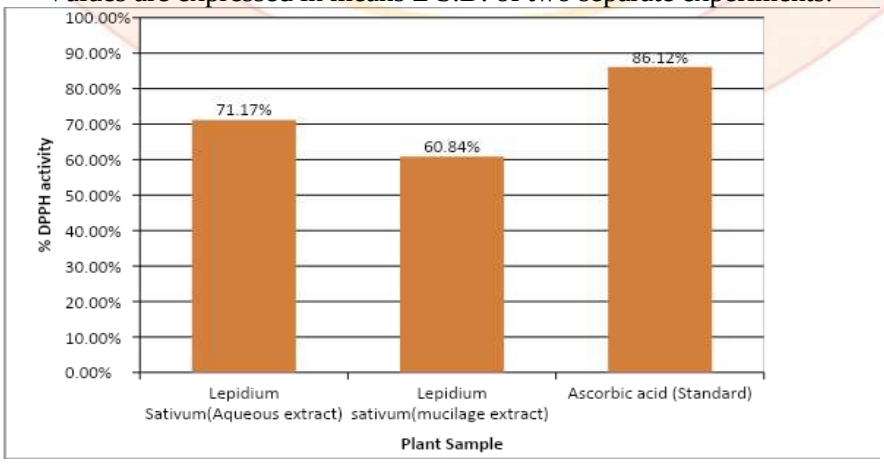

Fig: Graph showing percentage of antioxidant activity of seed extract.

Tyrosinase inhibition:

Tyrosinase involved in the formation of melanins because it facilitates melanin synthesis by catalyzing reaction from tyrosinase to DOPA and from DOPA to DOPA -quinine. Tyrosinase inhibitors have become more important as cosmetic and medicinal products, primarily to control melanin pigmentation. Melanin synthesis inhibitors are typically used for treating localized hyperpigmentation in humans such as lentigo, nevus, ephelis, post inflammatory state and melanoma of pregnancy. Mushroom tyrosinase enzyme was used for the assay because it is gamely available. Since the mode of reticence depends on the structure of both the substrate and inhibitor, L-DOPA was used as the substrate in this experiment, unless otherwise specified. So, the inhibitors discussed in this method are inhibitors of diphenolase activity of mushroom tyrosinase, and their inhibition activity on the enzyme was determined by spectrophotometry, based on dopachrome formation at 417 nm. In the present study the aqueous seed extract exhibited almost a good percentage of inhibition for Mushroom tyrosinase at (31units/ml) (Table- 3).

Table 3: Tyrosinase inhibition activity of seed extract.

Sr No.	Plant Species	% Tyrosinase Inhibition At Conc.(mg/mL)					
		4	**2**	**1**	**0.5**	**0.25**	**0.125**
1	***Lepidium sativum*L.**	81.02±0.12	67.35±0.22	62.12±0.14	56.65±0.30	31.28±0.26	13.85±0.02
2	**Ascorbic acid (Standard)**	85.74±0.21	73.86±0.13	68.23±0.23	60.70±0.32	37.66±0.25	18.23±0.22

Values are reported as means ± S.D. of two separate experiments.

Conclusion:

The present study shows aqueous seed of *Lepidiumsativum* L. could be used as a food supplement in human diet as it possesses potent antioxidant activity. It also helps to reduce oxidative stress in the human body. The tyrosinase inhibitory activity of *Lepidiumsativum* L. seed extract was increased with increasing concentrations. The inhibition of tyrosinase activity might depend on the hydroxyl group on the phenolic compounds of the seed extract, which may form hydrogen bonds with an enzyme site, leading to lower enzymatic activity. Some tyrosinases act through hydroxyl groups that bind to the tyrosinase active site, resulting in altered conformation. Ascorbic acid is an effective tyrosinase activity inhibitor. The antioxidant activity mechanism may also be an important reason for tyrosinase inhibition activity. Further pharmacological and clinical studies are required to understand the actual efficiency of these herbal extracts and in future it may be used for ingredients in the formulations of cosmetics and skin whitening agents.

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Effect of Weed – *Euphorbia Geniculata* L. On Biological Parameters of Chick PEA

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Abstract

In present investigations, the effects of Euphorbia geniculata L. on various biological parameters of chick pea were assessed. The healthy seeds of chick pea were treated with different concentrations of leaf, stem and root extracts of Euphorbia geniculata L. The effects on seed germination percentage, seedling groth and seedling vigour were assessed. The inhibitory as well as stimulating effect of weed extract on various biological paramters could be noticed.
Key words: *Euphorbia geniculata L., chick pea, inhibitory*

Introduction:

A weed is considered as unwanted plant in a particular situation and a plant in a wrong place. The weeds examples are those unwanted plants, which are growing in human-controlled setting such as farm fields. The term weed also is used to desribe any plant that grows or reproduces aggressively or is an invasive outside its native habitat. Besides competing for moisture, nutrients and light, weeds can also affect a crop growth by releasing chemicals into the growing environment (Rice 1984; Kadioglue *et al.*, 2005). All the plant parts of weeds such as root, stem, leaf, flower and fruit have allelopathic potential (Alam and Islam 2002). Different types of effects are exerted by different parts of weeds. Weeds interfere with crop plants through dominance, competition and allelopathy, which lead to decrease in quantity and quality of product of crop plants. The weeds affect the crop plants by releasing the various water-soluble allelochemicals (Batish *et al.*, 2007). These allelochemicals reported to be present in almost all plant parts including stem, leaves, buds, flowers, pollen grains, seeds, fruits, roots and rhizomes (Rice, 1984). Euphorbia geniculata is native to tropical and subtropical America but is now widespread throuhout the tropics. Many herbicides failed to control it and hence it has spread rapidly in many parts of the word. The present studies were undertaken to assess the effect of *Euphorbia geniculata* L. on popularly grown crop plant Chick pea (*Cicer arientinum* L.).

Materials And Methods:

The weed plant material used to study the effects on chick pea was collected and identified with the help of standard flora (Naik, 1998 and Dhore, 2020). Mature leaves of *Euphorbia geniculata* were collected from the agricultural fields in Amravati and aqueous extracts were prepared. Aqueous extracts of various concentrations *viz* 5%, 10%, 20% and 40% (v/v) were prepared. The seeds of chick pea were collected from Krishi kendra in Amravati. Healthy seeds were first prsoaked in distilled water for 6 hours. The presoaked seeds were treated with aqueous leaf extracts prepared freshly. The treatment was given at room temperature on rotatory shaker. The trartment was given for 6 hours. 200 seeds were used for each treatment along with control. The treated seeds along with control were studied for various parameters like germination percentage, seedling height and seedling vigour index. All the calculations were carried out by using standard formulae.

Results And Discussion;

The effects of weed extracts on chick pea are shown in table 1. The germination percentage in control was 80%. The maximum inhibition was observed in 10% treatment. In all treatments, inhibition was recorded. Germination is an important indicator which shows the plnat's response to changes in the environment or any allelopathic stress indicated as a result of allelochemicals released from donor plants (Hussain *et al.*, 2010). Similar inhibitory effects on seed germination were also recorded by Neelamegam *et al.*, 2012 in Paddy variety 5016 due to effect of Ipomea treatments.

Table 1: Effects of aqueous leaf extract of *Euphorbia geniculata* on various biological parameters of chick pea.

Treatment	Seed Germination (%)	Shoot length (Cm)	Root length	Seedling Vigour Index (SVI)
Control	80	17.70	16.70	1336
5%	65	21.60	23.00	1495
10%	50	14.60	12.80	640
20%	55	21.00	17.60	968
40%	65	18.60	10.80	702

Both inhibition and stimulation in root length and shoot length was noticed. Maximum inhibition in shoot length was induced by 10% treatment while maximum stimulation was recorded in 5% and 20% treatments. In addition, the stimulation and inhibition in root length could be observed. Maximum decrease in root length was observed in 40% treatment whereas the 5% treatment stimulated the root length. Stimulation in root and shoot length were also reported in *Oryza sativa* by Prasad and Subhashini (1994). Most of the treatment decreased the seedling vigour index. Only slight stimulation was found in 5% treatment as compared to control. Maximum reduction in seedling vigour index was found in 10% treatment.

Conclusion:

The aqueous leaf extracts of *Euphorbia geniculata* L. has shown both inhibitory and stimulatory effects on chick pea.

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Investigation of Taxonomic Morphology and Phytochemical analysis of *Cassia fistula* L.

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Abstract

*The qualitative phytochemical studies were carried out in the solvents viz. Methanol, Chloroform and Petroleum ether. The Methanol, Chloroform and n-Butanol Leaves extract of **Cassia fistula L.**shows the presence of alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols but high intensity of phytochemicals in leaves showed in table no.1 by twice and petroleum ether extract of leaves.*
***Keyword:** -Morphology, qualitative,phytochemical,Cassia fistula L.,n-Butanol etc*

Introduction

Medicinal Plants or Medicinal herbs are essence of Traditional medicine practice. Treatment using herbs developed different parts of world in different names. Herbalism is the systematic study of medicinal herbs and its botany. Mainly focusing its medicinal uses. Ethnomedicine is the study of traditional medicine. Researchers identify and separate various active chemicals in the medicinal plants.

Indian medicinal plants or Ayurvedic medicinal Plants are the essence of Ayurveda and Ayurvedic treatments. When used judicially and clocking with the basic principles they produce miraculous effects. Their role cannot be confined to mere curative of disease but they also used to be of human body. Hence, Ayurvedic drugs are rightly called the elixirs of life. Ayurvedic Herbs played important role in Ayurvedic treatment, from ancient time to this most modern time.

History of Medicinal Plants

The uses of medicinal plants can even see in pre historic time from the Sumerian civilization. In Sumerian civilization medicinal plants listed in clay. They mentioned about 100 medicinal plants. Ancient Egyptians documented about 800 medicinal plants in 'Ebers Papyrus'.

'Shennong Ben Cao Jing', is the Chinese pharmacopeia of medicinal plants, which helped Chinese Traditional healers to treat patients. 'Discords' was a Greek physician; he wrote a pharmacopeia of medicinal plants called 'De materia medica'. which described 600 medicinal plants and its various combinations useful in treatments.

Aristotle's and his student, Theophrastus wrote the first systematic botany text called 'Historia plantarum'. That was the first book in botany which classified plants into systematic groups.

In India, various traditional system of medicine is Sidha are well known, now commonly called Indian System of Medicine. Treatments based upon medicinal herbs and herb mineral combination are essence of Ayurveda and Sidha. Medicinal plants listed in Ayurvedic text books or coming under ayurveda listed as Ayurvedic Medicinal Plants. Ayurveda books classified medicinal plants according to its uses and properties. About 800 medicinal plants were listed.

Herbalism

From historical time, medicinal plants used for medical purpose. It is believed that about 50 thousand before herbalism existed. Written history could be seen in sumariencivilization, which was 5000 years old. Herbalism may apply modern standards of effectiveness testing to herbs and medicines derived from natural sources because many modern medicine compounds are derived from plants. It referred as phytomedicine, phytotherapy or Para herbalism. Nutrient supplements prepared from herbs classified under phytotherapy.

According to WHO (World Health Organization) 80 % of Asian and African population uses herbal medicine due to its low expense. About 25% of drugs using in USA derived from medicinal plants. 7,000 medical compounds and 120 active compounds currently isolated from herbs.

Herbal preparations

Single plant or multiple plant combinations are used. It Prepared in many forms. Herbal juice extract, dry powder, tea, decoction, Tinctures, alcoholic preparation and oil or ghee preparations are available.

Ethnomedicine

Ethnomedicine is a study or comparison of the traditional medicine based on bioactive chemicals in the herbs and animals and practiced by various ethnic groups. ethnobotany and medical anthropology are the tools using in Ethnomedicine. The purpose of the research is to identify and develop a marketable pharmaceutical product. From Chinese medicine 'Yu' identified 'Artemisin' named chemical compound useful in Malaria disease.

Phytochemicals

These are chemical compounds synthesized by plants as its part of metabolism, may be part of defensive mechanism. Alkaloids, Glycosides, Glycosides, Terpenes are main Phytochemicals. Alkaloids are bitter-tasting chemicals examples are atropine, scopolamine, hyoscyamine, caffeine, cocaine, ephedrine (Ephedra), morphine. Anthraquinone glycosides are found in medicinal plants such as rhubarb, cascara, and Alexandrian senna. Polyphenols of several classes of chemicals, useful defenses against plant diseases and predators. examples are phytoestrogens and astringent tannins. Terpenes and terpenoids are found in resinous plants such as the conifers.

Present investigation on Taxonomic morphology and phytochemical analysis of Cassia *fistula* L. with following aims and objectives.

Material and Methods

Collection of Plant

Collection of *Cassia fistula* L. plant part were collected from botany garden Manora, washim Maharashtra state, India. Plant part i.e., fruit and leaves cleaned soil dust with tap water. The plant material and specimens were identified by using standard floras like Cook 1907, Dhore 2005, Naik 1989, Yadav and Sardesai 2002.

Preparation of Plant Part Extract

Preparation of plant part leaves dried under shade and prepared fine powder, plant part extraction according to previously method used by Megala, and Elango, 2012, but were used some modified method in which the 5 gram of leaves dried powder extracted with 50 ml of three different solvent i.e. methanol, chloroform and petroleum ether , 24 hrs at room temperature and shaking constant and then filter with whatman filter paper no.1, excess solvent in extract evaporated and extract used for Qualitative evaluation of phytochemicals. The preliminary screening test were performed for the presence of following secondary metabolites such as alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols (Harborne, 1973) and Sofowara (2005).

According to Budhiraja, 2012, leaves powder extract in Chloroform and n-butonol solvent shows positive results of phytochemicals constituent and their activities against the anticancer and antibacterial so were used chloroform and n-butonol solvent.

Qualitative analysis of *Cassia fistula* L.

Alkaloids test

The plant extract was evaporated to dryness and the residue was heated on a boiling water bath with 2% hydrochloric acid. After cooling, the mixture was filtered and treated with a few drops of Mayer's reagent. Formation of turbidity or yellow precipitation showed the presence of alkaloid.

Glycosides

Glycosides are compounds which upon hydrolysis give rise to one or more sugars (glycones) and a compound which is not a sugar (Glycone or Genine). To the solution of the extract in glacial acetic acid, few drops of ferric chloride and concentrated sulphuric acid are added, and observed for a reddish-brown coloration at the junction of two layers and the bluish green colour in the upper layer.

Terpenoids and steroids

Four milligrams of extract were treated with 0.5 ml of acetic anhydride and 0.5 ml of chloroform. Then concentrated solution of sulphuric acid was added slowly and red violet colour was observed for terpenoid and green bluish colour for steroids.

Flavonoids

4 ml of extract solution was treated with 1.5 ml of 50% methanol solution. The solution was warmed and metal magnesium was added. To this solution, 5 – 6 drops of concentrated hydrochloric acid was added and red colour was observed for flavonoids and orange colour for flavones.

Saponins

0.5 g of extracts was added to 5 ml of distilled water in a test tube. The solution was shaken vigorously and observed for a stable persistent froth. The frothing was mixed with 3 drops of olive oil and shaken vigorously after which it was observed for the formation of an emulsion.

Phenols

The extract (50 mg) is dissolved in 5 ml of distilled water. To this few drop of neutral 5% ferric chloride solution are added. A dark green colour indicates the presence of phenolic compounds. 3

Tannins

To 0.5 ml of extract solution 1 ml of water and 1-2 drops of ferric chloride solution was added. Blue colour was observed for gallic tannins and green black for catecholic tannins.

Results and Conclusion

Taxonomic Morphology of Cassia fistula *L*. Plant

Habit: A small tree.

Stem: Aerial, erect, woody, branched, cylindrical, solid and glabrous.

Leaves: Alternate, unipennate par pinnately compound, stipules small, leaflets 4-8 pairs, large, ovate, entire or wavy, acute, base wedge-shaped.

Inflorescence: Long drooping racemes.

Flowers:

1. Bracteate, pedicellate, complete, zygomorphic, bisexual, yellow.
2. Calyx made up of 5 sepals, divided to the base, imbricate, oblong.
3. Corolla made up of 5 petals, clawed, obovate, veined.
4. Stamens 10, the 3 longest stamens are much curled and bear large, oblong, much curled anthers, the 4 median stamens are straight and the 3 remaining are very short and erect, staminodes. Ovary free at the bottom of the calyx, superior, monocarpellary, unilocular, ovules many, marginal placentation.

- **Fruit:** A legume, long, cylindric, pendulous, indehiscent.
- **Seeds:** Ovate, many, imbedded horizontally in sweet, dark-coloured pulp, separated by transverse dissepiments called phragmatas.
- **Flowering and Fruiting Time:** March-July (fruiting throughout the year)

Figure:-Stem(Arial erect woody and Branched

Figure: - Leaves (Bracteate, pedicellate)

Figure:Inflorences (Racemose)

Figure:- flower(Bracteate, pedicellate)

Figure:-Fruit (A legume, long, cylindric)

Figure :- Seeds (Ovate, dark-coloured pulp)

Table No. 1 Qualitative analysis of Cassia fistula L.leaves

Sr. No.	Phytochemical	Plant extract of leaves in		
		Methanol	Chloroform	Petroleum ether

1.	**Alkaloids**	++	++	++
2.	**Glycosides**	++	+	++
3.	**Terpenoids**	+	++	+
4.	**Steroids**	++	+	++
5.	**Flavonoids**	++	++	++
6.	**Saponins**	++	++	++
7.	**Phenols**	++	+	++
8.	**Tannins**	++	++	++

Results taken average of triplicates for different concentration of plant extract.

The qualitative phytochemical studies were carried out in the solvents viz. Methanol, Chloroform and Petroleum ether. The Methanol, Chloroform and n-Butanol Leaves extract of ***Cassia fistula* L.**shows the presence of alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols but high intensity of phytochemicals in leaves showed in table no.1 by twice and petroleum ether extract of leaves.

Conclusion

***Cassia fistula* L**. is the rich source of phytochemicals, alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols. Its extraction in petroleum ether solvent shows highest intensity and content of phytochemicals.

So, ***Cassia fistula* L**. of plant presence different phytochemical compounds useful for Further purification, identification and characterization of the active compounds of would be our priority in future studies.

Medicinal uses of Cassia ***fistula* L**.

Cassia species worldwide which are used in herbal medicine systems. These particular families of plants are used widely for their laxative actions. *Cassia fistula* is no exception... it is often used as a highly effective moderate laxative that is safe even for children.

However, in large doses, the leaves and bark can cause vomiting, nausea, abdominal pain and cramps. *Cassia fistula* is also employed as a remedy for tumours of the abdomen, glands, liver, stomach, and throat, for burns, cancer, constipation, convulsions, delirium, diarrhoea, dysuria, epilepsy, gravel, haematuria, pimples, and glandular tumours. In Ayurvedic medicine systems, the seeds are attributed with antibilious, aperitif, carminative, and laxative properties while the the root is used for adenopathy, burning sensations, leprosy, skin diseases, syphilis, and tubercular glands. The leaves are employed there for erysipelas, malaria, rheumatism, and ulcers. In Brazilian herbal medicine, the seeds are used as a laxative and the leaves and/or bark is used for pain and inflammation.

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Diversity of Asterinaceous Fungi from Mahabaleshwar, Maharashtra

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Abstract

The Asterinaceous fungi is the second largest group of black mildews and are characterized by having shield-shaped thyriothecia, which split radially like a star or either opening by stellate dehiscence or by longitudinal splits; bitunicate asci and transversely uniseptate ascospores; with or without their anamorph. The asterinaceous group belonging to order Asterinales and having two families namely, Asterinaceae and Lembosiaceae. The present paper gives the checklist of Asterinaceous fungi from Mahabaleshwar, Maharashtra State, India. The 31 species of genus Asterina, 2 species each from Lembosia and Asterostomella and single species from Asterostomula are arranged in alphabetically.

Key words: *Black Mildew fungi, Asterinales, foliicolous fungi.*

Introduction:

The documentation of biodiversity, its conservation and sustainable utilization is the major theme of research in life sciences. The fungi are the important biotic group in the biodiversity and they are an extremely important part of the ecosystem. They have significant role in recycling of minerals and carbon; as a source of food, medicines and chemicals; as important models in scientific research; and have received much attention by scientific society as they cause plant and animal disease (Hosagoudar, 2012). The microfungi have great diversity in ecosystem but they are less studied because of its inconspicuous nature. Black mildews are one of the neglected group but having large number of species contribution in fungal diversity from tropical and subtropical regions of the world. Most of these fungi are either saprophytic or obligate parasites and residing on the surface of the leaves and producing special organs (haustoria) and opting special adaptation (Hansford, 1946a). These fungi are very specific in their structural characters; produce thin to dense black colonies on the surface of the leaves, contain conspicuous superficial appressoriate mycelium, forming fruiting bodies with asci and ascospores at their maturity (Hansford, 1961; Hosagoudar, 2012).

Among the black mildews, the Asterinaceous fungi are the second largest group of black mildews and are characterized by having shield-shaped thyriothecia, which split radially like a star or either opening by stellate dehiscence or by longitudinal splits; bitunicate asci and transversely uniseptate ascospores; with or without their anamorph. Asterinaceous fungi are usually more or less inconspicuous, superficial, obligate biotrophs, infecting wide range of flowering plants and existed with or without their anamorph. These fungi produce thin to dense black colonies on the surface of the leaves. These are characterized by superficial mycelium with one to two celled appressoria; at the maturity of colony, they formed flattened fruiting bodies with radiating cells known as thyriothecia, which splits radially like a ‘star’ and hence known as ‘Asterinaceous fungi’ or by longitudinal slits (Lembosiaceae); the bitunicate asci formed within the thyriothecium, contain transversely uniseptate ascospores. These are usually flourished with or without their respective anamorph (Hosagoudar, 2012).

Following are the significant taxonomic characters which facilitate the identification and separation of genus and species of this group of fungi.

1.1. Host identity

As the black mildew fungi are obligate parasite and considered as host specific, it is essential to know the correct identity of the host plants, preferably up to species level. This is an important taxonomic tool, used to keyout these fungi (Hosagoudar, 2012). Most of the authors have described the species key for asterinaceous fungi on the basis of families and genus of host plant.

1.2. Colony

Generally, the asterinaceous fungi produce typically thin to dense, dark-black colonies superficially on living leaves of plants. Mostly, the colony formed on leaves (foliicolous), and rarely on soft stem (caulicolous) and on young branches (ramicolous). If the colonies are on the leaves, they may be exclusively on the upper surface of the leaf (epiphyllous), or they may be exclusively lower surface of the leaf (hypophyllous) or they may be on both surfaces of leaf (amphigenous) (**Plate-1, Fig. 1-4**). The nature of the colony may be thin, crustose (crust like) or dense. Colonies grow radially and may be developed solitary (isolated) or scattered or confluent (scattered colonies spread to join together). Radiate growth results in the formation of a more or less circular colony that sometimes becomes confluent with neighboring colonies of the same fungal species. Confluent colonies can form colonization on large leaf surface by a single fungal species. So, the infection site, nature and size (in diameter) of colony are usually uniform in particular species or may not be uniform in different species and are significant for species delimitation (Hosagoudar, 2012). However, features of colony

appearance in combination with other morphological characters can facilitate the identification process at species level.

1.3. Mycelium

The species of asterinaceous fungi develop superficial, dark pigmented, filamentous, septate, branched, appressoriate mycelium or lacking appressoria, invade the host plant surface and form specialized structures for host infection (haustorium). Mycelium consists of brown to black, cylindrical cells with thick cell wall. It may be straight, substraight, undulate or zigzag, flexuous or crooked in nature. The branching may be opposite, alternate or irregular in the arrangement and branched at acute angles (around 45° or less than that) to wide angles (more than 45°) (**Plate-1, Fig. 5-8**). Branched hyphae may be loosely or closely reticulate and form a solid mycelial mat by compactly placing the individual mycelial threads. Therefore, the appearance of mycelium, branching pattern and angle, density of mycelium, length and diameter of hyphal cells are important taxonomic characters for species segregation in Asterinaceous fungi (Hosagoudar, 2012).

1.4. Appressoria

In this group of fungi, generally single to two celled appressoria are formed laterally on hyphae, but, sometimes these are absent (*Asterostomula*). The arrangement of laterally formed appressoria may be strictly opposite or alternate, unilateral or irregular and closely or moderately to distantly placed. These may be straight to curved, antrorse (directed towards the growing tip) to retrorse (turned opposite to growing tip), subantrorse (making more than 45° angle to the mycelium) or spreading (having mixed characters of all these). The lower cells or stalk cells in bicelled appressoria are mostly unicellular and are cylindrical to cuneate in shape. The unicellular appressoria or the head cell of bicelled appressoria may be globose, oblong, ovate, clavate, pyriform and may be entire, angular, sublobate to lobate at margin (**Plate-1, Fig. 9-13**). So, the arrangement, position, nature, size, shape and margin of appressoria are the important criterion for species segregation in asterinaceous fungi.

1.5. Thyriothecia

Thyriothecia of asterinaceous fungi are dimidiate type, flattened and typically circular in outline, orbicular or rarely elongated, L-, Y- or X-shaped. The development of a thyriothecium is initiated by directly below or lateral outgrowths from a surface hyphae and it grows radially. At the maturity, the thyriothecia dehisced or splits stellately at the center or dehisced vertically or longitudinally at the center (**Plate-1, Fig. 14-17**). The shape of the thyriothecia and their dehiscence pattern are an important criterion to delineate families and genera of Asterinales. Hosagoudar *et al*. (2001) used these characters to introduce a new family Lembosiaceae, for the genera having thyriothecia oval to elongate, X or Y shaped and dehisced longitudinally at the center. However, the flattened and typically circular thyriothecium with stellate dehiscence are the characters of family Asterinaceae (Hosagoudar, 2012).

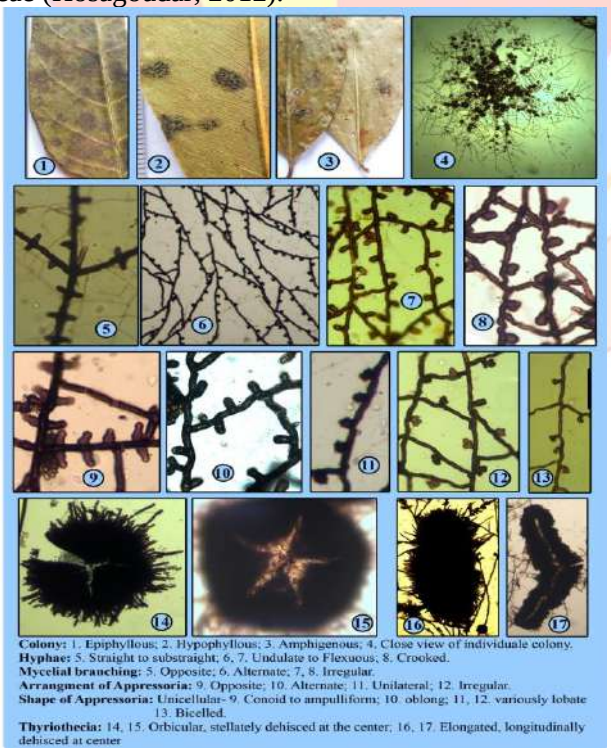

Plate 1. Colony, Hyphae, Mycelial branching, Appressoria & Thyriothecia in Asterinaceous fungi

1.6. Asci

The asci in asterinaceous fungi are bitunicate, globose, subglobose, ovate to broadly clavate. The ascus shape is relatively constant within the particular species of this group (Hosagoudar, 2012). The bitunicate asci have a distinctly thickened endotunica and it can be clearly visible when stained with cotton blue. Generally, thyriothecia are filled with numerous asci and contain 8 ascospores per ascus, more rarely 4 or 6 ascospores (**Plate-2, Fig. 1-4)**. So, the ascus numbers, shape and size are important taxonomical criteria for separation of species of asterinaceous fungi.

1.7. Ascospores

The ascospores of asterinaceous fungi are almost uniformly two-celled with one transversal septum at the center. At the region of the septum, the spores can be more or less constricted and the apices are mostly rounded or slightly acuminate to tapering. In general, the ascospores are almost oblong to ellipsoidal with equal cells or with the upper cell slightly longer and broader. Ascospore size is significant at species level (Hosagoudar, 2012). Ascospores are often pigmented and smooth-walled or more or less distinctly ornamented. The ornamentation pattern varies from warty or verrucose, truncate to echinulate (**Plate-2, Fig. 5-10**). Also, the germination pattern of ascospores is an important character for species segregation (**Plate-2, Fig. 11-13**). However, the ascospore shape, size, colour, absence or presence of ornamentation and its pattern are important criteria for species delimitation in asterinaceous fungi.

1.8. Anamorphic stages

The several numbers of genera of asterinaceous fungi produce anamorphic stages and are thought to be valid and important features in the classification of bitunicate ascomycetes. The asexual states (anamorphs) of several genera of Asterinales are present either along with teleomorph (sexual state) or develop isolated without respective teleomorph, and develop on the same surface mycelium forming conidia known as 'pycnothyriospores' within superficial Pycnothyria. Pycnothyria are always structurally similar to the thyriothecia, but usually smaller in size (Hosagoudar, 2012). The numerous pycnothyriospores are formed within the pycnothyria and are may be spherical, ovate, oblong, cylindrical, pyriform, angular to truncate (**Plate-2, Fig. 14-16)**. So, the presence or absence of anamorph, size and shape of pycnothyria and pycnothyriospores are the important taxonomic characters for species delimitation in asterinaceous fungi.

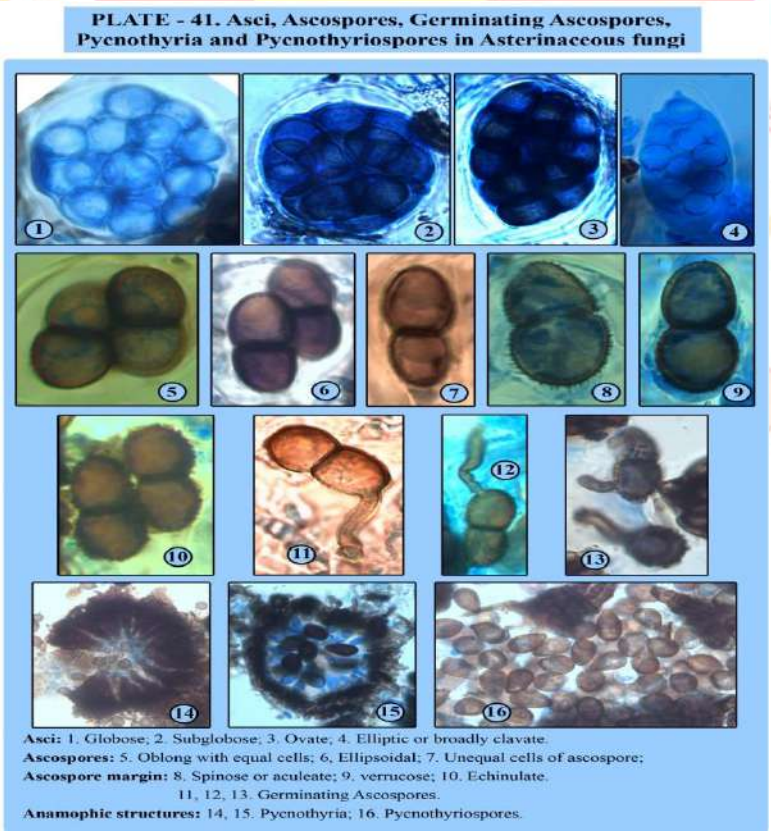

Plate 2. Asci, Ascospores, Pycnothyria & Pycnothyriospores in Asterinaceous fungi

Materials and Methods

The leaves and twigs of plant species infected with black mildew were collected from study area, during winter season (2012–2014). The infected host twigs were collected separately in sterilized polythene bags, tagged with field number, brought in the laboratory and pressed neatly to dry in between blotting papers. The well dried specimens were enclosed in butter paper and preserved in standard size herbarium packets. The host plants were identified by referring the regional flora (Deshpande *et al.*, 1995; Singh *et al*. 2000, 2001). Both macro and micro-morphological characters are used to taxonomical study of collected fungi. The fungal micro–morphological structures were mounted in lactophenol, stained with cotton blue and observed under compound light microscope. To observe mycelial branching and position of appressoria, a drop of peeling solution (Xylene–Thermocol solution) was applied on selected areas of the colonies, and after drying the film was mounted directly in again the same peeling solution. Biometric data were based on at least 10 measurements of structures; illustrations were prepared with Camera Lucida and photographed under Leica DM2000 fluorescence microscope equipped with digital camera. The fungal specimens were identified by using respective standard literature (Hansford, 1961; Hosagoudar, 2012; Patil *et al.*, 2014). Identified fungal specimens were deposited in Herbarium Cryptogamae Indiae Orientalis (HCIO), IARI, New Delhi (India) for their accession. The detail checklist of Asterinales group from Mahabaleshwar, Maharashtra state has been provided in present paper.

Enumerations of species: Family-Asterinaceae

Genus- *Asterina*

1. *Asterina atalantiae* Hosag. & Agarwal, Indian Phytopath. 56: 98, 2003; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala, p.41, 2011; Hosag., Mycosphere 2(5): 642, 2012.
Specimens examined: On leaves of *Atalantia racemosa* Wight (Rutaceae), Kate's Point, Mahabaleshwar, 17°55'78.2"N, 73°36'26.3"E, elev. 930 m, 12.12.2013, Bhise M.R., HCIO 51712; Ambenalighat, Mahabaleshwar, 17°53'39.9"N, 73°37'02.6"E, elev. 911 m, 15.03.2014, Bhise M.R., MHB 0602.
2. *Asterina beilschmiediae* Bhise, Patil & Salunkhe, Int. J. of Life Sciences 3(1): 68, 2015.
MycoBank No.: MB 811704
Specimens examined: On leaves of *Beilschmiedia dalzellii* (Meissn.) Kosterm. (Lauraceae), Mahabaleshwar, 17°55'25.6"N, 73°38'16.5"E, elev. 1289 m, 05.02.2014, Bhise M.R., HCIO 51713.
3. *Asterina casearíae* Hansf., Proc. Linn. Soc. London 156(2): 113, 1944; Hosag., Mycosphere 2(5): 650, 2012.
=*Asterina casearíae* Yamam., Sci. Rep. Hyogo Univ. Agric., Agric. Biol. Ser. 2:35, 1956.
Specimens examined: On leaves of *Caesearia graveolens* Dalz. (Flacourtiaceae), Hatlote, 17°51'43.6"N, 73°35'33.8"E, elev. 742 m, 06.02.2014, Bhise M.R., HCIO 51766; Renoshi forest, 17°47'43.1"N, 73°40'29.5"E, elev. 676 m, 13.03.2014, Bhise M.R., HCIO 51767; Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 10.12.2013, Bhise M.R., MHB 0235.
4. *Asterina chukrasiae* Hosag. in Hosag., H. Biju & Appaiah, J. Mycopathol. Res. 44: 40, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala, p.47, 2011; Hosag., Mycosphere 2(5): 653, 2012.
Specimens examined: On leaves of *Aglaia lawii* (Wight) Sald. (Meliaceae), Birmanwadi River side, 17°53'17.8"N, 73°37'20.5"E, elev. 676 m, 14.03.2014, Bhise M.R., HCIO 51768.
5. *Asterina combreti* Sydow, Engl. Bot. Jahrb. 45: 264, 1910; Hosag. & Abraham, Indian Phytopath. 51: 389, 1998; Hosag. & Appaiah, J. Mycopathol. Res. 43:172, 2005; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.55, 2011; Hosag., Mycosphere 2(5): 659, 2012.
Specimens examined: On leaves of *Terminalia elliptica* Willd. (Combretaceae), Par, 17°55'25.1"N, 73°40'26.2"E, elev. 732 m, 17.02.2013, Bhise M.R., HCIO 51769; Gonoshi forest, 17°55'22.3"N, 73°36'04.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51770.
6. *Asterina disciferae* Hosag. in Hosag., Balakr. & Goos, Mycotaxon 59: 172, 1996; Hosag., Mycosphere 2(5): 670, 2012.
Specimens examined: On leaves of *Syzygium caryophyllatum* (L.) Alst. (Myrtaceae), Pratapgad, 17°56'10.6"N, 73°35'06.5"E, elev. 836 m, 10.02.2013, Bhise M.R., HCIO 51651; *Syzygium cumini* (L.) Skeels, Gonoshi forest, 17°55'22.3"N, 73°36'06.2"E, elev. 696 m, 14.02.2014, Bhise M.R., HCIO 51653; *Syzygium rubicundum* Wight & Arn., Birmani–Bhairijogeshwari, 17°54'08.2"N, 73°36'45.8"E, elev. 705 m, 10.12.2013, Bhise M.R., HCIO 51454.
7. *Asterina dissiliens* (Sydow) Doidge, Bothalia 4: 287, 1942; Hosag. & Goos, Mycotaxon 52: 467, 1994; Hosag., Balakr. & Goos, Mycotaxon 60: 174, 1996; Hosag., Mycosphere 2(5): 671, 2012.
=*Asterinella dissiliens* Sydow, Ann. Mycol. 22: 425, 1924.
=*Parasterina reticulata* Doidge, Bothalia 1: 200, 1924.
Specimens examined: On leaves of *Maytenus rothiana* (Walp.) Lobreau–Collen (Celastraceae), Par, 17°55'22.3"N, 73°36'02.2"E, elev. 762 m, 17.02.2013, Bhise M.R., MHB 0162; Mahabaleshwar,

17°56'52.4"N, 73°40'16.4"E, elev. 1409 m, 19.02.2013, Bhise M.R., MHB 0208; Kate's point, Nakinda, 17°56'11.3"N, 73°35'06.6"E, elev. 1251 m, 18.10.2013, Bhise M.R., HCIO 51714, MHB 0339; *Maytenus senegalensis* (Lam.) Excell., Bhekawali, 17°56'11.3"N, 73°35'06.6"E, elev. 1251 m, 26.11.2012, Bhise M.R., MHB 0042.

8. *Asterina elaeagni* Sydow, Ann. Mycol. 29: 225, 1931; Hansf. & Thirum., Farlowia 3: 306, 1948.
=*Asterina elaegni* (Sydow) Sydow & Petrak, Hosag., Mycosphere 2(5): 672, 2012.
Specimens examined: On leaves of *Elaeagnus conferta* Roxb (Elaeagnaceae), Par, 17°54'86.9"N, 73°35'96.7"E, elev. 708 m, 10.12.2013, Bhise M.R., HCIO 51771; Gonoshi forest, 17°55'22.3"N, 73°36'02.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51772; Birmanwadi Road, 17°54'08.1"N, 73°36'45.8"E, elev. 712 m, 10.12.2013, Bhise M.R., MHB 0387.

9. *Asterina erysiphoides* Kalch. & Cooke, Grevillea 9: 32, 1880; Doidge, Trans. Roy. Soc. South Africa 8: 256, 1920; Hansf. & Thirum., Farlowia 3: 306, 1948; Hosag., Balakr. & Goos, Mycotaxon 59: 175, 1996; Hosag., H. Biju & Appaiah, J. Mycopathol. Res. 44: 7, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.72, 2011; Hosag., Mycosphere 2(5): 677, 2012.
Specimens examined: On leaves of *Jasminum malabaricum* Wight (Oleaceae), Par, 17°54'82.1"N, 73°35'92.1"E, elev. 720 m, 17.02.2013, Bhise M.R., HCIO 51699; Birmanwadi road, 17°54'08.1"N, 73°36'45.8"E, elev. 712 m, 10.12.2013, Bhise M.R., MHB 0385(b); Machutar-Tetawali, 17°53'98.5"N, 73°42'29.6"E, elev. 1265 m, 11.12.2013, Bhise M.R., MHB 0398(c).

10. *Asterina helicanthis* *sp. nov.*
MycoBank No: MB 811795
Specimens examined: On leaves of *Helicanthes elastica* (Desr.) Danser (Loranthaceae), Mahabaleshwar, 17°55'25.6"N, 73°38'16.5"E, elev. 1289 m, 05.02.2014, Bhise M.R., HCIO 51773; Dudhoshi, 17°55'15.6"N, 73°36'59.2"E, elev. 734 m, 15.03.2014, Bhise M.R., HCIO 51774.

11. *Asterina hibisci* (Doidge) Hosag. in Hosag., C. K. Biju & Abraham, J. Econ. Taxon. Bot. 28: 175, 2004; Hosag., Zoos' Print J. 21: 2327, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.88, 2011; Hosag., Mycosphere 2(5): 693, 2012.
=*Asterina diplocarpa* Cooke var. *hibisci* Doidge, Botahalia 4: 331, 1942.
Specimens examined: On leaves of *Hibiscus rosa-sinensis* L. (Malvaceae), Pratapgad, 17°56'12.1"N, 73°35'26.2"E, elev. 818 m, 15.03.2014, Bhise M.R., HCIO 51775.

12. *Asterina hosagoudarii* Bhise, Patil & Salunkhe, Int. J. of Life Sciences 3(1): 71, 2015. **MycoBank No.:** MB 811705
Specimens examined: On leaves of *Litsea josephii* S. M. Almeida (Lauraceae), Gureghar, 17°55'19.23"N, 73°44'22.79"E, elev. 1284 m, 19.11.2012, Bhise M.R. HCIO 51658 (holotype); HCIO 51657 (Isotype).

13. *Asterina jambolanae* Kar & Maity, Trans. Brit. Mycol. Soc. 54: 438, 1970; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.96, 2011; Hosag., Mycosphere 2(5): 701, 2012.
Specimens examined: On leaves of *Syzygium caryophyllatum* (L.) Alst. (Myrtaceae), Pratapgad, 17°56'12.7"N, 73°35'08.5"E, elev. 825 m, 20.11.2012, Bhise M.R., HCIO 51659; Gonoshi forest, 17°55'22.3"N, 73°36'06.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51660.

14. *Asterina laxiuscula* Sydow, Phillipine J. Sci. 8: 276, 1912; Patil & Pawar, Indian Phytopath. 42: 248, 1989; Hosag., Mycosphere 2(5): 708, 2012.
Specimens examined: On leaves of *Xantolis tomentosa* (Roxb.) Raf. (=*Sideroxylon tomentosa*, Sapotaceae), Gonoshi forest, 17°55'22.3"N, 73°36'00.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51776.

15. *Asterina litseae* Yates, Philippine J. Sci. 13: 373, 1918; Hosag., Balakr. & Goos, Mycotaxon 59: 180, 1996; Hosag., Mycosphere 2(5): 710, 2012.
Specimens examined: On leaves of *Litsea deccanensis* Gamble (Lauraceae), Chaturbet, 17°50'37.7"N, 73°38'10.8"E, elev. 677 m, 05.02.2014, Bhise M.R., HCIO 51716.

16. *Asterina lobulifera* Sydow in Sydow & Sydow, Philippine J. Sci. 9: 181, 1914; Hosag., C. K. Biju & Abraham, J. Mycophathol. Res. 40: 195, 2002; J. Econ. Taxon. Bot. 28: 175, 2004; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.108, 2011; Hosag., Mycosphere 2(5): 712, 2012
Specimens examined: On leaves of *Glochidion ellipticum* Wight (Euphorbiaceae), Birmani, 17°53'54.8"N, 73°36'41.4"E, elev. 720 m, 14.03.2013, Bhise M.R., HCIO 51717.

17. *Asterina macrosolenae* *sp. nov.*
MycoBank No: MB 811796
Etymology: The specific epithets based on the genus of host plant.
Specimens examined: On leaves of *Macrosolen capitellatus* (Wight & Arn.) Danser (Loranthaceae), Gonoshi, 17°55'22.3"N, 73°36'00.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51777; Birmani-Bhairijogeshwari,

17°54'08.2"N, 73°36'45.8"E, elev. 704 m, 10.12.2013, Bhise M.R., HCIO 51778; Dhudhgaon, 17°50'55.7"N, 73°37'36.0"E, elev. 772 m, 14.02.2014, Bhise M.R., MHB 0587.

18. ***Asterina morellae*** Hosag., C. K. Biju & Abraham, Indian Phytopath. 54: 137, 2001; Hosag., Zoos' Print J. 21: 2328, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.123, 2011; Hosag., Mycosphere 2(5): 726, 2012.

Specimens examined: On leaves of *Garcinia indica* (Du Petit-Thou.) Choisy (Clusiaceae), Pratapgad, 17°56'10.5"N, 73°35'04.3"E, elev. 848 m, 13.12.2013, Bhise M.R., HCIO 51779; Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., MHB 0420.

19. ***Asterina myrtacearum*** Bhise & Patil, in Bhise *et al*., Phytotaxa 184 (5): 284, 2014. **MycoBank No.:** MB 809993

Specimens examined: On living leaves of *Syzygium caryophyllatum* (L.) Alst. (Myrtaceae), Renoshi forest, 17°47'43.10"N, 73°40'29.50"E, elev. 676 m, 13.03.2014, Bhise M.R., HCIO 51664 (holotype); *Syzygium cumini* (L.) Skeels, Old Mahabaleshwar, 17°57'50.44"N, 73°39'12.47"E, elev. 1339m, 18.10.2013, Bhise M.R., MHB 0313(a).

20. ***Asterina nothopegiae*** Ryan, Mem. Dept. Agric. India 15: 104, 1928; Patil & Thite, J. Shivaji Univ. 17: 152, 1977; Hosag., Balakr. & Goos, Mycotaxon 59: 182, 1996; Hosag., C. K. Biju & Abraham, J. Econ. Taxon. Bot. 25: 305, 2001; Hosag., Zoos' Print J. 18: 1280, 2003; Hosag., Zoos' Print J. 21: 2328, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.128, 2011; Hosag., Mycosphere 2(5): 732, 2012.

Specimens examined: On leaves of *Nothopegia castaneifolia* (Roth) Ding Hou. (Anacardiaceae), Par, 17°55'22.4"N, 73°36'06.2"E, elev. 745 m, 17.11.2013, Bhise M.R., HCIO 51718; Par, 17°55'22.5"N, 73°36'05.2"E, elev. 462 m, 17.02.2013, Bhise M.R., MHB0160 (b); Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., MHB0418 (b).

21. ***Asterina oxyceri*** Bhise, Patil & Salunkhe, Int. J. of Life Sciences 3(1): 73, 2015.

MycoBank No.: MB 817106

Specimens examined: On leaves of *Oxyceros rugulosus* (Thw.) Tirveng. (Rubiaceae), Hatlote, 17°51'43.6"N, 73°35'33.8"E, elev. 742 m, 06.02.2014, Bhise M.R., HCIO 51719.

22. ***Asterina piperina*** Sydow, Ann. Mycol. 15: 243, 1917; M. S. Patil & Pawar, Indian Phytopath. 42: 251, 1989; Hosag., Mycosphere 2(5): 740, 2012.

=*Asterina piperis* Yates, Philippine J. Sci. 13: 374, 1918.

Specimens examined: On leaves of *Piper trichostachyon* (Miq.) C.B.Cl. (Piperaceae), Ghonaspur, 17°48'16.5"N, 73°39'25.7"E, elev. 696 m, 13.03.2014, Bhise M.R., HCIO 51720; Mahabaleshwar, 17°56'52.4"N, 73°40'16.4"E, elev. 1409 m, 12.03.2013, Bhise M.R., MHB 0203; Kate's Point, Mahabaleshwar, 17°55'78.2"N, 73°36'26.3"E, elev. 930 m, 12.12.2013, Bhise M.R., MHB 0414; Gonoshi, 17°52'46.5"N, 73°37'26.0"E, elev. 674 m, 04.02.2014, Bhise M.R., MHB 0472.

23. ***Asterina prataparajii*** Hosag. Robin & Archana, J. Appl. Nat. Sci. 2: 93, 2010; Hosag., Mycosphere 2(5): 745, 2012.

Specimens examined: On leaves of *Tylophora dalzellii* Hook. *f*. (Asclepiadaceae), Gonoshi, 17°52'46.5"N, 73°37'26.2"E, elev. 674 m, 04.02.2014, Bhise M.R., HCIO 51721; Pratapgad, 17°56'10.3"N, 73°35'17.1"E, elev. 832 m, 10.02.2013, Bhise M.R., MHB0243; Par, 17°54'86.9"N, 73°35'96.7"E, elev. 708 m, 10.12.2013, Bhise M.R., MHB0372; Hatlote 17°5'43.6"N, 73°35'33.8"E, elev. 742 m, 06.02.2014, Bhise M.R., MHB520; Chaturbet 17°50'37.5"N, 73°38'10.1"E, elev. 686 m, 07.02.2014, Bhise M.R., MHB547.

24. ***Asterina radians*** Ellis, Journal of Mycology 7 (3): 276, 1893; Kaul & Nair, Acta Botanica Indica 11: 227-229, 1988.

Specimens examined: On leaves of *Capparis rotundifolia* Rottl. (Capparaceae), Wilson point, Mahabaleshwar, 17°55'25.1"N, 73°40'26.2"E, elev. 1326 m, 03.02.2014, Bhise M.R., HCIO 51780; Cannot pick point, Mahabaleshwar, 17°56'52.4"N, 73°40'16.4"E, elev. 1409 m, 04.02.2014, Bhise M.R., HCIO 51781; Tapola Road, Mahabaleshwar, 17°56'52.4"N, 73°40'16.4"E, elev. 1409 m, 22.03.2013, Bhise M.R., MHB 0217.

25. ***Asterina rhamni*** Kar & Ghosh, Indian Phytopath. 39: 206, 1986; Hosag., Mycosphere 2(5): 747, 2012.

Specimens examined: On leaves of *Ventilago maderaspatana* Gaertn. (Rhamnaceae), Hatlote, 17°51'43.6"N, 73°35'33.8"E, elev. 742 m, 06.02.2014, Bhise M.R., HCIO 51722; Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., MHB 0416.

26. ***Asterina rubiacearum*** Bhise, Patil & Salunkhe, Phytotaxa 511 (3): 283-288, 2021.

MycoBank No: MB 811797

Etymology: the specific epithet refers to the host plant family–Rubiaceae.

Specimens examined: On living leaves of *Canthium dicoccum* (Gaertn.) Teijsm. & Binn. var. *umbellatum* (Wight) Sant.& Merch. (Rubiaceae), Machutar-Tetawali, 17°53'98.5"N, 73°42'29.6"E, elev. 1265m, 11.12.2013, Bhise M.R., HCIO 51666 (holotype); Linghmala, 17°55'15.1"N, 73°36'59.3"E, elev. 1177 m,

22.12.2012, Bhise M.R., HCIO 51665; Kharoshi, 17°50'10.4"N, 73°38'12.8"E, elev. 628 m, 07.02.2014, Bhise M.R., HCIO 51667.

27. ***Asterina tertia*** Racib. in Theiss., Die Gattung Asterina 7:103, 1913; Sacc., Sylloge Fungorum 24: 443, 1926; Hosag. & Abraham, J. Econ. Taxon. Bot. 4: 558, 2000; Hosag., Biju & Appaiah, J. Mycopathol. Res. 43: 204, 2005; 44: 12, 2006; Hosag., Zoos' Print J. 21: 2329, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.147, 2011; Hosag., Mycosphere 2(5): 755, 2012.

Specimens examined: On leaves of *Rhinacanthus nasuta* (L.) Kurz (Acanthaceae), Ambenalighat, Mahabaleshwar, 17°53'39.9"N, 73°37'02.6"E, elev. 911 m, 17.10.2013, Bhise M.R., HCIO 51723; *Asystasia dalzelliana* Sant., Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., HCIO 51724.

28. ***Asterina trichiliae*** Doidge, Trans. Royal Soc. South Africa 8: 253, 1920. Hosag. & Goos, Mycotaxon 60: 161, 1996; Hosag., Mycosphere 2(5): 765, 2012.

Specimens examined: On leaves of *Trichilia connaroides* (Wight & Arn.) Bentv. (Meliaceae), Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., HCIO 51782; Pratapgad, 17°56'10.9"N, 73°35'09.4"E, elev. 821 m, 15.03.2014, Bhise M.R., MHB 0621.

29. ***Asterina wingfieldii*** Hosag., Balakr. & Goos, Mycotaxon 59: 184, 1996; Hosag., Mycosphere 2(5): 672, 2012.

Specimens examined: On leaves of *Grewia abutilifolia* Vent. ex A. Juss. (Tiliaceae), Gonoshi, 17°55'22.3"N, 73°36'00.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51783; Birmani, 17°53'41.4"N, 73°36'41.4"E, elev. 720 m, 14.03.2014, Bhise M.R., MHB 0593; Dudhoshi, 17°55'15.6"N, 73°36'59.2"E, elev. 734 m, 15.03.2014, Bhise M.R., MHB 0610; *Grewia serrulata* DC., Hatlote, 17°51'43.6"N, 73°35'33.8"E, elev. 687 m, 06.02.2014, Bhise M.R., HCIO 51784.

30. ***Asterina woodfordiae*** Sahni, Mycopath. Mycol. Appl. 23(4): 330, 1964; Patil & Thite, J. Shivaji Univ. 17: 152, 1977; Hosag., Mycosphere 2(5): 771, 2012.

Specimens examined: On leaves of *Woodfordia fruticosa* (L.) Kurz. (Lythraceae), Gonoshi, 17°52'46.5"N, 73°37'26.0"E, elev. 674 m, 04.02.2014, Bhise M.R., HCIO 51725; Ambenalighat, Mahabaleshwar, 17°53'39.9"N, 73°37'02.6"E, elev. 858 m, 17.10.2013, Bhise M.R., MHB 0294; Par, 17°54'86.9"N, 73°35'96.7"E, elev. 708 m, 10.12.2013, Bhise M.R., MHB 0368; Hatlote, 17°51'43.6"N, 73°35'33.8"E, elev. 742 m, 06.02.2014, Bhise M.R., MHB 0527.

31. ***Asterina wrightiae*** Sydow in Sydow & Petrak, Ann. Mycol. 29: 236, 1931; Hosag. & Abraham, Indian Phytopath. 51: 390, 1998; J. Econ. Taxon. Bot. 4: 560, 2000; Hosag., C.K. Biju & Abraham, J. Econ. Taxon. Bot. 25: 305, 2001; Hosag., Zoos' Print J. 18: 1280, 2003; Hosag., Zoos' Print J. 21: 2329, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.160, 2011; Hosag., Mycosphere 2(5): 769, 2012.

Specimens examined: On leaves of *Wrightia tinctoria* R. Br. (Apocynaceae), Kharoshi, 17°50'10.4"N, 73°38'12.8"E, elev. 628 m, 07.02.2014, Bhise M.R., HCIO 51726; Chaturbet, 17°52'01.3"N, 73°38'10.1"E, elev. 652 m, 07.02.2014, Bhise M.R., MHB0550.

Genus- *Asterostomella*

Enumeration of the species

1. ***Asterostomella flacourtiae-montanae*** V.B. Hosagoudar & A. Sabeena, in Hosag., Mycosphere 2(5): 827, 2012.

Specimens examined: On leaves of *Flacourtia indica* (Burm. f.) Merr. (=*Flacourtia montana*, Flacourtiaceae), Machutar-Tetawali, 17°54'32.5"N, 73°41'29.9"E, elev. 1306 m, 12.03.2014, Bhise M.R., HCIO 51785.

2. ***Asterostomella nothopegiae*** *sp. nov.* **MycoBank No:** MB 811798

Etymology: The specific epithets based on the genus of host plant.

Specimens examined: On leaves of *Nothopegia castaneifolia* (Roth) Ding Hou. (Anacardiaceae), Dudhoshi, 17°55'15.6"N, 73°36'59.2"E, elev. 734 m, 15.02.2014, Bhise M.R., HCIO 51727; Par, 17°55'22.3"N, 73°36'00.2"E, elev. 762 m, 17.02.2013, Bhise M.R., MHB0160 (c); Par, 17°55'22.6"N, 73°36'01.2"E, elev. 768 m 17.12.2013, Bhise M.R., MHB0305 (c); Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., MHB0418 (c).

Genus- *Asterostomula*

1. ***Asterostomula pavettae*** Hosagoudar & Sabeena in Hosag., Mycosphere 2(5): 837, 2012.

Specimens examined: On leaves of *Pavetta concanica* Bremek. (Rubiaceae), Par-Wada, 17°55'25.1"N, 73°40'26.2"E, elev. 732 m, 23.12.2012, Bhise M.R., HCIO 51786.

Family- Lembosiaceae
Genus- *Lembosia*

1. *Lembosia mahabaleshwarensis* Bhise & Patil, in Bhise *et al*., Phytotaxa 184 (5): 284, 2014. **MycoBank No.:** MB 809994

Specimens examined: On living leaves of *Syzygium rubicundum* Wight & Arn. (Myrtaceae), Par, 17°55'22.30"N, 73°36'00.20"E, elev. 762m, 17.10.2013, Bhise M.R., HCIO 51673 (holotype); Pratapgad, 17°56'10.70"N, 73°35'07.50"E, elev. 829m, 13.12.2013, Bhise M.R., HCIO 51674.

2. *Lembosia memecylicola* Hosag., J. Mycopathol. Res. 43(2): 204, 2005; Hosag., Mycosphere 2(5): 814, 2012.

Specimens examined: On leaves of *Memecylon umbellatum* Burm. f. var. *umbellatum* (Melastomataceae), Ambenalighat, Mahabaleshwar, 17°53'39.9"N, 73°37'02.6"E, elev. 858 m, 06.01.2013, Bhise M.R., HCIO 51790; Old mahabaleshwar, 17°57'50.4"N, 73°39'12.4"E, elev. 1339 m, 18.10.2013, Bhise M.R., MHB 0320; Wilson point, Mahabaleshwar, 17°55'25.3"N, 73°40'26.4"E, elev. 1331 m, 19.10.2013, Bhise M.R., MHB 0348.

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Observations on Floral Nectar and Flower visitors in *Hamelia patens* Jacq. (Rubiaceae)

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Abstract

The present paper deals with the study of flowering phenology, flower dynamics, nectar production, chemical composition and flower visitors of Hamelia patens Jacq.(Rubiaceae)

Hameliapatens is large perennial shrub or small treein the family Rubiaceae that is native to the American subtropics and tropics.The common name of this plant is firebush, hummingbird bush,scarlet bush and redhead.Flowering season of this plant is throughout the year. The flowers are bright reddish-orange or scarlet tubular.And last for 2days.Anther dehisces in the mature bud. Nectary gland present at the base of ovary. The amount of nectar and nectar concentration from flowers was recorded after every two-hour interval from 08.00hrs -17.00hrs. The average volume of nectar was found to be 1µl. The average nectar concentration was found to be 15%. Sugars from floral nectars were detected by one directional thin layer chromatography. Nectar showed the presence of three sugars sucrose glucose and fructose. Flower visitors were observed for their visits and behaviour during the flowering period. Butterflies, sun birdwasps and ants were the main flower visitors.

Key words: Hamelia patens, Nectar, Sugars, Pollinators.

Introduction

*Hamelia patens*is a large perennial shrub or small tree that is native to the American subtropics and tropics.*Hamelia. patens* belonging to family Rubiaceae .The flowers of the *H. patent* are orangish-red tubular which recruit hummingbirds and butterflies for pollination.(Welch and willam C. 2003). Tha family Rubiaceae has 10,700 species consisting treem shrub and hurbs (Robbrecht 1998). Nectary gland presentat the base ovary. Presence of nectaries is a biological character as it is related to a vital function of pollination.Pollination is successful in many plant species as consequences of pollinators seeking nectar.(Southwick*etal*, 1981).Sucrose-rich nectar present. (Faegri and Van der pijl 1980). Floral nectar provides food for insect and birds pollinators.(Baude et al 2016;Carvell et al 2006).Nectar characteristic patterns of nectar secretion and availability, flower production spatial arrangement and morphological aspects of flowers and flower -visiting birds are important in order to understand the foraging behaviour of birds on flowers (Waser, 1982; Kearns and Inouye, 1993). This phonological pattern is associated with long-lived pollinators that set fixed daily foraging routes (Gentry 1974). Bird-pollinated plants are usually characterised by having brightly colour, odourless flowers, tubular and evenly curved corollas,diurnal anthesis(Faegri and Van der Pijl 1980).Flowers produce nectar and are adapted for pollination.In *H.patens* due to bright oranges tubuler colour of flower maximum butterflies, bees and birds are attracted. Ants and house flies are robbers.

Thus, the aim of the present work was to study flowering phenology, the nectar volume (µL), nectar concentration, chemical composition of sugars and flower visitors in *Hamelia patens*.

Material and Methods

Study Area

The present study was carried out in the campus of Shri Shivaji Arts, Commerce and Science College, Akot during February to April 2021.

Flowering phenology

A cultivated population of *Hamelia patent*in college campus was chosen for observations. Flowering phenology, time of anthesis and time of anther dehiscence was recorded during the peak flowering period.

Nectar Analysis

The time of nectar secretion was noted during the peak flowering period. The amount of nectar from flowers was recorded at 2hrs intervals during the flowering period. Nectar was extracted with micro-capillary tubes. Nectar concentration was determined using a hand-held sugar refractometer (Erma Japan) from 8.00hrs to 17.00hrs for 5 days during the peak bloom. For the analysis of sugar and nectar samples preserved in isopropanol as well as fresh nectar samples were used. The sugars present in nectar were studied by using thin layer chromatography. Nectar sample was loaded on the plate along with standard sucrose, fructose and glucose keeping a comfortable distance between the loaded nectar sample and standard sugars. Later the plates were run in a solvent prepared by mixing butanol-4 parts + acetic acid 1 parts + distilled water 5 parts (4:1:5). After solvent run, the silica gel plate was allowed to dry, sprayed with 1% aniline, 1% diphenylamine and 85% Ortho-phosphoric acid prepared in 100 ml acetone.

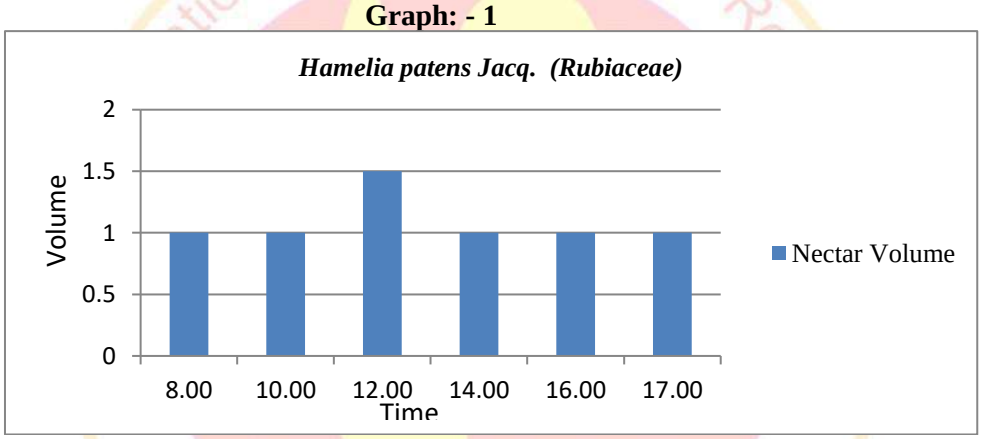
Flower Visitors

Observations were made on the type of flower visitors during the peak flowering period. The duration of visits, number of flowers was recorded at 2hrs interval.

Table 1.Nectar Volume and Nectar Concentration in*H. patens*

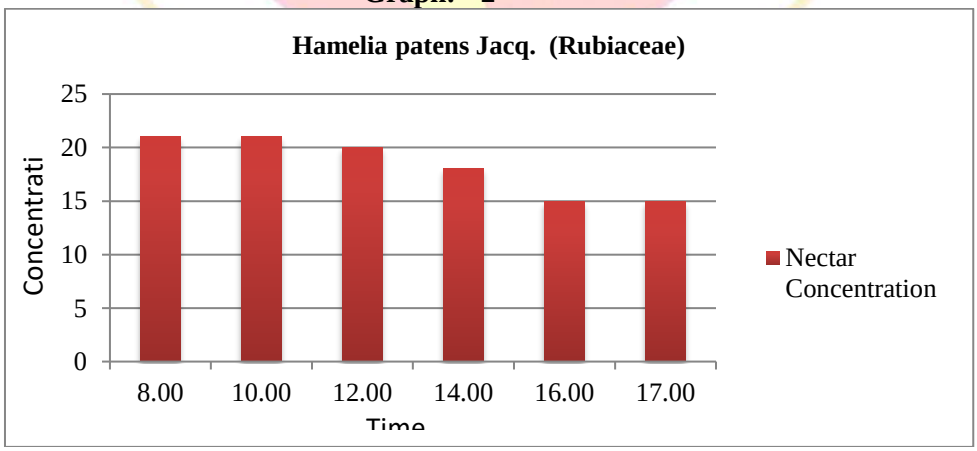
Time	Nectar Volume	Nectar Concentration
8.00	1µl	21%
10.00	1µl	21%
12.00	1.5µl	20%
14.00	1µl	18%
16.00	1µl	15%
17.00	1 µl	15%

Graph: - 1



Nectar Volume in *Hamelia patens Jacq. (Rubiaceae)*

Graph: - 2



Nectar Concentration in*Hamelia patens Jacq. (Rubiaceae)*

Table 2 : Flower visitor's census in *H.patens*

Flower visitors	Forage type	Time of visit	Flower visited
Bees and wasps	Nectar	08.00-1.00hrs	5-6
Butterflies	Nectar	08.00- 11.00hrs	2-3

Ants	Nectar	Throughout day	4-5
Sunbirds	Nectar	14.00- 16.00hrs	4-5
Houseflies	Nectar	11.00-12.00 hrs	2-3

Fig:1.Ant feeding on nectar.

Fig:2.housefly collecting nectar from flower.

Fig:3.Butterfly visiting the flower for nectar

Fig:4.Ant feeding on nectar.

Fig:5.wasp collecting nectar from flower

Result and Discussion

In *Hameliapatens*flowering period throughout years and but the peak flowering period was observed during month of April and september. However, flowering phenology quit variable and under the control of environmental conditions.The inflorescence is polychasial cyme. Flowers open daily 7.00hrs-800hrs. Anther dehiscence takes place between 11.00hrs-1200hrs in the mature bud. During the period of September-february, the flowers start to open around 03.00hrs and are fully open at 03.30hrs.The anther dehisce by longitudinal slits prior to anthesis. And anther dehisce inside the buds.(Chauhan and Galetto L. 2009).Nectar secreation begins before anthesis. The open flower produce 1.2ul nectar and fructose Glucose and sucrose sugars present in the nectar of *H. patent*(Chauhan and Galetto L.).Floral nectar is secreted by plants to attract and reward of pollinators, and it plays a key role in the functional ecology of plants (Baker and Baker, 1983; Gonzalez-Teuber and Heil, 2009). In *Hameliapatens* nectar secretion begins in the buds during morning 7.00hrs-8.00hrs. The quantity of nectar was measure on the day of flower opening at two hours intervals between 8.00hrs-17.00hrs. On an average the total amount of nectar measure during this period in each flower was 1µl (Table 1 & Graph 1). Maximum nectar production occurred during 12.00hrs-15.00hrs.The average nectar concentration was found 18.33% during the peak flowering period (Table 1 & Graph 2).Galetto(1998) made similar observations in H. patentconcentration of nectar 16% and later between 20-25%. The three nectar sugars fructose glucose and sucrose were identified. Sucrose present in abundant amount. Sucrose-rich nectar is present. (Faegri and Van der pijl 1980). The flowers are nectar-rich, orange colour and tubular serve as strong visual cues to attract the butterflies bees and Ants. The present observations showed that in *H. patens* butterflies bees and ants were the main pollinators. Among the peak flowering period observed in the study, in

morning between 07.00hrs -11.00hrs had greater number of pollinator visits per bout.Coloured butterflies and ants visited the flower throughout the day. Most of the bees and wasps visited in between8hrs-1.00hrs.Houseflies visited in between 11.00-12.00hrs. (Table 2).Thomas et,al (1986) studied the interaction between the butterflies and hummingbirds in *Hameliapatens*. While sunbirds are seen in the afternoon between 15.00hrs-17.00hrs. It is interesting observed that the butterflies visit in the morning hours 08.00hrs-11.00hrs. (Chauhan and Galetto L. 2009).

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In vitro evaluation of cytotoxic activity of *Curcuma inodora* Blatt. Rhizomeagainst (Miapaca-2) human pancreatic carcinoma cell line

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Abstract:

To determine the in vitro cytotoxic activity of Curcuma inodoraBlatt.,crude aqueous extract of rhizome against thehuman pancreatic carcinoma cell lines (MiaPaca-2). The cytotoxic activity was evaluated by the tetrazolium salt reduction assay (MTT)at different concentrations(10, 20, 30, 40 and 50µg/ml) of aqueous extract of rhizome for 48 hrs. with standard positive control chemotherapeutic agent viz. 5-Flurouracil.The aqueous extracts showed growth inhibition 26.24 ± 1.81 at highest 50µg/ml. IC_{50} for the 5-FU standard control was 25.9 ±0.68µg/ml. Crude aqueous extract of rhizome Curcuma inodoraproduced IC_{50} value 97.58 ± 2.45 µg/ml.Rhizome aqueous extract of Curcuma inodorashowed a significant reduction in growth of cancerous cells indicate the potential of anti-proliferative growth.

Keywords: *Curcuma inodora, rhizome, Cytotoxicity, Pancreatic cancer cells, MTT assay, 5-Flurouracil.*

Introduction:

Pancreatic cancer (PC) is a highly invasive human malignancy globally with an extreme poor prognosis (Siegel *et al*., 2016). Pancreatic cancer is seventh leading cause of cancer related death all over the world. However, mortality rate of pancreatic cancer are not completely clear. For the majority of concerning PC sufferers, the only therapeutic promise is cytostatic remedy using standard chemotherapeutic drugs such as gemcitabine and 5-FU (5-fluorouracil) or their combination (Michl and Gress, 2013). However, the median progress time of PC sufferers is only about 6 months usually due to an almost complete chemotherapy resistance, and the dismal 5-year survival is currently approximately 2% (Ramfidis*et al*.,2014) Therefore, there may be a great need for each new biomarkers with prognostic and predictive value and newer therapeutic preferences for this disease. MIA PaCa-2 cell line is a prime tumor currently used in vitro models to observe pancreatic carcinogenesis. Wild plants in nature have bioactive phytochemicals that have anti-carcinogenic property.

Curcuma inodora Blatt. belongs to family-Zingiberaceae, commonly known as scentless turmeric. Traditionally, it is used in the treatment of muscular pain, psychosomatic disorders and constipation. Scentless turmeric is used by the tribal as a hair tonic and to cure wound. Tribal uses of *Curcuma inodora* gives an importance to this plant to scientific community and no scientific literature is available to explore the use of anticancer effect of *Curcuma inodora*. Therefore, the aim of this research was to determine the cytotoxic assay in vitro effect of crude aqueous extract of *Curcuma inodora* rhizome.

MATERIALS AND METHODS:

Selection and Collection of Plant: *Curcuma inodora*rhizomes were collected from Melghat region of Amravati District in the month of June to September (Fig.1).

Identification and Authentication of plants: *Curcuma inodora* identification carried out using different

Fig.1. a)*Curcuma inodora* habitat **b)** Rhizome

methods with the help of standard floras (Sharma *et al*., 1996; Dhore, 2002) and authenticated by Taxonomist Dr. S.P. Rothe Professor and Head Department of Botany, Shri. Shivaji Science College, Akola.

Preparation of test solution: Rhizome 1 gm powder crushed in mortar and pestle by adding 10 ml. DW, then centrifuge at 4000 rpm for 10 min. Supernatant concentrations (10-50 µg/ml) prepared by serial dilution method.

In-vitro Cytotoxic Activity Assay: The human pancreatic carcinoma cells (MiaPaCa-2) wereprocure from the National Centre for Cell Sciences (NCCS), Pune, and Maharashtra. Cells were grow in Dulbecco's minimum essential medium (DMEM).MiaPaCa-2 cells were maintain at 37°C, 5% CO_2, in a 90% humidified atmosphere in CO_2 incubator (Galaxy Make). Cells were pass after every 5th days. Experimentation carried out in 96 well Microtiter plates. The cytotoxic activity was measured using MTT (3-(4,5dimethylthiazol- 2-yl)-2,5-diphenyltetrazolium bromide) assay Berridge MV- A new class of cell surface antigens. Quantitative absorption studies defining cell-lineage-specific antigens on hemopoietic cells.Briefly, 2 X 10^4cells/well were seeded in 96-well microliter plates.

Cell Treatment Procedure: Cells were treated with various working concentrations (10-50 µg/ml) of aqueous extract of rhizome and standard anticancer drug i.e. 5-Fluorouracil (5-FU) (10-50 µg/ml) for 48 hours. At the end of incubation period, the medium was replaced by 150µl fresh medium and 50 µl MTT (1mg/mL) was added to each well, followed by an incubation period for a further 4 hours at 37^{0}C. Later, 150 µl of DMSO added to each well for solubilization of the formazan products. Absorbance was taken at 630 nm using a Bio-Tek microplate reader. The percent cell cytotoxicity calculated by using the following formula.

$$\% \text{ Cytotoxity} = \frac{(\text{Absorbance of control sample} - \text{Absorbance of treated sample})}{Absorbance\ of\ control\ sample} X100$$

Statistical Analysis: The results presented as means ± SD of three independent experiments. Statistical differences among means were determined by one way ANOVA. Differences were considered significant at P<0.05. The IC_{50} values were calculated using Graph Pad Prism 5.0 (Graph Pad Software Inc., San Diego, CA). Every experiment included a set of negative controls (untreated cultures) and positive control treated with 5-Flurouracil.

Results And Discussions:

The results for cell growth inhibition by aqueous extracts of the rhizome against MIAPaCa-2 cell lines at 10-50µg/ml concentrations tabulated in Table 1 and graphically represented in Fig. 2. Aqueous extract of rhizome tested *in vitro* for their potential human cancer growth inhibitory effect on MIAPaCa-2 cancer cell lines at various concentrations ranging from 10-50µg/ml. Results obtained that aqueous extract inhibited the growth of cells in concentration dependent manner and showed the positive inhibitory effect on cell growth (Table 1 and Fig. 1). The aqueous extracts showed growth inhibition 26.24±1.81% at highest concentration of 50 µg/ml (Table 1). However, deviation seen when IC_{50} value was calculated. From the figure, it was found that the IC_{50} value with 97.58 ± 2.45 µg/mlrecorded in aqueous extract showed a significant reduction in growth of cancerous cells indicating the potential of anti-proliferative growth (Table 1, Fig.2). IC_{50} for the 5-FU standard. Control showed 25.9 ±0.68µg/ml. inhibition.

Table 1: Effect of aqueous extract of *Curcuma inodora*rhizome on growth of MIAPaCa-2 cell line after the incubation for 48 hrs.

Concentration (µg/ml)	% Inhibition	
	AQ	**5-FU**
Control	0	0
10	4.72 ± 4.16	43.02 ±1.00
20	10.76 ± 1.20	45.78 ± 0.10
30	14.69 ± 2.27	51.02 ± 0.36
40	19.42 ± 1.20	59.37 ± 0.72
50	26.24 ± 1.81	61.07 ± 0.52
IC_{50}	**97.58 ± 2.45**	**25.9 ± 0.68**

*Results represented as an average of three± replicates
[**AQ**-Aqueous extract; 5-FU- 5-Flurouracil]

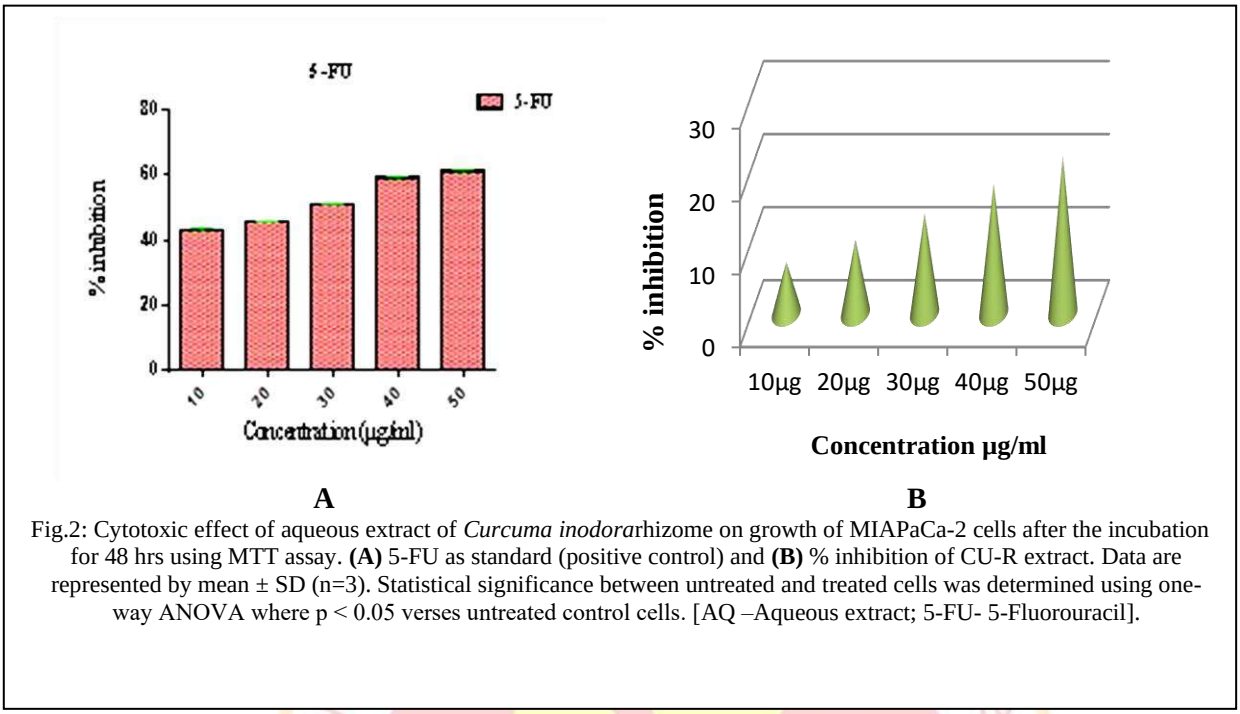

Fig.2: Cytotoxic effect of aqueous extract of *Curcuma inodora*rhizome on growth of MIAPaCa-2 cells after the incubation for 48 hrs using MTT assay. **(A)** 5-FU as standard (positive control) and **(B)** % inhibition of CU-R extract. Data are represented by mean ± SD (n=3). Statistical significance between untreated and treated cells was determined using one-way ANOVA where $p < 0.05$ verses untreated control cells. [AQ –Aqueous extract; 5-FU- 5-Fluorouracil].

The cytotoxicity assay is based on the capacity of mitochondria succinate dehydrogenase enzymes in living cells to reduce the yellow water soluble substrate tetrazolium salt 3-(4,5 dimethyl thiazol-2-yl)-2-5-diphenyl tetrazolium bromide (MTT) into a blue colored i.e. formazan crystals which is measured by spectrophotometer (Masters, 2000; Mosmann, 1983). Since reduction of MTT can only occur in metabolically active cells, the level of activity is a measure of the viability of the cells. The number of cells was found to be proportional to the extent of formazan production by the cells used (Francis and Rita, 1986).

MTT proliferation assay was carried out to determine the growth rate of cells. In the present study, the aqueous extract of *Curcuma inodora*rhizome has indicated significant growth inhibition on Miapaca-2 cell line. The aqueous extract treatment on Miapaca-2 cells lines showed significant decrease in growth rate compared with control. The qualitative phytochemical analysis of aqueous extract of *Curcuma inodora*rhizome detected the presence of carbohydrate and glycosides, protein and amino acids, alkaloids, phenolic compounds & flavonoids, phytosterols, saponins and terpenoids (Ghurde, 2018). Besides this polyphenol, curcumin has anti-inflammatory and anti-cancer properties, modulating the epigenetic alterations typically associated with cancer (Mazidi et al. 2016). Which could be responsible for anti-carcinogenic property. Flavonoids found to possess anti-mutagenic and anti-malignant effects (Masmaan, 1983). Moreover, it has protective effect against cancer by their effect on signal transduction in cell proliferation and angiogenesis.

Conclusions:

The present study revealed that the aqueous extract of *Curcuma inodora* Blatt. rhizome was found to be cytotoxic towards human pancreatic cancer cell line in MTT assay. The 50% cytotoxic effect (IC_{50}) of aqueous rhizome extract of *Curcuma inodora* found to be 97.58 ± 2.45µg/mlmay be due to thebioactive compounds. Hence, present study shows the positive efficacy of rhizome for cytotoxicity towards MIA PaCa-2 cells thus suggesting scientific community to carry out further after animal experimentation to evaluate the potentialtherapeutic agent in pancreatic cancer treatment.

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In vitro anthelmintic activity and phytochemical analysis of Crude Extracts of Aerial Parts of *Tridax procumbens* (L.) against *Pheretima posthuma.*

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Abstract –
The aim of the present study was to evaluate the anthelmintic activity of different extract of Aerial Parts of Tridax procumbens(L.) against Pheretima posthuma. as test worms. The time of paralysis and time of death were studied and the activity was compared with Albendazole as reference standard. The methanolic extract exhibited significant anthelmintic activity as evidenced by decreased paralyzing time and death time. The results thus support the use of Tridax procumbens (L.) as an anthelmintic agent.
Keywords: *Anthelmintic activity,* Pheretima posthuma, *piperazine citrate, Tridax procumbens (L.) Albendazole,*

Introduction-

Traditional knowledge, specific for particular society and community, it become a part of its cultural identity. All these information are unique for every society. in use and majority are still being used by the members of the society. It embraces information on the use of biological and other materials for medical treatment and agriculture, production processes. Use of plant as a source of medicine has been inherited and is an important component of the health care system in India. Herbal medicine claimed for the treatment of parasitic diseases in human and even animals. Helminthes are parasitic worms; which are among the most widespread prevalence in human as well as livestock. Helminthiasis is being endemic**.** It is found that about half (50%) of world population suffer from the Helminthiasis and the numbers are increasing day by day **(Sirama *et al.*, 2015).** According to World Health Organization (WHO) parasitic worm infection are more than (1.5) billion that is (24%) of world population **World Health Organization (2017).**

Few number of Anthelmintics drugs are available in the market, Benzimidazoles (BZD) is the past ones primes anthelmintics commonly called as 'White' dewormers. This class involved ; albendazole, fenbendazole, and oxfendazole, Piperazine citrate, livamizole, morantel and pyrental are chemical dewormers. The common side effects include nausea, vomiting, stomach and abdominal pain, headache, dizziness or temporary hair loss (**Saliha Siddiqui and Kalpana Patni 2018.).** Chemical control of helminthes coupled with improved management has been the important worm control strategy throughout the world. However, increasing problems of development of resistance in helminthes against anthelmintics have lead to the proposal of screening medicinal plants for their anthelmintic activity. Many researchers are screening the traditional herbal system in search of the anthelmintic herbal constituents which overcome all the problems of synthetic drugs. The present study was aim to investigate the "**Anthelmintic Activity**" of plants ***Tridax procumbens* (L.)**. It is a small attempt to find out traditional alternatives to helminthiasis

Materials and methods

Collection of plant materials

The aerial parts of *Tridax procumbens* (L.) were collected from the campus of Govt. Vidarbha Institute of Science and Humanities, Amravati India . Identification was done with the help of standard floras. The plant was identified and authenticated and the voucher specimen was preserved in the Herbarium of Department of Botany.

Preparations of extracts

The crude extract was prepared by crude maceration technique. In the process of maceration, the powdered solid material is placed in a closed vessel (to prevent evaporation) and the chosen solvents were added. When the solvent is water and the period of maceration is long, a small quantity of chloroform added to prevent microbial growth.

Crude aqueous, methanol, acetone and petroleum ether extract of powdered plant were prepared, Briefly, 25gm of grind/ powdered plant material was soaked in sufficient quantity (100 ml.) of aqueous, methanol, acetone and petroleum ether separately for continuous 7 days and the filtered off by a piece of porous cloth and then filter paper. Following extraction, the liquids were concentrated to remove traces of solvents and the process was repeated for two times. The solvent from total extract was distilled off and concentrate was evaporated water bath to syrupy consistency and the evaporated to dryness. This extract was stored at 40 c until use. The crude extract (as much as needed) was dissolved in distilled water on the day of the experiment to prepare stock solution and different dilutions for the purpose of evaluating anthelmintic activity.

Anthelmintic assay: Aqueous, methanolic and acetone extracts from the plants were investigated for their anthelmintic activity against *Pheretima posthuma*. Various concentrations (10, 25 and 50 mg/ml) of each extracts were tested in the bioassay, which involved determination of time of paralysis and time of the death of the worms. The anthelmintic assay was carried as per the method of Ajaiyeoba *et al.*, (2001). with minor modifications.

In the experiment, six groups of six earthworms were released into 25ml of solutions of Albendazole, aqueous, methanolic and acetone extracts of *Tridax procumbens* (L.) (25, 50 and 100mg/ml each) in distilled water. The remaining groups were treated for different concentrations. Albendazole was used as reference standard while distilled water as control. All drug and extract solutions were freshly prepared before starting the experiment. Observations were made for the time taken to paralysis and death of individual worms. Time for paralysis was noted when the movement of any sort could be observed except when the worms were shaken vigorously. Death was concluded when the worms lost their motility followed with fading away of their body colors.

Results and Discussions

Tridax procumbens (L.) is a well known medicinal plant and is widely used in folk ayurvedic system of medicine. In the present study solvents namely methanol, acetone, petroleum ether and aqueous, were used sequentially for crude extraction of *Tridex procumbens* (L.) whole plant. To justify the ethnomedical claims of the plant.

Anthelmintic activity of *Tridax procumbens* (L.)

Table -1: Anthelmintic Activity of *Tridex procumbens* (L.)

Test Sample *(Tridex)*	Conc. (mg/ml)	*P. posthuma* Time taken for Paralysis (in min.)	*P. posthuma* Time taken for Death (in min.)
Methanol	10	114.5 ± 10.6	125 ± 8.48
	30	72.5 ± 9.19	84 ± 12.7
	50	64 ± 14.1	78.5 ± 10.6
Acetone	10	129.5 ± 12.0	145 ± 16.9
	30	100 ± 5.65	124.5 ± 6.36
	50	81 ± 5.6	90 ± 9.89
Petroleum ether	10	164.5 ± 19.0	184.5 ± 14.8
	30	100.5 ± 14.0	120 ± 15.5
	50	87 ± 5.65	109 ± 11.3
Aqueous	10	166 ± 5.65	183.5 ± 9.19
	30	100.5 ± 19.0	130.5 ± 12.0
	50	94.5 ± 13.4	122 ± 12.7
Albendazole	10	401.5 ± 4.94	418 ± 8.48
	30	381.5 ± 4.9	395 ± 5.65
	50	367 ± 8.48	389 ± 2.82

Table-1: showed that Methanolicextract of ***Tridax procumbens(L.)*** significant anthelmintic activity against **'*Pheretima posthuma'*.** Methanolic extract also proved to be efficient than the standard drug.

The **Methanolic** extract of concentration **(10, 30, 50 mg/ml)** showed the paralysis time 114.5 , 72.5 , 64 min. and death time at 125 , 84 , 78min. respectively. Methanolic extract at 50 mg/ml showed efficient paralysis effect (64 min.) than other treated groups whereas methanolic extract 50 mg/ml showed significant anthelmintic activity with death time of (78 min.). Standard drug (10, 30, 50 mg/ml) showed paralysis time 401.5, 381.5, 367 min and death time was 418, 395, 389 min. respectively. This investigation revealed that methanolic extract of *T. procumbens (L.)* showed significant anthelmintic activity against *Pheretima posthumaand* also proved to be efficient than the standard drug.

The **Acetone** extract of concentration **(10, 30, 50 mg/ml)** showed the paralysis time 129.5, 100, 81min. and death time at 145, 124, 90 min. respectively. Acetone extract at 50 mg/ml showed efficient paralysis effect (81min.) than other treated groups whereas acetone extract 50 mg/ml showed significant anthelmintic activity with death time of (90min.). Standard drug (10, 30, 50 mg/ml) showed paralysis time 401.5, 381.5, 367min. and death time was 418, 395, 389 min. respectively. This investigation revealed that acetone extract of *Tridex*

procumbens (L.) showed significant anthelmintic activity against *Pheretima posthuma*. Acetone extract also proved to be efficient than the standard drug.

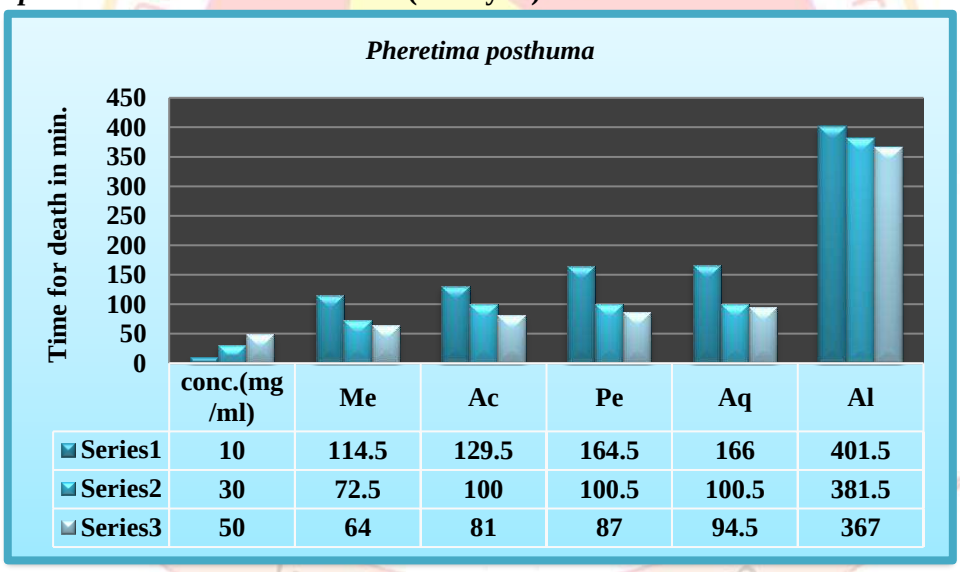
The **Petroleum ether** extract of concentration **(10, 30, 50 mg/ml)** showed the paralysis time 164.5, 100.5, 87 min. and death time at 184.5, 120, 90 min. respectively. Petroleum ether extract at 50 mg/ml showed efficient paralysis effect (87 min.) than other treated groups whereas petroleum ether extract 50 mg/ml showed significant anthelmintic activity with death time of (90min.). Standard drug (10, 30, 50 mg/ml) showed paralysis time 401.5, 381.5, 367 min and death time was 418, 395, 389 min. respectively. This investigation revealed that petroleum ether extract of *T. procumbens* (L.) showed significant anthelmintic activity against *Pheretima posthuma.* Petroleum ether also proved to be efficient than the standard drug.

The **Aqueous** extract of concentration **(10, 30, 50 mg/ml)** showed the paralysis time min. and death time at min. respectively. Aqueous extract at 50 mg/ml showed efficient paralysis effect (166, 100.5, 94.5min.) than other treated groups whereas aqueous extract 50 mg/ml showed significant anthelmintic activity with death time of (94.5min.). Standard drug (10, 30, 50 mg/ml) showed paralysis time 401.5, 381.5, 367 min and death time was 418, 395, 389 min. respectively. This investigation revealed that aqueous extract of *T. procumbens* (L.) showed significant anthelmintic activity against *Pheretima posthuma. Aqueous* extract also proved to be efficient than the standard drug.

When **Albendazole** use as a standard drug extract of ***Tridex procumbens* (L.)** plant of concentration **(10, 30, 50 mg/ml)** showed **paralysis** at **401, 381, 367 min.** and **death** at **418, 395, 389 min.** Respectively.

From the above result, it is clear that the Methanol, Acetone, Petroleum Ether, and Aqueous extracts of plant *Tridex procumbens* (L.) have significant anthelmintic activity in dose dependent manner when compared with standard anthelmintic drug. It reveals that the methanolic extracts of ***T. procumbnens*** plant took the less time to cause paralysis and death of the earthworm than that of acetone, petroleum ether, aqueous and albendazole standard drug**. (Methanl<Acetone<Petrolium ether<Aqueous)**

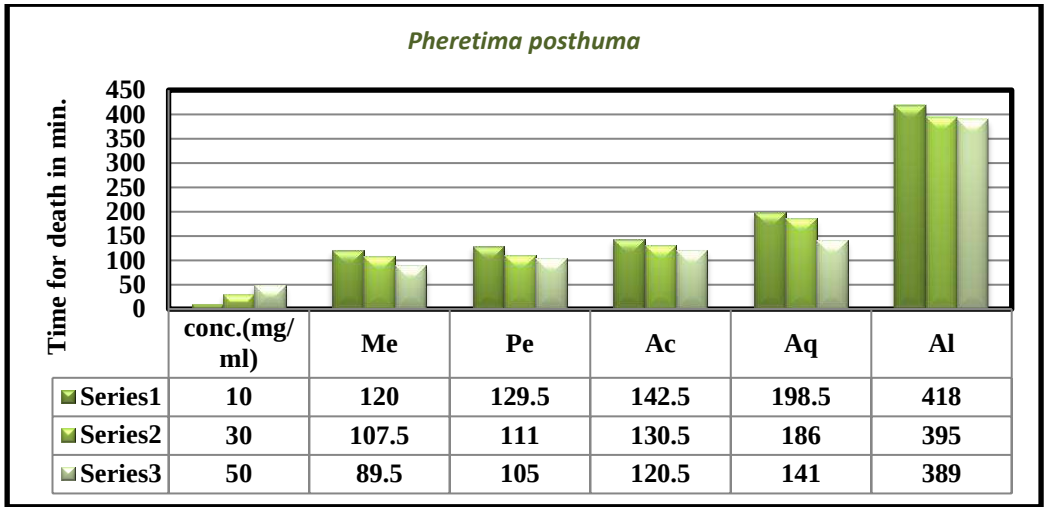
Fig-1. *Pheretima posthuma* showed the time for (Paralysis)



	conc.(mg /ml)	Me	Ac	Pe	Aq	Al
Series1	10	114.5	129.5	164.5	166	401.5
Series2	30	72.5	100	100.5	100.5	381.5
Series3	50	64	81	87	94.5	367

Where, Me: Methanol, Ac: Acetone, Pe: Petroleum Ether, Aq: Aqueous, Alb: Albendazole Respectively.

Fig. 2 :*Pheretimaposthuma*showed the time for (Death)



	conc.(mg/ml)	Me	Pe	Ac	Aq	Al
Series1	10	120	129.5	142.5	198.5	418
Series2	30	107.5	111	130.5	186	395
Series3	50	89.5	105	120.5	141	389

Where,Me: Methanol, Ac: Acetone, Pe: Petroleum Ether, Aq: Aqueous, Alb: Albendazole Respectively.

PHYTOCHEMISTRY:

Table -3 Preliminary Phytochemical Screening of *Tridax procumbens* (L.)

Tests	Aq. Extract	Alcoholic Extract
Test for Carbohydrate		
a) Molisch test	+	-
b) Benedict test	+	+
c) Fehlings test	+	+
d) Iodine test	-	-
e) Barfoeds test	+	-
f) Salwinoffs test	-	-
Test for Proteins		
a) Xanthoprotein test	-	-
b) Biuret test	-	-
c) Lead acetate	-	-
d) Millon test	-	-
e) Precipitation test	-	+
Test for Amino acid		
a) Ninhydrin test	-	-
b) Tyrosin test	-	-
c) Cysteine test	-	-
Test for Alkaloids		
a) Dragondroffs test	-	+
b) Modified dragondroffs test	-	+
c) Mayer test		
d) Hagers test	+	+
e) Wagners test	+	+
f) Krauts test	-	+
	-	-
Test for Glycosides(general)		
a) Saponin glycosides	+	+
b) Baljet test	+	-
	+	-
Test for Flavonoids		
a)alkali test	-	-
c) Lead acetate	-	-
d) Shinoda test	+	-
Test for Tannins		
a) Ferric chloride test	-	+
b) Dil. Iodine test	+	-

Test for Fatty oils	-	-

The qualitative phytochemicals analysis aqueous extract of *Tridax procumbens* (L.) showed the presence of carbohydrate, alkaloids, glycosides, flavonoids, tannins and saponins while proteins, amino acids fatty oils are completely absent. In alcoholic extract of carbohydrates, alkaloids, glycosides, and tannins are present and proteins, amino acid, flavonoids and fatty oils are completely absent. **(Table -3).**

From the above result, it is clear that the Methanol, Petroleum Ether, Acetone and Aqueous extracts *Tridax procumbens* (L.) have significant anthelmintic activity in dose dependent manner when compared with standard anthelmintic drug. It reveals that the Methanolic extracts took the less time to cause paralysis and death of the earthworm than that of acetone, petroleum ether, aqueous and albendazole. Standard.Tannis, Glycosides are known to interfere with energy generation in helminth by uncoupling oxidative phosphorylation **(Anthnasiadou *et al.*, 2001). Willam *et al.*, (2014)** reported that plant derived tannin have a definite anthelmintic effect on human intestinal parasite. Thus, these chemicals may responsible for the anthelmintic activity of the plants. Hence, it can be thought about the herbs as alternative source of anthelmintic drugs, further isolation of active constituents responsible for anthelmintic activity is needed, which would be responsible for **'Anthelmintic Activity'** and to possible mechanism of action.

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Plant Diversity of Village Pimpalgaon Chilamkha Tq. Deulgaon Raja Dist. Buldhana (MS)

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Abstract

*We have inherited a rich plant diversity with a high proportion of endemic elements. We are grateful to small, mid-sized or lofty trees who oblige us during their lifetime with oxygen,shade,food,fibre,fruits, timber and medicine. One of the major challenges of our country today is the management of plant specially tree diversity development. In a decades of years a number of very small trees have been planted in our campus. Keeping this in view, we have undertaken documentation of trees of our biodiversity rich village PimpalgaonChilmkha for the first time and we also propose to establish conservation strategies in future for tree(s). The total number of trees recorded in the village PimpalgaonChilmkha, 36 families, 48 genera and 50 species. The family Anonaceae was represented by maximum number of 110 tree genera.The genus Ficushas been represented by maximum number of 06 tree species viz. F. religiosa , F. benghalensis.*F. racemosa*. The medicinally important manyplants like Azadirachtaindica,Eucalyptus citriodora,Aloe vera,Ocimumgratissimumarepresent in village PimpalgaonChilmkha. Polyalthialongifoliais grown as ornamental or avenue tree and is represented by 110 plants followed by Albizzialebbek. As like as many ornamental plants are also present in this village.*

***Key Words**: Systematic Enumeration ,Tree Biodiversity, Village Pimpalgaon Chilmkha Tq.Deulgaon Raja*

Introduction

Ethnobotany deals with the study and evaluation of plant-human relations in all phases and the effect of plant environment on human society. Ethnobotany is considered as a branch of ethnobiology. The term "Ethnobotany" was coined by J. W. Harshberger in 1895 to indicate plants used by the aboriginals: From "ethno"-study of people and "botany" study of the plants. Ethnobotany is the study of how people of a particular culture and region make of use of indigenous plants. Ethnobotanists explore how plants are used for such things as food, shelter, medicine, clothing, hunting, and religious ceremonies. The plants growing in their natural habitat serve as raw material for industries and other local uses. Keeping these facts in view, it was undertaken to prepare an accurate and up to date inventory of trees growing in sprawling Village PimpalgaonChilmkhaTq.Deulgaon Raja is located in Buldhana district and boundryof the Vidarbha, of Maharashtra State. Deulgaon Raja is 80 Km away from district place and 90 Km also from Aurangabad. Deulgaon Raja is located in the northern part of Maharashtra. The 70% of the population is rural. The mainoccupations of these people are dairy, farming and agriculture. The famous salt water Lonar Crater is situated in this district, 90 kms from here. And, The RajmataJijabai's father LakhujiJadhav's native place is located at Sindkhed Raja which is important historical place in district also. The major crop of this district is cotton, jawar and groundnut. Several taxonomists and ethnobotanists continued to survey many areas of Maharashtra, Addition to Maharashtra Flora Vol.I (Singh N.P. &Karthikeyan S. 2000), Flora of Buldhana District (Diwakar P.G. & Sharma B.D. 2000). Saxton and Sedgwick (1918),The ethnobotanical and floristic work, were carried out by Saxton, W. T. and Sedgwick, L. J. (1918). Author also observed plant diversity of nearest college Shri Vyankatesh Arts, Com. & Science College Campus Deulgaon Raja(Mahendra S. Salve &Nilesh P. Kakde, 2017). Earlier the works were carried out ethnobotanical, medicinal and floristic aspects of plants by a good number of workers.The present research report iscarried out in Village PimpalgaonChilmkhaTq.Deulgaon Raja Dist. Buldhana (MS) to explore the diversity of plants.

Objectives of The Study

The main aim of the survey was to collect information about the vegetation of plant species which are used by local people for various purpose and also the species are identified and documented by collecting samples of plant species. Survey were made for collection of plants their identification, followed by Botanical name, Family, Habitat, Uses and Propagation. The campus was visited for the collection of medicinal plants, their digital photographs were also taken. The identification was also done based on literature study (Hooker,1875).

Materials And Methods

The field study was carried out during session 2021-2022 in the Village PimpalgaonChilmkhaTq.Deulgaon Raja Dist. Buldhana(MS). Description of habitat, material and methods as well as the methods of sample collection and identification have been described elsewhere (Bimal et al., 1991).

Table No.1: Plants diversity of Village PimpalgaonChilmkhaTq.Deulgaon Raja

Sr. No.	Tree Name	Family	Marathi Name
1	*Azadirachtaindica*	Meliaceae	Kaduneem
2	*Ficusreligiosa*	Moraceae	Pimpal
3	*Ficusbenghalensis*	Moraceae	Vad
4	*Ficusracemosa*	Moraceae	Umbar
5	*Ricinuscommunis*	Euphorbiaceae	Erand
6	*Emblicaofficinalis*	Euphorbiaceae	Awla
7	*Mangiferaindica*	Anacardiaceae	Aamba
8	*Cassia fistula*	Caesalpiniaceae	Bahawa
9	*Delonixregia*	Caesalpiniaceae	Gul Mohor
10	*Cathranthusroseus*	Caesalpiniaceae	Sadaphuli
11	*Albizzialebbek*	Mimosaceae	Siras
12	*Polyalthialongifolia*	Anonaceae	Ashok
13	*Alstoniascholaris*	Apocynaceae	Saptparni
14	*Neriumindicum*	Apocynaceae	Kanher
15	*Murrayakoenigii*	*Rutaceae*	Kadhipatta
16	*Citrus aurantifolia*	Rutaceae	Limbooni
17	*Hibiscus rosasinensis*	Malvaceae	Jaswand
18	*Bryophyllumpinnatum*	Crassulaceae	Panphuti
19	*Piper betle*	Piperaceae	Nagwel
20	*Ocimumgratissimum*	Lamiaceae	Ran Tulasi
21	*Aloe vera*	Liliaceae	Korphad
22	*Jasminumofficinale*	Oleaceae.	Chameli
23	*Jasminumsambac*	*Oleaceae*	Mogara
24	*Jasminummutiflorum*	Oleaceae	Kunda
25	*Dalbergiasissoo*	Papilionaceae	Shisam
26	*Prunusamygdalus*	Rosaceae	Badam
27	*Terminalia arjuna*	Combretaceae	Arjun
28	*Eucalyptus citriodora*	Myrtaceae	Nilgiri
29	*Zizyphus145ujube*	Rhamnaceae	Bor
30	*Micheliachampaca*	Magnoliaceae	Chafa
31	*American palm*	Arecaceae	Palm tree
32	*Moringaoleifera*	Brassicaceae	Shewaga
33	*Cupressussampervirens*	Cupressaceae	Saru
34	*Opuntiaficus*	Cactaceae	Niwdung
35	*Cereus peruvianus*	Cactaceae	Niwdung
36	*Bamboosa bamboo*	Poaceae	Bamboo
37	*Coccus nucifera*	Palmaceae	Nariyal
38	*Pongamiapinnata*	Fabaceae	Karanj
39	*Clitoriaternatea*	Fabaceae	Gokarn
40	*Abrusprecatorius*	Fabaceae	Gunj
41	*Mimosa pudica*	Fabaceae	Lajalu
42	*Spilanthesacmella*	Asteraceae	Akkalkadha
43	*Embeliaribes*	Primulaceae	Wavding
44	*Bougainvillea glabra*	*Nyctaginaceae*	BoganWel
45	*Dhaturainoxia*	Solanaceae	Dhotara
46	*Solanumtorvum*	Solanaceae	Ranwange
47	*Punicagranatum*	Lythraceae	Dalimb
48	*Musa acuminata*	Musaceae	Keli
49	*Canna indica*	Cannaceae	Kardali
50	*Cissusquadrangularis*	Vitaceae	Kandwel

Results

Floristic studies are important to understand the tree wealth as well as their biology (Panda et al., 2014) and also play an important role in developing the aesthetic values as well as ecosystem services. The present

paper is based on preliminary surveyerand serves as biodiversity data bank for biological and biotechnological applications (Uniyal and Singh, 2014). Further, it provides information related to the plant resources which is necessary for any conservation and management practices. On the basis of field survey of plant diversity in Village PimpalgaonChilmkhaTq.Deulgaon Raja, the preliminary data recorded such as botanical name of tree identified and tree count etc. It is resulted that36 families, 48 genera and 50 species showed their presence in the campus which were collected, identified and listed in Table No. 1. The inventory of tree wealth of the village shall provide the ground work for further studies.

Discussion

The data shows that maximum plant species are family Anonaceae similar result have also reported by Tirkey (2006). From these some are medicinal plant species in Village PimpalgaonChilmkhaTq.Deulgaon Raja. Similarly Ayyanar and Ignacimuthu (2005) also reported medicinal importance of plants. These plant species have Antibacterial, Insecticidal, Antiseptic, Analgestic properties and they are useful in treatment of various skin diseases,allergic reactions and diarrhea treatment. Similarly Thakur et al (1989), Jain, et al (2006), Kala (2009) have also reported antihelmintic, anticancerous, antitumour, antirheumatic, antiasthmatic and antidiarrhoeal activities of various plants .

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Phytochemical Screening and Qualitative Analysis of Medicinal Plants *Shorea robusta Gaertn*.

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Abstract

Since ancient time, Medicinal plants have been a major source of therapeutic agents to cure human diseases. Ayurveda, the traditional system of medicine using medicinal plant is highly regarded as the mother of all medical sciences. Herbal medicines are more popular than modern medicine because of their effectiveness, easy availability, low cost and for being comparatively devoid of side effects. Shorea robusta belonging to Dipterocarpaceae family is an important medicinal plant used in various Indian system of medicine. The present study was done for the qualitative analysis for primary metabolites and secondary metabolites of Shorea robusta Gaertn. F.. In this regards the phytochemical analysis of leaves extract of Shorea robusta Gaertn. Fwas done in both extract i.e, alcoholic (both ethanolic and methanolic) as well as aqueous extract. Qualitative phytochemical analysis was performed for the test of primary metabolites include protein and carbohydrate whereas secondary metabolites were phenol and tannins, flavonoids, saponins, glycosides, steroids, phlobatannins, alkaloids and terpenoids with the help of standard protocol. The qualitative phytochemical analysis revealed the presence of maximum numbers of bioactive substances such as protein, carbohydrates, phenol and tannin, saponin, glycosides, steroids, alkaloids and terpenoids in leaves extracts of Shorea robusta Gaertn. F. Therefore, it may be concluded that the medicinal value of these plants was due to the presence of these bioactive substances that has a very significant role to boost immunity and to develop therapeutics which must have a physiological action on human body that has a promising role in the treatment of various diseases. The results suggested that used of this medicinal plant in the present study provide justification for the use of medicinal plants by the local people of Kharsawan in Seraikella-Kharsawan district, Jharkhand (India) to cure many diseases.

Keywords: *Flavonoid, Phytochemical analysis, Primary metabolites, Saponin*

Introduction

Shorea robusta Gaertn.f. is very important non timber forest product. Itcovers approx. 14% of the total forest area of country and is spread across 10 million hac.It plays an important role to in the economicsof Indian states which includes Orissa, Jharkhand and Madhya Pradesh. About 20-30 million people, mostly tribal depend on Sal seeds, leaves and resigns for their livelihood. Sal is a deciduous tree that grows up to 50 m height. Under normal conditions it reaches 18-32 m height, with girth of 1.5–2 m. The bark is dark brown in colour. The average temperature required for the growth of this tree is 22-47^{O}C throughout the year. The tree requires mean annual rainfall around 3000 mm and maximum 6600mm. Sal grows in deep, well-drained, moist, slightly acid, sandy to clayey soils [2].Occurrence of this plant is in tropical Himalaya's region, central India, North-eastern and West Bengal hills upto 1,700m. [3, 4, 5]. Scientific classification of Shorea robusta is

- Kingdom: Plantae
- Division: Tracheophyta
- Class: Magnoliopsida
- Order: Malvales
- Family: Dipterocarpaceae
- Genus: Shorea
- Species: Shorea robust[6, 7]

The ethnomedicinal uses of this plants are for Jwara, Sweta pradara, rakshoghna, atisaara, hiccough, asthma, galaganda, diseases of mouth,diseases of eye, consumption[8, 9, 10, 11, 12 13, 14, 15].

Traditional folk treatment from medicinal plants has always guided researchers to search for novel medications to develop healthy life for humans and animals [16]. In addition, some medicinal plants are still obscured within the plant which need to be scientifically evaluated.Most important phytoconstituent presents in medicinal plants are alkaloids, tannins, flavonoids, terpenoids, saponins and phenolic compounds. These phytoconstituent has therapeutic activity and low toxicity, therefore Pharmacists has been shown their interest [17]. Herbal medicine is on demand due to low toxicity and no side effects in comparison to allopathic medicines [18]. The attention among population increased due to their effectiveness, lesser side effects, increasing cost of modern medicines, cultural acceptability and lack of current medical alternatives [19].

Thus, main purpose of this research work is to analyze the phytochemical screening and quantitative estimation of flavonoid, alkaloids and antioxidant activity of crude Shorea robusta extract.

Materials and Methods

The plant materials were shade dried until all the water molecules evaporated and plants became well dried for grinding. After drying, the plant materials were ground well using mechanical blender into fine powder and transferred into airtight containers with proper labelling for future use.

About 5gm dried powdered plant material was weighed and transferred into each conical flask. 250ml of water methanol and ethanol was added to these conical flasks. After that these conical flasks were heated at 30-40ºC and stirred at 350 rpm for 20 minutes. Aqueous ethanolic and methanolic extract were filtered with Whatman filtered paper. These extracts wereanalysed for the presence of bioactive compounds by using standard protocol [20, 21, 22, 23].

Preparation of plant aqueous extract:

5gm of dried fine powder of plant material was taken in a conical flask and 200ml of distilled water was added into it. This mixture was heated on a hot plate at 30º- 40ºC and stirring at 300 rpm for 20 minutes. After that this mixture of aqueous extract was filtered using Whatman filter paper. This filtered aqueous extract was used for the phytochemical analysis.

Preparation of plant ethanolic extract:

5gm of dried fine powder of plant material was taken in a conical flask and 200ml of distilled ethanol was added into it. This mixture was heated on a hot plate at 30º- 40ºC and stirring at 300 rpm for 20 minutes. After that this mixture of ethanolic extract was filtered using Whatman filter paper. This filtered ethanol extract was used for the phytochemical analysis.

Preparation of plant methanolic extract:

5gm of dried fine powder plant material was taken in a conical flask and 200ml of methanol was added into it. This mixture was heated on a hot plate at 30º- 40ºC and stirring at 300 rpm for 20 minutes. After that this mixture of methanol extract was filtered using Whatman filter paper. This filtered methanol extract was used for the phytochemical analysis.

Test for proteins

Millon's test

When 2ml of Millon's reagent was added to crude extract, white precipitate appeared which turned red upon gentle heating that confirmed the presence of protein.

Ninhydrin test

When 2ml of 0.2% solution of Ninhydrin was added to crude extract and then boiled, violet colour appeared which indicated the presence of amino acids and proteins.

Test for carbohydrates

Fehling's test

Equal volume of Fehling A and Fehling B reagents were mixed together. 2ml of this reagent was added to 2 ml of crude extract and gently boiled, a brick red precipitate appeared at the bottom of the test tube indicated the presence of reducing sugars.

Benedict's test

When 2ml of Benedict's reagent was added to 2ml of crude extract and boiled, a reddish-brown precipitate formed which indicated the presence of the carbohydrates.

Iodine test

2ml of iodine solution was added to 2 ml of crude extract, a dark blue or purple coloration appeared which indicated the presence of the carbohydrate.

Test for phenols and tannins

2ml of 2% solution of FeCl3 was added to 2 ml of crude extract, a blue-green or black coloration appeared which indicated the presence of phenols and tannins.

Test for flavonoids

Shinoda test

A fragments of magnesium ribbon was added to 2ml crude extracts (aqueous, ethanolic, methanolic) and concentrated HCl was added (drop wise) to the it. After few minutes a pink scarlet colour was appeared which indicated the presence of flavonoids.

Alkaline reagent test

2ml of 2% solution of NaOH was added to 2 ml of crude extract, an intense yellow coloured was formed, on addition of few drops of diluted acid it turned into colourlesswhich indicated the presence of flavonoids.

Test for saponins

5ml of distilled water was added to 2ml of Crude extract was and it was shaken vigorously. The stable foam formed which indicate the presence of saponins.

Test for glycosides

Liebermann's test

2ml of chloroform and 2ml of acetic acid was added to the 2 ml of crude extract. Concentrated H2SO4 was added. A colour change from violet to blue to green indicated the presence of steroidal nucleus, i.e., glycone portion of glycoside.

Salkowski's test

2ml of chloroform was added to 2ml of crude extract. After that 2ml of concentrated H2SO4 was added. A reddish-brown colour was appeared which indicated the presence of steroidal ring, i.e., glycone of the glycoside.

Keller-Kilani test

2ml of glacial acetic acid containing 1-2 drops of 2% solution of FeCl3 was added to 2 ml of crude extract. After that 2ml of concentrated H2SO4 was added to it. A brown ring at the interphase indicated the presence of cardiac glycosides.

Test for steroid

Liebermann's Test

2 ml acetic acid (CH2COOH) was added to 2 ml Crude extract. Then 1 ml of concentrated H2SO4 was added dropwise and then after 1 ml of concentrated H2SO4 was added drop wise. A blue green colour was appeared which indicates the presence of steroids.

Salkowski Test

2 ml of chloroform and concentrated H2SO4 was added to 2ml of Crude extract. A red colour developed at the lower portion of test tube that indicated the presence of steroids.

Liebermann's Bruchard Test

2ml of chloroform was added to 2 ml Crude extract. After that 2ml of concentrated H2SO4 and acetic acid wereadded into this mixture. A greenish colour developedwhich indicated the presence of steroids.

Test for Phlobatannin

2ml of 1% HCl was added to the 2 ml Crude extract (each aqueous, ethanolic, and methanolic) which gave red precipitate on gentle heating that indicate presence of phlobatannin.

Test for alkaloids

2 ml of 1% HCl was added into the 2ml Crude extract (each aqueous, ethanolic, and methanolic) and heated gently. After that Mayer's and Wagner's reagents were added into this mixture. Turbidity of the resulting precipitate was taken as evidence for the presence of alkaloids.

Test for terpenoids

2ml of chloroform was added to 2ml of Crude extract and evaporated to dryness. After that 2ml of concentrated H2SO4 was added and then heated for 2 minutes. A greyish colour was appeared which indicated the presence of terpenoids.

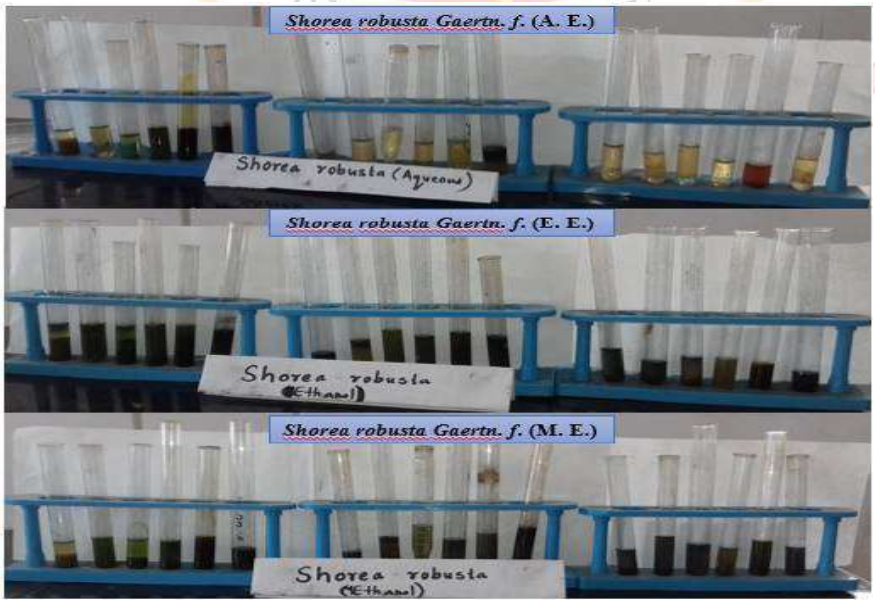

Fig.1: Phytochemical analysis of Shorea robusta Gaertn.f.

Result and Discussion

Table.1: Phytochemical analysis of Shorea robusta Gaertn. in aqueous, ethanolic and methanolic extract

Sl. No.	Phytochemical test	Shorea robusta Gaertn. F.		
		A.E	E.E.	M.E
1	Proteins	+++	+	+++
2	Carbohydrates	++	+	+
3	Phenol & Tannins	++	++	+
4	Flavonoids	++	+	+
5	Saponin	++	_	+
6	Glycosides	++	+	+
7	Steroids	+	+	+
8	Phlobatannins	_	+	+
9	Alkaloids	++	_	+
10	Terpenoids	+	+	+

A.E.=Aqueous extract, E.E.=Ethanolic extract, M.E.= Methanolic extract, (+) = Present,(-) = Absent

Phytochemical analysis of*Shorea robusta Gaertn. F*. (table 1.)revealed that primary metabolites such as proteins and carbohydrates were present in all the extract whereas secondary metabolites i.e. phenol & tannins, flavonoids, saponin glycosides, steroids,phlobatannins, alkaloids and terpenoids were present in all the three extracts except saponin is absent in ethanolic extract, phlobatannin is absent in aqueous and alkaloids is absent in ethanolic extract.

Results obtained by the phytochemical analysis of medicinal plants Shorea robusta Gaertn. F., it could be seen that carbohydrates, phenol & tannins and glycosides were present. Several reports revealed that medicinal plants are rich in phenolic compounds and have antioxidant properties [24, 25]. Phenolic compounds also possess potent antifungal, antiviral and antibacterial activity [26]. It is also mentioned that phytochemical analysis on plants extracts revealed the presence of constituents that are known to exhibit medicinal as well as physiological activities. It was reported that tannins contribute property of astringency i.e., fasten the healing of wounds and inflamed mucous membrane and have received considerable attention in the fields of nutrition.

Conclusions:

Shorea robusta is an important traditionalmedicinal plant used in wide range of medical treatments. Phytochemical analysis revealed that maximum numbers of phytochemicals e.g., flavonoid, tannin, steroid, saponin and many more were found to present in both the plants. Therefore, we can conclude that the medicinal value of these plants due to the presence of these bioactive substances which must have a physiological action on human body. The above findings, traditional uses, pharmacological activities and phytochemistry which provides preliminary information regarding this medicinal plantmight have huge potential for the pharmaceutical industry

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To study the Seasonal Variation of Rhineobothrium Linton from a Marine Fish Trygon Sephen

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Abstract: -

In seasonal variation of the fishes, to collect the different types of fishes in different areasand location. As a medicinal Point of view, fishes ProvidesVit. A, Vit. D and oil, body oil soup from fish, It is use as an Ayurvedic and medicine on color, blindness, Cold and Cough, Asthama &Tuberculasis. In this paper to study the seasonal variation of Rhineobothrium linton from a marine fish Trygon Sephen in Ratnagiri districtat Sangameshwar.
Key words: - Rhineobothrium linton, Marine Fish, TrygonSephen.

Introduction: -

Many fishes are having their high economic value as they provide the highly nutritious & delicious food for human population. These fishes are one of the components of the food cycle in ecology. Parasitology is an evergreen branch for a scientist. Parasitologist have theirpreference of studying helminth. Parasitism is a natural way of life among parasitic diseases are the major public heath Problems leading to mortality in tropical countries, including India. The differed types &several types of parasitism are recognized. Besides these intestinal Parasites there are various types of including Cestodes, Nematodes & Trematodes. Intestinal helminth infections are very common & more than 3500 million cases of helminthiasis exist atpresent either as single as mixed infection all over the world it is observe it.

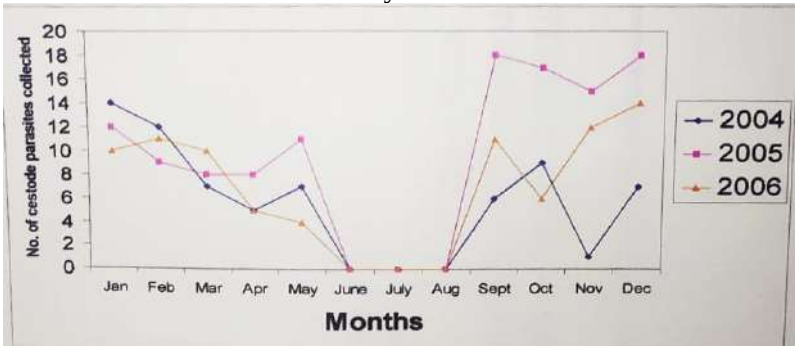
The work on the population dynamics were carried out by many workers on different hosts, Dagiel at (1958), (1964), Susheela (1987) Mittal (1908), Hopkins (1959), Anderson (1976), Pennyuick (1971), Guorder distribution of the Cestodes Parasites. The other workers also studied the effect of climatic factors on the helminthes, include Kennedy (1968-1969), Lawrence (1970), Crofton (1971), Patrick & Esch (1977) have elaborately to studied the effect of seasonal variation. on Parasite of fish.

To study the Seasonal Variation of fishes, it is highly infected to study the different types of cestodes, and the present study include application of statistical method to understand the surveyof seasonal variation is year wise or month wise. Present study includes application ofStatistical method to understand and distribution cestodes parasites both at infra andsupra population levels for each species of Parasites in three annual cycle (January to December)

Material and Methods: -To study the Seasonal Variation in Rhineobothrium linton, thequantitative analysis of helminths and structural grouping was. studied during three annual cycles i.e., January 2004-December 2006 It revealed that the cestode population was potentially dynamic with more or less durability, regularity and cyclic periodicity in the host under investigation. Each annual cycle comprises of three season 1) Rainy seasons (June to September) 2) Winter season (October to January) 3) Summer season (February to May) on the basis of incidence of the infection the influence of annual season. It was observed that the incidence of infection by Helminthes. Parasite increased with host age. The infection level low in young hosts and showed remarkable. infection rises in adults.

To show the above graphical representation in Seasonal Variation of Rhineobothrium linton, 1889. From a marine water fish Trygon Sephen (Cuvier, 1871) at Ratnagiri district for the year 2004-2006.

Graph: -Seasonal Variation of Rhineobothrium linton, 1889 From Trygon Sephen (Cuvier, 1871) at Ratnagiri district for the year 2004 – 2006



Conclusion: -

It is concluded that to study the different seasonal variation of the fishes and the. infected host is studying the different types of cestodes.

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A New Species of *Diatrypellaarborella*sp.nov. From Melghat Forest

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Abstract:
The Present communication deals with a new species of Diatrypellaarborellasp.nov from Aamdoh forest MelghatDist Amravati. Different varieties of ascomycetes and imperfect fungi were collected by the author. But after detail Morphological and cultural investigation an interesting ascomycetes Diatrypellawasincluded here as new species on new host Careya arborea Roxb.
Keywords:*Diatrypella,Ascomycets,Stroma,Ascus,Ascospores.*

Introduction :

De Notaris established the genus *Diatrypella* with type species *D.vrrucaeformis* (Ehrh.)Nitschke.Clement and Shear,Arx and Muller,included it under spheriales,whereasLutterelle,Martin considered it to be number of the order Xylariales.The first report of this genus was recored in India in 1962.There after Ramchandra Rao,Tilak, and Muthappa have reported a few species.Most of the species of this genus are saprobes in nature(Mehrabi*et a*l., 2019). The genus is characterized by conical to truncate, cushion or discoid stromata usually delimited by a black zone in host tissues,umblicate or sulcate ostiolarnecks,cylindrical,polysporales,long stalked,asci and allantoid hyaline yellowish ascospores in their sexual morph and liberatella like coelomycetes asexual morph(Kirket*et al.*,2008,Lakmali*et al.*, 2021).The species under study was compared with known species of*Diatrypella*and treated as new species, thedetailed description is given below. The result of molecular study is awaited.

Material and Methods:

The collected specimens were wrapped in butter paper and bagged in envelope. By taking hand sections, semi-permanent microscopic slides were prepared by using cotton blue as stain, sections of the material were studied with the help of relevant keys and literature (Ainsworth *et al*., 1973, Bilgrami*et al*., 1991,Chanen Yang *et al*., 2022, Dennis 1981, Jamaluddin *et al*., 2004, Mehrabi M *etal*., 2019, Pandey 2008, Shang QJ *et al*., 2017). The specimen was deposited in Ajrekar Mycological Herbarium(AMH) Agharkar Research Institute,Pune.AMH No. 9083.(Holotype)

Result and Discussion:

Ditrypellaarborellasp.nov(**Plate1.Fig;1**a,b,c,d,e)(**Fig;**2a,b,c)
(Etym: Host *Careya arborea*Roxb.)

Strom black errunpent, elliptical to cushion shaped,solitory or gregarious,oftencracked,roughened by slightly protruging,ostiolate, measure 413.0-489.6x535.5-1070 µm,perithecia globose to oblong,black,ostiolate measure 214.2-330.6x306-336.6 µm; asci cylindrical to clavate with long,tappering persistent stalk,binucliate,multisporous,measure 66-133x8-11 µm; ascosprealontoid,subhyaline, one celled,irregularlyarranged,nongutullate, measure 1.9-2.2 µm long,paraphysate.

Matrix: On dead stem of *Careya arborea*Roxb. (Fam:Lecythidaceae)) Legit N.S.D atAamdosh,Melghat Dist. Amravati on 31/7/2004 AMH No.9083.(Holotype)

Table-1: Comparison of *Ditrypellaarborella*sp.nov with related species

Species	Perithecia	Asci	Ascospore	References
***D.verrucaeformis* (Ehrh.)Nke (Type species)**	410-530 x 250-400µm	70-100 x 10-15 µm	6-8 x 1.5-2.0 µm	Subhedar(1977)
***D.citricola*El.&EV.**	315-468 µm IN diam.	81.92-126.90 x 9.0-12.83 µm	8.86-14.93 x 1.58-3.49 µm	Chitriv&Wangikar (1980)
***D.leguminacearum* Patil**	250-625 x 250-650 µm	10-20 x 80-150 µm	2.5-3.5 x 6.18 µm	Patil M.S.(1985)
***D. macroasca*M.Niranjan&V.VenkateswaraSarma**	350-520 × 330- 380 µm	115-170 × 18.75-23.75 µm	7.5-15× 2.5 µm	M.Niranjan&V.VenkateswaraSarma(2018)

***D. tectonae*M.Niranjan&V.VenkateswaraSarma**	240-440 x 255-389 ìmdiam	(107-) 120-150 (-173) x (13.5-) 15.5-21.5 (-39.5) ìm (X^{-}= 138 x 19 ìm)	(5-) 7-9 (-12) x (1.5-) 2-2.5 (-3) ìm (X^{-}= 8 x 2.3 ìm)	M.Niranjan&V.VenkateswaraSarma(2018)
***D.lijiangensis*Thiyagaraj&Wanas**	170-460 x 200-300 µm	50-90 x 6-9 µm	6-8 x 1-2 µm	Thiyagaraj&Wanas(2019)
***Diatrypellaarborella*sp.nov**	214.2-330.6x306-336.6 µm	66-133x8-11 µm	1.9-2.2 µm	Understudy

Conclusion:

On comparison with known species vide (Table1) the perithecia are smaller than *D.verrucaeformis, D.citricolaD.leguminacearum, D. tectonae*but larger than *D.lijiangensis.*Asci are larger than*D.verrucaeformis&D.lijiangensis,*the size of ascospores are smaller than the reported species therefore the species understudytreated as new species of *Diatrypellaarborella*sp.Nov

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16. **Illustration:**A New Species of *Diatrypellaarborella*sp.nov. From Melghat Forest :

Plate - 1
Fig - 1

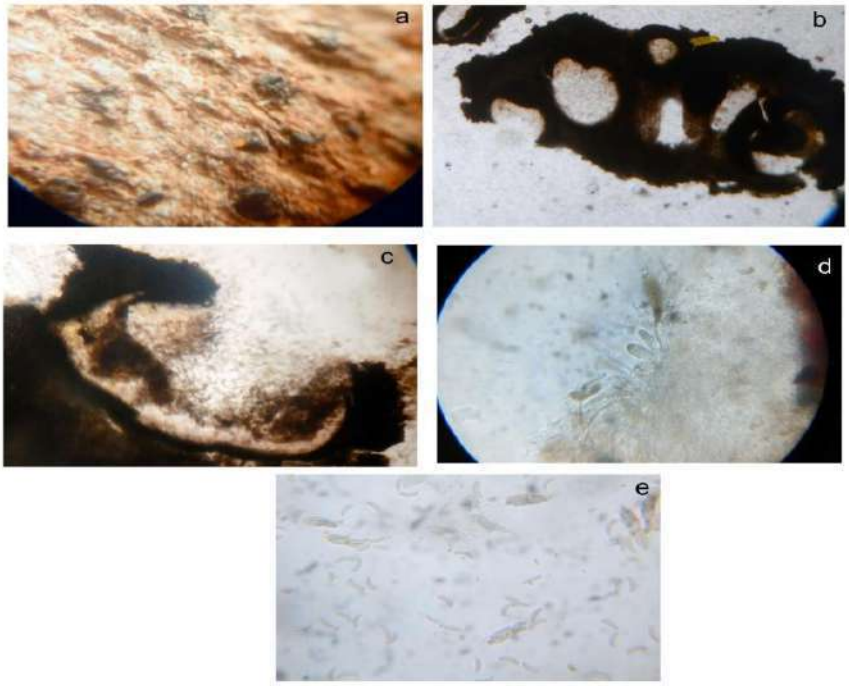

Fig - 2

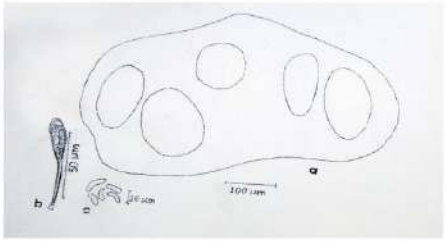

Fig1:(***Ditrypellaarborella*sp.nov)** a) Habit, b) Stroma with perithecium, c) Perithecium, d) Ascus & ascospores, e) Ascospores.

Fig. 2: a) Stroma with perithecium, b) Ascus with ascospore, c) Ascospores

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Distribution of Spider Fauna in the Agricultural Fields from Narkhed Region, District Nagpur (Maharashtra State) India

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Abstract:

Narkhed taluka has total area of 64491 Hectors. Most of the area of Narkhed taluka are under agricultural land. Some area are hilly and cover with rare forest also. Wardha river is flowing from western border of taluka. Kar river is flowing from southern border of taluka and Kolar river is flowing from eastern border of taluka. Other river are Jam, Mandakini, Wandali etc.The river Wardha flows in this region and enriches the biodiversity. Spiders are insectivorous predators on earth. They are Feed on insects and consume large number of preys without damaging the crops. Spiders, are the most common ubiquitous animals on land, constitute an essential portion of the predatory arthropods in several ecosystems. Recently in agricultural fields reduced pesticide use and ecological sustainability have lead to increased interest in spiders as potential biological pest control agents. Regularly use of pesticides in agricultural fields which decreases the spider populations. Spiders play an important role in insect pest control without any harm to ecosystem.

This article presents a study on the Diversity, distribution and current status of spider families in Narkhed of Nagpur District. During the present study, The diversity of spiders was studied during July 2021 to January 2022, using insect nets, tapping sticks and pit fall trap etc. During the survey 310 specimens were collected from agricultural field of Narkhed, 108 species were identified belonging to 10 families. Among the specimens collected most of the individuals were adult, the male–female ratio was 1:6. The Family Salticidae and Thomicidae represented 18 species each respectively, Araneidae 30, Oxyopidae and Lycosidae 6, Eracidae 4, Pholcidae 2, Uloboridae 2 species each. The population of spiders was abundant, species richness and diversity was high during the month of October to December. Spiders observed were exclusively carnivorous; mostly feed on insects and other Arthropods, naturally keeping insect population under control.

Keywords: *Spiders, Diversity, Biodiversity, Insects, Agricultural field, Narkhed.*

Intorduction:

Present study was designed to assess the diversity of spiders from Narkhed region, Most of the area of Narkhed taluka are under agricultural land. Some area are hilly and cover with rare forest also. The area extends over 100 sq.km., and lies on Wardha River, Spider species abundance in ecosystem can be high as undisturbed natural ecosystem. Spiders act as pest control creature, which feeds on crop destructive insects. Spiders are beneficial bio-control agent of insect pest in ecosystem **(**Jeyaparvathi S, et al. 2013). Spiders are known to occupying most of the terrestrial habitats. They are generalist predator, which can act against a broader range of insect pests. Spiders are considered to be of economic value to farmers as they play valuable role in pest management by consuming large number of prey in the agriculture fields without any damage to crops. Spiders are among the most abundant insectivorous predators of Terrestrial ecosystem. The current global list of spider fauna is approximately 44,234 belonging to 3928 genera and 110 families (Platnick NI 2019).

Order Araneae is a large group of animals commonly known as spiders, might have been evolved 380 million years ago during Devonian period (Penney and Seldon 2011). The current global list of spider fauna is approximately 42,055 belonging to 3821 genera and 110 families (Platnick, 2011). The spider fauna of India is represented by 1520 spider species belonging to 377 genera and 60 families (Sebastian and Peter 2009). General series on fauna published by Gazetteer of India, Maharashtra state, record a total of 90 species of spiders belonging to 14 families (Tikader and Malhotra 1974). 107 species of spiders belonging to 57 genera under 19 families have been described from Jabalpur district, Madhya Pradesh. (Gajabe, 2004).

Spiders are one of the most diverse groups in the world. Many types of spiders can easily be found even in small area. Salbardi is an untouched area, forest is dry deciduous and having rich bio-diversity. The abundance of spiders in the forest is ecologically important and may be studied for its nature of natural insecticide as well as bioindicator.

Material And Method:

Spider fauna was collected from agricultural field of Narkhed area (every weekend) from vegetation, on crop field, under stones/crevices, near water streams etc. For collection of spiders insects nets, pitfall trap and stroking sticks were used, the specimens were preserved in 70% alcohol, labeled and identified according to Barrrion and Listinger(1995), Davies and Zabka (1989), Gajbe (1987a,b), Tikader (1962,1973, 1982).

Result And Discussion:

The spiders were found abundantly in the agricultural field of Narkhed area. During the study 310 specimens were collected, of which 103 species belonging to 34 genera under 10 families were identified. The

large number of species belong to family Araneidae represented by 30 species in 08 genera, followed by Salticidae 18 species in 06 genera, Erecidae 4 species in 1genus, Gnaphocidae 06 species in 03 genera, Thomosidae 18 species in 06 genera, Tetragnathidae 02 species in 01 genera species, Lycosidae 15 species in 05 genera, Oxyopidae 06 species in 02 genus, and Pholcidae represented 02 species in 01genus and Uloboridae represented 02 species with 01 genera. The population of spiders was abundant, species richness and diversity was high during the month of October to December.

The spiders were found to be living in different types of habitats. The spiders belonging to Families Araneidae, Erecidae, Oxyopidae, Tetragnathidae, and Thomisidae, were mainly found on the vegetation, like shrubs and trees. Spiders living at the bank of rivers and swamp area belong to family Araneidae, Lycocidae, Salticidae, Uloboridae. Most spiders were found living on the ground under the crop field, foliage or in vegetation exhibiting some kind of colorations for camouflage. No exceptionally poisonous spiders were found among the species recorded. The spiders are most abundant and ecologically important, they are exclusively carnivorous and hence help naturally to control insect pest in any ecosystems and can be used as bio-indicator.

There are many environmental factors that affect species diversity (Rosenzweig 1995). Diversity generally increases when a greater variety of habitats types are present (Ried and Miller 1989). Downie et al. (1999) and New (1999) have demonstrated that spiders are extremely sensitive to small changes in the habitat structure; including habitats complexity, litter depth and microclimate characteristics. Documenting spider diversity in this ecosystem can provide important information to justify the conservation of ecosystem.

Sr. No.	Family	Genera	Species
1	ARANEIDAE	08	30
2	ERESIDAE	01	04
3	GNAPHOSIDAE	03	06
4	LYCOSIDAE	05	15
5	OXYOPIDAE	02	06
6	PHOLCIDAE	01	02
7	SALTICIDAE	06	18
8	TETRAGNATHIDAE	01	02
9	THOMISIDAE	06	18
10	ULOBORIDAE	01	02
Total		**34**	**103**

Table No. 1: Checklist of Spider Species from Agro-ecosystems of Narkhed region, District Nagpur. Maharashtra State

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Morpho-Taxonomic Studies of Diversity of Genus *Digitaria* Haller of Family Poaceae of Amravati District, Maharashtra.

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Abstract:-
Amravati is one of the 11 districts of vidarbha. It includes 14 talukas. Flora of Amravati district has been already studied by Dhore (2002) reported 84 species of grasses, during last 16 years no survey was conducted of the area. Survey of grasses conducted during 2014-2018 revealed 117 species belonging to 60 genera. Sporobolus R.Br. is a third largest genus of study area It has 5 species which belong to subfamily panicoideae and tribe paniceae. The aim of our investigation is to study morphotaxonomic revision of family poaceae. It focuses on details of macro and micro morphology of some important grasses.
Key words – Amravati , Flora, Survey, morphology.

Introduction

Grasses are most beautiful group of monocotyledonous plants. They occur on every soil, in all kind of situations and under all climatic conditions. As grasses do not like shade, they are not usually abundant within the forest. But in open places they grow very well and some times whole tracts become grasslands.

Grasses are important for entire ecosystem. Tiger is the king of forest ecosystem. If we want to save tiger, we have to save the grasses because tigers are indirectly dependant on grasses for their food. Robinson writes "Grass is king" it rules and governs the world, without it the earth would be a barren waste.

In the early days when the population was much limited and when limited land was under cultivationmuch of it was covered with plenty of green grasses. So the farmers paid no attention to the grasses. But now population has increased, open land is decreased very much and cattles have increased in number hence farmers have to pay more attentation to grasses. The present destruction of grasses is mainly due to overgrazing, increasing agricultural practices, over use of herbicides, formation of big dams, road widening, clean agricultural practices and trampling by men and cattles. Grazing needs to be inhibited in certain areas and also reduce the use of herbicides. Tender shoots of Bamboo are used as vegetables and also as pickle by locals. The grains of grasses certainly provide a staple food supply for the human beings *Oryza sativa, Triticum aestivum, Zea mays, Avena sativa, Setaria italica, Eleusine coracana, Echinochloa colonum, Sorghum* speciesand rice feeds more human beings than any other plant product. Sugarcane is main source of sugar. A high proportion of the most fertile and productive soil were developed under a vegetative covers of grasses. Root, rhizome and other part of grasses are good soil builders and effective soil stabilizers. Most of the birds and animals depend upon grassland habitat for food, shelter and normal completion of their life cycles Gould (1968).

Despite utmost importance of grasses to human beings, the study on grasses continues to be a neglected subject. This is mainly because of the feeling that it is a difficult group for identification, the leaves and branches of grasses are very much similar, Small floral organs, special terminology and variation in the structure of spikelet and inflorescence. "*Grasses of Burma, Ceylon, India and Pakistan*" studied by Bor (1960) is the main standard reference work on Indian grasses.

Study Area:-

Amravati district is located in the state of Maharashtra-India. It is at $20^0$55' and 20.93 North latitude $77^0$45' and 77.75 East longitudes. It has an average elevation of 343 meters (1125 feet). Total area of the district is 12210 sq. km. Amravati district has tropical wet and dry climate with hot, dry summer from April to June. The annual average rainfall in the district is 852.1 mm and the temperature has recorded between 18^0C to 46^0C (Falling rain Genomics, inc. 2010).

Apart from this, Amravati is one of the largest district of Maharashtra states. It includes fourteen (14) taluka namely Amravati,Achalpur,Warud,Chandurbazar,Dharni, Morshi,Daryapur ,Anjangaon Surji, Chandur Railway, Dhamangaon Railway, Teosa, Nandgaon-Khandeshwar, Bhatkuli, and Chikhaldara . Chikhaldara is the largest talukas of Amravati district and Bhatkuli is the smallest one.

Review of Earlier Work

Though botanical exploration of India has long history, Vidarbha and Marathwada regions remained somewhat neglected. A thorough exploration of Marathwada has been done by Naik and his students for nearly 30 years. Outcome of this work is *"Flora of Marathwada"* by Naik (1998) which a wonderful survey and reference flora.

The monumental work of Bor.(1953) on *"Grasses of Burma,Ceylon, India and Pakistan"*(excluding Bambusiae) published about 50 years ago has changed this scenario and created interest on the study of grasses. This resulted in publication of several books on grasses and the latest addition is *"Flora of Tamil Nadu-Grasses"* by Altaf and Nair (2009) that deals with 447 species (excluding Bamboos).

Patunkar(1980) studied *"Grasses of Marathwada"* region has also published a book "*Grasses of Marathwada*".

Recently, Potdar(2012) has published "*Grasses of Maharashtra*", the book is an outcome of exploration and detailed studies conducted on documents of grass diversity of Maharashtra for last 20 years. During this period 415 species belonging to 125 genera have been described. There are above 10,000-11,000 species belonging to 700 genera in the world (Clayton and Renvoize, 1989 and Watson and Dallwitz, 1992) in India there are more than 1200 species belonging to 268 genera (Karthikeyan *et al*., 1989, and Moulk 1997). Kamble and Pradhan (1988) reported 87 species belonging to 49 genera from Akola district. Acharya (1985) reported 100 species belonging to 57 genera from Wardha district. Deore (2010) reported 65 species of grasses from Washim district. Karthikeyan (1993) reported 81 species from Yavatmal district and Diwakar (2000) reported 60 species from Buldhana district.

Floristic surveys of different area of Maharashtra have been compiled and published by Botanical Survey of India such as *"Flora of Maharashtra state, Monocotyledon"*, Sharma *et al.*, (1996), *"Flora of Maharashtra state, Dicotyledon"*vol. I Singh *et al*., (2000), vol.II Singh *et al*., (2001).

Material and Methods

Plan of Work

1) Study of Habitat

In every season the selected areas were explored systematically. Grass covered sites were targeted for study. Grasses were collected from different habitats like irrigated fields, unirrigated fields, open grasslands, forest, bunds of field, bank of rivers, wastelands, rice fields and rocky places.

2) Sample collection and preservation-

During excursion specimens of grasses were collected and field number is given to each specimen. Field observations were noted down in field diary. After collection the samples are critically studied in laboratory . Then it is dried properly, poisoned by using 2% Mercury Chloride and mounted using conventional methods. For critical cases BSI (Pune) was consulted to match the specimens.

3) Identification-

The identification was confirmed by using floras like flora of British India(Hooker 1872-1897), Flora of Bombay Presidency (Cook 1958), Flora of Marathwada (Naik 1998), Flora of Maharashtra(Almeida,1990), Grasses of Maharashtra (Potdar, Salunkhe and Yadav, 2012) Grasses of Marathawada (Patunkar,1980). Specimens were observed under Sterioscopic binocular microscope.

Artificial keys were provided for genera and species. Population variations are critically studied. Latest nomenclature are given in detail for proper taxonomic level. Each grass specimen description was supported by a note on distribution and herbarium specimen number. Genera and species are arranged alphabetically. Floristic analysis was done to get clear picture of grass biodiversity. Grass species are arranged according to N.L. Bor. All the specimens were deposited in the herbarium of S.S.S.K.R.Innani Mahavidyalaya, Karanja(Lad), Dist-Washim.(M.S.)

4) Observations

Species of *Digitaria* and habitat.

Sr. No.	Specimen No.	Name of Species	Habitat
1	PAM 94	*Digitaria abludens (Roem. & Schult) veldkamp.*	Cultivated fields
2	PAM 25	*Digitaria bicornis (Lam.) Roem & Schult.*	Cultivated fields
3	PAM 97	*Digitaria ciliaris (Retz.) koeler.Descr. Gram.*	Unirrigated fields
4	PAM 84	*Digitaria ischaemum (Schreb.)Muhl.*	Forest
5	PAM 58	*Digitaria stricta Roth.*	Cultivated fields

Key for the species of *DIGITARIA*

1a -	Hairs on the spikelet clavate	2
1b -	Hairs on the spikelet not clavate	4
2a -	Spikelets in triads	*D. ischaemum*
2b -	Spikelets in pairs	3
3a -	Tips of pedicels some what thickened without a rim of hairs	*D. abludens*

3b - Tips of pedicles cupuliform with a hair of rim *D. Stricta*
4a - Spikelets of each pair heteromorphous sessile of spikelets nearly glabrous in front the pedicelled coated with long hairs often. Spreading at maturity *D. bicornis*
4b - Spikelets elliptic to elliptic lanceolate spikelets appressed. glabrous when young with spreading white tomentum at maturity *D. cillaris*

Conclusion:-

Present study is the outcome of exploration tours conducted to document the grass diversity of study area from 2014-2018 and visited different areas of Amravati district in different seasons. During this period over 600 specimens were collected from the study area. During the study 117 species belonging to 60 genera were collected.

Out of 60 genera *Eragrostis* is the largest genus belonging to sub-family pooideae. The 35 species collected from study area were found to be monotypic. In Amravati district pure patches of *Aristada, Ischaemum, Themeda, Andropogon, Heteropogon, Dicanthium, Cynodon and Saccharum* were observed.

Though grasses are herbaceous in nature, but are tough in texture so it is easy to prepare herbarium speciman. Some of the beautiful grasses are *Thelepogon elegans, Mnesithea granularis, Chrysopogon fulvus, Ischaemum rugosum and Dichanthium species.*

Some dominant genera are *Apluda, Aristada, Dicanthium, Cynodon, Dinebra, Eragrostis, Ischaemum, Rottboellia, Heteropogon, Ophiuros, Setaria*.Some grasses have underground rhizomes i.e. *Ischaemum pilosum, Cynodon dactylon, Saccharum spontaneum* whichcan not be eradicated hence the productivity of crops decreases. *Cynodon* is the first class fodder grass present throughout study area. It is palatable and resistant to grazing and trampling because of underground rhizomes. *Dactyloctenium aegyptium* , *Chrysopogon fulvus* are other palatable species of grasses. *Cymbopogon martini*,*Vetiveria zizanioides, Saccharum spontaneum* and *Cynodon dactylon* are the medicinal grasses. Hollow internodes of *Arundo donax* are used formaking pens and musical pipes by locals. The forest areas of Melghat (Chikhaldara and Dharni) are of mixed dry deciduous type with teak as dominant species.

Saccharum spontaneum, Vetiveria zizanioides, Arundo donax present along the sides of rivers and stream which reduce the pressure of flood. The dominant tribes of Melghat are Gond, Korku and Gawali. Gond, and Gawali are the tribal residents of Melghat forest range are the consumers as they feed their livestock mainly by grazing of grasses. Efforts are required to prevent free grazing as once vegetation is lost, it is very difficult to restore.

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Qualitative Phytochemical Screening And Antimicrobial Activity of *Oxalis Corniculata* L.

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Abstract
Medicinal plants have been a valuable source of natural active phytoconstituents that play an important role in treatment of many human ailments. In the present study, Oxalis corniculata L. (stem, leaves, roots and flowers) was evaluated for its phytochemicals and antibacterial potential. The Soxhlet extraction was done by using three different solvents viz. acetone, methanol and water. Qualitative phytochemical analysis showed the presence of various phytoconstituents. The antimicrobial activity was evaluated by disc diffusion method against four bacterial strains (Enterobacter aerogenes, Pseudomonas aerogenosa, Escherichia coli and Staphylococcus aureus) and two fungal strains (Fusarium oxysporum and Fusarium proliferatum). The methanol extracts showed better antimicrobial activity than acetone and aqueous extracts. This may be because of the difference in the presence of various phytoconstituents in them.
Key Words: *Oxalis corniculata, herbal medicine, phytochemical analysis and antimicrobial activity, etc.*

Introduction
Medicinal plants have been useful in the development of new drugs and continue to play a valuable role in the drug discovery process [1]. Herbal medicines have already formed the basis of therapeutic use in developing countries, but recently have also seen an increase in the use of herbal medications in the developed world as well. The biogeographic position of India is unique which makes India rich in all the three levels of biodiversity [2]. Some studies focusing on the investigation of traditional Indian medicinal plants have resulted in the identification of new sources of therapeutic agents [3]. Plants are recognized for their ability to produce a wealth of secondary metabolites and mankind has used many species for centuries to treat a variety of diseases. Many of these natural products have been shown to present interesting biological and pharmacological activities and are used as chemotherapeutic agents or serve as the starting point in the development of modern medicines [4, 5].

In addition, in developing countries, synthetic drugs are not only expensive and inadequate for the treatment of disease, but are also faced with adulteration and side effects. Therefore, there is a need to search new safe infection fighting strategies to control microbial infection. Natural products, either as pure compounds or as standardized plant extracts, provide unlimited opportunities for new drug leads because of the unmatched availability of chemical diversity. There is a continuous and an urgent need to discover new antimicrobial compounds with diverse chemical structures and novel mechanisms of action for new and re-emerging infectious diseases [6]. Therefore, researchers are increasingly turning their attention to folk medicine, looking for new leads to develop better drugs against microbial infections. The increasing failure of chemotherapeutics and antibiotic resistance exhibited by pathogenic microbial infectious agents has led to the screening of several medicinal plants for their potential antimicrobial activity.

So, the present study deals with the evaluation of phytoconstituents and antimicrobial efficacy of *O. corniculata*.

Materials And Methods
Collection of Plant Materials: Collection will be carried out from garden of Shivramji Moghe College Kelapur (Pandharkawada). Identification will be made with the help of standard floras [5, 6, 9, 12].

Preparation of Powder and Extract: The collected plant materials will be shade dried and mechanically powdered and stored in an airtight container. Various extracts will be prepared according to the methodology [11], will be subjected to our entire studies. The shade dried plants parts will be allowed to pulverization to get coarse powder. The coarse powder material will be subjected to Soxhlet extraction successively with acetone, methanol and aqueous extracts. These extracts will be concentrated to dryness in flash evaporator.

Qualitative Phytochemical Analysis: The study of bioactive component will be made to understand the medicinal values of the plant materials will be screened for bioactive compounds like, proteins, amino acids, carbohydrates, alkaloids, steroids, cardiac glycosides, anthroquinone, glycosides, saponine, flavonoids, terpenoids, quinine and coumarins. The qualitative phytochemicals analysis will be carried out using standard procedure [4, 7, 11].

Antimicrobial Activity: Antimicrobial activity will be carried by using antibiotic sensitivity Agar (Hi-Media) by disc diffusion method [3] against four bacterial (*Enterobacter aerogenes, Pseudomonas aerogenosa, Escherichia coli* and *Staphylococcus aureus*) and two fungal strains (*Fusarium oxysporum* and *Fusarium proliferatum*).

Results And Discussion

Phytochemical study of *Oxalis corniculata* L. showed the presence of carbohydrate, proteins, alkaloid, flavonoids, steroid and saponin. Alkaloid and steroid present in all parts of plant extract except in acetone extract of fruit and methanol extract of leaf respectively. Flavonoid present only in methanol extract of fruit and aqueous extract of leaf. Tannin and Phenolic compound present in all plant extract except acetone extract of fruit (Table-1). For antimicrobial activity, methanol, acetone and aqueous extract of all parts of plant extracts were tested with four bacterial strains - *E. aerogenes, P. aerogenosa, E.coli, S. aureus* and two fungal strains- *F. oxysporum* and *F. proliferatum* (Table-2). Methanol extract shows better antimicrobial activity than acetone and aqueous extract. Methanol extract of stem, leaves, roots and fruits shows a higher zone of inhibition for *S. aureus* than other microbes. This is because of the difference in the presence of phytoconstituents present in them.

Table 1. Qualitative phytochemical analysis of *O. corniculata*

Sr.No.	Phytoconstituents	Test	Plant parts	Acetone extract	Methanol extract	Aqueous extract
1	Carbohydrate	Benedict's Test	St	+	+	-
			Lf	+	+	+
			Rt	+	+	-
			Fl	+	+	-
2	Protein	Million's Test	St	+	+	-
			Lf	-	+	+
			Rt	-	+	+
			Fl	-	+	-
3	Antraquinone glycoside	Borntrager's Test	St	-	+	-
			Lf	+	-	+
			Rt	-	+	-
			Fl	-	-	-
4	Cardiac glycoside	Kellar-Killiani Test	St	+	+	+
			Lf	+	+	+
			Rt	+	+	+
			Fl	+	+	+
5	Coumarins		St	-	-	-
			Lf	+	-	-
			Rt	-	-	-
			Fl	-	-	-
6	Quinone		St	+	+	+
			Lf	+	+	+
			Rt	-	+	+
			Fl	+	+	+
7	Steroids	Salkowski Test	St	-	-	-
			Lf	-	-	+
			Rt	-	-	-
			Fl	+	-	-
8	Alkaloids	Hager's Test	St	+	+	+
			Lf	+	-	+
			Rt	+	+	+
			Fl	+	+	+
9	Flavonoids	Lead acetate Test	St	-	+	-
			Lf	-	-	-
			Rt	-	-	-
			Fl	+	+	-
10	Tannins and Phenolic compounds	$FeCl_3$ Solution Test	St	+	+	+
			Lf	+	+	+

			Rt	+	+	+
			Fl	-	+	+
11	Saponin	Foam Test	St	+	+	+
			Lf	+	-	+
			Rt	+	+	+
			Fl	+	-	+

[Note : St - Stem , Lf – Leaf , Rt – Root , Fl – Flower , Aq – Aqueous , Ac – Acetone , Me – Methanol]

Table 2. Antimicrobial activity of *O. corniculata*

Sr.No.	Name of Microorganism	Extract	Diameter of Zone of Inhibition in mm			
			St	Lf	Rt	Fl
1	*Enterobacter aerogenes*	Aq	6	11	12	10
		Ac	12	14	16	15
		Me	14	14	16	15
2	*Pseudomonas aerogenosa*	Aq	6	13	11	17
		Ac	10	17	16	20
		Me	12	18	17	21
3	*Escherichia coli*	Aq	6	6	10	14
		Ac	13	12	15	16
		Me	15	14	16	16
4	*Staphylococcus aureus*	Aq	6	10	13	15
		Ac	15	21	20	20
		Me	16	21	24	22
5	*Fusarium oxysporum*	Aq	11	6	10	11
		Ac	14	14	11	13
		Me	14	15	13	16
6	*Fusarium proliferatum*	Aq	8	6	10	9
		Ac	10	12	14	10
		Me	10	14	15	16

[Note : St - Stem ,Lf – Leaf ,Rt – Root ,Fl– Flower , Aq – Aqueous , Ac – Acetone , Me – Methanol]

Conclusion

The results obtained from the present investigation indicate that, the plant *O. corniculata* rich in alkaloids, flavonoids, steroids and saponin. They are known to show medicinal potential and antimicrobial activity for selected microbes. Thus, the plant under investigation showed their medicinal potential and can be a source of useful drugs. More phytochemical research work is required for isolation, purification and characterization of biologically active compounds. Since the plant *Oxalis corniculata* L. is useful in traditional medicine for the treatment of various ailments; it is need of time to standardize the plant for development of quality control parameters.

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Ethno-Medicinal Uses of Some Selected Medicinal Plants of Pusad Forest Ranges, Maharashtra

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Abstract:
Pusadtalukais enclosed within hilly region with forest vegetation consisting of medicinal and aromatic plants which have traditionally used by local peoples from 100 of years. Traditional indigenous knowledge reveals the immense value of almost all parts of the plant i.e. roots, leaves, fruits, seeds and gum for various medicinal uses. These species has high socioeconomic value providing livelihood to tribal population of the area and has high potential as commercial value.
***Keywords**: Pusad, Ethno-medicnalroperties, Medicinal plants.*

Introduction

Pusadtaluka is situated on the bank of river Pus and in the mountainous hilly region in Yavatmal district of Maharashtra state. Pusad is located at 19°54′N77°35′E19.9°N 77.58°E. It has an average elevation of 315 metres (1033 feet). River Pus flows very near to the town that is why the city was named as Pusad. Climate of Pusad is very high with the temperature going as high as 49 degree Celsius during summers and as low as 5 degree during the time of winters. It receives an average rainfall of about 471mm per year. Pusad is well furnished with hilly region with forest vegetation and separated forest divisionPusad; which is surrounded by hills from almost all the sides and is at little lower elevation than these hills. The name of the city originates from the name of the adjoining river called Pus river.

Plants provide the predominant ingredients of medicines in most medical traditions while the demand for medicinal plants is growing hence, some of them are increasingly being threatened in their natural habitat. Threats can be human-induced such as clearing of habitat, pollution, overharvesting, introduced species, or random natural events such as cyclones, floods, droughts, fire. Traditional methodologies cannot provide the increasing demand of worlds need in medicinal plants and hence there is urgency of development of new technologies to fluffiness of present requirements.

Traditionally from prehistoric times, the use of different parts of medicinal plants was practiced to cure specific ailments evidently due to presence of some bioactive compounds like alkaloids, flavonoids, essential oil, glycosides, tannins, terpenoids, steroids and others. Many of the drugs, currently in use have been isolated from natural sources based on information about curative agent in folklore medicine (Sameera and Mandakini, 2015). About 47000 plant species are found in different parts of India, of them 17,000 flowering plants, 6850 species are endemic to India and 8000 are ethnobotanically important (Wildlife Institute of India, 2007). Singh (1999) reported that out of 250,000 to 300,000 total plants of the world, India harbors' about 45,000 plants. Out of 20,000 medicinal plants of the world, India contributes about 3000-5000 plants. Biodiversity is one of the key components of our basic life support system. The traditional herbal medicines are still practiced in large part of our country in tribal and rural areas. The present attempt is to survey of different regions of Pusad and its surrounding area for medicinal plants and contribution to the knowledge of traditional uses of medicinal plants of this region.

Materials and Methods

For the study of different types of plants author visited different localities of Pusad and adjoining hilly region during all seasons of year. During visits various types of plant were found viz., trees, shrubs, herbs, grasses, ornamentals & medicinal and aromatic plants. For collection of these plants the author was plan to visit different localities at different times. The collected plants at the time of flowering were identified with the help of Botanical flora (Ugemuge, 1986). The medicinal uses of plants and plant parts were recorded from local peoples and the literature.

Observations and Results

S.N.	Botanical Name	Common Name	Family	Category	Locality
1	*Curcuma*aromatica	Ranhalad	Zingiberaceae	Threatened	Isapur
2	*Iphigenia indica*	Ranlasun	Liliaceae	Threatened	Khandala, Dhundi, Isapur,
3	*Gloriosasuperba*	Kal-lawi	Liliaceae	Threatened	Dhundi, Khandala, Belghavhan, Isapur, Katkheda, Harshi
4	*Withaniasomnifera*	Ashwagandha	Solanaceae	Rare	Pusad, Belghavhan, Khandala,

					Katkheda
5	*Vitexnegundo*	Nirgundi	Lamiaceae	Rare	Khandala, Dhundi, Belghavan, Isapur
6	*Amorphophallous* sp.	Dukkarkand	Araceae	Threatened	Khandala
7	*Terminaliaarjuna*	Arjun	Combretaceae	Rare	Khandala, Dhundi, Belghavhan, Harshi, Isapur, Khandala
8	*Buchananiacochinchinensis*	Charoli	Anacardiaceae	Rare	Belghavhan, Isapur, Khandala, Dhundi,
9	*Asparagus racemosus*	Shatawari	Liliaceae	Rare	Khandala, Dhundi, Belghavhan, Harshi, Isapur,
10	*Buteamonosperma*	Palas	Fabaceae	Rare	Khandala, Dhundi, Harshi,
11	*Bombaxceiba*	Katesawari	Malvaceae	Rare	Khandala, Dhundi, Harshi,Isapur
12	*Madhucaindica*	Moh	Sapotaceae	Rare	Khandala, Dhundi, Harshi,Isapur

Medicinal uses

1) *Curcuma aromatic*: It is used traditionally for eliminating blood stasis, delaying the ageing process, pain relief, liver disease, tonic, skin ailments, antidote for snake bite, wound healing, dysentery, indigestion, cosmetics, skincare, anticancer.
2) *Iphigenia indica*:The plant body is useful in damaged breast cancer, against different tumours, gout, skin infections, scrofula, snake bite, rheumatism, as a laxative; used against different types of cancers namely, thyroid, skin, cervix etc.
3) *Gloriosasuperba*: All the plant parts are useful as an abortifacient, tonic, in the treatment of ulcers, leprosy, piles, abdominal pains, itching, and indigestion.
4) *Withaniasomnifera*: In traditional medicine, the consumption of the roots improves cardiovascular health, reduces swelling and stress, strengthens heart muscles, regulates cholesterol, and reduces hair loss in the human body, bronchitis and malaria.
5) *Vitexnegundo*: The plants root, bark, leaves, fruits are useful as antiseptic, bronchitis, asthma, tonic anti-rheumatic, diuretic, wound , ulcers, muscle relaxant, cardiac disorder,
6) *Amorphophallous*sp.: The plant is useful in gastrointestinal diseases viz. haemorrhoids, vomiting, abdominal pain, liver tonics, digestive, bronchitis, asthma, cough and anaemia.
7) *Terminaliaarjuna*: The bark and fruits are used traditionally as cardio-tonic, tonic in fracture, ulcers, spermatorrhoea, diabetes, cough, tumour, asthma, skin disorder, provide energy to heart muscle.
8) *Buchananiacochinchinensis*: All parts of plant body use in the treatment of various disorders diarrhea, inter costal pains, relive itching, blood disorder, fever, ulcers, dysentery, asthma, snakebite.
9) *Asparagus racemosus*: This plant is recommended in Ayurvedic tests for prevention and treatment of gastric ulcers, inflammation, nervous disorder, liver diseases dyspepsia and as a galactogogue.
10)*Buteamonosperma*: Flowers are astringent to bowel, in cure "Kapha", leprosy, strangury, gout, skin diseases, thirst; flower juice is useful in eye diseases. Flower is bitter, aphrodisiac, expectorant, tonic, diuretic, and good in biliousness, inflammation and gonorrhoea.
11)*Bombaxceiba*: The plant has been used extensively for treatment of some diseases like anti-inflammatory, anti-HIV, hepato-protective, hypotensive, antiangiogenic, antioxidant activities
12. *Madhucaindica*: It is used as Anti diabetic, antiulcer, antiulcers, antipyretic, antifertility, analgesic, antioxidant, swelling, inflammation, piles, wound healing, dermatological, laxative, tonic, antiburn, headache and many more problems.

Conclusion

The plants collected and reported from Pusad, District Yavatmal in the present study are used by the local peoples and tribal in their routine treatment practices. All the traditional drugs obtained from different medicinal plants studied in present attempt are very effective, cheap and available around agricultural fields and in wastelands. So the tribals are using these plants as alternative to allopathic medicines. Further research on these plants on scientific lines may help in developing effective drugs for human health care.

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Ethno- Veterinary Plants Used in Animal Health Care Practices by Livestock Owners From Katepurna Region Dist- Akola (M.S.) India

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Abstract
Livestock economy forms a major part of our agriculture economics. Tribals in far flung rural areas are still depending upon plant and household remedies for curing various veterinary ailments. The folk knowledge of ethno-veterinary significance has been identified by tribals through a process of experience over hundreds of year. The present study throws a light on herbal remedies used in animal health care of Katepurna region district Akola, Maharashtra, India. The paper deals with 15 diseases of domestic animals and their treatments by 50 plant species found in close vicinity of the rural peoples of the study area.
Key Words: Domestic animals, herbal medicines, animal healthcare and Katepurna region.

Introduction
In India enough attention has not been given to the traditional veterinary herbal remedies (Boddings, 1927; Bandyopadhyay *et. al*., 2005 and Prajapati & Kumar, 2005). The use of plant and animal parts for medicines long been in existence and documented in records kept in ancient China, India and Egypt. These ancient indigenous practices were discovered by a series of trial and error which then could not be substantiated by proven scientific theories. However, these practices have produce result of proven efficacies compared to conventional modern medicines (Chopra *et. al*., 1956 and Prajapati *et. al*., 2003).

In recent times, herbal medicines have become indispensable and are forming an integral part of the primary health care system of many nations. There has been rich tradition and indigenous knowledge about animal healthcare in India (Raja Reddy, 1987; Sharma, 1993 and Bhattacharjee, 2001). Modern healthcare in the tribal and rural areas of Katepurna region is characterized by the deficiency of infrastructure, of qualities personal and of medicine. So, the present study was undertaken in rural as well as in forest areas of Katepurna in Akola district.

Methodology
The traditional knowledge of plant base remedies for the treatment of ailments rests with the medicine man, all of which belong to one family of hereditary indigenous practitioners. Skill and experiences are passed on from one generation to the next by word of mouth and guarded like secrets. In view of secretiveness of traditional men and women, it was decided to interview a number of elderly people, who have a great deal of practical knowledge about the plants and animal products used as medicine in the native system. Before actually launching into the field work, rapport was established with tribals of the locality. Experienced people, such as some elders, professional healers, medicine men can provide important information on useful medicinal plants.

To determine the authenticity of information collected during field work, repeated verification of data from different people and at different times was done. The collected plants were identified up to species level with the help of flora (Kamble & Pradhan, 1988; Karthikeyan & Kumar, 1993; Naik, 1998; Singh & Karthikeyan, 2000 and Singh *et. al.*, 2001). The information presented includes the name of ailment, plant parts, animal product or chemical used, their scientific names and mode of usage. The data are presented alphabetically disease and disorder wise.

Observations
In all 50 plant species are used by the natives in the treatment of domestic animals.

1] Anorexia: 50 gm tuber powder of *Corallocarpus epigaeus* Rottl.et Willed. mixed in 250 ml wine is given in anorexia for Loss of appetite.

2] Bloat: Leaves of *Ocimum basilicum* L. crushed with sugar and the decoction in water is given for blood purification. Tuber of *Discorea bulbifera* L. rubbed in cow urine and paste is applied over bloat. Inflorescence of *Mangifera indica* L. crushed in cow urine and the paste applied thrice a day on bloat. Tuber paste of *Corallocarpus epigaeus* Rottl.et. willd. Clarke made in cow urine administered over bloat.

3] Blood purification: Agents believed to remove impurities or deficiencies from blood. Leaves of *Ocimum basilicum* L. crushed with sugar and the decoction in water is given for blood purification.

4] Bone fracture: The stem branches of *Viscum articulatum* Burm. f. given orally or mixed with fodder. Warm leaves of *Soymida febrifuga* (Roxb.) A.Juss applied on fracture part. Poweder of leaves of *Blepharis repens* (Vahl) Roth. mixed with whey or pulses of black gram given for healing bones. Stem bark paste of *Terminalia arjuna* (Roxb.ex DC.) Wight & Arn. applied over bone fracture . Root powder of *Bauhinia racemosa* Lamk. with butter and rice given to animals to join the bones. Leaves of *Capparis zeylanica* L. crushed within castor oil, mixed with bulk of egg and sieve white soil. Paste prepared is plastered around fracture bone bandage with the help of hairs, cloth strips and wooden splints made of lightwood.

5] Cough, Cold and pneumonia: This disease makes the animal to cough continuously due to climate change or by grazing newly raised grasses on the ground. Warm vapour of *Eucalyptus globus* given to the animal in cough and cold.

6] Constipation: Constipation is a condition of bowels when defecation of faeces is irregular or difficult. *Abrus precatorious* L. seeds powder are used orally along with water. Crushed seeds of *Jatropha curcas* L. after removing epicarp are given to animals for same.

7] Dysentery: A disease caused by bacteria or protozoa, causing inflammation of mucus membrane and glands of large intestine, resulting in painful dysentery. The stool often accompanied by mucus or blood. Decoction of leaves of *Eucalyptus globules* Labill mixed with water and by adding by camphor given to animals. Decoction of leaves *Embelia ribes* N. Burm mixed with boiled fruit in water given to animals in dysentery. Dried fruits of *Cucumis melo* L. var. crushed and mixed with wheat for three days in morning given to cattel. Decoction of leaves of *Dolichondrone falcata* (Wall. Ex DC) Seem. after sieving through piece of cloth mixed with butter and given to animals. Decoction of pods of *Cassia fistula* L. mixed with water given to animals. Crushed leaves of *Cardiospermum halicacabum* L. mixed with butter milk given to animals against dysentery. Fruits of *Aegle marmelos* (L.) fed to animals to cure. Fruit powder of *Careva arborea* Roxb., *Sappindus emarginatus* Vahl mixed with *Curcuma longa* L. and decoction is prepared in ghee and 1 lit. decoctions given to cure dysentery.

8] Diarrhoea: A common symptom of gastro- intenstinal diseases resulting infrequent discharge of watery stool. Bark of *Ixora arborea* Roxb. Ex Smith soaked with pulses of *Phaseolus mungo* L. overnight in water then next day mixture is crushed together and mixed with 1 litre whey and given twice a day to cure body diarrhoea. The decoction of leaves of *Barleria prionitis* L. mixed in water is given to animals. Leaves and flowers of *Madhuca indica* J. The decoctionis given to cure body diarrhoea. Crushed leaves of *Cayratia auriculata* (Wall. Ex Wight & Arn.) Gamblle mixed with one liter butter milk and sieving through a piece of cloth is given to animals. The decoction of leaves and young pods of *Acacia nilotica* (L.) Willd. Ex Del. is given to animals against diarrhoea.

9] Eye diseases: Seed paste of *Balanites aegyptiaca* (L.) Del. Applied to eyes to cure corneal opacity. Seed paste mixed with juice of *Citrus limon* L. and *Curcuma aromatic* Salisb. Applied to cure injury of eyes. Fruit paste made in cow urine applied to cure redness of eyes. Latex from leaves of *Ficus benghalensis* L. applied in eyes to cure corneal opacity and watering of eyes. Fruits of *Semecarpus anacardium* L. f. crushed in cotton and soaked cotton is moved in eyes two to four times to cure redness in eyes.

10] External parasites: The leaf juice of *Ailanthus excels* Roxb. is used to kill external parasites like lice and ticks.

11] Fever: Body temperature increases, which can be judge b the touching the animals ear. Decoction of roots or leaves of *Trianthema portulacastrum* L. given to cure fever after worm infection. Decoction of crushed roots of *Marsdenia tenacissima* (Roxb.) Moon. given to cure fever. Bark of *Butea monosperma* (Lamk.) Taub. crushed in cow milk, mixed in cow milk , mixed in water and given to cure fever of bullocks. Leaves and flowers of *Madhuca indica* J.F. Gmel and *Tamarindus indica* L. crushed together and decoction is given to cure fever of Goat.

12] Maggoted wounds: Root powder of *Gloriosa superba* L. is dusted on maggoted wounds to kill worms. Leaf decoction of *Alianthus excels* Roxb. is applied on the wound to remove maggot. Decoction of leaves of *Datura metel* L. used to cure maggot wounds. Decoction of leaves of *Cleome viscosa* L. applied on sores for killing maggots. Decoction of leaves of *Clerodendrum multiflorum* (Burm. f.) O. Ktze. droped on worm infested wounds and crushed leaves are also applied to kill worms.

13] Hebicide poisoning: Roots of *Baliospermum montanum* (Willd.) Muell. – Arg. Are crushed and put under canine tooth in herbicide poisoning. Whole plant of *Cuscuta reflexa* Roxb. Crushed and mixed with 250 gm butter is given orally in herbicide poisoning.

14] Itch: Sense of irritation on skin. Inner bark of *Acacia nilotica* (L.) Willd. Ex. Del. *Emblica officinallis* Gaertn. *Ziziphus nummularia* Burm. f. and leaves of *Feronia elephantum* Corr. Boiled together . The

decoction is sieved through a piece of cloth, one spoon of pepper powder mixed with two spoon hot butter is added into above decoction and one bottle is given twice a day in itching.

15] Repeat breeder: Crushed fruits of *Thespesia populnea* (L.) Soland. Ex Corr. Boiled, mixed with half litter water and given orally for three days in repeat breeder or anestrus.

Discussion

The present study included extensive survey and research work regarding the use of herbal medicine in the Akola district. As observed in most of the cattle owners and common peoples, first choice of treating their animals is traditional herbals remedies. On field tests, it is revealed that the above common ailments were cured fully in all the cases excepting the few negligible. There were no side effects. Further, the costs of all these herbal remedies were negligible in comparison to modern veterinary medicines as prescribe by the veterinarians. As majority of the inhabitant of the Katepurna region solely depends on agriculture and animal husbandry sectors, their poor economic condition does not permit them to meet the cost of allopathic medicines. Hence, they strongly believe and rely upon their traditional herbal medicines.

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Impact of Laser Irradiation on Germination of Seeds

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Abstract

Majority of the population of India has agriculture as the source of their livelihood and it cannot be underestimated. The increasing population and globalization effects demands increase in quality as well as quantity of food along with its variety. Along with that food safety and security is essential factor to be consider. Since decades, novel techniques and technologies are employed to fulfill these demands. Laser technologies have been proved trustworthy in field of agronomy. This article represents the review on impact of laser irradiation on germination of seeds. It includes Laser applications namely impact of coherent laser irradiation on germination of seeds, effect of laser on fresh and dry weight, irradiation effects at different wavelengths on phenology and yield components of pretreated seeds. Herein the review of above mentioned applications of Laser technology in agriculture, its advantages, challenges and possible future work as well as impact of Laser irradiation on germination of seeds is included.

Keywords: *Laser, agriculture, coherent, irradiation.*

Introduction

Agriculture is the means of livelihood of majority of population of India. Even in twenty first century the agriculture field is facing challenges like water shortage, lack of use of technology, energy resources constraints, less availability of land under cultivation. The increasing world population demands increase in availability of foodgrains. Some innovative methods and smart use of available technology should be the wise way to overcome these issue. Along with that food safety and security is the major factor to be consider. Overuse of fertilizers, pesticides, fungicides makes the land infertile. Moreover, many climate changing activities making hazardous effect on environment. Thus there is need of use of novel techniques to fulfill the demands. Sustainable agriculture is a management system for renewable natural resource for food production income and livelihood for present and future generations, maintaining and improving in comic productivity and the ecosystem. (10)

Laser means Light amplification by stimulated emission of radiation. It is an optical device that can generate monochromatic and highly coherent light. (1). The laser discovery in the past century has been of great impact and applied in the society from its conception until today. Among its applications, its use in agriculture as a biostimulator device. The laser light of low intensity produces bio stimulation when used on seeds, seedlings and plants. (9)

Impact of coherent Laser irradiation on germination of seeds

Laser technology is mainly used for pre-sown seed exposure in order to achieve better and faster germination in various, often unfavorable, habitat conditions.Experiments were done on Soybean seeds which includes exposure of seeds to Laser light of different intensities in combination with bacterial vaccine dose. The samples were exposed to two types of laser, a Helium-Neon laser comprised of red light with a wavelength of 632.8 nm and irradiation density of 2 W m^{-2}, and an Argon laser with a blue light, a wavelength of 514 nm and irradiation density of 5W m^{-2}. After performing experiments, the morphological analysis, Isolation and identification of fungi colonized seeds and statistical analysis of the experimental soybean seeds were done. For 21 days the seeds were kept in chamber and effects on germination were observed. It was found that of all the examined cases, seeds germinated best after being photo stimulatedwith a red or blue laser. The highest number of germinating seeds was found in the case of irradiation of the seeds plus vaccine. This is an effective technique in protecting germinating soybeans and the roots of older plants against infestation by soil-borne pathogenic fungi(3)It is observed that the absorbed energy from laser light increased activities of biochemical and physiological process of seeds by the transformation of light energy into chemical energy(9)

Irradiation effects at different wavelengths on phenology and yield components of pretreated seeds

The aim of the study was to determine effects of different dose and different wavelengths on irradiation . The maize was chosen as experimental material. Three types of laser were used: He–Ne (red), Nd:YAG second harmonic generation (green), and diode (blue), generated at 632.8, 532, and 410 nm, respectively. It was found that with different exposure time and power density of the laser the maize plant showed remarkable effects. The irradiation of the sowing material hada positive influence on the seed yield of maize. (4).

Effect of laser on fresh and dry weight, root length, hypocotyl length

In the simple optical experiments of pretreating mug beans with laser of wavelength 632.8 and 488nm shows improvement in root length, hypocotyl length by 28% and 22% respectively (5). Researcher has exposed seeds of pea to helium neon rays for 10 min. gave the highest values of plant dry weight compared to untreated plants and other period (2 and5 min). (6)

Laser treatment for resistance to fungal and bacterial infection

Experiment were performed on wheat. As wheat is the major part of our daily food Development of new alternative therapeutic approach is necessary to curtail fungi infection. This invitro study demonstrated that pre sowing exposure to SHG Nd-YAG laser in wet and dry condition was able to sterilize wheat seeds, improve its growth and development, and may be a good candidate for novel treatment of fungal infected wheat seeds. (8). the irradiation of seeds with 660 nm laser light seems to induce resistance against diseases caused by microorganisms in seedlings (7), which could be an interesting and sustainable area of research. Furthermore, irradiatingseeds with red laser light seems to improve the nutritional value of seedlingsthrough the accumulation of vitamins, minerals, pigments and antioxidants, and isalso capable of boosting both the antioxidant capacity and anti-inflammatory activities(2)

Future Scope and limitations

Herein this review paper presented the impact of irradiation of deed germination of seeds. It is effective for enhancing the agricultural production. The above mentioned study shows the effect of pretreatment to seeds by laser with coherent sources, with sources of different wavelength as well as the use of laser for proper maintenance of water and fertilizers in field. But there are few limitations also. Laser induced changes are positive as well as negative. Bio stimulation by lasers may cause negative effects as well. Thus further study and investigation is needed in this field. This may offer us new horizons to explore and will prove worthy in fulfilling the demand of sustainable growth.

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ORB Weaver Spiders Fauna of Sugarcane Agroecosystems of Mahagaon Taluka Maharashtra, India

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Abstract: -

Spiders play a significant role in ambiguous insect pests in agricultural ecosystem. Modern trends in farming towards condensed pesticide use and natural sustainability lead to enlarged importance in spiders as potential biological control agents.

The association of a powerful involvement among species richness and an exchange the catalog is a serious issue in conservation biology. Such a association could gives the foundation for the association of commercial and easy-to-monitor methods intended for measuring biodiversity, given that an another prioritization of sites for conservation. Together family and genus richness are studied for their capability to calculate the number of spider species self-sufficient of diversity. Genus only is found to be trustworthy sign for ranking sites according to species richness. This study recommends accomplishment of higher taxonomic level as a hopeful loom for calculation of spider species richness or estimation and standing of areas according to conservation significance. This paper is an attempt to understand the diversity and assemblage of spider's fauna from Sugarcane argoecosystem of Mahagaon taluka of Yavatmal district. Out of 154 spider population Total 17 species were observed from 7 genera from Aranidae family.

Keywords:- Agroecosystems, Aranidae Integrated Pest Management ,Spiders, Sugarcane.

I. Introduction:-

ORB Web Spiders is the biggest family amongst spider's world. All species from this family spins web the particular structure of the web is useful for identification of species. Spiders from this family having flat cephalothorax; thoracic region is oval, or almost spherical, divided from head by tilted depression. Eyes are not different in size. Legs are covered with lots of hairy spines, with three tarsal claws. The legs are also varies greatly in length. When spider is in resting stage legs are likely to be drawn up tightly against carapace, which may be completely hidden. In this family male is much smaller and very differ from female and has large, rounded tarsal bulb on the end of each palp. Sternum is triangular or may be heart shaped and coxa IV is being next to it.

The biodiversity of invertebrate species on agricultural land is very important in terms of pest control and conservation. Spiders are principal predator found in Arthropods communities (Gertssch, 1979).

Spiders are significant but in general disappointingly studied arthropods due to unawareness, lack of knowledge, fear and general dislike towards them. The broadly spread concept that spiders are toxic and dangerous, may be the one of reason to stay away from them. All spiders are not venomous only a small number of species such as Black Widow spider, Recluse spider or Red Back spiders bite is harmful for human beings, and sometime they may cause allergic reactions. Venom produced by spiders is poisonous to their common pray like insects, mites and other small Arthropods; venom is inserted to pray through the fangs to immobilize them. Spiders only use their venom to immobilize their prey and hence they act as natural pest controller, so the study of diversity and variety of spiders in agro ecosystem is useful for determination of the benefits of agricultural practices for conservation of spiders, important for pest control (Eyre *et al.*, 1989). Spiders are wide spread in agro ecosystems making up to 20-80% of predatory fauna (Legotay, 1980; Zhang, 1992). To control effects of pests various pesticides are regularly been used by farmers, but these pesticides are having various adverse effects on non target fauna, sometimes these pesticides are harmful to human beings also, therefore more emphasis should be given on bio-pesticides, spiders plays major role in controlling population of insect pests.

II. Material & Method

A. Study Area:-

The area selected for collection of orb weaver's spiders is Sugarcane agroecosystems of Mahagaon Taluka of Yavatmal District (Maharashtra state). Mahagaon and nearby areas habitually depend on agriculture as the main resource of income. The land in the region is very well irrigated because of Pus dam, Veni Dam, Senad Dam, Pimpalgaon Dam And Mudana dam which provide multipurpose benefits of irrigation, drinking water supply, flood control and hydropower generation.. Pus River also provides direct irrigation water to farms. Drinking water is also sourced from this canal. The catchment area is hilly and forested in its upper niches from its source and the lower niches are flat wide valleys. (Rivers, Government of India 2010). Main

crops include Sugarcane, Cotton, Soybean, Bengal gram, Jawar, and Wheat.sugar cane is an irrigated crop, it *can* be *cultivated* on almost all types of soils provided sufficient organic matter is applied under rained conditions.

Mahagaon taluka of Yavatmal district, (Maharashtra) is located at the latitude of 19.7877244, and the longitude is 77.772378**. Mahagaon , Maharashtra, India** is located at *India* country in the *Cities* place category with the GPS coordinates of 20.7277° N and 80.0591° E. **Mahagaon , Maharashtra, India** 398 meters. Above Sea level, that is equal to 1,167 feet. Mahagaon taluka has an extreme variation in temperature with hot summer and cold winter. The rainfall comes from South Western called monsoon mainly in the month of June, July, August and September. The annual average rainfall in the Morshi is 738.40mm and temperature recorded between 17^0C to 45^0C.

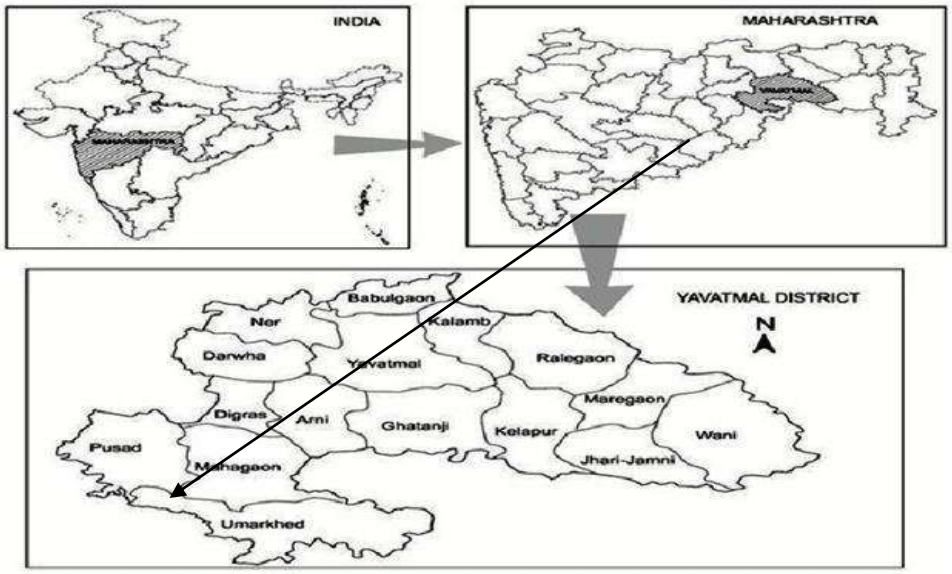

Fig: - Study Area

B. Method

a) Study Period

The investigation was carried out for a period of six months from September 2020 to February 2021. Sampling was conducted in six months at the randomly selected sugarcane field.

b) Sampling

Sampling was done every Saturday - Sunday from quadrates. Spiders were collected only for photographic purpose and released immediately in their natural habitats. Quadrates (1sq. m × 1sq m) placed at four corners and one centre of 10 sq. m × 10 sq. m region by visual search process between 8.00 Am to 12 PM 4 hours in morning and 4 to 6 PM 2 hours in Evening. An adequate interior part was left to avoid boundary possessions. All 1 quadrates were searched. Spiders were collected from the ground stratum and from the terminals of crops. Total 15 Villages were visited consistently for study of spiders.

c) Identification:

Identification of spiders is done with the help of keys available. The specimens were observed for their preserved or photographed. For identification keys of Tikader (1963), Gajabe (2005), Z.S.I. and other literature.

The family wise identification was mainly done with the help of eye position as well as other morphological characters.

III. Result & Discussion:-

Aranidae was the most dominant family in both the study areas as they are very good predators on web. They control the insect and other harmful arthropods which get entangled in the webs. Aranidae shows great predation towards *Leptocorisa acuta* (bugs), and White grubs than the other spider species. Various other observations suggested that spider distribution and re-colonization in fields are important aspects of spider population dynamics in agro ecosystems. (Bishop, L.and S.E. Riechert, 1990). Genus Araneus was dominant during winter followed by Cyclosa these two genera were represents 37% species richness from Aranidae family during 2020-21 but in 2022 the number reduced up to 26% from Sugarcane argoecosystem as the result of pesticide, burning of raw residues of sugarcane and human encroachment in study area.

Family	Species in Sugarcane agroecosystems	Population	Region	Meta- Region
1. ARANEIDAE	*Araneus mitificus* (Female)	9	Site 4	Sawana
	Araneus pahalgaonensis (Female)	11	Site 4	Kalgaon
	Araneus sp.(Female)	10	Site 2	Veni
	Araneus sp.(Male)	12	Site 4	Sawana
	Argiope sp. (Male)	8	Site 1	Pedhi
	Argiope aemula (Male) and (Female)	9	Site 2	Sawna
	Argiope anasuja (Thorell) (Female)	5	Site 3	Mahagaon
	Chorizopes calciope (Female)	6	Site 3	Malkinhi
	Cyclosa hexatuberulata (Female)	7	Site 1	Leva
	Neoscona nautica (Female)	10	Site 2	Tembhi kali
	Neoscona theis (Female)	16	Site 2	Gunj
	Neoscona mukharjee (Female)	11	Site 3	Bhosa
	Neoscona sp. (Male)	14	Site 4	Bori Ijara
	Telacantha brevispina (Female)	12	Site 1	Amni
	Telacantha sp.(Female)	5	Site 2	Amboda
	Zygeilla sp. (Female)	5	Site 4	Kalgaon
	Zygeilla sp.(Male)	4	Site 4	Veni

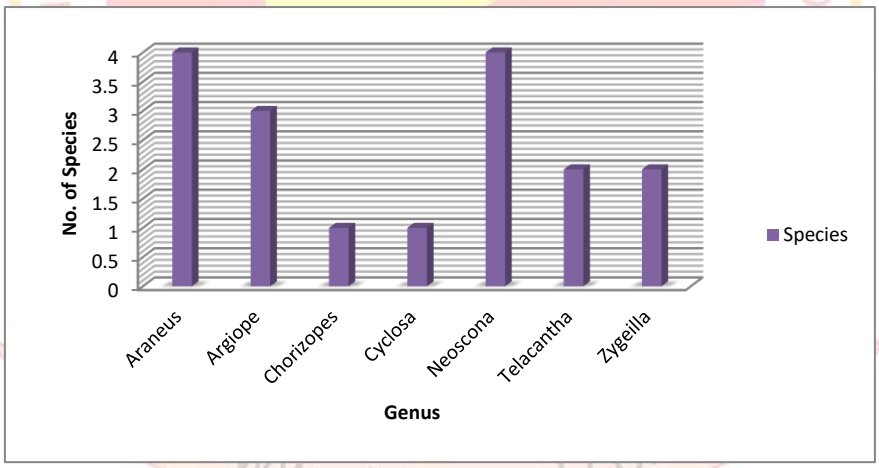

Chart No of Species against Genus of Aranidae Family.

Statistical Analysis:-

Total number of Organisms:-	**154**	Total number of Species	**17**
Average population size: -	**9.059**	Decimal Accuracy: -	4
Number of Regions	**15**	Region sets	6

Alpha Biodiversity [α]

Simpson Index $\frac{\sum_i n_i(n_i-1)}{N(N-1)}$ 0.06069 Simpson Index Approximation $\frac{\sum_i n_i^2}{N^2}$ 0.06679

Beta Biodiversity [β] Comparing two sample areas

Absolute beta Value ($(S_0$-c)-(S_1-c)…): **208** Whittaker's Index (S/alpha): **15**

Sorensen's similarity index: **0** Alternate Whittaker's Index (S/alpha-1):**14**

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Ethnomedicinal Study &Qualitative Analysis of Jatamansi- A Case Study in Lanku valley, Darjeeling, West Bengal.

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Abstract

Medicinal plants have important contribution in the healthcare system of local communities as the main source of medicine for the majority of rural population. The paper is about treatment of various diseases using ethno medicinal practices of Jatamansi. Nardostachysjatamansiis a flowering plant belonging to family Caprifoliaceae. This plant is also known as "Tapaswani" in Ayurveda. It is a perennial, dwarf, hairy, herbaceous and endangered plant species. According to herbal practitioners the plant is used in various herbal formulations to treat epilepsy, hysteria, convulsions, mental weakness, anxiety and insomnia. The study is conducted in Lanku valley, Darjeeing, West Bengal and it is located 60 kms. from the city of Siliguri. The main population of this area is tribal communities and they have their distinct knowledge of language, culture and food habits. In spite of availability of modern medicines, the tribes of Lanku valley region use plant therapy for treatment of various diseases. One of the main reasons of this is rich plant diversity of Lanku valley. Jatamansi is used for various medical purposes by tribes of Lanku valley. The phytochemicals obtained from the plant are widely applied in the traditional herbal medicines. This paper deals with the ethnomedicinal practices of Nardostychysjatamansiand its phytochemical analysis.

Key Word *Nardostychysjatamansi, Ethno Medicine, Traditional Knowledge, Tribal*

Introduction

Human civilisation have used plant for different purposes for centuries. They also found use of plants in treatment of health problems. Systematic study of ethnomedicinal plants are important to find new drugs from indigenous knowledge of medicinal plants. [1] This paper deals with the medicinal importance and preparation, extraction, and qualitative analysis of phytochemicals present in *Nardostachysjatamansi* DC belonging to the familyCaprifoliaceae. It is an endangered, therapeutic herbal plant mostly grows in moist, rocky and steep slopes of undisturbed grass in India, Nepal, Bhutan and China in Himalayan region from 2300 to 6000 m above sea level. The root of this perennial small rhizomatous herb has thick, short dark grey rhizomes which are crowned with fibrous remains of reddish brown petioles of the radical leaves. Different medicinal systems use these rhizomes in traditional medicines as tonic, laxative, antiepileptic, stimulant and antispasmodic. [2]In traditional herbal medicines It is used to treat neurological disorders like hysteria, epilepsy, convulsions and mental weakness. The decoction of its rhizomes also used in treating insomnia and cardiovascular system. [3]*Nardostachysjatamansi* is an endangered aromatic herbal plant is on the verge of extinction due to over-utilization. [4] The study was conducted in Lanku valley it is a village located in Kurseong block of Darjeeling district, West Bengal. The valley is covered with dense forest of both deciduous and evergreen trees, herbs, shrubs and thousands of varieties of flowerless plants like mosses lichens and ferns. [5] In spite of availability of modern medicines People prefer plant therapy for treatment of various diseases. This paper deals with the ethnomedicinal practices of Jatamansi used for the treatment of some selected health problems like insomnia, epilepsy, anxiety and depression. This paper also deals with the preparation, extraction and qualitative analysis of phytochemicals present in this plant.

Objective

To gather information about traditional knowledge aimed at redressing some medicinal value of Jatamansi used by local baidya of Lanku valley, Darjeeling, West Bengal.Authentic documentation of medicinal role of Jatamansi, reefing the existing knowledge and exploring future aspect of this medicinal plant.To provide a new interpretation of Jatamansi with respect to cultural, economic, ecological and conservational point of view.To motivate local people on conservation of JatamansiinLanku region. Phytochemical analysis ofJatamansi has also been performed.

Materials And Methods

For case study and collection of the data semi-structured interviews, questionnaire and direct observation were used. The information was gathered and confirmed by repeated queries raised time to time among the local herbal practitioners and the users as well.Healers have been registered for documentation.

The qualitative analysis has been done to identify the phytochemical constituents present in *Nardostachysjatamansi*DC . The preliminary phytochemical analysis for Proteins, Carbohydrates, Phenol & Tannins, Flavonoids, Saponins, Glycosides, Steroids, Phlobatannins, Alkaloids and Terpenoids has been done. [6]

Collection of plant material

The dried form of roots of Jatamansi is collected from local herbal practitioner of Lanku valley of Drajeeing District. The practitioner collects plant material from different parts of Sikkim that is Nathang, Tamsay and Kisheong.

Extraction of plant material

The extraction of plant material was done by hot water extraction method. The dried plant material was grinded and powder was kept in an appropriately labelled air tight bottle. To get aqueous extract 5gms of powdered material was weighed using an electronic weighing balance. Then it was taken in a beaker and 100 ml of distilled water was added. The mixture was heated on a hot plate with continuous stirring at 30°-40°C for 20 minutes. [7]Then water extract was filtered through filter paper and filtrate was used for the phytochemical analysis. Same process was repeated to get ethanolic and methanolic extract using ethanol and methanol in place of distilled water.

The Plant extract was tested for the presence of bioactive compounds by using standard methods of: *Sofawora,A.1993, *Trease,G.E, *W.C.1989, *Harborne,J.B.1973

Photochemical Analysis of: *Nardostachysjatamansi*
Family-Caprifoliaceae

Phytochemical analysis	**Plant Part used: Roots**
Proteins	**(a) Million's test: 2ml Ext.+2ml Million's reagent Δ→white/ red ppt**
	(b) Ninhydrin test: 2ml Ext.+2ml of 2% Ninhydrin sol. Δ→violet
Carbohydrates	**(a) Fehling's test: 2ml Ext.+(1ml Fehl.A+1ml Fehl.B) Δ→Brick red ppt**
	(b) Benedict's test: 2ml Ext.+2ml Benedict's reagent Δ→Reddish brown
	(c) Iodine test: 2ml Ext.+2ml Iodine solution →Dark blue/ purple
Phenol & Tannins	**2ml Ext.+2% $FeCl_3$ sol. →Blue/ Green or Black**
Flavonoids	**(a) Shinoda test: 2ml Ext.+few fragments magnesium ribbon + conc. HCl→Scarlet pink**
	(b) Alkaline reagent test: 2ml Ext.+2% NaOH Sol. →Intense yellow → few drops dil. H_2SO_4→Colourless
Saponins	**Foam test: 2ml Ext.+ 5 ml distilled water → Foam**
Glycosides	**(a) Liebermann's test: 2ml Ext.+ 2ml chloroform + 2ml acetic acid + conc. H_2SO_4→V/B/G**
	(b) Salkowski's test: 2ml Ext+2ml chloroform+2ml conc. H_2SO_4→Reddish brown
	(c) Keller-kilani test: 2ml Ext+2ml acetic acid+1-2 drops $FeCl_3$→2 ml conc. H_2SO_4→Brown ring
Steroids	**(a) 2ml Ext. + Acetic acid + conc. H_2SO_4→Blue green**
	(b) 2ml Ext. + Chloroform + conc. H_2SO_4→Red
	(c) 2ml Ext. + Chloroform ← Acetic acid + conc. H_2SO_4→Greenish
Phlobatannins	**2ml Ext.+1% HClΔ→Red ppt**
Alkaloids	**2ml Ext.+1% HClΔ + Mayer's reagent + Wagner's reagent →Red ppt**
Terpenoids	**Ext.+Chloroform+ conc. H_2SO_4Δ→Greyish**

(Δ)= Heat Ext=Extract

Case Study

For the case study the semi structured interviews and questionnaire are prepared and the questionnaire was designed to gather information regarding patient's description, case history, their believes and practices, treatment plan, expected outcome of the treatment and actual outcome. This case study was conducted between the month of October (14.10.2020) to April (15.04.2021) and the three patients were under observation.

s. no.	Name of the patient	Age	Disease/ Health problem	Doses	Duration	outcome
1.	Dil Kumar Biswakarma	44	Insomnia	½ tea spoon Jatamansi powder with honey twice a day	Three Months	No symptoms observed
2.	Salim Thapa	58	Epilepsy	1 tea spoon Jatamansi powder with honey or luke warm water twice a day	Four Months7 days	asymptomatic
3.	GhanshyamChhetri	24	Anxiety & Depression	½ tea spoon Jatamansi powder with honey twice a day	Two Months	No symptoms observed

Table.1: Phytochemical analysis of *Nardostachysjatamansi*. in aqueous, ethanolic and methanolic extract

Phytochemical Analysis of: *Nardostachysjatamansi* **Family-Caprifoliaceae**				
Phytochemical analysis	**Plant Part used: Roots**	**Aqueous extract**	**Ethanol extract**	**Methanol extract**
Proteins	**(a) Million's test**	++	++	_
	(b) Ninhydrin test	_	_	_
Carbohydrates	**(a) Fehling's test**	++	_	++
	(b) Benedict's test	_	++	_
	(c) Iodine test	_	_	_
Phenol & Tannins	**Ferric Chloride Test**	++	_	++
Flavonoids	**(a) Shinoda test**	_	++	_
	(b) Alkaline reagent test	++	++	_
Saponins	**Foam test**	++	_	++
Glycosides	**(a) Liebermann's test**	++	_	++
	(b) Salkowski's test	_	++	++
	(c) Keller-kilani test	_	_	++
Steroids	**(a) Liebermann's test**	_	++	++
	(b) Salkowski's test	++	_	++
	(c) Keller-kilani test	++	_	++
Phlobatannins	**1% HCL Test**	_	++	++
Alkaloids	**Mayer's & Wagner's reagents test**	_	_	++
Terpenoids	**Salkowski's test**	++	++	++

(+)= Trace (++)= Present (+++)= Strongly present (--)= Absent (Δ)= Heat Ext=Extract

Result And Discussion

The case study was conducted by selecting three patients randomly who were visiting to local Baidya of Lanku valley and being administered roots of Jatamansi in powdered form. These patients are of different age group who were suffering from different health problems. The method of administration and doses of the plant product was almost same. By certain courses and duration, it was found that the treatment was successful for all the cases.

The qualitative analysis has been done to identify the chemical constituents present in *Nardostachysjatamansi*. Here the + symbol indicates the presence of phytochemical in trace amount, ++

indicates in adequate amount, +++ indicates strong presence of phytochemicals, and -- indicates absence of phytochemicals.

Fig.1: Phytochemical analysis of *Nardostachysjatamansi*, Aqueous Extract

Fig.2: Phytochemical analysis of *Nardostachysjatamansi,* Ethanolic test

Fig.3: Phytochemical analysis of *Nardostachysjatamansi*, Methanolic test

Conclusion

The information gathered from local Baidya and three patients who were suffering from different health problems were consulted and it was found that treatment was successful for all the patients.Despite having modern medical facilities people of Lanku valley used plant therapy to a considerable extent. The phytochemical analysis of *Nardostachysjatamansi*suggested the plantcontains all the primary metabolites and one or other active secondary metabolites like phenol, tannins, Flavonoids, saponin, steroids, phlobatannins, alkaloids and terpenoids. The presence of such secondary metabolites in *Nardostachysjatamansi* shows it has very significant role in the treatment of various diseases in human being.

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Dioscorea bulbifera : A Review of its Phytochemical analysis of some Phenolics & Pigments by spectrophotometric method

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Abstract:

The present study was undertaken to find out phenolic compound content and pigments of leaves of Dioscorea bulbifera L. Collection of plant material were done from Melghat forest region, Dist.- Amravati, Maharashtra. Dioscorea bulbifera L. is tuberous climbing herb,it is commonly known as air potato. its leaves and bulb used in traditional medicine . Dioscorea bulbifera is effective against several therapeutic diseases such as cancer, skin infection,goiter and orchitis.Plants were identified with the help of the standard floras.1gm of were leaves used for determination of Phenolic compounds & some pigments. Phenolic compound act as antioxidant. Antioxidants have been reported to prevent oxidative damage caused by free radical. Estimation of total phenol, quinones, flavonols and tannins were done and estimation of some pigments Anthocyanin, Leuco-anthocyanins and Total carotenoids were done.

Keywords: *Dioscorea bulbifera L, Phenolic compounds, pigments, Spectrophotometer.*

Introduction

Ayurveda, the Indian system of medicine mainly uses plant based drugs or formulations to treat various human ailments because they contain the components of therapeutic value. In addition, plant based drugs remain an important source of therapeutic agents because of the availability, relatively cheaper cost and non-toxic nature when compared to modern medicine.Plant produces these chemicals to protect itself but recent research demonstrates that many phytochemicals can protect humans against diseases.

An ever increasing demand for herbal medicines due to its safety and less side effective has led to usage of medicinal plants worldwide(Kumar et al.,2016). D*ioscorea bulbifera* L. (family: Dioscoreaceae) commonly known as "air potato "is an important edible medicinal plant. Tuber, Bulbils, Leaves, Inflorescence and Flowers are edible, Cooked asVegetable. It is Considered as a very delicious dish by local as well as Trible People.

A variety of plant secondary metabolites have been reported to act as antioxidants and amongst them phenolic compounds from a major group. There are several reports on the contribution of phenolic compounds to the antioxidant potential of different plant species (Cai *et al.*, 2004). flavonoids are naturally occurring phenolic compound which largely include anthoxanthins (flavones, flavonols, flavanones, flavanols, chalcones and isoflavones), anthocyanins, leucoxanthins and flavonoidal alkaloid (Houghton, 2002).

Yam leaves and tubers used are to treat a variety ofaliments. the leaf of aerial yam is used as a poultice for pimples and tumors and inbath water to soothe skin irritations and stings.(Gao *et al*., 2002).D*ioscorea bulbifera* tubers contain furanoid, norditerpenes, norditerpene, norditerpene glucosides,diosbulbinoside D and F and diosbulbin B and D (Su *et al*., 2003).

Dioscorea bulbifera has gained less attention and an organized synthesis of literature is still missing. therefore ,this study helps to other researchers. According to traditional medicine *D. bulbifera* has used to treat several diseases and detoxify poison and clot blood to stop bleeding.(vasanthi et al.,2010).

Materials and Methods:

Plant material

***Dioscorea bulbifera* L.**

A genus belonging to Discoreaceae family, Large unarmed, tuberous climbing herb, tubershairy stem terete with bulbils in the leaf axils, leaves alternate, broadly ovate to orbicular reniform.flowers small, green, turning purplish with maturity male flowers in short slender, axillary, solitary or fascilated pendulousspikes. perianth

white, stamens 2-2.5 mm long,acute,staminodes 6;styles short;stigmas 3.capsule ablong 1.5-2 0.5-1.2 cm,reflexed 3-winged.seeds winged at one end only.

Flowers and Fruits- August to October

Flowers and fruits : October to January

Uses

Tuber, Bulbils, Leaves, Inflorescence and Flowers are edible, Cooked as Vegetable. It is Considered as a very delicious dish by local as well as Trible People.

Tubers use as Medicinal Properties like dispersing Tonic Intiflamatory, Cough, Bile, Bronchial, Asthma, Rheumatism, Swelling and bone Fracture. (Shkirsagar, 2010).

Preparation of plant material

Fresh leaves were collected and the dried in sunlight. After them powdered with mechanical grinder and stored in airtight container. samples were powdered separately. 1gm each of samples were taken for estimation of Phenolic compounds and pigments grm/ µgm.

Methods:

Estimation of Phenolics such as total phenol, Quinones, Flavonols and Tannins were done according to the methods prescribed by Thimmaiah (1999), which are given below.

Estimation of Total Phenols

1gm of sample was grind with the help of mortar Pestle with 10 ml of 80% ethanol. The homogenate was centrifuged for 20 mininutes at 10,ooo rpm. Supernatant was collected. Supernatant was Evaporate to dryness.

Then after dryness residue was taken and make up the volume with 5ml distilled water. 1 ml aliquate was Pippette out in test tube , and volume make up 3 ml with distilled water . To it 0.5 ml of Folin-Ciocalteu reagent was added. After 3 minutes, 2 ml of 20% Na_2CO_3 solution was added into each tube.

Mixed thoroughly and tubes was kept in boiling water for 1 minute, then allowed to Cool and absorbance at 650 nm was measured against reagent blank.

Standard curve was prepared using different concentrations (0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, and 1 ml) of catechol. (Thimmaiah S. R. 1999)

Estimation of Quinones

1gm sample was grind with the help of mortar and pestle with using chilled phosphate buffer (5ml for each gm of tissue). The supernatant was collected by

Centrifugation for 30 minutes this was used as enzyme extract. 3ml of buffer, 3ml of standard catechol and 1.5 ml of enzyme extract was pipette in a test tube. It was shaken gently and incubated in water bath. 4ml of TCA (Trichloro acetic acid) reagent (without ascorbic acid) to one and 4ml of TCA reagent (with ascorbic acid) was added. Precipitate was filtered. Absorbance was measured at 400 nm against a reagent bank lacking only extract.

Standard curve was prepared using different concentrations (0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, and 1 ml) of working standard catechol. (Thimmaiah S. R. 1999)

Estimation of Flavonols :-

1gm sample was grind with the help of mortar and pestle with 10ml of ethanol and the supernatant was collected by centrifugation for 20 minutes.The supernatant was evaporated to dryness; then the residue was dissolved in 5 ml distilled water. 1ml of extract was pipette out into 25ml conical flask and 1 ml of distilled water was added.

Then 4ml of vanillin reagent was added from a burette rapidly within 10-15 sec to flask A and 4ml of 70% H_2SO_4 to flask B.

A blank was prepared in flask C containing 4 ml of vanillin reagent and 2ml of distill water. Shaken the both flasks A and B in a water bath at the temperature below 35^0C. Keeping the flasks at room temperature for exactly 15min. Absorbance was measured flask A, B and C at 500 nm against 47%. H_2SO_4 (flask D).

The absorbance of the flasks B and C from that of A.The flavonol content was calculated using a standard curve prepared from phlorogucinol or kaempferol (100 µg/ml). (Thimmaiah S. R. 1999)

Estimation of Tannins :-

Vanillin hydrochloride method was used. 1 gm of sample was mixed in 10ml methanol after 20-28 hrs. centrifuged and supernatant was collected .pipette out 1ml supernatant into test tube and quickly 5ml of vanillin hydrochloride reagent was added and mixed. After 20 min absorbance was read at 500nm. A reagent blank was prepared with vanillin hydrochloride reagent alone. A catechin standard graph was prepared from working standard (100µg/ml) of catechin and amount of tannins was calculated. (Thimmaiah S. R. 1999)

Estimation of Anthocyanins

1 gm of sample was grind with the help of mortar and pestle by using absolute alcohol. Centrifuge and the extract was collected. 1ml of alcohol extract was pipette in test tube and 3ml of HCL in aqueous methanol was added. 1ml of anthocyanin reagent was add in the samples. The Blank was prepared in the same manner by adding 1 ml of methanol - HCL instead of anthocyanin reagent.

After 15min of incubation in dark, Absorbance was measured at 525 nm After 15min of incubation in dark, Absorbance was measured at 525 nm against the bank laking only extract. (Thimmaiah,S. R. 1999)

Estimation of Leuco-Anthocyanins

1gm of sample was grinded with the help of mortar and pestle by using 10 ml methanol. Centrifuge and supernatant was collected. Pipette out 1ml of extract in test tube and volume was reduce to 0.5 ml on a hot water bath.0.5 ml of distill water and 10ml of anthocyanin reagent was mix thoroughly in reduced extract.

The tubes was heated in water bath for 3 min without covering and with covering total for 40 minute. After heating cool under a running tap. Absorbance was measured at 550 nm against a reagent blank laking only extract. (Thimmaiah, S. R.1999).

Estimation of Total Carotenoids

1 gm of sample was grinded with the help of mortar and pestle by using 10ml of acetone. Extract was filter on Buchner Funnel through whatman no. 42 filter paper. The extraction was repeated until the tissue was free from pigments. Pool the filtrates and partition thrice equal volume of peroxide free ether was using seperatory funnel. For producing two layers during initial ether extraction distilled water was added. Hot water bath was used for evaporation of the combined ether layer which contains carotenoid. The residue was dissolve in 5ml of ethanol. 0.5 ml of 60% aqueous KOH was used for 10 ml of the ethanol extract to saponify.,The mixture was kept in the dark forovernight at room temperature. After overnight equal volume of water and equal volume of diethyl ether was used for partition. Evaporate the combined ether layer as before and the residue was added in minimum volume of ethanol. Absorbance was measured at 450 nm against a reagent blank lacking only extract. Standard curve was prepared using different concentrations (0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, and 1ml) of β-carotene. (Thimmaiah,S. R. 1999) After 15min of incubation in dark, Absorbance was measured at 525 nm against the bank laking only extract. (Thimmaiah,S. R. 1999)

A standard curve is the plot obtained by plotting concentration of a given standard along X- axis and the corresponding absorbance values along Y- axis on a graph sheet resulting a straight line which passes through the origin. It is used to quantify the amount of a given compound present in an unknown sample whose absorbance value is matched against that of standard along Y-axis and a corresponding concentration could be read off along X-axis. . (Thimmaiah S. R. 1999)

Result And Discussion

Table 1: Estimation of Phenolics

Sr. No	Name of plant and part used for estimation	Total Phenol		Flavonol		Quinone		Tannin	
1	*Dioscorea bulbifera* (leaves)	Absorbance (650nm)	1900µgm /gm	Absorbance (500nm)	0.65µgm /gm	Absorbance (400nm)	520µgm /gm	Absorbance (500nm)	720µgm /gm

Table 2 : Estimation of Pigments

Sr.No.	Name of plant and part used for estimation	Total Carotenoids Absorbance at (450nm)	Anthocyanins Absorbance at (525nm)	Leuco-Anthocyanins Absorbance at (550nm)
1	*Dioscorea bulbifera* (leaves)	112µgm/gm	33µgm/gm	3.375µgm/gm

Highest amount of total phenol in leaves (1,900µgm/gm) and tanin was observed in leaves of *Dioscorea bulbifera* (720 µgm/gm) and while lowest content of flavonol in leaves (0.65µgm/gm). However there is significant amount of quinone was found (520µgm/gm). In *Dioscorea bulbifera* leaves the rich amount of (112 µgm/gm) total carotenoids was found.

Phenolic compounds and flavonoids have been reported to be associated with antioxidative action in biological systems, acting as scavengers of singlet Oxygen and free radicals. (Rice-Evans *et al.*,1997). The nitric oxide scavenging activity of flavonoids and phenolic compounds are known (Kim H. *et al.*, 2002) . *Dioscorea bulbifera* posses antitumor, anti bacteria, anti-feedant, anti-fungaland hallucinogenic activities.(Urones *et al*., 1995; Biswanath *et al*., 2005).

The significant lowering of blood glucose level shown in the alloxane–induced diabetic rats in good manifestation to show that *D*ioscorea *bulbifera* is an effective antidiabetic regimen. (Okonand Ofeni,2013).
Phenols are present in food, they may have an impact on health and most are known to have an antioxidant activity. (Demitrios 2006) .

Phenols and polyphenolic compounds such as flavonoids are widely found in plant sources and they have been shown to posse's significant antioxidant activities (Van Acker S. *et al.*, 1996). *Dioscorea bulbifera* is widely recongnized for treatment of cancer.(Li et al., 1999).

Carotenoids may also have important anti-ageing and anticancer properties such lutein, which protects the tissues of retina, while canthaxanthin has been demonstrated to inhibit cancer cell proliferation (Palozza *et al*., 1998). Anthocyanins possess a high the rmost ability and contribute towards antioxidative, antiflammatory, cardioprotective and hepatoprotective activities. The mechanisms behind the reduction of blood pressure by anthocyanins were reported due to their antioxidantactivity (Shindo *et al.*, 2007). Extracts of *D. bulbifera* has a strong antibacterial activity(Hu et al.,2005). Pharmacologist studies and ethanobotanical studies and conservation reviews of *Dioscorea bulbifera* given by(Bishwa Bhushan kundu et al.,2020). According to

Conclusion

This study revels that the leaves of *Dioscorea bulbifera* L**.** contain rich total phenol, quinone and tannin, flavonoids and pigments which are known to posses good source of antioxidant ,anticancer activity and anti-inflammatory, antibacterial, anti obesity, antiviral activity. The reported phytochemical studies support its traditional uses and may prove to be useful for clinical evaluation. The use of natural antioxidants has been promoted because of the concerns on the safety against synthetic drugs.

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Behavioral Study of Parrots Around Gram Takarkheda Dharni Region of Western Melghat

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Abstract:

This study make known that the every day flight activity rose ringed parrots at early morning with massive flocking of parrots, and they find the foodstuff around farms located at Dharni region nearer to the small village Takarkheda. Similarly the flight activities at evening time the pattern of flight were in a different way acted, when they back towards the nesting. The intension following the significant learning of flight activity of Adults and younger parrots showed special difference in their behavioral patterns of early morning and evening instance.

This study recommended that the daily observation of flight activity of rose ring neck parrots move early in the morning form their nesting towards the food searches in the forest, farm etc. and vice versa again towards the nesting areas when they get back flight activity of flocking at evening time.

Key words: *Behavior, Flocking, Rose ring Neck Parrots, Nesting, Food, Flight Patterns.*

Introduction:

Behaviour patterns illustrate Most of the time parrots are not easy to catch. Even after being pets, they have a bad mannerism if not maintained properly. Some researchers state that most wild birds can be controlled by banding or wing tagging, but parrots are not birds to be easily trifled with; they chew off such affections. The behaviour of parrots differs from type to type. Some of them are strong and have direct flight whereas most of the species spend their time perching or climbing.

The habitat of African grey parrots is usually moist lowland forests, although they are found up to 2,200 m altitude in the eastern parts of the range. They are commonly observed at forest edges, clearings, gallery forests, mangroves, wooded savannahs, cultivated areas, and gardens Athan and Deter, (2000). African grey parrots often visit open land adjacent to woodlands, they roost in trees over water and may prefer roosting on islands in rivers. These parrots make their nests in tree holes, sometimes choosing locations abandoned by birds like woodpeckers. In West Africa, the species makes seasonal movements out of the driest parts of the range in the dry season **Melo and O'Ryan (2007).**

They are highly social and nest in large groups, although family groups occupy their own nesting tree. They are often observed roosting in large, noisy flocks calling loudly during mornings and evenings and in flight. These flocks are composed parrots, unlike other parrots that are often found in mixed flocks. During the day, they break into smaller flocks and fly long distances to forage**.** They often roost in trees over water and are said to prefer roosting on islands in rivers. Young birds stay with their family groups for a long period of time, up to several years. They socialize with others of their age in nursery trees, but remain in their family group within the larger flock. Young parrots are cared for by older birds until they are educated enough and old enough to become independent flock members. Young exhibit appeasement behaviors towards older members. As they mature, birds become more aggressive with nonspecific, **Athan, (1999)**. Parrots in the wild must learn a complex set of skills. They need to learn how to separate desirable food plants from toxic plants, how to defend territory, how to recognize and avoid predators, how to find safe water, and how to rejoin their families when separated. Also, they must learn how to develop role-appropriate behaviors such as competing and defending nest sites and raising offspring **Galef, (2004)**. Competition for nest holes during mating season makes the species extremely aggressive. Because parrots are partial ground feeders, there is a series of behavioral events that occur before landing and safe consumption takes place **Luescher, (2006)**. Groups of parrots gather at a barren tree until it is completely filled with hundreds of birds that partake in preening, climbing, vocalizing, and socializing. Eventually the birds make their way down to the ground in waves with the entire group never being on the ground at the same time. Once on the ground, they are extremely vigilant, reacting to any movement or sound **Wright, (2002).**

Materials and Methods:

Flocking behavioral and flocking routine of rose- ringed parakeet were studied for a period of 12 weeks (November 2021 to January 2022) in irrigated farm fields of Tehsil Dharni located Village Takarkheda, where adequately bulky crops be present. Incidence of such crops largely remains experimental throughout the year, and therefore, no possibility occurs here for the limitation of food to variety of birds. Various crops *viz.* wheat, maize, rice, fodders besides fruit orchards like citrus, mango, guava, occurs in good proportions. Different trees of variable heights also perform not only as shelter for birds', but also offer appropriate a place where birds regularly settle or congregate to rest at night, and nests (hollows), maintained by them for long durations. For

the present study, surveys were conducted to flight behavioral activity of flocks of the rose-ringed parakeet within the large agricultural area of Dharni region of Melghat. The parakeet settle was quite huge and was located less than distance away from the well grown croplands. Observations were made consecutively in the present studies and were observation on the basis of bulk flocking, forward journey at early morning for the searching of food and return journey towards the nesting at evening.

Results and Discussion:

In this observational study reveal that the flocking behavioral pattern shows modest difference pertaining to the flight towards food availability at early morning at 6 to 7 am for the searching of food and *vice versa* returning journey towards nesting at evening 5 to 6 pm daily observational study through the photographic analysis or flocking size and height of the flight of rose ringed parakeets. It seems to be observed that the early morning flight showed more height approximately 90-100 feet. of flock size containing 400-500 parrots group from the land surface area with creating sound as for call and communicate to each other. But in the return journey of flocking flight behavior seems to different, flocking flight at evening time showed very less distance approximately 10-15 feet contains 200-300 parrots group. Distance from land surface to the flight area, without noising any sound as communication in between the flocks size of parakeets.

Fig. 1. Map view of Dharni region of Amravati District

Fig. 2- Map view where the Observational study were performed

(Note: study area were noted with red colour arrow mark)

Fig. 3. Monthly parrots flights of flocking behavior and size
(November & December-2021 at Morning & Evening flight)

Fig. 4. Monthly parrots flights of flocking behavior and size
(December and January-2022 at Morning & Evening flight)

Table-1 Monthly noted flocking behavior and size of parrots (2021):

Months	Morning Time (Forward Journey from the Nesting) 6:00 to 7:00 am	Evening Time (Back Journey towards Nesting) 5:00 to 6:00 pm
November	400-500*	200-300*
December	400-500*	200-300*
January	400-500*	200-300*

**Note: approximate number of parrots in flight as per photographic collection may vary.*

Present reading circumstances showed that observation on the basis of the flock size of parrots in their natural habitats and behavioral patterns characteristically appears as in morning flight had a dispersed patterns in flight as shown in photo plates which indicates that random flight in parrots, more height than that of evening flight in four month observation. And in the return flight of parrots towards nesting they showed very less distance flight, and made pattern of flight were 'V' shaped noted in photograph captured.

Conclusion:

In this observational study showed that flocking size and their behavioral patterns vary. Parrots are locally common in the area of Dharni Melghat region; it appears seasonally available with the great quantity of nourish in surrounded areas such as, maiz, rice, cajanus, chickpea, and wheat as well as fruits such as guava, berry etc. conventionally yield taken by the Melghat peoples. This observation may show in the futuristic development and identified the issue act as pest for cropping because they feed voraciously on available food in their farm field. This available basic information of theirs seasonal flight and behavioral patterns seems to be identified as their habits and habitat learning in the additional improvements.

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Alteration In Enzyme Of Freshwater Fish,*Channa Orientalis*(Sch.), Exposed To Cyppermethrin And Fenvalerate

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Abstract:
Toxicity study was conducted on Freshwater Fish Channaorientalis to evaluate the enzyme activity of two Pesticides, Cypermethrin and Fenvalerateupto 96 hrs at a duration of 24, 48, 76, and 96 hrs, which shown toxic effect of Cypermethrin and Fenvalerate on Glutamate Oxaloacetate Transaminase. In present study Cypermethrin was found to be more toxic than Fenvalerate to the experimental fish, Channaorientalis.
***KeyWords** : Alterations in Glutamate Oxaloacetate Transaminase, Channaorientalis .*

Introduction:

In Vertebrates and Invertebrates, Cypermethrin acts mainly on nervous systym. Cypermethrin is both stomach and Contact poison(Jin and Webster, 1998).It has been shownto inhibit ATPase enzyme involved in movement of ions against a concentration gradient which are regulated by active transport, this action is especially critical to fish and aquatic insect, where ATPase enzyme provide the energy to active transport, are very important at the sites of oxygen exchange. ATPase inhibition and disruption of active transport, possibly affect ion movement and ability to maintain ion balance and disrupt respiratory surfaces, indicating that Cypermethrn is inherently more toxic to aquatic organism (Siegfried,1993). In pond water that contained apparantly lethal concentration of Cypermehrin(5ppb) because the chemical was absorbed on to suspended solids(Crossland,1982).

The use of synthetic pyrethroids for control various pests is regularly increasing. They are drained into rivers, tanks and pools resulting to pollute aquatic environment. Such chemicals are toxic to non target species and hamper human health too via ecological cycling and biological magnification. Aquatic pollution is greatly affecting the metabolism of fishes and some time heavy mortality has been experienced. A major part of worlds food is being supplied fish source, so it is essential to secure the health of fishes. Among the pyrethroids, Fenvalerate is widely used as synthetic toxicant that causes severe metabolic disorders in fishes(Coats et.al., 1979, Reddy et.al.,1989, Reddy and Philip, 1994,Thakur and Bais 2000).It has been extensively popularised because because of high insecticidal potency, low mammalian toxicity and very short persistance. However, Fenvalerate is extremely toxic to fish. The extreme toxicity of Fenvalerate to fish may be due to efficient gill uptake in efficient detoxification, elimination and sensitivity at the site of action(Bradbury et.al., 1997, Coats et.al.,1989,Tripathi et.al.,2001). Thus low rate of Fenvalerate elimination and metabolism appears to play an important role on the piscidal activity of this insecticide(Bradbury et.al.,1986).So for there are much limited response dealing with the effects Cypermethrin&Fenvalerate on enzyme activity of freshwater fish. Therefore, it is considered of an interest to analyse the effect of CypermethrinandFenvalerate on fish enzyme, Glutamate Oxaloacetate Transaminase.

Materials and Methods:

The freshwater fish, *Channaorientalis* were collected from Amravati local market and Rushi lake of Karanja (lad),(M.S.), and maintained in the laboratory conditions in large aquarium to the maximum number 2 lit/g of fish weight for a period of one month for acclimatization in aerated well water. Fishes were fed daily with ad-libitum and boiled eggs. Fishes weighing about 15 g and 10 cm in length were selected for evaluation or actual toxicity study. Fishes were starved for 48 hrs. Before the start of experiments and kept separately in a group of 10 fishes in each aquarium(test container about 20 lit. capacity). They were kept clean and away from visual and mechanical disturbances. The various physicochemical parameter of test water such as temperature, pH(by pH meter\) Conductivity (byConductometer), Acidity, Alkalinity, Hardness ,dissolved Oxygen and salinity were calculated daily during the toxicity test(following the method described in APHA). The test water was changed every day.Average value of all those environmental parameters were recorded. The pesticides Cypermethrin and Fenvalerate were added to the test water to obtain the described concentration. Then healthy fishes were exposed to various concentration of pesticides for 24, 48, 64, 72, 96 hrs. period respectively. Simultaneously the control aquarium was also maintained without pesticide concentrations. The fishes that survived for the test were sacrificed, by pitching, their different tissues like Liver, Kidney, Brain, Muscle and Gill were taken out for enzyme study. The required tissues from fish were immediately removed and weighed. The extracts were prepared in Mortar&Pestle using ice cold 0.25 m sucrose solution. All extracts were used as

early as possible and stored in the deepfreeze when required too. Substrate buffer (pH 9.0) was prepared by mixing 3ml.of petroleum ether,80 ml. of distilled water, 0.5 g of Sodium glycerophosphate and 0.0424 g. of sodium barbiturate.

The effect of Cypermethrin Glutamate Oxaloacetate Transaminase enzyme in different experimental fish groups (values are significant between p<0.01 to p<0.001).

Sr. No.	Group	Liver		Kidney		Muscle	
		Control	Expt.	Control	Expt.	Control	Expt.
1	Normal Pesticide	56.16± 3.32	53.53± 3.40	40.58± 2.86	38.32± 2.56	40.22± 3.78	39.92± 3.10
2	Low pH Alk. 8.5pH	58.28± 2.125	55.38± 2.39	42.21± 1.38	40.32± 1.37	41.35± 1.35	38.72± 2.82
3	Acidic pH 6.5	52.39± 2.38	51.29± 1.28	37.52± 2.35	35.25± 1.29	38.23± 1.72	36.85± 1.25
4	Hardness (100-200ppm)	48.35± 1.35	46.21± 2.73	33.72± 1.42	32.38± 1.25	35.29± 1.38	33.27± 2.38
5	Salinity (1.2%)	45.27± 2.35	42.6± 2.12	30.92± 1.82	28.28± 2.38	31.32± 01.25	28.65± 2.65

The effect of Fenvalerate on Glutamate Oxaloacetate Transaminase enzyme in differentexperimentalgroup (values are significant between p<0.01 to p<0.001).

Sr. No.	Group	Liver		Kidney		Muscle		
		Control	Expt.	Control	Expt.	Control	Expt.	
1	Normal Pesticide	57.28± 40.10	55.38± 9.88	40.66± 2.442.00	40.26±	40.88± 2.36	36.210± 3.32	
2	Low pH Alk. 8.5pH	58.28± 21.251.28	56.37±	42.21± 1.38	41.05± 1.28	41.35± 1.35	39.76± 2.21	
3	Acidic pH 6.5	52.39± 2.381.35	50.28±	37.9± 2.35	35.23± 2.25	38.73± 1.38	36.72±	1.72±
4	Hardness (100-200ppm)	48.35± 1.95 1.72	45.39±	33.72± 1.41	32.28± 1.27	28.29± 1.38	32.65± 1.25	
5	Salinity (1.2%)	45.27± 2.351.32	43.72±	30.92± 1.821.36	29.35±	31.32± 1.25	30.25± 1.72	

Result andDiscussion:

The Glutamate Oxaloacetate Transaminase activity was decreased in the tissues of *Channa oriental*streated with Cypermethrin and Fenvalerate. In control fishes the Glutamate Oxaloacetate Transaminase activity was maximum at 24 hrs. thengradually reduced upto 96 hrs. Maximum activity was recorded in liver,then followed by Kidney and Muscle. In experimental group of fishes the Glutamate Oxaloacetate Transaminase activity was significantly reduced in liver, kidney and muscle.

Conclusion:

Over all view concluded that very low quantity of pesticides affects aquatic organism and their metabolic activity.

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Histological changes in the ovary of *Catlacatla*exposed to lethal concentration of *B. aegyptiaca* root.

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Abstract:
20 fresh water fish Catlacatla of both sexes were purchased from local fisherman. They were kept in aquaria and well aerated. The differential acute toxicity of water extracts of B. aegyptiaca root on fish C. catla were carried out under laboratory conditions. The LC_{50} after 96 h of exposure for water extracts of Balanites aegyptiaca root were9.00, 11.00 and 13.00 mg/L, respectively. These values showed that water extracts of Balanites aegyptiaca root was more toxic.Histological alteration in the ovary tissues showed lesion, necrosis, malignancy, cellular degeneration and inflammation, when the fish were exposed to various concentrations (9.00 mg/L, 11.00 mg/L and 13.00 mg/L) of water extracts of B. aegyptiaca root for a period of 96 h revealed that root of B. aegyptiacamay be toxic to fish C. catlaas characterized by severe degeneration ofovary cells.The study concluded that caution must be taken in the disposal of this plant in water bodies as extended exposure time and at higher concentrations could pose adverse effect on the fish Catlacatla.
Key words: Histology, Balanites aegyptiaca, Catlacatla.

Introduction:

Water pollution, has been increasing at an alarming rate due to rapid industrialization, civilization and green revolution. Urban, agricultural and industrial activities release xenobiotic compounds that may pollute the aquatic habitat. Industrialization and growth of human population have led to a progressive deterioration in the quality of the earth's environment. **(Schwarzenbach*et al.*, 2006)** reported that about 300 million tons of synthetic compounds seep annually into water systems (rivers, lakes and sea) leading to water pollution. Pollution of water sources due to chemicals plays a primary role in the destruction of ecosystems. To improve the quality of aquatic ecosystems, it is necessary to know how the rivers and lakes are impaired and what factors caused the environmental deterioration.

Acute toxicities have been measured for many species in variety of ecological systems and most of the commonly used pesticides against Rainbow trout, Blue gills, Sun fish and the gaps are being filled for other species, such as channel fish, some cyprinids and salmons was reported by some authers**(Koprucu*et al.*, 2006)**. Test organisms to be used for acute toxicity test must be ecologically important, occupy trophic position leading to humans or other important species, and have adequate background biology, be widely distributed, be genetically stable, have its early stages (larvae, fry, and juveniles) available throughout the year and be sensitive **(Ernest Hodgson, 2004)**.*Catlacatla*(Hamilton) is one of the major fresh water carps native to India, Bangladesh, Myanmar, Nepal, and Pakistan and introduced in many other countries as exotic species. *C. catla*is a very rich source of proteins and is reported to attain a maximum size of 182 cm and weight of about 50 Kilograms. It is a surface and mid-water feeder, mainly omnivorous with juveniles feeding on aquatic and terrestrial insects, detritus and phytoplankton. It has a characteristically large, upturned mouth with a prominent protruding jaw. Because of its high nutritive value, it is a highly priced food fish and of great demand in the market. The physical and chemical changes in aquatic environment often cause some physiological changes in fish, thus, the water quality of an aquatic body is very crucial because it determines the productivity and other parameters necessary for the fish survival **(Fafioye, 2001)**.

Since prehistoric times, various cultures throughout the world have used piscicidal plants for fishing. Plants are regarded as inexhaustible sources of structurally diverse and biologically active substances **(APHA, 1976)**. Fossil record dates back the use of plants by man for various purposes including medicinal use **(Bhatt, J.P. 1991)**. There are various methods to capture fish from water. These include the use of hooks, net, setting of traps with baits, use of chemical substances and the use of plants and plant products **(Fafioye*et al.*, 2004)**. These methods seem cheap and affordable hence commonly practiced by fisher's folk all over the world. Histology can be used as biomonitoring tools for health in toxicity studies. Histological alterations are biomarkers of effect exposure to environmental stressors, revealing alterations in physiological and biochemical function. Histopathology, the study of lesions or abnormalities on cellular and tissue levels is useful tool for assessing the degree of pollution, particularly for sub lethal and chronic effects. Due to residual effects of pesticides, important organs like the kidney, liver, gill are the first organs to be damaged **(Rahman *et al.*, 2002)**.

In the present study, an attempt has been made to observe possible toxicity and histological changes in vital organ such as overy of the fish *Catlacatla*(Hamilton) exposed to lethal concentrations of plant *Balanites aegyptiaca*root extract for 96h.

Material and Methods:

Roots of *B. aegyptiaca* are collected from local area near to the Daryapur. After shade drying the plant material was grounded into powder using pestle and mortar. One liter of distilled water was mixed with 200 g of powdered plant material. The mixtures were kept for 2 days in tightly sealed vessels at room temperature and stirred several times daily with a sterile glass rod. This mixture was filtered through muslin cloth. Further extraction of the residue was repeated 3-5 times until a clear colorless supernatant extraction liquid was obtained indicating that no more extraction from the plant material was possible. The extracted liquid was subjected to water bath evaporation to remove the solvent. The water bath temperature was adjusted to 400^0 C. The semi-solid extract produced was kept under a ceiling fan to dry. The extract was weighed and portion of it used for phytochemical screening while the rest was use for the susceptibility test.

The adult specimens of *Catlacatla*were collected from the local market and brought to the laboratory. So for this experiment, fish are acclimatized in glass aquarium for 10 days.The survived fish are maintained in aerated condition and are fed regularly with fish food. The water is replaced every week and replaced with declorinated water. Faecal material and debris, if any, is also removed as and when necessary.

Lethal concentration of 09.00 mg/l, 11.00 mg/l and 13.00 mg/l was selected for this experiment. Ten fishes were exposed to each concentration. Along with this, appropriate control was maintained for each test. The mortality did not exceed 5% during the test period in control. Survival and mortality percentage were tabulated after 24, 48, 72 and 96 hrs.

For the lethal toxicity test, the fresh water fishes were divided in two groups as follows.

Group I: - Control group of *Catlacatla*

Group II: - Fishes *Catlacatla*were exposed to lethal concentration of root water extract.

To determine structural changes in internal tissues such as ovaryof both control and exposed fishes of lethal concentration were examined histologically.

Result and Discussion:

For lethal concentration at control there are no lesion, no necrosis, no pigments, no malignancy, no inflammation and cellular degeneration seen for the 24hrs, 48hrs, 72hrs, and 96hrs(Fig-1.1).While at 9.00mg/l inflammation of epithelial layer for 96hrs while no lesion, no inflammation, no necrosis, no pigments, no malignancy, and cellular degradation seen for the 24hrs, 48hrs and 72hrs(Fig-1.2).At 11.00mg/l inflammation on epithelial layer for 48hrs, for 72hrs lesion occurs on epithelial layer, while for 96hrs lesion occurs in epithelial layer and follicle cells and for 24hrs no lesion, no inflammation, no necrosis, no pigments, no malignancy and cellular degradation seen(Fig-1.3).At 13.00mg/l inflammation occurs on epithelial layer for 24hrs, for 48hrs lesion occurs in epithelial layer and follicle cells while, for 72hrs necrosis occurs in epithelial layer and lesion on follicle cells and oocytes and for 96hrs cellular degradation of epithelial layer and necrosis occurs on follicle cells and oocytes(Fig-1.4).

fig-1.1: Ovary (Section) of *Catlacatla* exposed to lethal concentration (control) of root water extract of *B.aegyptiaca*.

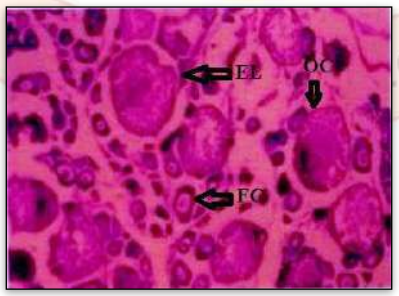


Fig.-Ovary of *Catlacatla* **(Control).**

EL: epithelial layer, **FC**: follicle cellsand**OC**: oocytes. No lesion (L), inflammation (I), pigment (P), necrosis (N), malignancy (M) and cellular degeneration(C).

Fig-1.2: Ovary (Section) of *Catlacatla* exposed to lethal concentration (9.00 mg/l) of root water extract of *B.aegyptiaca*showing lesion (L).

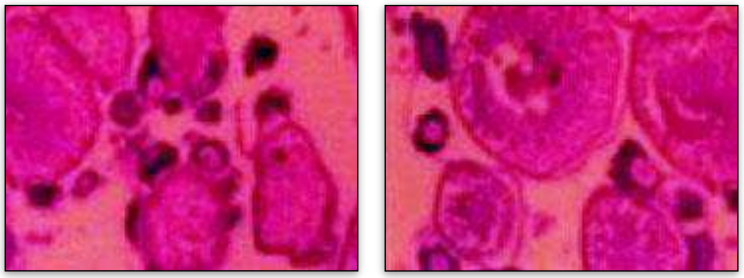


Fig.- 24hrs. **Fig.- 48hrs.**

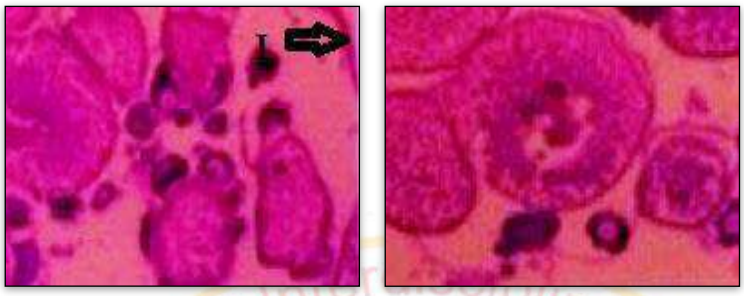


Fig.- 72hrs. **Fig.- 96hrs.**

Fig-1.3: Ovary (Section) of *Catlacatla* exposed to lethal concentration (11.00 mg/l) of root water extract of *B.aegyptiaca*showinglesion (L) andinflammation (I).

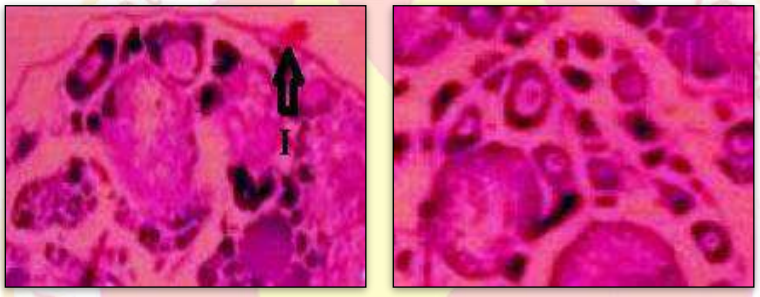


Fig.- 24hrs. **Fig.- 48hrs.**

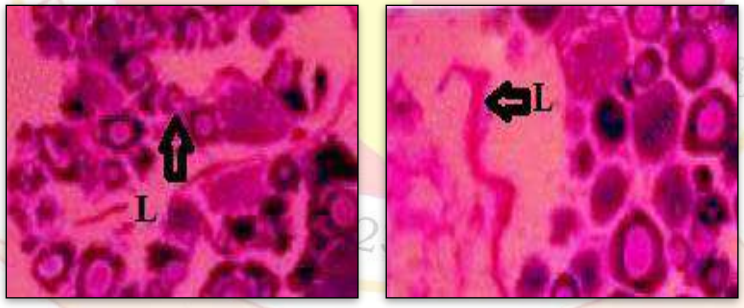


Fig.- 72hrs. **Fig.- 96hrs.**

Fig-1.4: Ovary (Section) of *Catlacatla* exposed to lethal concentration (13.00 mg/l) of root water extract of *B.aegyptiaca*showinglesion (L), inflammation (I),necrosis (N), and cellular degeneration(C).

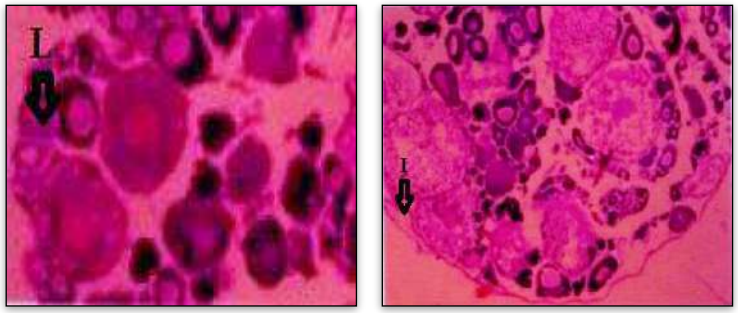
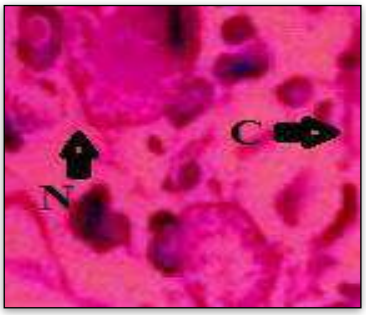


Fig.- 24hrs. **Fig.- 48hrs.**



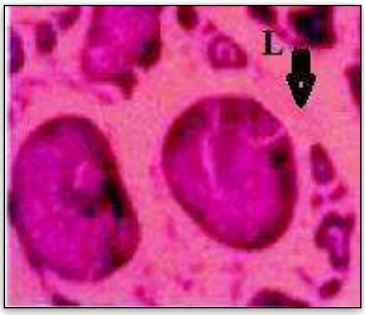


Fig.- 72hrs. **Fig.- 96hrs.**

In the present investigation the ovary of fish exposed to lethal concentration for different time exposure (24hrs. 48hrs. 72hrs. and 96hrs.) showed inflammation and lesion of epithelial layer and follicle cells during low concentration while, increasing concentration for different time exposure showed inflammation, lesion, necrosis and cellular degeneration of epithelial layer, follicle cells and oocytes were seen at later time of exposure(Fig-1.2 to 1.4).

In the present investigationshowed inflammation, lesion, necrosis and cellular degeneration of epithelial layer, follicle cells and oocytes in lethal and sub-lethal concentration. Similar observations agree with the finding of**(Khillare, 1992)** observed oocyte maturation and arrest of oocyte development in tertiary yolk stage.**(Lee and Yang, 2002)** observed at the dose of 100 ppm of sumithion, fragmented ova with abnormal shape and arrangement in the experimental fish as compaired to normal.

Conclusion:

The present study proves the toxic potential of the plant root extract and shows moderate to severe alterations inovary tissues which can lead to metabolic changes in the fish. The results of the present study clearly indicated that piscicides have a direct impact on the structural alterations in *Catlacatla*. The plant root extract is known to impair the metabolic and the physiological activities of the organism and through repeated exposure the piscicides tends to accumulate in its tissues even atlethal concentration.

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Effect of Selected Vigna Protease Inhibitors on Growth of Helicoverpa armigera, Hubner

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Abstract

Proteinase inhibitors are the most studied class of defense proteins. The genus Vigna belongs to Fabaceae, formerly called Leguminosae was used as the source material to screen for protease inhibitory activity against the polyphagous pest, H. armigera. The results showed significant reduction in weight of H. armigera larvae and more larval mortality when fed on proteinase inhibitors of studied Vigna. The LC_{50} values of V. hainiana, V. aconotifolia and V. sublobata were found to be 15%, 20% and 20% respectively after 72 hours of exposure.

Introduction:

H. armigera, Hubner (Lepidoptera: Noctuidae), is a major polyphagous pest present widespread in Asia, Africa and Oceania (EPPO, 2006) responsible for significant levels of yield losses in many economically important crops. Helicoverpa pest attack is the big problem as it has covered major part of the world from tropical climates to regions with cooler temperate climate and spread easily to natural migration. Application of huge amount of the pesticides resulted in to high levels of resistance in *H. armigera*. Some of the examples of pesticides to which *Helicoverpa* has acquired resistance are pyrethroids, endosulfan, carbamates and organophosphates (Armes, 1993 and 1995; Armes et al., 1992, 1994 and 1996; Forrester et al., 1993; Kranthi et al., 2001; Martin et al., 2000 and 2003; Torres Villa et al., 2002a). The genus Vigna belongs to Fabaceae, formerly called Leguminosae. It is found that, seeds of the Leguminosae generally contain large quantities of PIs active against insect serine proteases such as trypsin and chymotrypsin (Ryan, 1974). The earlier study indicates that wing bean proteinase inhibitors are good candidates for engineering resistance in to *Helicoverpa armigera* host plants (Harsulkar et al., 1999). Therefore, the study of interactions between such plant proteinase inhibitors and insect proteases can be useful in further insect pest management system.

Material And Methods:

Rearing of *H. armigera:*

Healthy, actively feeding H. armigera larvae were collected from the field & reared on an artificial diet (Nagarkatti and Prakash, 1974 with modification) & maintained under controlled conditions in the laboratory at Dr. Panjabrao Deshmukh Krishi Vidyapith, Akola, India. The laboratory conditions were maintained at 28±2^{0}C temperature, humidity 75±5% and 14:10 h light: dark period. The pupae were collected and disinfected with 0.02 per cent sodium hypochloride solution and transferred to the individual screw capped vials, containing soil bed. The adults emerged from the pupae after 7-10 days were then transferred to the bell jar covered with muslin cloth at its mouth. The sexes were differentiated on the basis of coloration pattern of the wings as female shows chocolate brown wings whereas male are pale brown. The adults were provided sterile cotton swabs imbibed with liquid diet of honey, sucrose and vitamin-E.

Plants for study:

The genus Vigna belongs to Fabaceae, formerly called Leguminosae was used as the source material to screen for protease inhibitory activity. Some of the wild Vigna seeds were collected from Melghat Region of Maharashtra.

Bioassay of PIs against *H. armigera* larvae:

The in vivo effect of Vigna proteinase inhibitors on larval growth of *Helicoverpa* was studied using feeding assay after screening 3 genotypes of Vigna. In spectrophotometric and electrophoretic studies, three accessions of Vigna were found to have potent proteinase inhibitors against *H. armigera*, hence these Vigna relatives were selected for bioassay studies. Early instars larvae were taken from the homogenous culture of *H. armigera* for experimental studies and were allowed to feed on chickpea-based diet having equal quantity of Vigna proteinase inhibitors. This culture was maintained in the laboratory at 27^{o}C with 80% relative humidity. The weight of larvae was taken after every 24 hrs after ingestion of food. Fresh food was given to the larvae on every alternate day to avoid the chances of microbial contamination. Control population was also maintained simultaneously on chickpea bases diet without PIs. The larval mortality and larval weight was recorded.

IC 50 Value of protease inhibition:

It is the amount of PI needed for 50% inhibition of protease activity was determined by conducting the assay. Bioassay of PIs against *H. armigera* larvae was conducted using different vigna genotypes such as *V.*

hainiana, V. aconotifolia and *V. sublobata*. The chickpea-based diet (PI removed by heat treatment) was used for feeding assay. The 10%, 15% and 20% concentrations of the PIs extracted from seed samples were made and equally added to chickpea-based diet for feeding assay. Ten neonates *Helicoverpa* larvae were released on the chickpea-based diet with PIs. The observations were recorded at 24 hours up to 3 days. The mortality data were recorded with the moribund larvae considered as dead. Water spray as control was maintained to study mortality percentage.

Results And Discussion

Bioassay of *Vigna* PIs against *H. armigera* larvae

Bioassay of PIs against *H. armigera* larvae was conducted using different vigna genotypes such as *V. hainiana, V. aconotifolia* and *V. sublobata*. The chickpea-based diet (PI removed by heat treatment) was used for feeding assay. Equal quantity of PIs extracted from seed samples was added to chickpea diet for feeding assay. The initial weights of the larvae were taken at the time of releasing the larvae on the diet and the final weights were taken on 13th day. The diet was changed on alternate day to avoid the chances of contamination. The results showed significant reduction in weight of *H. armigera* larvae and more larval mortality when fed on proteinase inhibitors of *V. hainiana, and V. aconotifolia* as compared to *V. sublobata* whereas, in control (Chickpea diet without PI) no larval mortality was recorded.

Table 1. Bioassay of PIs against *H. armigera* larvae

PI Source	Initial weight of larvae in (mg)	Final weight of larvae in (mg)	Weight gain in (mg)	Weight reduction as compare to control (%)	Mortality observed at 11th day (%)
V. hainiana	23.7	199.7	176.0	37.61%	45%
V. aconotifolia	23.7	198.3	174.6	38.05%	47%
V. sublobata	23.9	215.2	191.3	32.77%	41%
Control	24.0	320.1	296.1	0% (control)	0%

IC 50 value of protease inhibition

For determining LC_{50} values, the homogenous population of 10 *Helicoverpa armigera* neonates was subjected to chick pea-based diet having different concentrations of *Vigna* protease inhibitors as given in the chapter" Materials and Method". The observed mortality was recorded up to 72 hours at 24 hours interval. The values of median lethal concentrations (LC_{50}) of respective *Vigna* PIs were recorded and presented in the following table.

Table 2: Toxicity of *Vigna* PIs against *Helicoverpa armigera* neonates

Protease inhibitors source	LC_{50} Value in % after 72 hrs.
Vigna hainiana	15%
Vigna aconotifolia	20%
Vigna sublobata	20%
Control	No mortality on 3rd day

The LC_{50} values of *V. hainiana, V. aconotifolia and V. sublobata* were found to be 15%, 20% and 20% respectively after 72 hours of exposure.

Conclusion

Protease inhibitors are important tools for regulating the target proteases. They play a crucial role in controlling many physiological functions. The gut of this insect found to have both trypsin and chymotrypsin proteinases like activity. These proteinases were involved in protein digestion and provided the source of essential amino acids and energy to the insect. Thus, such proteinases become a target for the proteinase inhibitors having tryptic and chymotryptic inhibitory potential.

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The Study of Seed Germination. Seedling and Early Plant Growth by the Effect of Metal Ion and Their Complexes in Plumbago Zeylanica (Chitrak) Plant

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Abstract

This work investigates the usefulness of 3-(2-methoxyphenoxy)-1,2-propanediol as an alternate fertilizer by field experiments on growing Plumbago Zeylanica. Separate field experiments using 3-(2-methoxyphenoxy)-1,2-propanediol and original soil compare the effectiveness of different products for agronomic applications. Attempt has been made with the impact of heavy metals and their complexes of 3-(2-methoxyphenoxy)-1,2-propanediol on to improve the yield of economically important plant Plumbago Zeylanica (Chitrak). The seeds were immersed in Co (II), ligand and its complexes to study the seed germination and growth pattern and certain physiological processes. Effect of ligand, metal ion and complex solution on growth, determination of % of nitrogen, proteins and chlorophyll in the leaves of plants, are studied. The data harvested indicates increased germinations in all seed treatments. The changes in growth pattern of roots length and shoots length are observed in the experimental plants. However, chlorophyll content was found to be higher in plant species. The percentage of nitrogen and proteins were found affected in the leaves of Plumbago Zeylanica(Chitrak). Plant treated with 3-(2-methoxyphenoxy)-1,2-propanediol, complex and metal Co (II). Nitrogen and protein contents are found higher in the treated plants as – Complex >3-(2-methoxyphenoxy)-1,2-propanediol > Co (II).

Key words *- 3-(2-methoxyphenoxy)-1,2-propanediol, Co (II), Plant, Seed Germination of Chitrak, Chlorophyll*

Introduction:

Plant growth regulators are organic compounds, other than nutrients, that produced naturally inhigher plants, controlling growth or other physiological functions at a site remote from its placeof productionand active in minute amounts, modify plant physiological process. The plant physiologists not only to supply basic information regarding how plants growand develop but also to undertake research program undergo designed specifically to increase yield of plant products. Seed germination behavior is important for horticulture and agriculture [1-2].One of the important contributions of the 19th century experimental plant physiology to agriculture was to discovery that soil fertility and adding several nutrients to the soil could increase crop yields. Agricultural scientists realize that crop plants grow in production to the amounts of various nutrients present in soils. Today the application of various salts to soils is a basic future of agricultural practice. With the application of these and other fertilizer to soils, the large crop yields obtained in developing countries throughout the world during the past 50 years and more could not be possible. In modern agricultural practice, various chemicals in solution or aqueous suspension are sprayed on the crop plants with in the object of accelerating and modifying the plant growth and developing.

The complexes of transition metals with bi- allyl thiourea are prepared and their herbicidal and plant growth regulating activities are tested with wheat and cucumbers by Daverski et al [3] Complexes of Piperidene-2-Carboxilic acid with some bivalent metal ions have been reported to be useful in agriculture as plant growth regulators [4]. The Complexes of rare earth with peptides showed the herbicidal and plant growth regularity activity with wheat and barley plant [5].

Since 3-(2-methoxyphenoxy)-1,2-propanediol has intense biological activities, anti-inflammatory, antipyretic and analgesic activities. 3-(2-methoxyphenoxy)-1,2-propanediol inhibits the activity of the enzymes and since no work is reported on the biological application of binary complexes of Co (II), with 3-(2-methoxyphenoxy)-1,2-propanedioland comparing with pure ligand, metal and control solution (double distilled water) to study the effect of complex, metal, ligand and control solution on germination, survival seedlings height etc, on Plumbago Zeylanica (Chitrak) plant in order to make suggestion whether complex metal and ligands can be used as a plant growth regulator.

Also, biological analysis of chlorophyll contents and percentage of nitrogen and proteins in the leaves of leafy vegetables are carried out at room temperature.

Material And Experimental Methods:

Seed of Plumbago Zeylanica Species were collected from forest department Akot. Various seed characteristic like seed size, Shape, color and weight of seed/gm. would beobserved. Seed shape - oblong, Seed coat- Hard, Seed color-reddish brown,no. of seeds/gm- 47.9 andSeed size-5-6mm. The solution of Co (II) in the form of nitrate and 3-(2-methoxyphenoxy)-1,2-propanediol of the concentration of 0.01 M was prepared in

double distilled water. The applications of complex, metal, ligand solution are studied by dissolving it in proper solvent at 4, 7.00 and 9.5 pH and at constant ionic strength of 0.01 M potassium nitrate solution. Fertilized soil was collected from agricultural land. It was then grindand filtered. This soil was filled in two wooden trays and tray was moistened with water. Sowing of seeds was done in the soil after one hour.

Experiments Performed:

In general practice various chemicals are used in agriculture as an ingredient of various pesticides, insecticides, fertilizers etc, to improve the crop yield. Amongst several economical and medicinally important plants Plumbago Zeylanica (Chitrak) is selected as a plant system.

1. 20 gm healthy seeds of Plumbago Zeylanica (Chitrak) were taken 4.0, 7.00 and 9.5 pH for about three hours. These seeds soaked were taken out of each solution and sowed in the wooden tray in a row, during 14 August 2021 to 30 Sept.2021; the wooden tray was kept under atmospheric pressure at room temperature.
2. Effect of ligand, metal Co (II), complex on percentage of nitrogen, protein and chlorophyll in the leaves of Plumbago Zeylanica (Chitrak) plant. Chlorophyll pigments in fresh leaves were determined by spectrophotometric method given by Jahagirdar[21].

Parameters:

Soil pH of soil sample was measured by taking extract of mixture of soil water withpH-meter. Plant growth is decided on the basis of parameter such as percentage of germination, survival, seedling height, shoot length; root length and thickness of young leaf having high values compare to control systems. Germination was noted after $3\frac{1}{2}$ days and survival were noted after 10 days.

After noting the survival of plant, they were taken out of soil. The seedling height and thickness of leaves of survived plants were measure.

Table 1
Effect of Ligand, Metal ion and Complex on Germination, Survival, Seedling height etc. on Plumbago Zeylanica (Chitrak) Test System.

Test System	Effect of	pH	Parameters						
			%Germination after $3\frac{1}{2}$ days	% Survival after 10 days	Seedling height (cm)	Root length (cm)	Shoot length (cm)	Root / Shoot	**Width of young leaf (cm)**
Plumbago Zeylanica (Chitrak). Test System	Water (Control)	4.0	73.00	72.00	21.084	7.552	13.478	0.5603	**3.25**
		7.0	78.66	76.66	22.569	7.256	13.698	0.5415	**3.27**
	Ligand	4.0	75.66	75.33	21.964	7.698	13.852	0.5557	**3.87**
		7.0	82.00	81.66	24.214	7.963	15.108	0.5270	**3.63**
	Complex	4.0	76.00	76.00	22.458	8.748	13.563	0.6449	**3.56**
		7.0	79.66	78.00	23.569	8.986	14.231	0.6314	**3.89**
	Metal	4.0	82.00	79.33	21.483	8.698	14.125	0.6157	**3.12**
		7.0	**50.00**	**91.33**	**26.586**	**9.025**	**14.244**	**0.6336**	**3.56**

Table 2
Estimation of Chlorophyll for Plumbago Zeylanica (Chitrak) Plants System

S.No.	Treatment	Leaves of plant	Total Chlorophyll gm/Lit.x10^{-3}	Chlorophyll 'a' gm/lit.x 10^{-3}	Chlorophyll 'b' gm/lit.x10^{-3}
1	Control	Plumbago Zeylanica(Chitrak).	4.986	3.714	**1.754**
2	Ligand		5.725	4.821	**1.018**
3	Complex		5.782	3.560	**1.215**
4	**Metal**		**6.312**	**5.255**	**1.196**

Table 3
Estimation of Total Nitrogen and Proteins in Leaf Powder of Plumbago Zeylanica (Chitrak)

S.No	Plant	Treatment	% Element			% Protein
			Nitrogen	Carbon	Nitrogen	
1		Control	6.58	55.28	7.52	**44.562**

2	Plumbago Zeylanica (Chitrak).	Ligand	6.90	56.22	7.34	**42.816**
3		Complex	7.26	54.28	7.12	**46.195**
4		**Metal**	**6.02**	**52.78**	**7.01**	**41.406**

Results And Discussion:

Seed of the target species were taken to study the germination behavior under the influence pre–treatments. Germination starts when the seed shows emergence phase of growth, which begins, with penetration of embryo from the seed coat and end with the development of root and shoot system. Elongation of shoot axis follows emergence of radical.

The rate and extent of elongation is subjected to the variety of controls, including nutrition, hormones and environmental factors. Though the root and shoot development start within a fraction of time but the further developments may vary according to the nutrients required for the development of root length and length shoot independently. Therefore, root length and shoot length differs. The observation table clearly indicates that average root length in 3-(2-methoxyphenoxy)-1,2-propanediol, complex, Co(II), at all pH increase over is seen that in complex, Co(II), showed decrease in shoot length control. But in case of Plumbago Zeylanica (Chitrak) plant system shoot length increases in 3-(2-methoxyphenoxy)-1,2-propanediol, complex and Co(II), and all pH over control.

Chlorophyll pigment / chlorophyll control were found affected in Plumbago Zeylanica (Chitrak) plant by the treatments. Total chlorophyll was found to be higher in Plumbago Zeylanica (Chitrak). Total chlorophyll content in 3-(2-methoxyphenoxy)-1,2-propanediol and complex is higher than in metal and control treatment in both plant systems.

Percentage of nitrogen and proteins were found affected in leaves of Plumbago Zeylanica (Chitrak) by the treatment of 3-(2-methoxyphenoxy)-1,2-propanediol, complex, Co (II). It is observed that percentage of nitrogen and protein are higher than that of control.

Complex >3-(2-methoxyphenoxy)-1,2-propanediol > H_2O > Co (II).

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Current Study on physico –chemical characteristics and biological factors of Chargaon Lake in Warora Taluka, District-Chandrapur (M.S.). India.

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Abstract

The physico-chemical parameters are water temperature, electric conductivity, total dissolved solids, total hardness, total alkalinity, turbidity, pH, dissolved oxygen, chlorides, COD , BOD, etc. The biological factors considered were macro-zoo benthos and plankton of the lake.Chargaon Lake was constructed as part of irrigation projects by Government of Maharashtra. Nearest city to Lake is Chimur and the Lake is situated in Warora Taluka of Chandrapur District of Maharashtra in India. In the present study an attempt has been made on physico –chemical characteristics and plankton diversity and density of a sub urban perennial water body, located in Chargaon in Warora Taluka District Chandrapur of Maharashtra. The study was conducted during August-2020 to July-2021. The samples were analyzed at monthly intervals for a period of one year. Limnological parameter and plankton diversity are an important criterion for determining the suitability of water for irrigation and drinking purpose. Chargaon Lake has greatest importance for humankind. Lake was highly productive as presence of various class and order of benthos, zooplankton and phytoplankton although there were no sign of problem like eutrophication. Biological studies indicate that lake water was fit for aquatic organism, such as fishes because of there were plenty of food in the form of benthos, zooplankton and phytoplankton repectively.

Keywords:*Humankind, Irrigation, Benthos, Diversity and Eutrophication.*

Introduction:

Biological production in any aquatic body gives direct correlation with its physico-chemical status which can be used as trophic status and fisheries resources potential (Jhingran*et al.,* 1969). Life in aquatic environment is largely governed by physico-chemical characteristics and their stability. The physico-chemical as well as the biological factor of lake have vital role in aquaculture and productivity of fishes. The quality of water determines the quality of fish to be produce in it. The physical factors are water temperature, water current and turbidity of water, whereas the chemical parameter of lake comprise pH, dissolved oxygen, total alkalinity and total hardness of water. The biological factors considered were macro-zoo benthos and plankton of the lake. The seasonal changes in different physico-chemical parameters are responsible for annual variation and growth of biological factors viz., macro-zoo benthos and plankton etc.

Tepe*et al.,* (2005) found that the water quality attributes such as water temperature, light penetration, dissolved oxygen, total alkalinity and total hardness are the representative of the seasonal fluctuation. Ali *et al.,* (2006) showed that the water quality of fresh water ecosystem undergoes complex changes due to all physico-chemical factors and water quality as a sequence disrupting the aquatic life. Hayat *et al.,* (1996) and Jena *et al.,* (1998) revealed that temperature and ecological conditions are responsible for the fluctuation of salt contents, which in turn influence the production, and growth of fish .

Materials and Methods:

The sampling was carried out in ChargaonLake at five different sites monthly between August-2020 to July-2021 for one year. About 12 water sample were collected in each months.

The physico-chemical factors are water temperature, watercurrent, turbidity of water pH,dissolved oxygen, total alkalinity and total hardness of water, whereas biological factors were macro-zoo benthos and plankton of the lake. Study of physico-chemical factors was carried out by using standard methods(APHA, 1998). For the qualitative estimation safe water quality standards were use(Boyd and Tucker, 1998; Ali*et al.,* 2000). Macro-zoo benthos collected from 1m²area of lake at the depth of 15cm. The plankton was sampled at each spot by filtering 100liters of water. Preservation was made on the spot in 4% formalin. The quantitative analysis of plankton was made with the help of Sedgwick-Rafter counting slide as suggested by Welch (1952).

Result and Discussion:

Water temperature

The average water temperature of lake was found to be varying from 14.12˚c to 21.58˚c during Jan.to July respectively. Thus, water of ChargaonLake is coldest in winter and hottest in monsoon. (Table 1)

Table.1 Average monthly and seasonal variation in water temperature (˚C) of Chargaon Lake (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	12.3	14.7	15.5	17.8	20.4	21.5	21.9	20.4	19.7	17.9	14.5	12.7
Spot B	15.5	17.3	17.3	19.6	20.5	20.4	20.8	19.5	18.6	17.7	16.4	15.6
Spot C	11.2	15.6	17.2	19.7	19.5	20.7	22.4	20.6	18.8	16.9	13.4	11.6
Spot D	16.3	17.8	18.5	20.5	20.8	21.5	21.3	19.6	18.6	17.6	16.8	15.3
Spot E	16.5	17.9	18.3	20.8	20.2	20.3	21.5	19.5	18.8	17.3	16.7	15.4
Average	14.36	16.66	17.36	19.68	20.28	20.28	21.58	19.92	18.9	17.48	15.56	14.12
Season	Summer				Monsoon				Winter			

Water velocity

While calculating the velocity of water, we observed that the rate of water flow is fluctuated from a minimum value of 0.307m/s in Feb.to a maximum value of 0.899m/s in Aug. Thus the water current with a rate of 0.313m/s in winters to 0.849m/s in monsoon is useful for fish survive (Table 2).

Table.2 Average monthly and seasonal variation in water current velocity (m/s) of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	0.289	0.364	0.393	0.416	0.576	0.663	0.849	0.615	0.433	0.269	0.281	0.274
Spot B	0.304	0.337	0.393	0.428	0.438	0.864	0.957	0.813	0.522	0.391	0.324	0.314
Spot C	0.271	0.366	0.398	0.421	0.421	0.633	0.765	0.651	0.434	0.354	0.265	0.261
Spot D	0.337	0.351	0.598	0.924	0.924	0.963	0.972	0.811	0.614	0.483	0.388	0.391
Spot E	0.334	0.349	0.598	0.944	0.923	0.877	0.951	0.813	0.619	0.433	0.335	0.325
Average	0.307	0.353	0.476	0.627	0.656	0.656	0.899	0.741	0.524	0.386	0.319	0.313
Season	Summer				Monsoon				Winter			

Turbidity

It has been observed that the water is highly turbid during monsoon period (July-August) with a value of 92.9NTU. Thus is obvious because water becomes turbid due to the rainfall and flash flood. With an unusual variation water was found extremely less turbid during rest of the seasons with the minimum of 7.9NTU in winter. (Table 3).

Table.3 Average monthly and seasonal variation in turbidity (NTU) of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	09	11	17	10	12	95	86	51	31	11	08	10
Spot B	06	05	11	09	17	91	96	64	41	18	07	10
Spot C	05	08	09	11	22	88	99	59	39	14	05	07
Spot D	07	09	06	13	21	89	94	61	31	12	11	08
Spot E	09	07	05	09	19	94	97	57	27	10	09	08
Average	7.2	8.0	9.6	10.4	18.2	91.4	94.4	58.4	33.8	13	8.0	8.6
Season	Summer				Monsoon				Winter			

pH

pH fluctuation occur only within a narrow range. The pH of lake was found to be varying from 7.6 to 8.32 during July to December. Therefore, during monsoon the water is least basic and it seems more basic during winter (Table 4).

Table.4 Average monthly and seasonal variation in pH of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	8.2	8.3	8.2	8.1	8.2	7.9	7.9	8.3	8.2	8.6	8.2	8.1
Spot B	7.4	8.3	8.2	8.7	8.6	7.6	7.6	7.3	7.4	7.7	8.1	8.3
Spot C	8.1	8.6	8.2	7.9	7.9	7.2	7.8	8.2	8.3	8.1	8.7	8.4
Spot D	8.2	8.1	8.2	8.3	8.5	8.1	8.1	7.9	7.8	8.3	8.5	8.2
Spot E	8.0	8.1	8.2	8.3	8.3	8.0	8.1	7.6	7.8	8.0	8.1	8.2
Average	7.98	8.28	8.2	8.26	8.3	7.76	7.9	7.86	7.9	8.14	8.32	8.24
Season	Summer				Monsoon				Winter			

Dissolved Oxygen

In December, the oxygen content dissolved in water was found to be highest with the value of 10.72mg/l.The Lake has less D. O. content in Jun. with the value of 7.6mg/l. Thus the fish can endure water having the dissolved oxygen content from7.93mg/l (during monsoon) to 10.57mg/l (during winter). (Table 5).

Table.5 Average monthly and seasonal variation in dissolve oxygen (mg/l) of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	9.8	8.9	8.4	8.6	7.8	7.2	8.1	8.5	9.3	9.8	10.5	10.3
Spot B	11.3	8.9	7.8	7.2	7.4	7.4	7.1	8.6	9.3	10.1	10.4	10.8
Spot C	9.8	8.9	9.5	8.3	7.9	8.2	8.7	8.7	9.4	9.2	10.9	10.1
Spot D	10.4	9.3	8.7	7.4	7.4	8.2	8.3	9.3	9.9	10.5	11.1	10.9
Spot E	10.4	9.3	8.6	7.9	7.5	7.9	8.2	9.5	9.8	10.5	10.7	11.2
Average	10.34	9.06	8.6	7.88	7.6	7.78	8.08	8.92	9.54	10.02	10.72	10.66
Season	Summer				Monsoon				Winter			

Total Alkalinity

In our observation it has been observed that the lake water was alkaline and the magnitude was varying from 59.34mg/l to 100.46mg/l from Augustto February. Thus, the water ofChargaon Lake is most alkaline during winter and then with a regular decrement is least alkaline during monsoon. (Table 6)

Table.6 Average monthly and seasonal variation in total alkalinity (mg/l) of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	91.9	80.1	76.2	71.0	64.2	62.4	60.8	64.4	73.5	85.9	89.9	92.4
Spot B	96.2	87.1	80.8	74.1	63	61.7	61.8	62.5	79.8	89.1	99.2	101
Spot C	99.6	83.4	78.5	74.7	62.7	65.4	59.9	67.8	77.6	81.1	101.5	99.2
Spot D	103.3	97.1	79.7	70.2	71.1	60.1	57.6	70.4	91.1	95.3	98.2	99.8
Spot E	111.3	97.1	81.7	73.2	73.1	62.8	56.6	71.1	87.1	91.3	91.9	108.2
Average	100.46	88.96	79.38	72.64	66.82	62.48	59.34	67.24	81.82	88.54	96.14	100.16
Season	Summer				Monsoon				Winter			

Total Hardness

The degree of hardness calculated in the lake water was lowest in July (78.52mg/l) and highest in February (109.26 mg/l). The study summarized that the water in winter in highly hard, while least hard during monsoon. (Table 7).

Table.7 Average monthly and seasonal variation in total hardness (mg/L) of Chargaonlake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	101.2	93.7	91.2	89.1	75.4	77.5	78.2	77.2	82.5	90.6	92.3	97.5
Spot B	109.3	98.8	85.9	78.2	77.1	75.9	74.9	78.2	82.1	89.2	96.7	101.2
Spot C	104.3	98.5	99.8	92	90	84.4	81.7	84.9	89.6	98.4	99.6	103.1
Spot D	112.4	96.5	94.7	87.5	85.1	74.9	82.4	88.2	91.5	101.4	106.1	109.2
Spot E	119.1	107.4	96.2	86.3	84.6	79.9	84.3	86.9	87.5	98.2	106.3	108.5
Average	109.26	98.98	93.56	86.62	82.44	78.52	80.3	83.08	86.64	95.56	100.2	103.9
Season	Summer				Monsoon				Winter			

Macro-zoo benthic Density

The number ofEphemeroptera (211Units/m²in December while 12 Unit/m² in July), Trichopteran (210 Unit/m² in December while 8Unit/m² in July), Dipteran (13 Units/m ² in July while 145 Units/m² in February), Plecopteran nymphs (51Units/m²in January while 1 Units/m² in August), Coleopteran larvae (99 Units/m²in December while 9 Units/m² in July). Odonata larvae (130 Units/m² in December while 7 Units/m² in June). The average total macro-zoo benthos observed (812Units/m² in December while56 Units/m²in July) and (in winter season 646.33 Units/m² while during monsoon 114 Units/m²). (Table 8).

Table 8. Average monthly and seasonal variations in Macro-zoo benthic density (Units/m^2) (2020-2021)

Macrobenthic groups (Units/m^2)	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Ephemeroptera	149	73	52	24	21	12	35	64	110	144	211	155
Trichoptera	140	77	35	21	10	08	35	64	110	144	210	150
Deptera	145	116	63	43	34	13	29	62	88	139	142	110
Plecoptera	48	39	43	40	21	02	01	14	03	14	20	51
Coleoptera	46	61	22	38	11	09	22	22	94	88	99	39
Odonata	42	76	39	29	07	12	50	52	92	110	130	52
Total Macro-zoo benthos (Unit/m^2)	570	442	254	195	104	56	172	278	497	639	812	557
Season	Summer				Monsoon				Winter			

Plankton Diversity

The total phytoplankton were Chlorophyceae, Bacillariophyceae and Cyanophyceae (2925 Units/l in January while 400 Units/l in August). The total zooplankton were Crustaceans and Rotifers (25Units/l in August and 400 Units/l in January). The total plankton density vary (3110 Units/l in January to 425 Units/l in August. (Table9).

Table 9. Average monthly and seasonal variations of Plankton density (Units/L). (2020-2021)

Plankton group (Units/L)	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Chlorophyceae	375	725	325	510	135	275	Nil	230	475	650	500	600
Cyanophyceae	225	175	Nil	200	125	125	Nil	125	75	150	200	250
Total phytoplankton	2175	1725	1550	1420	950	802	400	1080	2850	2629	2550	2925
Crustaceans	175	100	50	175	25	75	25	75	100	225	155	125
Rotifers	Nil	100	200	220	75	Nil	Nil	25	25	175	100	60
Total Zooplankton	175	200	250	395	100	75	25	100	125	400	215	185
Total Plankton (Units/L)	2350	1925	1800	1815	1050	877	425	1180	2975	3029	2850	3110
Season	Summer				Monsoon				Winter			

In the present study, the water temperature of the lake was observed to be moderate throughout the year. This moderate water temperature is due to its spring-fed nature of origin. It is also supported by Odum (1971) that photoperiod was shorter in winter than summer which is directly related to temperature and hence water temperature is highest in June. The velocity of water current was observed to be fluctuated from a minimum of 0.307 m/s (February) to a maximum of 0.899 m/s (August). It is also obvious from our study that the average rate of water is highest in monsoon whereas lowest in winter.

In present study water was highly turbid during Monsoon (July-August) while very low during rest of the seasons with the minimum of 7.9 NTU in winter. These observations are also supported by Jhingran (1965) who reported that turbidity generally increased to a maximum value in monsoon due to the suspended solids in the flooded water whereas, during the post monsoon months the turbidity values were low but increased again during the summer months with the increase in tidal management and intensity .Upadhyay (1997) calculated the turbidity variation from 2 to 162NTU.

pH is gradually increased from a minimum of 7.83 during monsoon to a maximum of 8.28 during summer. Similar variations in pH of the lake were recorded by Kumar *et al.*,(2006) in Garhwal Himalayas. They concluded that winter maxima for pH might be due to algal growth and minima in monsoon might be due to influx of organic and inorganic ions in to the lake caused by flash flood.

In our study D O highest during winter whereas lowest during, Ali (1999) reported that the dissolved oxygen variation shows inverse relationship with water temperature variation. Bhatt *et al.*, (1984) also reported high D O and low free CO2 concentration in winter.

In present study, the water of ChargaonLake was found to be most alkaline during winter and least during monsoon. Total hardness show minimum during monsoon to a maximum during winter.
Density of total macro-zoo benthos and total plankton populations were plenty in winter while rarely during monsoon. Detritus standing stock is the main reason for high density of benthos in winter and substratum stability too. Moderate temperature low gradient of velocity favors the growth of biotic communities. Similar study was carried out by Rautela*et al.*,(2006) who reported that the macro-zoo benthos had a maximum population during winter(325 Units/m ^{2}) and the minimum (15 Units/m ^{2}) during monsoon season.

Conclusion:

Briefly, present study concluded that physico-chemical parameters levels indicate the moderate quality of water, lake water of the study area was not polluted in respect to physico-chemical assessment. But biological studies indicate that lake water was fit for aquatic organism, such as fishes because of there were plenty of food in the form of benthos, zooplankton and phytoplankton.

Chargaon lake water was habitable for fishes and fit for development of aquaculture. There were no sign of problems like eutrophication. It is also concluded that the higher growth of macro-zoo benthos and planktons in the lake is favored by low water temperature, low current velocity, and moderate turbidity with high D High alkalinity and high hardness during winter's season.

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Isozyme study in *Leucas biflora* (Vahl.) R. Br. of Lamiaceae.

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Abstract:

The present study reveals plant allozymes of family Lamiaceae (Leucas biflora) to establish the phylogenetic relationship. In the present study five allozymes were tested Viz. Superoxide dismutase, Succinate Dehydrogenase, Polyphenol Oxidases, Catalase and Rubisco and data was interpreted by using STATISTICA package. Four enzymes showed reliable polymorphism except Catalase. In Catalase monomorphic allele was elucidated. The bands were stained and allele frequency was calculated. The difference in allele frequency can be helpful to the taxonomist in establishing genetic diversity amongst the taxa of Lamiaceae.

Keywords *- Isozymes, Zymogram, Allele frequency, Polymorphism, Phylogeny.*

Introduction:

The most widespread in its distribution amongst Plant kingdom is Angiosperms. "Tubiflorae" is the largest order of Engler and Diels (1936), revised system of classification with primarily herbaceous plants, gamopetalous corolla, and epipetalous stamens.Taxonomists treated the order Tubiflorae differently. The variation in allele frequency would support as an additional taximetrics in deciding the position of the families like Acanthaceae, Lamiaceae, Scrophulariaceae and Lentibulariaceae.

Allozymes share a common substrate but differ in their electrophoretic mobility that helps in making the comparisons between the populations. In the present investigation, efforts have made to support the new taximetrics on the basis of Isozyme pattern and shared loci.

Allozyme pattern has been studied for calculating the percentage of gene loci and polymorphism per population. For out crossing plants, the numbers and frequencies of alleles detected in any one population are often very similar to another population of the taxa belonging to same family studied. Thus, the findings in the present investigation proved to be helpful to justify the position of the family in the order Tubiflorae on molecular basis.

Review of Literature

Meister (1950), studied the taxa to understand the molecular heterogenesity. Markert (1975a, b, c) published the information about isozymes in 3 volumes namely Isozymes –I, Isozymes –II, &Isozymes –III. Sonnante et al. (1997) obtained better insight into genetic relationship within and between the taxonomic entities of *Vigna luteola* and *V. marina*. Bhat et al. (1998) studied the Isozyme diversity in Indian primitive maize landraces and observed polymorphism for Peroxidase, esterase and acid phosphatase. Apavatjrut et al. (1999) carried out the study on *Curcuma* species. Volis et al. (2003), interpreted that allozyme variation in wild barley is adaptive and directly related to local environment. Soltis & Soltis (2005) gave the detailed study of isozymes in different chapters of plant biology. Isozyme used as a molecular marker to assessed the genetic diversity and structure of wild Tunisian *Thymus capitatus* of Lamiaceae (Ali et. al.2011). Gömöry *et. al.* focussed on potential discordances in spatial patterns of allozyme and quantitative phenotypic variation.

Materials and Methods

The plant material was collected from localities in and around Nagpur District. The seeds of *Leucas biflora* were randomly collected. They were sun-dried and investigation was carried out with fresh material as well as water soaked viable seeds. Band variation was studied as per the method given by Sadashivam and Manickam, 1996; Vellejos, 1983; Wendel & Weeden, 1989.The gel was photographed and interpreted by using the "STATISTICA" package.

Observations

The taxa under investigation showed reliable polymorphism except Catalase due to variation in the banding pattern. Allozyme data was analyzed through cluster analysis by simple matching coefficient method. 27 significant alleles were resolved, of which, number of alleles (bands) found in Rubisco i.e. eight, next to it is seven in Amylase followed by two in Alcohol Dehydrogenase. Catalase is the only monomorphic showing single allele. Zymogram of Rubisco is explained in the given table and scored as follows-

The isozyme pattern of Rubisco is explained below:

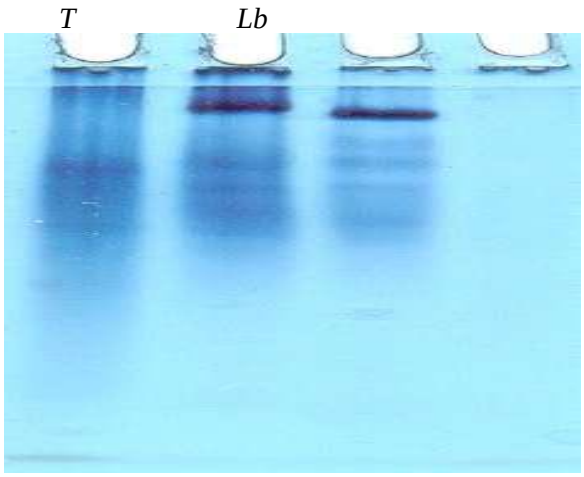

Fig: 1- Zymogram of of Rubisco

Table 1:

Name of Enzyme	**Alleles**	A	***Leucas***	B	C	**% of shared loci(P)**
Rubisco	1	1.000	1.000	1.000	0.000	75.000
Rubisco	2	0.000	1.000	1.000	0.000	50.000
Rubisco	3	0.000	0.000	1.000	0.000	50.000
Rubisco	4	1.000	1.000	1.000	1.000	100.000
Rubisco	5	1.000	1.000	1.000	0.000	75.000
Rubisco	6	1.000	1.000	1.000	0.000	75.000
Rubisco	7	0.000	1.000	1.000	0.000	50.000
Rubisco	8	0.000	0.000	1.000	0.000	25.000
Allele Frequency		**0.500**	**0.750**	**1.000**	**0.125**	

The zymogram represents various isozymes of Rubisco. Figure: 1 show 8 bands of four samples species (A, B, C) along with *Leucas biflora* studied for isozymes. The intensity of band indicates the amount of isozyme present in the sample loaded for electrophoresis. Rubisco 1,4,5,6 present in three samples. Rubisco 2, 7 reported as a single band in two taxa, while 8 in only sample C. 3 bands are shared by Maximum Species. The presence and the absence of band is stated as 1 or 0 respectively and the data is tabulated in Table- I & II. The percentage of population per sample sharing each band /allele/ locus has been calculated below.

The example studied is Rubisco. In Fig. 2 the first locus is present in 4^{th} samples and hence the distribution % among the population is 4/6 x 100 = 66.667. Second in only one sample and hence distribution % is 1/6 x 100 =16.667. Similarly the allele frequency is calculated for all the samples on the basis of enzyme locus present out of the total detected isozyme loci. Thus, the allele frequency of *Gantelbua*, *Leucas* and *Utricularia* is same i.e. 500, as far as the band pattern and sharing of loci is concern. The taxon showing more than one band is said to be polymorphic where as only one band is monomorphic by nature. The isozyme scoring and relative frequency in the taxa investigated is given in Table II.

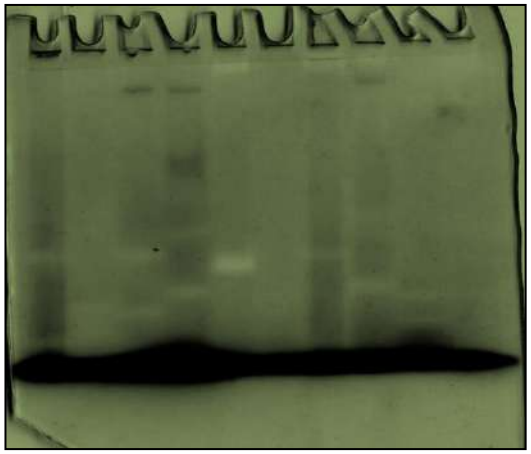

Fig2: Superoxide dismutase

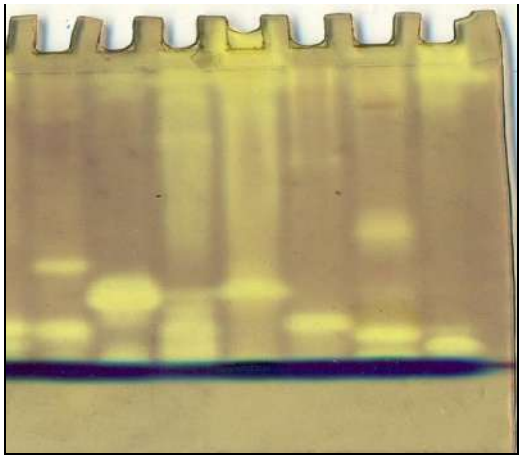

Fig3: Succinate Dehydrogenase

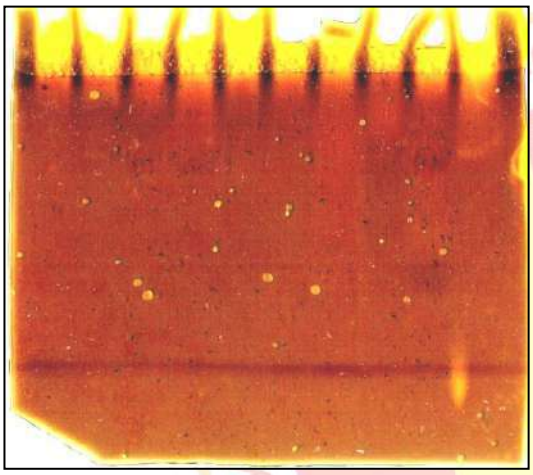

Fig3: Catalase

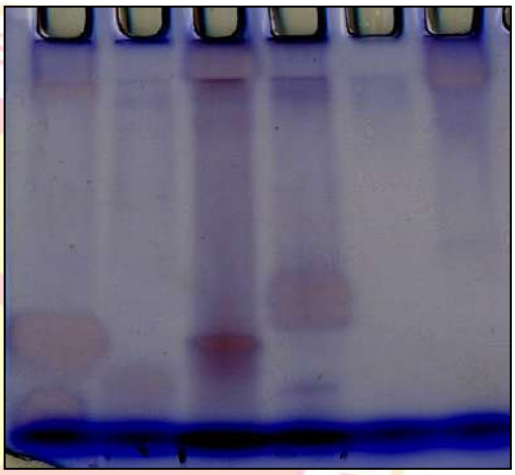

Fig4: Polyphenol Oxidases

The Rubisco shows 8 bands recorded in three taxa and roughly recorded in single taxon. The intensity of band indicates the amount of isozyme present. Rubisco 1 is shared by maximum Species present in all the four samples. Rubisco 1, 4, 5 & 6 reported in maximum taxa while 3 and 7 shared by only 2 taxa whereas 8 shared by only one percent population. In enzyme catalase, the first locus is present in all the four samples and hence the distribution % among the population is 4/4 x 100 = 100%. The allele frequency is calculated for all the samples on the basis of enzyme locus present out of the total detected allozyme loci. Thus, the allele frequency calculated of *Leucas biflora* is helpful when it is compared with the related data collected from the remaining taxa of same family. The band pattern and sharing of loci is concern. The taxon showing more than one band is said to be polymorphic where as only one band is monomorphic by nature. The isozyme scoring and relative frequency of the four other enzymes are given below:

Table: II

Name of Enzyme	A	***Leucas***	B	C	**% of shared loci(P)**
Catalase	1.000	1.000	1.000	1.000	100.000
Allele Frequency	**1.000**	**1.000**	**1.000**	**1.000**	
Polyphenol Oxidases	1.000	1.000	0.000	0.000	50.000
	1.000	1.000	0.000	1.000	75.000
	1.000	0.000	0.000	0.000	25.000
	0.000	0.000	0.000	1.000	25.000

	0.000	1.000	0.000	0.000	25.000
	0.000	1.000	0.000	0.000	25.000
	1.000	0.000	0.000	0.000	25.000
	1.000	1.000	1.000	1.000	100.000
Allele Frequency	**0.500**	**0.600**	**0.100**	**0.300**	
Superoxide dismutase	1.000	0.000	0.000	1.000	50.000
	0.000	0.000	1.000	1.000	50.000
	1.000	0.000	0.000	0.000	25.000
	0.000	0.000	0.000	0.000	00.000
	0.000	1.000	1.000	0.000	50.000
	0.000	0.000	1.000	0.000	25.000
Allele Frequency	**0.333**	**0.167**	**0.500**	**0.333**	
Succinic Dehydrogenase	1.000	0.000	0.000	1.000	50.000
	1.000	0.000	0.000	1.000	66.667
	1.000	0.000	0.000	0.000	25.000
	0.000	0.000	0.000	0.000	0.000
	0.000	1.000	0.000	0.000	25.000
	0.000	0.000	1.000	0.000	25.000
	1.000	0.000	1.000	0.000	50.000
	0.000	0.000	0.000	0.000	0.000
	0.000	1.000	0.000	0.000	25.000
	0.000	0.000	1.000	1.000	50.000
	0.000	0.000	0.000	1.000	25.000
	1.000	1.000	1.000	0.000	75.000
Allele Frequency	**0.417**	**0.250**	**0.333**	**0.333**	

Table II shows the total allele frequency in all the four taxa studied, depicting the affinity between them. It is calculated on the basis of total allozymes detected.

Discussion and Conclusions:

The investigation carried out could be helpful to find the co-relation among different families which shows affinities and to discuss the link between them. Here one taxon i.e. only Leucas biflora has been studied for five different plant enzymes so as to know about how far this data is reliable to establish the link between close families like Acanthaceae, Lamiaceae, Scrophulariaceae and Lentibulariaceae.

The use of new cladistics in taxonomy for ascertaining taxonomic similarities is recent at infra specific, generic and family level. In this aspect, the present investigation could be helpful for the taxonomists in ascertaining the new data. Earlier, in nineteenth century many taxonomists make use of phytochemical investigations, cellular details and took support of the embryological findings. The isozymes have been used for

the first time as a tool in the identification of some *Curcuma* species (Apavatjrut et al., 1999). Molecular markers proved to be effective in presenting the reliable data in deciding the positions of certain families. The isozyme data in the present investigation has been proved to be helpful in making the taxonomic clusters. For eg. One is of Acanthaceae and Scrophulariaceae and second of Lamiaceae and Lentibulariaceae .

Lange and SchifinoWittmann (2000), Batista and Sosa (2002), Fu and Dane (2003), Mateu-Andres (2004), Gonzalez Astorga et al. (2004) and Jaaska (2005). Das and Mukherjee (1997), and Kofi et al (2009) combinely analysed the isozyme data to confirm the taxonomic alignment. The isozyme data in the present investigation has been proved to be helpful in making the taxonomic clusters. For eg. One is of Acanthaceae and Scrophulariaceae and second of Lamiaceae and Lentibulariaceae .

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Ayurvedic Application of Butea monosperma and its histochemical investigation

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Abstract:
The histochemistry of plant is used to study of anatomical characters as well to find out synthesis and storage of metabolites. Each and every plant have medicinal importance but we does not know which plant parts have much more Synthesis and accumulation of actives Compounds. Plant parts like leaves ,stem ,roots bark are sources of production of one or more metabolites through this technique a correct detection of secretion and accumulation we can find out ,so we can used only that plant parts Systematic screening of them may result in the discovery of novel effective compounds. This studies helps in Histochemical investigation of Butea Monosperma, these plants have many folk medicinal used.
Key Words- Histochemistry, Butea monosperma, folk medicine

Introduction:

Histochemistry is the branch of histology handling the identification of chemical additives of cells and tissues. Starch deposition occurs extensively in the plant body, but the specifically not unusual locations of its accumulation are seeds, the parenchyma of the secondary vascular tissues within the stem and root, tubers, rhizomes and corn (V. B. Kadam, 1999) Starch and proteins are the main ergastic materials of the protoplasm (E. Kuster etal 1996). Fat are extensively distributed inside the plant frame and that they probably occurs in small quantity in every plant cellular (W. Seifriz., 1936). Fats are not unusual reserve fabric in seeds, spores and embryos in meristematic cells. Glucosides are the degradation made from the carbohydrates

Butea monosperma (Lamk.) is a quintessential tree. Tribals use its plants and younger fruits. The plant is used in Ayurveda, Unani and Siddha medicine for diverse ailments. nearly all the elements of the plant namely root, leaves, fruit, stem bark, flora, gum young branches are used as medicine, food, fiber and for other miscellaneous functions including fish poison, dye, fodder, utensils, etc. about forty five medicinal makes use of are related to the plant and out of those claims nearly half of the wide variety of claims have been scientifically studied and said these observations are noteworthy for further studies on present day medical lines. (Burli and Khade, 2007) Flowers are soaked in water in a single day and a cup of this infusion is drunk each morning towards leucorrhoea until remedy (Patil, et.al. 2006).

Histochemistry techniques:-

Fresh plant material are used for sectioning and prepare permanent for studies of histochemistry. Jeffery's fluid (Johansen, 1940) and Johansen (1940) and Gurr (1965). The specific tests achieved are indexed in Table

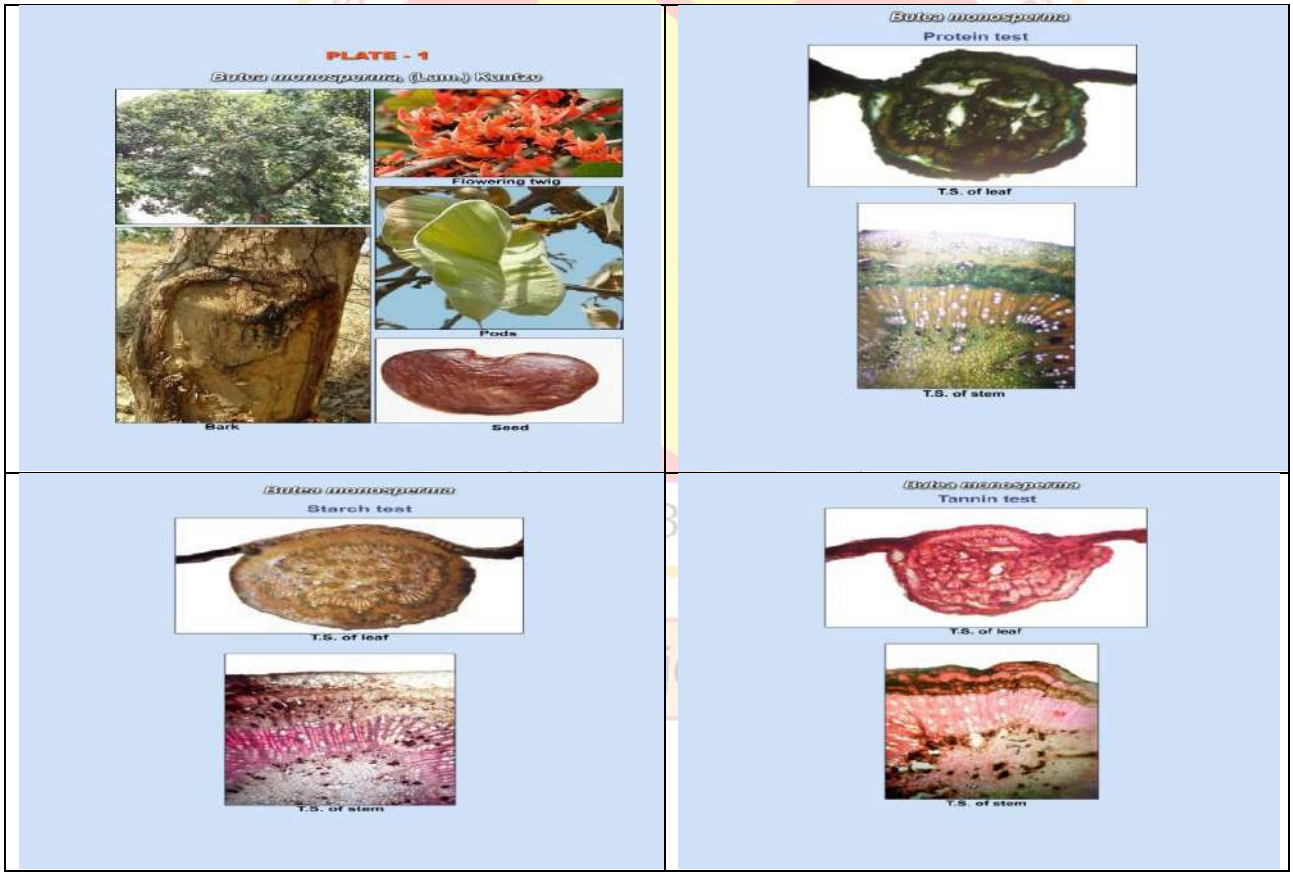
Sr. No	Erastic Content	Chemical Test	Reference:
1	Starch	Iodine, Potassium iodide soln. (IKI Solution.)	**Johansen (1940) and Gurr (1965)**
2	Protein	Potassium Ferro cyanide, Glacial acetic acid	**Johansen (1940)**
3	Tannins	10% ferric chloride solution (aq)	**Johansen (1940) and Gurr (1965)**
4	Saponin	Conc. Sulphuric Acid	**Johansen (1940)**
5	Fats	Sudan III Sudan IV	**Johansen (1940)**
6	Glucosides	Phloroglucinol in 90% alcohol+20% hydrochloric acid	**Johansen (1940) and Gurr (1965)**
7	Alkaloids	a) Idonine solution	**Johansen (1940)**
		b) dil. Nitric a cid	**Johansen (1940)**

Loose hand cutting of plants parts of Stem and leaves are used for histochemical studies with reference to Johansen and Gurr different reagent is used for study of localization of different metabolites Viz starch,

protein, tannin, saponin, fat, glucosides and alkaloids within the tissues (Johansen, 1940). The tests employed was observe:

Studies of histochemistry s of actives compound (metabolites) likes carbohydrates, protein, fats, tannin, saponin, glucoside and alkaloids reacts with specific reagent it offers diverse color stains in section through which accumulation of a few metabolites of the plant is localized in leaf and stem phase describe in table no 2 and picture plate no1

1) Most of starch accumulated in common places like in the parenchyma of the secondary vascular tissue in stem and roots, tuber, rhizome and corms inside the present work, for the taxa under examine, starch become found in leaves and timber of all of the taxa,
2) Protein have been observed within the top and; decrease dermis, scattered cells of mesophyll of leaves, pith parenchyma and cortical parenchyma inside the stem
3) Tannin additionally display distributions, taking place usually in dermis, mesophyll cortical as well as parenchymatous tissue, associated with conductive tissue. Tannins had been discovered inside the leaves
4) Saponin: were discovered within the mid-rib parenchyma of leaves and cortex and pith parenchyma of timber and inside the cells of mesophyll and xylem parenchyma in stem
5) Fats: In taxa underneath take a look at, fat was observed in cells of mesophyll and phloem parenchyma (leaves and stem)
6) Glucoside: Glucosides are the degradation production of carbohydrates glucosides were determined in the dermis ,pith parenchyma of leaves vascular bundles and scattered cells of medullary ray of stem
7) Alkaloids: have been located within the scattered cells of mesophyll of leaves and pith parenchyma of stem .In wanger's reagent, alkaloids were located inside the cells of mesophyll and cells of cortex parenchyma and pith parenchyma of stem



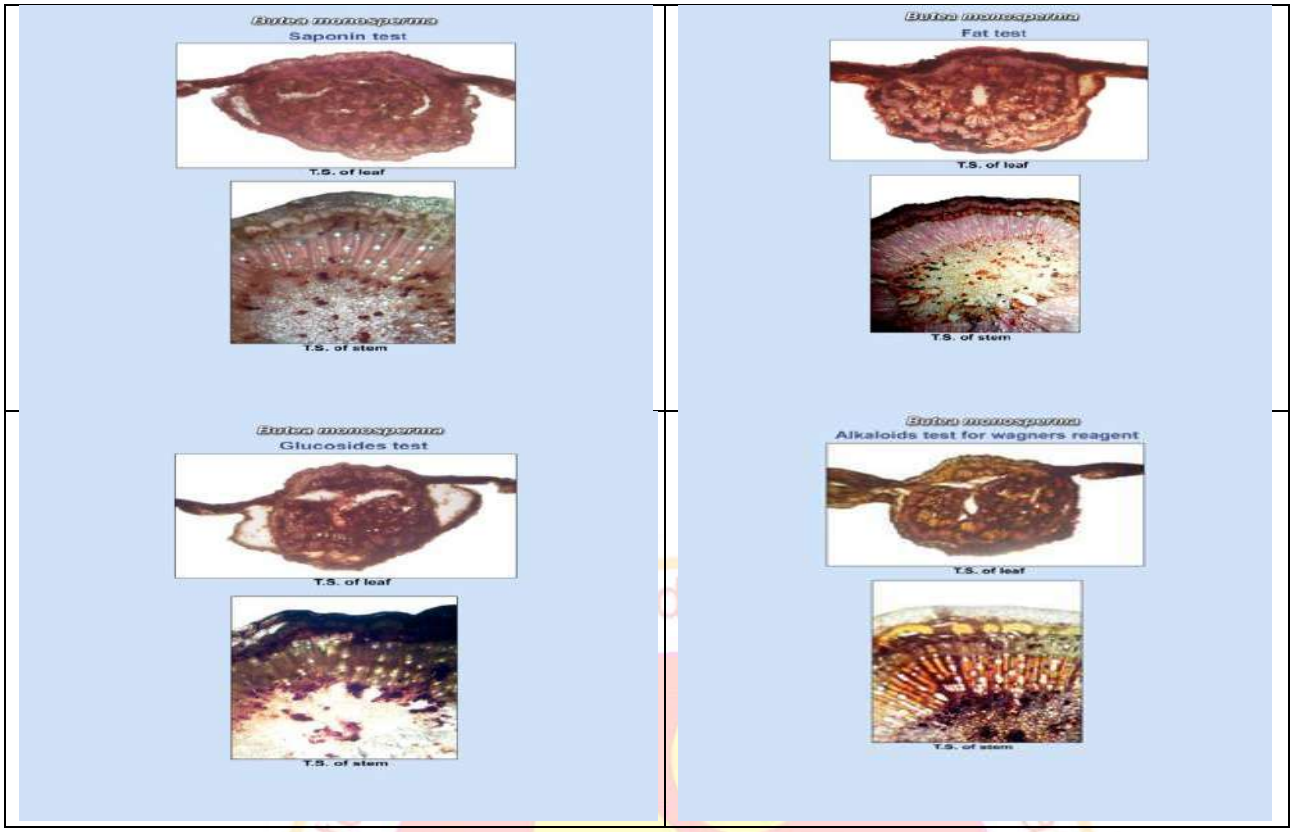


Photo plate shows slides of leaves and stem T.S of histochemistry of Butea monosperma

Sr. No.	Ergastic content	Reaction		Localization	
		Leaves	Stem	Leaves	Stem
1	Starch	$^{+}$ve	$^{+}$ve	Scattered cells of mesophyll, Mid –rib pith parenchyma,	**Cortical parenchyma, Medullary rays, Vascular bundle, and Pith parenchyma**
2	Protein	-do-	-do-	Epidermis, Scattered cells of mesophyll, mid – rib Pith parenchyma	**Epidermis, Scattered cells of Cortex and Pith parenchyma, and Phloem parenchyma.**
3	Tannin	-ve	-do-	-----	**, Scattered cells of Cortex and Pith parenchyma**
4	Saponin	-ve	-do-	----	**Epidermis, Scattered cells of Cortex parenchyma, and Pith**
5	Fat	-do-	-do-	Upper and lower epidermis, Scattered cells of Mesophyll cells and Mid –rib	**Cortical parenchyma, Medullary rays, Scattered cells of Pith parenchyma.**
6	Glucoside	-ve	-ve	-----	**-parenchyma, pith**
7	Alkaloids	-do-	-do-		
	a) Mayer's reagent	-do-	-do-	Cells of Mesophyll, Mid –rib	**Cortex, Xylem parenchyma, and Pith parenchyma.**

	b)Wagner's reagent	**-do-**	**-do-**	**Upper and lower Epidermis, Mid – rib parenchyma.**	**Epidermis, Cortical parenchyma, Medullary rays and Vascular bundle and Pith parenchyma**

Results and Discussion

Histochemical test for fresh section of leaves and stem of *Butea Monosperma*Conclusion

The present helps to save the medicinal plant through histochemical studies through this technique we find out sites of secretion and accumulation of bioactive compounds of the plant. Many plants are used as folk medicine through these techniques people get aware which plant parts are used instead of whole plants the identification of the chemical compounds of the species and its histolocalization contribute to enlarging the pharmacognostic knowledge about this species.

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Preliminary phytochemical screeningof stem bark of *Ficus hispida* L.

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Abstract

Skin infections create physiological and anatomical problems and also affect the social life of an individual. Plant medicines prove to be very effective in simple as well as chronic dermal disease.Traditional medicinal resources,especially plants, have been found to play a major role in managingdermatological ill conditions. The need of the hour is to screen a number ofmedicinal plants for promising biological activity against skin diseases. Hence the present study has been undertaken to investigate the phytochemical constituents from the extract of stem barkof Ficus hispida L.by using six solvents i.e., petroleum ether, benzene, acetone, chloroform, ethanol and distilled water.Preliminary phytochemical analysis revealed the presence of Carbohydrates, saponins, flavonoids, alkaloids, glycosoids, proteins, phytosterols, steroids, terpenoids and phenols in stem bark extracts.This indicates potential of stem bark of Ficus hispida L. in treatment of skin diseases.

Keywords *- Corticosteroids, Dematological, Leprosy, Phytosterols.*

Introduction

The skin as the largest organ of the body, play a number of vital role such as in protection, thermoregulation, percutaneous absorption, sensory and secretory activity. The acidic sebaceous secretions and surface of skin are aggressive to many pathogens. The rich blood and lymphatic supply of the dermis ensures that both specific and nonspecific immune responses can be quickly recruited against pathogens that invade the skin. The skin defense system may however, be compromised if the surface is penetrated via injury or thinned from the used of corticosteroids, excoriated by inflammatory processes (Barrister *et al.*2000). Disease of the skin may in their turn sharply and deeply affect the whole organism. General indisposition and loss of sleep in certain skin diseases which cause itching may serve as an example of such affections.

Psoriasis, Leprosy, vitiligo etc are among diseases that affect the aesthetics, appearance and social life of the patients. Use of herbal medicine can help the patient with dermatological disease to the quality of his social life which was impaired due to his disease condition. Traditional medicinal resources, especially plants, have been found to play a major role in managing dermatological ill conditions. The demand for herbal medicines is increasing rapidly due to their lack of side effects. Further as the health care costs continue to rise, there is attraction for low-cost remedies. The need of the hour is to screen a number of medicinal plants for promising biological activity against skin diseases. Hence the present study has been undertaken for preliminary phytochemical screening of *Ficus hispida* L.used for treatment of manifestations caused by microorganisms causing skin diseases.

Material and Methods

The material of study i.e., stem bark was collected and washed thoroughly with running tap water and after complete shade drying the plant material was grinded. The grinded plant material of 25 gms was taken in Whatman filter paper No.1. The extraction was done by using Soxhlet's extraction method with analytical grade refluxing solvents like.

a. Petroleum ether
b. Benzene
c. Acetone
d. chloroform
e. Ethanol
f. Distil water

The liquid extract obtained in each solvent was concentrated by distilling of the solvent and then evaporated to dryness at room temperature. At the completion of extraction process, the plant extract was used for the qualitative estimation of carbohydrates, saponins, tannins, flavonoids, alkaloids, glycosides, proteins, steroids, phytosterols, phenols and terpenoids.

Phytochemical analysis

Preliminary qualitative phytochemical screening was carried out for each solvent with the following methods.

1. **Test for Detection of carbohydrates :** Molisch's Test: To a small quantity of extract 10 ml of distil water and two drops of Ethanolic naphthol (20%) and 2ml of concentrated Sulphuric acid were added, formation of reddish violet ring at the junction indicates presence of carbohydrates.

2. **Test for Detection of Saponins :** Foam Test: 2 ml of extract was added to equal amount of distil water and shaken in a graduated cylinder for 15 minutes lengthwise. Formation of 1 cm layer of foam indicates the presence of saponins (Kumar *et al*., 2009).
3. **Test for Detection of Tannins:** Ferric Chloride Test: Small Quantity of extract was taken separately in water, 2-3 drops of 5% ferric chloride was added. Formation of black or green colour indicates the presence of tannins.
4. **Test for Detection of Flavonoids :** Sulphuric Acid Test: A fraction of extract was treated with concentrated sulphuric acid and observed for formation of orange colour.
5. **Test for Detection of Alkaloid**s : Mayer's Test: To 2ml of plant extract, 2ml of concentrated hydrochloric acid was added then few drops of Mayer's reagent were added. Presence of green colour or white precipitate indicates the presence of alkaloids.
6. **Test for Detection of Glycosides :** Sulphuric Acid Test: To 2ml of plant extract, 1ml of glacial acetic acid and 5% ferric chloride was added then few drops of concentrated sulphuric acid were added. Presence of greenish blue colour indicates the presence of glycosides.
7. **Test for Detection of Proteins and Amino acids :** Ninhydrin Test: To 2ml of plant extract, few drops of 0.2% Ninhydrin was added and heated for five minutes. Formation of blue colour indicates presence of proteins.
8. **Test for Detection of Steroids and phytosterols :** Sulphuric Acid Test: To 1 ml of plant extract, equal volume of chloroform and few drops of concentrated sulphuric acid were added. Formation of brown ring indicates the presence of steroids and formation of bluish green colour indicates the presence of phytosterols.
9. **Test for Detection of Phenols :** Ferric Chloride Test: To1 ml of plant extract, 2ml of distilled water followed by few drops of 10% ferric chloride was added. Formation of blue or green colour indicates presence of phenols.
10. **Test for Detection of Terpenoids :** Salkowski test: To 2ml of plant extract 2ml of chloroform and 3ml of concentratedsulphuric acid was carefully added to form a layer. Reddish brown coloration at theinterface is formed indicating the presence of Terpenoids.

Result and Discussion

The detail study of ethno-medicinal plants used in Skin diseases revealed that the most of these diseases remained incurable by the use of modern drugs. The treatment using modern drugs is costly, time consuming and have many side effects. Plant medicines and cosmetics are considered to be more beneficial in treatment of skin disease like psoriasis, eczema dermatitis, vitiligo, candidiasis, athlete's foot, carbuncle, ketosis, acne, pimples, wart, hives and ageing signs etc.

The observations in general revealed that mostly medicinal plants are concerned with traditional medicinal system.In the present investigation preliminary phytochemical investigation in different extracts of *Ficus hispida* L. stem bark showed the presence of phytochemical constituents namely carbohydrates, saponins, flavonoids, alkaloids, glycosoids, proteins, phytosterols, steroids, flavonoids, terpenoids and phenols.

Carbohydrates and proteins which were present in petroleum ether, benzene, chloroform and distilled water extract work together to maintain barrier functions of skin in face of everyday challenges. Saponin was extracted in all extracts except ethanol, shows protection against UV damage. Tannins and flavonoids was found in acetone and ethanol extract accountable for the potent antioxidant capacity of *Ficus hispida* L. Alkaloids showed positive test for petroleum ether, benzene, acetone and ethanol, alkaloids have extensive pharmacological activity such as antioxidant and anti-inflammatory. Glycosides are present in petroleum ether, benzene, chloroform and distilled water extract showed significant antioxidant, antifungal and antibacterial activity.

Phytosterols and steroids showed positive test for petroleum ether, acetone and ethanol. Phytosterols have anti-aging property whereas steroids are very effective in helping in itching and irritation. Phenols are present in acetone, ethanol and distilled water extract; they present antimicrobial, anti-inflammatory or anti-aging actions. Terpenoids showed positive test for petroleum ether, acetone, ethanol and distilled water extract it used to enhance skin penetration and prevent inflammatory disease.

Table 1: Preliminary Phytochemical Screening of various extracts
(Obtained by Successive solvent extraction of plant material)
Ficus hispida L.Present:- **'+ ve'** and Absent:- **'- ve'**

Sr. No	Secondary metabolite	S_1 Petroleum ether	S_2 Benzene	S_3 Acetone	S_4 Chloroform	S_5 Ethanol	S_6 Distil water
1	Carbohydrates	+	+	---	+	---	+
2	Saponins	++	+++	+	+	---	+
3	Tannins	---	---	++	---	+++	+
4	Flavonoids	+	---	+++	---	+++	+
5	Alkaloids (Mayer's test)	++	+++	++	---	++	---
6	Glycosides	+	+	---	+	---	+
7	Proteins	++	++	---	++	---	+
8	Phytosterol & Steroids	+	---	++	---	+	---
9	Phenols	---	---	++	---	+++	+
10	Terpenoids	+	---	+++	---	++	+

Conclusions

The results of phytochemical analysis of stem bark of *Ficus hispida* L. showed presence of many phytochemical constituents which has potential to cure many infectious diseases. The curative potential of ethno-medicinal plants studied during the present investigation will be helpful to evaluate the effectiveness of herbal medicine against skin diseases.

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Study of Diversity of Mollusca and Fish in Borgaon Dam District Yavatmal, Maharashtra, India

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Abstract:-

Molluscan and fish diversity of Borgaon dam Dist Yavatmal Maharashtra have been studies during June 2019 to May 2021 of Borgaon dam of Yavatmal, District Yavatmal and factor which affecting on them. Study reveals that molluscan diversity in Borgaon dam of Yavatmal region, Dist. Yavatmal, Maharashtra, India, reported that total of 18 fish species were recorded and 14 species of molluscs from the dam. The dominant class Gastropoda of Mollusca was dominated by 14 species including Pila globosa, Thiara scabra, Melanoides tuberculata, Bellamya bengalensis, Lymnaea accuminata, Lymnaea lutiola, Indoplanarbis exustus, Zootecus insularis, Tarebia lineate Cerastua maussonianus Filicaulis alte, Laevicaulis alte, Senperula maculata and Rachis punctatus.. Ichthyo fauna of Borgaon dam Dist Yavatmal Maharashtra were dominated by major carps with 10 members belonging to cypriniformes including Labeo rohita, Catla catla, Cyprinus carpeo, Cirrhinus marigala, Labeo calbasu, Labeo bata, Labeo fimbriatus, Puntius sarana followed by 6 members of family siluriformes including Clarius batrachus, Mystus bleekeri, Mystus vittatus, Ompak bimaculatus, Wallago attu, Heteropnoustes fossilis, Amblypharyngodon mola, Puntius sophore and one genera with two species of family channiformes represented by Channa punctatus and Channa striatus. The composition, distribution of benthic organisms over a period of time provide index of the ecosystem as well as sustain a rich molluscan and fish fauna.

Key Words:- Borgaon dam, Mollusca, Ichthyo fauna, cypriniformes.

Introduction:-

The Phylum Mollusca is a second largest phylum in invertebrate. Molluscan are soft bodied animals with or without calcareous shell adapted to almost all habitats with varied ecology. Molluscs are divided into freshwater, marine and terrestrial forms. It includes snails, slugs, clams, oysters, mussels, scallops, cuttlefish, squid and octopus. All the molluscan comprises in three groups, Gastropods, Bivalves and Cephalopods. The freshwater ecosystems in India harbour a rich diversity of molluscs, representing 212 species belonging to 21 families. Of these, 164 species were recorded from rivers and streams (Subba Rao, 1993). Biodiversity is one of the important lives supporting system on the earth. Molluscs are found in various habitat and are divided into freshwater, marine and terrestrial forms. The freshwater Mollusca play an important role in water ecosystem. Gastropoda is extremely diverse group in Mollusca and adapted to all habitats, includes snails and slugs. Bivalves as a group have no head and it characterized by a shell that is divided from front to back into left and right valves. They include clams, oysters, mussels and number of families that live in freshwater (Subba Rao,1989; Patil and Talmale, 2005; Kumar and Vyas 2012; Tripathy and Mukhpadhyay, 2015). Aquatic ecosystem provides a home to many species including phytoplanktons, zooplanktons, aquatic plants, insects, molluscans etc. They are organized at many levels from smallest building blocks of life to complete ecosystems, encompassing communities, populations, species and genetic levels. All aquatic ecosystems around the globe are generally colonized by the representatives of phylum Arthropoda and Mollusca. Benthic invertebrates occupy the bottom of water body. The functional role of benthic communities in the trophic dynamics of river ecosystem is well acknowledged. The composition, distribution of benthic organisms over a period of time provide index of the ecosystem. In recent years, there is a greater emphasis world over for better understanding of benthic environment, For present study the Borgaon dam is selected which was constructed as part of Irrigation Projects by the Government of Maharashtra in the year 1993. It is built on and impounds a local Nallah River. Nearest city to dam is Yavatmal in Yavatmal District of Maharashtra. The dam is an Earth fill Dam .The purpose of the dam is for Irrigation. The Length of dam is 830 m (2723.1 Feet) , while the Height of the dam above lowest foundation is 20 m (65.6168 Feet) . The above lake is used for fishing and bird watching. As per availablity of Literature no authentic data on various species of Mollusca was found Borgaon dam . So present work has carried out to study the diversity of molluscan in Borgaon dam.

Study Area:-

Borgaon dam is 10 km from city Distric Yavatmal located near village Borgaon at 20.3533°N, 78.5879°E which was constructed by the Government of Maharashtra in 1975. It contains rich treasure of flora and fauna. It is fresh water annual lake; water is used for irrigation as well as fishing Purpose by the villagers map.

Material And Method:-

The present work was carried out from studies during June 2019 to May 2020 in Borgaon dam near Borgaon . District. Yavatmal. The sample were hand picked from surface area and by fishing net submerged

surface. The few collected live samples were Preserved in 70% ethanol and dead sample were washed, dried and photographer were taken by Nikon D 5000 camera and species were identified from the handbook an Indian freshwater Mollusca by Ramkrishan and Dey,2007

Result And Discussion:-

Molluscs, a group of most diverse and dominant benthic fauna in water bodies, the Borgaon dam is harbors a number of aquatic weeds in the submerged as well as floating state. Molluscans are of great significance because they form the food of fishes and their productivity play an important link in the food chain. In present study, It was come to notice that molluscan specimens were represented in Borgaondam by only one doinated class Gastropoda. The quantitative analysis of molluscs was not done but it observed that Bellamya species, Pila globosa species and Lymnaea species was the dominant than other because the shell of these species were seen scattered throughout the margin of dam compared to other species.

Observation Table:-

Table 1. Systematic classification of molluscan species observed in Borgaon Dam during June 2019-May 2021 Class Order Family Genus and species of Gastropoda

Sr.No	Class	Order	Family	Genus and Species
1.	Gastropoda	Pectinibranchiata	Pilidae	Pila globosa (Swainson)
2	Gastropoda	Mesogastropoda	Thaiaridae	Thiara scabra (Muller)
3	Gastropoda	Mesogastropoda	Thaiaridae	Melanoides tuberculata (Muller)
4	Gastropoda	Mesogastropoda	Thaiaridae	Tarebia lineate (Benson)
5	Gastropoda	Stylommatophora	Viviparidae	Bellamya bengalensis (Lamark)
6	Gastropoda	Stylommatophora	Cerastuidae	Cerastua maussonianus (Petit)
7	Gastropoda	Stylommatophora	Veronicellidae	Laevicaulis alte (Ferrussac)
8	Gastropoda	Stylommatophora	Veronicellidae	Senperula maculate (Templeton
9	Gastropoda	Stylommatophora	Subulinidae	Zootecus insularis (Pfieffer)
10	Gastropoda	Stylommatophora	Enidae	Rachis punctatus (Anton)
11	Gastropoda	Stylommatophora	Lymnaeidae	Lymnaea accuminata (Gray)
12	Gastropoda	Stylommatophora	Lymnaeidae	Lymnaea lutiola (Gray)
13	Gastropoda	Stylommatophora	Planorbidae	Indoplanarbis exustus (Deshayes)
14	Gastropoda	Soleolifera	Veronicellidae	Filicaulis alte (Ferrussaca)

* Not directly found in water but on grass, moist soil and under rocks near Dam

Table 2. Fish species observed in Borgaon Dam during June 2019-May 2021 Family, Genus and species of Fishes .

Sr.No.	Family	Genus and Species
1	Cyprinidae	*Labeo rohita*
2	Cyprinidae	*Catla catla*
3	Cyprinidae	*Cyprinus carpeo*
4	Cyprinidae	*Cirrhinus marigala*
5	Cyprinidae	*Labeo calbasu*
6	Cyprinidae	*Labeo bata*
7.	Cyprinidae	*Labeo fimbriatus*
8	Cyprinidae	*Puntius sarana*
9	Siluriformes	*Clarius batrachus*
10	Siluriformes	*Mystus bleekeri*
11	Siluriformes	*Mystus vittatus*
12	Siluriformes	*Ompak bimaculatus*
13	Siluriformes	*Wallago attu*
14	Siluriformes	*Heteropnoustes fossilis*
15	Siluriformes	*Amblypharyngodon mola*
16	Siluriformes	*Puntius sophore*
17	Channiformes	*Channa punctatus*
18	Channiformes	*Channa striatus*.

* Directly found in Dam water collected by fisherman's.

Number of workers conducted studies on molluscan diversity in different parts of India the freshwater ecosystem in India harbors a rich diversity of molluscs representing 212 belonging to 21 families out of these 164 species recorded from river and streams. Mollusca perform key role in functioning the aquatic ecosystem. The availability of maximum molluscs during summer months could be related to two important ecological phenomenons. Kumar and vyas, reported the eleven species of molluscs from narmada sagar, out of which 8 species comprises of Rachis bengalensis, R. punctatus, Bellamya bengalensis, Melanoides tuberculatus, M. seabra, Lymnaea acuminate, L. lutola and Indoplanorbis exustus. The species of freshwater molluscs as gathered in the present study were quite different and also as reported earlier by some authors. 23 A study on the molluscan diversity of saipung wildlife sanctuary, Meghalaya. Revealed 13 species of molluscs, out of which 12 species were identified as gastropoda and 1 species of Bivalvia bengalensis, F.annadalei, Pila theobaldi, Thiara (lareba) lineata, Brotia (Antimelania) costula, Paludomus (poludomus) Conica, P. (P.) regulaa,, P. (P) Stephanus and Indoplanorbis exustus. Water temperature exhibit a positive correlation with molluscs during 2 years of present study. This shows that increase in temperature within the observed range favors. The growth of molluscs. As per the finding of researcher from above data. The generic as well as species diversity seen in freshwater aquatic ecosystem in different region, Tyagi, 2018 mentioned that there was a variation in molluscan diversity in different freshwater bodies as earlier studied by different researcher which was not due either a single factors is responsible for such variation. Malhotra et.al. 1996 reported the maximum molluscas during summer month could be related to some ecological important phenomenon's such as maximum abundance of decomposers, settled organic matter and macrophytes on bottom of water body and also increase water temperature activating the process of decomposition of organic sediments. Bath et.al. observed that the important for breeding and feeding of the molluscs. Borgaon dam is due to moderate amount of water, temperature and available micro vegetation and decomposers. The abundance of molluscan fauna from present study area indicates the rich productivity. The species inhibiting bottom of lake plays an important role in converting organic matter together with the microbenthos into a biomass, which in turn consumed by the fishes thus help in the secondary productivity and form an important component in the food web of ecosystem.

Conclusion:-

It can be conclude from the present study that among the selected site. The freshwater mollusks and fishes aid in assessment of ecological status of water bodies. The study relevant to the diversity distribution and ecology become imperative during the study. Present study observed the present status of mollusks and fish shows richness of Borgaon dam. Some anthrogenic activities may be consider as a threat to the mollusks and fishes as well as other living organisms of this dam. Hence the mollusks and fishes have a tremendous impact on Indian tradition and economy and it is also considered as bioindicatores of pollution and ecosystem health. The identification, taxonomic account and distribution of mollusks and fishes found in Borgaon dam is useful for better management and Borgaon dam region.

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Review on Effect of EMS as a Chemical mutagen for improvement of Legume Cropsvarieties

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Abstract

Mutation is defined as any heritable changes in an individual's genome and phenotype. In the hands of plant breeders, mutation breeding is the most potent and effective weapon available. It has been used to improve morphological and physiological characters, disease resistance, draught resistance and quantitative characters including yielding ability.

It is a cheap and fast method of developing new improved varieties.Plant breeding aims to generate novel, high-yielding, and improved cultivars by examining genetic variability in important qualities. The chemical ethyl methane sulfonate (EMS) is routinely used to cause mutations at loci that control economically important features.

Keywords: *Mutation, Phenotype, breeding, cultivar, EMS.*

Introductions:

Hugo de Vries first time used the term "mutation" in 1901. Mutation is described as a change in the number or sequence of nucleotides that is permanent and relatively uncommon. The genetic improvement of crop plants for various economic characters through the use of induced mutations is referred to as mutation breeding.

Mutations have been induced using physical mutagens such as X-rays, Gamma rays, fast and thermal neutrons, heavy ion beams, and chemicals such as EMS, DES, and SA. As of now, 408 mutant varieties of food legume crops from 24 distinct crop species have been released for cultivation utilising mutation procedures around the world (Kharkwal et al., 2005).

There is immense scope to enhance mineral nutrient (biofortification) and essential amino acid contents of human food as well as animal feed along with altered protein and fatty acid profiles, physicochemical properties of starch, enhance phytonutrients in fruits and reduced antinutritional factors in staple food grains. Induced mutations could play a key role in inducing mutations in crop plants to improve nutritional quality. 776 mutant varieties have been recognised for their improved nutritional qualities among the globally developed 3,000 mutant types. (Jain et. al., 2011).

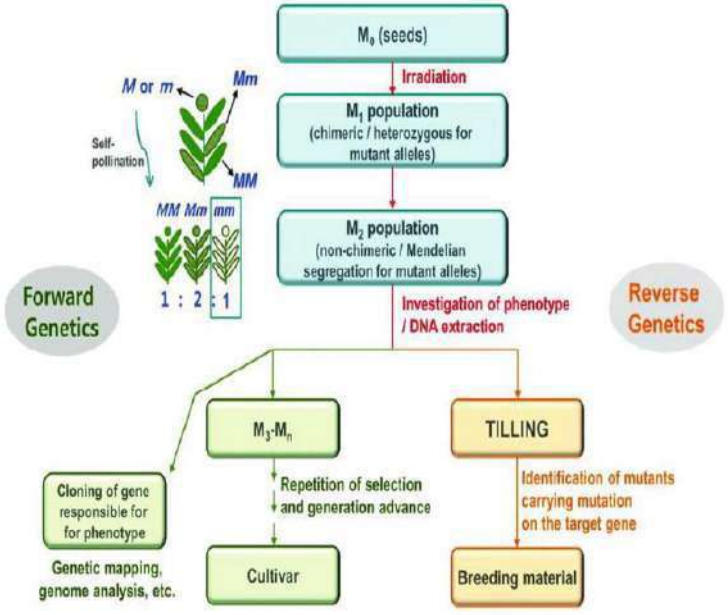

Fig.1. Mutation breeding integrated use with modern techniques.
Source: Directly taken from Jo and Kim, 2019.

Development of legume mutant varieties:

Physical or chemical mutagens can cause mutations. This is an excellent method for increasing genetic diversity for use in functional genomics and plant breeding. There have been 3,218 mutant varieties released around the world so far. Free exchange of mutant material and deployment in locations where farmers' needs are vital can maximise the use of mutant lines around the world.

Mutagenesis can be made more beneficial in the improvement of crop plants with the help of well-defined objectives in national research programmes, the availability of effective mutagenesis techniques, and efficient phenotype screening tools. Mutant identification/selection at the genotypic level, using new, high-throughput technologies, has changed the way mutations are now used in genetics and breeding.

Chemical mutagens are popular in in-vitro mutation induction, although irradiation can also be applied at low doses, EMS has become the mutagen of choice for developing mutant populations for high throughput screening such as in developing TILLING populations (Pathirana et. al. 2016)

As a result of sustained efforts through the use of physical and chemical mutagens, the IARI institute has made important contributions in understanding of induced mutagenesis(Kharkwal et al., 2004, 2005) and also achieved major success in developing eleven high yielding, disease resistant and agronomically suitable mutant varieties in several crops like chickpea,cow pea, field pea, pigeonpea and soybean(Kharkwal et al, 2004, Kharkwal et al., 2008).

Sagade (2008) used gamma rays, EMS, and MMS to achieve dramatic results in quantitative features in urdbean.

In Chickpea (Cicer arietinum L.) Var. Virat, the effect of Ethyl Methane Sulphonate (EMS) on seed germination and seeding injury was investigated. With rising EMS concentrations, the percentage of seeds germination reduced and seedling damage rose. Chickpea yield has not increased significantly in the last ten years. (Barshile et. al., 2006).

One of the reasons for chickpea's failure to achieve breakthrough productivity has been suggested to be a lack of genetic variety.Long pod mutants with greater diameter are a beneficial variant that can be used to boost seed yield by increasing the number of seeds per pod and seed size.

Long pod mutants with gamma rays, EMS, HZ, and SA in mungbean were identified by Sharma and Singh (1992) and Wani et al. (2011). while long pod mutants with EMS, gamma rays, and their combination in cluster bean were reported by Singh and Agarwal (1986) to have higher genetic variation and yield potential.

Four gigas mutant plant types were obtained from the M2 population of Chickpea cultivar Vijay; three from 300 Grey dosage and one from 0.2 percent EMS.All gigas exhibit a dominating phenotypic appearance, with 1.5 times the height of the control, an elongated, strong stem, and wider and broader leaflets than the control. The EMS gigas has fewer primary branches and larger, smooth leaves. One of the 300 Grey dose was sterile, while the other three contained flowers and pods. In comparison to the control, one gigas (EMS 0.2%) demonstrated 10 days of early flowering (Bogawar et. al. 2017).

Physical mutagen (gamma rays at 300 and 400 Gy doses) and chemical mutagen (ethyl-methane sulphonate 0.5 percent) treatments were used to mutagenize the seeds of three desi varieties of Chickpea released from Pantnagar. M1 generation showed gradual decrease in germination with increase in mutagen strength in addition to this, combination treatments caused more biological damage than individual mutagen treatment. Except for two agronomic traits, number of primary branches per plant and pod length, variation for variety demonstrated considerable differences in M2 generation..For eight traits, including yield per plant, all types of mutagenic treatments and variety treatment variance were significant (Dinkar et. al.,2020). Chickpea secondary branch number grew significantly in both the 300 Gy alone and the combination treatment with 0.5 EMS treatments. For several traits, the genotypic response was variable at different mutagenic levels.Although none of the genotypes outperformed the control for yield per plant at all of the treatment levels, one genotype, PG114, showed a substantial improvement in yield component trait pods per plant at 300 Gy + 0.5 percent EMS (Dinkar et. al.,2020).

M2 generation showed a complete positive trend of shift as a result of EMS treatment to mungbean, with lower and moderate doses of the mutagens increasing the mean number of seeds per pod and 100-seed weight, whereas M3 generation showed a complete positive trend of shift as a result of EMS treatment to mungbean. By increasing the quantity of seeds per pod and seed size, long pod and bold seeded mutants can be employed to increase yield potential The genotypic coefficient of variation, heritability, and genetic advancement in the treated population increased considerably for all of these variables, showing that mutagen-induced variability has a significant potential to improve the mungbean crop (Wani et. al. 2017).

When compared to gamma rays and combo therapies, EMS was found to be more successful at causing mutations. In this way, gamma rays were the least effective. The reaction to mutagenic efficacy was higher in the var. pusa-372 than in the var. Pusa-212 among the two Chickpea varieties (Wani 2009).

Conclusion:

From the above discussion regarding mutagens EMS (Ethyl Methane Sulphonate) is a effective chemical mutagen for the improvement of pulse crops like Chickpea, mungbean, urdbean etc. these improvement may be in the quantity or the quality of the crop.

The effect of EMS in the specified amount of dose is may be useful for the improvement of legume crops varieties and can be use as a best tool for mutational breeding to fulfil the food demand of country and having an economical value.

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Case Studies in Kidney Stone Herbal Treatment

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Abstract

The efficacy and safety of Ayurvedic drugs is a proved one, through clinical experiences, over not only hundreds but thousands of years. However, for global acceptance there is need to assess the efficacy of these drugs through scientific clinical research. A kidney stone, also known as renal calculus, is a solid concretion or crystal aggregation formed in the kidneys from minerals in the urine. If stones grow to sufficient size (usually at least 3 mm or 0.12 in) they can cause blockage of the ureter. Finally it results into renal colic. Herbal treatment was given for twelve days. Clinical follow-up was taken after 3 days, 6 days and 12 days. In all 15 studies were made to understand the efficacy of the treatment.

Keywords: *Case Studies, Kidney Stone, Herbal Treatment.*

Introduction:

During the past two decades, the cost for the development of novel drugs has tremendously increased. In parallel, the number of novel drug candidates with acceptable toxicity is decreasing. Therefore, pharmaceutical companies focused their attention on novel technologies such as genomic, bioinformatic methods and the development of macromolecular drugs (Simon, 2008; Deverka et al, 2010; Allerheiligen, 2010). The availability of sophisticated therapies developed by high-tech medical and pharmaceutical research in industrialized countries will be more and more restricted to rich elites. On the other hand, traditional medicines have been developed in almost all cultures worldwide. As a consequence, two-thirds of the world population with insufficient access to modern drugs still relies on natural medicines (Efferth, 2011).

Routine of drug development involves a synthesis of bioactive compounds (taking clues either from alternative systems or ethnobotany) and their preclinical (animal experimentation) and clinical trials before bringing the medicine in market. This is a time consuming as well as tremendously costly method. However, in the eyes of traditional healers and also researchers working in the field of ethnobotany, traditional medicines have been applied for hundreds or thousands of years in patients. Therefore, it is not obvious why the activity of natural medicines should be first tested in cell lines in-vitro or in mouse experiments in-vivo.

Uses of crude drug in treatment are almost unacceptable to the modern society. Modern society thinks that to give an 'Herbal Tea' to a patient is unethical, only because they culturally do not recognize the value of popular tradition. Best example of this mentality is the failure of herbal drug programme in Brazil. In 1970s a programme was started in Brazil to introduce the herbal preparation into primary health service. In-spite of wonderful results the programme was stopped for unknown reasons (Elisabetsky and Posey, 1994).

There has been a gradual increase in use of alternative therapy worldwide. A survey released in May 2004 by the National Center for Complementary and Alternative Medicine focused on who used complementary and alternative medicines (CAM), what was used, and why it was used. The survey was limited to adults living in the United States. According to this survey, herbal therapy, or use of natural products other than vitamins and minerals, was the most commonly used CAM therapy (18.9%) when everything else proved to be ineffective (Mwangi and Gitonga, 2014). In the United Kingdom, it is estimated that in 1996 alone, at least 72 million pounds was spent on alternative therapies (licensed herbal medicine, homeopathic remedies and essential oils for aromatherapy). Herbal remedies are very common in Europe. In Germany, herbal medications are dispensed by apothecaries (e.g., Apotheke). Prescription drugs are sold alongside essential oils, herbal extracts, or herbal teas. Herbal remedies are seen by some as a treatment to be preferred to pure medical compounds regulated as supplements, same case with the US (Goldman, 2001). In USA approximately 40% of the annual expenditure on medicine can be attributed to sales of herbal remedies directly to the public and other naturopathic treatments (Barnes, 2002). However, in India selling the traditional drugs or practicing the local traditional health system has no legal acceptance.

In case of Ayurveda people are now actively conducting clinical trials to establish the authenticity of Ayurvedic medicines. In fact, Ayurveda has been practiced in India since ages and has stood the test of time. The efficacy and safety of Ayurvedic drugs is a proved one through clinical experiences over not only hundreds but thousands of years. However, for global acceptance there is need to assess the efficacy of these drugs through scientific clinical research.

A kidney stone, also known as renal calculus, is a solid concretion or crystal aggregation formed in the kidneys from minerals in the urine. Kidney stones typically leave the body by passage in the urine stream, and

many stones are formed and passed without causing symptoms. If stones grow to sufficient size (usually at least 3 mm or 0.12 in) they can cause blockage of the ureter. Blockage of the ureter causes decreased kidney function and dilation of the kidney. This leads to pain in the flank or lower back and often radiating to the groin or genitals. This pain is often known as renal colic. It is commonly accompanied by urinary urgency, restlessness, hematuria, sweating, nausea, and vomiting. Other associated symptoms include: fever, blood in the urine, pus in the urine, and painful urination. Urinary stones are typically classified by their location in the kidney (nephrolithiasis), ureter (ureterolithiasis), bladder (cystolithiasis), or by their chemical composition (calcium-containing, struvite, uric acid or other compounds). Calcium (calcium oxalate) is one of the most common types of component in human kidney stones. Vegetarians tend to have higher levels of citrate excretion and low risk of stone formation (Johri et al., 2010). About 80% of those with kidney stones are men. For stones pain control is usually the first measure. More severe cases may require procedures, e.g. extracorporeal shock wave lithotripsy and percutaneous nephrolithotomy.

Methodology:

In case of Ayurveda people are now actively conducting clinical trials to establish the authenticity of Ayurvedic medicines. In fact, Ayurveda has been practiced in India since ages and has stood the test of time. The efficacy and safety of Ayurvedic drugs is a proved one, through clinical experiences over not only hundreds but thousands of years. However, for global acceptance there is need to assess the efficacy of these drugs through scientific clinical research.

For case studies selection of disease was based on two important criteria-

1) The disease should be non-infectious or is the result of changed life style (life style diseases).
2) It was strictly avoided to select the critical diseases like cancer or those which need surgery.

Consent form was prepared with the help of registered medical practitioner.

Only those patients were considered who were willing to give the consent without any condition or hesitation. Before taking consent the proper counseling of concerned person was done regarding the disease for which he/she was taking the treatment and need to keep record at particular time intervals.

Consent form was also prepared for medicinemen. The most important fact mentioned in the consent form was that his formulations will not be disclosed to any other person who can take the disadvantage of his knowledge and secondly he will not face any medicolegal situation.

Case studies were undertaken to examine and establish the credibility of ethnic health practices. Collaboration was made with registered medical practitioner Dr. S. G. Kadu (M. B. B. S., Ex Medical Officer, Regi. No. 1080) and local vaidus. To make it very clear I would like to state that these are not clinical trials but is simply scientific case follow-up with the consent of patient and vaidu.

In case studies the diagnosis made by medicineman was either confirmed by registered medical practitioner or the patient started traditional/herbal treatment after the ailment was diagnosed by the doctor. All are non-comparative studies (no comparison parallel to allopathic medicine). Original papers of case studies signed by registered medical practitioner and local herbal healer as well as consent forms signed by patients are retained with author.

Study Treatment:

Fully expanded leaf of *Bryophyllum calycinum* Salisb. and fruits of *Piper nigrum* L. was given to eat on empty stomach. After half an hour, 50 ml of decoction, prepared from roots of *Hemidesmus indicus* (L.) Schult. and fruits of *Tribulus terrestris* L., was given. Treatment was repeated twice/day till relief upto twelve days. Clinical follow-up was taken after 3 days, 6 days and 12 days. In all 15 studies were made to understand the efficacy of the treatment.

Result and Discussion:

It is mainly confirmed by acute stomach-pain over the kidney angle in abdomen, difficulty in passing urine and painful urination. In all 15 case studies have been recorded. The age of the test group varies from 20 Yrs. to 78 Yrs. Period of suffering varies from 1- 4 Yrs. In all cases 6-7 days of treatment resulted in 90% relief irrespective of the period of suffering and age. In one case even sonography reports were procured. In Ayurveda, *Bryophyllum pinnatum* (Lam.) Oken (Syn. *B. calycinum* Salisb.) known as 'Pashanbhed' is used to treat the kidney stone. In Warud tahsil also traditional healers use the same plant. This shows intimate relationship between ethnomedicine and the ancient life science i. e. Ayurveda in India (Sharma, 1982).

In traditional practices whole plant or its extract or polyherbal extract are used. It is the synergistic effect of phytoconstituents in a plant which exhibit their action. It is frequently observed that single medicinal

herb or complex herbal mixture show the expected bioactivity, but during fractionation with bioactively-guided isolation of natural products the activity gets weaker and finally can even be lost. An interesting aspect in this context is that one compound of an herbal mixture may activate some proteins of a signal transduction pathway of interest, while another constituent of the mixture may activate the other proteins of the same signaling cascade. Hence the reciprocal supplementation leads to full stimulation of a signaling route and thereby therapeutic effects (Efferth, 2011). Hence there is a need to adapt traditional treatments after more scientific validation.

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An Investigation of Plant Growth and Nutrient Content by the Effect of Metal Ion and Their Complexes in Cassia Tora (Tarota) Plant

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Abstract

*In the present study Cassia Torawere taken as experimental plant in order to study effect of heavy metals and their complexes of (1S- cis)- 4- (3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine on to improve the yield of economically important plant.*Cassia tora *Linn. (Family: Leguminosae) is well known plant widely distributed in India. Different parts of the plant (Leaves, seed, and root) are reputed for their medicinal value.The seeds were immersed in Mg (II), ions, ligand and its complexes to study the germination and growth pattern and certain physiological processes. Effect of ligand, metal ion and complex solution on growth, determination of % of nitrogen, proteins and chlorophyll in the leaves of plants were studied. The data harvested indicates increased germinations in all seed treatments. The changes in growth pattern of roots length and shoots length are observed in the experimental plants. However, chlorophyll content was found to be higher in plant species. The percentage of nitrogen and proteins were found affected in the leaves of Tarota plant treated with Sartraline, complex and metal Mg(II). Nitrogen and protein contents are found higher in the treated plants as compared to control.*

Key words –Sartraline, Mg (II), Plant, Chlorophyll, Nitrogen, Protein.

Introduction:

India is virtually a herbarium of the world. In India, we are using plants and herbs as the basic source of medicine because we are rich in them. The plant physiologists not only to supply basic information regarding how plants grow and develop but also to undertake research program to increase yield of plant products. Seed germination behavior is important for horticulture and agriculture.[1,2]

Metals are acting a beneficial role for plant growth, development, and productivity at an optimum concentration in the form of the essential micronutrient[3]. To grow and complete the life cycle plants use the essential micronutrients[4]. The plant takes these essential heavy metals like iron, zinc, copper, and manganese from the soil due to concentration gradients and selective uptake of these metals[5]. These ions enthusiastically affected the function of many enzymes and cellular metabolism. These metals also play a prominent role in the synthesis of protein, nucleic acids, photosynthetic pigment, and it also take part in the structural and functional integrity of cell membranes[6].Agricultural scientists realize that crop plants grow in production to the amounts of various nutrients present in soils. Today the application of various salts to soils is a basic future of agricultural practice. With the application of these and other fertilizer to soils, the large crop yields obtained in developing. In modern agricultural practice, various chemicals in solution or aqueous suspension are sprayed on the crop plants with in the object of accelerating and modifying the plant growth and their development.Manganese (Mn) is an essential plant mineral nutrient, playing a key role in several physiological processes, particularly photosynthesis.

Some of heavy metals (Fe, Cu and Zn) are essential for plants[7].Oxines and Gibberlines are the growth promoting harmones.[8-10] Very dilute solution of these growths promoting hormone solutions, if sprayed over the plant, chlorophyll synthesis is accelerated and consequently vegetative growth has been observed. Experimental results indicate that, if the hormonal solution sprayed over crop plants, the crop yield increases to a considerable extent.

Since *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine*has intense biological activities,antidepressant, selective competitive inhibitor. Sertralineinhibits the activity of the enzymes and since no work is reported on the biological application of binary complexes of Mg (II), with *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine* and comparing with pure ligand, metal and control solution (double distilled water) to study the effect of complex, metal, ligand over control solution on germination, survival seedlings height etc, on *Tarota* plant in order to make suggestion whether complex, metal and ligands can be used as a plant growth regulator.

Also, biological analysis of chlorophyll contents and percentage of nitrogen and proteins in the leaves of leafy vegetables are carried out at room temperature.

Material And Experimental Methods:

The solution of Mg (II)in the form of nitrate and *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine*of the concentration of 0.01 M was prepared in double distilled water. The applications of complex, metal, ligand solution is studied by dissolving it in proper solvent at 3.60, 7.00 and

10.5 pH and at constant ionic strength of 0.01 M potassium nitrate solution. Fertilized soil was collected from agricultural land. It was then ground and filtered. This soil was filled in two wooden trays and tray was moistened with water. Sowing of seeds was done in the soil after one hour.Passioura J.B.[11] has studied on soil structure and plant growth. Many soils contain continuous macrospores that provided niches for the roots to grow in. The presence of such macrospores increases the extent of the root system, Soil structure not only affect the ability of root to grow and to supply the leaves with water and nutrients it also induces them to send hormonal signals that slow the growth of shoot.

Experiments Performed:

In general practice various chemicals are used in agriculture as an ingredient of various pesticides, insecticides, fertilizers etc., to improve the crop yield. Amongst several economical important plants *Tarota* is selected as a plant system.

1. 100 healthy seeds of *Tarota* were taken 3.5 and 7.00 pH for about two hours. These seeds soaked were taken out of each solution and sowed in the wooden tray in a row, the wooden tray was kept under atmospheric pressure at room temperature.
2. Effect of ligand, metal ion, complex solution on growth of Tarota (*Cassia tora) species*plants was studied at different pH (3.5 and 7.00).
3. Effect of ligand, metal Mg (II), complex on percentage of Nitrogen, Proteins and Chlorophyll in the leave of *Cassia tora* plants were studied.
4. Chlorophyll content in fresh leaves were determined by spectrophotometric method given by Jahagirdar[12].

Parameters:

Plant growth is decided on the basis of parameter such as percentage of germination, survival, seedling height, shoot length; root length and thickness of young leaf having high values compare to control systems. Germination was noted after 3 days and survival was noted after 10 days. After noting the survival of plant, they were taken out of soil. The seedling height and thickness of leaves of survived *Tarota*plants were measured.

Table 1.1-Effect of Ligand, Metal ion and Complex on Germination, Survival, Seedling height etc. on *Cassia tora*Test System.

Test System	Effect of	pH	Parameters						
			%Germination after 2&1/2 days	% Survival after 10 days	Seedling height (cm)	Root length (cm)	Shoot length (cm)	Root / Shoot	**Width of young leaf (cm)**
***Tarota*Test System**	Water (Control)	3.5	60.00	60.00	23.072	8.621	14.450	0.590	**1.65**
		7.0	66.66	66.66	23.62	8.84	14.78	0.5981	**1.620**
	Ligand	3.5	73.33	73.33	22.984	8.718	14.603	0.5970	**1.761**
		7.0	80.00	86.66	25.24	9.14	16.08	0.5440	**1.841**
	Complex	3.5	60.00	60.00	23.614	8.712	14.702	0.5925	**1.421**
		7.0	73.33	80.00	24.49	9.07	15.41	0.5885	**1.490**
	Metal	3.5	80.00	73.33	23.881	8.804	15.077	0.584	**1.850**
		7.0	**30.00**	**93.33**	**27.71**	**8.22**	**14.44**	**0.5692**	**1.843**

Table 1.2- Estimation of Chlorophyll for ***Cassia tora***Plants System

Sr.No.	Treatment	Leaves of plant	Total Chlorophyll gm/Lit.x10^{-3}	Chlorophyll 'a' gm/lit. x 10^{-3}	Chlorophyll 'b' gm/lit. x 10^{-3}
1	Control	*Tarota*	5.125	3.714	**1.754**
2	Ligand		6.725	5.921	**2.028**
3	Complex		6.873	4.659	**2.316**
4	**Metal**		**7.413**	**6.354**	**2.292**

Table 1.3 - Estimate of Total Nitrogen and Proteins in Leaf Powder of***Cassia tora***

Sr. No	Plant	Treatment	% Element			% Protein
			Nitrogen	Carbon	Hydrogen	
1		Control	7.35	38.18	6.85	**38.657**

2	*Tarota*	Ligand	7.87	37.23	6.78	**39.213**
3		Complex	8.11	35.54	6.67	**39.443**
4		**Metal**	**8.32**	**33.76**	**6.39**	**39.574**

Results And Discussion:

Germination starts when the seed shows emergence phase of growth, which begins, with penetration of embryo from the seed coat and end with the development of root and shoot system. Elongation of shoot axis follows emergence of radical.

The rate and extent of elongation is subjected to the variety of controls, including nutrition, hormones and environmental factors. Though the root and shoot development start within a fraction of time but the further developments may vary according to the nutrients required for the development of root length and length shoot independently. Therefore, root length and shoot length differs. The observation table 1.1 clearly indicates that average root length in *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine*, complex, Mg (II), at all pH increases over control.

Chlorophyll control / chlorophyll pigment were found affected in *Tarota*plant by the treatments. Total chlorophyll was found to be higher in *Tarota*.

Percentage of nitrogen and proteins were found affected in leaves of *Tarota* by the treatment of *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine*, complex, Mg (II). It is observed that percentage of nitrogen and protein are higher than that of control.

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Extraction of Natural Dyes From *Nerium Oleander* L.Flowers For Cotton And Silk Colouration

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Abstract:
Alarming environmental issues posed by largescale use of synthetic dyes in textile industries made researchers to focus on the development of safer alternatives i.e. natural dyes. In present investigation, aqueous, ethanoland alcohol extracts of flowers of Nerium oleanderused for dyeing cotton and silk.Protocol adopted were – without mordanting and with two different chemical mordant i.e. Ferrous ammonium sulphate and Copper sulphate. Aqueous extract shows lighter color shade than the ethanolic and alcoholic extracts. All extracts with mordant ferrous ammonium sulphate shows darker color than Copper sulphate. In dyeing without mordant procedure, dark and lightest colors obtained were Grey beige and Thunder respectively. It was found that mordant ferrrous ammonium sulphate exhibit darker coloration on cotton than the Copper sulphate. Dark olive and uniform were the darkest shades obtained by dyeing with mordant ferrous ammonium sulphate. While silk exhibitthree lighter coloration i.e. Surfmist, Squirrel grey and Light pewter by dyeing with mordant Copper sulphate.
Keywords: *Natural dyes, Nerium oleander, Ferrous ammonium sulphate, Copper sulphate, mordants.*

Introduction:

Nature is full of wonderful colours, which enriched our life. These colors are utilize for dyeing purposes. Colour variability and promising shades can be obtained by using synthetic dyes, they posed devastating effects in the form of pollution, health hazards, toxicity and high saturation rate in environment. As hazards of synthetic dyes are no longer unknown, evaluation of natural resources available for their possible dye yielding potential is gaining more attention in recent years.

The word "Natural dyes" comprises all those colorants that can be obtained from plant, animal or mineral resources without any chemical processing. As the food, pharmaceutical, cosmetic as well as the textile coloration industry increased demand for these dyes during the last decade, use of natural dyes has gained more importance. Certain natural dyes are known to have mutagenic effects e.g., safflower yellow and elderberry color; while some like carmine, can cause serious respiratory consequences like asthma. But yet most of them are safe, mostly eco-friendly, biodegradable,less toxic, and less allergenic as compared to synthetic dyes. In the beginning, there were dyes derived only from natural sources which were used in the coloration of textiles, food, drugs, cosmetics and also for coloration of paper leather, shoe polish, wood, cane, candles in smaller quantities (Han and Yang, 2005; Hill, 1997; Ali *et al.,* 2006; Gulrajani, 2001).

Even though natural dyes have so many advantages over synthetic dyes, non-availability in their color shades and non-efficient applicationprocedure limiting their use as a most promising dye resources. *Nerium oleander* (Syn. *Neriumindicum*) is a large, spreading, evergreen shrub with whorled branches and leaves. Flowers are red, pink or rosy colored born in terminal cymes (Dhore,2002). Present investigation is an attempt to evaluate dye yielding potential of flowers of *Nerium oleander* (red variant) for cotton and silk coloration.

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Materials and Methods:

Flowers of *Nerium oleander* L. were collected from local area of Pawan Nagar, Amravati and were identifiedby using standard flora(Dhore, 2002). Fresh flower petals of *Nerium oleander* (Red variant) were used for dye extraction and dyeing process (Figure 1).Two different fabric materials -Tasar silk and cotton fabric were bought from Amravatimarket.2% Ferrous Ammonium sulphate and 5% Copper sulphate were used as chemical mordents.Three different solvents - water, ethanol and alcohol were used for dye extraction.50 gm of fresh flowers petals of *Nerium oleander* were crushed in mortar and pestle with 100 ml. of solvent. The solution was filtered through muslin cloth to obtain dye.

For dyeing without mordanting procedure,cotton and silk fabrics were immersed directly in a dye bath solution containing dye. After dyeing, the dyed material was dried at room temperature.For dyeing with mordanting procedure,Cotton and silk were first immersed in beaker containing either 2% Ferrous Ammonium Sulpahte or 5% Copper Sulphate for 3 hours and then they were further immersed in a dye bath solution containing dye. After dyeing, the dyed material was dried at room temperature.For washing and shade analysis, dyed fabrics were washed with tap water and finally dried in air at room temperature. Pantone shade color charts system was used for matching the naturalcolorants shade.

Results and Discussions

Different shades of colors obtained from Aqueous, alcoholic and ethanolic extract of *Nerium oleander* with and without use of chemical mordantshas been tabulated in Table I and Table II (Figure 2) with their Panton shade number.

About six different color shades obtained by direct treatment of cotton and silk fabrics in dye solution. Among those darkest shade exhibited by alcoholic extract on cotton (Grey beige, Panton paint shade no. 5773) while most lighter color exhibited by alcoholic extract on silk(Thunder, Panton paint shade no. 5645). All other extracts exhibited different intermediate colors on cotton and silk fibers.

Table I: Effect of aqueous, alcoholic and ethanolic extract of *Nerium oleander*on cotton and silk without mordant.

Sr. No.	Materials	Extract	Color shade (Panton paints color chart)	Color
1	Cotton	Aqueous	5845	Dark beige
2	Silk	Aqueous	5527	Edge comb grey
3	Cotton	Alcoholic	5773	Grey beige
4	Silk	Alcoholic	5645	Thunder
5	Cotton	Ethanolic	451	Himalaya
6	Silk	Ethanolic	452	Paper bark

About twelve different color shades were obtained from aqueous, alcoholic and ethanolic extracts of *Nerium oleander* with mordantsFerrous ammonium sulphate (FAS)and Copper sulphate were tabulated in Table II (Figure 3).

Ethanolic and alcoholic extract with mordant Ferrous ammonium sulphate found to exhibit Dark olive (Panton paint shade no.418) and Uniform (Panton paint shade no. 5615) respectively on cotton which are the darkest shades while most lighter shades exhibited by silk fiber dyed by ethanolic extract with Copper sulphate (Surfmist, Panton paint shade no. 4535), alcoholic extract with Copper sulphate (Squirrel grey, Panton paint shade no. 442) and aqueous extract with Copper sulphate (Light pewter, Panton paint shade no. 5517).

Table II: Effect of aqueous, alcoholic and ethanolic extract of *Nerium oleander* on cotton and silk with mordant.

Sr. No.	Materials	Mordant	Extract	Color shade (Panton Paints color chart)	Color
1	Cotton	FAS	Aqueous	448	Best bronze
2	Silk	FAS	Aqueous	416	Gulf
3	Cotton	Copper sulphate	Aqueous	5797	Dark ivory
4	Silk	Copper sulphate	Aqueous	5517	Light pewter
5	Cotton	FAS	Alcoholic	5615	Uniform
6	Silk	FAS	Alcoholic	443	Shale grey
7	Cotton	Copper sulphate	Alcoholic	5783	Moss
8	Silk	Copper sulphate	Alcoholic	442	Squirrel grey
9	Cotton	FAS	Ethanolic	418	Dark olive
10	Silk	FAS	Ethanolic	429	Harbor grey
11	Cotton	Copper sulphate	Ethanolic	15-1218	Flaxen
12	Silk	Copper sulphate	Ethanolic	4535	Surfmist

Bhuyan and Saikia (2005) evaluated dye yielding potential of different parts of five plant species *Rubiacordifolia, Morindaangustifolia, Tectonagrandis, Mimusopselengi* and *Terminalia arjuna*and concluded that dyes obtained from native plants might be alternative sources to synthetic dyes for dyeing of natural silk and cotton. Parthsarthi and Lokesh (2015) tested efficiency of dye extracted fromdried and semidried sample (without calyx) of*Spathodeacampanulata* and found that cotton fabricdyed with water extract was found to have bestresults and can be used for textile application.

The color variability from camel brown to dark chocolate brown was obtain by Vankar*et al.* (2009) when cotton, silk and wool yarn fabrics were dyed with *Garcinia mangostana*pericarp after premordantaing with metal salts of Al, Sn, Fe, Cr and Cu. Again Vankar*et al.* (2009) proposed that huge amounts of

Tagetuserecta(marigold) flowers offered in Indian temples generate very large waste. They suggested use of this floral waste as a source of natural dye for cotton, silk and wool coloration on industrial scale.

Figure 1 : Plant Material

Nerium oleander

Figure 2 : Notable color variation obtained by using dye extracted from *Nerium oleander*

P. S. No. – Panton Paint Shade Number

Singh *et al.* (2004) even reported antimicrobial properties of natural dyes obtained from five plants *Acacia catechu, Kerrialacca, Quercusinfectoria, Rubiacordifolia*and *Rumexmaritimus*against common pathogens *Escherichia coli, Bacillus subtilis, Klebsiellapneumoniae, Proteusvulgaris* and *Pseudomonas aeruginosa.*They found that*Quercusinfectoria*dye was most effective and showed maximum zone of inhibition.

Many workers worked on applications of plant based dyes for fabric and textile coloration. Ali *et al.* (2006) Eucalyptus bark, Sachan and Kapoor (2007) from turmeric rhizome (*Curcuma longa*), Nilani*et al.* (2008) from marigold (*Tageteserecta*), Kulkarni *et al.* (2011) from Pomegranate (*Punicagranatum*) Peel,Kamel*et al.*(2009) from *Crocus sativus*, Mongkholrattanasit*et al.*(2010) from Eucalyptus leaves, Shingane in *Bombaxceiba* (2015).

Conclusions

In aqueous extract of *Neriumoleander* there is lighter color shade than the ethanolic and alcoholic extracts on cotton and silk fiber. On cotton dark color obtained than silk fiber. Six color shades obtained when cotton and silk fabrics in dye solution out of which Grey beige was the darkest one while Thunderwas the lighter shade. There are twelve different color shades obtained in dyeing with mordant treatment. All extracts with mordantFerrous ammonium sulphate showed darker color than Copper sulphate. Dark olive and affix uniform to fabrics the dark shades obtained by dyeing with mordant Ferrous ammonium sulphate. While silk exhibit three lighter colorations i.e. Surfmist, Squirrel grey and Light pewter by dyeing with mordant Copper sulphate.

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Inventory of Scorpion Fauna from Akot Tehsil of Akola District, Maharashtra, India

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Abstract:

The present paper deals with the inventory of the scorpion fauna of Akot tehsil of Akola district, Maharashtra, India. Two species of scorpions were recorded from different microhabitats. Present information provides a baseline biological data for further demographic and ecological studies and stresses the need for impact assessment prior to undertaking developmental projects in region, since Arachnids exhibit restricted movements and are vulnerable to habitat modification.

Key words:*Akola, Akot, India, Inventory, Maharashtra, Scorpion.*

Introduction

Scorpions are predatory arachnids of the order Scorpiones. They have eight legs, and are easily recognized by a pair of grasping pincers and a narrow, segmented tail, often carried in a characteristic forward curve over the back and always ending with a stinger. The evolutionary history of scorpions goes back 435 million years. They mainly live in deserts but have adapted to a wide range of environmental conditions, and can be found on all continents except Antarctica. There are over 2,500 described species, with 22 extant (living) families recognized to date. Their taxonomy is being revised to account for 21st-century genomic studies (Ahmadi*et al.,* 2020; Anderson *et al.,* 2021).

Scorpions primarily prey on insects and other invertebrates, but some species hunt vertebrates. They use their pincers to restrain and kill prey, or to prevent their own predation. The venomous sting is used for offense and defense. During courtship, the male and female grasp each other's pincers and dance while he tries to move her onto his sperm packet. All known species give live birth and the female cares for the young as their exoskeletons harden, transporting them on her back. The exoskeleton contains fluorescent chemicals and glows under ultraviolet light (Feola. *et al.,* 2020).

The vast majority of species do not seriously threaten humans, and healthy adults usually do not need medical treatment after a sting. About 25 species have venom capable of killing a human, which happens frequently in the parts of the world where they live, primarily where access to medical treatment is unlikely.Scorpions appear in art, folklore, mythology, and commercial brands. Scorpion motifs are woven into kilim carpets for protection from their sting. Scorpius is the name of a constellation; the corresponding astrological sign is Scorpio. A classical myth about Scorpius tells how the giant scorpion and its enemy Orion became constellations on opposite sides of the sky (Howard. *et al.,* 2019).

In this concern, a present study is an approach to understand the diversity of Scorpion Fauna from Akot Tehsil of Akola District, Maharashtra, India

Materials and Methods

The Akot tehsil of Akola district is one of the most diversified regions in Maharashtra State of India, with respect to biodiversity. Its healthy climate, mountainous terrain, rugged configuration, and sudden fall in elevation are phenomenal. Akot is a city in the Vidarbha Region and a municipal council in Akola district in the Indian state of Maharashtra. It is located between 21.1°N 77.06°E. The climatic condition of this district is characterized by a hot summer, well-distributed rainfall during the south-west monsoon season, and generally dry weather during the rest of the year (Akola Gazetteer,2022). The survey was conducted to prepare an inventory of Scorpion Fauna from Akot Tehsil of Akola District, Maharashtra, India. The observed scorpion species were identified on the spot using published keys (Tikader and Bastawade 1983);

Results and Discussion

The study was conducted during 2021 in Akot tehsil of Akola district, Maharashtra, India. Study reveals the presence of two scorpion species. *Heterometrusphipsoni* (Pocock, 1893), the forest scorpions, is a species of scorpions belonging to the family Scorpionidae. *Hottentottapachyurus* (Fabricius, 1798), the Indian scorpion is a species of scorpion of the family Buthidae.Heterometrusphipsoni (Pocock, 1893) are lapidicolous scorpions found under stones. Hottentottapachyurus (Pocock, 1897) are non-burrowing species and mostly found only under tree bark.

Warburg (1997) studied biogeographic and demographic changes in the distribution and abundance of scorpions inhabiting the Mediterranean region in northern Israel. Warburg (2000) studied intra- and inter-specific cohabitation of scorpions in the field and the effect of density, food, and shelter on their interactions. Raz*et al.* (2009) have studied biodiversity, species abundance, inter-slope divergence and other aspects of scorpion fauna of Mt. Carmel, Israel. Pande*et al.*, (2012) studied the diversity of scorpion fauna of Saswad-Jejuri, Pune District, Maharashtra, India. Thus, scorpion diversity, distribution, abundance as well as other related aspects of scorpion ecology are well studied elsewhere. As the study area is earmarked for development projects such as plantation, beautification, dam construction, urbanization and industrialization that will lead to habitat loss through land use modification.

Detailed studies on scorpion fauna of India including various ecological aspects such as population estimates, diversity, distribution, abundance, biogeographic and demographic changes, microhabitat preferences, etc. are necessary to understand the potential threats to the scorpion fauna and to direct conservation efforts.

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The Effect of Feed Cycling And Ration Level on Compensatory Growth Response in Fresh Water Fish Ctarias Batrchus

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Abstrat:
To investigate the nature of compensatory growth in fish, a 6 week study was performed on fresh water fish claras batsaushus Fishes were starved for 0 (control-lA), 1 (IB), 2 (1C) and 3 (ID, IE & IF) weeks and then re-fed to satiation for 1,2 and 3 weeks. Weekly changes in weight gain, percentage weight gain and specific growth rate were monitored during re-feeding. Although «1 and I/ feeding cycle group (IB) with 5% ration level performed better than '3 and 3* and '2 and 2' feeding cycle groups since all the parameters viz. mean weight gain, percentage weight gain, SGR and FCR values showed an improving trend after re-feeding in this group but it is much less than control group. Final results suggested that growth parameters were significantly different (P<0.05) in case of control group as compared to experimental groups suggesting that starvation followed by subsequent re-feeding did not play a role in more growth of Cyprinus carpio.*
Keywords: *Compensatory growth, Starvation, Specific growth rate Food conversion ratio. Feed cycle.*

Introduction

catch-up growth refers to the unusually fast growth that follows a period of reduced growth resulting from restricted food availability. Compensatory growth is a phase of unusually rapid growth following a period of undcr-nutrition. Compensatory growth is usually accompanied by hyperphagia (an increase in appetite) and sometimes improved growth efficiency. This phenomenon has been reported in a range offish species covering different taxa (Dobson & Holmes, 1984; Russell & Wootton, 1992; Jobling *et al.*, 1994; Kirn & Lovell, 1995; Hayward *et al.*, 1997; Sacther & Jobling.1999; Qian *et at.* ,2000; Wang *et al.* ,2000 and AH *et al.* ,2003).

Present study was designed to investigate the effect of feed cycling/starvation on *C.carpio.* Particular emphasis was laid to understand whether compensatory growth is present or not since it is a way to ameliorate fish growth performance, as in some of the species, compensatory growth is so intense that fish exhibit a higher growth rate than those continuously fed. Moreover, this information can also be utilized in designing the feeding schedules of particular fish in culture operations.

Material And Methods

Fishes were divided into 6 groups having 6 fishes in each group. Feed cycling period and ration level were changed in all the treatments.

Group 1A - (Control group) Fed @ 5% body weight during the whole experimental period.

Group IB - Starved for one week and then re-fed for next week. This feed cycling (alternate starvation periods and feeding periods) continued throughout the period of experiment i.e. 6 weeks. Again the feed was given @ 5% of the body weight.

Group 1C - Initially starved for 2 weeks and then re-fed for next 2 weeks. The feed was provided @ 5% of the body weight.

Group ID- Fasted for first 3 weeks and then re-fed for next 3 weeks. The feed was provided® 3% of the body weight.

Group IE - Fasted for first 3 weeks and then re-fed for next 3 weeks. The feed was provided @ 5% of the body weight.

Croup IF - fasted for first 3 weeks and then re-fed for next 3 weeks. The feed was provided @7% of the body weigh! per day ration level, adjusted weekly.

In all the treatments, diet was given once a day. Groups were .sampled weekly. Three fishes were netted from each group and measured and then were returned to their appropriate groups. The experiment was conducted in duplicate and it continued for six weeks. The left over feed and excreta were removed once a week. The left over feed was collected in already weighed beakers and oven-dried at 105°C aad weighed. The data was statistically analysed to calculate ANOVA with the help of MS, Excel 2003 and SPSS (12.0 version Inc. Chicago, USA) and mean compared by using Duncan's Multiple Range Test (Duncan, 1955).

Results And Discussion

1. Weight gain : Analysis of Table. 1 reveals that at the end of sixth week:
1. The weight gain was observed to be best in group-IA with weight gain of about 0.33±0.02 gm which was signi ficantly different (P<0.05) from all other groups;

2. The weight gain was found to be less in group ID having -0.04±0.01 grn weight gain which was not found to be significantly different (p<0.05) from the value recorded for group 1C, having weight gain of-0.08±0.01 gm.
3.The value of the weight gain showed a decreasing trend from groups IA to ID and again a little increase in group IF, and IF.

Table. 1 Observed values for weight grain, % weight grain, specific growth rate ; and food conversion ratio for groups IA-IF.

Parameters	Weight gain		Percentage weight gain		Specific growth rate	
Weeks/Groups	Week 3	Week 6	Week 3	Week 6	Week 3	Week 6
IA	0.12i0.05"	0.33i0.02"	11.53±0.02'	31.73iO.03"	0.52^.01"	0.64iO.()l"
IB	0.10±0.02[a]	0.26±0.03[b]	10.OOiO.05"	26.00i2.00"	0.42i0.01[b]	0.54*0.01"
1C	-0.05iO.01"	-0.08±0.01[d]	-4.76i0.01[c]	-2.85i0.01[c]	-0.19iO.01"	-0.16iO.01"
ID	-0.24iO.01"	-0.04±0.01[d]	-35.41±0.01[r]	-4.16i0.04°	-1.14±0.01[f]	-0.38i0.01[c]
IB	-0.I8iO.OP	0.05i0.01[c]	-17.82±0.02[C]	4.95i0.05<	-0.81i0.01[c]	-0.07i0.01[d]
IF	-0,!6±0,01[C]	0.05±0.01'	-10.73i0.03[c]	3.35i0.05[d]	-0.52±0.0!°	-0.0710.01"

2. Percentage weight gain (% WG): Analysis of Table. 1 reveals that at the end of sixth week
   1. The percentage weight gain was observed to be best in group IA with percentage weight of about 3! .73 ; 0 03% which was significantly different (P<0.05) from all other groups;
   2. The percentage weight gain was found to be less in group ID having -4.16±0.04% which was not found to be significantly different (P<0.05) from the values recorded for group 1C, having % weight gain of-2.85±0.01 %.
   3. The values of the % weight gain showed a decreasing trend from groups IA to ID and again a little increase in group IF and IF.
3. Specific Growth Rate (SGR): Analysis of Table. 1 reveals that at the end of sixth week:
   1. The specific growth rate was observed to be best in sub-group IA with SGR of about 0.64±0.01% which was significantly different (P<0.05) from all other groups;
   2. The SGR was found to be less in group ID having -0.38i0.01% which was not found to be significantly different (PO.05) from the values recorded for group 1C, having SGR of QO. 16±0.01%.
   3. The value of the SGR showed a decreasing trend from group IA to ID and again a little increase in the group IE and IF.

The results suggested that the growth parameters were found to be significantly different (P<0.05) in case of group IA and was best among all treatments suggesting that starvation followed by subsequent re-feeding did not play a role in the more growth of the fishes. Our observations are in accordance with Schwarz et al. (1985) who have also observed that the controlled groups with constant and regular ration level showed better growth than other groups. The experiment performed showed that compensatory growth does not occur Almost every group undergoing starvation showed the largest weight loss during the first week of starvation as found by Dobson and Holmes (1984) due to gut emptying (Elliott,1972). The rate of weight loss declined in subsequent weeks upon re-feeding there was a moderate increase in the weight due to gut refilling in all the groups, same has been recorded by Quinton and Blake (1990) while studying the effect of feed cycling and ration level on compensatory growth response in rainbow trout, Oncorhynchus mykiss.

A perusal of the Table. 1 reveals that as the experiment progressed, a decline in specific growth rate (SGR) was observed in groups (IB-IF) as compared to control group IA with starvation producing a negative specific growth rate in all the groups. The present observation thus indicates that the length of starvation had a marked effect on SGR. Similar results have been put forth by Furhan et al. (2006) in Cirrhinus mrigala and Muhammcd et al. (2006) in Labeo rohita. Further, The results indicate that common carp was unable to maintain its SGR during re-feeding periods like that of control (lA).Contrary to this however, Van Dijk et al (2005) observed that juvenile roach, Rutilus rutilus was able to fully compensate SGR when transferred to rc-fccding after 21 days of starvation. Similar results have been recorded by AH (1999) for three-spined sticklebacks, Gastrosteus aculeatus.

Data reveals that occurrence of compensatory growth is species specific and depends upon the duration of fasting period in warm water fish species (Xie et al. ,2001). A comparative analysis of all the treatments reveals that' 1 and 1' feeding cycle group with 5% ration level (IB) performed better than rest of the experimental groups and weight gain, % weight gain, SGR and FCR values also showed an improving trend after re-feeding in restricted fish (Table. 1). Such an improving trend cannot be designated as compensatory

gain rather it appears more to be a case of the stunted/restricted fish performing at the level expected for smaller/restricted fish. Thus, it can be safely concluded that compensatory growth does not exist in Cyprinus carpio as data of our present study is also quite convincing for this conclusion.

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Some Wood-Rotting Fungi from Khultabad Tehsil, District Aurangabad (M.S.) India.

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Abstract

Wood rotting fungi are the parasite as well as saprophytic which grow on the living trees, dead trees, wood logs and decay the external and internal structural components which are cellulose, hemicellulose, and lignin. In the present investigation, thirty-seven specimens of macro-fungi were collected from different areas of Khultabad Tehsil, District Aurangabad (M.S.) India, from that twelve specimens were studied. Based on morphological and microscopic characteristics which belong to nine genera and twelve species. It was observed that Auricularia nigricans, Flavodon flavus, Phellinus badius, Pseudofavolus tenuis, Scytinostroma duriusculum, Trametes cingulata, and Truncospora tephropora were most abundantly found while Ganoderma mediosinense, Phellinus allardii, Phellinus gilvus, Pleurotus djamor, and Trametes ellipsospora are rarely observed macro-fungi.

Keywords: *Khultabad, Macro-fungi, Microscopic, Morphological, Saprophytic.*

Introduction

Wood rotting fungi have the ability to decompose wood causing rot, fruiting bodies of macro-fungi grow on living trees, dead trees, and wood logs which comprise 10% of total fungal diversity from which 16–41% have been described to date (Rossman 1994, Mueller et al, 2007). Wood decaying fungi are classified into three groups i.e. brown rot, white rot, and soft rot, wood decay by brown rot fungi is brown and crumbly which degrade via the enzymatic and non-enzymatic system. Cellulase enzymes are secreted by brown rot fungi for degradation, but no lignin-degrading enzyme is involved. White rot fungi associated with hardwood decay show different decaying patterns by secretion of cellulase and lignin-degrading enzyme. According to (Jasalavinch et al. 2000) white rot fungi can utilize all major components of the cell wall including carbohydrates and lignin. Soft rot fungi secrete cellulase enzyme from hyphae which break down cellulose and lower lignin content in wood and create the cavity in the wood cell wall. The injuries to branches, roots and the main trunk of trees allow wood-decaying agents to gain entry through wounds and make the serious loss of wood's mechanical strength. Wood decaying fungi are an important component of the forest ecosystem (Wang et al, 2011).

Studies on Indian wood-rotting fungi were initiated with Europeans' launch of studies in Indian fungi. The first Indian record of its kind could be traced back to the work of (Klotzsch 1832) in his paper on Indian Polyporaceae. (Ranadive et al., 2013) studied eight families, fourteen genera, and twenty species of Aphyllophorales from Pune district. (Chouse and Mali 2020) on the diversity of Aphyllophorales from Latur district, Maharashtra reported thirty-four genera and forty-seven species of wood-rotting fungi. (Gore and Mali 2021) reported seventeen genera and eighteen species of wood-decaying fungi from Paithan Tehsil, Aurangabad district (M.S.) India.

Materials And Methods

In the present investigation, the thirty-seven specimens of wood-rotting macro-fungi were collected 20 to 25 days after heavy rainfall during the year 2014 – 2019 after several intervals from various regions of Khultabad Tehsil, District Aurangabad (M.S.) India. The specimen of Basidiome were collected in brown paper bags, noting the hostname, locality, date of collection, color of the specimen, and type of attachment suggested by Gilbertson and Ryvarden (1986). The morphological and microscopic character was recorded, fresh material from the field and dried material in the laboratory. Macroscopic observations were carried out by using Cosmo Compound Light Microscope under a 10X objective. The freehand thin section cutting of fruiting bodies was done by chopping method with the help of sharp razor blades, stained and studied in 10% KOH, Lactophenol, Cotton Blue, and Melzer's reagent and microscopic observations were made under 40X and 100X Magnification (Olympus CX 41) in the laboratory.

Result And Discussion

Details of the wood rotting fungi collected during present investigation has been described with photo plate 1 as fallows.

***Auricularia nigricans* (Sw.) Birkebak, Looney& Sancher–Garcia.**

Basidiome 5–31 × 4–26 mm, annual, pileate, lossely attached with small tapered stalk, moist dependent, jelly like when fresh and brittle on drying. Upper surface velvety hairy. Margin acute, decurved. Lower fertile surface smooth. Context jelly like when fresh, waxy hard when dry. Basidia cylindrical, hyaline, 3-septate, 39 –

58 × 3.5 –5 µm with 1–3 lateral sterigmata, sterigmata 9–14 × 1.5–11 µm. Spores 13–15 × 4–5µm, cylindrical to allantois, slightly kidney shaped, thin walled, smooth. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′39″N 75˚14′10″E; alt 677m; on the wood logs of *Mangifera indica* L.; 08/09/2016; Vijay Gore (VUG/VPM–360).

***Flavodon flavus* (Klotzsch) Ryvarden**

Basidiome 5–73 × 4–59 mm annual, resupinate to pileate, widely effused reflex. Upper sterile surface concentric zonation, tomentose. Lower fertile surface poroid, lamellate, iripicoid to hynoid, pores 1–2 per mm. Tube up to 3 mm deep. Context up to 2 mm thick. Hyphal system dimitic. Generative hyphae hyaline, thin to slightly thick-walled, septate, branched, 1.4–3 µm wide. Skeletal hyphae thick-walled, branched, 2–6 µm wide. Cystidia occur as skeletal hyphal projection, thick-walled, encrusted at the tip, 11–32 × 6–11µm. Basidia 23 – 28 × 6 – 8 µm, clavate, hyaline, thin-walled, with 4-sterigmata. Spores 5.3–7 × 3–4.5 µm, ellipsoid, smooth, thin–walled, hyaline.

Specimens examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Gadhana; 20˚02′23″N 75˚15′33″E; alt 702m; on the living tree but on dried main trunk *Senna siamea* (Lam.) H.S.Irwin & Barneby; 22/09/2016; Vijay Gore (VUG/VPM–397).

***Ganoderma mediosinense* J.D. Zhao**

Basidiome 87–132 × 52–108 × 3–29 mm annual, pileate, laterally to centrally stipitate, leathery when fresh, corky to woody on drying. Upper sterile surface mostly sulcate, weakly zonate, glabrous. Margin distinct, acute to obtuse. Lower fertile surface poroid round, regular, pores 3–4 per mm. Context up to 19 mm wide, homogenous. Tubes up to 10 mm deep. Stipe 59–79 × 14–26 mm, cylindrical to inflated near pileus, homogenous. Hyphal system trimitic, generative hyphae 1.4–3 µm wide, clamped, septate, thin-walled, hyaline. Skeletal hyphae 2–5 µm wide, thick-walled. Binding hyphae 1.4–3 µm wide, thin, hyaline. Basidia clavate, 4-sterigmate, clamped at base. Spores 8–10 × 5–6 µm, ovoid to ellipsoid, exospore smooth and hyaline, endospore distinctly echinulate. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′19″N 75˚13′48″E; alt 718m; on the wood logs of *Senna siamea* (Lam.) H.S.Irwin & Barneby; 08/09/2016; Vijay Gore (VUG/VPM–358).

***Phellinus allardii* (Bres.) S. Ahmad**

Basidiome 72 × 106 × 2–18 mm, perennial, resupinate to pileate. heavy when fresh, corky hard on drying, broadly attached and elongated, frequently sub-resupinate. Upper sterile surface narrowly sulcate. Margin fertile, sharp, undulating, velvety. Lower fertile surface poroid, round, pores 5–8 per mm. Context very thin, sometimes almost absent. Tubes up to 3 mm deep. Hyphal system dimitic, generative hyphae 2–3 µm wide, simple septate, smooth, hyaline. Skeletal hyphae 3–3.5 µm wide, thick-walled, smooth, hyaline. Basidia 11–15 × 5–6 µm, clavate, 4-sterigmate, septate at base. Spores 4.5–6 × 3–4 µm, broadly ellipsoid to subglobose, thick-walled, smooth. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′20″N 75˚13′48″E; alt 719m; on the living tree but on dried main trunk *Senna siamea* (Lam.) H.S.Irwin & Barneby; 07/11/2019; Vijay Gore (VUG/VPM–771).

***Phellinus badius* (Cooke) G. Cunn.**

Basidiome 34–109 × 22–71 × 2–28 mm, perennial, sessile, semicircular, easily detachable from the host. Upper sterile surface velvety. Margin obtuse, sterile. Lower surface poroid, pores 4– 7 per mm, thick-walled. Context up to 22 mm thick, corky when fresh, hard on drying. Tube up to 4 mm deep. Hyphal system dimitic, generative hyphae hyaline, septate, branched, 3.5–4 µm wide. Skeletal hyphae thick-walled, 3.5–5 µm wide. hymenial setae absent. Basidia broadly clavate 10.5–14 × 5.5–7 µm, 4–sterigmate. Spores 6–7.5 × 5–6.5 µm, ellipsoid to sub-globose. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′19″N 75˚13′47″E; alt 722m; on the living tree on main trunk *Senna siamea* (Lam.) H.S.Irwin & Barneby; 07/11/2019; Vijay Gore (VUG/VPM–769).

***Phellinus gilvus* (Schwein.) Pat.**

Basidiome 22–54 × 18–37 × 4–11 mm, annual to perennial, imbricate, sessile to effuse reflexed, corky to brittle on drying. Upper sterile surface weakly zonate, finely velutinate, glabrous, strigose to radiate-striate. Margin acute, lobed. Lower surface poroid, round and regular, smooth, shiny, pores 6–9 per mm. Context homogenous, up to 7 mm thick. Tube up to 4 mm deep. Hyphal system dimitic, generative hyphae septate, branched, 2.4–4 µ m wide. Skeletal hyphae thick-walled 3.5–5 µm. Hymenial setae thick-walled, 25–35 × 6–10 µm. Basidia 5.8–11 × 4.4–6 µm, clavate, hyaline with 4-sterigmata. Spores sub-globose to ellipsoid, 4.5–6 × 2.4–3.5 µm, thin-walled, smooth. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Varegoan; 20˚05′01″N 75˚21′40″E; alt 655m; on the dried standing stump at main trunk *Azadirachta indica* A.Juss.; 21/08/2016; Vijay Gore (VUG/VPM–272).

***Pleurotus djamor* (Rumph. ex Fr.) Boedijn**

Basidiome 15– 39 × 12–31 mm, annual, spathulate to flabelliform, convex or depressed towards the base. Upper sterile surface finely tomentose towards the base, finely striate. Margin at first involute, often incised. Lamellae are deeply decurrent, sometimes with yellowish cream or pale red tints, narrow, moderately crowded. Stipe absent or reduced and then lateral or eccentric, 1–5 × 3–4 mm, cylindrical, solid. Context thin, 1–4 mm thick, soft, fleshy. Hyphal system dimitic generative hyphae 3–8 µm, with prominent clamp-connections, skeletal hyphae, 2.5–8 µm. Basidia 23–30 × 3–6 µm, narrowly clavate bearing 4-sterigmata. Cheilocystidia 22.5–30 × 6–7 µm, inflated clavate. Spores 7.5–9×4–5 µm, cylindric, hyaline, thin-walled, Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′20″N 75˚14′48″E; alt 679m; on the wood logs of *Mangifera indica* L.; 08/09/2016; Vijay Gore (VUG/VPM–753).

***Pseudofavolus tenuis* (Fr.) G. Cunn.**

Basidiome 25–53 × 19–38 mm, annual to perennial, dimidiate, flabelliform to semicircular, effused-reflexed to pileate, leathery when fresh, corky to tough on drying. Upper sterile surface smooth concentrically zonate, sulcate, glabrous, radially wrinkled. Lower fertile surface poroid 1–2 per mm wide, angular to hexagonal. Context up to 1 mm wide, homogenous; Tubes 1–2 mm long, homogenous. Hyphal system trimitic, generative hyphae hyaline, thin-walled, clamp, branched, 1.5–3 µm wide. Skeletal hyphae thick-walled, 3.5–6 µm wide. Binding hyphae hyaline, thick-walled, 3–5.5 µm wide. Spores 14–17.5 × 4–6 µm, cylindrical, hyaline, thick-walled. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Gadhana; 20˚02′23″N 75˚15′32″E; alt 702m; on the fallen dried twing of *Senna siamea* (Lam.) H.S.Irwin & Barneby; 22/09/2016; Vijay Gore (VUG/VPM–394).

***Scytinostroma duriusculum* (Berk. & Broome) Donk.**

Basidiome 19–104 × 17–72 mm, annual, membranous, resupinate to widely effused papery thin, and brittle on drying. Fertile surface smooth, when touched gives velvety sensation. Context finely layered, smooth, dense, subhyaline in section, faintly stratose, homogeneous. Hyphal system dimitic, generative hyphae thin-walled, clamp absent, branched, nondextrinoid, 1.5–2.4 µm wide. Skeletal hyphae branched, branches mostly lateral, 1.2–2 µm wide. Spores 5.5–7.5 × 4–7.5 µm in diameter, globose, amyloid, smooth. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Gadhana; 20˚02′20″N 75˚15′32″E; alt 711m; on the living tree at main trunk *Senna siamea* (Lam.) H.S.Irwin & Barneby; 22/09/2016; Vijay Gore (VUG/VPM–390).

***Trametes cingulata* Berk.**

Basidiome 20–39 × 12–16 × 3–6 mm, annual, dimidiate, semicircular, hard, corky, sessile. Upper sterile surface glabrous, weakly zonate, concentrically ridged to radially wrinkle. Margin thin, acute to obtuse, wavy. Lower fertile surface poroid, round to regular, 5–7 per mm. Context homogenous, up to 4 mm thick. Tubes up to 2 mm deep. Hyphal system trimitic, generative hyphae hyaline, thin-walled, septate with clamp, 2–3.5 µm wide, skeletal hyphae hyaline, thick-walled, unbranched, narrow lumen, 3–5.5 µm wide. Binding hyphae 1.5–3 µm wide, thick-walled, smooth, hyaline. Basdia clavate, thin-walled, 4- sterigmate, 16–22 × 4–6 µm. Basidiole clavate, thin-walled, 19–26 × 9–12 µm. Spores 3.5–5.5 × 3–3.5 ellipsoid, thin-walled, smooth, hyaline. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Khultabad; 20˚00′51″N 75˚12′08″E; alt 706m; on wood log *Acacia nilotica* (L.) Delile; 10/08/2014; Vijay Gore (VUG/VPM–12).

***Trametes ellipsospora* Ryvarden**

Basidiome 16–34 × 10–19 × 2–4 mm, annual, resupinate to effused reflex to pileate, sessile with a broad base, leathery when fresh, brittle on drying.. Upper sterile surface covered with stiff persistent strigose hairs, shiny, sulcate, weakly zonate. Margin thin, acute, wavy. Lower fertile surface poroid 4–6 per mm pores, pores surface flat or decurrent, angular, irregular, toothed. Context duplex, up to 2 mm thick. Tubes up to 2 mm deep. Hyphal system dimitic, generative hyphae hyaline, thin-walled, septate with clamp, 1.5–3 µm wide, skeletal hyphae hyaline, thick-walled, unbranched, narrow lumen, 2–5 µm wide. Binding hyphae 2–3.5 µm wide, thick-walled, smooth, hyaline. Basdia clavate, thin-walled, 11–14 × 4–6 µm. Basidiole clavate, thin-walled, 19–26 × 9–12 µm. Spores 3.5–5.5 × 2–3.5 µm, ellipsoid, thin-walled, smooth, hyaline. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′20″N 75˚13′47″E; alt 725m; on the living tree on dried branch *Senna siamea* (Lam.) H.S.Irwin & Barneby; 07/11/2019; Vijay Gore (VUG/VPM–772).

***Truncospora tephropora* (Mont.) Zmitr.**

Basidiome, 72 × 34 cm, up to 1.4 cm thick at the center, resupinate to widely effused, tough to hard when fresh, woody hard on drying, broadly elongated. Margin sterile, obtuse. Fertile surface poroid, 4–6 per mm pores, round, regular, cracked when mature. Context papery thin to almost absent, hard, homogenous. Tubes up to 14

mm wide, duplex or in the layer, each layer or strata up to 3 mm wide. Hyphal system trimitic, Generative hyphae 2.1–3 µm wide, clamped, thin-walled, smooth, hyaline. Skeletal hyphae 3.2–4 µm wide, thick-walled, smooth. Binding hyphae1.4–3 µm wide, thin to thick-walled, branched, smooth, hyaline. Basidia 13–16 × 4–5 µm, narrowly clavate, 4-sterigmata, clamped at the base. Spores 4.7–6 × 3.5–4.5 µm, broadly ellipsoid, truncate, collapsed partly, moderately thick-walled. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Yesgaon; 20˚04′56″N 75˚20′24″E; alt 660m; on the dried standing stump on main trunk *Eucalyptus oblique* L'Hér.; 21/08/2016; Vijay Gore (VUG/VPM–273).

Conclusion

Wood-rotting fungi were collected during July (2014) to November (2019) after the regular interval from different sites of Khultabad Tehsil, Aurangabad district (M.S.) India. Thirty-seven specimens of macrofungi were examined, and from that nine different types of genera and twelve species, were studied (Photo Plate 1) which belong to six families Auriculariaceae, Hymenochaetaceae, Irpicaceae, Peniophoraceae, Pleurotaceae, and Polyporaceae. Polyporaceae is dominating family consists of four genera. From the above discussion, it is concluded that *Auricularia nigricans*, *Flavodon flavus*, *Phellinus badius*, *Pseudofavolus tenuis*, *Scytinostroma duriusculum*, *Trametes cingulata*, and *Truncospora tephropora* were most abundantly found while *Ganoderma mediosinense*, *Phellinus allardii*, *Phellinus gilvus*, *Pleurotus djamor*, and *Trametes ellipsospora* are rarely observed macro-fungi, belongs to four hosts *Acacia nilotica*, *Azadirachta indica*, *Mangifera indica*, and *Senna siamea*.

Photo Plate-I

Auricularia nigricans (Sw.) Birkebak, Looney& Sancher–Garcia.

Flavodon flavus (Klotzsch) Ryvarden

Ganoderma mediosinense J.D. Zhao

Phellinus allardii (Bres.) S. Ahmad

Phellinus badius (Cooke) G. Cunn.

Phellinus gilvus (Schwein.) Pat.

Pleurotus djamor (Rumph. ex Fr.) Boedijn

Pseudofavolus tenuis (Fr.) G. Cunn.

Scytinostroma duriusculum (Berk. & Broome) Donk.

Trametes cingulata Berk.

Trametes ellipsospora Ryvarden

Truncospora tephropora (Mont.) Zmitr

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Ethnoveterinary Plants to Treat Bone Fractures of Animals in Buldana district, Maharashtra.

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Abstract:

The people of rural areas still depend to a large extent upon plants and household remedies for curing Veterinary ailments. The folk knowledge of Ethnoveterinary medicine and its significance has been identified by the traditional communities through a process of experience over thousands of years. This paper deals with commonly found in different categories of livestock (i.e. Cow., oxen, buffalo etc) and their treatment with10 medicinal plants 10 species belonging to 10genera and 9 families that occur in forests as well as close vicinity of the rural settlements. Out of the Total population, majority of the people was found dependent on traditional (herbal) system of treatments practiced by local herbal healers. In this study observed that old aged people have more knowledge and experience particularly in remote areas for curing Veterinary ailments. The traditional system of Treatment is one of the most important Prevailing systems in the area where modern Veterinary health care facilities are rare or in very poor conditions.

The purpose of the present Study was to unravel the mode of application of the medicine prepared from Plants and quantify the dependence of the local people on herbal and allopathic systems of veterinary health care.

Key words: *Ethnoveterinary plants, livestock.*

Introduction:

Ancient human beings were closely associated with animals ,especially the domesticated ones and with the plants those were found in and around their close vicinity as well as with other plants which were used for their daily necessities like food ,shelter, clothing and medicines .Ethnoveterinary medicine consists of local peoples knowledge dealing with folk beliefs ,skiills,methods, and practices pertaining to animal health care and production .This knowledge is based on close observation of animals and or the oral transmission of experience from one generation to the Next .The Buldana district has a predominately livestock based economy and social welfare .However ,economic dependence on livestock ,lack of effective veterinary infrastructure have forced the local farmers even today to apply their indigenous knowledge to look after and maintain their livestock population. This paper includes social practices and the ways in which livestock are incorporated into farming system. Over centuries people have developed their own system of keeping animals healthy and productive using age old remedies, surgical and manipulative techniques and religious practice. The use of ethnoveterinary medicine uses differ not only from region to region but also among and within communities. Ethnoveterinary medicinal practice and skills have developed through time mainly by tribal and error and sometimes through experimentation and innovation.This paper deals with commonly found in different categories of livestock (i.e. Cow., oxen, buffalo etc) and their treatment with10 medicinal plants 10 species belonging to 10genera and 9 families that occur in forests as well as close vicinity of the rural settlements.

Material and Method: -

During investigation, repeated field visits were made to the remote villages. After establishing good rapport with local herbal healers, elderly persons and a person athorough knowledge of veterinary practices. Some of the commonly occurring veterinarydiseases were listed. The morpho taxonomical description of each plant taxon was done and identified with the help of different floras.

Observation-

Local people of various regions used 10 different types of plants for Bone fracture in animals. The plants arranged alphabetically with family name and Mode of Administration.

Sr. no.	Name of Plant	Family	Mode of Administration
1.	*Bauhinia racemosa*	Fabaceae	Root powder with butter and boiled rice is given to animals for three days in bone fracture to join the bones.
2.	*Blepharis repens*	Acanthaceae	Powder of leaves mixed with pulses of Black gram given to bone facture in animals.
3.	*Buchanania latifolia*	Anacardiaceae	Gum resin is used in case of Bone fracture where plaster cannot be tied
4	*Capparis zeylanica* L.	Capparaceae	Leaves crushed with water mixed with 250ml edible oil and

			applied on bone of cattle on Bone of cattle in Bone fracture.
5.	*Cassia fistula*	Fabaceae	One Pinch seed powder is mixed with melted Jaggery and applied on thigh swelling in lamness.
6.	*Cissus quadrangularis*	Vitaceae	1.Stems are crushed, and the paste is applied on bone fracture in cattle. 2. Stems crushed and mixed with jawar floor and the bolus is fed to animals for healing the bone fracture.
7.	*Clematis triloba*	Ranunculaceae	The vegetable oil or butter is applied over the fractured part and then the decoction of leaves is applied for joining bone of Animals. This treatment used in case where plaster can not be tied.
8.	*Soyamida febrifuga*	Meliaceae	Warmed leaves are tied on the fractured bone.
9.	*Terminalia arjuna*	Combrataceae	Stem bark crushed in water and the paste applied over bone fracture.
10.	*Viscum articulatum*	Santalaceae	Stem branches are given orally or mixed with fodder.

Conclusion-

The ethnoveterinary medicinal plants species are collected by local people from the surrounding areas, forests and are being used as remedies for various animal ailments. Documentation of ethnoveterinary medicinal plant survey of vital importance in finding some miraculous medicines for curing various veterinary diseases .10 plants from 9 families used in bone fracture of animals. Taking into consideration all these facts and the importance of plats Uses it is very necessary to save plant and to undertake such studies before the knowledge is lost forever.

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Status and distribution of Barn owl *Tyto alba* from Melghat Tiger Reserve, Amravati, Maharashtra, India

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Abstract
Distribution and population status of Barn owl Tyto alba was assessed by survey methods. This study implies thatowl species distribution is not common and also the species is less observed in dense forests.
Keywords – MTR, Owls, Owlets, Population status, Birds of prey, Barn owl

Introduction
Owls are found in diverse habitats such as from deserts to forests, including human habitations. However, despite their wide presence they are confined and difficult to be seen (Kumar *et al*. 2017).Owls are of great economic, scientific and aesthetic values hence the species has been given much importance (Santhankrishnan, 2011).

All owls have a large, rounded head with eyes directed forward. The basic morphological features of the members of this group include a curved bill with a pointed tip similar to diurnal birds of prey, and talons having curved and sharp claws which are very powerful which may be considered as an adaptation for carnivory. These birds have mostly coloured plumage which is soft and fluffy. Ecologically Owls may be considered as nocturnal counterparts to diurnal birds of prey, without being related to them.

Barn owls are Normally nocturnal, sometimes hunting diurnally in dim weather; flies slowly low over fields. This species roosts and nests mainly in cavities in old buildings, ancient forts and ruins or caves. Breeds throughout year, Nest is a collection of straw, twigs, rags and rubbish padded into tree-hollow and holes. The same site is used year after year.

The Indian subcontinent is home to 32 species of owls, according to Grimmet et al. (1999) 30 of them recorded from India. Also recently updated checklist of India by Praveen *et al.* (2016) recorded presence of all 32 owl species.

Amravati district harbours dense forest cover. It includes the famous widely spread Melghat Tiger Reserve and many other forests adjoining the Amravati city. Diversity studies have been done many years ago (MTR official checklist) thus requiring re- assessment of current status of owl diversity with location data, hence an effort was made in the present work to study the diversity of owls and owlets in this region.

Materials and Methods -

The work was conducted in the Melghat Tiger Reserve of Amravati district, Melghat is the hotspot of biodiversity of the state. It is located in Central India, as a southern part of Satpuda hill range. The Melghat Tiger Reserve and adjoining forest lies at the Northern extreme of Amravati district of Maharashtra State on the Madhya Pradesh border. Melghat Tiger Reserve is a representative of the Biogeographic Zone '6 E Deccan peninsula' Central Highlands in the central India.

Fig – 1 – Map of Melghat Tiger Reserve.

Extensive Survey of Melghat Tigre reserve was done during the July 2013 to December 2017 to enlist number of owl and owlet species. Interviews with local indigenous people were conducted for collecting

information about sightings of the owls. Various other inputs from the local people were also taken into accord. Following survey techniques were used in the present study,

1) Surveys were done systematically in the study area by making use of existing forest roads, local trails, animal trails along rivers and streams and around water holes. Surveys were conducted either by foot or by motorized vehicle. Information provided by the local people was considered during each visit
2) Point survey (around villages and Rest Houses, ancient trees and riverine ecosystem) were done. At larger spatial scales, counts or detections at points have been used to document raptor presence (Kennedy and Stahlecker 1993), community diversity (Manosa and Pedrocchi 1997), and to estimate occupancy (McLeod and Andersen 1998).
3) Sighted owls were photographed and identified with the help of different field guides, some owls were identified with self recorded calls, using Sony ICD voice recorder and parabolic disc. The latitude and longitude data (GPS) of the sites of sightings of the owls were recorded by a GPS device.

Result and Discussion–

Species was not commonly recorded in Melghat Tiger Reserve. The species was reported from both East and west Melghat but not in dense forest. Total 21 individuals were reported, of which 10 were sighted. All of which were in association with human habitation such as Rest house premises, and agricultural farms. Surprisingly all nests were found in old or dry Banayan tree holes. It is observed that it is present in its nest in tree cavity for whole day and is not seen generally in day time. Pellets from the owl species were collected and studied.

According to Taylor (1992), Bam Owl selected isolated trees around farm sheds and villages and along hedgerows and woodland edges, rather than in the centres of woodland, which is in corroboration with the present study. Following map depicts an idea about distribution of Barn owls from MTR.

Fig. 2 – Map Showing Barn owl sighting locations recorded during Study.

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Phylogeny of Vertebrates from striated muscle proteins

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Abstract

Every living cell requires specific enzymes for the thousands of chemical reactions that maintain life. Like enzymes muscle proteins such as actin and myosin are specified by genes with unique DNA sequences. Both actin and myosin and the unique structures into which they are organized are conserved among all animals, no matter how diverse. This conservation implies that the encoding DNA sequences have changed little through evolutionary time. Just as similarities of structures indicate a common descent, variations and differences indicate divergence on the evolutionary tree. A complete understanding of DNA and inheritance, however, requires a greater appreciation of the importance of proteins. DNA dictates the production of specific proteins, but the proteins themselves directly determine an organism's traits. Therefore, a close study and comparison of particular proteins from different species may indicate how closely related the species are. Proteins have important in phylogeny and the classification and hence the present study designed to know evolutionary correlation between different vertebrate animals with respect to striated muscle proteins which are involved in movements in the selected animals.

Key words : skeletal muscle, muscle protein, amino acid sequences , molecular phylogeny

Introduction :

Recently DNA has been a primary focus of research, but the ultimate function of DNA is to specify what proteins are made. In fact, recent studies of the genome sequences of humans and other organisms have revealed that the number of proteins expressed by a species contributes more to its complexity than does the number of genes (Jasny and Kennedy, 2001, International Human Genome Consortium, 2001).

The genes for actin and myosin are members of gene families that encode proteins that enable movement while actin and myosin are highly conserved across all animal species, other muscle proteins show more variability . The variations in an organism's proteins are the results of random DNA mutations within the encoding genes, which have occurred over thousands to millions of years. Each mutation may results in some kind of change in a protein. These changes can lead to novel traits and generate diversity individual differences among members of a population. Occasionally, a genetic mutation will alter a protein's structure to confer a functional advantage, enhancing an organism's survival in a particular niche, environment, or predator-prey relationship. Thus, genetic diversity makes evolution possible, The Evolutionary biologists are interested in how individual species arose from earlier forms. A classic way of addressing this question is to compare the morphology of different living organisms to one another and to fossilized species. With the onset and advancement of molecular biology, it is now possible for evolutionary biologists to compare not only the physical form and structure of different organisms, but their DNA and proteins as well.

Therefore, a close study and comparison of particular proteins from different species may indicate how closely related the species are. Species that diverged from a common ancestor a long time ago are less similar biochemically than those that diverged more recently. The biochemical composition of organisms includes their protein molecules. Thus, the degree of relatedness of two species can be estimated from the amount of similarity between their protein make ups. Molecular phylogeny , is the use of the structure of molecules to gain information on an organism's evolutionary relationship. The origin of species over a century later, evolutionary biologists still use tree diagrams to depict evolution because the floral analogy effectively convey the concept that speciation occurs. Recent advances in molecular technique as well as more powerful phylogenetic algorithms and faster computers have made it possible to infer phylogenetic relationships using sequences data, (Zardoya, and Meyer,). Different branches of related organisms separated at evolutionary times. The further apart species are on the tree, the less related they are, Molluscs and arthropods diverged from one another before the emergence of chordate animals with backbones, very early in evolutionary time. These animals are only distantly related to fish, birds, reptiles, mammals and amphibian, which are more closely related to each other. Just as similarities of structures indicate a common descent, variations and differences indicates divergence on the evolutionary tree. Proteins have important in phylogeny and the classification and hence the present study designed to know evolutionary correlation between different vertebrate animals with respect to striated muscle proteins which are involved in movements in the selected animals.

Materials and Methods :

Analysis of Proteins by using Block Maker and Peptool online software

The analysis of molecular information of muscle proteins in the different Vertebrates. Their amino acid sequences were obtained in the FASTA format from the NCBI Home Page by using NCBI sequence viewer v 2.0 windows internet explorer cited by www google com and conducted a comprehensive search for muscle protein sequences such as Actin, Myosin, Troponin, Tropomyosin. From selected species and their fasta formats were aligned together by Block Maker by accessing the website WWW. Block Server. Finally build the Phylogenetic tree for each protein. A set of blocks can also be used to construct and display a neighbour joining tree for examination of possible subfamily relationships. Because blocks represents the most highly conserved regions of proteins, misaligned regions were avoided to get a high quality tree. Further studies was carried out by using pep tool a protein analysis software.

Observations and Results :

I) Phylogeny of Actin :

The results obtained are shown in Fig.1.1 All the 14 sequences selected for phylogeny resulted into one block, with a width 14. The tree (Fig.1.1) showed 3 clades . First clade comprises of 4 lineages, B.gargarizans, C.batrachus, R.tigrina and C.punctatus. Second clade comprises of 6 lineages , C.coturnix, G.gallus, H.japonica, M.musculus, N.naja, and R.norvegicus as these lineages split originated from a common ancestor. The third clade includes 4 species with a common ancestor which splits into 2 subclades. C.livia showed the separate lineage and other three L.rohita, O.cuniculus and C.versicolor mutuated at various time from one common ancestor. The most recent lineages are C.versicolor and L.rohita with more mutational changes. C.versicolor and O.cuniculus developed from a common ancestor.

Fig.1.1 Phylogeny of Actin

ii) Phylogeny of Myosin:

The results obtained are shown in Fig. 1.2 All the nine myosin sequences used for phylogeny studies resulted into one block, with a width 17.The phylogram of myosin (Fig.1.2) showed four clades, among the 4 clades first and fourth clades comprises 2 lineages, the *R. tigrina* and *H. chrysoscelis* which split from common ancestor. The second clade comprises of 2 lineages, *O.cuniculus* and *N.naja* as a sister taxa. The lineage *O.cuniculus* has undergone less changes in myosin development during evolution than lineage *N.naja* The third clade represents 5 species with a common ancestor which further evolved in 4 different directions (4 subclades). *G.gallus* showed the separate lineage and other four *C.coturnix*, *M.musculus*,

L.rohita and *R.norvegicus* mutuated at various time from one common ancestor, the most recent lineages are *R.norvegicus* and *C.coturnix* with more mutuational changes, *R.norvegicus* and *L.rohita* developed from a common ancestor. *C.coturnix, M.musculus, L.rohita* and *R.norvegicus* are the cousins with respect to development of myosin.

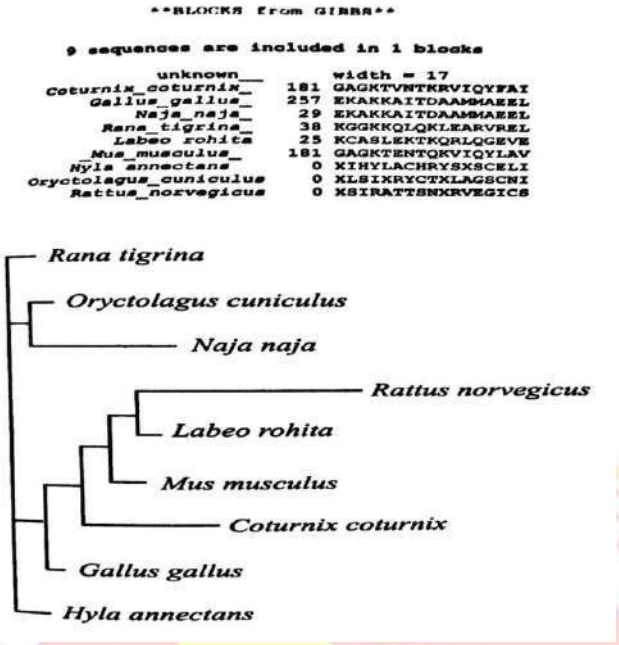

Fig.1.2 Phylogeny of Myosin

iii) Phylogeny of Troponin :

The results obtained are shown in (Fig.1.3). All the nine sequences selected for phylogeny of troponin resulted into one block with a width, 23. The phylogram (Fig.1.3) showed four clades. First, second and third clades comprises 3 separate lineages leading to *M.musculus, R.norvegicus, R.tigrina.* These lineages originate from a common ancestor.The fourth clade includes 6 species with a common ancestor which splits into 2 subclades. *C.coturnix* showed separate lineage and other five *L.rohita, G.gallus, B.marinus, N.naja* and *O.cuniculus* mutuated at various times from a common ancestor. *N.naja* and *B.marinus* are sister taxa developed from a common ancestor. The most recent lineage is *O.cuniculus. O.cuniculus* and *N.naja* are cousin lineages in the development of troponin.

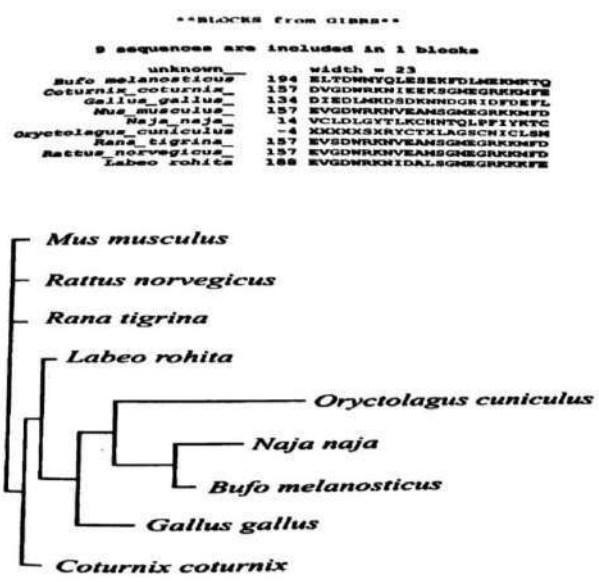

Fig.1.3 Phylogeny of Troponin

iv) Phylogeny of Tropomyosin :

The results obtained are shown in (Fig.1.4). All the ten sequences selected for phylogeny of tropomyosin resulted into one block with a width,32. The tree (Fig.1.4) showed four clades. First, second and third clades comprises 3 separate lineages leading to *M.musculus*, *R.norvegicus* and *G.gallus.* The fourth clade is separated into 4 lineages *B.viridis*, *H.chrysoscelis* , *R.tigrina* and a fourth complex lineage. The fourth clade includes two main lineages which split from a common ancestor. *C.coturnix* is quite separate lineage and the remaining three *O.cuniculus*, *L.rohita* and *N.naja* develop separately. *L.rohita* and *O.cuniculus* are the sister taxa developed from a common ancestor. The most recent lineages are *N.naja and O.cuniculus* with a more mutational changes and they are cousins with respect to tropomyosin development.

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**BLOCKS from GIBBS**

10 sequences are included in 1 blocks

unknown__          width = 32
Bufo_melanosticus_    25 ESERGMKVIENRALKDEEKMELQEIQLKEAKH
Coturnix_coturnix_   166 EEKSGMEGRKKMFEAGESXXXXXXXXXXXXXX
Hyla_annectans_      120 ESERGMKVIENRALKDEEKMELQEIQLKEAKH
Mus_musculus_        122 ESERGMKVIESRAQKDEEKMEIQEIQLKEAKH
Oryctolagus_cuniculus -4 XXXXXSXRYCTXLAGSCNICLSMDAIKKKMQM
Rana_tigrina_        122 ESERGMKVIENRALKDEEKMELQEIQLKEAKH
Rattus_norvegicus_   122 ESERGMKVIESRAQKDEEKMEIQEIQLKEAKH
Labeo_rohita          50 DTQQCCSVINAKYARRLADSFLASCRIQKKQI
_Gallus_gallus_      122 ESERGMKVIENRAQKDEEKMEIQEIQLKEAKH
_Naja_naja_           50 HQRRPFSLRYIRGCAATCPETKPRDMVECCST
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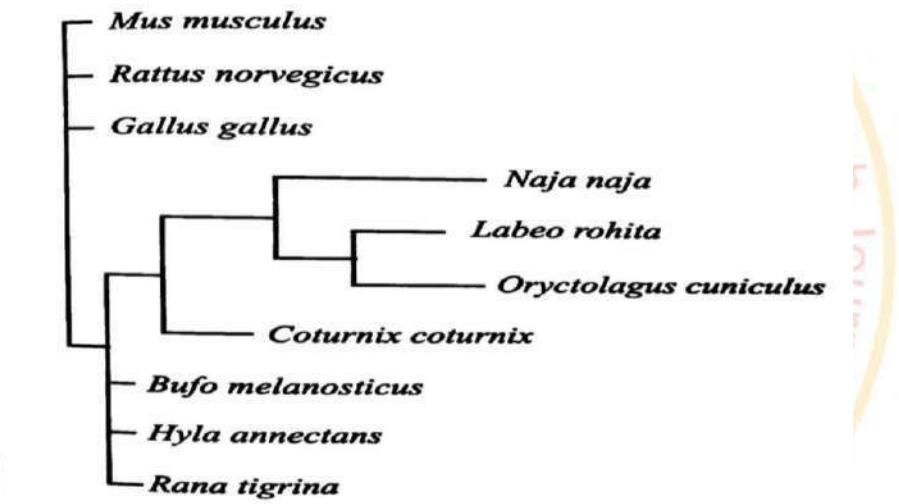

Fig.1.4 Phylogeny of Tropomyosin

Discussion and Conclusion:

The muscle protein phylogeny studies indicated divergent evolution with respect to Actin, Myosin, Tropomyosin and Troponin on different lines (Fig.1.1 to1.4) . Actin exhibited conserved amino acid sequences in C.coturnix, G.gallus, H.japonica, M.musculus, N.naja and R.norvegicus with a width of 14 amino acids . Thereafter actin exhibited divergent evolution with similar conserved amino sequences in Bufo, Clarias, Rana and Channa and diversified sequences in Columba, Labeo, Oryctolagus and Calotes. Actin in Columba livia striated muscles evolved simultaneously with Bufo. The phylogeny tree drawn for Actin amino acid sequences indicate the latest mutation in Labeo rohita which could be because of the genetic modification and or its introduction as an invasive species.

Similar observations are recorded by Volff (2005) who stated that the striated muscle development in all the culturable fish species are recent in the evolution. Myosin phylogeny was found to be more divergent than that of actin. Astonishingly, a conserved sequences of 17 amino acid width is found in Gallus gallus and Naja naja , though both of them evolved on separate lines.With respect to myosin evolution myosin in R.norvegicus, Labeo rohita and Coturnix coturnix, the mutations appear to be recent and this could be because all of them are culturable species. However, in R.tigrina and H.chrysoscelis myosin is evolved separately showing their divergent evolution and thus they are distantly related. Zardoya and Meyer (2001) studied the origin and phylogenetic relationships among living amphibians and supported the Batrachus hypothesis from both molecule and morphology based studies provides a robust phylogenetic framework that will be helpful to

comparative studies among the living amphibians and will permit better understanding of the considerably divergent digit developmental patterns found in frogs and tree frogs. Troponin in all the culturable species like Rattus norvegicus, Labeo rohita and Coturnix coturnix show primitive nature , however all the molecules in all these culturable species show divergent evolution from a common ancestor. Mus musculus, Rana tigrina and Rattus norvegicus exhibit a conserved block of 23 amino acids. Troponin from Labeo rohita also shows the similarity in this 23 amino acid block with 5 replacements as shown below.

Rattus norvegicus EVGDWRKNVEAMSGMEGRKKMFD
Labeo rohita EVGDWRKNIDALSGMEGRKKFE

The troponin evolution which is much more divergent proves the functional modifications. Performance is an intermediate step between morphology and biochemical evolution (Harris and Steudel, 2002). The bones to which the striated muscles are attached change the functional efficiency of the animal variability in the myosin ,tropomyosin and other muscle proteins are studied by Harris and Sterdel (2002) and concluded that the existence of most of the vertebrates are because of survival of fittest and the muscle proteins play a major role in it. Thus during evolution of striated muscle, biochemical changes took placed in Actin, Myosin, Troponin and Tropomyosin elimination some amino acids and by addition of some amino acids. Secondly, these alterations in amino acids sequences might have taken place as a change in the bones to which these muscles are attached with respect to increase the functional efficiency for survival. The present results also indicated that the amino acids proline, alnine, glutamic acid and glycine are lost gradually from actin and myosin during evolution. Protein analysis is quite cheaper, time saving and more reliable for phylogenetic relationship of animals.

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X-ray Diffraction Analysis of Mn-Ti doped Co-ferrite Nanoparticles

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Abstract

In the present investigation, Mn-Ti doped $CoFe_2O_4$ with the formula $CoFe_{2-2x}Mn_xTi_xO_4$ ($x = 0.05$) using well known standard sol-gel auto combustion synthesis method with a view to understand the influence of Mn-Ti doping on the structural properties. X-ray diffraction technique was used to investigate the crystal structure, nano-crystalline nature and for the determination of structural parameters. Absence of impurity peaks in the XRD pattern revealed the single-phase formation. Powder X-ray diffraction analysis of the XRD pattern proves that prepared nanoparticles belong to cubic spinel structure. The crystallite size estimated from Debye Scherrer formula was found to be 21 nm. The lattice constant obtained from XRD data found to increase as compared to pure cobalt ferrite.

Key words: *Sol-gel method, X-ray diffraction, lattice constant.*

1. Introduction

Magnetic materials are key aspects of today world. Nanotechnology and nana science are the two side of coins leads to develop magnetic materials. The magnetic materials in particular ferrite plays a key role in many technological applications on the basis of their very good electrical and magnetic properties. Iron oxide and metal oxide are the basic composition of ferrite materials.

Ferrite materials are metal oxides have high electrical resistivity, low eddy current losses and convincingly low costs coupled with their potential microwave applications such as circulators, isolators and phase shifters. Now a day nanosized ferrite materials have been widely used to prepare many electromagnetic devices such as inductors, converters, phase shifters and electromagnetic wave absorbers. The crystal structure of ferrite leads to different types namely spinel ferrites, cubic garnet and hexagonal ferrite. Spinel ferrite are the most common magnetic material represented by AB_2O_4 formula (where A= divalent metal ions and B = trivalent Fe^{3+} ions)[1]. These materials are widely studied because of their interesting electrical and magnetic properties. .

Various electrical and magnetic properties of ferrite such as DC electrical resistivity, activation energy, drift mobility, saturation magnetization, coercivity, permeability, Curie temperature are of current interest to many researchers. The combined electrical and magnetic properties along with low eddy current and dielectric loss associated with the ferrite have placed them at the top of the magnetic materials. Many researchers have carried out synthesis and investigations of electrical and magnetic properties of ferrite for different applications[2].The crystal structure of the ferrite is such that any cations of different valance and size can accommodate in the interstitial sites bringing wide variation in the properties of ferrite. The synthesis of ferrite is simple and can affect the properties of ferrite. Apart from method of synthesis chemical composition, choice of dopant cation distribution, etc also influences the properties of ferrite. Spinel ferrite, garnet and hexagonal ferrites are of great interest to many scientists and technologist. However, considering the processing, cost and applicability spinel ferrite are found to be more versatile and useful in many technological applications. Interest in the production of nonmetric metal oxides has enormously risen in the last years because of the novel and/or exalted properties they display. Among the many synthetic methods proposed, good results have been obtained by standard sol-gel auto combustion synthesis method.

Spinel ferrite possesses cubic spinel structure with FCC type and has two interstitial sites[3]. In the family of spinel ferrite, cobalt ferrite is one of the best and promising candidates for many applications. Cobalt ferrite possesses inverse spinel structure in which cobalt ions occupy octahedral [B]site and F^{3+} occupy both tetrahedral (A) and octahedral [B] site. The coercivity of the cobalt ferrite is much more than another spinel ferrite. The high saturation magnetization, high magneto crystalline anisotropy and high permeability are the features of cobalt ferrite[4]. In the literature there are many reports on the various properties of cobalt ferrite and substituted cobalt

ferrite. In last two to three decades cobalt ferrite in nanocrystalline form has attracted the attention of many researchers. The properties of nanoparticles are very much different than that of their bulk counterpart. Greater reactivity, larger surface area to volume ratio, greater stability, chemical homogeneity etc are the important characteristics of the spinel ferrite nanoparticles[5]. Researchers have investigated various electrical and magnetic properties of the cobalt ferrite nanoparticles for various applications such as drug delivery, magnetic hyperthermia, sensors, catalyst, water purification, photo degradation etc. There is ample scope to prepare the cobalt ferrite using different technique with improved properties which can lead to novel applications. Therefore, it is of great interest to prepare cobalt ferrite in nanosized form by wet chemical method. Doping of Zn, Al, Cd, Mg etc ions in Cobalt ferrite have been reported in literature, however, co-doping of magnetic Mn^{2+} ions and non-magnetic Ti^{4+} ions in cobalt ferrite is not reported in the literature. Therefore, attempt is made to synthesize Mn-Ti doped cobalt ferrite and study the X-ray diffraction analysis.

2. Experimental details

2.1. Chemicals

For the preparation of $CoFe_{2-2x}Mn_xTi_xO_4$ (x = 0.05) nanoparticles, the chemical such as Co $(NO_3)_2 \cdot 6H_2O$, Fe $(NO_3)_2 \cdot 9H_2O$, Ti $(OC_4H_9)_4$, Mn $(NO_3)_3 \bullet 4H_2O$, $C_6H_8O_7$, NH_3 samples having 99.99 % pure AR grade chemicals are used. The following (Fig.1) flow chart shows the stages involved in the complete process for preparation of spinel ferrite by sol-gel auto combustion method

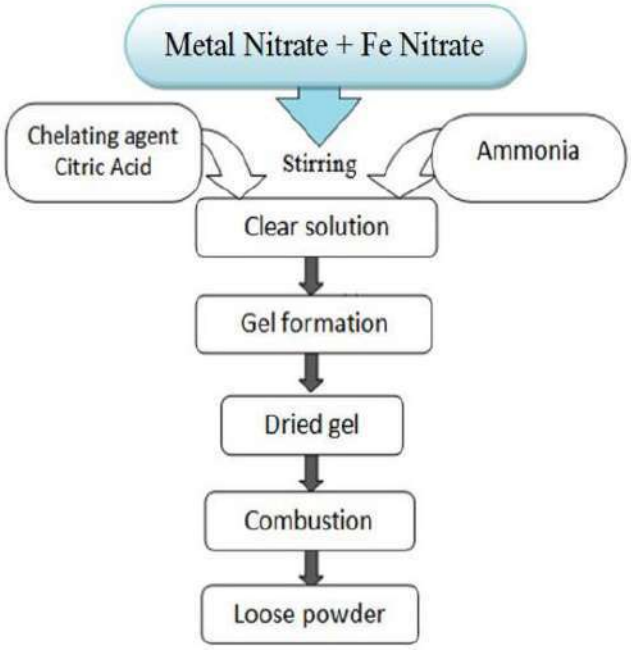

Fig. 1: Flow chart shows the stages involved in preparation of spinel ferrite by sol-gel auto combustion method

2.2. Characterization tools

To study the X-ray diffraction (XRD) analysis, $CoFe_{2-2x}Mn_xTi_xO_4$ (x=0.05) nanoparticles were carried out at room temperature by using standard characterization tools. The details of characterization tools along with their make and specification applied are given in Table 1.

Table 1: Details of the characterization techniques

Name of the Technique	Make and Model	Specifications
X-ray diffraction (XRD)	Rigaku X-ray diffractometer	Source: Cu-Kα radiation Range: 10^0 - 70^0
UV-Visible spectrophotometer (UV-Vis)	Agilent Technologies Carry 100 UV-Vis	Range: 100-1000nm

3. Results and discussion

3.1. X-ray diffraction analysis

Crystallographic structures were examined by powder X-ray diffraction (XRD) using Rigaku X-ray diffractometer. The prepared Mn-Ti doped cobalt ferrite ($CoFe_{2-2x}Mn_xTi_xO_4$, where x = 0.05) nanoparticles were characterized by X-ray diffraction technique. The X-ray diffractogram were recorded at room temperature is shown in **Fig. 2.**

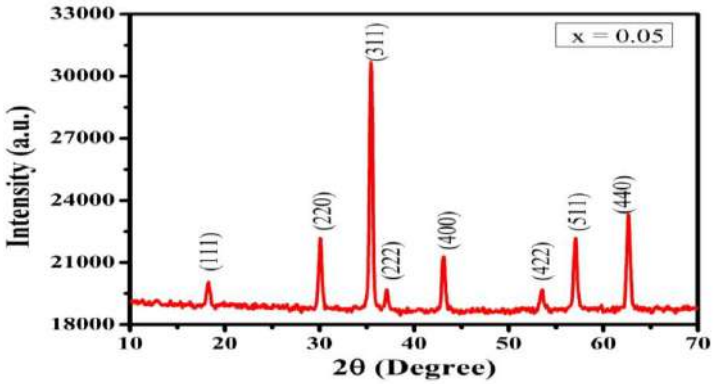

Fig.2: XRD pattern of $CoFe_{2-2x}Ti_xMn_xO_4$ (x= 0.05) nanoparticles

A close examination of XRD pattern shows that the presence of well-defined intense and sharp Bragg's peaks which are indexed using Bragg's law. The diffraction peaks are designated as (220), (311) (222), (400), (440), (511) oriented at various Bragg's angle[6]. All these diffraction peaks are the part of cubic structure with FCC type. No extra peaks other than the cubic phase was observed in the XRD pattern. Thus, it proves that the prepared nanoparticles possess single phase cubic spinel structure. The structural parameters like lattice constant (a), unit cell volume (V) and X-ray density (d_X) were determined using the XRD data and their values are put in Table 2. On comparison with the lattice constant of the pure cobalt ferrite (a = 8.382, [7]), it is noticed that that the lattice constant of the presents Mn-Ti doped cobalt ferrite has been increased. These results can be supported by the ionic radii of Mn-Ti is greater than that of Fe^{3+} ions. The replacement of Fe^{3+} ions by Mn-Ti composition x results in increase of lattice constant. The unit cell volume and X-ray density was also determined using the value of lattice constant. The X-ray density (d_x) of all the samples was calculated using the molecular weight and volume of the unit cell using the following relation.

$d_x = 8M / Na^3$

where, M is molecular weight and N is Avogadro's number.

Table 2 shows the values of unit cell volume and X-ray density, which show increased and decrease respectively in comparison with pure cobalt ferrite. These results can be attributed to the fact that both unit cell volume and X-ray density depends directly and inversely respectively to the lattice constant.

Table 2: Variation of lattice constant 'a' (Å), Crystallite size 't' (nm), X-ray density 'dx' (g/cm^3), lattice volume (Å^3)

Composition (x)	a (Å)	t (nm)	d_X(g/cm^3)	V (Å^3)
0.05	8.385	21	5.324	589.6

4. Conclusions

The successful incorporation of Mn-Ti dopants in cobalt ferrite has been achieved through sol-gel auto combustion synthesis technique. The X-ray diffraction pattern and its analysis revealed the formation of single-phase cubic spinel structure of prepared samples. Lattice constant and unit cell volume increased, whereas X-ray density is decreased as compared to lattice constant of pristine cobalt ferrite nanoparticles.

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Characterization and Thermal Stability measurement of Chemically Synthesized polyaniline-SnO_2 nanocomposites

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1. Introduction

In earlier days, use of conventional sources of energy is increased due to increase in necessity and also this result in increase in pollution for environment. [1] Hence there arises a need of some alternate and renewable source that exists last long and should not pollute the environment and soil as well. For this purpose some conducting polymers like polyaniline (PANI) has gained much interest as having some interesting applications such as sensors, microactuators, polymeric batteries, electronic devices and electrolytic capacitors. [2] The commercial exploitation of most of the applications based on polyaniline is closely linked to the lack of its processability and mechanical properties [3]

The properties of electronically conductive polymers depend strongly on their microstructure and morphology. [4] It is well known that polymer composites can be produced exhibiting enhanced properties that the constituent materials may not exhibit. Conducting polymer nanocomposites formed by immobilization of metal nanoparticles into the conjugated conducting polymer matrices [5]. Conducting polymers synthesized with doping any metal oxide such as SnO_2 given much increased conductivity and stability of the composite formed in nanosize.

In the present work, chemical oxidative polymerization method used to synthesize polyaniline doped with SnO_2 at a particular weight percent. The SEM images shows, polyaniline nanoparticles of different diameters were obtained, Thermal stability of the polymers plays important role to modify the polymer properties to be used for advanced applications. Also it indicates that, the morphology and particle size of product are depend on the temperature during synthesis Hence thermal stability of conducting PANI and its composites has great importance.[6,7] It is measured using TG-DTA analysis.

2. Methods and Materials:

2.1 Materials used:

The Aniline Hydrochloride (AR grade), Ammonium Persulphate (AR grade), Hydrochloric Acid, Acetone (AR grade) obtained from Loba Chem. Mumbai, (India). All the chemicals were used as received. Double distilled (DD) water was used for synthesis.

2.2 Synthesis of Polyaniline (PANI) nanoparticles:

In this process polyaniline nanocomposite was synthesized by chemical oxidative polymerization method [8]. 2.59 gm of aniline hydrochloride was dissolved in 50 ml distilled water in a volumetric flask. Similarly 5.71 g of ammonium persulfate (APS) was dissolved in 50 ml distilled water kept for 1 h. at room temperature (303 K), During additions, the mixture is stirred for 2 h. and allowed to polymerize for next 1 h. Then the resulting dark green precipitate of PANI was filtered. Then washed with three 100 ml portions of 0.2 M HCl and acetone. Obtained precipitate was kept in oven to dry for about 8 hrs. at 50-60 ^{0}C.

2.3 Synthesis of PANI- SnO_2 Nanocomposite:

In this process polymer composite was synthesized by in-situ chemical oxidative polymerization method [9] for 15 wt. % of SnO2. SnO2 nanoparticles were dispersed into the APS solution of 50 ml DD water and stirred for 1 h before added to aniline monomer. Aqueous solutions of 2.59 g of aniline hydrochloride prepared in 50 ml DD water. It is then added slowly in APS under vigorous stirring for 2 h. and allowed to polymerize for next 1 hr. The resulting dark green PANI-SnO2 precipitate was filtered and washed with three 100 ml portions of 0.2 M HCl, and acetone. Obtained precipitate was kept in oven to dry for about 8 h. at 50-60 0C. In this way PANI-SnO2 nanoparticles were formed.

3. Characterization Techniques:

3.1 Scanning Electron Microscopy (SEM):

In the present work Field Emission Gun-Scanning Electron Microscope with model number JSM-7600F was used. Magnification was about 25 times to 1,000,000 times. This technique gives the morphology of synthesized composite.

3.2 X-Ray Diffraction Technique (XRD):

XRD is a method for structural materials characterization and quality measurement. To determine particle size Debye-Scherrer method is used. Sixth generation MiniFlex 600 X-ray diffractometer (XRD) is used for the determination of crystallite size, strain and molecular structure of material.

4. Result and discussion:

4.1 Scanning Electron Microscopy:

The surface morphology of PANI and PANI-SnO_2 (15 wt %) nanocomposite was observed under scanning electron microscope (SEM) and obtained images are as shown in figure. The surface morphology of nanocomposite was completely different compared to without dopant. The surface morphology changes from rough to smooth. PANI - SnO_2 shows fine microsphroidal surface observed with poor matrix.

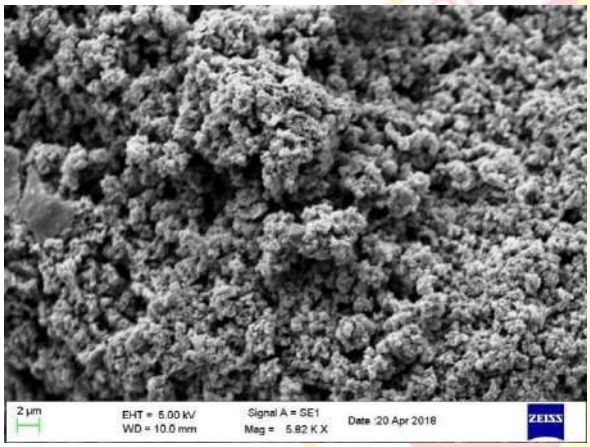
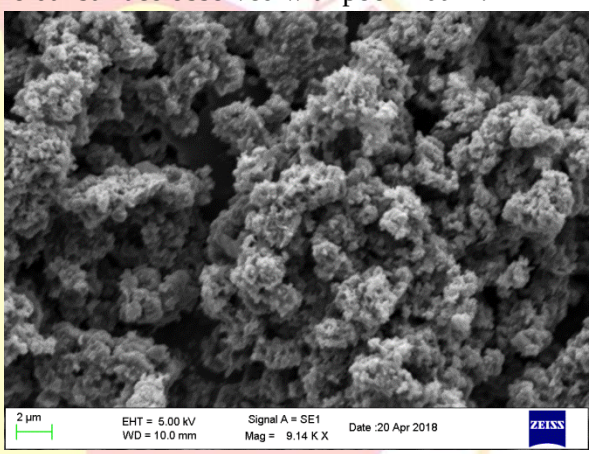


Fig. Pure PANI



PANI-SnO_2 nanocomposite

The average size of the particles is 15-268 nm. PANI is completely amorphous in nature whereas PANI-SnO_2 nanocomposite shows partly crystalline as well as amorphous phase. The micrograph shows porous microstructure in which SnO_2 nanoparticles are dispersed in fibrous PANI forming a nanocomposite. It is highly microporous and thus capable of increasing the liquid–solid interfacial area providing more locations for the insertion.

4.2 X-Ray Ddiffraction:

From the following figures it can be stated that the more crystalline regions in the zinc oxide sample are observed with major reflections between 20° and 30° (2θ values). Also less intense peaks at 17°, 20°, 25° (2θ values) indicate the high crystallinity of SnO_2 samples.

Absence of peak in the intensity versus 2θ curve represents complete amorphous state of sample. Indication of peak or peaks in the curve suggests formation of phase or phases in the composite during polymerization process.[10] The degree of crystallinity increased in PANI-SnO_2 nanocomposite than pure conventional PANI, clearly indicated the homogeneous distribution of nanoparticles in the polymer matrix.

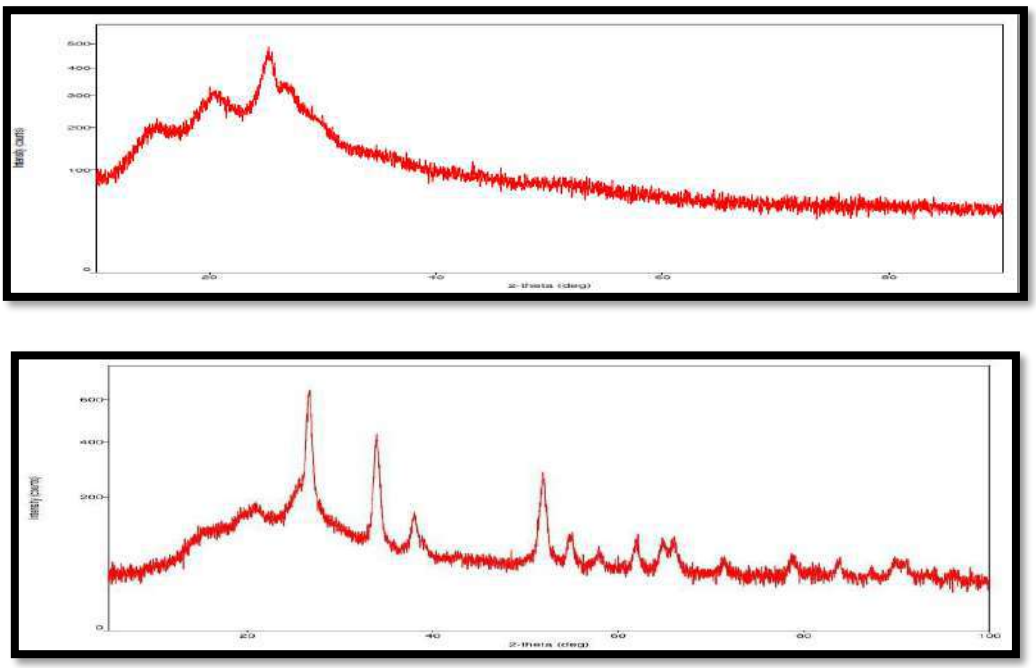


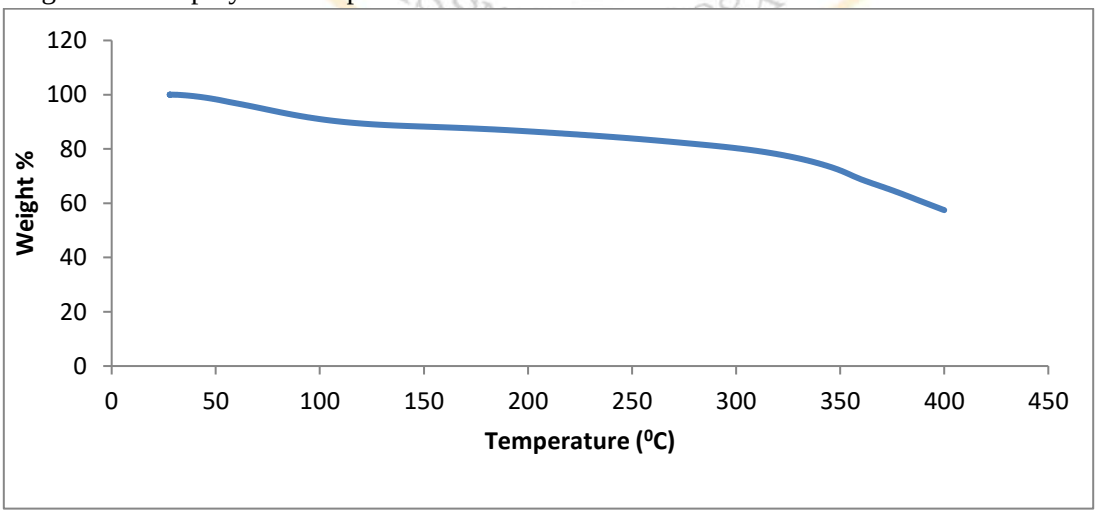
Fig. XRD pattern of Pure PANI and PANI-SnO_2 nanocomposite

The crystallite size can be determined using Debye Scherrer formula and found as 40 nm. The XRD-pattern of PANI-SnO_2 shows sharp diffraction peaks at 26°, 34°, 51° which confirms the presence of SnO_2 nanoparticles are highly crystalline and can be indexed as (110), (101) and (211) planes of SnO_2. Also these peaks were slightly shifted from their respective standard positions which may be due to metal oxide. [11] The XRD pattern of PANI shows the three broad peaks at 2θ= 15.13°, 20.34°, 25.20°.PANI showed two broad hallows at 2θ =20.34° and 25.20°. A nanocomposite show the greater crystallinity due to the addition of SnO_2.

4.3 Thermogravimetric Analysis and Differential Thermal Analysis:

Thermal properties of pure Polyaniline and PANI doped with Tin Oxide (SnO_2) nanocomposite were evaluated by TGA/DTA in the temperature range 0ºC to 700 ºC at a heating rate of 15 ºC/min as shows Figure.

TGA thermograph of PANI-SnO_2 nanocomposites shows two step degradation. In first step the initial weight loss was observed between 35 to 200^0 C and was attributed to the loss of moisture and low molecular weight compounds in polymer composite. It can be clearly seen that both samples exhibit minimal weight loss until the samples reached 200^0 C. In second step, a major weight loss was observed form 200 to 700^0 C and was due to the degradation of polymer composite.



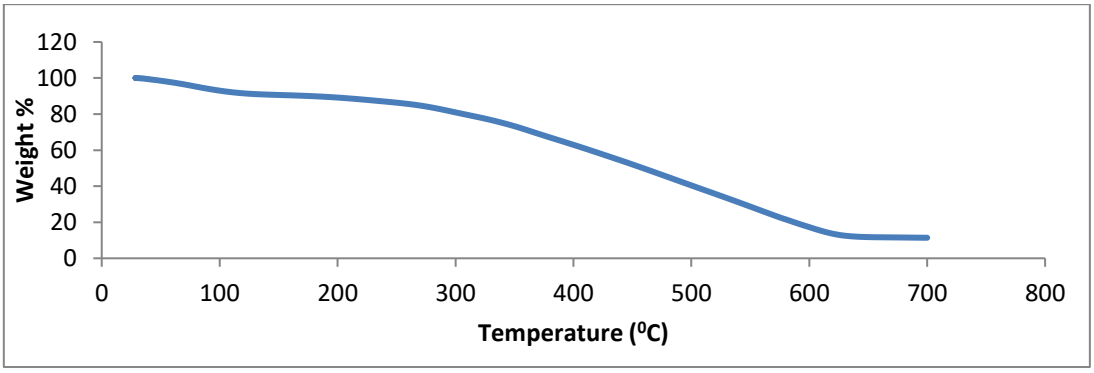


Fig. Thermogravimetric Analysis Curve of Pure PANI and PANI-SnO_2 nanocomposite

Figure shows that in two step degradation of PANI-SnO_2 nanocomposite, loss of ~ 93 % of its weight when it was heated to 670^0 C. It indicates that ~ 83 to 93 % of the sample consists of polymers and softeners. The residual about ~ 6 to 16 % was considered to account for metallic compounds, added as Tin Oxide and dopant.

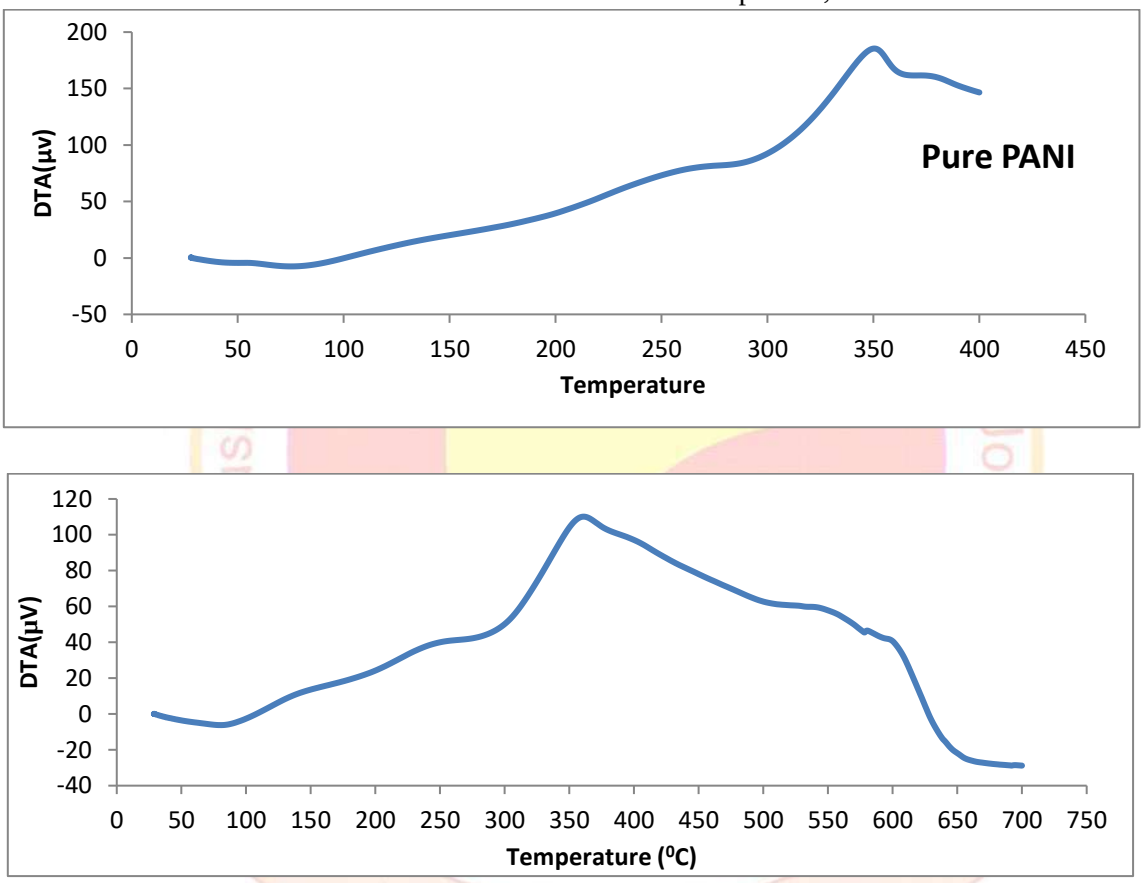


Fig. Differential Thermal Analysis Curve of Pure PANI and PANI-SnO_2 nanocomposite

Figure shows DTA curves of pure Polyaniline and PANI doped with SnO_2. In DTA curve, the endothermic peak appearing at ~ 75-100^0 C is probably due to the melting point of PANI that identified as melting of crystalline phase of polymer. Another endothermic peak appearing at 273 – 285^0C in the in situ synthesised hybrids is assigned to the decomposition and elimination of dopant. The sample PANI-SnO_2 nanocomposite shows the strong and broad exothermic peak in the range 350 to 400 ^{0}C accompanied by rapid weight loss can be ascribed to the decomposition of PANI-SnO_2 nanocomposite. This study indicated that the sample is thermally stable up to 343^0C.

PANI doped with Tin Oxide (SnO_2) shows the strong and narrow exothermic peak as compared with pure Polyaniline. It shows that with the addition of Tin Oxide the thermal stability of PANI-SnO_2 nanocomposite was increased. Thus it indicates that PANI-SnO_2 nanocomposite is more thermally stable than pure Polyaniline.

5. Conclusion

In this work, Pure polyaniline (PANI) and PANI-SnO_2 nanocomposites were successfully prepared by *insitu* polymerization method at room temperature. The particle size of PANI-SnO_2 was found to be 15 to 268 nm. SEM image shows the formation of nanoparticles of composite with agglomeration of the particles. XRD shows a size of about 40 nm for the nanoparticles of PANI-ZnO with 15% of weight. Also thermal stability of the nanocomposite is observed as more than the pure PANI. At about 400 and 500 deg. celcius the powder is degraded. It is more stable and less degradation of the nanocomposite is observed due to addition of metal oxide SnO_2. Such type of material could be used for various applications such as photovoltaic cell, rechargeable batteries, etc.

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Synthesis And Characterization of Zinc Oxide Nanoparticles from *Alishewanella Sp*. And Its Antimicrobial Activity Against Escherichia Coli

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Abstract

Metal nanoparticles have been intensively studied within the past decade. Nanosized materials have been an important subject in basic and applied sciences. Zinc oxide nanoparticles have received considerable attention due to their unique antibacterial, antifungal, and UV filtering properties, high catalytic and photochemical activity. The objective of this work is to synthesize Zinc oxide nanoparticles using green synthesisl method and characterize zinc oxide nanoparticles using scanning electron microscope and X-ray diffractometer. Further its antimicrobial activity against Escherichia coli is studied.
Key words: *Nanoparticles, Zinc oxide, Alishewanella sp., Escherichia coli.*

Introduction

New technologies often create new challenges to science in addition to their benefits, raise concerns about health and various environmental problems. Recent nanotechnology holds a promise and a broad aspect towards wide applications of nanoparticles in a multiple way of emerging fields of science and technology. Over last decades, nanotechnology has established as the great innovation of science and technology. Nanotechnology is a science and engineering branch of recent well established technology refering at the nanoscale, i.e. 1 to 100 nm Generally, metal oxide nanoparticles are inorganic. Various nanoparticles like Fe, Ni, Co, Mn, Zn, etc. are known as the enormously accepted magnetic materials for a wide range of applications like various electronic ignition systems, generators, vending machines, medical implants, wrist watches, inductor core, transformer circuits, magnetic sensors and recording equipment, telecommunications, magnetic fluids, microwave absorbers, etc. They are also applicable in other high-frequency applications. Green synthesis method is proved as beneficial over other methods which are implemented for the synthesis of nanoparticles. Green synthesis methods are eco-friendly approach and compatible for pharmaceutical and other biomedical applications, as the toxic chemicals are not used in these methods.

Besides, this method does not require high pressure, temperature. Synthesis of various nanoparticles by microorganisms is used more than the other techniques due to its ecofriendly nature. The use of environmentally beneficial materials like plant leaf extract, bacteria, fungi and enzymes for the synthesis of zinc nanoparticles proposes abundant benefits of eco-friendliness and compatibility for pharmaceutical and many other biomedical applications

These compounds act as chemo-therapeutic agents for the treatment or prevention of bacterial infections (Saunders Comprehensive Veterinary Dictionary 2007). An antibacterial agent is considered as bactericidal if it kills bacteria or as bacteriostatic if it inhibits their growth. Different methods have been adopted for the assessment and investigation of antibacterial activity in vitro. These methods include disk diffusion, broth dilution, agar dilution, and the microtiter plate-based method.

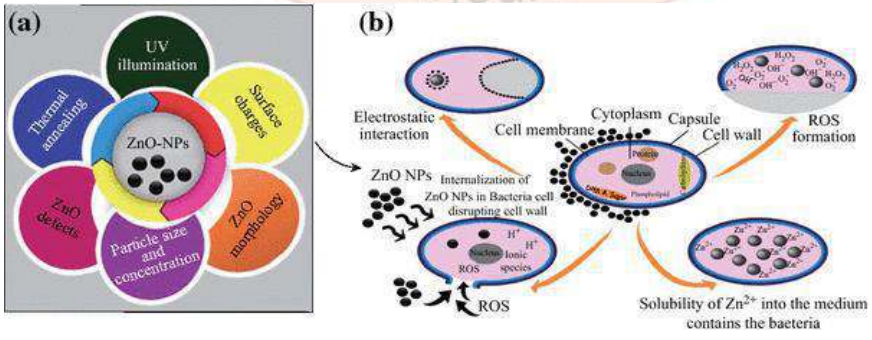


Fig:2 Correlation between the a influence of essential ZnO-NPs parameters on the antibacterial response and the different possible mechanisms of ZnO-NPs antibacterial activity.

Correlation between the influence of essential ZnO-NPs parameters on the antibacterial response and the **b** different possible mechanisms of ZnO-NPs antibacterial activity, including: ROS formation, Zn^{2+} release, internalization of ZnO-NPs into bacteria, and electrostatic interactions.

The antimicrobial property of nanoparticles is determined by their size, shape, morphology, composition and crystallinity. Researchers are going on to synthesize nanoparticles, designing of nanodevices and application of these in different fields like medical science, environment, energy, information, and communication, industries and also in food technology etc. Generally there are two parts of nanoparticles, the core material and a surface converter. The surface converter is responsible for alteration in the physicochemical properties of core materials. The core material consists of a variety of biological materials like phospholipids, lipids, lactic acid, chitosan, and dextran or may be formed of carbon, chemical polymers, silica or meta

Experimental:

Materials And Methods

- Culture of *Alishewanella species*
- Distilled water
- Zinc Sulphate
- Mueller Hinton Agar
- Nutrient agar
- Nutrient broth

Nutrient agar:

Composition

Ingredients	Gms/lit
Peptic digest of animal tissue	5.000
Sodium chloride	5.000
Beef extract	1.500
Yeast extract	1.500
Agar	15.000
Final Ph (at 25^0)	7.4 to 0.2

Nutrient broth:

Composition

Ingredients	Gms/lit
Peptic digest of animal tissue	5.000
Sodium chloride	5.000
Beef extract	1.500
Yeast extract	1.500
Agar	15.000
Final Ph (at 25^0)	7.4 to 0.2

Muller Hinton Agar

The major used of Mueller hinton agar is for antimicrobial susceptibility testing

Composition

Ingredients	Gms/lit
Beef extract	2.00 gm
Acid hydrolysate of casein	17.50 gm
Starch	1.50 gm
Agar	17.00 gm
Distilled water	1000 ml
Final pH (at 25^0)	7.3 to 0.1

Reagent

- Crystal violet
- Iodine
- Safranin (0.25%)
- Alcohol (95%)
- Hydrogen peroxide (3%)
- Oxidase reagent (1% tetramethylene paraphenylene diamine dihydrochloride).
- N HCl.

Following reagent was used for identification and characterization of isolated.

1. Crystal violet stain

Solution A:

Crystal violet - 2.0 g
Ethyl alcohol - 20ml

Solution B:

Ammonium oxalate - 0.8 gm
Distilled water - 80 ml
Mixture of solution A and B

2. Grams Iodine solution

Iodine - 1gm
Potassium Iodine - 2.0 gm
Distilled water - 100 ml

3. 95% alcohol

4. Safranin solution (1%)

Safranin - 1.0 gm
Distilled water - 100ml

Preparation of 2mM ZnO solution

100ml $ZnSO_4$ solution was prepared which has the molecular weight of 161.47g/mol. 2.86 gm of $ZnSO_4$ was dissolved in 100ml distilled water.

Method

Enrichment of culture

Enrichment culture is a medium having specific and known qualities that favour the growth of particular microorganism. Enrichment culture's support the growth of particular microorganisms while inhibiting the growth of others. These cultures are used to increase the small number of desired organism to detectable work in the present work. Enrichment of culture was done in nutrient broth containing zinc sulphate solution as a source for synthesis of ZnO nanoparticle.

Centrifugation

Centrifugation is used to separate the two miscible substances. The culture was centrifuged at 3000rpm for 20 minutes. After centrifugation cell pellets were seperated by removing supernant. Separated cell pellets were inoculated in 100ml of 2mM zinc sulphate solution.

Synthesis of ZnO NPs

For synthesis of ZnO nanoparticle flask containing 2mM solution of zinc sulphate with cell pellets was incubated on rotary shaker for 3 days at 100 rpm. Zinc oxide nanoparticle synthesis was seen by means of change in colour from white to pale yellow.

For confirmation of zinc oxide nanoparticle synthesis UV-visible spectophotometric studies was done, from which the graph was obtained showing spectra at 430nm.

Results And Discussion

Nutritional responses, optimization of pH and temperatures of *Alishwanella sp.*			
Colour	Creamy	Trehalose	-
Size	Large	Arabinose	+
Shape	Circular	Galactose	-
Texture	Moist	Rhamnose	-
Elevation	Flat	Salicin	-
Opacity	Opaque	Xylose	-
Margine	Serrete	Esculin	-
Gram staining	-	Malic acid	-
Shape	Rod	pH 6	-
Catalase	+	pH 7	+
Oxidase	+	pH 8	+
Indole	-	pH 9	++
Methyl red	-	pH 10	++
Voges Proskauer	-	pH 11	++
Citrate utilization	-	pH 12	+
Nitrate reduction	+	Temp 30ºC	+
Dextrose	+	Temp 40ºC	++
Lactose	-	Temp 60ºC	-
SR- Short Rod; (+) = Positive; (-) = Negative; + = Normal growth; ++ = Moderate growth; +++ = Luxuriant growth			

Biosynthesis of ZnO NP's

Fig 1. Biosynthesis of Zno NPs

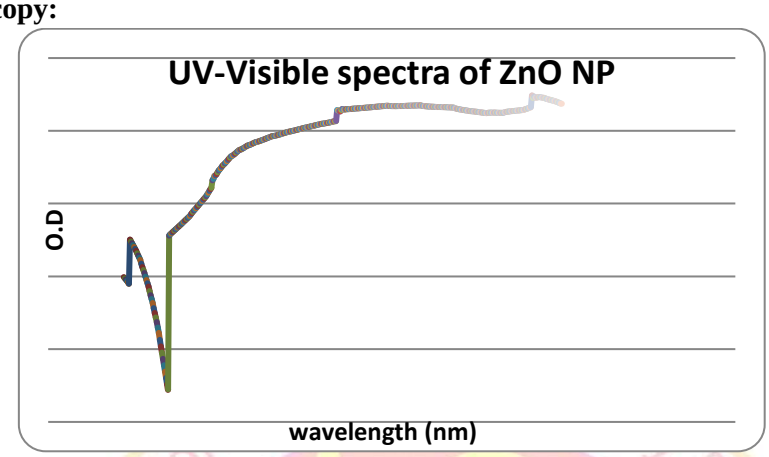
1. Control eppendrop without cell pellets
2. Experimental eppendrop with cell pellets showing colour change from white to pale yellow.

Culture was maintained by serial sub-culturing on nutrient agar slants. Two experimental flask was used for the zinc oxide nanoparticles synthesis of nanoparticle shown in the figure. Confirmation of synthesized nanoparticle in the medium was characterized by the change in color of the reaction mixture from white to pale yellow after 24h of incubation. First flask was used as a control containing 2mM $ZnSO_4$ without inoculation of cell pellet kept on rotary shaker, which did not show color change after 24 hours. The second flask containing 2mM $ZnSO_4$ with cell pellet kept on rotary shaker, pale yellow color formed after 24 hours which shows positive result. That means it confirmed that the zinc oxide nanoparticle was synthesized (Fig 1).

reaction mixture from white to pale yellow after 24h of incubation. First flask was used as a control containing 2mM ZnSO4 without inoculation of cell pellet kept on rotary shaker, which did not show color change after 24 hours. The second flask containing 2mM ZnSO4 with cell pellet kept on rotary shaker, pale yellow color formed after 24 hours which shows positive result. That means it confirmed that the zinc oxide nanoparticle was synthesized.

Characterization of zinc oxide nanoparticles:

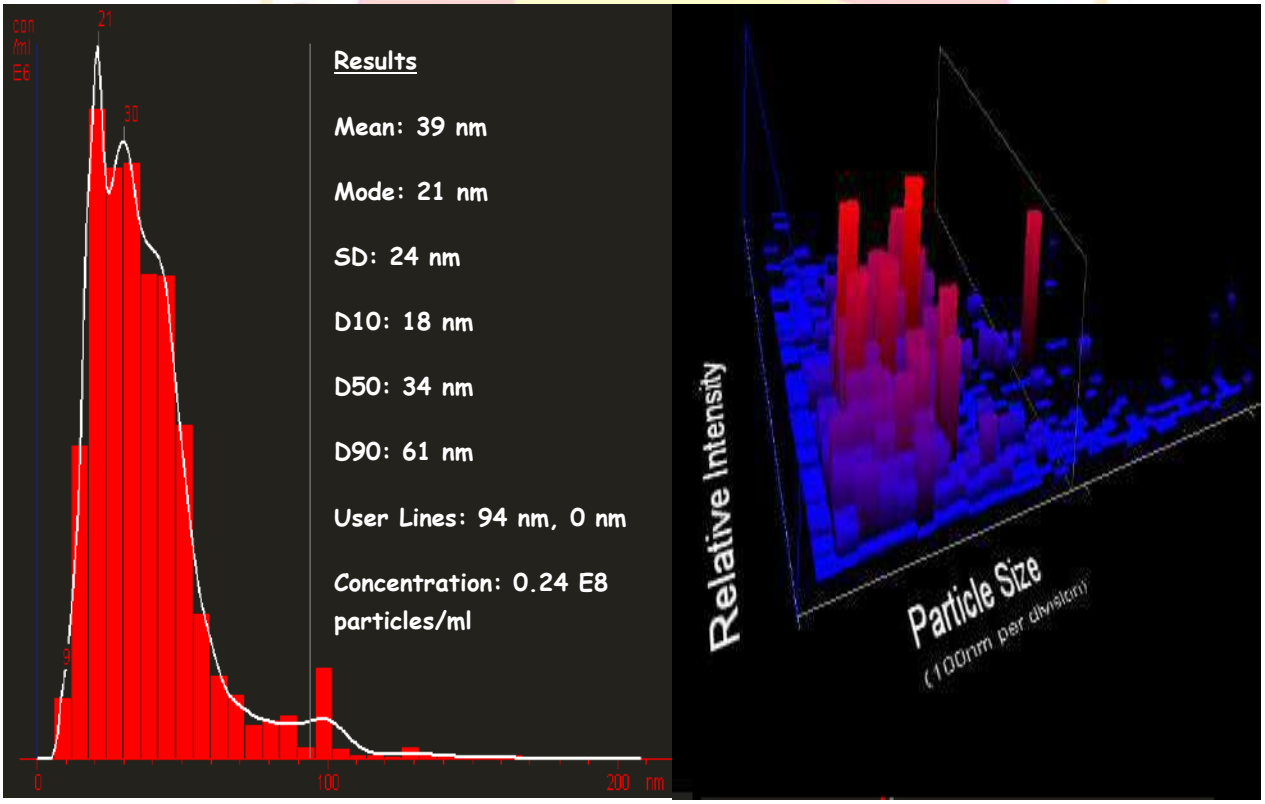
UV- Visible spectroscopy:



Graph1. UV-Visible spectra of ZnO NPs

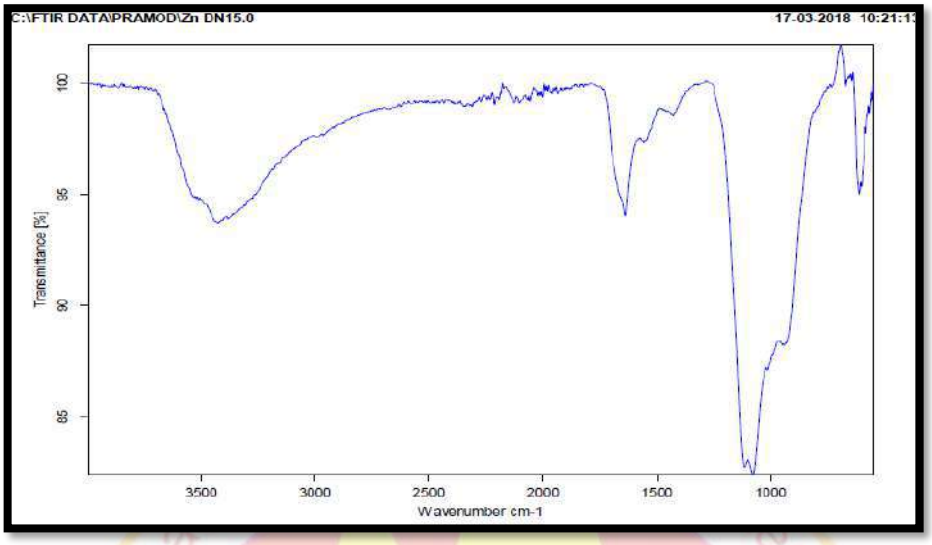
The synthesized zinc oxide nanoparticle solution was observed in UV–visible spectra, the change in color of this solution was recorded in Spectrophotometer in the range of 350–500nm. The absorption Maxima was seen at 440 nm, which confirms the synthesis of zinc oxide nanoparticles for studied bacterium. The absorption maxima was at 440 (Graph1).

Nanoparticles tracking and analysis (Nanosight LM 20)



Nanoparticle tracking analysis NTA (NanoSight-LM 20) histogram showing particle size distribution and the average size of zinc oxide nanoparticles (39 nm). The particle analyzer results revealed the presence of nanoparticle in the range of 21 to 39 nm. The mode displayed by the analyzer was 21 and the mean was 39nm.

Fourier transform Infra-red spectroscopy



Graph 2: FT-IR of zinc oxide nanoparticle

Graph 2.Shows the of FTIR spectrum of the ZnO nanoparticles synthesized by biological, which was acquired in the range of 500-4000cm-1. The band between the 500-550cm^{-1} corelated to metal oxide bond (ZnO). FTIR method measurements was carried out to identify the possible biomolecules responsible for capping and efficient stabilization of the metal nanoparticles synthesized by the microbes. It also confirms the reduction of metal ions by the used bacteria. The peaks in the range of 1100-1600cm^{-1} corresponds to the C=O bonds.

Antimicrobial activity of ZnO NPs:

A. Experimental **B. Control Positive**

Fig 2: Antimicribial action of ZnO NPs

Fig 2 A: Action of zinc oxide nanoparticle against *E.coli*.

Fig 2 B: Action of standard antibiotic tetracycline

Table 2: Antibacterial action of zinc oxide nanoparticle.

Test organism	Zone of inhibition (mm)
E.coli	**19**

Table 3: Antibacterial action of standard antibiotic

Antibiotic	Zone of inhibition (mm)
Tetracycline	22

The antibacterial activity of zinc oxide nanoparticle against pathogens was performed by well diffusion method. For testing the antibacterial activity of zinc oxide nanoparticle the well diffusion method was used, the pure bacterial culture was subculture on muller hinton agar respectively. Wells of 8 mm diameter made on muller hinton agar using cork borer. The strain was swabbed uniformly into the individual plates using spreader. After that Using a micropipette, sample of nanoparticles solution poured into the well and incubated plates for 24 hours. And the zone of inhibition was observed.

This work demonstrates that zinc oxide nanoparticle showed the property to synthesized by bacteria. The isolated strain of *Alishwanella sp.* was found to have the potential to form zinc nanoparticles at room temperature within 24 h. The synthesized zinc oxide nanoparticles was characterized by UV– Vis spectroscopy and confirmed by particle analyze, FT-IR spectroscopy and Zeta potential. Zinc oxide nanoparticle was again tested for its antimicrobial activity against pathogenic *E.coli*. These zinc oxide nanoparticles shows very good effectivity on some pathogens.

Conclusion

Alishwanella sp. was able to synthesized zinc oxide nanoparticle efficiently. The source used for synthesizing zinc oxide nanoparticle was zinc sulphate. The nanoparticle was characterized by visual observation, UV-VIS spectrophotometer, FT-IR spectroscopy and zeta potential. The size of zinc oxide nanoparticle ranged from 21 to 39 nm.

The UV-Vis spectroscopic study shows the Plasmon resonance property, confirmed the reduction of metal ion and formation of nanoparticle with plasma resonance peak at 440 nm. The change in color of ZnO solution was recorded in Spectrophotometer in the range of 350–500nm. The sharp bands of zinc colloids were observed at 426 nm proves the zinc metal reduces the bacterial cell extract more efficiently.

Nanoparticle tracking analysis NTA (NanoSight-LM 20) showed particle size distribution and the average size of zinc oxide nanoparticles (39 nm). FTIR confirms the reduction of metal ions by the used bacteria. The peaks in the range of 1100-1600cm^{-}1.The nanoparticles was found to be the potent inhibitors of pathogenic bacteria and have shown significant zone of inhibition against pathogenic *E. coli*.
particle size.

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Water vapour sensing mechanism of pristine SnO_2 nanoparticle based thick film sensor

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Abstract

The SnO_2 was synthesized by co-precipitation method. The gross structure and phase purity of the pure SnO_2 nano powder were examined by powder X-ray diffraction technique. It reveals that the sample crystallize in tetragonal structure. The surface morphology investigated through field emission scanning electron microscope(FE-SEM) results that pure SnO_2 possesses uniform grains and is almost homogeneously distributed, which indicates the high packing density of the materials and nano spheres like structures. Further, Water vapour or humidity sensing investigations of pristine SnO_2 nano powder were study. Our result indicates that pristine SnO_2 in form of thick film was most sensitive for humidity under same conditions. The hysteresis plot between increasing and decreasing the RH range of 30–90% Rh and vice versa. The samples resistance decreases from 10^{11} Ω to 10^{8} Ω. The similar change was also observed in sensitivity. The response and recovery time were also studies. The results were re- producible up to ± 79% after 2 months of observations.

Key words: *SnO_2 nanoparticle, Humidity sensor.*

1. Introduction

Humidity plays a significant role in every part of the Earth in biology factors and varrious industrial processes. To have a desirable surrounding atmosphere, it is essential to monitor, detect and control the ambient humidity under different conditions ranging from low temperature to high or in combinations with other gases by precise and provident sensors [1,2]. Due to the different operating conditions of moisture sensors in different areas of application ranging from indoor to open air uses, various types of humidity sensing instruments have been developed based on different work principles and diverse hygroscopic sensing materials [3-5]. The operating principle of metal oxide semiconductor sensors is based on the change in conductivity of the sensitive layer by the chemical adsorption of molecules. Typically, the metal oxides semiconductors (SnO_2, In_2O_3, WO_3, ZnO, etc.) are used to create sensitive layers [6-8]. Tin oxide is an n- type wide band gap semiconductor (Eg = 3.6 ~3.97eV) and its electrical properties critically depend on its stoichiometry with respect to oxygen, on the nature and amount of impurities or dopants present and on its size as well as shape of nanostructures [9-11]. Stannic oxide is formed in the structure of rutile, the spatial group being P4/mnm. The unit cell is tetragonal, it consists of six atoms – two stannum and four oxygen atoms – and is characterized by the lattice parameters a and c and intrinsic parameter u. The optimized cell parameters obtained in the calculation are as follows: a=b= 4.738Å, c= 3.188Å and u = 0.30756. In the bulk all Sn atoms are six-fold coordinated to threefold coordinate oxygen atoms. The SnO_2 is an anisotropic polar crystal, which crystallizes in tetragonal rutile structure [12-16]

In this work, SnO_2 nanoparticles is synthesized by using co-precipitation method. The humidity sensing properties of the synthesized material such as hysteresis cycle, sensitivity and response time of pure synthesized material were studied.

2. Experimental

2.1 Synthesis of SnO_2 nanoparticle

All the chemicals used in this study were of GR grade purchase from Sd-fine, India (purity 99.99%). In preparation of SnO_2, 2 g (0.1 M) of stannous chloride dehydrate ($SnCl_2.2H_2O$) is dissolved in 100 ml distilled water. After complete dissolution, about 4 ml ammonia solution is added to above prepared aqueous solution with magnetic stirring. The solution was stirred for 20 minutes to make homogeneous solution. White gel precipitate is immediately formed and it is allowed to settle for 12 hrs. Then it is filtered and washed with deionised water 2-3 times. The obtain precipitate were mixed with 0.27 g carbon black powder (charcoal activated). The obtained mixer is kept in vacuum oven at 70 ºC for 24 hours so that the mixer gets completely in to dried powder. Then this dry product was crushed into a find powder by grinder. Now obtained product of fine nano powder of SnO_2

was calcinated at 800°C up to 8 hours in the auto-controlled muffle furnace (*Gayatri Scientific, Mumbai, India*.) so that the impurities from product will be completely removed.

Preparation of thick films

The thick film was prepared by screen printing technique on a glass substrate. Initially, for the screen printing the thixotropic paste was formulated by mixing the sintered fine powder of pure nano SnO_2 powder a with a solution of ethyl cellulose (as 10% temporary binder) in a mixture of organic solvent such as butyl cellulose, butyl carbitol acetate and turpineol. The ratio of inorganic to organic part was kept as 75:25 in formulating the paste. The paste of pure SnO_2 and it was screen printed on a glass substrate in the form of thick films. The prepared films were dried at 80-110°C in oven for 1hrs then the dried films are kept for fired at 500°C for 25 min in muffle furnace (Kumar make Mumbai), so that all the organic materials (in the form of binders) and organic impurities can be evaporated form the sensor material. For the surface conductance measurement, the electrodes of silver paint were formed on adjacent sides of the films and again, the films were subjected to heating at 80°C for 15 min for drying the silver paint.

2.2 Characterization

X-ray diffraction (XRD)

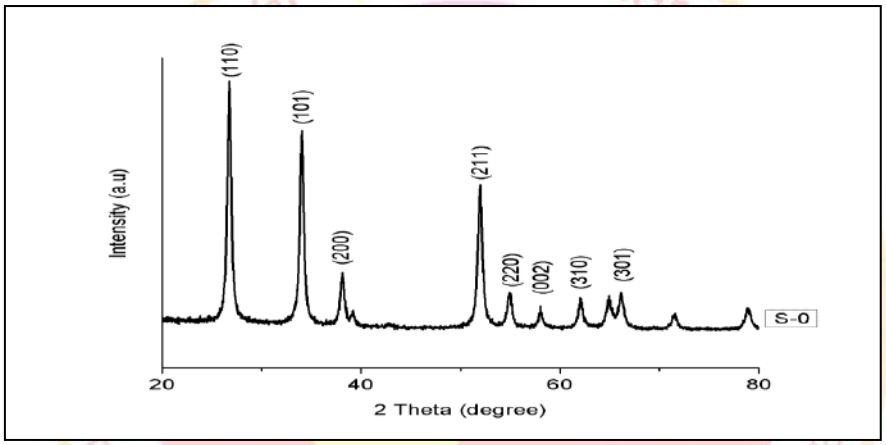

Figure 1 XRD pattern of pristine stannic oxide (SnO_2)

Figure 1. shows the XRD pattern of pristine stannic oxide (SnO_2) nanostructure synthesized by liquid phase via co-precipitation method calcinated at 400°C it is clearly observed that the highest intensity peak is obtained at (110) crystal planes and other peaks lying at (101), (200), (211), (220) and (002) of SnO_2. All the peaks match well with the standard tetragonal structure of SnO_2 with lattice constant a = 4.723 nm and c = 3.238 nm and its unit cell volume ($V=72.24A^{o3}$) with JCPDS card no. 71-0652. All the peaks are perfectly match with pure SnO_2 nanostructure, which indicates the high purity of obtained SnO_2 nanoparticles. The average crystalline size was found to be 23.19 nm calculated by using Debye-Scherer formula [17].

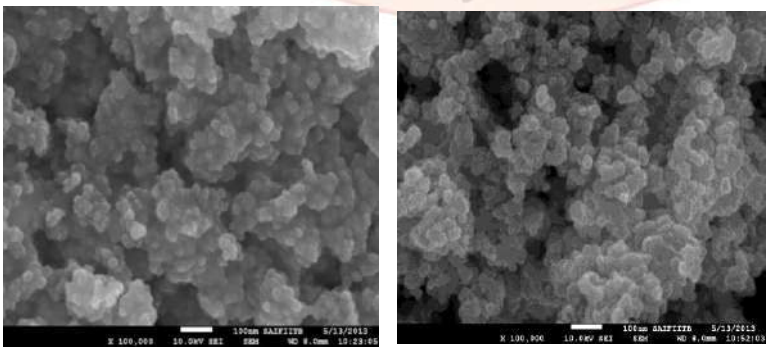

Figure 2. FE-SEM of pure SnO_2

Figure 2. shows the micrograph of sample pure SnO_2 thick films in this the particles are found to in the tetragonal shape within the particle size in the range of about 15 nm to 31.2 nm.

3. Result and Discussion

Hysteresis Plot

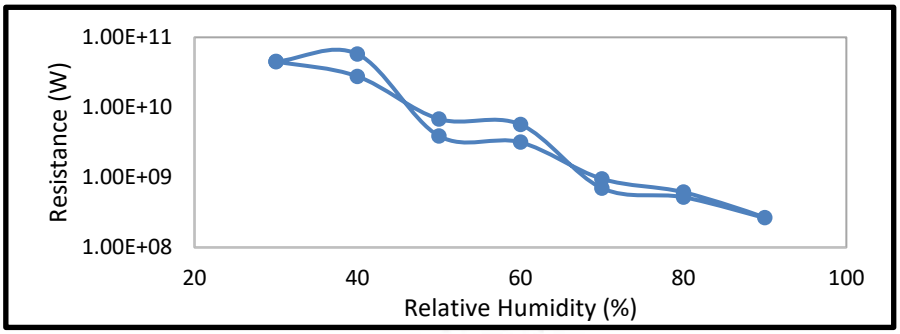

Figure 3. Hysteresis Plot

Hysteresis plot of pristine SnO_2 shows the variation between resistances of sample with respect to the relative humidity in increasing and decreasing order from 30 to 90 % RH as shown in the figure 3. A very small hysteresis present during forward and reverse cycle of relative humidity, where as a very significant average change observed in the value of resistance from 10^{11} Ω to 10^{8} Ω, these is a very remarkable change in the observed in the value of resistance in pristine SnO_2 material. In all the prepared sample the hysteresis is present which shows processes of regeneration is quite slower. Apart from these a sample shows comparable decrease in resistance with an increase in % RH which indicates that the conduction occurred at the grain surface by release of electron from the water molecule and possessed a high sensitivity factor due to large surface area and porosity in the form of thick films.

Sensitivity

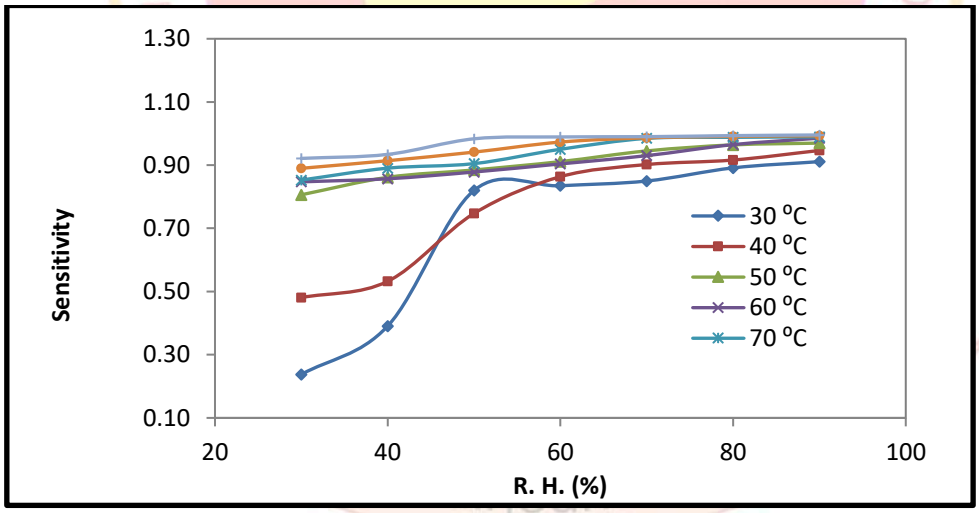

Figure 4. Sensitivity curve

The sensitivity is found to be increasing with the RH for the thick films and it is increasing up to some particular RH and then afterward it remains constant as shown in figure 4. For higher RH the sensitivity curve is found to be higher for the thick film of pristine SnO_2. It also state that the change in conductivity is more in SnO_2 nano materials the similar change is observed in sensitivity also. The Pure SnO_2 nanoparticle-based sensors exhibits significantly higher sensitivity it is due to the formation of heterogeneous interface between them and more adsorption site was created to absorbed more water vapuors. The fall in resistance is mainly due to the increased amount of conduction electron or charge carrier upon adsorption of water vapours by the surface layer of the thick films.

Response Time

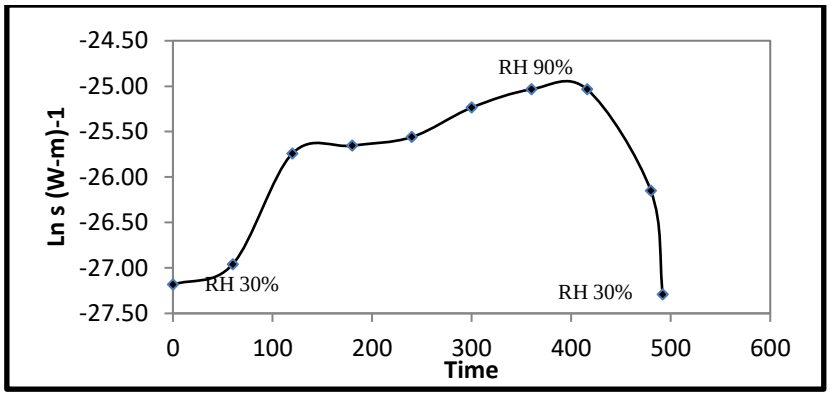

Figure 5. Response Curve

The responses curve pristine SnO_2 at constant temperature is as shown in figure 5. From the response curve, on time and recovery times are measured. Under the condition of constant temperature, the relative humidity is increases from 30 % RH to 90% RH in some appropriate time and then at the 90 % RH it is stopped, (ON response time) 360 sec which is after, it was allowed to fall up to 30 % RH (OFF recovery time) which is 127 sec. It is observed that response and recovery time is nearly fast in the pristine SnO_2.

4. Conclusion

SnO_2 nanoparticle was successfully synthesise co-precipitation method. Minimum crystallite size was found to be 23.19 nm for SnO_2 nanoparticle. The Surface morphology of pure SnO_2 shows that most particles are spherical in shape leaving more space as pores and hence it was most sensitive for humidity sensing. The Hysteresis plot shows very significant average change in the value of the resistance from 10^{11} Ω to 10^{8} Ω during forward and reversed cycles. Sensitivity is found to be increasing with the RH in pure SnO_2 thick film and it is increasing up to some particular RH and then afterward it remains constant. This shows that it has good scope for the development of moisture sensor in the range of relative humidity 30% to 90% RH. The response and recovery time of pristine SnO_2 based thick film sensors were satisfactory i.e. the sensors were found to be fast in operation. The recovery time found to 127 s at constant temperature respectively.

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Green And Facile Synthesis Of Silver Nanoparticles Using *Azadirachta Indica* (NEEM) Extract

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Abstract:
Nanoparticles are gaining interest in biomedical applications due to its importance such as anti-bacterial, anti-fungal and anti-cancer agents. Eco-friendly green methods using plant extracts are gaining popularity due to the abundance of raw materials and the production of non-toxic by-products threatening to the environment. For the synthesis of silver nanoparticles (SNPs) using the leaf extract of Azadirachta indica as a reducing agent from 1 mM silver nitrate ($AgNO_3$) has been investigated. The synthesis silver nanoparticles were characterized by UV/VIS spectroscopy, XRD, EDAX, IR and Scanning Electron Microscopy. Thus from this study it can be concluded that Azadirachta Indica can be effectively used for synthesizing silver oxide nanoparticles.
Keywords: *Silver oxide Nanoparticles, Green Synthesis, Azadirachta indica*

Introduction

Biological synthesis process provides a wide range of environmentally acceptable methodology, low cost production and minimum time required. At the same time the biologically synthesized silver nanoparticles has many applications includes catalysts in chemical reactions [1]. In this context, the concepts of green chemistry have gained immense popularity; these are mainly concerned with replacing chemical products and improving or developing processes and technologies to reduce or even eliminate substances that are harmful to health and the environment [2]. Generally, metal nanoparticles can be prepared and stabilized by chemical, physical, and biological methods; the chemical approach, such as chemical reduction, electrochemical techniques, photochemical reduction and pyrolysis and physical methods, such as Arcdischarge and physical vapor condensation are used. To synthesis stable metal nanoparticles with controlled size and shape, there has been search for inexpensive, safe, and reliable and "green" approach. The novel methods so called green/biosynthesis have been recently developed by a variety of plant extract such as Ocimum Sanctum, Petroselinum crispum, Murraya koenigii, Coriandrum Sativum for the synthesis of metal nanoparticles[3-5]. Among the various metal nanoparticles synthesized (such as silver, gold, iron, zinc and platinum), silver nanoparticles have gained more importance in the nanotechnology field. As, silver in the nano size is safe inorganic and non-toxic agents and encompasses a wide range of applications such as antibacterial and antifungal effects. It promotes reactions without hazardous solvents, reducing agents, and stabilizers [6]. Several green methods have been applied so far for the preparation of AgNPs including electrochemical reduction, microwave and sonochemical preparation, or synthesis from supercritical liquids [7].

Here we have developed a rapid, eco-friendly and convenient green method for the synthesis of silver nanoparticles from silver nitrate using leaf extracts of Azadirachta indica.

Material And Methods

Materials: Materials used in this research consist of Silver nitrate, *A. indica* (Neem) used in this work were collected from the garden of Shri. Shivaji science college Akot.

Preparation of Water Leaf Extract of A. indica (Neem): To 10 gram of powered leaf sample 100 ml of water as a solvent was added (10g/100ml). Plugged with cotton wool and then kept on a rotary shaker at 200 for 10 hours. After 10 hours the extract was filtered and the filtrate was concentrated using flash evaporator and stored in air tight containers at 4°C and used for further experiments.

Synthesis of Silver Nanoparticles (AgNPs) from water Leaf Extract of A. indica (Neem): Silver nanoparticles were prepared from water leaf extract of *A. indica (Neem)*. To 10 ml of the water leaf extract 90 ml of 1mM silver

nitrate solution was added. The extent of nanoparticles synthesis was monitored by measuring the absorbance at 400-600nm

Characterization of Silver nanoparticles

UV-Vis spectrophotometer:

Formation of silver nanoparticles is easily detected by spectroscopy because the colored nanoparticle solution shows a peak ~400 nm. The band in silver nanoparticles solution was found to be close to 400 nm. In this study, spectrophotometer was used to measure the optical density of solutions.

EDAX Spectroscopy:

The EDAX is a reliable tool to determine the elemental composition of the synthesized AgNPs from *A. indica (Neem)* extract. The EDX profile of the AgNPs from *A. indica (Neem)* extract showed the presence of typical peaks for silver. Additional peaks also observed which indicated the presence of nitrogen and oxygen, representing the existence of other elemental compounds in the AgNPs.

FTIR Spectroscopy:

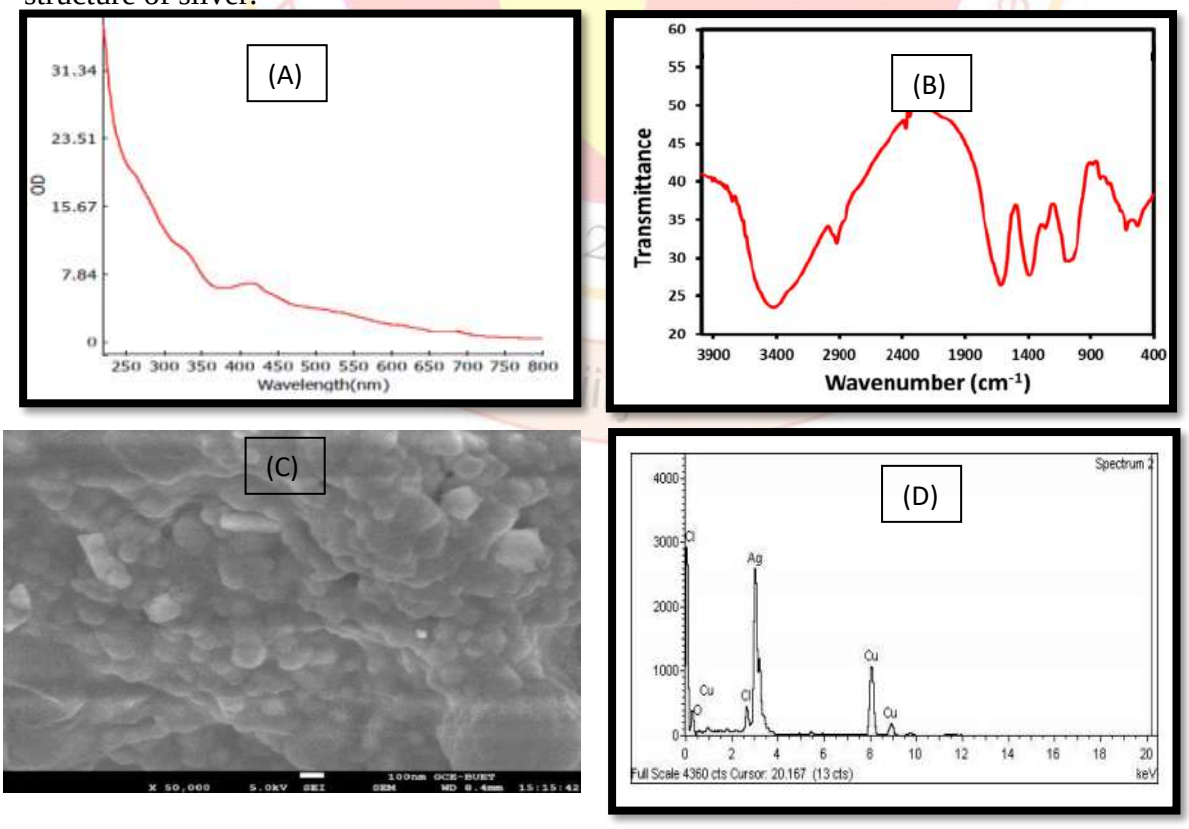
The FTIR spectra of *A. indica (Neem)* extract leaf extract showed the characteristic peaks of OH, alkene, aldehyde groups which may be involved in the reduction and stabilization of silver nanoparticles. The presence of OH, aldehyde and alkene in the extract acted as the capping and stabilizing agent for the synthesis of silver nanoparticles. The silver nanoparticles synthesized from *A. indica (Neem)* extract leaf extract showed the presence of phytoconstituents namely amides, alkenes, aliphatic amines, alkanes and alkyls, responsible for the reduction of silver nitrate.

Scanning electron microscopy:

SEM images showed that most of the silver nanoparticles are predominately spherical in shape having smooth surface and well dispersed with close compact arrangement shown in fig. (C).

X-Ray Diffraction:

The XRD pattern of synthesized AgNPs using *A. indica (Neem)* leaf extract was shown in Fig. (E). The XRD was done to determine the crystalline nature of AgNPs and the resulted peaks were found at 37.90°, 44.05°, 64.25° and 77.20° representing (111), (200), (220) and (311) face centered cubic structure of silver.



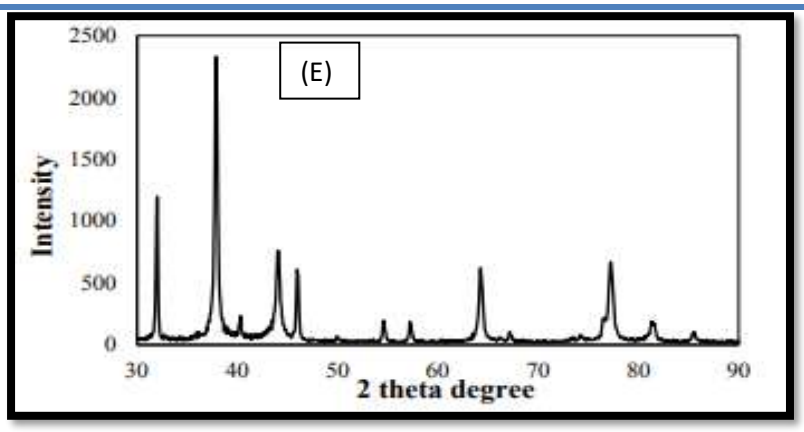


Fig. (A) UV-Vis spectrum (B) FTIR spectrum (C) SEM spectrum (D) EDAX spectrum (E) XRD spectrum of silver nanoparticles.

Conclusions

The green synthesis of AgNPs using *A. indica (Neem)* leaf extract was shown to be rapid, eco-friendly and produced nanoparticles are fairly uniform in size and shape. The functional groups present on their surface confirm the bioactive potential. The AgNPs showed a good stability profile. The ideally suited structure for AgNPs was successfully characterized. This work indicates that neem leaf extract had a good valuable potential in the future for production of silver nanoparticles

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Application of Nanotechnology in Food Packaging: A Review

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Abstract

Nanotechnology has validated its competence in almost all feasible fields. But still, Food Nano packaging is an incompletely explored discipline of observe both in Nano technology and food science. The motive of this paper is to expose the applications of nanotechnology in food packaging. Bio primarily based packaging is a one of the terrific techniques to reduce the environmental pollution. It replaces the non-degradable polymers with biodegradable materials which reduces waste and may be altered to increase the shelf life, and beautify food nice. Next is advanced packaging, which objectives in producing packaging cloth with excellent barrier homes, mechanical energy, flexibility and stability. Smart packaging is set use of Nano sensors and Nano devices inside the detection of freshness of food, contaminants in meals, screen changes and integrity of packaging fabric.

Keywords: Nanoparticels, Nano biosensors, Nanopacking

I. Introduction

Nanotechnology is the engineering of practical systems at less than a hundred nm scale degree. Nanotechnology applications are multiplied in the numerous sectors within the industrial world so as in food industry. Nanotechnology acts a distinguished function in food enterprise via supporting to enhance its range of sub sectors together with meals packaging. At present studies are being carried out to extend the shelf lifestyles and enhance meals first-rate even as decreasing packaging waste.

Thus, Nanotechnology applications in food packaging have brought about big amount of improvements which can be used inside the packaging industry commercially. This evaluate covers the position of novel nanotechnology primarily based meals packaging strategies in order to get higher enhancement in Food Quality and Safety.

Application of nanotechnology in improvement of bio based totally packaging which includes starch and polylactic acid, progressed packaging consisting of Nano laminates, Nano coatings and Nano clay, and clever/shrewd zone such as spoilage indicators, Nano-primarily based sensors and lively tags have been reviewed

II. Bio Based Packaging

The developing problem related to disposable of plastic in-turn has caused the development of bio degradable packaging. Bio based totally packaging are biodegradable packaging movie which can be able to controlling moisture switch and/or fuel trade with the intention to enhance protection and keep the dietary and sensory satisfactory. Bio polymers are used to produce these sorts of packaging movies. Bio polymers have poor mechanical, thermal and barrier houses [1].

Particularly, high brittleness, low warmth distortion temperature, excessive permeability of gasoline and vapored bad resistance to processing operations has confined their programs in meals enterprise [2,3]. Thus nanotechnology has been applied to improve the properties of these biopolymers. Nano-composites are advanced to conquer these boundaries of the biopolymers via nanotechnology. At nano scale degree, the size of the filler is immensely decreased, leading to the full-size increment in the floor area of the fillers. This is desired due to the fact bio Nano composites depend upon the high floor location of the Nano sized fillers which ends up in a massive boundary or interfacial place among the matrix or biopolymer and Nano filler. These kinds of alteration to biopolymers have advanced the homes of it as food packaging materials.

Biopolymers consist of plant-derived substances along with, starch, cellulose, other polysaccharides, and proteins; microbial products like polyhydroxylbutyrate and polymers synthesized chemically from naturally derived monomers including, polylacticacid. Most reviews centered on software biopolymer movies as fit for human consumption films

III.**Starch**

Starch and derivate are the most commonly used form of biopolymers that has been studied to supply bio-Nano composite materials for food packaging programs. Studies display that starch is absolutely degradable and will induce biodegradability of non-biodegrable substances while mixed Unfortunately, the starch has some limitations, including poorer mechanical residences and robust hydrophilic behavior (bad moisture barrier) [4, 5]. To conquer this problem, incorporating inorganic materials and artificial polymers has been proposed to improve water barrier belongings of starch. If starch is processed in an extruder via both mechanical and thermal power, it may be transformed to a thermoplastic fabric.

Here, plasticizers are used to reduce intra-molecular hydrogen bonds and to offer balance to product residences. But still thermoplastic starch (TPS) cannot meet some of these necessities along with green mechanical, oxygen and moisture protection. To overcome this problem, clay turned into used as follows. Clay has been used as a potential filler to improve the residences of TPS. Starch or clay Nano composite films have been obtained through dispersing montmorillonite (MMT) nanoparticles via polymer melt processing techniques [6].

IV.**Polylactic Acid (PLA)**

Polylactic acid (PLA) is the maximum common artificial biopolymer that has been studied until nowadays. PLA has received attention as a biocompatible, sustainable, biodegradable cloth with better mechanical properties. Therefore, PLA presents greater disposal alternatives and its production is much less environmentally burdensome than traditional petroleum-primarily based plastics [7, 8].The most essential barriers for the packages of PLA in meals packaging are its negative hardness, sluggish degradation, terrible gasoline barrier properties, and hydrophobicity [8]. Nanotechnology may be carried out to enhance this assets through the usage of Nano composites. Solvent casting of combinations of PLA and organophilic clay in chloroform led to substances with an improved crystallization tendency and extended Young's modulus.

The PLA layered silicate Nano composites, evolved by means of simple soften extrusion, exhibited considerable development of material residences in each solid and soften states as compared to the matrix without clay [2]. The oxygen barrier residences of Nano composite of amorphous PLA blended with chemically changed kaolinite had progressed by using 50%. The mixture of PLA and MMT layered silicate may additionally bring about a Nano composite with barrier homes appropriate for food packaging applications [4].

V. **Improved Packaging**

In the improved packaging improvement, nanomaterials are mixed into the polymer matrix to get better barrier properties and to enhance temperature and humidity resistance of the packaging [4]. Such new packaging materials have top notch barrier houses to save you the migration/diffusion of O2, CO2, water vapor, and taste compounds. This could have a high effect at the shelf existence of clean and processed meals. In many events, it has been stated that the barrier residences of this new packaging film can be improved through about 50% as compared to the properties of the neat polymer. This is due to the creation of a maze shape results in a tortuous route for gases and different molecules and by way of that decreasing their permeation fee [9]

VI. **Nano Coatings**

Coating in meals may be defined as skinny film of edible fabric placed among meals additives to provide a barrier to mass switch. Edible coatings are currently broadly used on a spread of ingredients, consisting of veggies, end result, chocolate, meats, cheese, bakery products, candies and French fries [6].Up to now range of researches has been done in order to improve the bodily homes of these suitable for eating movies by way of the combination of Nano-debris.

In order to decrease the migration of oxygen, clay MMT has been integrated into pectin. Anoticeableraise in stability of chitosan layered Nano composites become received [6]. The inclusion of inorganic Nano fillers which include, TiO2, ZnO and ZnS, and carbon nanotubes has more desirable the retention of taste, acids, sugars, shade and texture, elevated balance at some point of delivery and garage, stepped forward look and decreased spoilage [8].

VII. **Nano Laminates**

A Nano laminate is made of two or more layers of fabric with nanometer dimensions which can be bodily or chemically bonded to each different. Nano laminates provide some blessings over traditional technologies for the practise of fit to be eaten coatings and films and therefore have some of crucial applications in the food enterprise [10]. A range of various adsorbing substances could be used to increase the distinctive layers, which includes; natural poly electrolytes (proteins, polysaccharides), charged lipids (phospholipids, surfactants), and colloidal debris (micelles, vesicles, droplets) [11,12]. It could be useful to incorporate active functional agents such as antioxidants, antimicrobials, enzymes, anti-browning dealers, flavors, and colors into the movies. These purposeful agents might increase the shelf lifestyles and high-quality of coated ingredients [6]. These Nano laminates may be created completely from food-grade ingredients (proteins, polysaccharides, lipids) by way of the usage of easy processing operations which includes dipping and washing [11].

VIII. **Nano Clays**

Nano clays are bi-dimensional platelets with a completely minute thickness (1 nm) and several micrometer lengths. Those are high performance, enormously to be had and occasional price substances. Thus vast range of clinical researches has been carried out approximately nanoclays. Interaction among the Nano clays and polymers are considered as the number one principle for Nano primarily based packaging. According to the prevailing clinical researches; two varieties of Nano scale composites are created by means of the interactions among Nano clays and polymers, named as intercalated Nanocomposites and exfoliated Nano composites.Beer packaging gives particular examples on Nano clay packages in packaging zone.

In the past, plastic was no longer used as a packaging material in beer industry because of the oxidation and unwanted flavour improvement.

Nanotechnology has given a practical answer using Nano composites to conquer the hassle. This caused employment of plastic substances in beer bottling and this cloth offers 6 month shelf existence for beer. This era may be additionally carried out in packaging of gentle liquids (ETC institution 2004). In addition to liquids, positive meals gadgets such as processed meat, cheese, confectionary, and boil-in-bag ingredients can also be packaged according to this era. Other than the shelf life extension, there are numerous different blessings in Nano clays and Nano-crystals primarily based packaging. As an example, the weight of the Nano-based packaging is appreciably less and as a result it results in cut-off the transportation value. Significant boom in film electricity is also may be performed in these types of substances and this ends in make certain the protection of the meals stuff that is within the packaging. The maximum full-size limitation of this generation is that the Nano clays on polymers reduce the transparency of the packaging.

IX. **Nano-Based Sensors**

Environmental modifications leads to the deterioration of food product and also leads to boom the microbial hobby on meals stuffs and toxicant generation. Nano particles and Nano composites may be used to meals packages which can be act as reactive particles and pick out unwanted changes. These kinds of substances are considered as nanosensors.Nanosensors can discover precise chemical substances, pathogens and toxicants, with reaction to their level of incidence in food stuff.

Time temperature integrators, gasoline detectors for food spoilage and O2 sensors are the not unusual kinds of Nano sensors applied in food packaging. As an instance, Scientists at Kraft, Rutgers University and the University of Connecticut, have designed the “digital tongue” to come across pathogenic microorganisms and other substances in elements in step with trillion with the assist of embedded Nano sensors within the packaging substances using nanotechnology. The sensors can detect coloration modifications in the bundle when the food merchandise start to destroy

X.**Conclusion**

Researches screen that nanotechnology is a promising generation that facilitates in innovative tendencies inside the meals packaging. Application of nanotechnology in meals packaging shows sizeable enhancements in

the processing, shelflife, fitness and packaging functionalities, transportability, and decreased expenses. Nanotechnology can be applied in food packaging in many approaches. Most of this applications are nonetheless in the experimental or fundamental level and some are handiest restrained to excessive-cost merchandise.

Bio based packaging is one among such utility. Increased interest in environmental pollutants made bio based packaging an indeed generation. Bio based totally programs have changed the non-degradable polymers. The problems associated with these biopolymers are overall performance, processing and value. The Nano composite is evolved to triumph over those barriers of the biopolymers via nanotechnology. In starch to improve its first-class Nano composite is produced the use of MMT clay as Nano filler. The mixture of PLA and MMT layered silicate results in a Nano composite with better barrier houses appropriate for meals packaging.

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Particle Size Confinement of Hybrid Nanostructured Zinc Oxide / Polyaniline Matrix

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Abstract

Hybrid matrix of Zinc oxide/Polyaniline (ZnO/PANI) nanocomposite material was synthesized by typical oxidative polymerization which followed by Ultra-sonication treatment. Due to this post treatment of ultra-sonication radiation bombardment; particle size was reduce which causes confinement in particle size. This confinement of particle size reveled by XRD patterns, also it is found that at polymerization stage nanotube were formed. These reduce small sized hybrid nanostructured Zinc oxide/Polyaniline materialmay enhanceextensive properties like electrical and gas sensing properties.

Keywords: Hybrid ZnO/PANI, Ultra-sonication, X-ray diffraction, Particle Size, Confinement.

1. Introduction

The use of nano-sized materials, nano-composite materials and hybrid structurematrix nano-compositematerial are rapidly arousing interest in scientific community due its intensive properties like the surface-to-bulk ratio for the nano-sized materials is much greater than that for coarse materials [1]. In nano-sized materials, a large fraction of the atoms are present at the surface and hence the surface properties become paramount.

Since then, broad research has been carried out on nano-sized conducting polymers because of their excellent electrical, optical and sensing properties. These materials have broad application in areas ranging from anticorrosion coatings to chemical sensors and biosensors, light-emitting devices, and solar cells, as well as many others [2]. Among the variety of conducting polymers due to unique electrical properties, stability and easy fabrication process polyaniline is one of the most attractive materials. Because of these interesting properties, polyaniline has been a potential candidate in many applications [3, 4].

Semiconductor Metal oxide (SMOx) material like Zinc Oxide (ZnO), Titanium dioxide (TiO2), Magnesium Oxide (MgO) etc has many applications in electrical, thermal, optical and sensing devices. These materials are easily synthesized by using large variety of synthesis methods. These SMOx materials particle sized varies from bulk to nano- size; depending upon synthesis techniques and conditions during synthesis [5-7].

Now days, there are emergent interests to combine both organic and inorganic materials for applications in electro-optic [8-10]. Combination of nanosized metal oxides and conducting polymer has the potential to enhance the property of the hybrid complex matrix of metal oxide and conducting polymer. Such composites material enhances properties due to its optimized volume to surface ratio of nanosized metal oxides. The properties of nanocomposite materials depend not only on the properties of their constituents but also on their combined morphology and interfacial characteristics [9-12].

Among the various semiconductor oxides materials, Zinc Oxide (ZnO) has been chosen as the key sensing material. Zinc Oxide is among the extensively studied metal oxide outstanding because of their unique properties and important characteristics for example low cost, easy availability and wide range of applications

Polyaniline which can be synthesized either by chemical oxidization polymerization [13-15] or electro polymerization [16]. Conventional chemical polymerization is conducted by polymerizing aniline monomers in the presence of a free radical activator.In past two decades, a variety of methods have been used to synthesize polyaniline nanofibers, including electrospinning, interfacial polymerization, rapid- mixing,nanofibers seeding, templates and surfactants or oligomer-assisted polymerization [12].

In present work composite material of Zinc Oxide (ZnO) and Polyaniline (PANI) synthesized and structural properties were studied also on the basis of X-ray diffraction (XRD) patterns the property of particle size confinement was studied.

2. Experimental

I. Synthesis of Nanomaterial Metal Oxide: Zinc Oxide (ZnO)

All the chemicals used in this study were of GR grade purchase from Sd-Fine, India (purity 99%). The chemicals are used without any further purification. Synthesis method adopted from S.D. Charpe *etal*[17] liquid –phase method. Finally we get product of ZnO nanoparticles.

II. Synthesis of Conducting Polymer: Polyaniline

In present work, use International Union of Pure Applied Chemistry (IUPAC) method is used prepare polyaniline in which aniline hydrochloride (5.18gm) is dissolved in 100 ml distilled water to make up volume. Ammonium peroxydisulphate (11.42gm) is dissolved in 100 ml distilled H_2O in a volumetric flask. The solutions are kept for 1 hour at room temperature. The above solutions are mixed together in equally proportion with constant stirring [18].

The precipitated is collected by filtration and washed with 0.2 M HCl, to remove all residual monomers, oxidant and its decomposing products. Finally it is washed with acetone to removes low –molecular-weight organic intermediates and oligomers. It also prevents the aggregation of PANI precipitated during drying. The precipitated is dried at 60^0C for 12 hours. The resultant material is a polyemeraldine salt.

2.1.Synthesis of Nanocomposite (PANI/ZnO)

In the experimental work, there were syntheses of hybrid matrix of ZnO/PANI done. For this synthesis process *in –situ polymerization* method was adopted [17-20] to prepare nanocomposite of PANI/ZnO hybrid matrix. First we prepare 1 M HCl solution in distilled water. Here we used Zinc Oxide which prepared in steps I.

In preparation we add Zinc Oxide (ZnO) in 1M HCl solution to achieved 0.1 M gel solution of Zinc Oxide then this solution under treatment of sonication for 1 hour. Now prepared 100 ml 0.1 M Aniline hydrochloride Solution then add 10 ml sonicated ZnO solution. Again go for sonication for 10 minutes then add 100 ml Ammonium peroxydisulphate (APS) solution slowly with continues stirring, after 3 hours we achieved polymerization. This type polymerization is called as *in-situ Polymerization*[21-22].

After 3 hours filter, washed above solution with 1 M HCl solution and dried under vacuum for 12 hours. Hence, nanocomposite hybrid matrix structures of PANI/ ZnO were synthesized [21].The yield of synthesized ZnO/PANI nanostructure was found to be well proportion. To study particle size conferment effect, bombardment of Ultra-sonication radiation of specified voltage and for specific time intervals.Synthesized ZnO/ PANI nanostructure which were sonicated for 0 min(without sonication),10 min and 20 min time period named as 0 min ZnO (S_1), 10 min ZnO (S_2) and 20 min ZnO (S_3) respectively.

3. Results and discussion

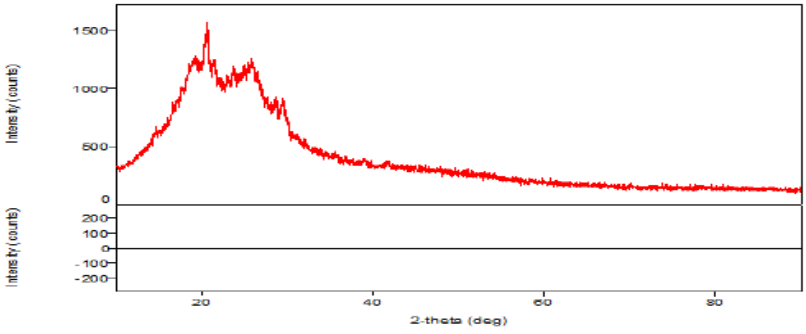
3.1. X-Ray Diffraction Studies

3.1.1 ZnO/PANI Composite

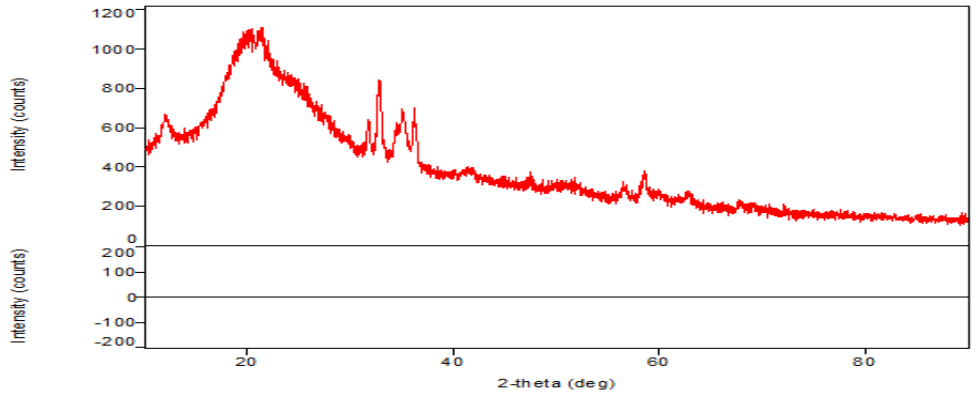
The main objective of the present investigation is synthesis of nanocomposite of ZnO/PANI. In present work three samples were studied and they are labelled 10% Zinc Oxide – Polyaniline (10%-ZP) [S_1], 15% Zinc Oxide – Polyaniline (15%-ZP) [S_2], 20% Zinc Oxide – Polyaniline (20%-ZP) [S_3].

The semi-crystalline structure of nanocomposite (ZnO/PANI) were characterized by powder X-ray diffraction (RigakuX-ray diffractometer) with Cu-α source and 2θ range of 10° - 90°.

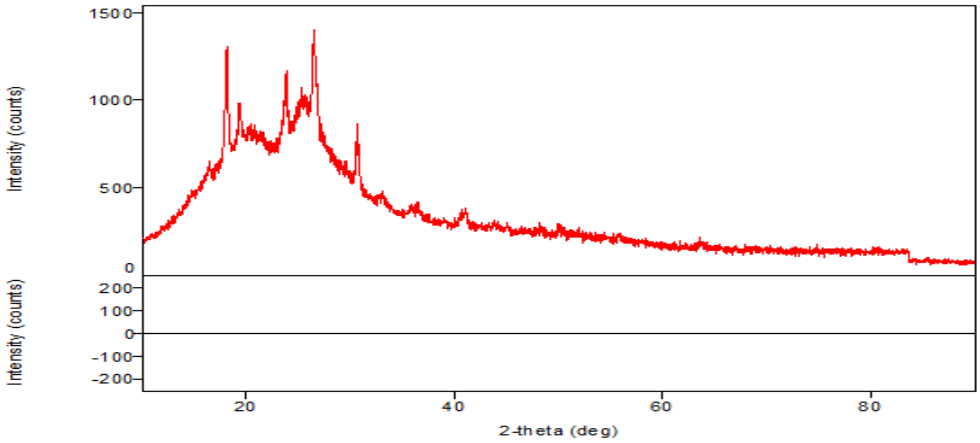
Figure 01 (a, b and c) shows X-ray diffraction patterns of synthesized nanocomposite samples of ZnO/PANI (S_1 to S_3).



(a)



(b)



(c)

Fig. 1: XRD Pattern (a) 10%-ZP, (b) 15%--ZP, (c) 20%-ZP

Left part of all figures 1(a) to 1(b) showscrystalline nature. The corresponding X-ray diffraction peak for (100), (002), (101), (102) (110), (103), (200), (112), (201), (004), (202) and (104) planes confirm the formation of hexagonal wurtzite structure of ZnO (DB card no.-2300013).Hence XRD pattern confirmed that synthesized ZnO are highly crystalline in nature [23].

The recorded XRD pattern figure 1 (a to c) confirmed that synthesized composite of ZnO/PANI Zinc Oxide/ Polyaniline are polycrystalline nature that is semi amorphous in nature [24, 25].One can see the presence of peaks corresponding to zinc oxide nanocrystallites. However, these peaks are slightly shifted, from their respective standard positions, may due presence of PANI matrix. This superficial property of the nanocomposites as has also been suggested by Tang *et al* [26] in the study of x-rays patterns of Polymethylmethacrylate (PMMA) and zinc oxide composites.

With increasing concentration of ZnO, a slight broadening in all the peaks corresponding to PANI is observed. The broadening is however more pronounced as the concentration of the zinc oxide increases in composites and as concentration of zinc oxides in polyaniline (PANI) increases crystallinity increases. The probable reason for this is influence induced on nanoparticles due to the surface effects arising from the surrounding PANI [27]. However, the presence of such polymer matrix seems to cause the decrease in the size of zinc oxide nanoparticles due to the formation of polymer-Zn complex on the surface of zinc oxide nanoparticles present within/on the surface of the nanocomposites. Various nanocomposites combinations showed similar peak patterns, therefore, it may be assumed that presence of polyaniline did not cause any change in crystal structure of zinc oxide or negligible change which may be ignored.

3.2. Effect of Ultra-Sonication on ZnO/PANI Matrix:

To compare the broadening of peaks obtained in case of different samples, XRD patterns are merged together. Further, the calculated average crystallite size of prepared samples is shown in Table 1.It was found that

average crystallite size decreases due to increase in sonication time interval [28-29]. The influence of thesonication time on the crystallite size was the main subject of interest here.

Furthermore, from XRD patterns can be seen that there little shift in diffraction peaks due to ultrasonic radiation treatment

Table1: Comparison of crystallite size among S_1, S_2 and S_3

Sr. No	Sample	2 Theta (degree)	FWHM Value (degree)	Crystallite Size (nm)
1	S_1	36.25	0.1022	85.46
2	S_2	36.41	0.1235	70.76
3	S_3	36.45	0.1485	58.85

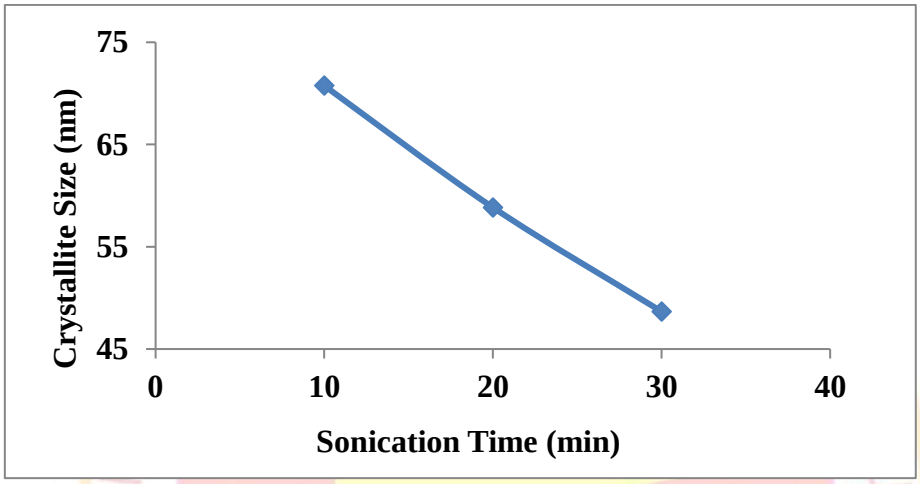
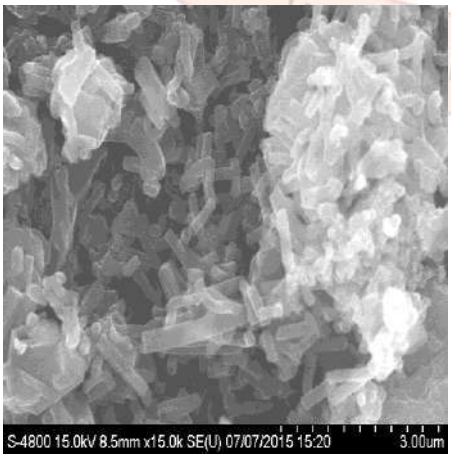


Fig. 2: Variation of crystallite size with sonication time.

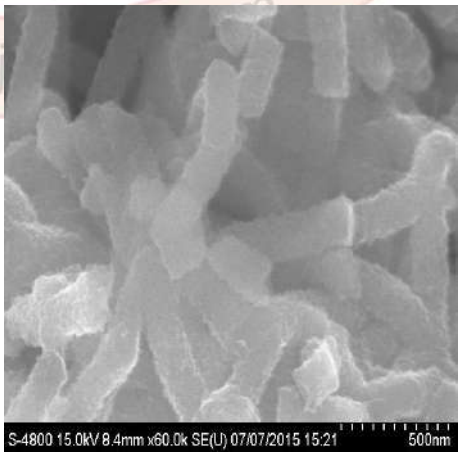
Figure 2 shows the variation of crystallite size of synthesized ZnO/PANI with its sonication time. It is seen that poly-crystallite size decreases with sonication time. So it observed that the mechanical influence produced by ultrasonic waves such as emulsification, stir, and others, could prevent the crystal growth and aggregation [30].

3.3. SEM of Nanocomposite PANI/ZnO

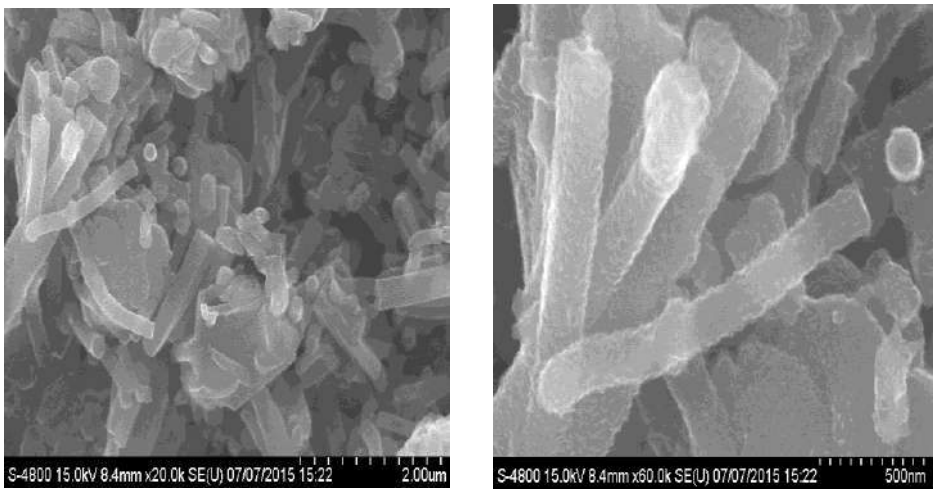
Figure 3(a, b, c & d) shows SEM micrograph of nanocomposite of zinc oxide and polyaniline at different resolution scale. From micrographs it is cleared that there were formation of nanotubes of nanocomposite material ZnO/PANI. It is observed that from SEMimage 3 (a and d) on head of polyaniline nanotube there is decomposition of nanosized Zinc Oxide. This is evidence for *in –situ polymerization* method of PANI and ZnO to synthesis nanocomposite of ZnO/PANI.



(a)



(b)



(c) **(d)**

Fig. 3 (a to d) SEM micrograph of ZnO/PANI at different resolution scale

4. Conclusions

The Pure Zinc Oxide, Pure Polyaniline and ZnO/PANI nanocomposites have been successfully synthesized. ZnO nanotubes were successfully covered with PANI by process of '*in situ'* chemical oxidative polymerization of aniline. Due to interfacial interactions between nanocomposite ZnO and PANI, there is formation of PANI and ZnO matrix. This type of hybrid material will use in many applications.

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Humidity Sensing Propertiesof PANI Doped Zinc Oxide Nanocomposites Thick Film Sensor

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Abstract

Over the last decades a variety of chemical sensors have been developed based upon semiconductors, which monitor different characteristic sensor properties such as conductivities for electronic conductivity sensors. In the present work Polyaniline is prepared by polymerizationof aniline under acidic condition. Zinc Oxide (ZnO) nanopartical prepaired by wet chemical method at room temperature using zinc nitrate and sodium hydroxide as starting material . ZnO nanoparticles were combined with conducting (PANI) polymer via polymerization in acidic aqueous solution to obtain a new type of inorganic – organic composites nanostructured . It is observed that PANI doped ZnO nanocomposites sensor shows a high response and sensitivity with good repeatability as compared to that of purePANI and ZnO nanoparticle.Theeffect of hysteresis is of the sensors, theeffects of pure and composite oxide on sensitivity of the sensors were studied. The crystallinity and the crystallite size were examined byX-Ray Diffraction technique.

Keywords: Polyaniline ,Zinc Oxide Nanocomposites,Humidity sensor.

1. Introduction

There is a growing demand for a sensing system that has high sensitivity, wide dynamic range, good stability, quick response, good reproducibility, simple structure and minimal cost. Metal oxide films sensitive to humidity have been reported earlier where sensing has been done using optical means. However, metal oxide humidity sensors depending upon measurements of electrical parameters require high temperature operation and consume significant amount of power.Humidity control and monitoring are of great interest to a wide area; these include moisture sensitive products, fresh and pack-age food, drug storage and environmental control for valuable Antiques or paintings etc. [1, 2]. Humidity sensors that are available in the market include dew point, infrared, catalytic and tin oxide-basedsensors, which may be expensive, or require high temperature operation and consume significant amount of power and high cost ofmaintenance [3].Much research has been focused on the development of humidity sensitive material [4–6]. Among these are the investigation of using conducting polymers such as polyaniline, polypyrrole, and polythiophene for humidity and gas sensing [7–9]. Advantages with polymers as sensing materials are light weight, flexible, low cost and simple fabrication process [10]. Pure polymer, polymer blends and polymer–inorganic composites have also been studied for the purposes, resulting in different degree of advancements in this area [11–16].

2. Synthesis of Material:

A) Synthesis of Polyaniline (PANI): In general is synthesized using two major polymerization approaches: electronic and chemical polymerization. In the present work polyaniline is synthesized by chemical polymerization method in which 0.2 M aniline hydrochloride is used as monomer unit. The synthesis is done by oxidative polymerization with 0.25 M ammonia peroxysulphate in aqueous medium. Bothsolutions kept 1 hour at room temperature then mixed in beaker, briefly stirred. And left at rest to polymerized , next day, the pani precipitate was collected on a filter , washed with three 100 ml portion of 0.2 M HCL and similarly with acetone . polyaniline hydrochloride powder was dried in air and then in vaccum at 60°c. Polyaniline prepared under these reactions and processing condition are further referred to as standard sample.

B) Synthesis of Zinc oxide (ZnO): It is prepared by the aqueous solution of zinc nitrate. And ispreparedbydissolving 0. 2M of zinc nitrate hexahydrate in 100 ml of distilled water .To this aqueous zinc nitrate solution 0.2 M sodium hydroxide is added and the reaction mixture was heated at 80°c along with stirring and the

process is carried out for four hour after which the white precipitate was obtained. The formed oxide wet precipitate is centrifuged Then the wet precipitate is washed with de-ionized water to remove impurity ions present in it and further heated in the oven at 150°c to dry the precipitate formed.

Characterization :The above synthesized PANI-ZnO composites are structurally and surface morphologically characterized by using different technique like X- ray diffraction (XRD),the x-ray diffraction patterns of the prepared samples are obtained by Siemens D 5000 X-ray diffractometer using CuKα radition (λ =1.717 A°). The diffractograms are recorded in terms of 2ᵬ in the range 40°-50° at ambient temperature with scanning rate of 2° per minute .The surface morphology of polyaniline and its composites are studied by using Leica's SEM (modal S 440) at 10kv.

Result And Disscusions:

XRD Pattern of ZnO

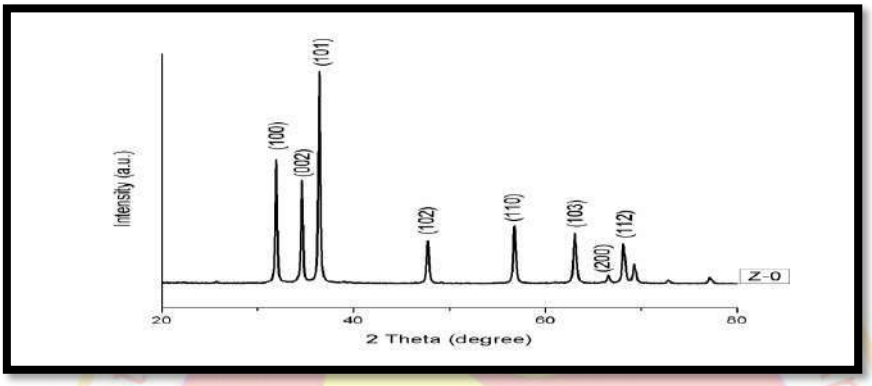

Fig. 1 XRD of Pure ZnO

XRD pattern of pristine zinc oxide (ZnO) nanostructure synthesized by liquid phase method via chemical wet reaction method were calcinated at 800ºC as shown in figure 1.The crystalline nature with 2θ peak lying at (100), (002), (101), (102), (110) and (103) planes. All the peaks match well the standard hexagonal wurtize structure of zinc oxide (ZnO) with lattice constants a = b = 0.3249 nm and c = 0.5206 nm [JCPDS card no. 36-1451]. All the peaks are perfectly match with pure ZnO structure, which indicates the high purity of the obtained ZnO nanoparticle. The average crystalline size was found to be 37.38 nm calculated by Deye-Scherrer formula.

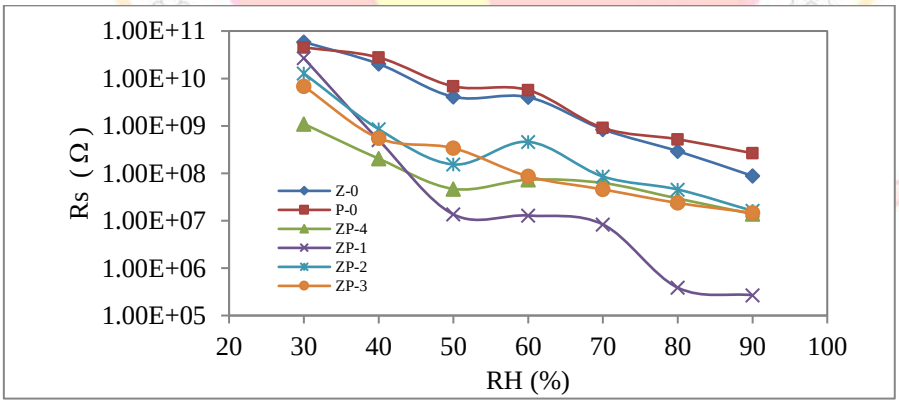

Figure: 2 Hysteresis plot

Hysteresis plot shows the variation between resistances of sample with respect to the relative humidity in increasing and decreasing order from 30 to 90 % RH as shown in the fig. 2. A very small hysteresis present during forward and reverse cycle of relative humidity, where as a very significant average change observed in the value of resistance of sample, in the sample ZP-1 (10ZnO – 90PANI) the change in value of resistance is from $10^{11}\Omega$ to $10^{5}\Omega$, these is a remarkable change in the value of resistance.

Sensitivity

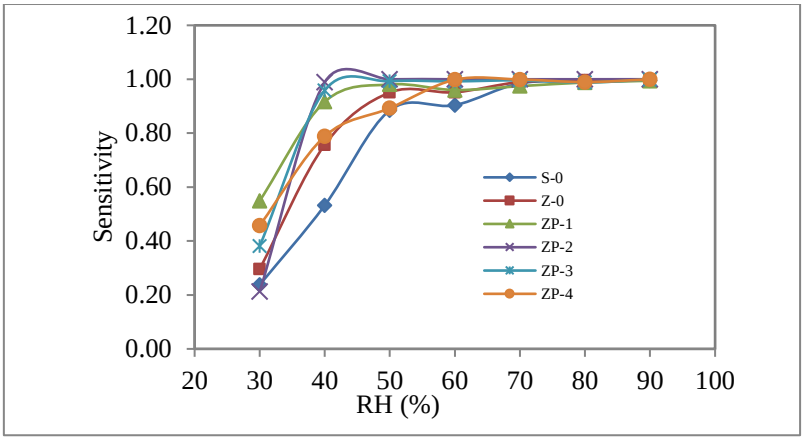

Figure: 3 Variation of sensitivity with Relative Humidity

In the above samples the sensitivity is found to be increasing with the RH for all the samples of thick films and it is increasing up to some particular RH and then afterward it remains constant as shown in fig. 3 For higher RH the sensitivity is found to be higher in case of all samples of thick films. The sensitivity of ZP-1 (10ZnO-90PANI) is more than ZP-2, ZP-3, and ZP-4 samples and also from the pristine samples P-0 and Z-0. The (ZnO-PANI) composite sensors exhibits significantly higher sensitivity than sensor constructed specially from ZnO nanoparticles and PANI itself due to the formation of heterogeneous interface between them and more adsorption site was created to absorbed more water vapours.

5. Conclusions:

Nanostructured ZnO was successfully prepared via chemical precipitation method and PANI with IUPACpolymerization technique. Minimum crystallite size was found to be for ZnO is 37.38 nm. The Hysteresis plot shows very significant average change in the value of the resistance from$10^{11}\Omega$ to $10^{5}\Omega$during forward and reversed cycles of sampleZP-1(10ZnO-90PANI). The sensitivity is found to be increasing with the RH for all the samples of thick films and it is increasing up to some particular RH and then afterward it remains constant.Amongst all the prepared samples ZP-1 is more sensitivity than other prepared composite samples.

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Ba TiO_3 doped Polyaniline based Nanocomposites thick film senor for humidity sensing Application

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Abstract

Polyaniline (PANI) and $BaTiO_3$-Pani composites were synthesized by chemical polymerization method using ammonium per sulphate (APS) as an oxidizing agent. This is a single step polymerization process to synthesize the conducting polymer. Thick films of PANI and BaTiO3-Pani were fabricated by Screen – Printing followed by firing at 70º c for 30 min. BaTiO3-Pani thick films resulted in humidity sensor. An exceptional sensitivity was found to the relative sensor at 80º c and no cross sensitivity was observed to other hazardous and polluting gases ever at higher concentration. . The effect of microstructure and dopant concentrations on the gas response,Hysteresis , sensitivity, of the sensor in the presence of humidity were studied and discussed.

Keywords: *Polyaniline , Barium Titanate,BaTiO3-Pani composites , Humidity sensor.*

1. Introduction

The use of sensors by human being has been day by day increasing at an astounding rate in the last few years and modern society depends heavily on the use of the sensors for variety of purposes. Over the last decades a variety of chemical sensors have been developed based upon semiconductors, which monitor different characteristic sensor properties such as conductivities for electronic conductivity sensors, impedance for capacitance sensors, potentials for field effect sensors or temperatures for calorimetric sensors. For the determination of gas components, many of these devices make use of the same molecular detection principle. Depending on the operation temperature, their signals are caused by changes in the concentration of free electrons, dielectric constants, electrical fields and heats of adsorption or reaction. These changes result from physisorption, chemisorption, catalytic reactions, and surface or bulk defect reaction with particles from the gas phase.

There is a continuing need for accurate, reliable, inexpensive sensing systems for measuring relative humidity (RH), not only for human comfort but also for a broad spectrum of applications in chemical industry, process control, atmospheric sciences, agriculture etc. Humidity is one of the most common constituents present in the environment and its measurement is indispensable when it comes to monitoring of various environmental parameters. For instance, detecting organic pollutants in indoor atmosphere, organic vapour monitoring, maintenance of Green houses, performance of air/ smoke filters, hydrocarbon sensing are all affected by relative humidity conditions. Therefore, sensing and controlling relative humidity is of great importance [1].

In the recent years there has been significant progress in the field of polymer based humidity sensors. According to their sensing mechanisms these can be either resistive type or capacitive type. In addition to the traditional quaternary ammonium and sulfonate compounds, polymers containing phosphonium have also been studied for humidity sensing. Copolymers, mutually reactive copolymers and conjugated polymers have also been reported for humidity sensing. Conjugated polymers especially conducting polymers like polypyrrole, polyethylene, polypropylene etc. have shown humidity sensing properties [2]. Besides these metal-polymer nanocomposites for instance iron oxide-polypyrrole have also been reported for relative humidity sensing sensor. The present study deals with the humidity sensing application such as relative humidity, stability humidity, selectivity etc. of selected inorganic materials.

Humidity control and monitoring are of great interest to a wide area; these include moisture sensitive products, fresh and pack-age food, drug storage and environmental control for valuable Antiques or paintings etc. [3,4]. Humidity sensors that are avail-able in the market include dew point, infrared, catalytic and tin oxide sensors, which may be expensive, or require high temperature operation and consume significant amount of power

and high cost ofmaintenance [5].Much research has been focused on the development of humidity sensitive material [6–8]. Among these are the investigation of using conducting polymers such as polyaniline, polypyrrole, and polythiophene for humidity and gas sensing [9–11]. Advantages with polymers as sensing materials are light weight, flexible, low cost and simple fabrication process [12]. Pure polymer, polymer blends and polymer–inorganic composites have also been studied for the purposes, resulting in different degree of advancements in this area [13–19].

2. Synthesis of Material :

A) Synthesis of Polyaniline (PANI): In general is synthesized using two major polymerization approaches : electronic and chemical polymerization. In the present work polyaniline is synthesized by chemical polymerization method in which 0.2 M aniline hydrochloride is used as monomer unit . the synthesis is done by oxidative polymerization with 0.25 M ammonia peroxysulphate inaqeous medium . both solution kept 1 hour at room temperature then mixed in beaker ,briefly stirred. And left at rest to polymerize, next day, the pani precipitate was collected on a filter , washed with three 100 ml portion of 0.2 M HCL and similarly with acetone . polyaniline hydrochloride powder was dried in air and then in vaccum at 60°c. Polyaniline prepared under these reaction and processing condition are further referred to as standard sample[63].

B)Synthesis of Barium titanate ($BaTiO_3$): In preparation of barium titanate ($BaTiO_3$) 0.25 M $Ba(NO_3)_2$ solution and 0.25 M $TiO(NO_3)_2$ solution were dissolved in 2 N nitric acid solution in a beaker. About 0.6 M tartaric acid solution was then added to under constant magnetic string. The solution heated under continuous string to its boiling point until all the liquid evaporated. About 7 gm of ammonium nitrate was added towards the ends to avoid slurry formation. Brown fumes evolution takes places and fluffy mass were settled at the base of the beaker. The product is then dried in vacuum oven at 96^oC for 2 hrs. So that moisture will removed from the final product and we will get dry product. Then this dry product was crushed into fine powder and finally this fine nanopowder of $BaTiO_3$ was calcinated at temperature 800^oC for 5 hrs. in the auto controlled muffle furnace to remove the impurity form the product will be completely removed and get a final product of $BaTiO_3$ nanoparticle.

3. Experimental methodology for humidity: -

The humidity chamber/ stability chamber has stainless steel body purchased from Gayatri Scientific, Mumbai . The working size of humidity chamber is 50×43×430cm (H×D×W). The chamber having two open side door window namely inner side door and outside door, inner side is full length inner plexi glass door which is transparent and outer side door was metal door with magnetic gasket and lock . inside the chamber it has two trays, which are made of stainless steel. it has PID digital display temperature indicators which is outside at the top of the chamber , indicating the current temperature of the chamber .indicating the current temperature of chamber. The power sources of 230 V having frequency of 50Hz required. the temp[rapture range is ambient to 80 C. The chamber has temperature accuracy of ± 1.0 C .

The range of humidity varying from 40% RH to 80% RH having the accuracy of ± 3% RH. To operate the chamber a program feed for the varying RH as well as different temperature. Which will sets the controlled the humidity of set temperature for given time. To measure the humidity characteristics , the sensor element was placed inside the humidity chamber by operating the program at different RH and temperature the humidity was varied . The sensor element was placed inside the humidity was measured by standard hygrometer which is already placed inside chamber . The electrical resistance of the file was measured by using Keithley source meter (2400). The humidity and temperature of the chamber camn be controlled by using Bull's Eye control UK-100, it is a program controller for humidity and temperature verses time even controller .The UK-100 can be program by varing RH, temperature , time parameters. The total number of programs are 99out of this are set program for set temperature 40 C by varying RH 1 steps NO. Of program 8, event 0001, are tabulated

4.Characterization :

The above synthesized PANI-$BaTiO_3$ composites are structurally and surface morphologically characterized by using different technique like X- ray diffraction (XRD), and scanning electron microscopy (SEM).the x-ray diffraction patterns of the prepared samples are obtained by Siemens D 5000 X-ray diffractometer using CuKα radition (λ =1.717 A°). The diffractograms are recorded in terms of 2ꝏ in the range

40°-50° at ambient temperature with scanning rate of 2° per minute .The surface morphology of polyaniline and its composites are studied by using Leica's SEM (modal S 440) at 10kv.

X-Ray Diffaration

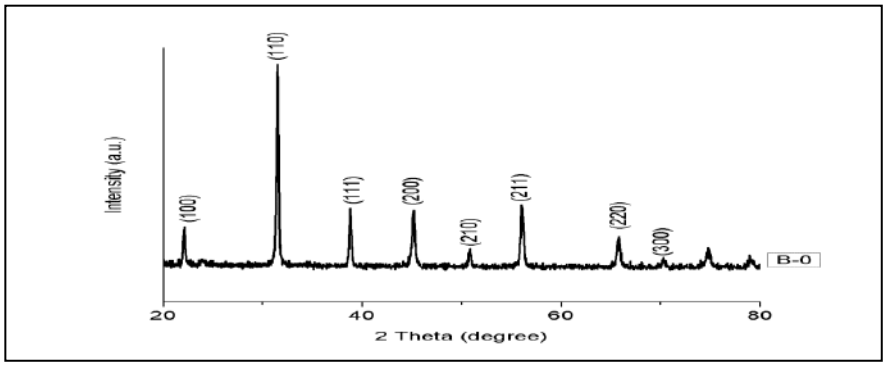

Figure: 1 XRD of ($BaTiO_3$) (B-0)

The XRD pattern of pristine Barium Titanate ($BaTiO_3$) nanostructure synthesized by liquid phase method via solid state method calcinated at 800ºC as shown in figure 1.The crystalline nature with 2θ peak lying at (100), (110), (111), (200), (210) and (220) planes. All the peaks match well the standard provskite type structure of Barium Titanate ($BaTiO_3$) with lattice constants a = 3.992 nm and c = 4.036 nm . All the peaks are perfectly match with pure $BaTiO_3$structure, which indicates the high purity of the obtained $BaTiO_3$nanoparticle. The average crystalline size was found to be 46.90 nm calculated by Deye-Scherrer formula.

Hysteresis plot :

Hysteresis plot shows the variation between resistances of sample with respect to the relative humidity in increasing and decreasing order from 30 to 90 % RH as shown in the figure. 2. A very small hysteresis present during forward and reverse cycle of relative humidity, where as a very significant average change observed in the value of resistance of sample, in the sample BP-1 (10$BaTiO_3$ – 90PANI) the change in value of resistance is from $10^{11}\Omega$ to $10^{3}\Omega$, these is a remarkable change in the value of resistance.

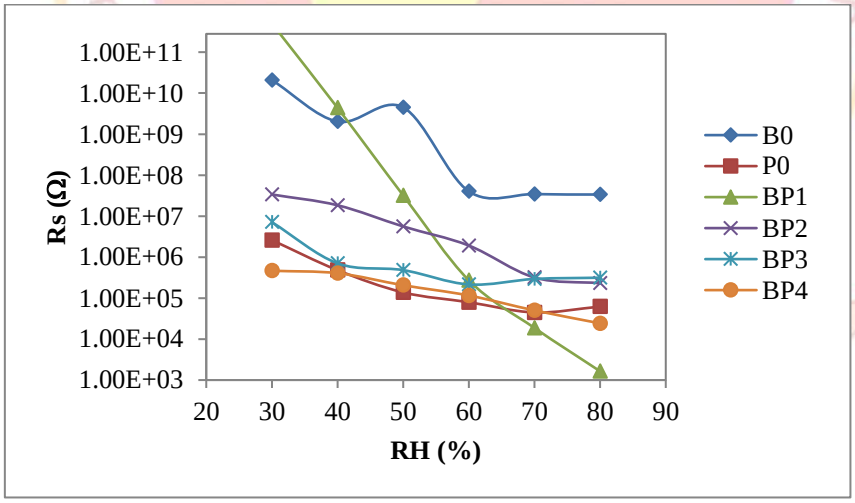

Figure: 2 Hysteresis plot

Sensitivity

In the above samples the sensitivity is found to be increasing with the RH for all the samples of thick films and it is increasing up to some particular RH and then afterward it remains constant as shown in figure 3. For higher RH the sensitivity is found to be higher in case of all samples of thick films. The sensitivity of BP-1 (10 $BaTiO_3$ -90PANI) is more than BP-2, BP-3, and BP-4 samples and also from the pristine samples P-0 and B-0. The ($BaTiO_3$-PANI) composite sensors exhibits significantly higher sensitivity than sensor constructed specially from Barium Titanate nanoparticles and PANI itself due to the formation of heterogeneous interface between them and more adsorption site was created to absorbed more water vapours.

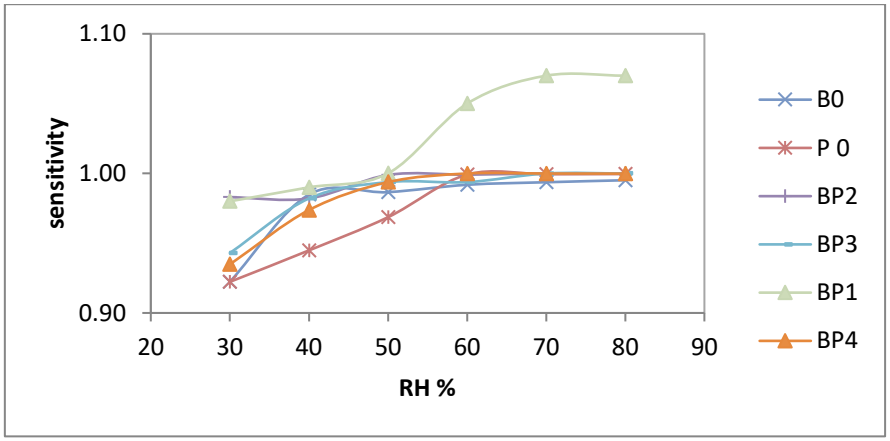

Figure: 3 Sensitivity curve

5. Conclusions

Nanostructured $BaTiO_3$ was successfully prepared via chemical precipitation method and PANI with IUPAC polymerization technique. Minimum crystallite size was found to be $BaTiO_3$ is 46..90 nm. The Hysteresis plot shows very significant average change in the value of the resistance from $10^{11}\Omega$ to $10^{3}\Omega$ during forward and reversed cycles of sample BP-1 (10 $BaTiO_3$-90PANI)). The sensitivity is found to be increasing with the RH for all the samples of thick films and it is increasing up to some particular RH and then afterward it remains constant. Amongst all the prepared samples BP-1 is more sensitivity than other prepared composite samples.

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Sol-gel Auto Combustion Synthesis and Characterizations of Cobalt Ferrite Nanoparticles

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Abstract
Cobalt ferrite ($CoFe_2O_4$) nanoparticles were successfully synthesized by sol-gel auto combustion method. Pure phase formation of cobalt ferrite with cubic spinel structure was observed in X-ray diffraction pattern. The average crystallite size, lattice parameter and other structural parameters were calculated from XRD data and they were in reported range. The magnetic parameters were measured by M-H hysteresis loop technique at room temperature and saturation magnetization, remenant magnetization and coercivity was estimated.
Keywords: *Cobalt ferrite, Sol-gel auto combustion,XRD, Magnetization.*

1. Introduction:
In order to meet today's technologies requirement, the development of new synthes is technique to develop new materials is essential which produces nanosized materials with superiormagnetic performance compared to that of bulk materials is desired. Different wet chemical methods areavailableforthesynthesis of spinel ferrite nanoparticles, suchas, chemical co-precipitation,sol–gel, hydrothermal, solvothermal, thermaldecomposition and microwavecombustion methods[1, 2]. These wet chemical methods are economic, easy, requires less time and low temperature, produces particles of nanometer dimensions and therefore now a days commonly used in the synthesis of magnetic nanoparticles of spinel ferrite.

Amongst these wet chemical methods, thesol–gel auto-combustion technique is one of the most convenient and effective method, involving a low reaction temperature(80°C–100 °C) and a rapid turn-around time for powder synthesis[3]. In the variety of spinel ferrite materials, cobalt ferrite is the unique spinel ferrite with inverse spinel structure, in which Co^{2+}ions occupy an octahedral [B] site. The high saturation magnetization,high permeability,high electrical resistivity,high Curie temperature, high magneto-crystalline anisotropy etc are the notable properties of nanocrystalline cobaltferrite[4].These properties are useful in many applications including magnetic recording media, magnetic sensors, magnetic memories, magnetic fluids, magnetic composites and catalysis, antennarods, permanentmagnets etc[5].

Thus, the present work reports on synthesis of nano-crystalline spinel structured cobalt ferrite sample by sol-gel auto combustion method using citric acid as a fuel. The results on structural, morphological and magnetic properties are reported in this work.

2. Experimental
The nano-crystalline cubic spinel structured cobalt ferrite ($CoFe_2O_4$) sample was prepared by sol-gel auto combustion method using citric acid as a fuel. AR grade chemicals such as cobalt nitrate ($Co(NO_3)_26H_2O$), ferric nitrate ($Fe(NO_3)_39H_2O$) and citric acid ($C_6H_8O_7$) were used for the synthesis. The metal nitrates to fuel ratio calculated using propellant chemistry was taken as 1:3. Ammonia solution was added to maintain the pH of the solution at 7. The as-synthesized powder is sintered at 550°C for 4 h and then used for further investigations. The detailed procedure is reported in the literature[6].

The prepared sample was characterized by X-ray diffraction (XRD) technique by Regaku model. The XRD patterns were recorded at room temperature in the 2θ range of 20° to 80° using Cu-Kα radiation (λ = 1.54056 Å). The magnetic properties of the cobalt ferrite sample were measured using pulse field hysteresis loop technique at room temperature.

3. Results and Discussions
3.1 Structural characterizations
The room temperature X-ray diffractions patterns of un-irradiatedand irradiated $CoFe_2O_4$ ferrite nano-particles are shown in Fig. 1. All the reflection peaks in the XRD pattern were indexed by using Bragg's law. The presence of planes (220), (311), (222), (400), (422), (511) and (440) in the XRD pattern reveals the cubic spinel structure of all the samples.It is also evident that all the reflection peaks are intense and sharp. No impurity peaks were observed thus the samples are single phase in nature[7].

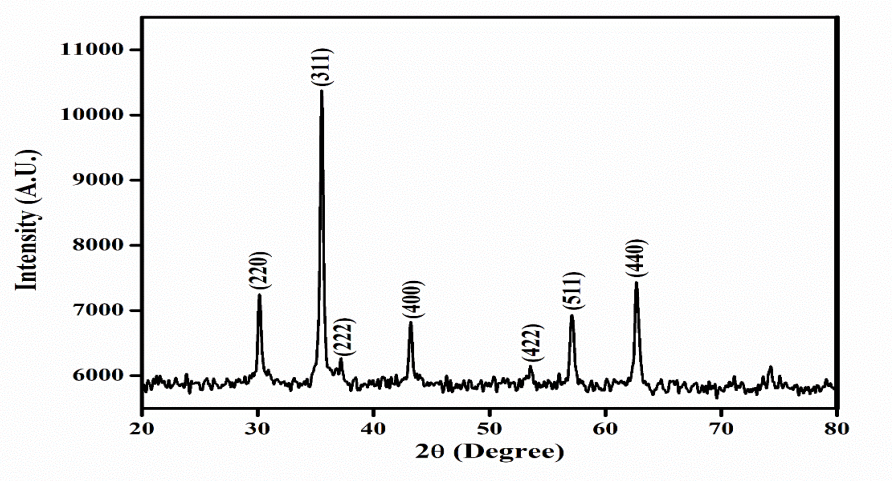

Fig.1. X-ray diffraction pattern of $CoFe_2O_4$

The Lattice constant (a) values of the cobalt ferrite samples was calculated using standard relation,

$$a = d\sqrt{(h^2+k^2+l^2)} \quad Å$$

where, (d) is interplanar spacing;(h k l) is Miller Indices.
The obtained values of the lattice constant (a) are tabulated in Table 1.
The unit cell volume (V) was calculated by using the following equation

$$V = a^3 \quad Å$$

where, V is the unit cell volume, a is the lattice constant.
The X-ray density (d_X) was calculated by using the relation and values are summarized in Table 1;

$$d_x = \frac{Z \times M}{V \times N_A} \text{ gm/cm}^3$$

where, Z is the number of molecules per formula unit (Z = 8 for spinel system),M is molecular mass of the sample,V= $a^3$is the unit cell volume,$N_A$is the Avogadro's number.

Table 1. Lattice parameter (a), Average particle size (t), Unit cell volume (V) and X-ray density (d_x) of $CoFe_2O_4$

a (Å)	**8.28**
t (nm)	26
V (Å^3)	588
d_x (gm/cm^3)	5.19

The crystallite size of cobalt ferrite powder was calculated using the Debye-Scherer's relation for small and uniform sized cubic crystals mentioned below;

$$t = \frac{0.9\lambda}{\beta \cos\theta}$$

where, λ is wavelength of the Cu-Kα radiation, β is the full width of the half maximum, θ is Bragg's angle. The obtained values of the particle size are presented in Table 1 and are having good agreement with the literature [8].

Magnetic characterizations

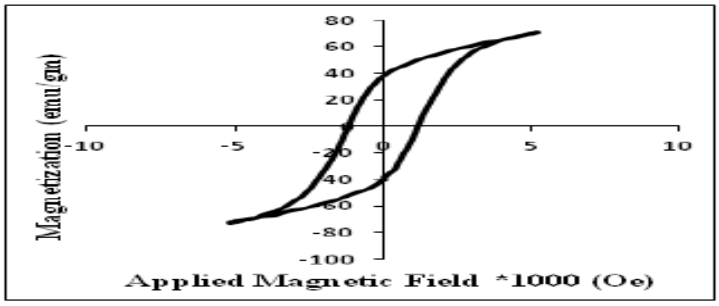

Fig. 2 The M-H plot of the $CoFe_2O_4$nanoparticles

The magnetic properties of present cobalt ferrite sample were recorded using pulsed field hysteresis loop technique at room temperature with the applied field ranging upto 1000 kOe is shown in Fig. 2.Saturation magnetization(M_s), remenance magnetization(M_r) and coercivity(H_c) values are reported in Table2. The magnetic hysteresis(M–H) loop confirms that the sample possessferro magnetic performance with soft magnetic nature[8, 9].

Table 2: Saturation magnetization (M_s), coercivity (H_c), remenance magnetization (M_r) of cobalt ferrite nanoparticle

M_s (emu/gm)	M_r (emu/gm)	M_r/M_s	H_c (Oe)
68.70	40.50	1.69	1096

4. Conclusion

The spinel structured cobalt ferrite nanoparticles were successfully synthesized by sol-gel auto combustion method usingcitric acid as a fuel. Pure phase formation of spinel type cobalt ferrite with no impurities was observed from X-ray diffraction pattern. The average crystallite size of the prepared sample was found to be 26 nm. The values of saturation magnetization (M_s) and coercivity (H_c) were found to be 68.70 emu/gm, and 1096 Oe respectively.

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Study of thermal properties of Polyaniline-Poly vinyl acetate blend

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Abstract

An attempt was made to study the thermal properties of Pani-PVAc blend. Pani-PVAc blends were prepared by chemical synthesis method. Thermo gravimetric analysis was carried out for various polymers to determine the wt. loss at different temperatures. The themal analysis of pure conducting polymer was recorded for comparison as original standard. TGA/DTA data shows that, interaction between the polymers, altered the rate of degradation and wt. loss decreases as the PVAc concentration increases in the blend i.e. thermal stability increases. The decrease in wt. loss was observed from 68.75% to 52%.

Keywords: Pani-PVAc blend, Chemical synthesis, TGA/DTA.

1. Introduction

In last few decades, there has been a great deal of increasing interest in the synthesis and characterization of conducting polymers because of their applications in organic batteries, sensors, microelectronic devices, electro catalysis and also their electrical, electrochemical and optical properties [1].

Earlier the blends of PVC and PPy were prepared by oxidative chemical polymerization of pyrrole with an oxidizing agent $FeCl_3$. Ionic conductivity study of such material was carried out and studied the effect of oxidizing agent on conductivity of the films [2]. Polyvinyl acetate (PVAc) is used extensively in coatings, adhesives [3] and films. The carbonyl group (C=O) in the structure of PVAc forms hydrogen bonding (like polyamide) with amine and hydroxyl groups and this may also enhance miscibility with polyaniline. Hence, PVAc has been chosen for blending with Pani.

There are many methods of blending polymers but only limited techniques can be applicable for conducting polymers. PVAc is soluble in high dielectric constant solvent such as methanol. However, Pani is not soluble in this solvent even after modification with suitable dopants. Hence, a new method has been adopted for blending these two components [4].

2. Experimental

Poly vinyl acetate obtained (M.W. 40000), 2 gram dissolved in 100 ml methanol was taken in a beaker. To that, 0.51 gram of monomer aniline (0.005M) and 5 ml of 1 N HCL solution were added. About 25 ml of 0.1 M initiator ammonium per sulphate was added slowly to the above reaction mixture under constant stirring. Similar reactions were carried out with aniline concentration of 0.01M, 0.02M and 0.05M and 10 ml of 1N HCL, 20 ml of 1N HCL, 50 ml of 1N HCL solution. The aniline to ammonium per sulphate molar ratio in all the above reactions was 1:1, so as to reproduce same conditions in all cases.

The polymerization of aniline was carried out simultaneously in each vessel. The reaction was carried out at ambient temperature for 10 Hr. The blend was precipitated in distilled water, filtered, washed with distilled water several times and dried in a vacuum till moisture was removed. The green mass of each composition of the blend was crushed in mortar and pestle to a fine powder.

Thermo gravimetric analysis was carried out for various samples to determine the weight loss at different temperatures. All the measurements were carried out using TG/DTA (Seiko II SSC 5100 Japan model). The samples used were in the form of powder and tested under nitrogen atmosphere at the rate 10^0/min from room temperature to 500^0 C.

3. Results

The interaction between the polymers can also be noted from the degradation curves through TGA studies. Given figure shows the wt. loss and thermal stability in the blend. Thermogram was scanned under the nitrogen atmosphere at the rate of 10^0/min (heating) and the temperature range were 25^0C to 500^0C. Thermal data is given in the table. The TGA curve of Pani and PVAc shows three steps wt. loss. The first wt. loss in both the prestine polymers at 150^0C to 300^0C was owing to the loss of absorbed moisture and solvent from room temperature to around 300^0C. The second stage occurring at 350^0C, decreased from 68.75^0C to 52^0C and the broad DTA peak of PVAc shows that the melting owing to the loss of acid dopant in Pani salt, as there is very less interaction between N atom and Cl atom and degradation of PVAc chain. The final degradation of the polymers occurs from 350^0Cto 500^0C. S. H. Goh, etal [5] has studied the TGA of the same blend film. It was observed that the nature of the degradation pattern matches very closely to our data.

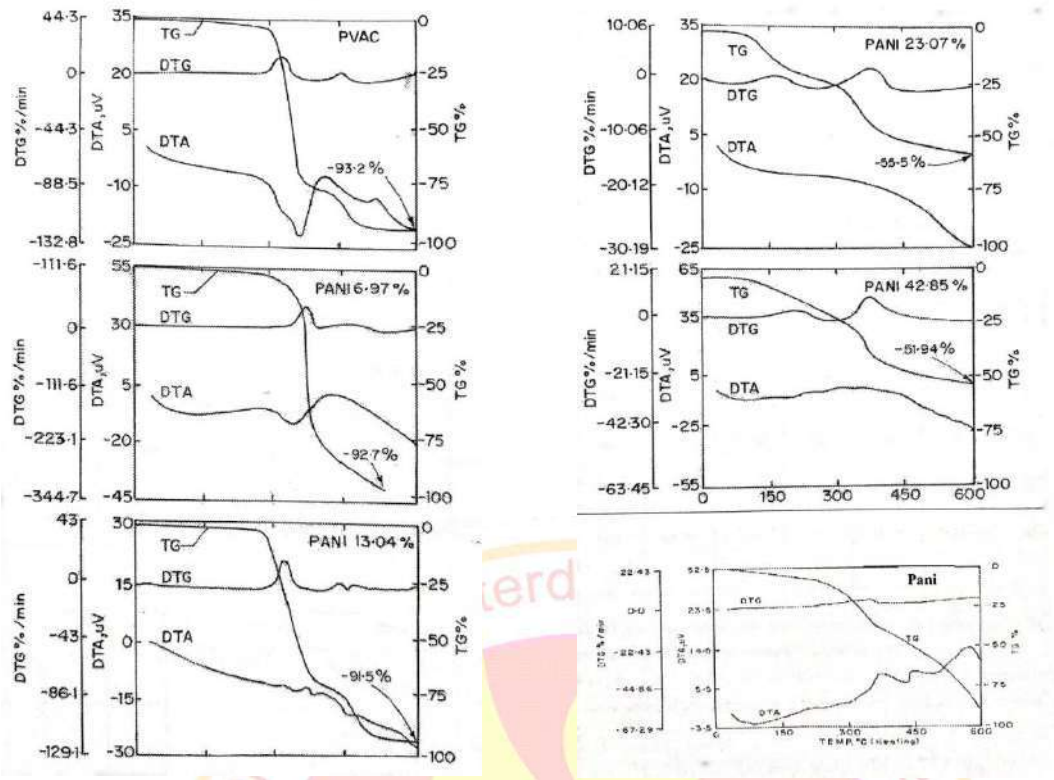

Figure: Thermogram of Pani-PVAc blends

It was noticed that as the percolation of Pani in the blend is increased, the wt. loss decreased from 68.75^{0}C to 52^{0}C and the broad DTA peak of PVAc shows that the melting temperature was reduced on modification. From the thermogram it was observed that the blend shows the improvement in thermal stability.

Table: Thermal data of Pani-PVAc blend

S.N.	Temp (^{0}C)	PVAc wt. loss in %	Pani (3%) wt. loss in %	Pani (7%) wt. loss in %	Pani (13%) wt. loss in %	Pani (68%) wt. loss in %	Pani wt. loss in %
1	100	1	1	1	3	2	3
2	200	4	2	6.25	14	13.50	6
3	300	10.50	36.50	29	26	30	18
4	400	37	44	48	43.75	43.50	40
5	500	68.75	63	72	56.25	52	60

As the PVAc concentration increases in the blend, and blend concentration follows the same trend of degradation pattern as observed in PVAc. The wt. loss found in the blend concentration is not observed in prestine polymers, suggesting the presence of interaction between the polymers, which alters the degradation pattern.

4. Conclusion

TGA/DTA data shows that, interaction between the polymers, altered the rate of degradation and wt. loss decreases as the PVAc concentration increases in the blend i.e. thermal stability increases. The decrease in wt. loss was observed from 68.75% to 52%.

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Recent Advancement of Electrochemical Biosensors Based On Conducting Polymers: A Mini Review

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Abstract :

Day by day humans life style become fast due to this fast life style people forgot to take care of their health. From the health care point of view the development of biosensors is necessary. The various conducting polymers showed prominent response in the field of biosensing due to their great electrochemical, physical, optical and thermal properties. The many researchers try to enhance the sensitivity by adding the dopant or taking their composition such as TiO2, SiO2 andMnO2 etc. These mini-reviews give the information about recent development in the field of electrochemical biosensors based conducting polymer. Also tell us about the process of biological sensing and their different electrochemical technique for detection.

Keywords : electrochemical biosensors, paper based biosensor, urea biosensor, glucose biosensor, cancer biosensor.

1.Introduction

The health care point of view biosensing is necessity in our everyday life. Now a day's world suffering from most silent health related issues one of them is diabetes can damaged the heart, blood vessels, eyes, kidneys and nerves, leading to disability and premature death [1]. Generally most of the patient insulin which is utilized by the cell to get glucose inside cell decreases so that cell cannot utilize glucose. Hence the sugar level in the blood increases. The patient health is depends on glucose concentration that related to the symptoms of diabetes mellitus [2]. The classification of various types of biosensors which are shown below.

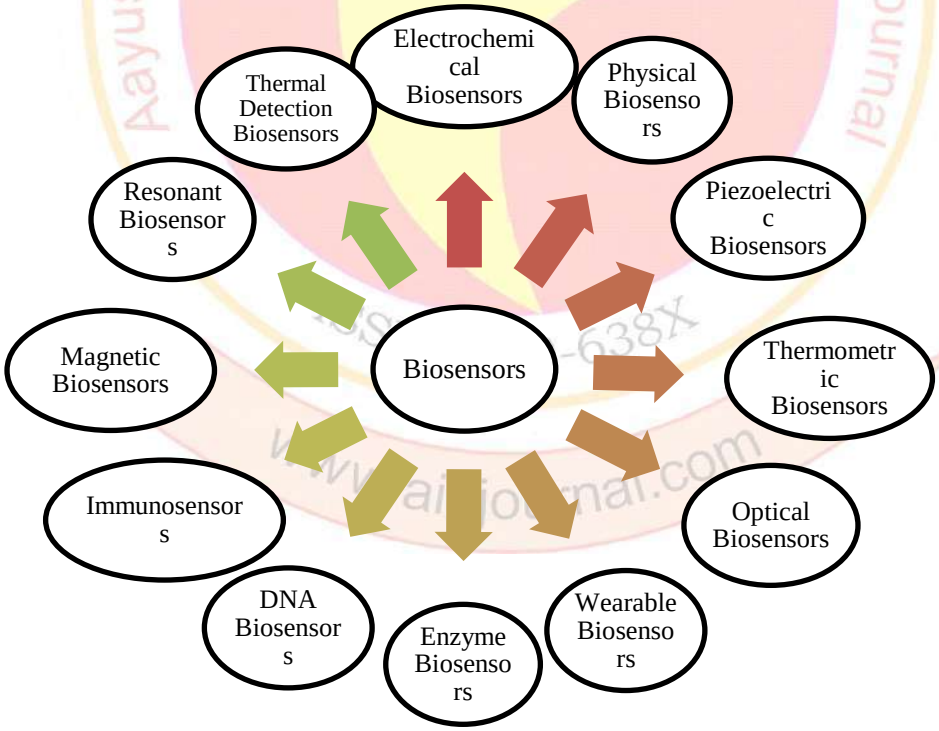

Figure1.https://www.elprocus.com/what-is-a-biosensor-types-of-biosensors-and-applications/

Paper based diagnostic technologies are affordable, robust, rapid, user friendly and scalable for manufacturing for the determination of blood glucose in real time is very important for diabetic patient [3]. Polymers are studied in the different field of polymer science that is polymer chemistry and polymer physics, biophysics and materials science and engineering. Conducting polymers are attracted more interest in the field

of gas sensor, biosensor, actuators, super capacitor and electronic devices due to their unique attribution, ease of production and often ductile nature and light weight [4]. A variety of conducting polymer such as polyaniline, polypyrrole, polythiophene and PEDOT (Poly-3,4ethylenedioxythiophene) has given more attention toward nanoscience and nanotechnology [5]. There are a lot of progress remain in the field of biosensor. Now a day's researcher focus on PEDOT polymer has been a significant and promising one of the conducting polymers family due to its high electrical conductivity, superior optical transparency, long term electrochemical stability, highly mechanical strength and very less study has been happened using graphene and titania nanoparticles [6]. The homogeneous entrapment on the paper, antistatic and electrochemical property has turned a new page for the paper based biosensing application [7-9]. Different type of oxides are radially used in the field biosensor such TiO_2, MnO_2, ZnO_2, iron oxide and phytic acid. Titania is identifying better dopant in the PEDOT-PSS polymer to enhance the conducting ability by several order of magnitude and biosensing and humidity response due to its porous morphology. Moreover reliable glucose detection methods with high sensitivity, excellent selectivity, good stability, fast response and portability have been the focus of scientist [10].

1. Electrochemical Biosensors

The biosensor is device of biological recognition element using transducer [11]. The basic principle of electrochemical biosensors that convey the biological signal such as enzymes, tissues, cells etc. that can detect with the help of transducer element then transducer signal may converted into an electric signal and amplified with the help of detector circuit; get physical parameters and measurements from computer software for the analysis [12].

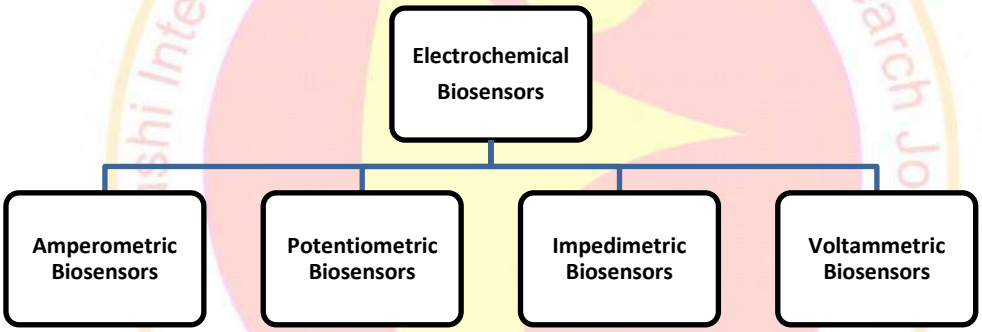

Figure 2. These show the different types electrochemical biosensors.

The commonly used paper substrate for the fabrication of electrochemical biosensors is whatman No.1 chromatography paper. This whatman paper having uniform structure, excellent wicking properties, smooth surface, high content of α- cellulose and free hydrophobic binders [13]. Researcher have special attention towards that certain enzymeless glucose sensors have numerous advantages of high sensitivity, simplicity in the development, high stability and no need to be immobilize enzyme [14].

2. Process of Biological Sensing:

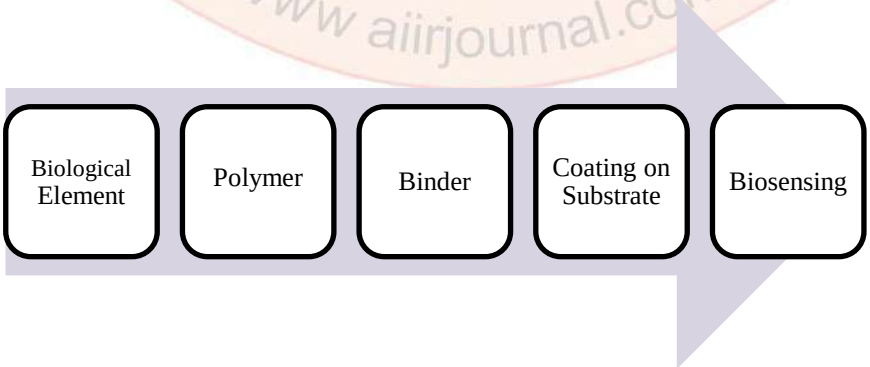

Figure 3. These show the procedure of biological detection.

Firstly take the biological element (e.g. glucose oxidase, antigen, H_2O_2, etc.) that use as sensing then this element attach to the surface of polymer with the help binder (e.g. n- butyl carbitol , ethyl cellulose, polyvinyl alcohol, etc.) after that it will be coated with the help of different method such as layer by layer [15], chemical bath deposition [16] , spin coat [17] and SILAR [18]. The biosensing response check by using electrochemical method. To increase the efficiency and capacity of the biosensor system certain dynamic and static measurement are necessary. Selectivity, sensitivity, linearity, response time, stability and reproducibility are the different characteristics of biosensors [19].

4. Biosensors:

According to the properties there are various types of biosensors and their recent development in most focus biosensor can be discussed as follows.

1] Urea Biosensor:

X. Hung and his team developed a disposable conducting paper based analytical device for measuring the salivary uric acid in human body based on electropolymerization of PEDOT and graphene composite on the ITO substrate. The electrochemical behavior of uric acid at different working electrode was determined by cyclic voltammetry in PBS with Ph 7.5. The linear range for uric acid detection is 2-1000 µM. The result indicated that the developed device is promising for non invasive monitoring of salivary uric acid [20]. The researcher Zhybak M. and his coworker developed creatinine and urea biosensors based on polyaniline-Nafion-Cu composite.Immobilisation of enzymes was shown the important step in the development of biological sensor. The electrochemical measurements done with the help of three electrode system and analytical performance were measured. It shows high selectivity for creatinine and urea biosensor. The sensitivity of urea and creatinine biosensor are found to be 112±3.36 mA $M^{-1}cm^{-2}$ and 85±3.4 mA M^{-1} cm^{-2}.The response time for analytes to be 15 sec and limit of detection foun to be 0.5 µM. The linear concentration range to respond the biosensor to be 1 to 125 µM [21]. Singh A.K. and his team studied urea biosensor and its application in milk sample. This sensor developed with the help of Fe_3O_4/MWCNT- polyaniline nanocomposite film. This composite polymer with enzyme characterized by scanning electron microscope, fourier transform infrared shows strong sharp band around 1031.09cm^{-1} and different electrochemical techniques were used for the analysis. The linear range of urea biosensor found to be 1.0-25.0 mM with detection limit 67 µM. The biosensor response gives great result up to 40 days with 90% activity and it can be responded up to 60 days with 70% activity [22]. The researcher Botewad S.N. and his coworker reported about fiber optic urea biosensor modified by polyaniline-cladding. The active cladding was obtained by depositing uniform layer of polyaniline. In UV-vis spectrum shows two peaks at ~ 227nm and 280 nm. The two broad diffraction peaks occur between 20 and 40°. The exposure time response for each concentration of urea solution was ~120 sec. It shown variation in absorbance at ~250 nm with different concentration urea sample. The stability of sensor tells us about that the sensor is stable about 28 days. It shows lower sensing limit up to 100 nm [23].

2] Cancer Biosensor :

S. Kumar and his team developed a flexible, lightweight and disposable paper based elctrode modified with nFe_2O_3:PEDOT:PSS for the detection of carcinoembryonic antigen (CEA), a cancer biomarker. The electrochemical response measured with the help of chronoamperometry method and concluded the sensitivity of 2.1µAng^{-1}mL.cm^{-2}which is nearly 4.8 times lower than electrochemical paper electrode. The electrical conductivity was found to be 2.4 ×10^{-2} Scm^{-1}. The proposed electrode was verified by ELISA for the CEA detection in serum sample of cancer patients [24]. S. Kumar and his team developed PEDOT-PSS and reduced grapheme oxide (RGO) composite based paper sensor studied for cancer biosensor. The incorporation of RGO into the conducting paper results in improved electrochemical performance and signal stability. The conductivity found to be 1.16×10^{-4} S$cm^{-1}$to~3.57×10^{-2} Scm^{-1}(nearly 300 times increases) on the treatment with ethylene glycol increase in electrical conductivity is due to the conformational rearrangement in the polymer [25]. Kivrak E. and his Coworker studied aptamer based electrochemical biosensing on human non small cell lung cancer. The sensing response done by using polyacrylonitrile and polypyrrole polymers with the help of nanofiber modified disposable pencil graphite electrodes. The surface morphology of composite nanofibers was confirmed

using scanning electron microscopy. Analytical performance of the aptasensor achieves high sensitivity and sample of optimization condition were tested. The aptasensor showed low detection limit of 1.2× 10^3cells/mL [26]. Soni A. and his team gives information about cancer biomarker detection. The sensing of cancer biomarker done with the help of polyaniline-MoS_2 hybrid nanostructures. The composite material detect the chronic myelogenous leukemia (CML) using electrochemical impedance spectroscopy method. The composite material has wide range of target DNA concentration (10^{-6}-10^{-17}M).The low limit of detection found to be 3×10^{-18} M. This biosensor was found the high stability of 6 weeks and retained 87.5% to the original signal [27].

3] **Glucose Biosensor:**

L. Yang and his co-worker studied an electrochemical two step synthesis route to produce CuNPs(copper nanoparticale) /PEDOT/PA(Phytic acid) nanocomposite through electrochemical oxidation of EDOT and PA substrate and reduction of CuNPs. This shows a wide analytical range (5-403µM), high sensitivity upto 79.27 $\mu A.\mu M^{-1}.cm^{-2}$, low detection limit of 0.278µM and response time of the glucose sensor 4 sec. The hospital provided glucose value 3.8mM, 5.5mM, 7.5mM and biosensor detected values 3.6mM, 5.3mM, 7.6mM matches approximately 98% for enzymeless glucose sensing [28]. J. Liu and his co-worker studied organic thin film transistor for glucose sensor with the help of spin coating technique using PEDOT conducting polymer film. This showed that a linear increase in the OTFT drain current was observed resulting from the increase in glucose concentration. This developed glucose sensor showed rapid response time within 20 sec and give high sensitivity of 1.65 µA per mM. The result was indicated that the OTFT based glucose sensor retain the enzyme bioactivity [29]. Z. Amirzadeh and his co-worker developed a non-enzymatic glucose sensor based on a pencil graphite electrode (PGE) using PEDOT-PSS/CuO/MWCNTs composite. A cheap electrode, as well as simple modification process, make the developed glucose sensor economic as the modifier film were simply prepared by drop coating of the modifier suspension on the surface of a pencil graphite electrode. At an applied potential of +0.70V gave an acceptable sensitivity of 663.2 µA $mM^{-1}cm^{-2}$ in wide linear range upto 10mM [30]. Popov et.al. has prepared, rGO in combination with PANI,Nafion and Gox for an amperometric biosensor. The developed glucose biosensor showed a wide linear range (0.5-50) mM, low limit of detection 0.089 mM, good selectivity, better reproducibility, and good stability. The PANI nanostructure and rGO dispersion is proved to be an excellent material for the glucose biosensor [31]. Yang J and his team developed non-enzymatic an amperometric glucose biosensor. The investigation done with the help of polypyrrol nanowires electrode loaded with nickel hydroxide nanoflakes by chemical bath deposition method on substrate. The surface morphology of the composite material characterized by scanning electron microscopy and verified by X-ray photoelectron spectroscopy. The electrochemical behavior showed excellent performance and result tell us about the current was increased from 0.4 V to 0.7 V in glucose solution. The sensing characterization was evaluated by its dynamic detection range, stability, selectivity and reproducibility.The performance of the glucose biosensor detected range of 0.001-4.863 mM with sensitivity 1049.2 $\mu A\cdot mM^{-1}\cdot cm^{-2}$ and low detection limit found to be 0.3 µM [32]. Sheng L. and his team developed enzyme-free glucose sensor with novel nanocomposite of Ni(OH)2 over reduced graphene oxide and PEDOT with the help of electrodeposition method and show that Ni(OH)2 nanoparticles uniformly deposited on PEDOT-RGO hybrid film for detecting glucose. This sensor gives ultrafast response time (< 1 S), low detection limit, a wide linear range up to 7.1mM and the sensitivity found to be 346 µA mM^{-1} cm^{-2} [33]. Paul G. and his coworker developed the conducting paper-based biosensor using PEDOT-PSS grafted reduced graphene oxide-titanium dioxide [rGO-TiO2] nanohybrid. The different dopant like ethylene glycol, methanol and glycerin were doped and their effect on the conductivity of sample was investigated. Electrochemical results show that modified conducting paper (CP) shows high sensitivity with a low limit of detection 0.01mM [34]. The information regarding the other biosensor can be given in the following table.

Table : The below table represent the development in biosensor based conducting polymer.

Sr. No.	Material	Biosensor Analyte	Limit of Detection	Stability	Response Time	Linear Range	References
1.	(P(3HT-co-3TAA))	Urea	5mM	-	6 min	1.3-3.5 mM	[35]
2.	polythiophene-AgBr (PT-AgBr)	glucose	310 nM/10.4 µA mM^{-1} cm^{-2}	14 days	<1 min	370 nM/756 µA mM^{-1} cm^{-2}	[36]
3.	PANI-MMT	glucose	0.1 µM	40 dayes	-	10 µM-1.94mM	[37]
4.	Polythiophene	small RNA	0.7 pM miR-221	-	1.2 h	1-100 pM	[38]
5.	functional Polythiophene	cancer cell (sialic acid)	10 cells mL^{-1}	-	10 min	$1x10^1$-$1x10^6$ cells mL^{-1}	[39]
6.	pdAg NSPs-PPy	Dopamine	0.0258 -0.0860µM	-	-	0.001-200 µM	[40]
7.	Pt-PPy-Uri-Grap	Uric acid	0.541nmol^{-1}	-	-	0.002 to 0.024 nmol^{-1}	41]
8.	Ppy-CS-TiO_2	non enzymatic Glucose	614µM	14 days	<3 sec	1-14 mM	[42]
9.	PPY-(MWCNT-COOH)	DNA	0.08 µmol L^{-1}	15 days	150 sec	0.2–100.0 µmol L^{-1}	[43]
10.	PPY-NrG	epirubicin	1.0nM	-	-	0.004-55.0 µM	[44]
11.	PPy-PtPd	H_2O_2	(sensitivity)	60 days	-	2.5-8000 µM 1360.83 µA.mM^{-1}.cm^{-2}	[45]
12.	PANI-AuNPs	DNA	0.01fM	10 week	5 Min	1000-0.001 pM	[46]
13.	GRA-PANI	glucose	2.769 µM	-	400 sec	10.0 µM-1.48 mM	[47]
14.	PANI-CQD	dopamine	0.1013 µM	-	50-300 sec	0.1-100 µM	[48]
15.	PANI-Ni-MOF	HCV	0.75 fM	-	15 min.	1f -100 nM	[49]
16.	TiO_2/ PANI / GCE	glucose	18 µM	30 days	10sec	0.02 mM to 6.0 mM	[50]
17.	HCS@PANI	AChE	0.16 ng mL^{-1}	15 days	-	1.0 ng mL^{-1} to 10 µg mL^{-1}	[51]
18.	rGO-PANI	Hg^{2+}	0.035 nM	-	-	0.1 nM to 100 nM	[52]
19.	SiO_2($LuPc_2$)PANI-(PVIA)-CNB	Glucose	0.1 mM	45 days	~2 sec	1-16 mM	[53]
20.	GCE/PEDOT:PSS-AuNPs	xanthine	3.0 × 10^{-8}	4 week	5 min	5.0 × 10^{-8} to 1.0 × 10^{-5} M	[54]

Conclusion:

The present review article, we have discussed the electrochemical paper based biosensors due to their unique properties such as low cost, light weight , easily portable and gives instant result. Also discuss the procedure of analyte the biosensing element these can be done with their various coating methods. The sensitivity , selectivity, stability , limit of detection , linear range and fast response time in biosensor can be understood on different conducting polymer such as Poly(3,4-ethylenedioxythiophene), Polypyrrol, Polyaniline and Polythiophene with their composition. A very few of the biosensors were achieved sensitivity, fast response time and made their stability. The researchers need to focus on this parameter and try to evolve another method to reach the efficiency of biosensor.

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AC conduction of Polythiophene composite thin films doped with Bromine

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Abstract
Thin solid films of PTh-PVAc doped withBromine (3.5, 5.5, 10.4, 14.9, 18.9 and 22.5 wt %) were synthesized by chemical oxidative polymerization method in order to study the ac conduction at various temperature ranges. The impedance spectra of PTh-PVAc doped with Bromine films (323-343K over frequencies from 0.1-200 KHz) found to consist of only one arc suggest various parameters such as relaxation time, bulk resistance, bulk capacitance, dielectric activation energy etc. Comparison of impedance spectra was done on the basis of various AC conduction parameters
Keywords: Poly(vinyl acetate) (PVAc), Polythiophene (PTh), Bromine, dc,ac

1.Introduction
The conjugating polymers thin films have been studied by many workers, because of special electrical properties, considerable thermal stability and oxidation resistance that are favorable in applications such as optoelectronic, biosensors, electro chromic displays and chemical sensors [1-3]. Roncali [4] surveyed the electrochemical synthesis and the electronic properties of substituted PThs in 1997. The overall review on chemical synthesis of PThs and applications as chemical sensors, organic memory devices, photo conductivity, etc., is given by many researchers [5,6]. Temperature-dependent conductivity, in the case of ion conducting solid electrolytes, is more completely explained by Vogel-Tamman-Fulcher (VTF) [7-9] rather than other models. Ryu et al. [10-11] predicted that PTh powder prepared by electrochemical method, shows better results than that prepared by the fast oxidation method. The present paper focuses on comparison in electrical properties of Polythiophene composite thin films doped with Bromine.

2 Experimental Procedures
2.1 Sample preparation
Thin solid films of PTh-PVAc doped withBromine (3.5, 5.5, 10.4, 14.9, 18.9 and 22.5 wt %) were synthesized by chemical oxidative polymerization method in order to study the ac conduction at various temperature ranges.

2.2 ac conductivity measurement
ac conductivity of the samples were recorded on LCR meter (Wayne Kerr, UK) having range of frequencies from 0.1-200 KHz at temperature in the range 323-343K with heating rate 1°C min^{-1}. A constant voltage is applied to the sample and corresponding impedance and phase angle was measured at constant temperature for all frequency range. ac conductivity of the pure PTh-PVAc sample and doped with different Bromine wt % was measured at various temperatures 323-343K by applying a wide range of frequencies from 0.1-200 KHz.

3 Results and discussion
3.1 ac conductivity of PTh-PVAc films doped with Bromine
Fig.3.1.1-3.1.3 shows Nyquist plots of the samples DD7, DD8 and DD9 and it is observed that the resistance of all the samples decreases with the rise of temperature. From the fig., it is observed that the sample shows similar trend of semicircle for temperature 323-343 K. Many researchers [12-15] reported a similar behavior in the Nyquist diagram. The impedance spectrum of PTh-PVAc films doped with Bromine is found to consist of only one arc.

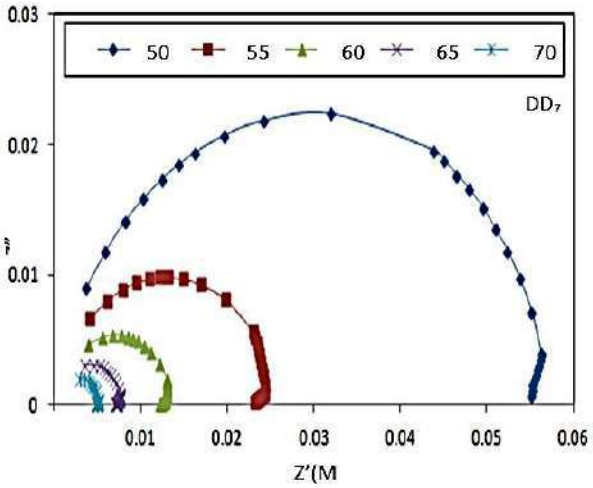

Fig.3.1.1

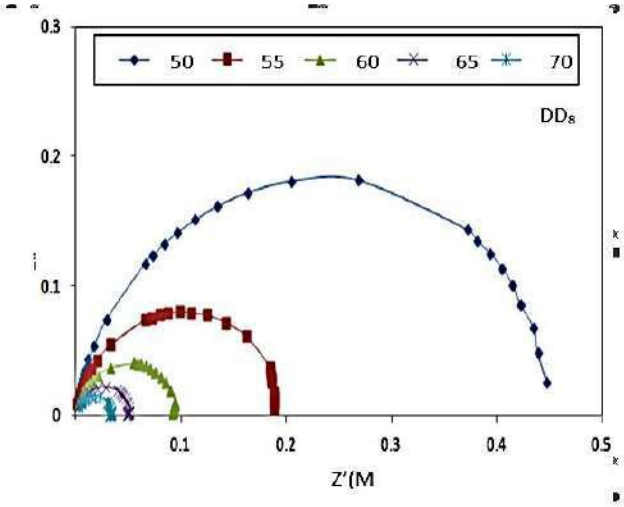

Fig.3.1.2

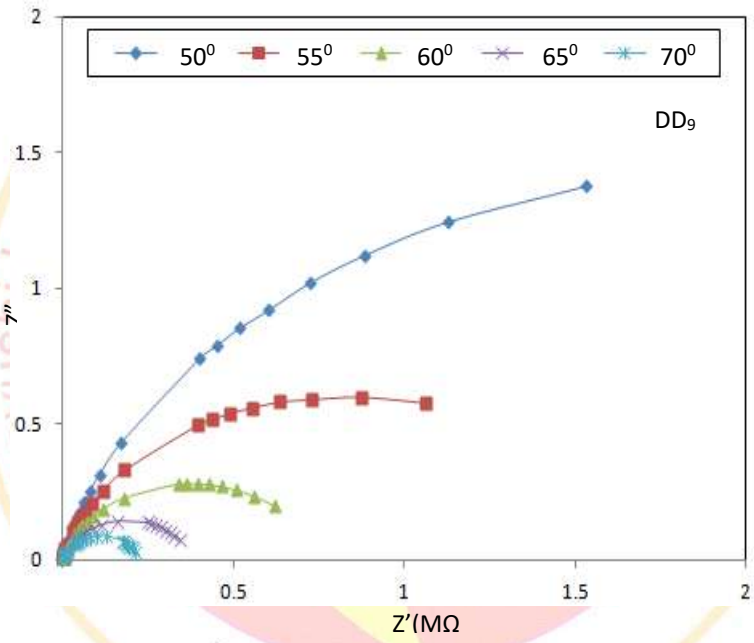

Fig.3.1.3

Also it may be argued that as the temperature increases for PTh-PVAc films doped with Bromine reduces the arc of semicircle indicating the increase in conductivity. The impedance spectra in figure 5.24 exhibited a single capacitive time constant at high frequencies and a finite length transport impedance with a permeable boundary at the low frequency end. The basic features of the spectra seem to be qualitatively similar to those obtained by Johnson et al. [14] for polythiophene films and Komura et al [23] for polypyrrole polystyrenesulfonate composite films. The arcs are found to be highly depressed for all films for different temperatures which indicate the distribution of relaxation times [15]. From the semicircle, the values of bulk resistance are calculated and noted in table 3.2.2. The variation of log f versus Z' at different temperature is as shown in fig 3.1.4-3.16.

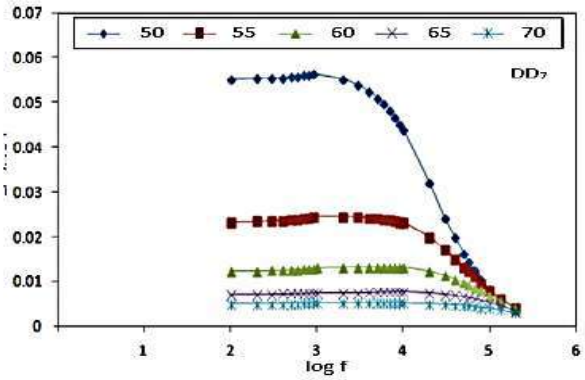

Fig.3.1.4

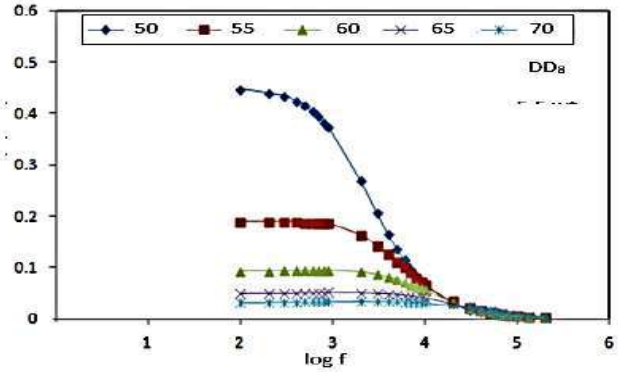

Fig.3.1.5

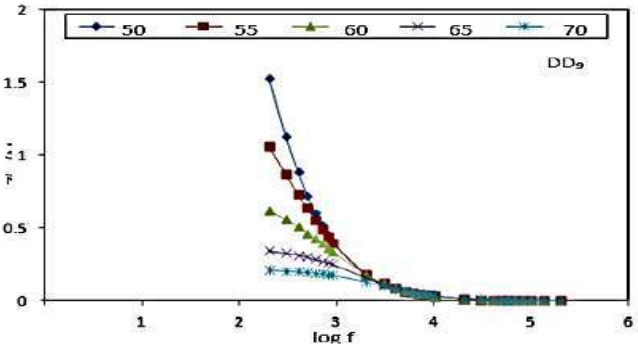

Fig.3.1.6

From the figure it is observed that the pure PTh-PVAc sample shows the wide variation of resistance with all frequencies. The resistance of the sample is found to be decreased with increase in frequency. Also as the concentration of the dopant Bromine is increasing, the sample constitutes much lesser resistance for increasing frequencies. The magnitude decreases on increasing temperature in the low frequency range which merges in the high-frequency region irrespective of temperature. This nature may be due to the release of space charge [16].

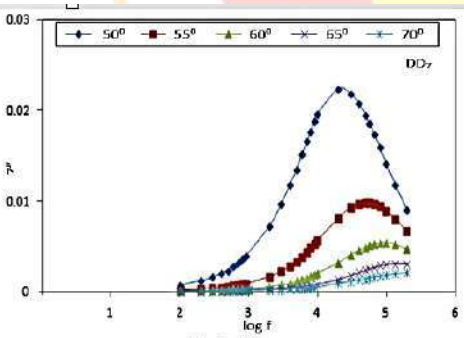

Fig.3.1.7

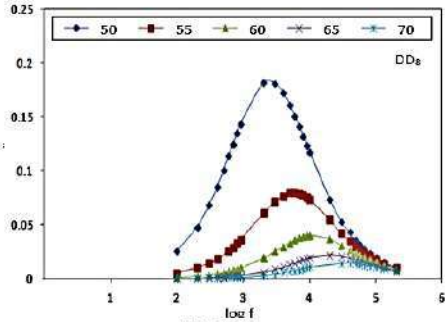

Fig.3.1.8

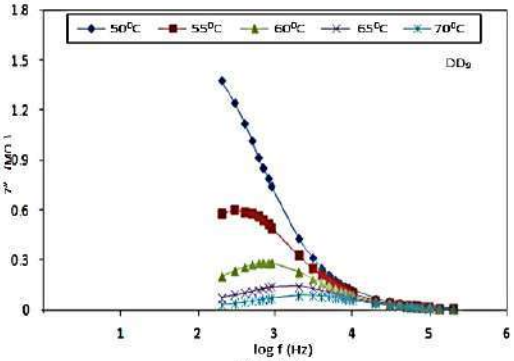

Fig.3.1.9

The reduction in barrier properties of the materials with rise in temperature may be a responsible factor for enhancement of a.c. conductivity of the materials at higher frequencies [17-18]. Further, in the low frequency region, there is a decrease in magnitude with rise in temperature showing negative temperature coefficient of resistance (NTCR) behavior [19]. This behavior is changed drastically in the high frequency region showing complete merger of plot above a certain fixed frequency. The variation of log f versus Z" is as shown in fig.3.1.7-3.1.9 which shows asymmetric peaks at different temperatures. Each peak is associated with a maximum frequency called as relaxation frequency. As the temperature increases the relaxation frequency is found to be shifting towards higher frequency [20-21]. The relaxation frequency (fr) follows the Arrhenius behavior as same in **equation no 3.2.1**. This equation is explored to find out the dielectric relaxation activation energy (ΔE) and relaxation time (τ).

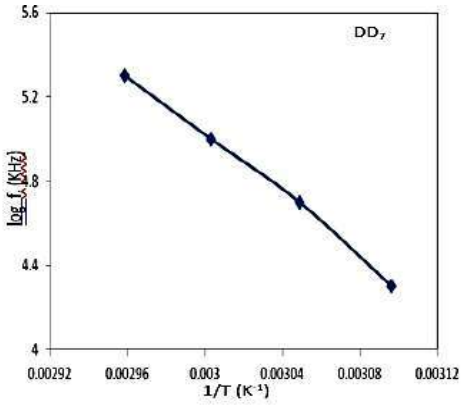

Fig 3.1.10

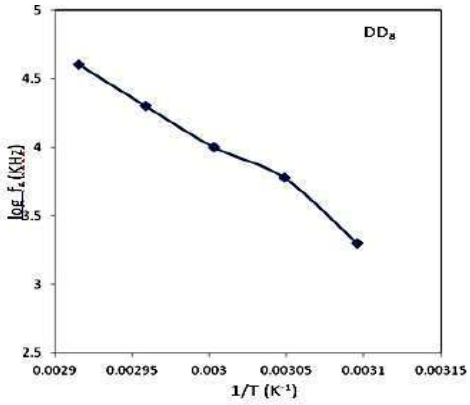

Fig 3.1.11

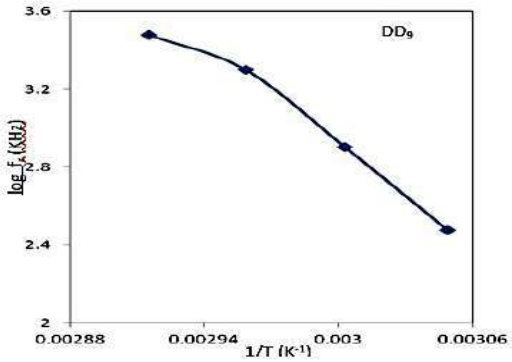

Fig. 3.1.12

The variation of 1/T versus log fr for samples DD7, DD8 and DD9 in fig.3.1.10-3.1.12. shows a straight line nature [20-22]. The values of peak frequencies (log f) are plotted against the 1/T as shown in fig 3.2.10-3.2.12. From this straight lines dielectric relaxation activation energy (ΔE) and relaxation time (τ) is calculated and tabulated in table 3.1.1.

Table 3.1.1: Dielectric relaxation activation energy and Relaxation time of PTh-PVAc with doped Bromine

Sr.No.	Bromine wt %	ΔE (eV)	τ (μs)
1	3.5	0.6224	2.51
2	5.5	0.5985	17.78
3	10.4	0.6619	199.52

From the table it is observed that, dielectric relaxation activation energy and relaxation time is maximum for the sample 10.4 wt % of Bromine and minimum for 3.5 wt % of Bromine.

Table 3.1.2: Bulk resistance and Bulk capacitance of PTh-PV Ac doped with Bromine at different temperature

Bromine wt %	323K		328K		333K		338K		343K	
	R_b(KΩ)	C_b(pF)	R_b(KΩ)	C_b(pF)	R_b(KΩ)	C_b(pF)	R_b(KΩ)	C_b(pF)	R_b(KΩ)	C_b(pF)
3.5	57	139.7	24.2	131.6	13	153.1	7.9	150.2	5.3	-
5.5	450	176.9	185	172.1	98	180.3	51.8	153.7	35	113.7
10.4	3800	-	1700	312.2	750	303.3	380	209.5	225	235.1

The values of bulk resistance (Rb) and bulk capacitance (Cb) at peak frequencies are noted in table 3.1.2.From the table it is observed that the bulk resistance of the sample is decreasing as the temperature increases but the bulk capacitance of the samples almost remain constant at all temperature. The bulk capacitance is found maximum for the sample with 10.4 wt % of dopant Bromine.

4. Conclusion

The impedance spectra of PTh-PVAc for the samples 5.5, 10.4, 14.9 and 22.5 wt % of Bromine dopant consist of only one arc which may be taken to mean that the conduction processes have identical time constants. The variation of real axis Z' with log f shows negative temperature coefficient of resistance (NTCR). The variation of imaginary axis Z" versus log f shows asymmetric peaks at different temperatures that lead to Debye type of relaxation. On the basis of impedance spectra various parameters such as relaxation time, bulk resistance, bulk capacitance, dielectric activation energy etc. are calculated. Dielectric relaxation activation energy and relaxation time is maximum for 5.5wt% of Bromine and minimum for 10.4 wt % of Bromine. The bulk capacitance is found to be maximum for the sample with 5.5 wt % Bromine. Dielectric relaxation activation energy and relaxation time is minimum for 5.5 wt % of Bromine. The bulk capacitance is found to be maximum for the sample with 10.4 wt % Bromine.

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Synthesis And Experimental Evaluation of New Chalcone Derivative.

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Abstract:

Chalcones which are also known as α,β-unsaturated ketones is an important class of organic compounds and reported to possess a wide spectrum of biological activities such as antibacterial, antifungal, anticancer, anti-inflammatory etc. This compound is the main precursor in the synthesis of a variety of heterocyclic compounds, therefore it is very important to develop the latest strategies in the synthesis of Chalcone. Chalcones are a valuable molecule of medicinal importance due to presence of reactive ketoethylenic group –CO–CH=CH–, belonging to the flavonoid family. These reactive α,βunsaturatedketo function in chalcones are responsible for their biological activity. Chalcone can be synthesized by several methods using aldehydes and ketones as starting material.

This paper is focused about different methods of synthesis and characterization done by NMR, MASS and IR spectroscopic techniques and physical properties with experimental data such as melting point, molecular weight,density,refractive index and viscosity of chalcones.

Keywords :Chalcone, Molecular weight,Density, Refractive index, Viscosity etc.

Introduction:

Chalcones are the aromatic ketones which belong to 1, 3-diaryl-2-propen-1-ones, which forms the central core for the synthesis of variety of important biologically active compounds.They are ubiquitous in natural products and belong to the family of flavonoids examples - licochalcone and morachalcone[1,2].

The compounds with the backbone of chalcone have been reported to exhibit a wide variety of pharmacological activity including antimalarial[3],antibacterial [4], antitubercular[5,6], antiviral[7], anticancer [8], anti-inflammatory [9], antifungal [10], antioxidant [11], antileishmanial[12], antidiabetics[13] etc.. Furthermore, chalcones are industrially used as light stabilizing agent[14], Sweetening agent[15], analytical reagent in amperometry[16] ,spectrometric reagent[17] and synthetic reagent for the synthesis of pharmacologically active heterocyclic compounds[18–20].Chalcones are also present in nature and can be obtained from plant species like Angelica, Glycyrrhiza, Humulus and Scutellaria, which are widely used as traditional folk remedies. Chalcones are important intermediates for the biosynthesis of flavonoids. The bright yellow-colored chalcones found in many plants and in some families contribute significantly in the pigmentation of corolla. Chalcones can be synthesized in the laboratory by Aldol condensation between a benzaldehyde and an acetophenone in the presence of base.

In this study we synthesized,characterize and physical interpretation of the new substituted chalcone. The structure of the compound was characterized by NMR,MASS and IR spectroscopic studies.

Refractive Index along with density, molecular mass andviscosity is very useful in the evaluation of variousthermodynamics properties of chemical materials. The number of atoms, groups, radicals and bonds present in thecompound can also be calculated by refractive indexmeasurement.

Scheme for Synthesis of Chalcone derivatives :

Substituted acetophenone [21] and substituted benzaldehyde[22] were mixed in a round bottom flask. Ethanol was annexed and then sodium hydroxide.The mixture was stirred at room temperature, then left to stand for 24 h. The mixture was poured into a beaker containing crushed ice to quench the reaction and then neutralized with HCl. The precipitates formed were filtered, washed with distilled water and dried. They were then recrystallized fromabsolute ethanol to obtain the desired products[23-29].

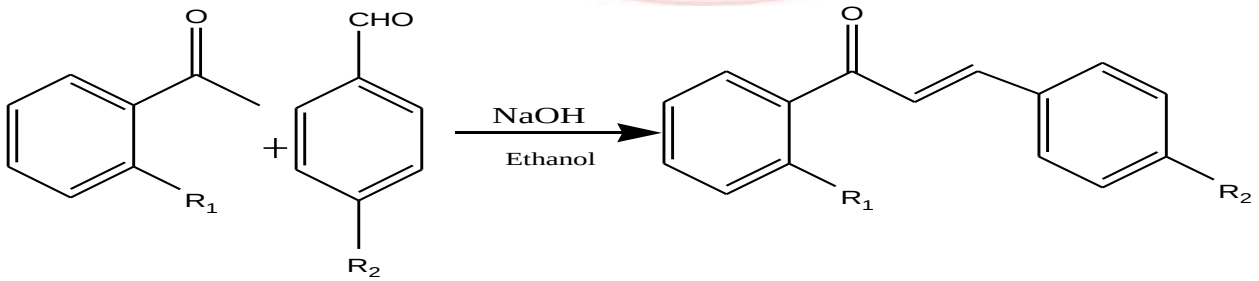


Table : 1 : Physical parameters of synthesized Chalcone.

Sr. No.	Compound	Substitution	Molecular Formula	Molecular Weight	Yield
1	Chalcone	OH and Cl	C15H11O2Cl1	258.5	75 %

Experimental

I.Synthesis :

Substituted chalconehave been synthesized andtheir general structures were confirmed by IR, 1H NMR and mass spectral data. Table 1,Table 2, Table 3,Table 4and Table 5 shows thevarious physicalparameters of synthesized Chalcone.

II.Physicochemical studies:

The synthesized chalconewas recrystallized from DMF. The solvents dimethylformamide(DMF) and dimethylsulfoxide (DMSO) were used for thephysicochemical studies.The selection of solvents indifferent physicochemical study is due to solubility andother practical problems.

III.Density and Refractive index:

Solutions of differentconcentrations were made in DMF and DMSO of the synthesized compound. The density and refractive index ofsolutions were measured at various temperatures and various concentrations. Abbe refractometer was used to determine the refractive index of all the solutions. Table shows the refractive index of synthesized chalcone at various temperatures and various concentrations.

Results and Discussions:

I.Refractive Index of synthesized Chalcone:

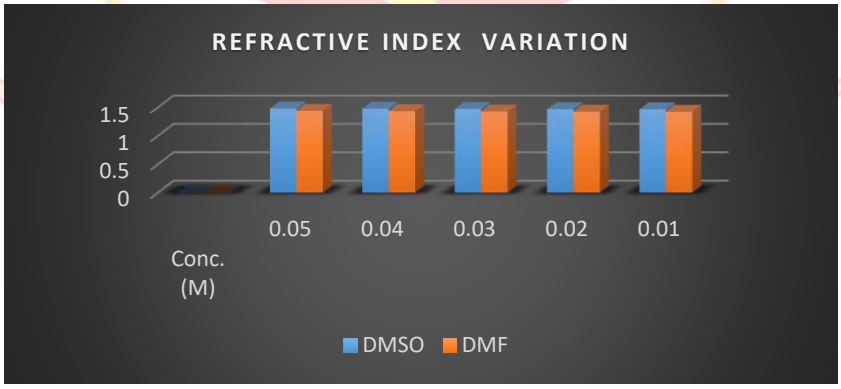
Values of refractive index are varies with various concentrations of solution at 313.15 K temperatures.The below table shows the dynamic values of refractive index.

Table :2 **Temperature: 313.15 K**

Conc. (M)	DMSO solvent	DMF solvent
	RI	**RI**
0.05	1.482	1.440
0.04	1.479	1.434
0.03	1.474	1.429
0.02	1.470	1.426
0.01	1.468	1.424

Space Graph:

Below space graph clarifies that the refractive index with solvent DMF is lesser than that of solvent DMSO.



II. Density and Viscosityof synthesized Chalcone:

The table below shows the dynamic experimental values of density (ρ), and viscosity (η), at different temperature and different concentrations.

Table :3 **Temperature: 303.15 K**

Conc.	DMSO Solvent	DMF Solvent

(M)	Density(ρ) ($g.cm^{-3}$)	Viscosity ($\eta.10^{-3}$)poise	Density(ρ) ($g.cm^{-3}$)	Viscosity ($\eta.10^{-3}$)poise
0.05	1.1209	12.349	0.9619	7.882
0.04	1.1199	12.297	0.9612	7.789
0.03	1.1192	12.274	0.9608	7.753
0.02	1.1187	12.135	0.9602	7.691
0.01	1.1170	12.058	0.9576	7.651

Table :4 **Temperature: 308.15 K**

Conc. (M)	DMSO Solvent		DMF Solvent	
	Density(ρ) ($g.cm^{-3}$)	Viscosity($\eta.10^{-3}$)poise	Density(ρ) ($g.cm^{-3}$)	Viscosity ($\eta.10^{-3}$)poise
0.05	1.1204	11.190	0.9642	7.281
0.04	1.1201	11.082	0.9644	7.202
0.03	1.1193	11.031	0.9633	7.139
0.02	1.1188	10.929	0.9629	7.088
0.01	1.1171	10.899	0.9617	7.002

Table :5 **Temperature: 313.15 K**

Conc. (M)	DMSO Solvent		DMF Solvent	
	Density(ρ) ($g.cm^{-3}$)	Viscosity($\eta.10^{-3}$)poise	Density(ρ) ($g.cm^{-3}$)	Viscosity ($\eta.10^{-3}$)poise
0.05	1.1198	10.397	0.9658	6.583
0.04	1.1193	10.331	0.9653	6.494
0.03	1.1180	10.294	0.9641	6.437
0.02	1.1175	10.184	0.9632	6.382
0.01	1.1172	10.131	0.9605	6.284

The above physical parameters show that, decrease in concentration of solution,the density and viscosity are decreased,while the same values were increased in increased temperatures.Table 1 shows the experimental values of refractiveindex of solutions of the newsynthesized compound in DMF and DMSO at 313.15 K.Table 2,Table 3 and Table 4 shows the dynamic valuesof densities and viscosities of compound in various concentration and various temperatures with solvent DMF and solvent DMSO.

Conclusions:

From above experimental values it is concluded that densities,viscosities and refractive index of solution are changes by changing temperatures and by changing the solvent due to solute-solvent interaction.

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A short theoretical view on fundamental aspect of material science

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Abstract:
Materials science still incorporates elements of physics, chemistry, and engineering. The interdisciplinary field of materials science, also commonly termed materials science and engineering, covers the design and discovery of new materials, particularly solids. The basis of materials science is studying the interplay between the structure of materials, the processing methods to make that material and the resulting material properties.
Key word: *chemistry, physics, engineering, phenomenological, ancient,*

Introduction:

Beginning in the 1940s, materials science began to be more widely recognized as a specific and distinct field of science and engineering, and major technical universities around the world created dedicated schools for its study. Materials scientists emphasize understanding, how the history of a material (*processing*) influences its structure, and thus the material's properties and performance. The understanding of processing-structure-properties relationships is called the materials paradigm. This paradigm is used to advance understanding in a variety of research areas, including nanotechnology, biomaterials, and metallurgy.

Methodology:

Materials science is also an important part of forensic engineering and failure analysis – investigating materials, products, structures or components, which fail or do not function as intended, causing personal injury or damage to property. Such investigations are key to understanding, for example, the causes of various aviation accidents and incidents.

1. **Fundamental**
   The main classes of materials are metals, semiconductors, ceramics and polymers.
   A material is defined as a substance (most often a solid, but other condensed phases can be included) that is intended to be used for certain applications. There are large numbers of materials around us they can be found in anything from buildings and cars to spacecraft. New and advanced materials that are being developed include nonmaterials, biomaterials, and energy materials. The complex combination of these produces the performance of a material in a specific application. Many features across many length scales impact material performance, from the constituent chemical elements its microstructure and macroscopic features from processing. Together with the laws of thermodynamics and kinetics materials scientists aim to understand and improve materials
2. **Structure**
   Structure is one of the most important components of the field of materials science. Materials science examines the structure of materials from the atomic scale, all the way up to the macro scale. Characterization is the way materials scientists examine the structure of a material. This involves methods such as diffraction with X-rays, electrons or neutrons, and various forms of spectroscopy and chemical analysis such as Raman spectroscopy, energy-dispersive spectroscopy, chromatography, thermal analysis, electron microscope analysis, etc. Structure is studied in the following levels
3. **Atomic structure**
   Atomic structure deals with the atoms of the materials, and how they are arranged to give rise to molecules, crystals, etc. The length scales involved are in angstroms (Å). The chemical bonding and atomic arrangement (crystallography) are fundamental to studying the properties and behavior of any material. Much of the electrical, magnetic and chemical properties of materials arise from this level of structure.
4. **Bonding**
   This involves the study and use of quantum chemistry or quantum physics. Solid-state physics, solid-state chemistry and physical chemistry are also involved in the study of bonding and structure. To obtain a full understanding of the material structure and how it relates to its properties, the materials scientist must study how the different atoms, ions and molecules are arranged and bonded to each other.
5. **Crystallography**
   Crystallography is a useful tool for materials scientists. Crystallography is the science that examines the arrangement of atoms in crystalline solids. In single crystals the effects of the crystalline arrangement

of atoms is often easy to see macroscopically because the natural shapes of crystals reflect the atomic structure. The understanding of crystal structures is an important prerequisite for understanding crystallographic defects. Further physical properties are often controlled by crystalline defects. Mostly materials do not occur as a single crystal but in polycrystalline form as an aggregate of small crystals or grains with different orientations.

6. **Nanostructure**
   Nanomaterials are subject of intense research in the materials science community due to the unique properties that they exhibit Materials which atoms and molecules form constituents in the nanoscale (i.e., they form nanostructure) are called nanomaterials. Nanostructure deals with objects and structures that are in the 1 - 100 nm range. In many materials, atoms or molecules together to form objects at the nanoscale. This causes many interesting electrical, magnetic, optical and mechanical properties in describing nanostructures it is necessary to differentiate between the numbers of dimensions on the nanoscale
7. **Microstructure**
   Microstructure is defined as the structure of a prepared surface or thin foil of material as revealed by a microscope above 25× magnification. It deals with objects from 100 nm to a few cm. The microstructure of a material (which can be broadly classified into metallic, polymeric, ceramic and composite) can strongly influence physical properties such as toughness, strength, hardness, ductility, corrosion resistance, high/low temperature behavior wear resistance and so on. Most of the traditional materials such as metals and ceramics are micro structured
8. **Macrostructure**
   Macrostructure is the appearance of a material in the scale millimeters to meters, it is the structure of the material as seen with the naked eye
9. **Thermodynamic**
   Thermodynamics is concerned with heat and temperature and their relation to energy and work. Thermodynamics describes the bulk behavior of the body not the microscopic behaviors of the very large numbers of its microscopic constituents such as molecules. It defines macroscopic variables such as internal energy, entropy, and pressure that partly describe a body of matter or radiation. These general constraints are expressed in the four laws of thermodynamics. It states that the behavior of those variables is subject to general constraints common to all materials. The behavior of these microscopic particles is described by and the laws of thermodynamics are derived from statistical mechanics the study of thermodynamics is fundamental to materials science.

Result and Discussion:

Materials science is a highly active area of research. Together with materials science departments, physics, chemistry, and many engineering departments are involved in materials research. Materials research covers a broad range of topics. Materials science is also an important part of forensic engineering and failure analysis – investigating materials, products, structures or components, which fail or do not function as intended, causing personal injury or damage to property.

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Fabrication of FeSe thin films deposited by successive ionic layer adsorption and reaction method.

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Abstract
Fabrication of Iron chalcogenide materials has been the subject of much interest in essential research because of their novel physical and chemical properties. In this paper, FeSe thin films were deposited on glass substrates by successive ionic layer adsorption and reaction deposition method and the number of cycle varies. These deposition techniques are a very simple and produce thin films at room temperature. The spaceman were investigated by X-ray diffraction techniques and SEM. The XRD pattern confirmed that Iron Selenide thin film. The SEM image exhibited that the obtained sample is homogonous in nature.
Key Words: *Thin Films, XRD, SILAR method, Morphological properties*

1. Introduction
Chalcogenide thin films are persistently under development to extend new potential materials appropriate for photo-voltic devices. The chalcogenides materials have magnetized scientists maybe due to their potential uses in a variety of optoelectronic devices[1,2]. The structural, morphological, magnetic, electrical, and optical properties of FeSe thin film materials are strongly dependent on production methods. Among these methods, it is known that parameters such as solution temperature, molarity, pH value, annealing temperature and time, drying atmosphere, substrate have an influence on the quality, thickness, and production cost of the film. When the literature is reviewed, It is seen that a wide variety of methods like Pulsed Laser Dep, chemical method and other method[3,4] The most important plan of this learning is to set up a successive ionic layer adsorption and reaction deposited FeSe thin films and studies its morphological and structural characteristics.

2 Experimental
2.1 Deposition of thin films
The thin films of iron selenide (FeSe) have been grown on glass substrates by successive ionic layer adsorption and reaction deposition technique. The chemicals used in this work were of analytical reagent grade (99% purity). Before the deposition the glass slides with dimensions 75 × 25 × 1 mm^3 ultrasonically were cleaned and rising with distilled water for each 6 min. The Na_2SeSO_3 solution was prepared by mixing 100 g anhydrous sodium sulfite in 500 ml of distilled water with 10 g selenium powder (99% purity, Merck) with constant stirring for 10 h at 80 ^{0}C. It was sealed and kept overnight, since on cooling, a little selenium separated out from the solution. It was then filtered to obtain a clear solution. The deposition of FeSe films was done at room temperature in a reactive solution prepared in a beaker. Glass substrates were immersed in the 60 ml of Fe $(NO_3)_3.9H_2O$ solution for 10 s. It was then immersed in the 30 ml of EDTA solution for 10 s and then to immersed in 60 ml of freshly prepared Na_2SeSO_3 solution for 10 s. This forms one SILAR deposition cycle. Deposition cycles were varied from 100 to 250 cycles in the steps of 25 cycles. All the prepared samples were annealed for 24 h for the complete transformation. The X-ray diffraction was used to study the structure of the film. X-ray diffraction patterns of the films were taken with a PANalytical X'Pert PRO MRD X-ray diffractometer with Cukα radiation in the 2θ range from 20^0 to 90^0. The morphological study of the film was carried out using scanning electron microscopy (SEM) with a Park Scientific Instruments and SEM/EDAX with JOEL's JSM -7600F.The scanning electron microscope gives topographical and elemental information at various magnifications.

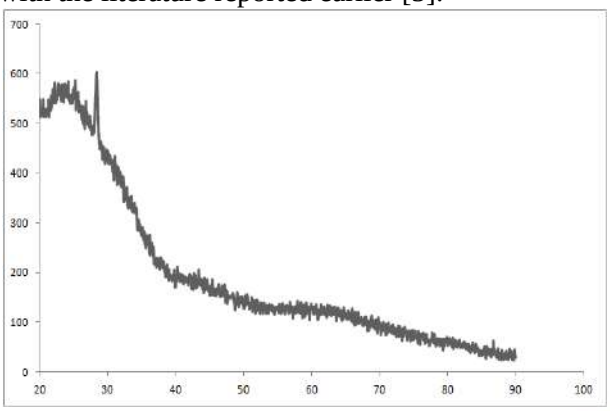
2.2 X-ray diffraction
X-ray diffraction technique is an appropriate system for studying the crystal formation of the deposited thin films. The inter-planar spacing's d was calculated using the relation,

$$D_{hkl} = (\lambda/2)\ \mathrm{Sin}\theta$$

Fig.1. shows the x-ray diffraction pattern of FeSe thin film deposited on glass substrate at room temperature. The differaction peakes of FeSe is found at 2θ values of 28.3912, corresponding to the lattice plane (100). The d value calculated using equation confirm well with available JCPDS standered for FeSe. The average crystallite size of the deposited material is determined by using Debye-Scherer's formula,

$$d = \frac{0.9\,\lambda}{\beta \cos\theta}$$

where β is Full Width at Half Maximum of the peak in radians, λ is the wavelength of CuKα radiation (λ=1.5418 A^0), θ is the Bragg diffraction angle at peak position in degrees. These results are in good agreement with the literature reported earlier [5].



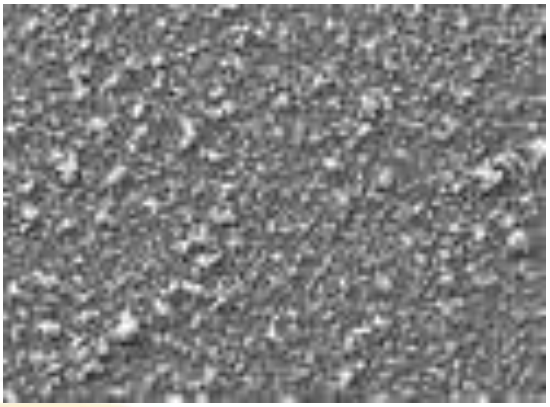


Fig.1. shows the x-ray diffraction pattern of FeSe thin film and Fig.2. shows, the SEM image of as deposited FeSe thin film on to glass substrate

2.3 Surface morphology

Fig.2. shows, the SEM image of as deposited FeSe thin film on to glass substrate. From SEM, we can examined that as-deposited FeSe film is homogeneous and covering the substrate. The surface investigation from two dimensional micrograph showed that the film surface is uneven which confirms its absorbent nature observed in SEM image.

3. Conclusions

The structural properties of FeSe thin films deposited by successive ionic layer adsorption and reaction deposition technique have been studies. These results are in good agreement with the literature reported earlier.

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Application of PANI-Mn Nano-composite for Removal of Dyes from Wastewater

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Abstract

The waste water generated from industries creates severe public health issue and environmental pollution concern, create a major challenge to existing conventional water treatment systems. The different biological and physiochemical treatment process have been studied, but they shows different removal ability on the basis of their experimental condition. Among them, adsorption methods is most efficient due to its high removal efficiency, cost-effective, easy to operated and recyclability of adsorbent. In this research Facile synthesis of Polyaniline-Mn Nano-composite was done by oxidative polymerization methods and used as an adsorbent for removal of methyl orange dyes from waste water. The effect of some important parameter such as Initial Concentration of dyes, pH of water, temperature and contact time on the removal and efficiency was investigated in adsorption system. The adsorption capacity of PANI-Mn Nano-composite was high 94%at pH of 3-4 and the adsorption of dyes increased with 92.60% to 96.42% increase in temperature from 35ºC to 50ºC.

Keyword: *Polymer, PANI-Mn, Polyaniline, Methyl Orange, Dyes.*

1. Introduction

The dye may be defined as a coloured substance which when applied to the fibres gives it a permanent color. The dyes contain Chromophore which are responsible for producing color to a dye because they are capable of absorbing light in near U.V region.[1]The dyes are classified mainly on the basis of structure and their application. Depending upon the type of chromophore present in their structure the dyes are Nitro and Nitroso dyes, Azo dyes, Triphenyl methane dyes, Phthalein dyes, Indigoid and Thioindigoid dyes, Anthraquinone dyes, Miscellaneous dyes.[2] The Methyl Orange dyes an azo dye containing one azo (-N=N-)group. It contain sulphuric acid (-SO_3H) group and hence it is acidic Azo dye. This –SO_3H group make the dye more soluble and It is also used as reactive point for fixing the dyes. This –SO_3H group act as auxochrome.[3] The IUPAC name is dimethyl amino azobenzene sulphonic acid. In our country the use of dye is high and wastewater from textile industries causes damages to water living organism. Consequently these are affecting to the ecological system of environment. It also affect to public health, hence its removal from waste water is big challenge.[4] It also affect to soil if it is not degradable because most of the dyes are stable to light and non-degradable.

The many researchers are attracted towards its removal with the help of Nano scale material. When polyaniline doped with any transition metal then it is called Nano-composite. Some researchers used the Nano-composite for different dyes for example, the polyaniline sawdust is used to removal of Acid Violate 49 dyes.[5] The removal of cationic dye using a new magnetic Nano-composite based on starch-g-poly (vinylalcohol) and functionalized with sulphate group.[6] Polyaniline Nano-composite for the adsorption of Acid dyes from aqueous solution. The polyaniline Nano-layer composite for removal of tartrazine dyes from aqueous solution.[7] The basic blue dye adsorption from water using Polyaniline/Magnrtite (Fe3O4) Composite.[8] The green synthesis of magnetic nano- composite by Cordia Africana(CA) leaves extract for the treatment of Methylene blue.[9] An Eco-Friendly NiO/Polydopamine Nano-Composite used for efficient removal of Dyes from wastewater.[10] polyacrylamide/Ni,ZnO, Nano-composite an efficient adsorbent capacity for toxic dyes.[11] The various adsorbents such as bio-adsorbents, carbon-based Nano-adsorbent,[12] Transition metal oxides-based adsorbent,[13] Polymer-based adsorbent[14] are used to treat waste water containing dyes. It can be observed that adsorbents such as polymer-based material and activated carbon are studied more for the removal of dyes. There has been increasing interest in finding the easy and efficient Nano-composite for removal of dyes from waste water.

In present research the facile synthesis of Polyaniline–Mn Nano-composite and its application in removal of methyl Orange dyes from waste water. The Factors which affects removal from waste water i.e Initial dyes concentration, pH, temperature describe here.

2. Materials and Methods

The chemicals used such as Ammonia, aniline, ammonium persulphate, manganese dichloride, ethanol, concentrated HCl, aldehyde, dethyl phosphite are of analytical grade, The Distilled water used for experimental work.

2.1 Synthesis of Polyaniline:

The 0.5 M aniline monomer (99%) and 0.5 M ammonium persulphate (APS) was prepared in 0.5M Cons. HCl solution, In a round bottom flask. These are mixed slowly with constant stirring on magnetic stirrer. This mixture was kept in ice bath maintaining the temp below 0-4ºC for 8-10 hours. The reaction mixture was

poured into 200 ml water to complete the precipitation, washed with distilled water and HCl solution to remove un-reacted monomers.[15] After some time polymerization take place and the dark suspension becomes green in color. The green colored residue like paste was obtained. The final product was washed 2-3 times with D.W. and ethanol. Finally the dark-green powder is dried at 80°C for 6-8 Hours in Oven[16] The final product was grinded to form a green powder is known as conducting PANI (ES).Fig-1.

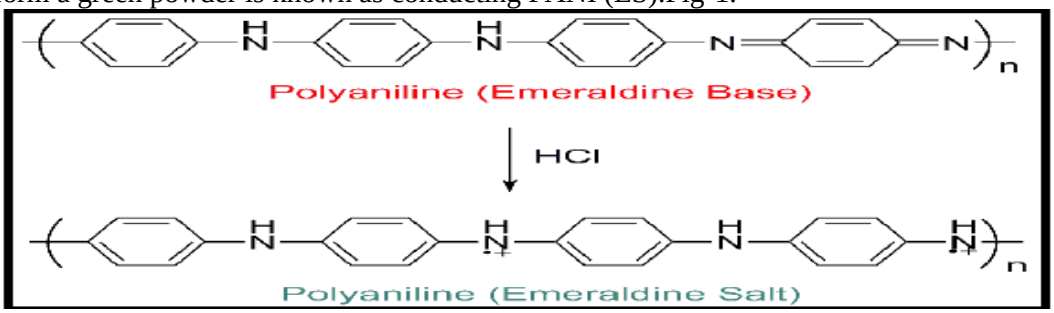

Fig-1 Structure of Polyaniline

2.2 Synthesis of PANI-Mn Nano-composite:

After formation of Polyaniline Emeraldine Salt (ES) the accurate amount of 0.2 M solution of Manganese chloride ($MnCl_2$) slowly and carefully dissolved in polyaniline. The Polyaniline Manganese chloride solution was kept in R. B. flask and kept for vigorous stirring with the help of hot plate with magnetic stirrer (700 RPM) is adjusted, about 3-5 hours. The dark green suspension is formation in the R. B. flask after that this R B flask was kept in Ice bath for 12 Hours. After filtration, The product were washed with 2 times with distilled water and 3 times with ethanol. The prepared Nano catalyst was kept in hot air oven for 7 hours at 70^0C.[17] In this method the Nano particle of Mn is uniformly distributed in Polyaniline. There is formation of Nano- catalyst having dark green color, The surface morphology was studied on Scanning Electron Microscopy. **(Fig-2)**

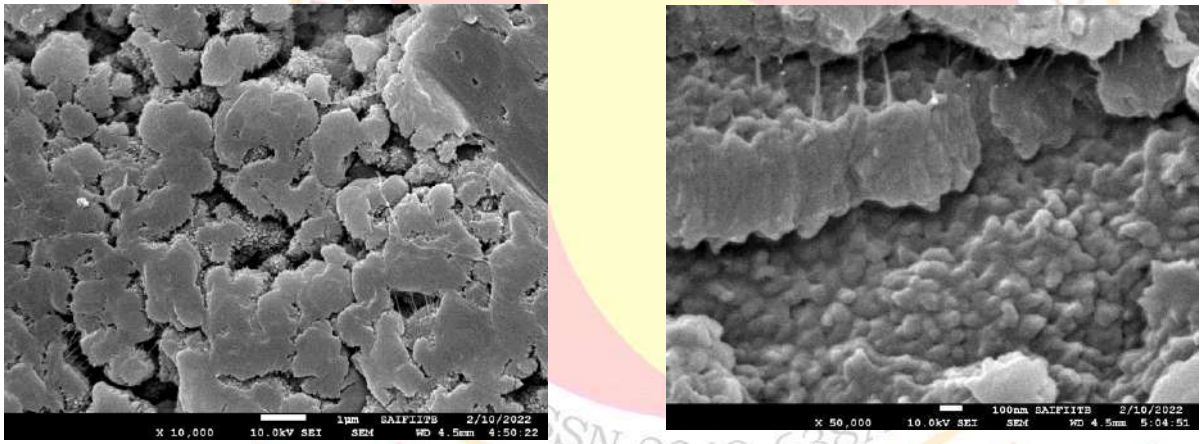

Fig-2 SEM images of PANI-Mn Nano-composite at 1nm and 100 nm

On the basis of scanning electron microscope structure the manganese molecule is uniformly distributed in the polyaniline. The size of particle is 1-100nm. The high surface area is available for electrostatic attraction to methyl orange dyes.

3. Adsorbate

The dyes used in this studies was methyl orange it is an acidic dyes. Having molecular formula $C_{14}H_{14}N_3NaO_3S$ and Molecular weight 327.34g mol^{-1} The molecular structure is given in Fig-2. The stock solution of 1000mg/L prepared by by dissolving appropriate amount of dyes in 1 litre of Distiled water. The solution were obtained by diluting the dye stock solution in accurate proportion to different initial concentration.

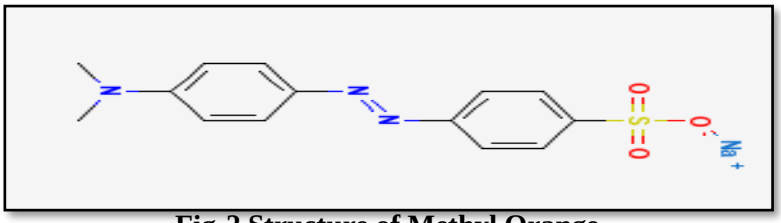

Fig-2 Structure of Methyl Orange

4. Batch mode adsorption experiments

The adsorption experiments were carried out by agitating 100 mg adsorbent with 200 mL of dye solutions of 25 to 100 mg/L concentration at 150 rpm on Hot Plate with magnetic stirrer. The mixture was withdrawn at specified intervals, centrifuged using electrical centrifuge at 4500rpm for 20 minutes and un adsorbed supernatant liquid was analyzed for the residual dye concentration using spectrophotometer. at 558 nm.

The effect of temperature on adsorbent was studied at four different temperature i.e. 25ºC, 30ºC, 35ºC, 40ºC. The effect of pH was studied by using dilute HCl and NaOH solutions. . All experiments were carried out repeated and the mean values are reported, where the maximum deviation was within 5%.

5. Desorption Studies

The main aim to study the Desorption to analyze the mechanism of adsorption and recovery of the adsorbate and adsorbent. The supernatant Liquid was separated after centrifugation and the adsorbent was separated and allowed to agitate with 100 mL of distilled water at different pH i.e. 3-12 above the equilibrium time of adsorption. The desorbed dye solution was estimated as given in the adsorption studies. [18-19]

6. Mechanism of adsorption

In process of adsorption firstly Nano-composite having high surface area. On this surface the surface diffusion process take place and molecules of dyes attracted towards surface area of Nano-composite. It should be noted that adsorption of methyl orange dye present in waste water on surface of adsorbent is mainly due to electrostatic attraction, pi-pi interaction, "van der waals" forces, hydrogen bonding, acid base reaction, and hydrophobic interaction.[20] Out of which adsorption of methyl orange dye on surface of adsorbent mainly due to electrostatic attraction and ion exchange phenomenon. In electrostatic attraction -SO3H groups having negative charge and adsorbent surface having positive charge they attract each other and easily removed. In ion exchange mechanism involves exchange of ion between dyes solution and solid phase adsorbent.

Fig-3

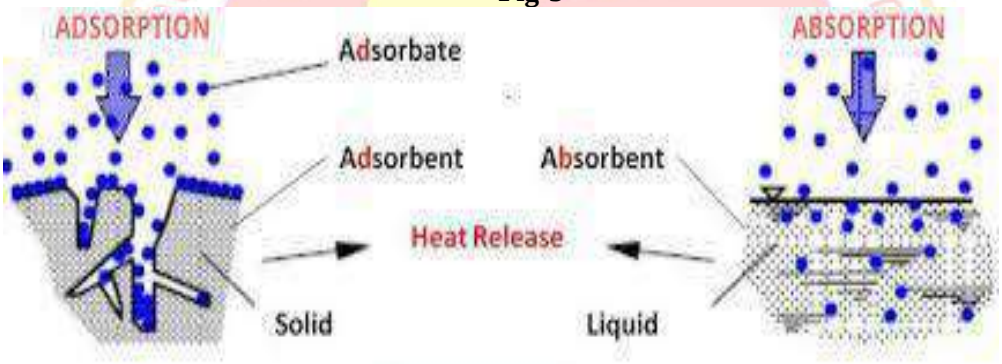

Fig-3 Mechanism of Adsorption

6.1 Effect of Initial dye concentration

The effect of time on the removal of Methyl orange dye is observed. The percentage of removal increases with time and attains equilibrium at 50 minutes for all concentrations studied (30 to 100 mg/L). After that no significant change was observed in the extent of adsorption. The amount of dye adsorption increases from 49.45 mg/g to 174.51 mg/g. while increasing the initial dye concentration from 30 to 100 mg/L. This is due to the fact that with increase in dyes concentration, it shows that dyes molecule near the adsorbent also increased.

6.2 Effect of pH

It is found that the percentage removal of Methyl Orange was higher when the pH is below 4. After pH 4, the adsorption rate decreased. In acidic conditions, the surface of the adsorbent is positively charged due to high concentration of H^+ ions, so electrostatic attraction between the adsorbent and the adsorbate is enhanced.[21] Lower adsorption of Methyl Orange under alkaline conditions is due to the presence of hydroxyl ions on the surface of adsorbents competing with the adsorbate for adsorption sites . Methyl Orange has anionic dipositively fixed charged sites which are balanced with the anions originating from monomer or oxidant solution during their synthesis. The small size dopant anions can be exchanged with other anionic species in treated, solutions which have stronger interactions with the polymer . It may be suggested that the rate of anionic dye removal is high due to the ion exchange mechanism between mobile cation and anionic dye molecules. It was observed that The removal of Methyl Orange dyes 94% at lower pH i.e 3-4.

6.3 Effect of temperature

It has been observed that the percentage removal of Methyl Orange by PANI-Mn Nano-composite increases from 92.60 % to 96.42% on increasing the temperature from 35°C to 50°C. This indicates that the adsorption of anionic dyes is endothermic in nature[19]. These adsorption data were further analyzed with adsorption isotherm models to find out the suitable model.

7.Equilibrium adsorption isotherm

The Langmuir adsorption isotherm has been used successfully for many adsorption processes of monolayer adsorption. Langmuir model[21] is represented by the following equation

Equation-1

$$C_e/q_e = 1/Q_o b_L + (1/Q_o) C_e$$

where, qe is the amount of dye adsorbed at equilibrium (mg/g), Q0 is the monolayer adsorption capacity (mg/g) and bL is Langmuir constant related to energy of adsorption, Ce is the equilibrium concentration (mg/L) It shows a linear plot of Ce / qe against Ce for the removal of AV49 by PAC. The Langmuir adsorption capacity varies from 187.77 mg/g to 212.18 mg/g for Mehyl orange onto PANi-Mn Nano-composite with increase in temperature from 35°C to 50°C. This indicates that the adsorption is favored at high operating temperature.

7.1 Kinetics of Adsorption

In this present research paper, the following two kinetic models were applied for the experimental data. Adsorption kinetics is necessary for the design of adsorption systems[22]

Pseudo first - order kinetic model assumes that the rate of change of solute uptake with time is directly proportional to difference in saturation concentration and the amount of solid uptake with time.[23-24] The rate constant of adsorption is expressed as a first – order rate expression given as: Eq-2.

Equation-2

$$\log (q_e - q_t) = \log q_e - K_1/2.303\, t$$

Where, k1 is the pseudo-first-order rate constant (min^{-1}). The plot of log (qe-qt) versus t should give a straight line with slope of –k1/2.303 and intercept log qe which allows calculation of adsorption rate constant k1 and equilibrium adsorption capacity qe . Calculated values of k1 and qe for the adsorption of Methyl orange dyes on PANI-Mn Nano-composite.

7.2 The pseudo second-order kinetic equation

$$t/q_t = 1/k_2 q^2_e + t/q_e$$

Equation-3

In Eq-3. Where, 2 k is the rate constant of pseudo second –order adsorption (g/mg min) and e q is the equilibrium adsorption capacity (mg/g). The pseudo second -order plot for the adsorption of Methyl Orange at various initial dye concentrations (Temperature 30°C). A plot of t/qt against t should give a linear relationship from which 2 k and qe can be determined from the intercept and slope of the plot.[25-26] The correlation coefficient values are greater and the data points give a linear straight line. It indicates that the adsorption of Methyl Orange by PANI-Mn follow the pseudo second order kinetic model.

7. Conclusions

In this present research paper The Polyaniline-Mn Nano-composite was easily synthesized by Oxidative polymerization. The removal of Methyl orange is pH dependent and the maximum removal is observed below pH 4, due to its mechanism. The adsorption of dyes increased with 92.60% to 96.42% increase in temperature from 35ºC to 50ºC. The kinetic study shows that adsorption of Methyl orange followed pseudo-second order kinetics model. It was observed that PANI-Mn Nano-composite having potential to remove Methyl Orange dyes from waste water.

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Graphene Based Space Qualified Battery Materials

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Abstract

Space craft's require different technologies that envisioned for power generation, storage and its management. Generally, in the CubeSats, solar cells are the power generator and secondary batteries serve as energy storage. The primary task of the battery is to deliver power when the production of power from solar panels is stop or not sufficient to cover the consumption. When a satellite passes through an eclipse and no light available for solar cells to produce power, that time batteries take charge of power supply. If the battery fails to provide power to satellite, it leads to interruption of the mission or loss of the satellite. Hence battery is very crucial component in satellites for smooth functioning. Therefore, by considering the need of battery system in space mission, present review paper reports some noteworthy contribution in this field. In this review, some recent advances in the graphene-containing materials used in lithium-ion batteries are summarized and future prospects are highlighted.

Key words: *Space Qualified, Rechargeable Battery, Non-Rechargeable Battery*

Introduction

Graphene is single layered atomic sheet of carbon atoms, which has outstanding mechanical, electrical and optical properties [1]. A continuous and conductive composites formed by graphene can effectively improve the electron and ion transportation of the electrode materials. Therefore, the use of graphene can greatly boost Li-ion battery's properties with considerable chemical stability, higher electrical conductivity and higher capacity [2]. Figure 1 shows the single sheet graphene.

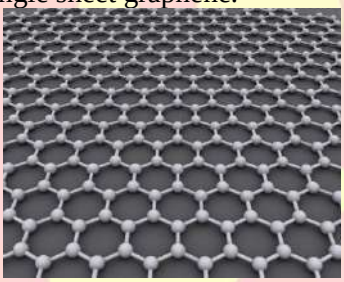

Figure 1. Single sheet of graphene.

CubeSats and small satellite are very useful solutions for space missions they enable a fast, cheap, and agile. To make them powered, crucial component of satellite system is the energy storage device, which is practically equal to a battery. In power system of space vehicle, group of several batteries used as secondary power source for a space mission.

The desired characteristics from Space Batteries are,

- Reliability and robustness
- Light weight and compact for reducing the launch costs
- Capability to perform under extreme temperatures
- Long calendar life
- Tolerance to high intensity radiations.

The small satellites have mainly two benefits, first is they are cost effective due to their size and shape. Second, their compactness fit to the structure and combability [3].

In light of above discussion, this brief review is planned to reports some recent developments in space qualified rechargeable and non-rechargeable battery materials. In subsequent section, some noteworthy reports in this field are discussed. Figure 2 depicts the batteries which are used in space missions.

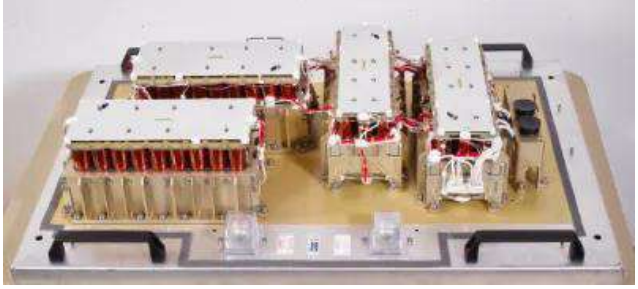

Figure 2. Batteries used in outer space.

Literature survey

In order to meet all above listed qualities, graphene-based materials are the key option. Due to two-dimensional structure of graphene, it has many outstanding characteristics such as high conductivity, mechanical strength, high charge carrier mobility and high surface area which make graphene a suitable electrode material for Li-ion battery.

However, graphene-based composites face many problems like low tap density, volumetric energy density and more capacitor-like behavior. But all these issues which are associated with graphene can resolve by incorporating proper metal oxide on graphene surface, which results in improving the electrochemical properties.

During literature survey, we came across with two significant contributions. First is reported by Mussa et al, which reports a microwave irradiation method for the preparation of reduced graphene oxide (RGO) based Co_3O_4 nanocomposites as anodes for lithium-ion (li-ion) batteries. The Co_3O_4/RGO nanocomposites displayed good electrochemical behavior as anodic materials for li-ion batteries when compared to pure Co_3O_4. The Co_3O_4/RGO nanocomposites with low RGO content resulted in stable electrochemical performance with 100% coulombic efficiency at a high current density of 500 mA/g for 50 cycles. The enhanced capacity of the Co_3O_4/RGO nanocomposites is due to the incorporation of RGO, which resulted in a four times larger surface area than that of Co_3O_4. This increased surface area could facilitate the absorption of more lithium ions, resulting in excellent electrochemical performance. Interestingly, the novelty of this work is that the designed li-ion batteries showed stable electrochemical performance even at a high temperature of 100 °C, which might be useful for rechargeable battery applications in a wide temperature range [4].

And second report made by Cheng et al, which reports carbon material called graphene-like-graphite (GLG) as anode material of lithium-ion batteries that delivers a high capacity of 608 mAh/g and provides superior rate capability. The morphology and crystal structure of GLG are quite similar to those of graphite, which is currently used as the anode material of lithium-ion batteries. Therefore, it is expected to be used in the same manner of conventional graphite materials to fabricate the cells. Based on the data obtained from various spectroscopic techniques, this work propose a structural GLG model in which nanopores and pairs of C-O-C units are introduced within the carbon layers stacked with three-dimensional regularity. Three types of highly ionic lithium ions are found in fully charged GLG and stored between its layers. The oxygen atoms introduced within the carbon layers seem to play an important role in accommodating a large amount of lithium ions in GLG. Moreover, the large increase in the interlayer spacing observed for fully charged GLG is ascribed to the migration of oxygen atoms within the carbon layer introduced in the state of C-O-C to the interlayer space maintaining one of the C-O bonds [5].

Due to cost effectiveness, easy availability and environmental friendliness, $LiMn_2O_4$ is used as cathode material since 1990s. But the disadvantages like its low electrical conductivity and low-rate capacitance make it less commercial for use in battery. Bak et al experimentally shows that graphene sheets are very efficient in improving the electrical conductivity and rate capacity. This study prepares the $LiMn_2O_4$-graphene composites using microwave assisted hydrothermal method which showed the reversible capacities of 117 mAh/g and 101 mAh/g at 50 C and 100 C [6]. Figure 3 shows the TEM image and Specific Capacitance response of $LiMn_2O_4$-graphene composites.

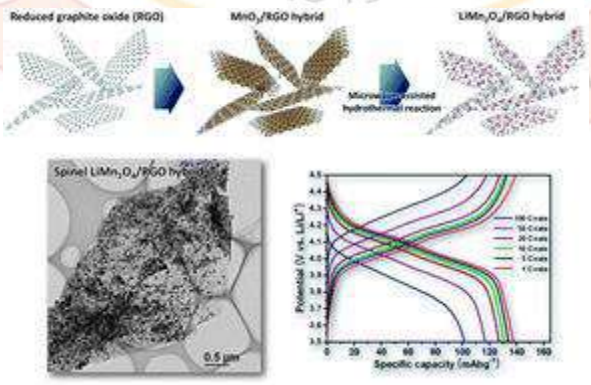

Figure 3. TEM image and Specific Capacitance response of $LiMn_2O_4$-graphene composites.

$LiNi_{1/3}Mn_{1/3}Co_{1/3}O_2$ is another potential cathode material for battery application due to its outstanding properties such as high energy density, good stability, enhanced safety and low cost. Jiang et al demonstrated that

$LiNi_{1/3}Mn_{1/3}Co_{1/3}O_2$-graphene composites are prepared as cathode materials for battery application which deliver a capacity of 115 mAh/g at 6C [7].

Relevance with ISRO's Activities

Presently, ISRO pressing on exploration and envisions to send humans/space craft to Mars, spacecraft into the atmosphere of Venus, onto the surface of outer planetary icy moons, and even boring through the ice covering liquid oceans on these moons. To complete these challenging missions, presently available space-rated Li-ion batteries are not satisfactory. Therefore, it is extremely necessary to extend the operational temperature range, increase the specific energy of the electrodes, to improve the radiation tolerance of Li-ion batteries.

In 2018, ISRO offers Technology Transfer of Lithium-ion cells intends to qualify and shortlist suitable industries in India/Start-ups based on eligibility criteria through an open evaluation process.

Conclusions

Current studies demonstrated that pristine graphene can't become straight substitute for current carbon-based commercial electrode materials in lithium-ion batteries. As it has low coulombic efficiency, high charge–discharge platform and poor cycle stability. However, when used as a matrix or in synergetic form in the composite electrode materials, graphene can play a very important role.

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Study of Infrared spectra of PVC –PS Polymer blend and Polyaniline doped polymer Blend

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Abstract :

InfraRed Spectra of PVC –PS Polymer blend and Polyaniline doped polymer Blend has been measured in the region 4000 to 650 cm^{-1} on spectrophotometer.The infrared absorption band frequencies , their intensities and tentative vibrational assignments are discussed.

Keywords *: PVC – PS Blend , InfraRed Spectra*

Introduction

Polymers having different properties and chemical structures are usually mixed togrther to obtain polymer blendswhich may acquire a set of valuable properties. A lot of attention has been devoted in recent years to the characterization of polymer blends as was studied by Ahn et al [1]and Straka et al [2] FTIR spectrum of 2-chloro-6-methyl benzonitrile in the region 2-4000 cm has been recorded in KBr pellet technique with a Braver IFS - Fourier transform spectrometer. FT-Raman spectrum in powder form has been recorded in the region 50-4000cm on a Bruker IFS 66 optical each with an FRA 106 Raman module attachment interfaced to a microcomputer. Geometry and vibrational wavenumbers were calculated using ab-initio calculations with HF method by Virendra Kumar et al [3].Sharma et al [4] characterised the super ionic AgI-$Ag_2O.V_2O_5$-TeO_2 glasses by X-ray FTIR and DSC studies. The FTIR spectra reveal that the network structure remains essentially the same with AgI concentrations.Pradeep kumar et al [5] measured near nomal incidence for infrared (FIR) reflectivity spectra of a single crystal of $TbMnO_3$ from 10K to 300 K in the spectral range of 50 cm^{-1} - 700 cm^{-1} Indulal and Raveendran [6] used The FTIR for study of the stretching and bending frequencies of molecular groups in the sample.The pressure of of naphthalene in PS thin film was confirmed by IR spectra of the sample taken on FTIR - 8400 spectrophotometer by Sangawar et al [7] IR spectra of undoped polyblend and 30% napthalene doped polyblend was studied by Dhokne et al The infrared spectra of undoped and naphthalene doped polyblend are observed in the range of 500 cm^{-1} to 4000 cm^{-1} FTIR spectra for gamma doses of 0, 10, 35 and 50 KGY was student by Tarafdar et al [8]. They showed the results of infrared absorption frequencies for doses 0, 10, 35 and 50 kGy. Thicknesses are nearly equal and salt concentration is 18% for all samples studied and so intensities of the peaks in the graphs can be directly compared. There are evident changes with gamma irradiation. The most prominent change is in the peak at 1150 cm^{-1} which has been attributed to C-C bond stretching and C-0-C asymmetric stretching The morphology of PVF_2, films grown from the selection has been studied by Mehendra and Chand [9]. The IR spectra in the frequency range $90-480 cm^{-1} were recorded at room temperature and compared with Murayama's spectra. Venkata Chalapathy et al [10] carried out the FTIR analysis of Neyvelilignite and fly ash samples. The extinction coefficient (K) values calculated for the bands at 3450, 2900, 2835, 1695, 1600 cm^{-1} etc. Saikia et al[11] have carried out FTIR and impedance spectroscopy studies of PVC-PMMA-NH_4 SCN-DBP based polymer blend electrolyte to see the formation of polymer-salt complex and to measure the bervity respectively. Deshpande and Tyagarajan [12] have recorded the polarised IR polyvinyl alcohol (PVA) film. Ishra [13] studied the IR spectra of pure and 1.0 wt% I_2 doped PVC/NBR blend. The results obtained by him showed that a new band of weak intensity appeared at 1670 cm^{-1} and the intensity of bands at 3510 cm^{-1} and 555 cm^{-1} decreased on doping with iodine. Agari et al [14] prepared 200 µm films of PVC/ PMMA gradient polymer blends containing a wide compositional gradient phase. They characterized the films with FTIR technique. The ideal blend was found to have significantly new or improved properties (eg a large half width of temperature of dissipation factor) which cannot be observed in any PVC,PMMA homogeneously (that is ordinarily) miscible blend or laminate system.

Experimental details

The polyvinyl chloride (PVO) and polysterene (PS) of standard grade product supplied by Polychem Industries, Mumbai were used for the study The conducting polymer (polyaniline)was prepared by chemical oxidation using ferric chloride by conventional procedure. Polyaniline was used as a dopant Sample Preparation For the preparation of PVC-PS polyblend, the two polymers PVC (1.25g) and PS (0.25g) were taken in the ratio 5:1 by weight. 1.25 g of PVC in 15 ml tetrahydrofuran (THF) and 0.5g of PS in 10 ml of THF dissolved seperately and subsequently mixed together. For the preparation of Polyaniline doped thin films the two polymers PVC (1.25g) and PS (0.25g) were taken in the ratio 5:1 by weight. 1.25 g of PVC in 15 ml tetrahydrofuran (THF) and 0.5g of PS in 10 ml of THF dissolved seperately and subsequently mixed together.

Polyaniline was taken in 25 wt % and was dissolved in 5 ml of THE to produce Polyaniline solution . After allowing them to dissolve completely. the three solutions were mixed together The solution was heated at 60° c for two hours to allow polymers to dissolve completely to yield a clear solution . A glass plate thoroughly cleaned with hot water and then with acetone was used as a substrate, To achieve perfect levelling and uniformity in the thickness of the film, a pool of mercury was used in a plastic tray in which the glass plate was freely suspended .The solution was poured on the glass plate and allowed to spread uniformly in all directions on the substrate. The whole assembly was placed in a dust free chamber maintained at a constant temperature (40°C). In this way, the film was prepared by isothermal evaporation technique [15.16]. The film was subjected to 12 hours heating at constant temperature of 50°C and for another 12 hours at room temperature to remove traces of solvent .Finally, the film was removed from the glass plate, it was cut into small pieces of suitable size which were washed with ethyl alcohol to remove the surface impurities Thickness measurement For measuring the thickness, micrometer screw guage [16] with least count 0.001cm (10 μ m) was used. But for greater accuracy and resolution, a compound microscope in conjunction with an acculometer which gives least count 1.3 μ m and 3.3 μ m, at the magnification of 1:10 and 1 100 respectively was used. A small section of the sample was taken mounted vertically to get a clear section of view of the thickness. The film used for the present study was of the thickness 70 μ m Electrode coating The electrode coating on the film of measured thickness was done by quick drying and highly conducting silver paste [16] supplied by Eltecks Corporation, Bangalore. A mask of a circular aperture of 25 cm diameter was used while coating to ensure uniformity in size of coated silver electrode

Study of Infrared Spectra

The infrared spectra of all the samples of series I and II are studied in the region 4000 to 650 cm^{1} on Perkin Elmer (Japan) spectrophotometer. The KBr technique was used. All the spectra were taken at the department of metallurgical and materials Engineering, Visvesvaraya National Institute of Technology, Nagpur - 440011 (India). Typical IR spectra of series I . (samples are J1, J2, J3, J4 and J5) and series II (samples are JPI, JP2. JP3, JP4 and JP5)are shown in fig 3.3.1 and 3.3.2 respectively

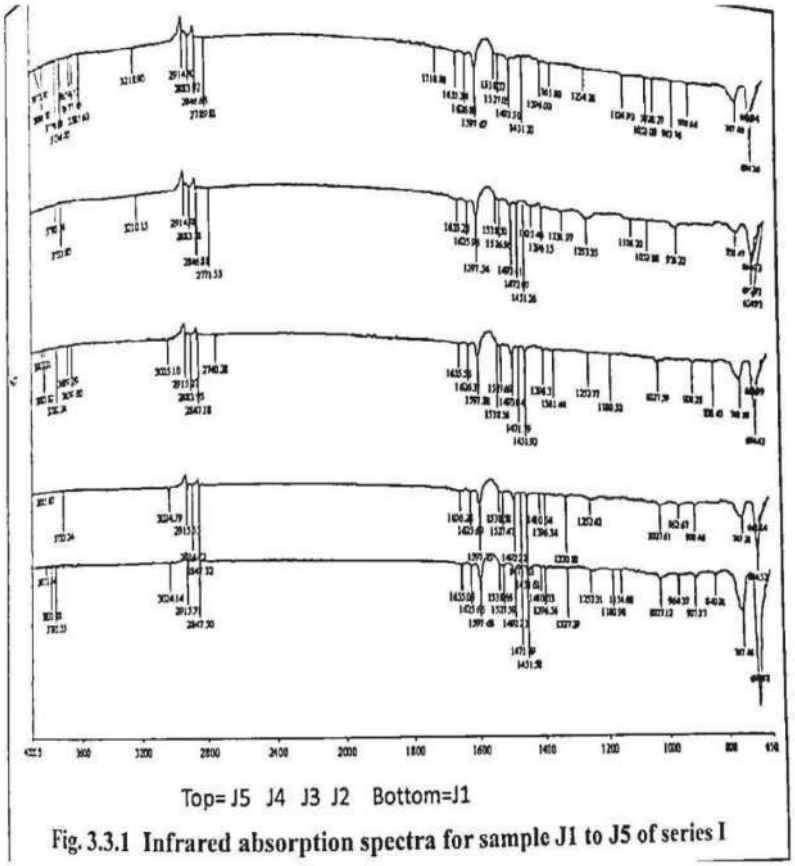

Fig. 3.3.1 Infrared absorption spectra for sample J1 to J5 of series I

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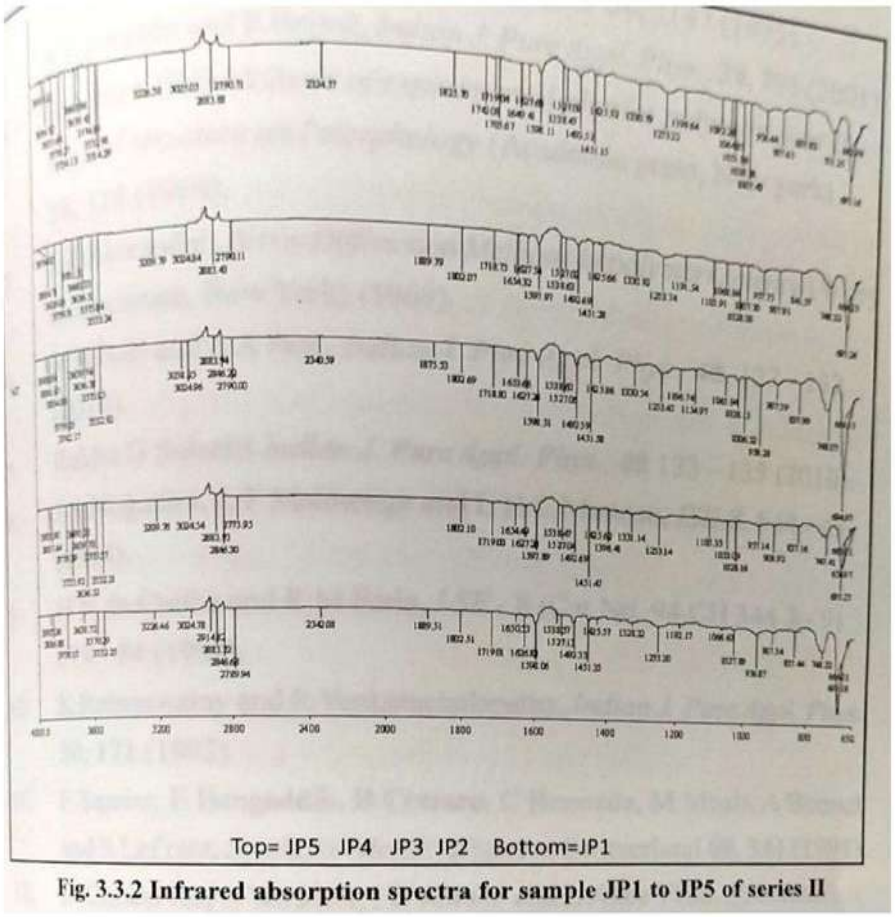

Fig. 3.3.2 **Infrared absorption spectra for sample JP1 to JP5 of series II**

Result and Discussion

A weak absorption band appeared for all the samples in the frequency 3024. 14 to 3025.13 cm^{-1} and attributed to C-H stretching due to aromatic ring (benzene ring) A strong absorption band appeared in all the samples range except JS (medium absorption band) in the frequency range 2914.76 to 2915.70 cm^{-1} which indicates the presence of C-H stretching of monosubstituted alkane. The medium absorption band appeared for all the samples in the frequency range 1625.57 to 1626.29 cm^{-1} which can be attributed to C-C stretching alkene nonconjugated.The strong absorption band appeared in all the samples in the frequency range 1597.57 to 1597.83 cm^{-1} which indicates the presence of C=C in aromatic (benzene ring).The strong absorption band appeared for all the samples in the frequency range 1492.22 to 1493.20 cm^{-1} which attributed to C-H bonding in methylene group.A medium absorption band appeared for all the samples except J5 (Weak absorption band) in the frequency range 907.29 to 908.81 which attributed to Ar - H bending.These strong absorption band observed at 747.23 to 750.42 cm^{-1} and 93.80 to 695.97 cm^{-1} in all the samples which is attributed to C-H out c ane bending and C-Cl stretching.

Similarly in the IR spectrum of PVC+PS +PANI (Samples JP1,JP2,JP3,JP4 and JP5), All the samples show a weak absorption band in the frequency range 3514.29 to 3533.24 cm^{-1} which indicates the presence of N-H amines.A weak absorption band for all samples in the frequency range 3024.79 to 3025.07 cm^{-1} which is attributed to C-H stretching due to aromatic ring.

There is medium absorption band for all samples in the frequency range 2883.32 to 2884.04 cm^{-1} and 1626.78 to 1627.52 cm^{-1} which is attributed to C-H stretching of monosubstituted alkane and C- C stretching alkene nonconjugated.The strong absorption band in the region 1597.93 to 1598.15 and 1492.31 to 1492.68 cm^{-1} for all samples are assigned as = C aromatic stretching and C-H bonding in methylene group. The presence of weak absorption band at around 1053.09 to 1068.86 cm^{-1} show the presence of C-N vibrations.There is medium absorption band for all samples in the frequency range 907.63 to 909.01 cm^{-1} which is due to Ar-H bending.The strong absorption band for all samples in the frequency 751-26 and 694.96 to 695.26 cm^{-1} which is due to C-H out of plane bending and C-Cl stretching.

Conclusions

The values of frequencies observed in the IR spectrum agree well standard IR spectrum frequencies. The orientation of NH, group in aniline makes ortho and para positions more susceptible towards electrophilic attack and as a result of this polymerization of aniline monomers into polyaniline molecule is occuring at these (ortho and para) positions. The polymer thus obtained still has possibility to expose its reactive sites towards suitable reactants under the influence of -NH-/- NH = groups . It was therefore thought that it is interesting to use polyaniline as PVC-PS blend to study the conductivity of the mixture (blend) The electron rich ortho and para positions of polyaniline aromatic nucleus also shows susceptibility towards the attack of electropositive sites of PVC-PS blend. The overall influence of -NH-/- NH= group on geometry of PVC-PS blend and the interaction of positive centres with ortho and para positions of aromatic nucleus enchances the conductive property to considerable extent, so also a protonic exchange between –NH-/-NH= groups of polyaniline helps to increase the conductance in PVC –PS blend

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Comparative Study of Blood Glucose Measurement Using Non- Invasive Method

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Abstract –

The past three decades has attracted tremendous attention in the diagnosis and monitoring of diabetes by non-invasive methods. The main objective of this paper is to compare measurement of blood glucose concentration using invasive and non-invasive method. Measurement of blood glucose levels was done using an existing invasive in the pathology laboratory and non-invasive tool that have been develop in this research. Non-invasive method based on NIR spectroscopy is used as it can be easy and safe to measure blood glucose concentration. In this study 50 patients glucose measurement test readings are recorded using both methods and has been compared. The result found is in the standard range.

Keywords: Diabetes mellitus, Invasive, Non-invasive, Optical Spectroscopy.

1. Introduction

In the 21st century diabetes is one of the fastest growing global health emergencies. It is estimated that 537 million people have diabetes in 2021[1]. Diabetes Mellitus is a condition in the human body wherein body does not produce enough insulin required to maintain normal circulating blood glucose. Insulin is a hormone that enables glucose to enter the body's cells to be used for energy [2]. Regular monitoring of blood glucose is very important as diabetes can lead to very serious and severe complications including heart failure, blindness, gangrene and amputation. Blood glucose measuring in day to day life is becoming a need of society. Regular monitoring of blood glucose is important to avoid complications of diabetes. In recent medical practice, glucose in blood is measured using an invasive technique which involves pricking of finger for blood sample. Non-invasive method is a pain free technology which helps patient's regular blood glucose monitoring [3,4,5].

There are two main types of diabetes, type 1 and type 2. The implications of your blood glucose results will depend on the type of blood glucose test used. For a fasting blood glucose test, a normal blood glucose level is between 70 and 100 mg/dL. For a random blood glucose test, a normal level is usually around or below 125 mg/dL. Mostly the exact level will depend on when you last ate [6].

II. Methods for glucose measurement

1) Invasive Method

Invasive method is used in recent medical practice to measure the concentration of glucose in blood. Invasive technique involves finger puncturing for the blood sample. This simple test involves giving a small sample of blood. In pathology laboratories, before drawing blood the healthcare provider cleans the area with an antiseptic to kill any germs and tie an elastic band around upper arm of patient, causing veins to swell with blood. Once a vein is found, they insert a sterile needle into it and then blood drawn into a tube attached to the needle. When drawing blood have been finished, the healthcare provider removes the needle and places a bandage over the puncture site and pressure will be applied to the puncture site for a few minutes to prevent bruising. The sample of blood is then passed through the standard chemical tests to measure glucose concentration.

In generic few ml of blood required where as recently patient can measure blood glucose at home using invasive glucometer, less than a drop of blood is taken out. The sample of blood will be placed on the strip and is inserted into the blood glucose meter. Inside a glucometer, a series of chemical reactions will take place and result is display on the screen.

Being a diabetic, it is necessary to check your blood glucose level regularly but regular use of an invasive method has many drawbacks such as,

1) For diabetics, measuring blood glucose level is an everyday thing so it is very difficult to incorporate pain into routine.
2) Both Laboratory and glucometer tests are costly. While using glucometer, one strip is used at a time and need to be replaced once finished.
3) Due to low immunity, diabetic people are more prone to infection. Invasive method has more risk of infection.
4) Non-compliance can be dangerous as it can increase the complications of diabetes. [7,8]

2) Non-Invasive Method

The advent of a pain free non-invasive technology would improve the patient's compliance for regular blood glucose monitoring. Subsequently the diabetic patient's life will improve considerably [9]. It prevents both chronic and acute complications, as this blood glucose measurement method is without drawing blood, puncturing the skin, causing pain or trauma. This technique is applied to overcome the pain, scare procedure, infections.

In non-invasive blood glucose monitoring the most commonly approaches are by using optical detection or optical scanning methods. i.e., Polarimetry, Raman Spectroscopy, Photo Acoustic Spectroscopy, Mid-Infrared (MIR), Spectroscopy using an Attenuated Total Reflection (ATR) Prism, and Near- Infrared (NIR) spectroscopy. The NIR spectroscopy is one of the most promising optical methods. NIR spectroscopy is very useful in Non- Invasive blood glucose monitoring [10].

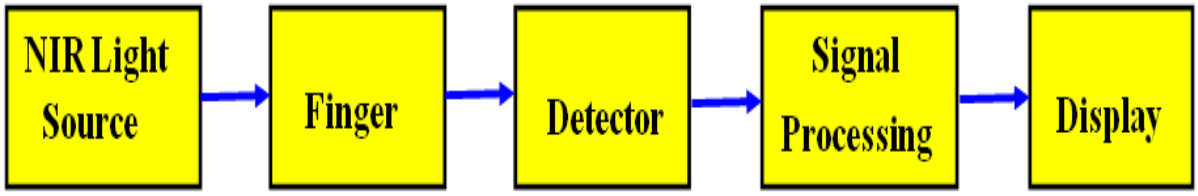

Figure-1

III. Comparative blood glucose measurement

Glucose concentration is measured non-invasively with the help of developed system and invasively with the help of pathology laboratories. Following figures are the result mapping chart of different age group, which shows the glucose concentration measured by the designed system and at the same time, for the same person glucose concentration measured in pathology laboratories. Good correlation is found between the blood glucose concentration value measured by the both methods.

To calculate error in measurement of invasive and non-invasive method the formula used is,

$$\% \text{ Error} = \frac{IV - NIV}{IV} \times 100$$

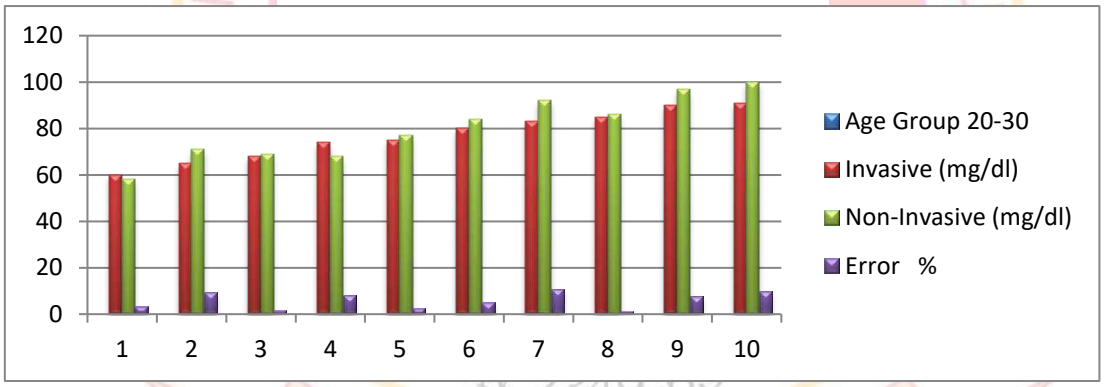

Figure-2: Blood glucose measurement of ten persons of age group 20-30

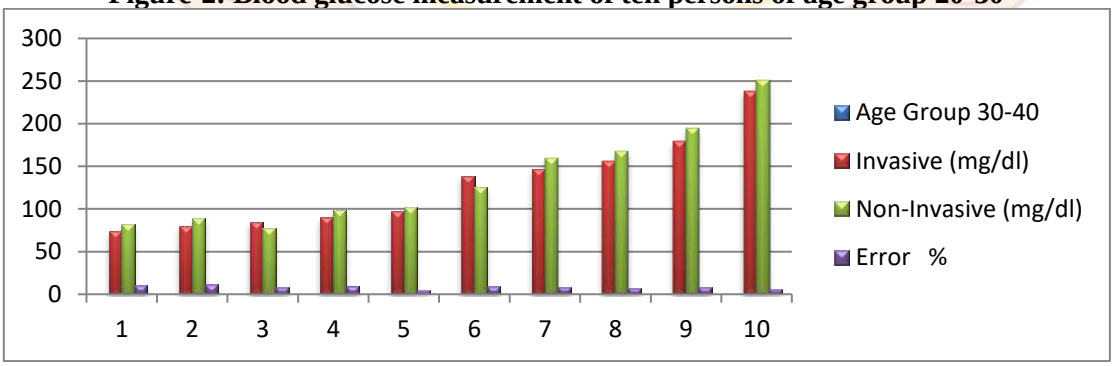

Figure-3: Blood glucose measurement of ten persons of age group 30-40

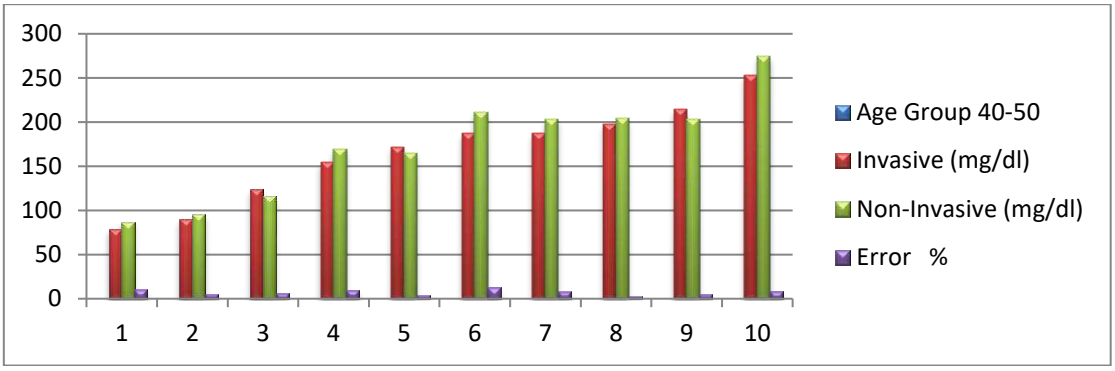

Figure-4: Blood glucose measurement of ten persons of age group 40-50

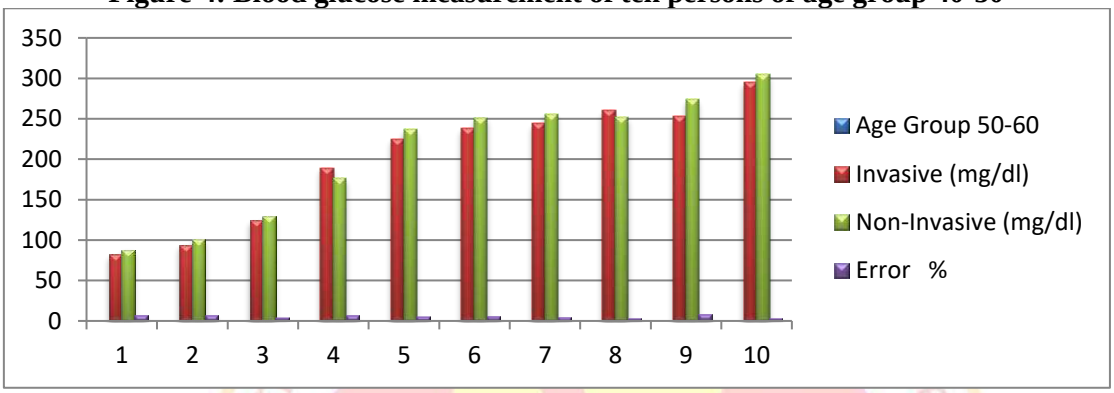

Figure-5: Blood glucose measurement of ten persons of age group 50-60

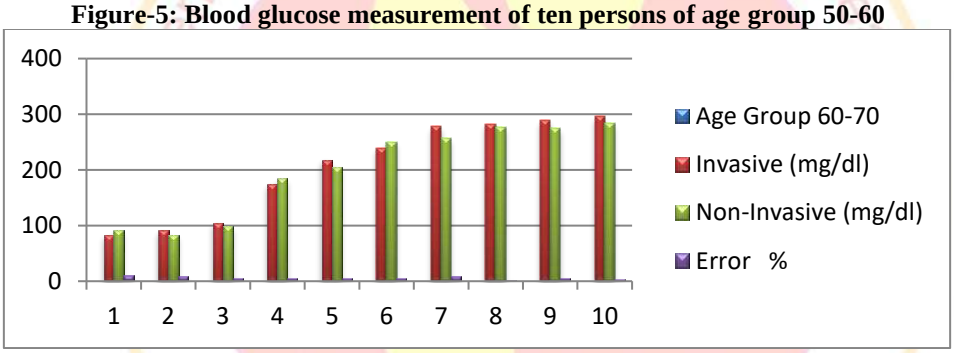

Figure-6: Blood glucose measurement of ten persons of age group 60-70

III. Result and Discussion

Regular monitoring of blood glucose level is important to avoid the long-term and short-term effects of diabetes. Data analysis was done by measuring the percentage error of invasive and non-invasive blood glucose measurement results. The result shows that the lowest percentage error measurement is 1.17% and the highest is 12.83%. In this research, lowest error was obtained in blood glucose measurement of 8th person from the age group of 20-30 and highest error was obtained in blood glucose measurement of 6th person from the age group of 40-50. The result obtained shows the feasibility of using NIR based non-invasive blood glucose measurement technique.

IV. Conclusion

Non-Invasive blood glucose monitoring system needs to improve for continuous monitoring in healthcare centres and homes hence, diabetic patient will monitor their blood glucose regularly. The performance of the system can be increased by developing suitable signal conditioning circuit to minimize error.

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Study Sem and Ftir Analysis of PEO: PVP: Naclbased Polymer Electrolyte

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Abstract

The sodium ion conducting polymer electrolyte complexes with PEO and PVP were prepared by solution caste technique with different compositions of PEO, PVP with NaClrespectively. Theoretical aspects of characterization technique such as Scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR) analysis were used to characterize these electrolyte.

SEM result shows the crystalline behavior of the polymer electrolyte. In FTIR spectra it is observed that, the intensity of the aliphatic C-H stretching vibrational band observed around 2900 cm^{-1} in pure PEO, PVP which is found to be decreased with increased in concentration of salt in the polymer. The width of the C-O stretching band observed around 1100 cm^{-1}in pure PEO,PVP which is also found to be decreased with increased in concentration of salt.

Keywords: Polymer electrolyte, PEO, PVP, NaCl.

Introduction

The polymer electrolyte (Solutions) serve as electronic insulators between the anode and cathode but it must be a good ionic conductor. Polyethylene oxide (PEO) is used as the polymer matrix because it is chemically inert, able to dissolve in number of inorganic salts and it provides moderate ionic conductivity. Polymer electrolytes based on PEO complexed with $NaClO_3$, $AgNO_3$ and $NaYF_4$ etc. have been reported [1]-[6]. Also the polymer electrolytes based on PVP complexed with $NaClO_3$ have been prepared [7]-[8]. The polymer electrolyte based on PEO, PVP complexed with $NaClO_3$ were prepared [9].Keeping this view in mind, authors prepared polymer electrolyte based on PEO, PVP complexed with NaCland study their SEM and FTIR analysis.

Preparation of polymer electrolyte

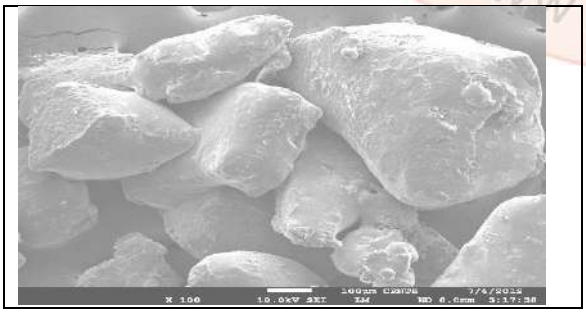
The polymers PEO and PVP were taken separately at different ratio with NaClwt% as (40:50:10) (35:50:15), (30:50:20), (25:50:25), (20:50:30) and (15:50:35). Each mixture dissolved in methanol for making polymer-salt mixture into solution. To obtain the perfect solution of this mixture, the solution was stirred well for 24 hours and powered into a polypropylene dishes. The solution was slowly evaporated at room temperature. Thus, thin film of polymer electrolyte was prepared by solution cast technique. Further these films were crushed into powder form. This powder is used for SEM and FTIR analysis.

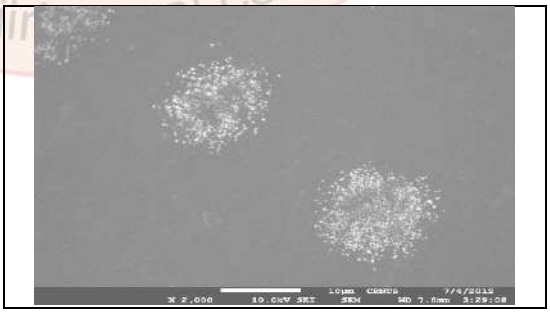
Result and discussion

4.1 Scanning electron microscopy (SEM)

The surface morphology of the composite films of 25wt% of NaCl was analyzed by SEM and the pictures are shown in Fig.1.The SEM pictures show crystalline behavior. The distorted crystals of NaCl are seen. Because of random size of crystals voids are created.

Energy dispersive X-ray analysis was performed for different wt% of NaCland pictures are shown in Fig.2 Energy dispersive spectroscopy (EDS) allows to identify particular elements and their relative proportions. From EDAX measurements the characteristics peaks corresponding to NaCl , PEO and PVP are identified which shows the existence of these in composite films.





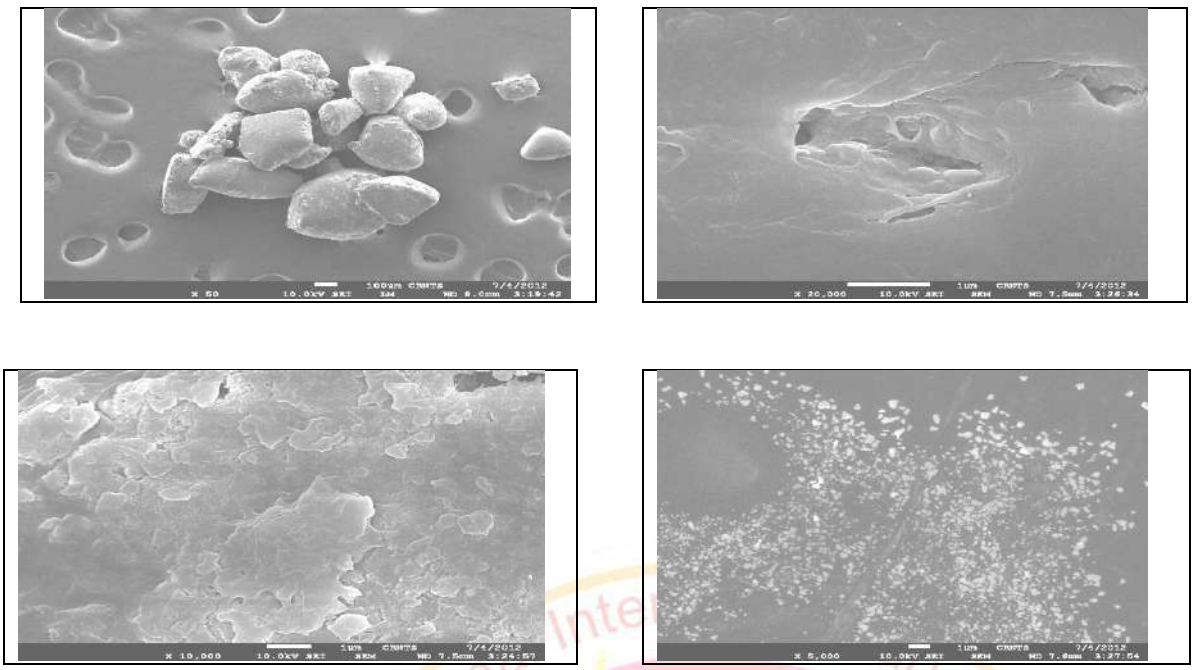


Fig.1 : SEM pictures of 25 wt% of NaCl at different magnification

Element	Weight%	Atomic%
C K	61.09	67.91
N K	9.48	9.03
O K	25.30	21.11
Na K	1.76	1.02
Si K	0.33	0.16
Cl K	2.05	0.77

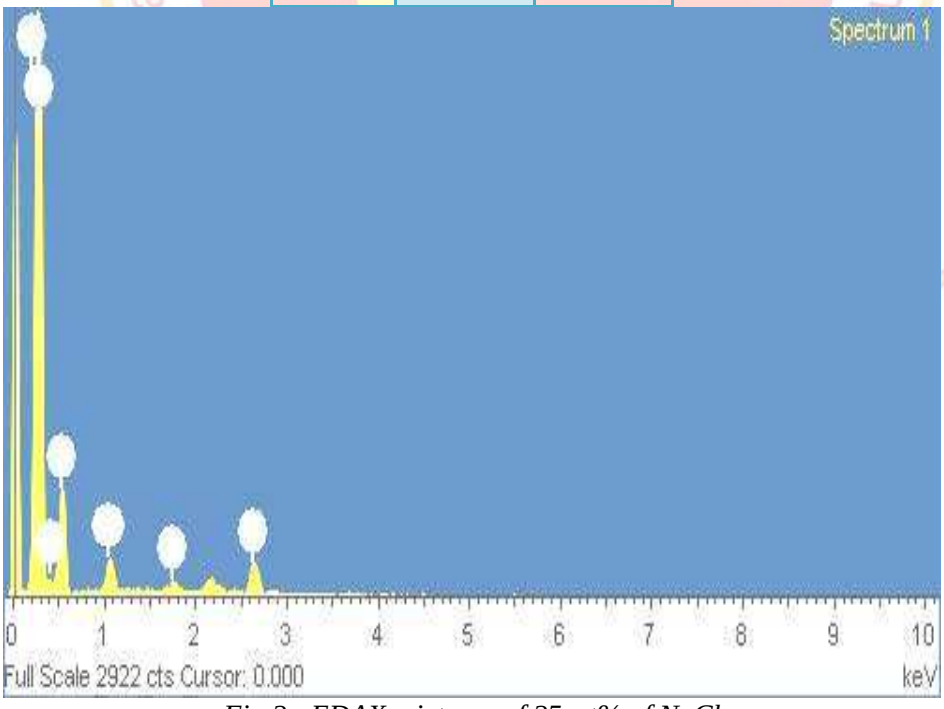


Fig.2 : EDAX pictures of 25 wt% of NaCl

4.3 Fourier transform infrared spectroscopy (FTIR) analysis

Sr. No	Composition Wt % NaCl	Peak Position cm^{-1}									
1	20	680	840	1100	1310	1500	1700	1880	2400	2900	3900
2	25	680	840	1100	1310	1500	1700	1880	2400	2900	3900
3	30	680	840	1100	1310	1500	1700	1880	2400	2900	3900

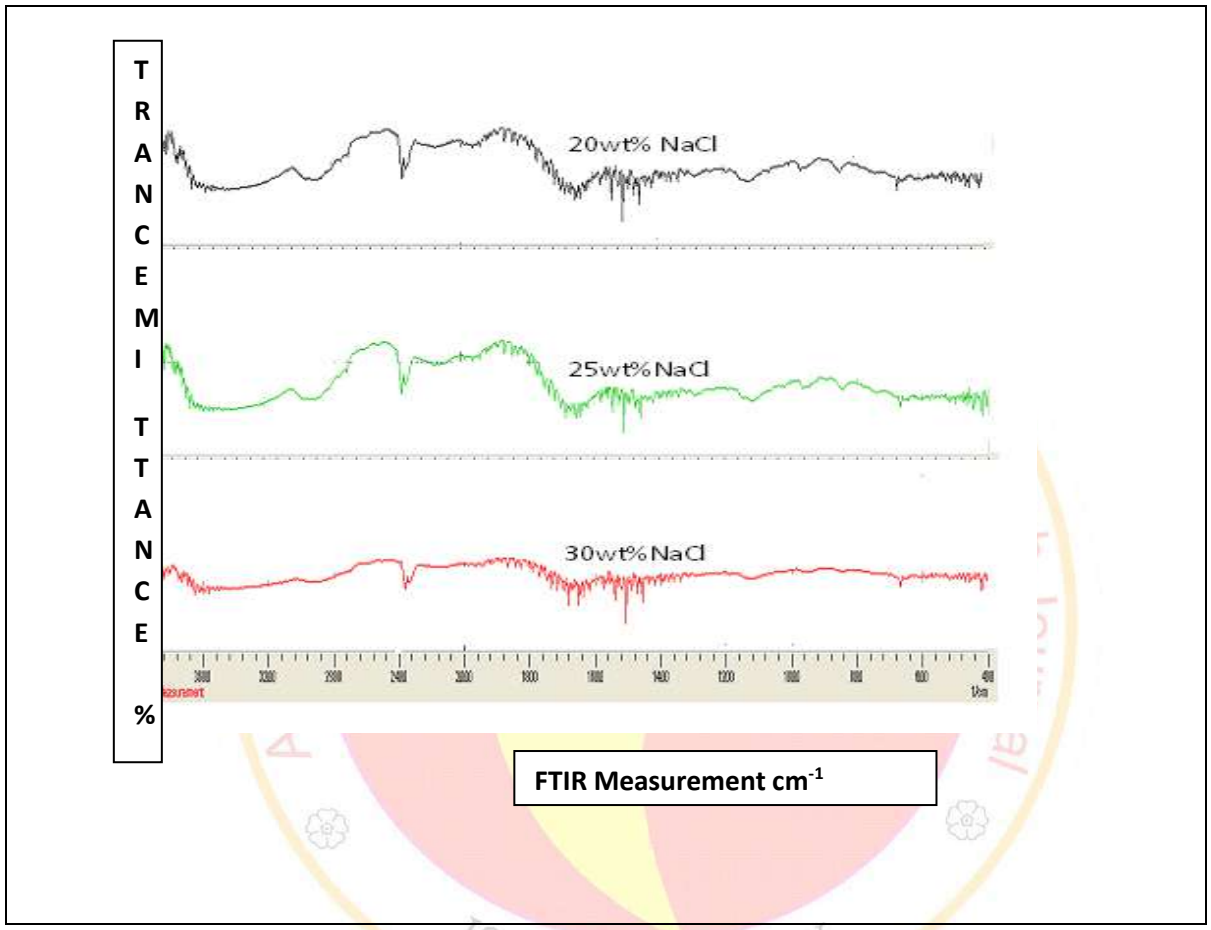


Fig.3 FTIR spectra of 20,25 and 30 wt% NaCl

The FTIR spectra of 20,25 and 30 wt% NaCl were recorded in the range 4000- 400 cm^{-1} and are shown in fig.3.

In the IR spectra of pure PEO and PVP strong broad absorption band is observed around 2900 cm^{-1} corresponds to the symmetric and asymmetric C-H stretching mode of CH_2 group. The width of the band decreased with increased in concentration of NaCl salt in the polymer. Also the band is observed around1100 cm^{-1}in IR spectra of pure PEO and PVP corresponds to the C-O stretching . The width of this band is decreased with increased in concentration of NaClsalt[10,11].Several new peaks are around 3900,2400,1880,1700,1500,1310,840 and 680 cm^{-1} have been observed in PEO:PVP complexed with NaClsalt. The appearance of the new peaks along with the changes in existing peaks (and/or their disappearance) in the IR spectra directly indicate thecomplexation of NaClsalt with PEO:PVP.

Conclusion

A sodium ion conducting polymer electrolyte based on PEO with PVP was prepared by solution cast technique. Polymers PEO and PVP were taken separately at three different ratios with NaClsalt. Each component was dissolved in methanol for making polymer salt mixture into solution. This solution was stirred well for 24 hrs. so that homogeneous solution was obtained and then polymer electrolyte was made.

PEO:PVP:NaCl polymer electrolyte was studied via structural , thermal characterization. Following conclusions were drawn.

In NaCl series distorted crystals of NaCl are seen. So, SEM result shows the crystalline behavior of the polymer electrolyte.

From FTIR spectra it is observed that, the intensity of the aliphatic C-H stretching vibrational band observed around 2900 cm^{-1} in pure PEO, PVP which is found to be decreased with increased in concentration of salt in the polymer. The width of the C-O stretching band observed around 1100 cm^{-1}inpure PEO,PVP which is also found to be decreased with increased in concentration of salt. The appearance of the new peaks along with the changes in existing peaks (and/or their disappearance) in the IR spectra directly indicate the complexation of salt with PEO:PVP.

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Development of Polyaniline -Metal oxide Nanocomposite: Brief Review

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Abstract:

Nanostructures and Nano composites of conducting polymers have developed as a new field dedicated to the manufacture of smart materials for use in forthcoming technologies. Preparation of Blends of inorganic nanoparticles in intrinsically conducting polymer matrix is believed to be an easy method to prepare and design Nano composites where delocalized -electrons can interact with inorganic nanoparticles, which have a unique combination of mechanical properties, the processability of conventional polymers and the electrical property of conducting polymers. The current review paper will emphasize PANI composites with thermosetting polymer matrices Many studies special attention is given on synthesis of Polyaniline Nano composite have been reported in the quest to develop new advanced materials with improved mechanical, electrical, optical and catalytic properties or to improve conduction mechanism in electronic devices. These materials have found their use in many electronic and nanoelctronic devices.

Keyword: (PANI)- Polyaniline Nano composites

Introduction:

In recent years, developments of inorganic–organic hybrid materials on nanometer scale have been receiving significant attention due to a wide range of potential applications and high absorption in the visible part of the spectrum and high mobility of the charge carriers. Polyaniline is the most attractive conductive polymer because of the presence of the reactive – NH– groups in polymer chain [1-2], and used in broad applications such as batteries, sensors , electronic devices , super capacitors and corrosion protection in organic coatings due to its physical and chemical properties, good electrical conductivity (p-type), high environmental stability, low cost, light weight, flexibility, facile fabrication and possibility of both chemical and electrochemical syntheses . Electrical conductivity of polyaniline is a very important parameter and it could be modified by the addition of inorganic fillers . Additionally, electrical conductivity of polyaniline depends on dopant ions . Metals and semiconducting nanostructure materials are used as stabilizers or capping agents of these conducting polymers. In recent decades, several reports have been published on the synthesis of the PANI nanocomposites with the inorganic nano-scale such as TiO2, CdS, Silica , Ag, CeO2 , Fe3O4 , Zn and MnO2 [3-5].

Polyaniline (PANI) is a promising conducting polymer due to its easy synthesis, environmental stability and high electrical conductivity on doping with protonic acids [5-6]. The highly ordered structures such as crystalline or self-assembled structures of ideal conducting polymer with conjugated structure is expected to have Metal - like electrical conductivity .To induce an ordered structure, other materials acting as filler for the composite are required [7-12]. The preparation of PANI composites with various materials has received great attention because of their unique properties and applications in various electrical and electronic devices.

Literature Review:

Among the various conducting polymers, Polyaniline (PANI) has been investigated as a potential material for gas sensing applications, due to its controllable electrical conductivity, environmental stability and interesting redox properties associated with the chain nitrogen's. It is the unique type of conducting polymer in which the charge delocalization can, in principle, offer multiple active sites on its backbone for the adsorption and desorption of gas analyte [8]. However, PANI is not as sensitive as metal oxides towards gas species, and its poor solubility in organic solvents limits its applications, but it is suitable as a matrix for preparation of conducting polymer nanocomposites [9-10]. Therefore, there has been increasing interest of the researchers for the preparation of nanocomposites based on PANI for gas sensing applications. Hybridization of metal oxide and conducting polymer could improve the properties of pure metal oxides or conducting polymers based gas sensor and the new synthesized material shows the synergistic effect of these two materials

PANI-ZnO with different weight percentage of zinc oxide were successfully synthesized and tested for hydrogen gas sensing. It was concluded that PANI-ZnO showed the best response compared to other composition[12].

A Mehata et al [13] synthesized polyaniline/ZnO nanocomposites for ammonia gas sensing application. The lower intensity polaron absorption bands for polyaniline/ZnO nanocomposites in the UV-Vis spectra indicate that the conducting state of the polymer has been improved. Observed results clearly indicate that polyaniline/ZnO nanocomposite is a good candidate for ammonia sensing with better sensitivity.

M. Sawarkar et.al. [14] studied PANI, ZnO and CdO nanoparticles along with PANI/ZnO, PANI /CdO nanocomposites had been successfully synthesized by a simple, cost effective technique. ZnO and CdO nanoparticles were synthesised by sol gel method. XRD studies clearly showed the crystalline and hexagonal quartzite nature of the ZnO nanoparticles and PANI/ZnO nanocomposites of 32 nm and 48 nm, respectively. A change in the lattice parameters of ZnO in the PANI/ZnO nanocomposites was observed which also indicated the interaction between ZnO particles and PANI matrix. The SEM study of PANI/ZnO nanocomposites revealed uniform distribution of ZnO nanoparticles in PANI matrix. FTIR spectra revealed that the absorption peaks of PANI/ZnO nanocomposite were found to shift towards lower wave number as compared to those observed in pure PANI. The shifting of absorption bands were attributed to the interaction of ZnO nanoparticles with the PANI molecular chains.

Meng, F et. Al. [15] Polyaniline (PANI) and MnO2/PANI composites are simply fabricated by one-step interfacial polymerization. The morphologies and components of MnO2/PANI composites are modulated by changing the pH of the solution. Formation procedure and capacitive property of the products are investigated by XRD, FTIR, TEM, and electrochemical techniques. We demonstrate that MnO2 as an intermedia material plays a key role in the formation of sample structures. The MnO2/PANI composites exhibit good cycling stability as well as a high capacitance close to 207 F g−1. Samples fabricated with the facile one-step method are also expected to be adopted in other field such as catalysis, lithium ion battery, and biosensor.

Conclusion

The current review paper will emphasize PANI composites with thermosetting polymer matrices Many studies special attention is given on synthesis of Polyaniline Nano composite have been reported in the quest to develop new advanced materials with improved mechanical, electrical, optical and catalytic properties or to improve conduction mechanism in electronic devices. These materials have found their use in many electronic and nanoelctronic devices.

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DC Conductivity and Thermal Analysis of Polyaniline Cadmium Sulphide nanocomposite

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Introduction

In recent years, with the rapid development of nanotechnology and composite materials, polyanline (PANI) nanocomposites have attracted considerable interest. PANI is one of the most promising conducting polymers due to its high conductivity, easy preparation, good environmental stability and large variety of applications [1]. Unlike other conjugated polymers, PANI has a simple and reversible acid/ base doping/dedoping chemistry, enabling control over properties such as solubility, electrical conductivity and optical activity [2]. Polymer nanocomposites show quite different properties from the constituent materials due to interfacial interactions between nanostructured semiconductors and polymers.

CPs join the electronic and optical properties of semiconductors and metals with the alluring mechanical properties and handling preferences of polymers. CPs have numerous profitable properties in chemical, electrical, physical and optical angles, contrasted with ordinary polymers. These properties cover high conductance, iridescence, electrochromism and high thermal soundness. This has set off the improvement of novel CPs, for example, polyaniline (PANI), polypyrrole (PPY), polythiophene, polyphenylene, etc. [3-5] and their application in batteries [6-9].

Polyaniline (PANI) has gotten much consideration in view of its electronic, thermoelectric and optical properties and additionally its great ecological solidness and simplicity of synthesis. Polyaniline is likewise one of a kind among natural conducting polymers in that its electrical properties are controlled by the two its oxidation state and level of protonation. Thus, polyaniline is generally utilized for different applications, for example, battery-powered batteries [10,11], chemical transtiors , supercapicitors , electrochromic shows , actuators, sensors and hostile to corrision covering .

Among conducting polymers, polyaniline (PANI) is presumably the most generally examined because of its few interesting properties [12,13]. It simplicity of arrangement, light weight, ease, better electronic, optical properties, exceptionally stable in air and dissolvable in different solvents, and great processibility [14-16]. Then again it very well may be utilized in numerous applications, for example, electromagnetic obstruction (EMI) protecting, electro-impetuses, battery-powered battery, light-producing diodes (LEDs), solar cell, chemical sensor, biosensor, erosion gadgets and microwave ingestion [17,18].

Experimental

Materials

The Aniline monomer (AR grade) and Ammonium Persulphate (AR grade). Cadmium Nitrate (AR grade), Ammonium Sulphide (AR Grade)

Synthesis of Polyaniline Cds Nanocomposite

In the Present work polymer composite film of Polyaniline (PANI)-CdS was prepared for different weight percent of Cadmium Sulphide (CdS).

Synthesis steps of PANI/CdS nanocomposite are similar to the synthesis method of PANI. Different amount of CdS were dispersed into the APS solution and stirred for 1 h prior to the addition of aniline. Aniline (0.4 mol) stirred with 0.4M H_2SO_4 in 100 ml of distilled water were added drop-wised using burette into the APS-CdS solution and stirred vigorously to form homogeneous dispersion. For convenience, PANI Composites were prepared with different weight percentages of CdS [19]. Same synthesis conditions were maintained for all composites as that of pure PANI.

Result and Discussion

1) TG/DTA

Thermogravimetric Analysis or thermal gravimetric analysis is a sort of testing performed on tests that decides changes in weight in connection to a temperature program in a controlled atmosphere.Such analysis relies on a high degree of precision in three measurements: weight, temperature, and temperature change. TGA is commonly employed in research to determine characteristics of materials, degradation temperatures, absorbed moisture content of materials, the level of inorganic and organic components in materials,

decomposition points of explosives and solvent residues. The TGA/DTA of PANI-CdS nanocomposite TGA/DSC temperature is maintained up to 973K. and heating rate of the sample was 10°C/min.

Thermal properties of pure Polyaniline polymer and PANI doped with Cadmium Sulphide (CdS) were evaluated by TGA/DTA in the temperature range 0 °C to 500 °C at a heating rate of 10 °C /min (Figure 1).

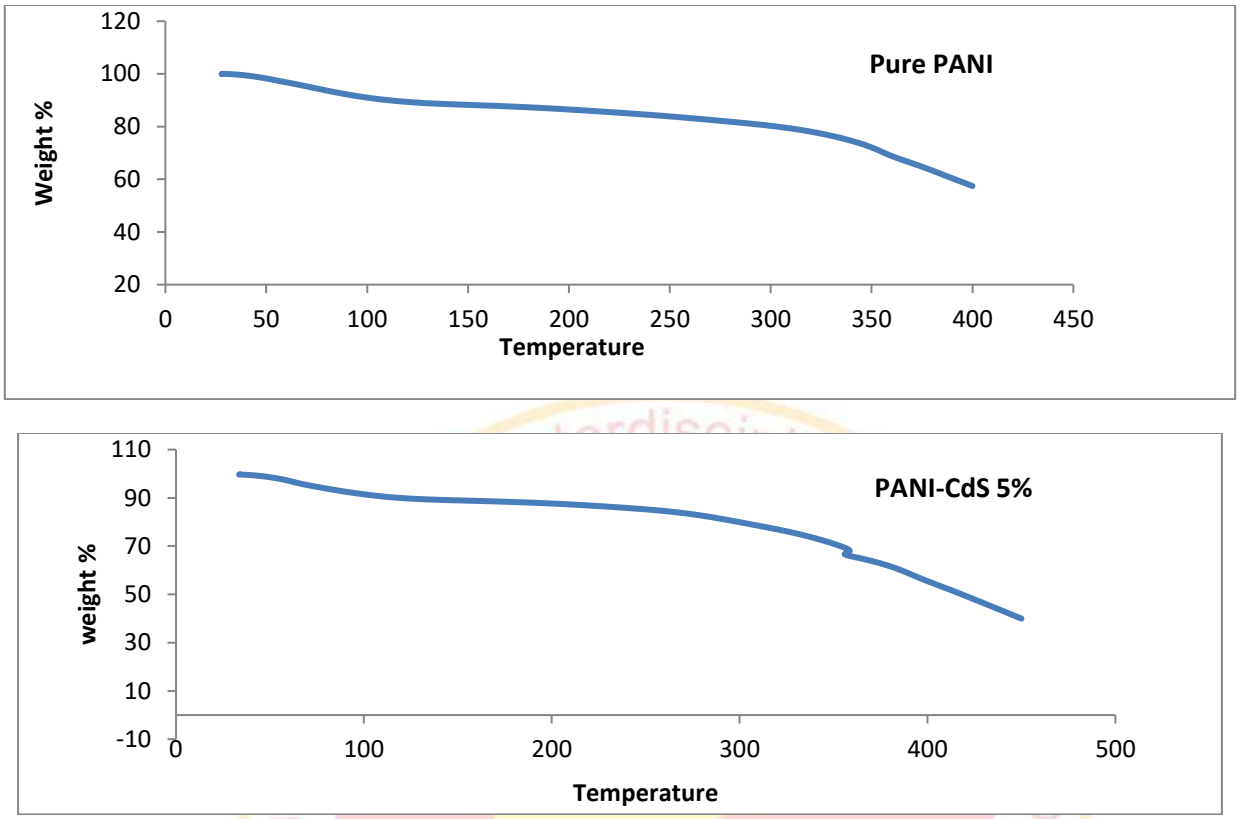
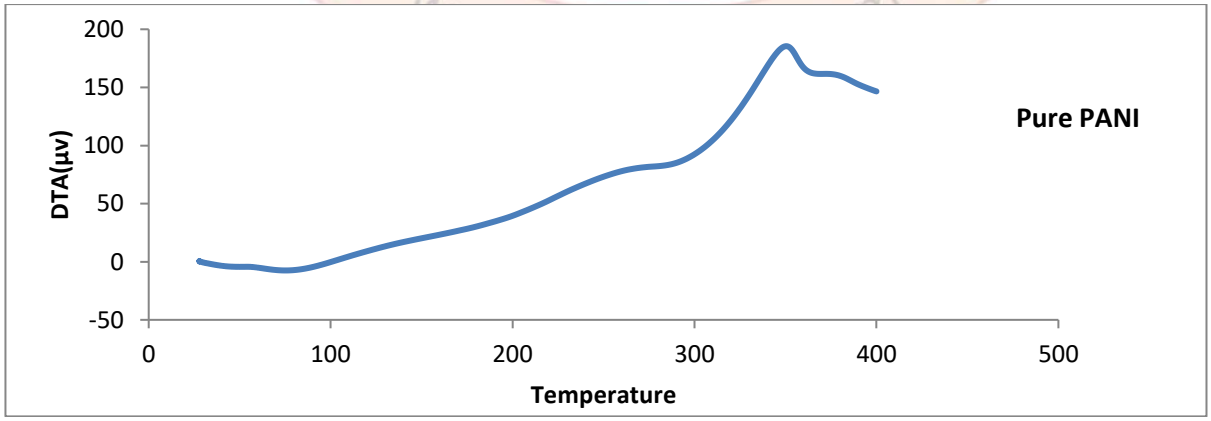


Fig. 1 TGA thermographs of pure PANI and PANI doped with 5 wt % of Cadmium Sulphide CdS

TGA thermograph of PANI-CdS nanocomposites shows two step degradation Figure 1 shows the two step degradation of PANI-CdS nanocomposite having 60-65% of its weight loss when it was heated to 500^{0}C. It indicates that 60-65 % of the sample consists of polymers and softeners. The residual about 35-40 % was considered to account for metallic compounds, added as sulphide and dopant. Residual was increases with increasing the wt. % of dopant. Addition of CdS weakens the structure of PANI as weight loss increases.

Figure 2 shows DTA curves of pure Polyaniline and PANI doped with CdS(10 %). In DTA curve, the endothermic peak appearing at ~ 70-80 ^{0}C is probably due to the melting point of PANI that identified as melting of crystalline phase of polymer. The sample PANI-CdS nanocomposite shows the strong and broad exothermic peak in the range 340 to 400 °C accompanied by rapid weight loss can be ascribed to the decomposition of PANI-CdS nanocomposite.



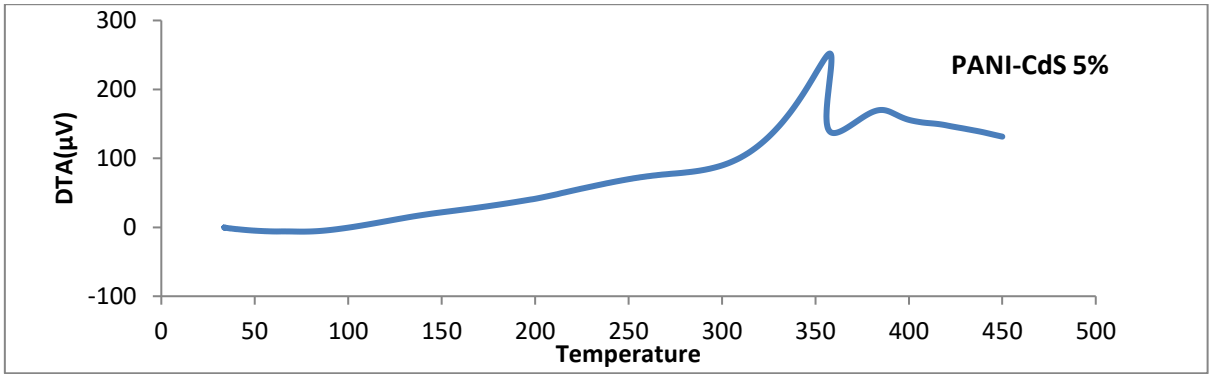


Fig. 2 DTA Curve of pure PANI and PANI doped with 5 % of Cadmium Sulphide CdS

ll) DC Conductivity

A suitable heating rate (2^0C/min.) was maintained with the help of dimmer stat. A digital temperature indicator connected to a thermocouple (resolution 1^0C) placed near the sample to measure the temperature of the sample. A constant voltage is applied to the sample and corresponding current (Pico-ammeter, Scientific Equipment Roorkee, resolution 1 pA) was measured at constant temperature, which gives resistance of the sample. Then the change in conductivity of the samples with temperature was estimated.

DC conductivity of the pure PANI polymer and doped with different wt. % of CdS was measured in the temperature range 308 to 328K by using Ohms law. The resistance of the samples was measured. It is observed that the value of resistance depends on temperature as well as on composition.

The variation of dc conductivity with different wt. % of CdS is shown in fig 3 As compared to pure Polyaniline the conductivity increases with CdS wt. % . Polyaniline doped with the 5 wt. % CdS shows the maximum value of dc conductivity.

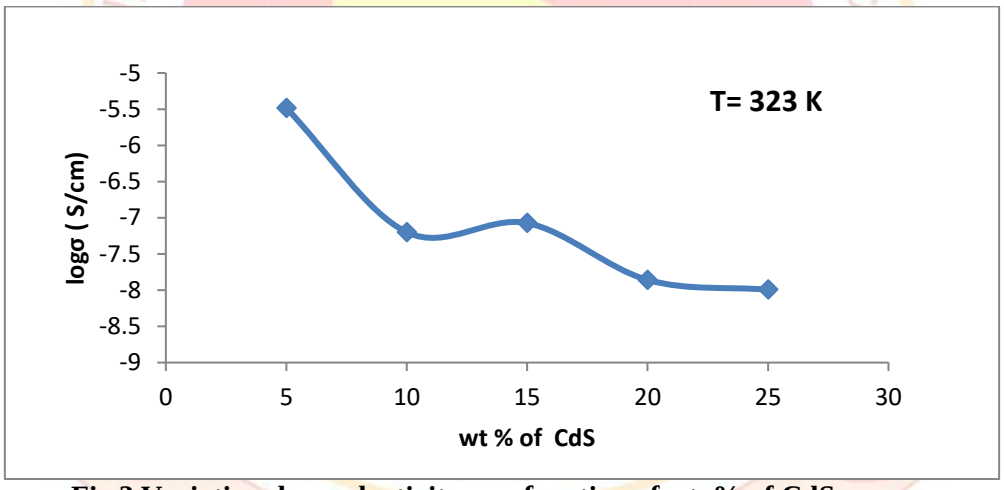


Fig 3 Variation dc conductivity as a function of wt. % of CdS

The variation of dc conductivity as a function of inverse temperature for Polyaniline polymer doped with the different wt. % CdS was estimated. The nature of plots is shown in Figure 4, over the temperature range 308 to 328 K. It can be observed that the dc conductivity for all the compositions of PANI doped with the different wt. % CdS increases with increasing temperature for the entire range.

It tends to be seen that the Arrhenius plots for every one of the examples show a comparative behavior. The dc conductivity esteems increments with the different wt. % CdS at various temperatures.

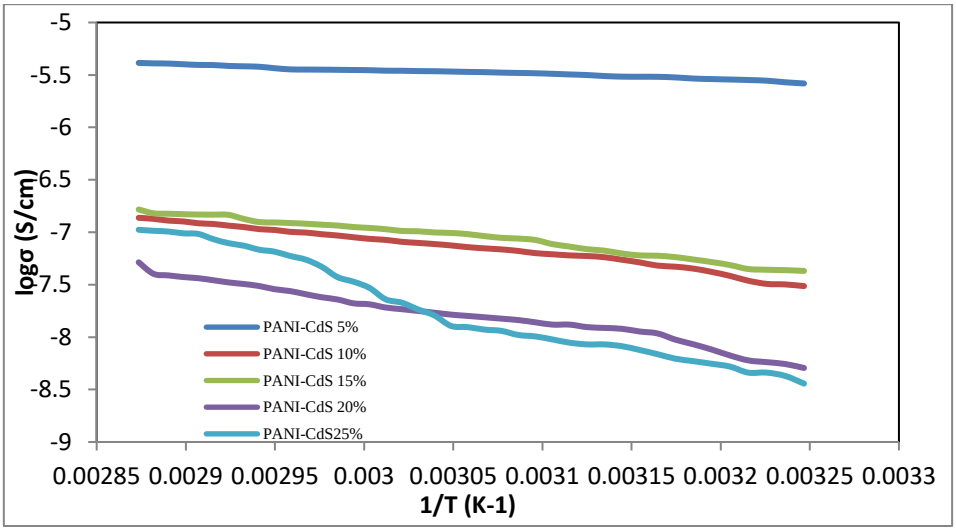


Fig 4 Arrhenius plots of the dc conductivity of PANI-CdS composite for different wt. % of CdS

As the temperature builds, versatility of the ions expands, which results the rise in conductivity . Uppermost curve belong to 5 wt % of CdS for which conductivity is maximum. The conductivity versus temperature curves of all synthesized samples shows the increase in conductivity. The rate of increase of conductivity is linear for the composite; which may be due to the segmental motion of the ions in the polymer [20].

The natures of the curves are consistent with Arrhenius type charge conduction in polymer composites and the conductivity relationship follows the equation,

$$\sigma = \sigma_0 \, ex \, (-E_a/kT) \qquad (1)$$

Where E_a is the activation energy, σ_0, is the pre-exponential factor and k is the Boltzmann's constant. The slope of each straight line gives the activation energy which lies between 0.039 and 0.36 eV. From the figure 5, DC parameters are calculated and noted in table 5.1.

Sr.No.	CdS wt %	Activation Energy E_a (eV)	Conductivity σ (S/cm)
1	5	0.039	3.2833×10^{-6}
2	10	0.146	6.3232×10^{-8}
3	15	0.135	8.4481×10^{-8}
4	20	0.201	1.3852×10^{-8}
5	25	0.364	1.0162×10^{-8}

Table 1 : DC parameter for the PANI-CdS Nanocomposite

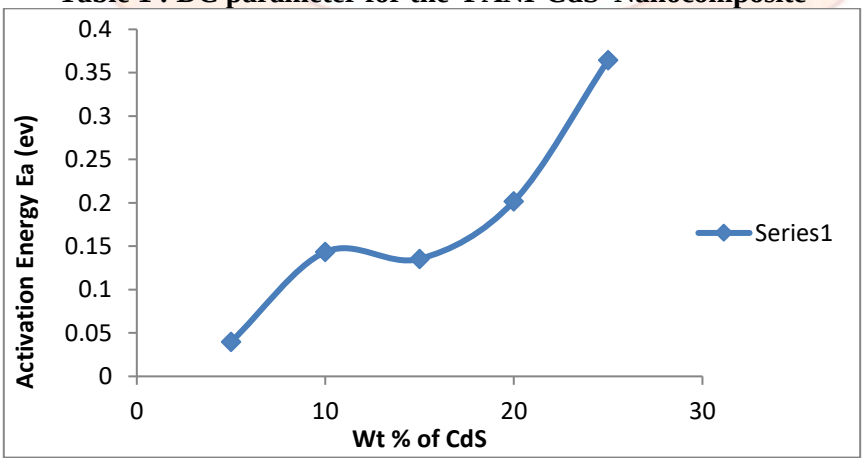


Fig. 5 Variation Activation Energy as a function of wt. % of CdS

Plot of activation energy with different wt. % of CdS is illustrated in figure 5.8, which shows that activation energy Ea is found to be maximum for the 25 wt % of CdS. The value of activation energy increases with wt. % CdS.

Conclusion

In this work PANI-CdS nanocomposites were successfully prepared by *insitu* polymerization method at room temperature. As compared to pure Polyaniline the conductivity increases with CdS wt. % . Polyaniline doped with the 5 wt. % CdS shows the maximum value of dc conductivity and 25 wt % CdS shows maximum activation energy. TGA shows the two step degradation of PANI-CdS nanocomposite having 60-65% of its weight loss when it was heated to 500^0C. In DTA curve, the endothermic peak appearing at ~ 70-80 ^{0}C is probably due to the melting point of PANI that identified as melting of crystalline phase of polymer.

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Density, Viscosity and Ultrasonic Velocity Studies of Aqueous Solution of D-(-) - Tartaric Acid at Different Temperature

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Abstract

At concentration range (0.01 to 0.1) mol/kg and temperature range T = (298.15 and 303.15) K, densities (ρ) , ultrasonic speeds (u) and viscosities (η) of aqueous solutions of D-(-) - Tartaric acid were measured. From these experimentally measured values the parameters such as Adiabatic Compressibility (β_a), Free Length (L_f), Free Volume (V_f), M_{eff}, Internal Pressure (P_i), Acoustic Impedance (Z), Gibbs free energy (ΔG), Molar Cohesive Energy (M_{CE}), Relaxation Time (τ), Molar Volume (V_m) and Rao Constant (R) have been evaluated. The results have been interpreted in terms of solute-solvent and solute-solute interactions in these systems. It has been observed that there exist strong solute-solvent interactions in these systems and these interactions increases with concentration of solute in aqueous medium.

Keywords: *Density, Ultrasonic speed, Viscosity, molecular interaction.*

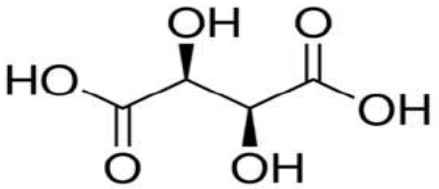
Introduction

Tartaric acid is a white, crystalline organic acid that occurs naturally in many fruits, most notably in grapes, but also in bananas, tamarinds, and citrus. Tartaric acid has three stereoisomeric forms dextrorotatory tartaric acid, levorotatory tartaric acid and racemic tartaric acid. Tartaric acid is an alpha-hydroxy carboxylic acid, and is diprotic organic acid [1]. All the forms of tartaric acid are readily soluble in water. It can form salts with bases, and some of the important salts of tartaric acid are cream of tartar (potassium hydrogen tartrate) and Rochelle salt (potassium sodium tartrate).Tartaric acid plays an important role in the preparation of many food additives. Tartaric acid is used in pharmaceutical products, skin care, beverages, agriculture products and textiles. The studies on Tartaric acid solute solvent interactions are most important for the field of biosynthesis, medicine, immunology and pharmacology. The study of physiochemical behaviour and molecular interaction in liquid mixtures is of considerable importance and number of techniques has been used to investigate the interaction between the components of binary liquid mixtures. In recent years, the measurement of ultrasonic velocity has been extensively applied in understanding the nature of molecular systems, physiochemical behavior and molecular interactions in liquid mixture.

In the present article, we report the densities, ρ, ultrasonic speeds u and viscosities η of solutions of Tartaric acid in water at different temperatures and atmospheric pressure have been computed using standard relations given by literature [2-4]. Various physicochemical parameters, viz., Adiabatic Compressibility (β_a), Free Length (L_f), Free Volume (Vf), M_{eff}, Internal Pressure (P_i), Acoustic Impedance (Z), Gibbs free energy (ΔG), Molar Cohesive Energy (M_{CE}),Relaxation Time (τ),Molar Volume (Vm) and Rao Constant (R) have been calculated using the experimental data.

Material and Methods

Tartaric acid (AR 99%) having molecular weight of 182.65 was obtained from Sigma Aldrich chemicals Ltd. The molecular structure of this compound is as follows



D-(-)-tartaric acid

The aqueous solutions of Tartaric acid of different concentrations were freshly prepared by using double distilled water. The required amount of solute was measured by using a digital weighing machine. The solutions were made on the basis of molality and stored in special airtight bottles to avoid contamination and evaporation. The densities measurements have been done by using specific gravity bottle (10ml). Ultrasonic velocities have been determined by using digital ultrasonic pulse echo velocity meter (VCT -70A). The viscosities of the solutions were measured by using Ostwald's type viscometer. The instrument has been calibrated with double distilled water at certain temperatures before taking measurements. The flow time has been measured with a digital stopwatch and average flow times were taken for each series of liquid solutions.

Mathematical Formulation

Apparent molal volume measurements (v_φ)

$$\emptyset_v = \frac{1000(\rho_0 - \rho)}{m\rho\rho_0} + \frac{M}{\rho} \quad (1)$$

Where, m= molality of the solute

ρ = density of solution

ρ_o= density of solvent

M= molar mass of the solute (tartaric acid)

Where f = frequency of the ultrasonic wave

Apparent molar compressibility (k_s, φ)

$$K_s, \varphi = \frac{1000(K_s\rho_0 - K_s^0\rho)}{m\rho\rho_0} + \frac{K_s M}{\rho} \quad (2)$$

Where, $k_s$and k_s^0= isentropic compressibility of the solution and solvent (water) respectively.

Isentropic Compressibility

$$K_s = \frac{1}{u^2}\rho \quad (3)$$

Acoustic Impedance (Z)

The specific acoustic impedance is given by

$$Z = U\,\rho_s \qquad \text{Kg } m^{-2}s^{-1} \quad (4)$$

ρ_s = Density of solution

U = ultrasonic velocity of solution

Relaxation Time (τ)

$$\tau = \frac{4}{3\beta\eta} \quad (5)$$

where η is the viscosity of solution

Classical absorption $(\alpha/f^2)_{cl}$

$$(\alpha/f^2)_{cl} = \frac{8\pi^2\eta}{3\rho U^3} \quad (6)$$

Where f = frequency of the ultrasonic wave

Free Length (L_f)

$$L_f = K\beta^{1/2} \quad (7)$$

K= temperature dependant constant

Result and Discussion

The experimental values of basic parameter of Ultrasonic velocity (u), Density) and Viscosity obtained are given in table 1 and by using these basic parameter the various acoustic parameter such as Acoustic Impedance (Z), Adiabatic compressibility (βa), Relaxation Time (T), Free Length (Lf), Free Volume (Vf),Meff (kg), Internal Pressure (Pi), MCE,Molar Volume (Vm), Rao Cont. Molar Sound Velo.etc are calculated in table2,3,4 and 5 the various acoustic parameter's calculated values are given.

Composition M(mol/kg)	298.15 K			303.15 K		
	Velocity U(m/s)	Density ρ (kg/m^3)	Viscosity η (N.s.m^3)	Velocity U(m/s)	Density ρ (kg/m^3)	Viscosity η (N.s.m^3)
0.01	1410.19	1035.1220	9.81E-04	1503.14	1020.2290	8.67E-04
0.02	1493.54	999.0480	9.58E-04	1503.75	1020.2290	8.62E-04
0.03	1494.14	1001.0520	9.60E-04	1503.76	1020.2290	8.43E-04
0.04	1494.14	1002.0540	9.45E-04	1504.35	1021.2520	8.48E-04
0.05	1494.73	1000.0500	9.37E-04	1504.96	1022.2760	8.24E-04
0.06	1495.33	1001.0520	9.76E-04	1504.96	1023.2990	8.38E-04
0.07	1495.33	1003.0560	9.83E-04	1505.56	1023.2990	8.73E-04
0.08	1495.93	1004.0580	9.63E-04	1505.56	1026.3690	8.55E-04
0.09	1496.53	1005.0600	9.42E-04	1506.17	1025.3460	8.17E-04
0.1	1497.53	1006.0620	9.48E-04	1506.17	1027.3920	8.53E-04

Experimental Values of density, viscosity and ultrasonic velocity of aqueous D- (-)-Tartaric Acid and other parameters

Table 1
Table 2.

	298.15 K			303.15 K		
Composition M	Adiabatic Compre. βa ($10^{-10}N^{-1}.m^2$)	Free LengthL$_f$ (10^{-11}m)	Free Volume V$_f$ ($10^{-8}m^3.mol^{-1}$)	Adiabatic Compre. βa	Free Length L$_f$ (10^{-11}m)	Free Volume V$_f$ ($10^{-8}m^3.mol^{-1}$)
0.01	4.858E-10	4.534E-11	1.5E-08	4.338E-10	4.324E-11	2E-08
0.02	4.487E-10	4.357E-11	1.7E-08	4.335E-10	4.322E-11	2.0E-08
0.03	4.475E-10	4.351E-11	1.7E-08	4.335E-10	4.322E-11	2.1E-08
0.04	4.470E-10	4.349E-11	1.7E-08	4.327E-10	4.318E-11	2.1E-08
0.05	4.476E-10	4.352E-11	1.8E-08	4.319E-10	4.314E-11	2.1E-08
0.06	4.468E-10	4.348E-11	1.6E-08	4.315E-10	4.312E-11	2.1E-08
0.07	4.459E-10	4.343E-11	1.6E-08	4.311E-10	4.310E-11	2E-08
0.08	4.451E-10	4.340E-11	1.7E-08	4.298E-10	4.304E-11	2E-08
0.09	4.443E-10	4.336E-11	1.8E-08	4.299E-10	4.304E-11	2.2E-08
0.1	4.432E-10	4.331E-11	1.7E-08	4.291E-10	4.300E-11	2.1E-08

	298.15 K			303.15 K		
Composition m	Meff (kg)	Internal Pressure Pi (10^9pas)	Acoustic Imped. Z (kg. m^{-2}.s^{-1})	Meff (kg)	Internal Pressure Pi (10^9pas)	Acoustic Imped. Z (kg. m^{-2}.s^{-1})
0.01	1.80E-02	3.004E+09	1.460E+06	1.80E-02	2.709E+09	1.534E+06
0.02	1.80E-02	2.817E+09	1.492E+06	1.80E-02	2.701E+09	1.534E+06
0.03	1.81E-02	2.805E+09	1.496E+06	1.81E-02	2.654E+09	1.534E+06
0.04	1.81E-02	2.785E+09	1.497E+06	1.81E-02	2.663E+09	1.536E+06
0.05	1.81E-02	2.769E+09	1.495E+06	1.81E-02	2.626E+09	1.538E+06
0.06	1.81E-02	2.827E+09	1.497E+06	1.81E-02	2.650E+09	1.540E+06
0.07	1.82E-02	2.823E+09	1.500E+06	1.82E-02	2.687E+09	1.541E+06
0.08	1.82E-02	2.796E+09	1.502E+06	1.82E-02	2.664E+09	1.545E+06
0.09	1.82E-02	2.766E+09	1.504E+06	1.82E-02	2.602E+09	1.544E+06
0.1	1.82E-02	2.776E+09	1.507E+06	1.82E-02	2.663E+09	1.547E+06

Table 3.
Table 4.

	298.15 K		303.15 K	
Composition m	Gibbs free energy ΔG (Jmol^{-1})	Molar Cohesive Energy MCE (kJ mol^{-1})	Gibbs free energy ΔG (Jmol^{-1})	Molar Cohesive Energy MCE (kJ mol^{-1})
0.01	4.616E-21	5.224E+04	3.748E-21	4.780E+04
0.02	4.238E-21	5.076E+04	3.724E-21	4.765E+04
0.03	4.235E-21	5.072E+04	3.642E-21	4.708E+04
0.04	4.174E-21	5.031E+04	3.657E-21	4.719E+04
0.05	4.147E-21	5.012E+04	3.545E-21	4.650E+04
0.06	4.290E-21	5.112E+04	3.603E-21	4.687E+04
0.07	4.309E-21	5.122E+04	3.750E-21	4.779E+04
0.08	4.227E-21	5.067E+04	3.663E-21	4.725E+04
0.09	4.139E-21	5.009E+04	3.497E-21	4.619E+04
0.1	4.154E-21	5.022E+04	3.648E-21	4.717E+04

Table 5.

	298.15 K			303.15 K		
Composition M	Relaxation Time T (10^{-13}sec)	Molar Volume Vm ($10^{-5}m^3.mol^{-1}$)	Rao Const. (Mol. Sound Velo.) R ($10^4m^5.N^{-2}$)	Relaxation Time T (10^{-13}sec)	Molar Volume Vm ($10^{-5}m^3.mol^{-1}$)	Rao Const. (Mol. Sound Velo.) R ($10^4m^5.N^{-2}$)
0.01	6.354E-13	1.739E-05	1.95E-04	5.015E-13	1.764E-05	2.02E-04
0.02	5.732E-13	1.802E-05	2.06E-04	4.982E-13	1.764E-05	2.02E-04
0.03	5.728E-13	1.808E-05	2.07E-04	4.872E-13	1.774E-05	2.03E-04
0.04	5.632E-13	1.806E-05	2.06E-04	4.892E-13	1.772E-05	2.03E-04
0.05	5.592E-13	1.810E-05	2.07E-04	4.745E-13	1.771E-05	2.03E-04
0.06	5.814E-13	1.808E-05	2.07E-04	4.821E-13	1.769E-05	2.03E-04
0.07	5.844E-13	1.814E-05	2.07E-04	5.018E-13	1.779E-05	2.04E-04
0.08	5.715E-13	1.813E-05	2.07E-04	4.900E-13	1.773E-05	2.03E-04
0.09	5.580E-13	1.811E-05	2.07E-04	4.683E-13	1.775E-05	2.03E-04
0.1	5.602E-13	1.809E-05	2.07E-04	4.880E-13	1.771E-05	2.03E-04

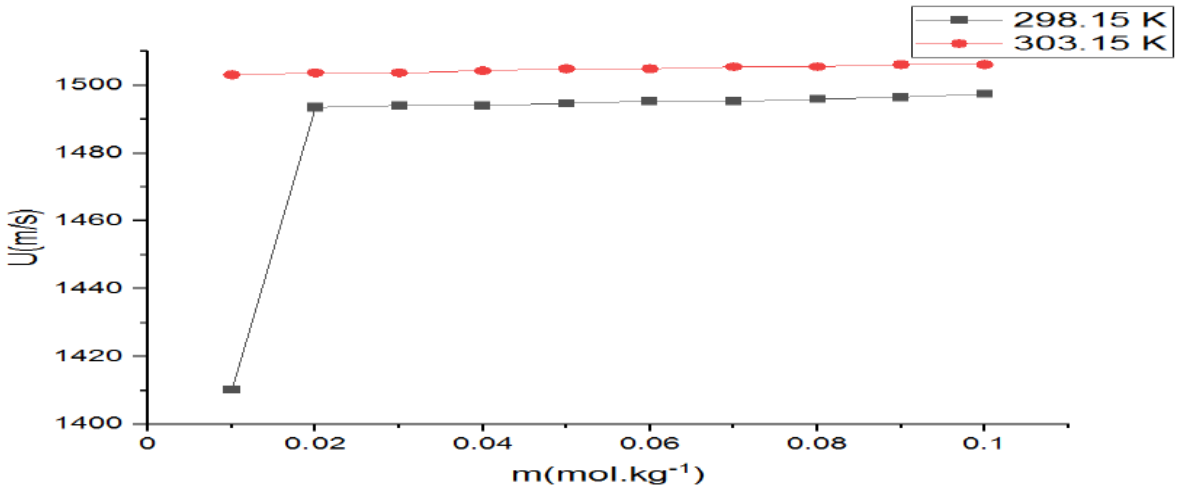


Fig.1 Variation of Ultrasonic Velocity with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

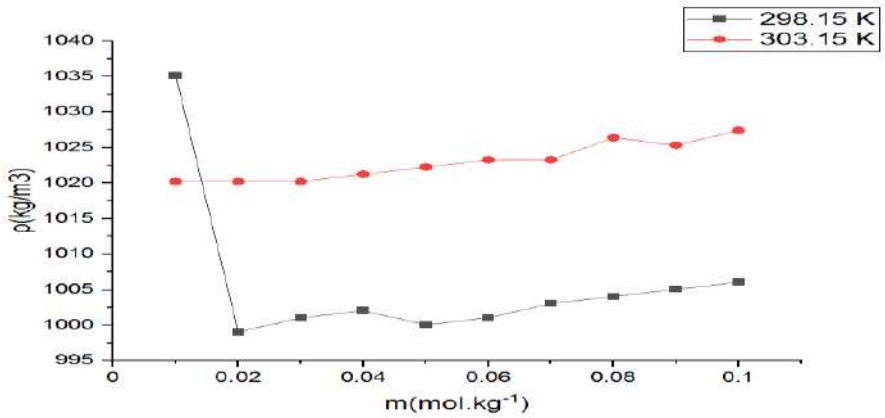


Fig.2 Variation of Ultrasonic Density with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

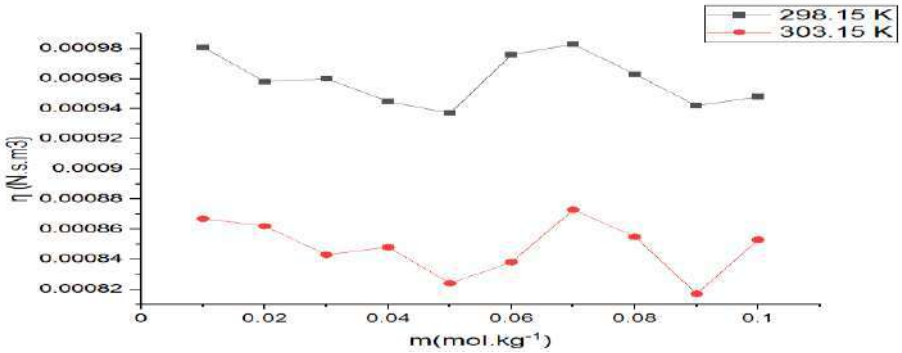


Fig.3 Variation of Ultrasonic Viscosity with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

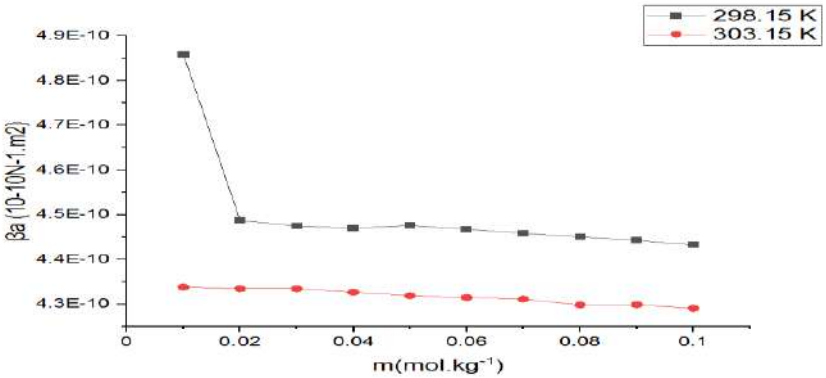


Fig.4 Variation of Adiabatic Compressibility with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

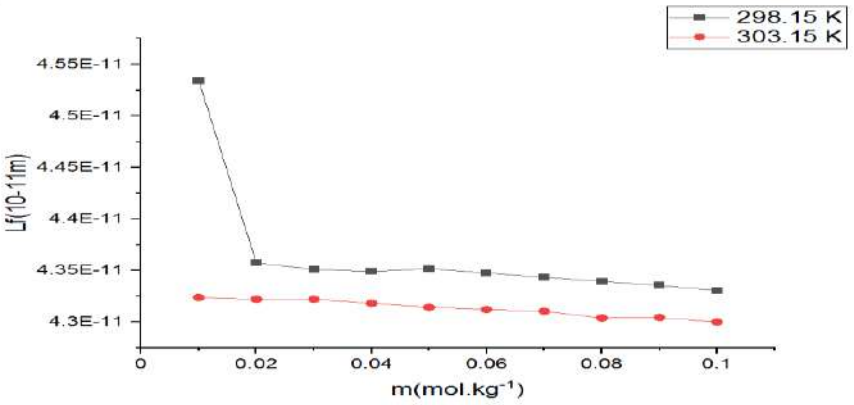


Fig.5 Variation of Free Length with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

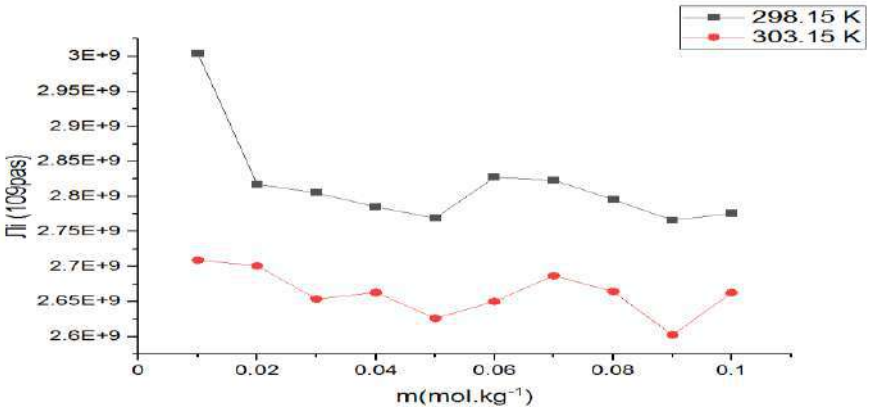


Fig.6 Variation of Internal Pressure with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

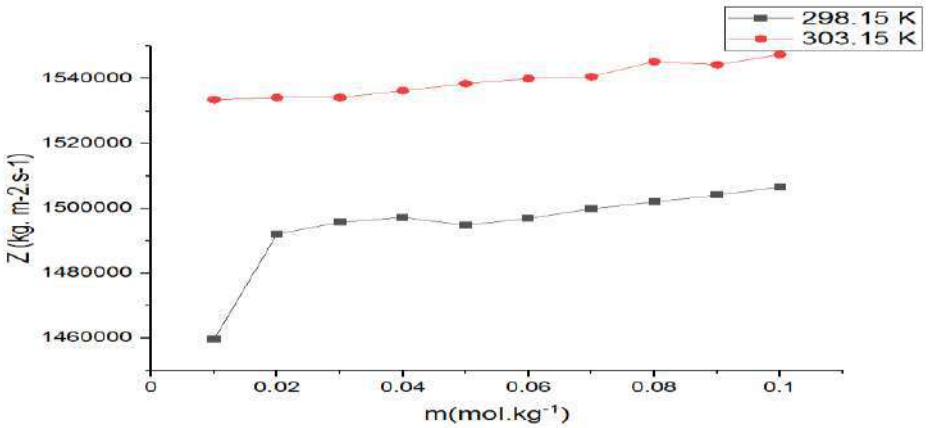


Fig.7 Variation of Acoustic Impedance with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

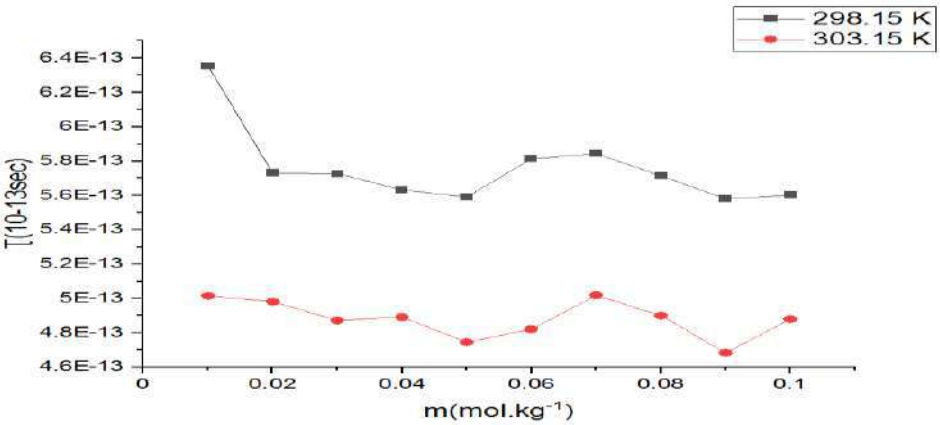


Fig.8 Variation of Relaxation Time with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

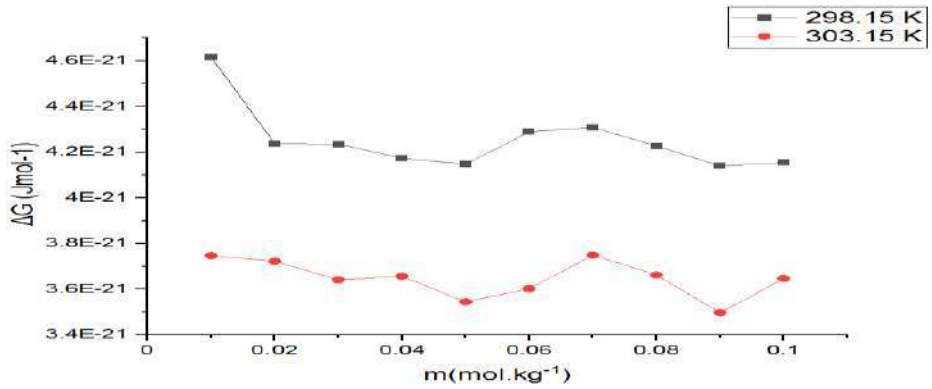


Fig.9 Variation of Gibbs free energy molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

In the present study, the experimental value of ultrasonic velocity, density and viscosity with different concentration of D-(-)-tartaric acid in distilled water at temperature 298.15K and 303.15K are tabulated table 1. While other parameters such as adiabatic compressibility ,free length, free volume, internal pressure , acoustic impedance , relaxation time, molar volume, Gibbs free energy , meff , rao constant and molar cohesive energy are tabulated table 2 to table 5 Fig.1. Shows that the ultrasonic velocity increases with increasing number of solute particle in solvent double distilled water and also with rise in temperature. The increase in ultrasonic velocity is an indication of enhanced solute solvent molecule interaction and structure making tendency of solute D-(-) - Tartaric acid in water.

Fig.2. shows that density of solution increases with increase in concentration due to increase in number of particle in solution. It is predict that there strong interaction in molecule of solution. The density of solution increases with rise in temperature.Fig.3. shows that Viscosity is inversely proportional to the adiabatic compressibility means that adiabatic compressibility decreases at that time viscosity is increases. Fig.4. It

represents the adiabatic compressibility decreases with increase in the concentration also with temperature. The decrease in the compressibility shows that there are enhanced molecular association in this system with increase in the solute content as the new entities become compact and less compressible [5].Fig.5. It is observed from this figure that the free length of aqueous D-(-) - Tartaric acid solution decrease with rise in concentration . This indicates that there exists a significant solute-solvent interaction which leads to a structure promoting behavior. The decreasing trends of free length with rise in concentration is due to decrease in spacing between the molecule of D-(-) - Tartaric acid solution. The free volume increases with increase in concentration as well as temperature. The increase in free volume may be attributed to lose packing of the molecule inside the shield. This may be brought about by weakness of molecular interaction. The free volume is inverse function of internal pressure.Fig.6. shows that the internal pressure decrease with increase in concentration which indicates the decrease in cohesive forces. The reduction in internal pressure may be due to loosening of cohesive force leading to breaking the structure of the solute. Decrease in internal pressure indicates that there is a weak interaction between the solute and solvent molecule [6]. Fig.7. It is observed that acoustic impedance increase with concentration and also with temperature. This may be due to the variation of pressure from one particle to another particle and the increase in acoustic impedance value with solute concentration can be attributed to the effective solute solvent interaction.Fig.8. shows that relaxation time decreases with increase in concentration also with temperature. The relaxation time is order of 10^{-12} sec is due to structural relaxation process in such a case it is suggested that molecule get rearranged due to co-operative process. It was reported that if the variation in Rao's constant is linear then it show that there is complex formation and so is found in the present investigation which means that there is no complex formation.Fig.9. Gibbs free energy first decreases and then increase with concentration of solution also with temperature. This result are in accordance with clathrate like structure of D-(-) - Tartaric acid.

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Synthesis and Characterization of Bis-Schiff Bases Derived from Vaniline

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Abstract

The Schiff Bases are the utmost extensively used organic compounds . Schiff bases are significant class of compounds in medicinal and pharmaceutical field as they have also been shown toexhibit wide range of biological activities, including antifungal, antibacterial,antiferative, anti inflammatory, antiviral, and antitumor properties.

The Bis-schiff bases are the product of the reaction between Bis-aldehydes and triazole amine. Some Bis-Schiff base derivatives of 1,2,4- triazole amine and their reduced derivatives have been also found to posses pharmacological activities[6-8].

Keyword *Synthesis of Bis-schiff base,anti inflammatory, antifungal, antibacterial, antitumor etc.*

Introduction

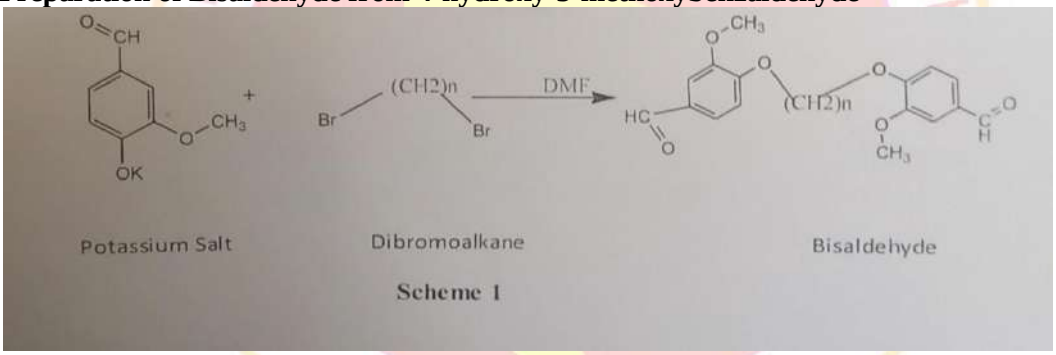
Schiff bases are the condensation products of primary amines and carbonyl compounds[1]. In present investigation,we report synthesis, characterization of Schiff Base derived from 1,2,4-triazole-4-amine and 4-hydroxy 3-methoxy benzaldehyde. Synthesis of various triazole derivatives have been reported[10-11].

In general Schiff base are most widely used compounds. They have been shown to exhibit a broad range of biological activities.

Litrature survey has revealed several advantages of Schiff bases derived from triazole. In vitro antibacterial , antifungal and cytotoxic activities of some Schiff bases and their complexes give the more research focus on this compounds[4-5].

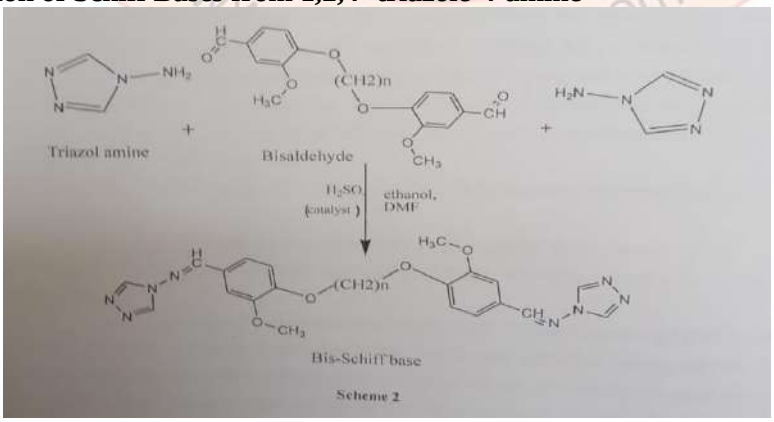
Methods for synthesis of Schiff base

Scheme I- Preparation of Bisaldehyde from 4-hydroxy-3-methoxybenzaldehyde



Take 1.5 g of 4-hydroxy-3-methoxybenzaldehyde dissolve in methanoic KOH. Stirr for 15 min. and remove solvent. Dissolve remaining in DMF and add Dibromoalkane. Reflux the reaction mixture for half an hour . Pour the content in crushed ice after ther completion of reaction . Collect solid Bis aldehyde from recrystalisation.

Scheme II – Preparation of Schiff Bases from 1,2,4- triazole-4-amine



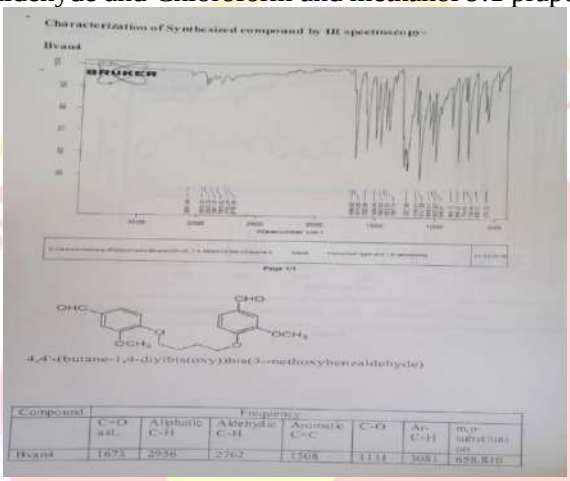
Take 0.86 g of Bisaldehyde and 0.42g of triazole in round bottom flask. Add ethanol and DMF in 9:1 praportion resp. Heat the solution till it will be completely soluble . Add 2-3 drops of H_2SO_4 to it. Reflux the solution till ppt appears.

Properties of the compound synthesized-

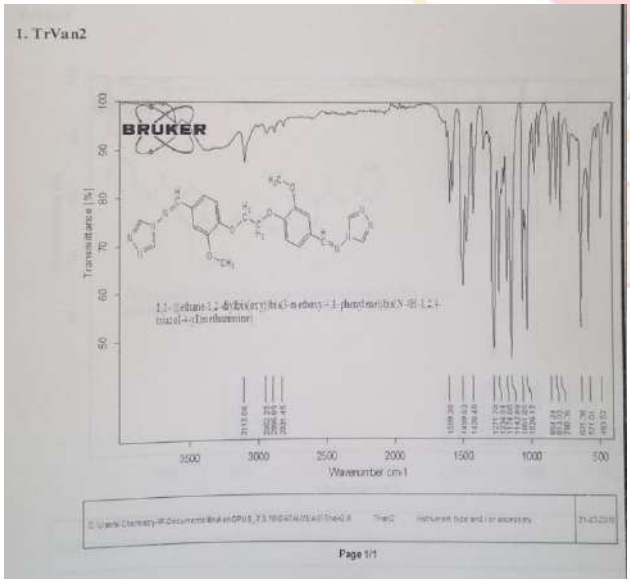
Compound	N	Molecular Formula	Molecular Weight	Melting Point
TrVan 2	$-(CH_2)_2-$	$C_{22}H_{22}N_8O_4$	430.198	228^0C
TrVan 3	$-(CH_2)_3-$	$C_{23}H_{24}N_8O_4$	444.208	244^0C
TrVan 4	$-(CH_2)_4-$	$C_{24}H_{26}N_8O_4$	458.218	240^0C
TrVan 5	$-(CH_2)_5-$	$C_{25}H_{28}N_8O_4$	472.228	216^0C

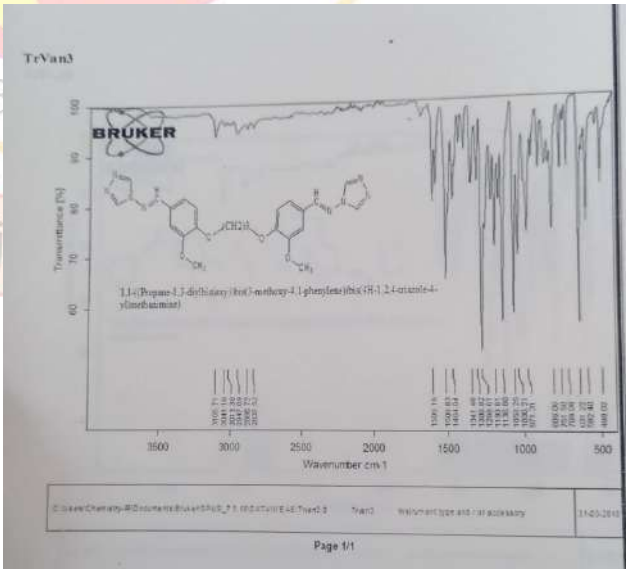
Result and Discussion-

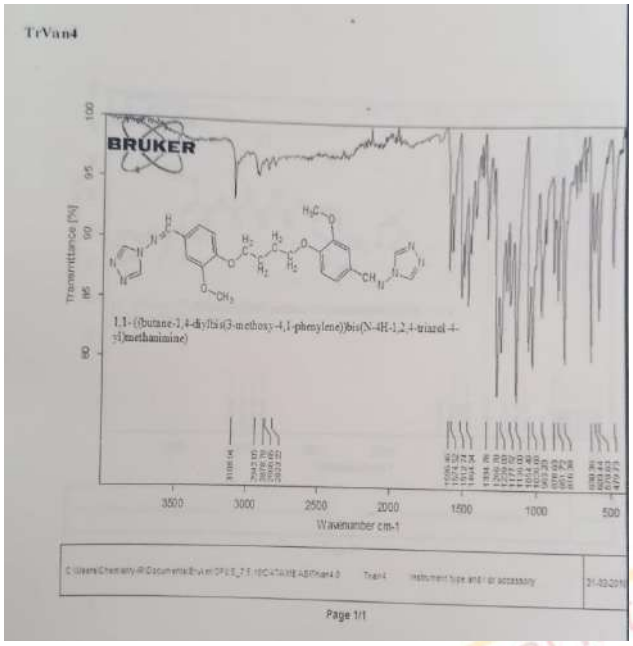
The synthesis of Schiff bases from triazolamine and bisaldehyde is very efficient required short reaction time , atom economical and with better yield. In present investigation the reaction of the various bisaldehyde with triazole were studied. The purity of the product obtained was checked by TLC using ethyl acetate and cyclohexane in 6:4 ratio for bisaldehyde and Chloroform and methanol 9:1 praportion for Schiff bases.

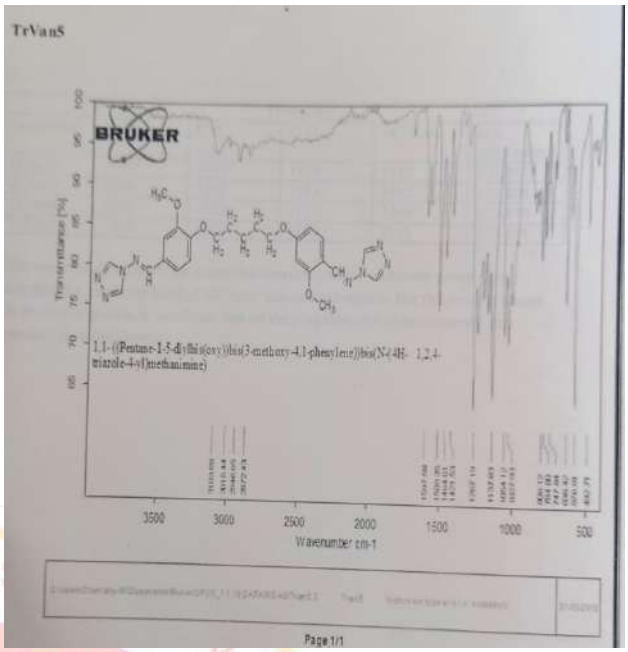


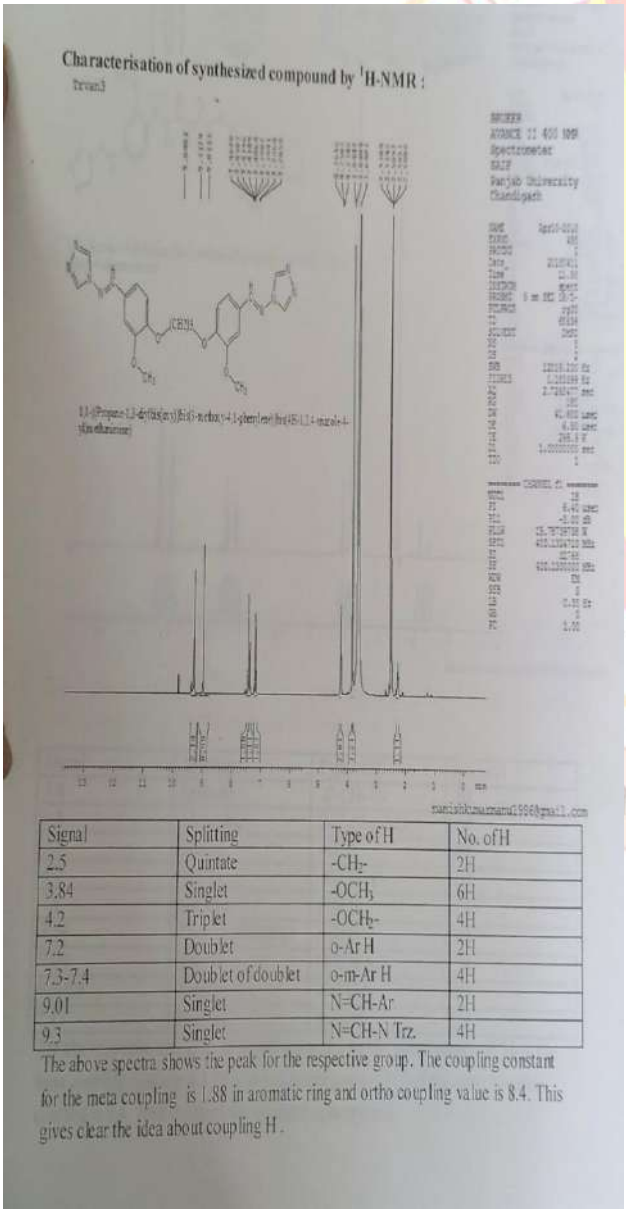
The conventional method take more time for the completion of reaction. But by using H_2SO_4 as the catalyst we can increase the rate of reaction . After addition of catalyst we get the product immediately within 5-10 min. This process is energy efficient and also autoeconomical. All the new compounds are tested with TLC , purified and crystalize with ethanol.





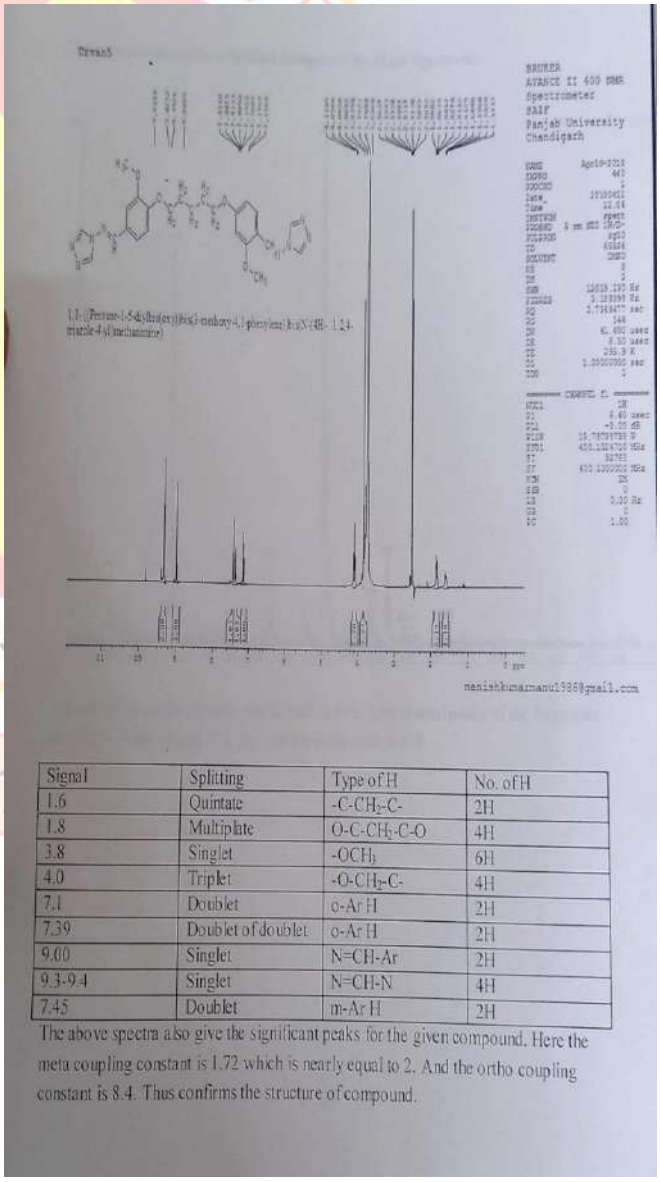






Signal	Splitting	Type of H	No. of H
2.5	Quintate	-CH_2-	2H
3.84	Singlet	-OCH_3	6H
4.2	Triplet	-OCH_2-	4H
7.2	Doublet	o-Ar H	2H
7.3-7.4	Doublet of doublet	o-m-Ar H	4H
9.01	Singlet	N=CH-Ar	2H
9.3	Singlet	N=CH-N Trz.	4H

The above spectra shows the peak for the respective group. The coupling constant for the meta coupling is 1.88 in aromatic ring and ortho coupling value is 8.4. This gives clear the idea about coupling H.



Signal	Splitting	Type of H	No. of H
1.6	Quintate	-C-CH_2-C-	2H
1.8	Multiplate	O-C-CH_2-C-O	4H
3.8	Singlet	-OCH_3	6H
4.0	Triplet	-O-CH_2-C-	4H
7.1	Doublet	o-Ar H	2H
7.39	Doublet of doublet	o-Ar H	2H
9.00	Singlet	N=CH-Ar	2H
9.3-9.4	Singlet	N=CH-N	4H
7.45	Doublet	m-Ar H	2H

The above spectra also give the significant peaks for the given compound. Here the meta coupling constant is 1.72 which is nearly equal to 2. And the ortho coupling constant is 8.4. Thus confirms the structure of compound.

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Thermokinetic Studies of Cr(III), Mn(III) and Fe(III) Complexes Derived From Thiazole Schiff Base.

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Abstract:
Thiazole Schiff base ligand was derived from the condensation of thiazole and 2-hydroxy-5-chloro-3-nitro acetophenone. The Schiff bases behaved as charge bidentade ligand. The ligand was characterized by elemental analysis and spectral methods. The coordinating ability of the ligand is investigated by preparing its metal complexes with Cr(III), Mn(III) and Fe(III),) have been prepared and characterized by elemental analysis, conductance measurements, molecular weight determinations, spectral and thermal studies. The synthesized products are coloured solids, soluble in DMF, DMSO and THF.
Keywords: *Schiff base, Magnetic susceptibility, Thermal*

Introduction :

Synthesis, characterization and antifungal activity of manganese (II) complex with Schiff Base derived from acetylacetone andl leucine[1] synthesis, characterisation and various methods of Schiff base derived from sulphanilic acid and salicylaldehyde and Comparative study of Schiff base using various synthesis methods and their theoretical prediction of activities[2] The newly synthesized Schiff bases, 2-acetylthiophene thiosemicarbazone and thiophene-2-aldehyde thiosemicarbazone and their metal complexes with Co(II), Cu(II), Zn(II) and Ni(II) complexes and Their Schiff bases metal complexes were tested for antibacterial activity[3] There is the combination of the azo group, the imidazole unit and the Schiff base fragment to studies the synthesis, characterization, and optical properties of four different Schiff bases ligands. They are reported the possible use of such systems in biological applications for their antifungal properties and antioxidant activities[4]. Synthesis and structural diversity transition metal coordination complexes with diverse Schiff base ligands and macrocyclic systems[5] The aim of present investigation is to synthesize various transition metal complexes of Schiff base derived from 2-hydroxy-5-chloro-3-nitro acetophenone and 2-amino-4-phenylthiazole

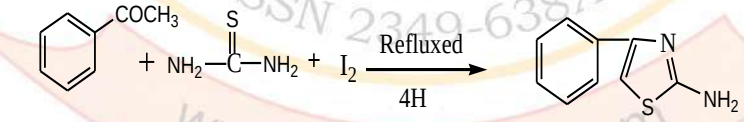
Experimental :

All the chemicals were of A.R. grade and used as received. 2-hydroxy-5-chloro-3-nitro acetophenone (HCNA) and 2-amino-4-phenylthiazole was prepared by known methods6-9. The solvents were purified by standard methods10.

Synthesis of 2-amino-4-phenylthiazole;

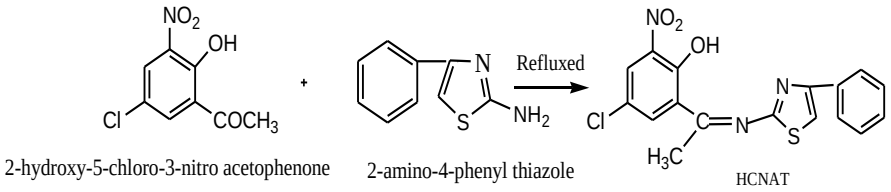
The synthesis of 2-amino-4-phenylthiazole prepared by known method7-9. The product was filtered and crystallized from 70% ethanol, after several minutes the golden coloured product of 2-amino-4-phenylthiazole was separated out.

Yield: 9g (75%); m.p.: 148-1500C



Acetophenone 2-amino-4-phenylthiazole

Synthesis of 2-hydroxy-5-chloro-3-nitroacetophenone 4-phenyl-2 imino thiazole [HCNAT]: A solution of 4-phenyl-2 imino thiazole (0.02M) in 25ml of ethanol was added to an ethanolic solution(25ml) of 2-hydroxy-5-chloro-3-nitro acetophenone (0.02M) and the reaction mixture was refluxed on a water bath for 4h. After cooling a pale yellow coloured crystalline solid was separated out. It was filtered and washed with ethanol, crystallized from DMF and dried under reduced pressure at ambient temperature. The purity of ligand was checked by elemental analysis and m.p. It was also characterized by IR and 1H NMR spectral studies. Yield:75%; m.p. 3050C



2-hydroxy-5-chloro-3-nitro acetophenone 2-amino-4-phenyl thiazole HCNAT

Table1. Analytical data of the Ligands.

Ligand	Molecular Formula	Formula Weight	Color and nature	Elemental Analysis			
				C% found (Cal.)	H% Found (Cal.)	Cl% Found (Cal.)	S% Found (Cal.)
HCNAT	**$C_{17}H_{12}N_3O_3SCl$**	**373.06**	**Yellow Crystalline**	**52.35 (52.20)**	**03.20 (03.34)**	**9.22 (9.38)**	**08.34 (08.46)**

Preparation of complexes:

All the metal complexes were prepared in a similar way by following method. To a hot solution of ligand HCNAT (0.02M) in 25ml of ethanol a suspension of respective metal salts was added drop wise with constant stirring. The reaction mixture was refluxed on a water bath for 3-5 h. The precipitated complexes were filtered, washed with ethanol followed by ether and dried over fused calcium chloride. Yield : 55-60%. The complexes are soluble in DMSO and DMF but insoluble in water and common organic solvents. The metal chloride content of complexes were analyzed by standard methods11,12 The 1H NMR spectra of ligand was recorded and obtained from RSIC Chandigarh. IR spectra of the compounds were recorded on Perkin Elmer 842 spectrophotometer in the region 400-4000cm-1, Carbon, Hydrogen and Nitrogen analysis were carried out at RSIC, Punjab University, Chandigarh. The molar conductance of the complexes at 10-3 M dilution in DMF were determined using equiptronic digital conductivity meter EQ-660 with a cell constant 1.00 cm-1 at room temperature. The magnetic moment measurement were made on a Gouy balance at room temperature using [HgCo(SCN)4] as the calibrant. The thermogravimetric analysis were performed on laboratory set up apparatus in air atmosphere at 100 C min-1 heating rate. The molecular weights of the complexes were determined by Rast method.

Table 2. Analytical data and molar conductance of the compounds.

Ligand	Formula weight g $mole^{-1}$	Colour	Elemental Analysis Found (Calcd.)				μ_{eff} B. M	Λ_M (Ω^{-1} cm^2 mol^{-1})
			M%	C%	H%	Cl%		
$[CrL_2(H_2O)Cl]$ H_2O	868.7	Green	5.42	44.98	2.56	11.18	3.6	17.6
			(5.96)	(45.29)	(2.98)	(11.19)		
$[MnL_2(OAc)]$ H_2O	895.1	Brown	5.46	46.35	3.23	7.41	4.8	17.4
			(5.80)	(46.59)	(3.42)	(7.53)		
$[FeL_2(H_2O)Cl]$ H_2O	872.6	Black	6.12	44.85	3.22	11.46	5.4	21.2
			(6.19)	(45.10)	(3.28)	(11.72)		

Result and Disscution:

The Schiff base HCNAT and its complexes have been characterized on the basis of ^{1}H NMR, IR spectral data, elemental analysis, molar conductance, magnetic succeptibility measurements and thermogravimetric analysis data .

All these values and analytical data is consistent with proposed molecular formula of ligand . All the compounds are coloured solid and stable in air. They are insoluble in water but soluble in coordinating solvents like DMF and DMSO. The molar conductance values in DMF(10^{-3} M) solution at room temperature (Table2) shows all the complexes are non electrolytes.

The ^{1}H NMR spectra of ligand shows signals at δ 12.14,(1H, s phenolic OH), δ 7.56, 7.54, 7.53 and 7.52 (4H, m, phenyl) δ 6.81,6.80, and 6.78 (3H, s, Phenyl), 6.68 (1H,s, thiophene), and 2.56 (3H, s, methyl) [11,13-15].

IR spectra of ligand and metal complexes shows ν(C=N) peaks at 1622 cm^{-1} and absence of C=O peak at around 1700 – 1750 cm^{-1} indicates the Schiff base formation[16-19].

Table 3. IR spectra of ligand and metal complexes

Compound	(O H) hydrogen bonded	(C=N) imine	(C O) phenolic	(M O)	(M N)	(C S)
HCNAT (LH)	3119	1622	1514	--	--	1126
$[CrL_2(H_2O)Cl]\ H_2O$	--	1595	1500	478	406	1118
$[MnL_2(OAc)]\ 2H_2O$	--	1567	1462	498	418	1095
$[FeL_2(H_2O)Cl]\ H_2O$	--	1605	1505	513	436	1085

Table 4. Thermal decomposition data of HCNAT and its complexes.

Compounds	**Half Decompo-sition** Tempera-ture **(°C)**	**Activation Energy (kJ $mole^{-1}$)**			**Frequency Factor** Z **(sec^{-1})**	**Entropy Change -ΔS (J mol^{-1} K^{-1})**	**Free Energy Change ΔF (kJ mol^{-1})**
		B*	H-M**	F-C***			
HCNAT (LH)	260.46	3.22	5.47	4.31	87.28	211.42	118.65
$[CrL_2(H_2O)Cl]\ H_2O$	550.32	9.78	12.92	12.92	259.78	208.14	183.62
$[MnL_2(OAc)]\ 2H_2O$	710.34	11.15	18.54	11.16	222.34	208.83	217.88
$[FeL_2(H_2O)Cl]\ H_2O$	429.25	3.78	9.48	8.40	169.78	208.34	156.57

Thermogravimetric studies : Thermogravimetric study indicates all the complexes are stable up to 60-700C. All the complexes shows half decomposition temperature(Table 4). The Thermal activation energy was calculated by Freeman-Carroll,20 Horowitz-metzger21 and Broido22 method.

Conclusions

In conclusion, we have synthesized new ligand 2-hydroxy-5-chloro-3-nitro acetophenone 4-phenyl-2 imino thiazole and their metal complexes. Ligand was found to bind the metal ion monobasic (ON) bidentate manner. Conclusion of thermal decomposition temperature and activation energy of synthesized Schiff base metal complexes

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Fabrication and Characterization of Ce modified $SmFeO_3$thick film

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Abstract
Thick films of $SmFeO_3$ were prepared onto a glass substrate by screen printing technique and fired at 500^0C for 30 min. As-prepared pure $SmFeO_3$ thick films were then dipped into 0.1 M aqueous solution of Cerium Chloride for 5 min. The films were then fired at 550 ^{0}C for 30 min to obtainCe modified $SmFeO_3$ thick films. Structural and morphological properties ofboth pure and surface modified $SmFeO_3$ thick films were characterized by Field Effect Scanning Electron Microscopy (FE-SEM) and Energy Dispersive X-Ray Analysis (EDAX) techniques. The effect of cerium doping on microstructure and surface morphology of pure $SmFeO_3$ thick film was discussed.
Keywords: $SmFeO_3$, Surface modification, Perovskite, Gas sensor.

Intruduction
Presently, environmental pollution due to hazardous gases emitting from auto and industrial exhaust has become a big challenge for human being. Therefore, detection and monitoring these gases is strongly required for better air quality. Different techniques have been employed for environmental monitoring. Among them metal oxide based gas sensors are of practical interest due to their small size. In 1962, Seiyama et al reported first semiconductor metal oxide gas sensor and since then different semiconducting metal oxides have been studied for ethanol, benzene, NO_2 and VOCs [1-3].But, their gas sensing characteristics such as sensitivity, selectivity, stability and operating temperature are still unsatisfactory.

Over a past few decade, perovskites of type ABO_3 (A: rare earth, B: transition metal) have attracted a great deal of attention for gas sensordue to their improved physical and chemical properties.Due to its doping flexibility, adsorption and desorption behavior can be controlled and sensor performance can be optimize. Properties of perovskite such as ionic and electronic conductivity, chemical stability and reactivity depends on the nature and amount of A and B cations. These properties can be tuned for particular application by partial substitutions at A-site, B-site and/or both A-site and B-site. Therefore perovskites have extensively studied for wide range of applications including solid oxide fuel cell[4], catalysis[5] and gas sensors[6-7].Among various perovskite oxides, $SmFeO_3$is reported to be a promising material for gas sensor due to its stability in thermal and chemical atmosphere. $SmFeO_3$is one of the rare earth orthoferritep-type semiconducting material[8]. It is extensively used in gas sensor for oxidizing gases like O_3,NO_2, ethanol. However, its use for reducing gases, like CO and $H_2$is limited because of its lower reduction stability and electrical conductivity[9-10] .Both reduction stability and electrical conductivity depends on nature of A and B cations. ABO_3 type perovskite structure of $SmFeO_3$ permits the modification in microstructure by partial substitution at A-site and/or the B-site. Literature survey showed that doping of A-site with bigger cation enhances reduction stability whereas doping at B-site affects electrical conductivity as well as thermal stability. Researchers have reported the advantages of introducing Ce at A-site and Co, Ni and Mg at B-site[11-12] . S.M. Bukhari et al have reported that the partial substitution of Sm by Ce within the solubility limit improves the electrical conductivity of perovskite as well as prevents it from decomposing under reducing conditions[13] . This creates the possibility of using Ce doped $SmFeO_3$ as a gas sensor for reducing gases.

For the synthesis of $SmFeO_3$ perovskite different methods like sol-gel method[14] and hydrothermal method [15] have been adopted. Sol-gel method in citric system has advantage of providing $SmFeO_3$ perovskite powder with high sensitivity and selectivity.
In our previous work, we reported the synthesis of pure $SmFeO_3$ perovskite powder by Sol-gel method. In the present work, surface modification in $SmFeO_3$ thick films prepared by screen printing method was achieved by dipping technique.

Methods And Material
2.1.Preparation of $SmFeO_3$ powder
Stoichiometric amounts of samarium nitrate$Sm(NO_3)_3.6H_2O$, iron nitrate $Fe(NO_3)_3.9H_2O$and citric acid monohydrate were mixed in the ratio 1:1:1. The mixture was grounded in Agate mortar for 30 minutes. Ethylene glycol was added to this mixture under constant stirring at 75^0C for 2 hours to obtaina sole which was then dried into a gel. The gel was dried in oven at 110^0C for 12 hours and allowed to cool naturally. Finally, sample was calcined at 800^0C for 4 hours.

2.2.Preparation of $SmFeO_3$ thick films

The thixotropic paste was formulated by mixing the fine powder of $SmFeO_3$ with the solution of ethyl cellulose in a mixture of organic solvent The ratio of inorganic to organic part was 75:25 .This paste was then screen-printed on glass substrate in desired pattern.The films were fired at 500^0C for 30 min. and termed as pure $SmFeO_3$thick film.

2.3.Preparation of Ce surface modified thick films

As-prepared pure $SmFeO_3$thick films were dipped into 0.1 M aqueous solution of cerium chloride for 5 min. After drying, these films were fired at 550 ^{0}C for 30 min and termed as Ce surface modified $SmFeO_3$thick film.

Results And Discussion

3.1. X-ray diffraction and surface morphology analysis of pure $SmFeO_3$ powder

X-ray diffraction pattern of synthesized pure $SmFeO_3$ powder was reported in our previous paper [16]. The crystallite size was estimated to be 50.08 nm.

3.2. Surface morphology of pure and modified $SmFeO_3$ thick films by FESEM analysis

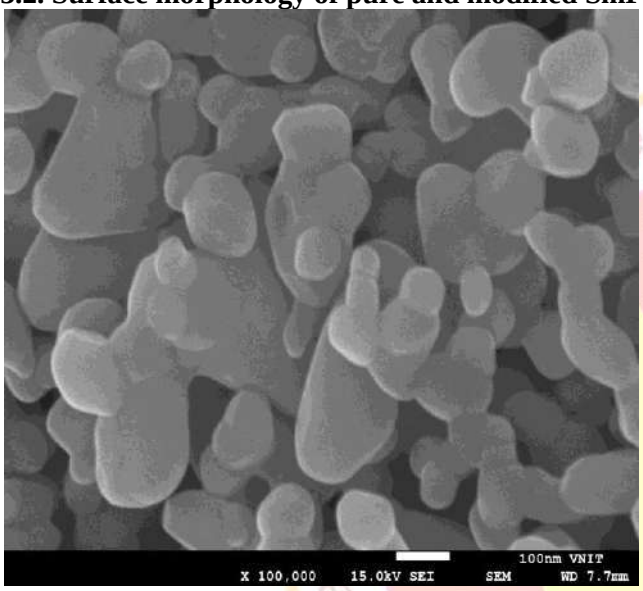

Fig. 1: FESEM of pure $SmFeO_3$ thick film.

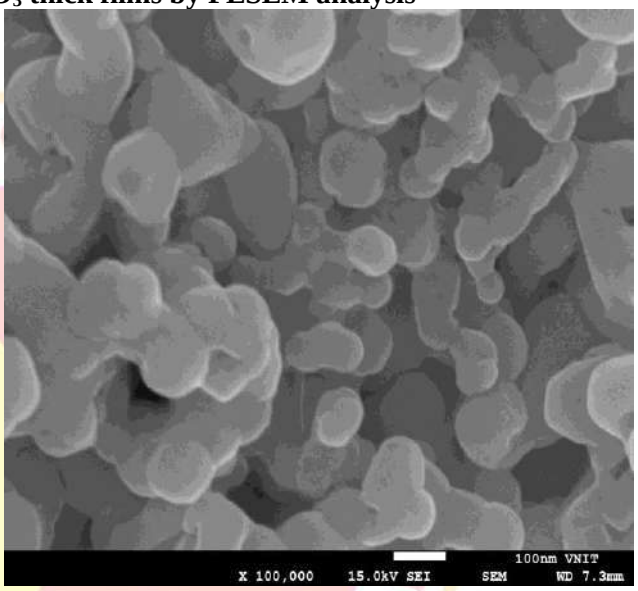

Fig. 2: FESEM of Ce doped $SmFeO_3$ thick film.

Fig. 1 represents the FESEM images of pure $SmFeO_3$ thick film fired at 500 ^{0}C for 30 min. The micrograph shows the presence of large number of grains with grain size ranging from 53 nm to 131 nm on the film. The films were highly porous with inner layer of perovskite type oxide adhere to the substrate.Due to the firing temperature, sintering proceeded and growth of the grains was observed. The composition of organic vehicle also influences the morphology of film. The presence of α-terpineol favored the sintering of grains.Fig. 2 depict FESEM image of Ce doped $SmFeO_3$ thick film for dipping time interval 5 min and fired at 550 ^{0}C for 30 min. The micrograph shows the distribution of smaller particles around the larger grains. The smaller particles may be attributed as Ce species. The modified thick film appears to have comparatively high porosity and large surface area for oxygen adsorption.

3.3.Elemental composition of pure and modified $SmFeO_3$ thick films by EDS analysis

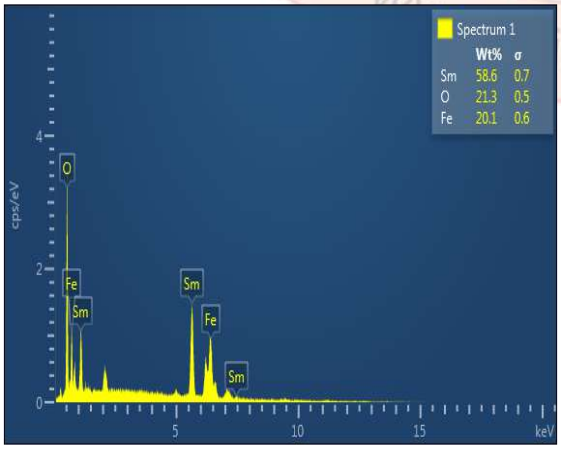

Fig 3: EDS of pure $SmFeO_3$ thick film.

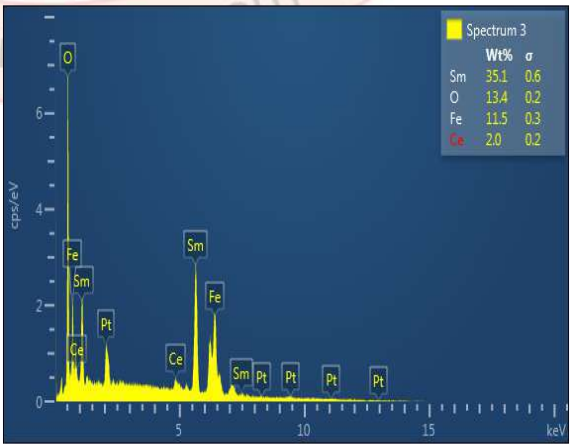

Fig 4: EDS of Ce doped $SmFeO_3$ thick film.

Elemental analysis of pure and Ce doped thick films was carried out by EDS technique. Table 1 represents the wt % of constituent elements of both pure and modified films.

Table 1**:** Quantitative elemental analysis**.**

	Pure $SmFeO_3$ thick film	**Ce modified $SmFeO_3$ thick film**
Sm (wt.%)	58.6	35.1
O (wt.%)	21.3	13.4
Fe (wt.%)	20.1	11.5
Ce (wt.%)	---	2.0
Total	100	100

It is observed from table 1 that weight percentage of oxygen decreases due to Ce doping. Further it was observed that both the samples are oxygen deficient but oxygen deficiency is more in Ce doped thick film than pure SmFeO3 thick film. Therefore,Ce doped SmFeO3 thick film may facilitate increased oxygen adsorption.

Conclusions

The results demonstrated that surface modification of SmFeO3thick films can be achieved by dipping technique.Moreover Surface modification promotes increased oxygen adsorption. FESEM analysis and EDX analysis respectively confirm the structural morphology and the elemental composition of both pure and modified thick films .

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X-ray diffraction, Uv-Vissible and Photoluminescence Study of Dysprosium Doped Lanthanum Calcium Borate La_2O_3-8CaO-$3B_2O_3$ Glasses

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Abstract.

In the present work, borate glasses doped with dysprosium in the system (x)Dy_2O_3-(1-x)La_2O_3-8CaO-$3B_2O_3$ with x = 0 (LaCOB), 0.01, 0.03, 0.05 and 0.07 (Dy:LaCOB) were prepared by melt-quench technique. The synthesized amorphous material confirmed by the X-ray techniques. The various optical transition states of dysprosium ions doped in glasses are analyzed by using ultraviolet-visible spectroscopy. The optical band gaps of the grown glasses have been evaluated form optical transparency data. The results show that there are decreases in the optical band gap as the concentration of dysprosium ions increases. The luminescence properties of LaCOB glasses doped with different concentrations of Dy^{3+} ions show emission bands at 470 nm ($^4F_{9/2}\rightarrow{}^6H_{15/2}$) and 575 nm ($^4F_{9/2}\rightarrow{}^6H_{13}$) under the excitation of 358 nm. The chromacity colour coordinates have also been calculated.

Introduction

The rare earth ions doped borate glasses and crystals find important application in the area of solid state laser, fiber laser, waveguide laser, laser amplifier in optical communication, optical data storage and amplifier in integrated optical components [1-4]. Different glassy materials like as borate, phosphate, fluoride, fluoroborate and tellurite have been usually investigated to understand the outcome of host glass on the lasing properties of rare earth ions [5, 6]. Borate glasses as a host material doped with different rare earth (RE) ions are being developed and their suitability as laser material has been tested by studying optical properties [7, 8]. The chemical composition of borate and oxide glass plays a vital purpose in the photoluminescent properties of RE ions, affecting the usefulness of the energy transition process. Oxide glasses are classical stable hosts for obtaining efficient luminescence in rare earth ions due to their high thermal stability, high transparency, and good rare earth ion solubility [6, 9-11].

Recently, the physical and optical properties of rare earth ion Dy^{3+} doped Li_2O–K_2O–B_2O_3 glasses were reported by Azizan et al [10]. Luminescence and spectroscopic properties of Dy^{3+} doped sodium fluoro-phosphate (FP) glasses useful for white light emission were reported by Babu et al [11]. Optical properties of lead borate glasses containing Dy^{3+} ions have been studies by Pisarska et al [12]. Glasses doped with trivalent dysprosium are being considered as promising laser materials due to their optical transitions. Dy^{3+} ions have two strong emission transitions with $^4F_{9/2}\rightarrow{}^6H_{15/2}$ transition corresponding to magnetic dipole at 470 nm in the blue wavelength region and $^4F_{9/2}\rightarrow{}^6H_{13/2}$ transition corresponding to electric dipole at 575 nm in the yellow wavelength. The currently transition is hypersensitive and is effectively dependent lying on the host glass composition. This transition is also significantly affected by the radial integral of 4f and 5d electrons. Thus, by providing suitable environment and varying Dy^{3+} ion concentration we can tailor the intensity ratio of yellow to blue transition so as to generate white light [3, 5, 8].

This report, present the synthesis of borate glasses doped with dysprosium in the system (x)Dy_2O_3-(1-x)La_2O_3-8CaO-$3B_2O_3$ with x =0 (LaCOB), 0.01(1%Dy:LaCOB), 0.03 (3%Dy:LaCOB), 0.05 (5%Dy:LaCOB) and 0.07 (7%Dy:LaCOB) prepared by melt-quench technique. Prepared glasses were subjected to optical and luminescence studies.

Experimental

The Lanthanum oxide (La_2O_3) was purchased from Central Drug House (CDH) Ltd, India. Calcium carbonate ($CaCO_3$) was purchased from Fisher Scientific, Dysprosium oxide (Dy_2O_3) was purchased from LOBA, India and boric acid (H_3BO_3) was purchased from sd Fine chemicals. All materials were of analytical reagent grade.

An alkali borate glasses (LaCOB), (1%Dy:LaCOB), (3%Dy:LaCOB), (5%Dy:LaCOB) and (7%Dy:LaCOB) were prepared by the melt-quenching method. The chemicals La_2O_3, $CaCO_3$, Dy_2O_3 and H_3BO_3 with 99.99% purity used as the starting raw materials. Dy_2O_3 in appropriate amount was mixed with La_2O_3, $CaCO_3$, and H_3BO_3. The raw materials were crushed in a mortar with the help of pestle to make the homogeneous mixtures. The mixtures were calcinated at 550^{o}C for 6 hours to remove moisture. The material was removed from the crucible and once again crushed and calcinated at 950 ^{o}C for 12 hours. This process was repeated two times. The obtained polycrystalline powders of LaCOB, 1%Dy:LaCOB, 3%Dy:LaCOB,

5%Dy:LaCOB and 7%Dy:LaCOB compound were melted in a platinum crucible in an electric furnace at 1000 ^{o}C and kept it for 120 minutes [6]. The obtained melt was poured on a stainless steel plate and immediately pressed with second one for immediate quenching to form amorphous phased solid. The formed glass samples were allowed to cool gradually to room temperature. The obtained glasses were cut into rectangular slabs of dimensions 4x2x1 mm^3 and polished to use for further characterizations.

Characterizations

Powder X-ray diffraction (XRD) patterns of powdered glass samples were recorded on a X-ray diffractometer (Rigaku, Miniflex-600, Japan) using Cu-Kα (λ=1.504 Å) radiation to check the amorphous state of the prepared glass sample at the scanning rate of 8 deg/min and 2θ varied from 10–90^{o}. Ultraviolet-visible (UV-Vis) transmission and optical band gap studies have been performed using Black-CSR-50 Stellar Net Spectrophotometer, USA. Photoluminescence study has been done using FL-7000 Hitachi Fluorescence spectrophotometer.

Results and discussion

1.1. **Powder XRD study**

XRD patterns were taken to confirm the glassy nature for all the glass samples. The typical XRD profile of the LaCOB, 1%Dy:LaCOB, 3%Dy:LaCOB, 5%Dy:LaCOB and 7%Dy:LaCOB are shown in figure 1. The pattern doesn't exhibit any sharp peak that reflects amorphous nature of the material.

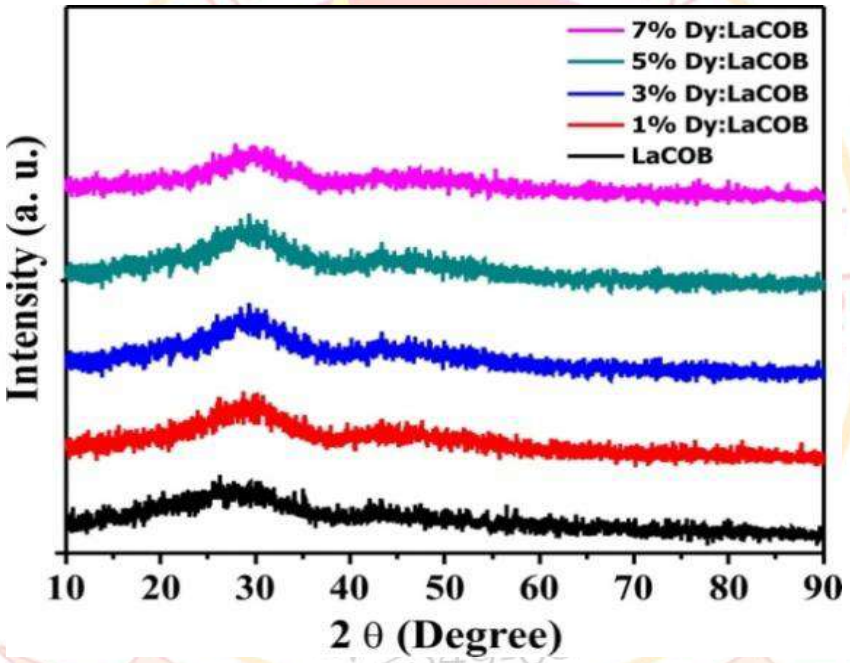

Figure 1. Powder XRD patterns of pure and Dy doped LaCOB glasses.

1.2. **UV-Vis spectroscopy**

Figure 2 a) shows the optical transmission spectra of prepared glasses recorded in the wavelength range 190-1083 nm. It can be observed that, the absorption peak for the grown glasses have lower cutoff wavelength in the range 204 - 220 nm. The glasses LaCOB, 1%Dy:LaCOB, 3%Dy:LaCOB, 5%Dy:LaCOB and 7%Dy:LaCOB show the optical transparencies around 75, 67, 53, 45 and 34% of in the UV and visible region, respectively. The optical transparencies of prepared LaCOB glasses doped with dysprosium are found to be decreased with increasing concentration of Dy^{3+}. The values of optical absorption coefficient (α) were determined using the relation (1) from the absorption data;

$$\alpha = (2.303/d)\log(1/T) \quad (1)$$

Where, T is the transmittance and d is the thickness of the glass [6]. The direct optical band gap of the glass can be determined by using relation (2);

$$(\alpha h\nu)^2 = A\,(Eg - h\nu) \quad (2)$$

Where, A is a constant.

Plotting a graph between $(\alpha h\nu)^2$ and photon energy ($h\nu$), as shown the figure 2 b), and drawing tangent to straight portion intercepting energy axis gives energy band gap and it was found to be 6.3, 6.2, 6.1, 5.7 and 5.3eV for LaCOB, 1%Dy:LaCOB, 3%Dy:LaCOB, 5%Dy:LaCOB and 7%Dy:LaCOB, respectively.

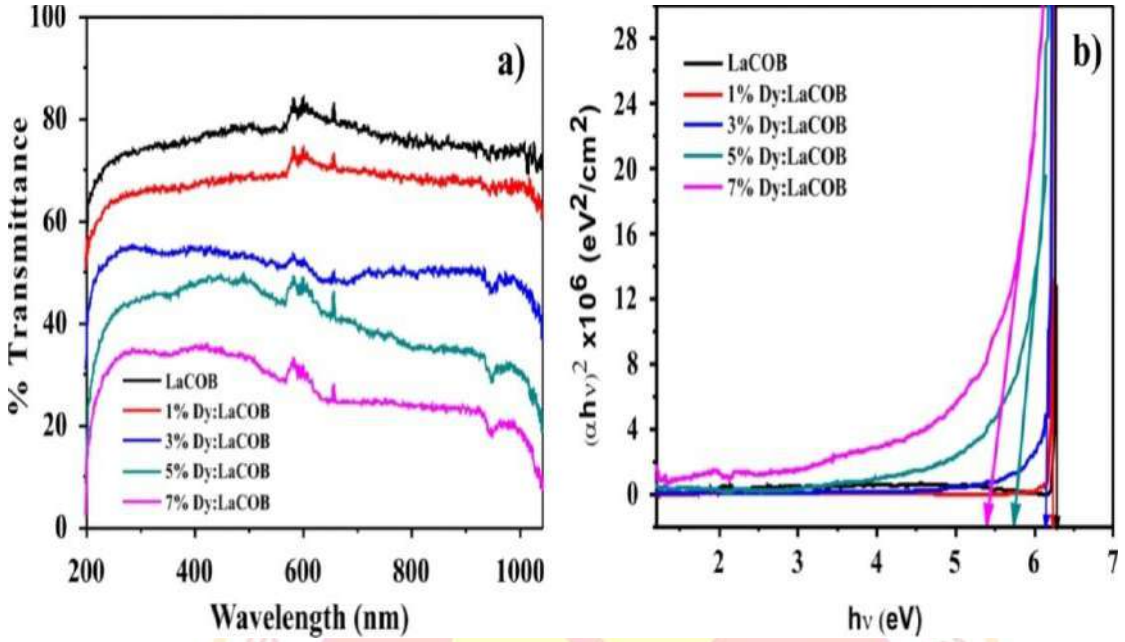

Figure 2.
a) UV-Vis transmission spectra and
b) a plot of variation of $(\alpha h\nu)^2$ versus hν pure and Dy doped LaCOB glasses.

1.3. Photoluminescence study and color quality of light Source (CIE)

The figure 3 (a) shows the photoluminescence spectra of Dy^{3+} doped LaCOB glasses. The glass shows emissions at 470 and 575 nm under the excitation at wavelength 358 nm. The peak centered at blue emission band (at 470 nm) is a typical emission of Dy^{3+} ions corresponding to transition $^4F_{9/2}\rightarrow{}^6H_{15/2}$ ground state, while the peak centered at yellow emission (at 575 nm) corresponds to the $^4F_{9/2}\rightarrow{}^6H_{13/2}$ optical transition of Dy^{3+} [2, 5, 13]. Similar results were reported for Dy^{3+} doped sodium aluminum phosphate and alkali lead tellurofluoro borate glasses [13-15]. The transition from $^4F_{9/2}\rightarrow{}^6H_{15/2}$ is a magnetic dipole transition which possess most intense blue emission band at wavelength 470 nm. The transition from $^4F_{9/2}\rightarrow{}^6H_{13/2}$ is electric dipole transition which possess moderate intense yellow emission band at 575 nm [1, 6, 7, 14]. The excitation spectrum Dy^{3+}:LaCOB shows narrows line in the UV range [15]. From figure 3 a), emission spectra also indicate that luminescence intensity increases with increase in concentration of Dy^{3+} dopant [10, 2]. The photoluminescence intensity for both blue and yellow emissions increased with the concentration of Dy^{3+} ions reaching a maximum at x = 0.05, and then it decreased for x = 0.07 because of concentration quenching.

The excitation spectra of Dy^{3+} doped LaCOB glasses recorded at emission wavelength of 470 nm are as shown in the figure 3 (b). The spectra consist of excitation band ($^6H_{15/2}\rightarrow{}^4P_{5/2}$) at 358 nm for various concentrations of Dy^{3+} ions [3, 6, 16]. The energy level scheme for all the observed absorption of Dy^{3+} doped LaCOB glass is shown in Fig. 3 (c).

The emission spectra (as shown in figure 3 (d)) of Dy doped LaCOB glasses consist of two important emissions in blue color at 470 nm and yellow color at 575 nm wavelengths. The appropriate color combinations of blue and yellow light results into a white light emission. CIE diagram is provided for an understanding of color relationships [2, 5, 7, 17]. This outcome it is predict that Dy doped LaCOB glasses can be intended for white light emitting devices under ultraviolet excitation.

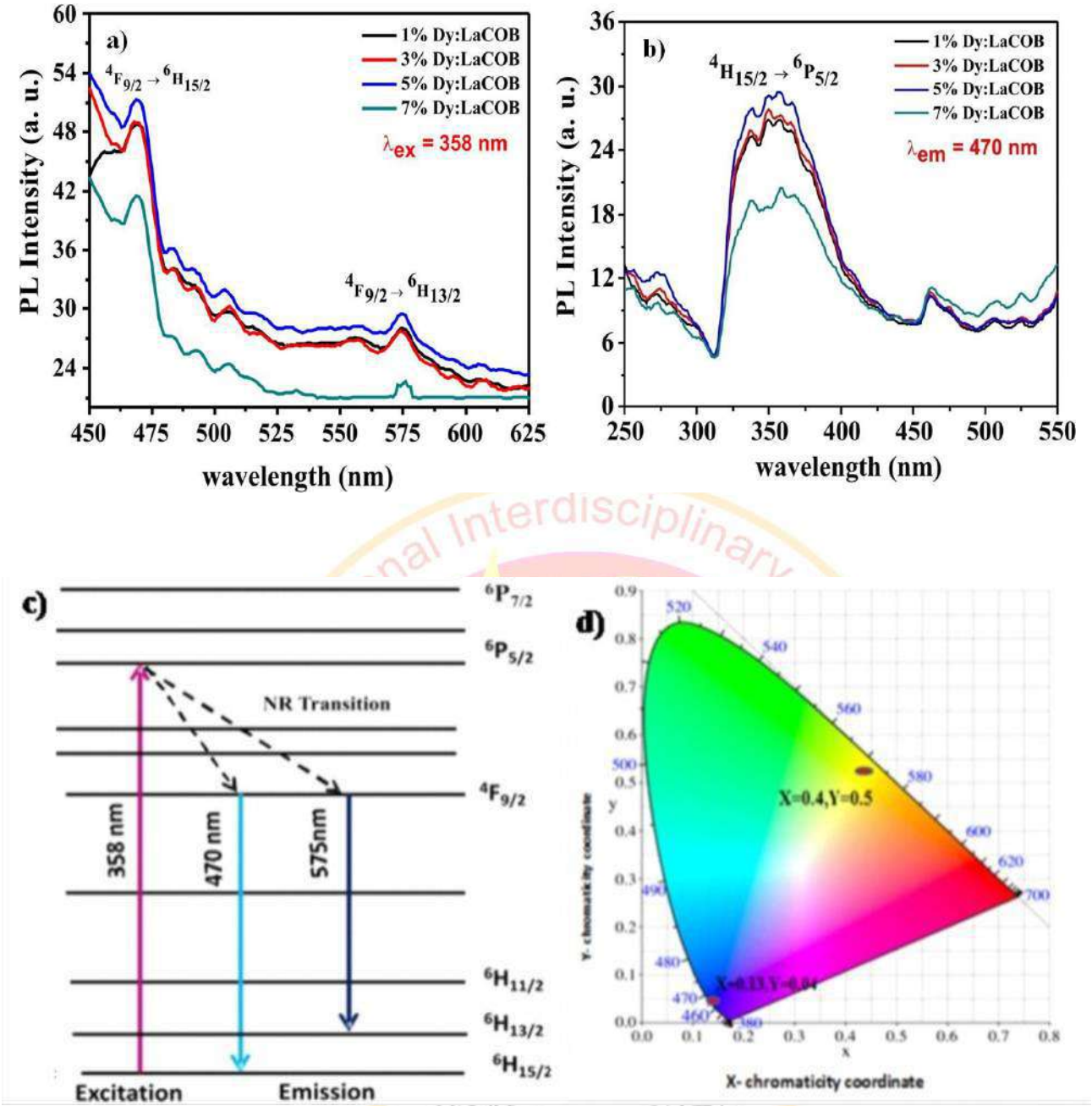

Figure 3.
a) Emission spectra, b) Excitation spectra,
c) Energy level diagram of Dy^{3+} ions showing transition and
d) The CIE diagram of Dy: LaCOB glasses.

Conclusion

The Pure and Dy doped LaCOB glasses are successfully synthesized by melt quenching method. The amorphous nature of the glasses was confirmed by XRD technique. Borate glasses pure and Dy doped LaCOB have been fabricated and characterized their properties through emission spectra and CIE 1931 color chromaticity studies. The photoluminescence of Dy^{3+} ions were studied and related to the host matrix nature. It is clear that there are two emission bands $^4F_{9/2} \rightarrow ^6H_{15/2}$ and $^4F_{9/2} \rightarrow ^6H_{13/2}$ over the excitation wavelength of 358 nm these bands correspond to the electron transitions from the discrete levels $^4F_{9/2} \rightarrow ^6H_{15/2}$ and $^4F_{9/2} \rightarrow ^6H_{13/2}$ transitions respectively for Dy^{3+} and which confirmed the presence of trivalent rare-earth ions in the glass matrix. The photoluminescence intensity for both blue and yellow emissions increased with the concentration of Dy^{3+} ions reaching a maximum at x = 0.05, and then it decreased for x = 0.07 because of concentration

quenching. It also provides guidelines for several applications in connection with industrial and technological needs. This outcome may potential to expand emission display and laser material applications.

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Optical Propertiesand IV characteristic of proton conductor solid polymer electrolyte

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Abstract:
In the present work proton conductor solid polymer electrolyte was prepared by solution cast technique. The dc conductivity was obtained from I-V characteristics by using Kitley 6487 picoammeter/voltage source meter instrument at various constant temperature. UV-Vis Double Beam Spectrophotometer in the wavelength range (190-700) nm were used to investigate the optical properties. It was found that the energy band gaps are decreased upon the increase of salts concentration. This is explained in terms of charge transfer complexes between the dopant and host matrix
Keywords: Polyvinyl alcohol, Ammonium Iodide, Optical properties

Introduction:

In recent year, there has been increase in focus on replacing traditional aqueous electrolyte by solid polymer electrolyte. Due to flexibility electrochemical stability, long life etc. Among solid polymer electrolyte proton conducting polymer electrolyte have receive considerable very much attention due to their large *applications.* Polyvinyl alcohol (PVA) is commercial availability, dopant dependent electrical and optical property, good film forming ability, mechanical strength, low cost etc. It has carbon chain backbone with hydro-oxyl group attach to the methane carbon. PVA is a nontoxin and water-soluble polymer having good charge storage capacity [1]. The electrical and optical properties of polymers can be modified by the addition of suitable dopants. [2-6]. This paper presents the results of investigations on the electrical and optical properties of NH_4I doped PVA films.

Experimental technique

In the present study, polyvinyl alcohol, ammonium iodide and deionized water were used to prepare solid polymer electrolyte. A solid polymer electrolyte system based on polyvinyl alcohol (PVA) with ammonium iodide (NH_4I) was prepared using solution cast technique. The film of pure and different composition of PVA -NH_4I has been prepared by solution cast technique. In this technique, appropriate amount of PVA and NH_4I have been dissolved individually in deionizedwater. These solutions have been mixed together in different molar ratio and stirred well by using magnetic stirred for 10-12 hr to obtained homogenous mixture. The obtained mixture is casted in petri dish. The whole assembly was placed in dust free chamber. The solvent was allowed to evaporate slowly at room temperature for 3-4 days. The films have been formed with uniformed thickness.

Result and Discussion:

I-V Characteristics

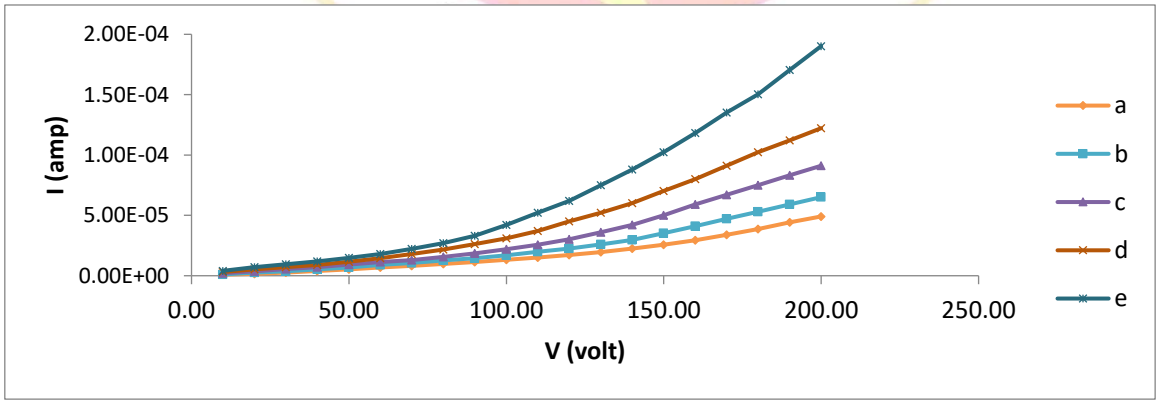

Fig 1: Variation of current (I) with voltage (V) for PVA with different (a) 5 mole %, (b) 10 mole %,(c) 15 mole %, (b) 20 mole %, (d) 25 mole % of NH_4I.

Current (I) with Voltage (V) characteristics of polyvinyl alcohol with ammonium iodide of different mole percent as shown in figure (1). The current increases linearly with applied voltage and followed ohmic conduction [7]. But in fig 1 when added the concentration of ammonium salts the current increases nonlinearly with applied voltage and absence of Ohmic conduction this mechanism is very different to intrinsic

semiconductor. There is no permanent dipole and random charge trap in sample. The localize motion of charge traped in the sample serves as effective electric dipole, when external electric field is applied. As a result, quasi particle was createdpolarons and bipolarons acts as charge, therefore the curve is nonlinear, when the strength of electric field is increases, the formation of charge are increases which contributing to increase in current with respect to voltage [8-9].

Optical properties:

Optical absorption spectra of PVA doped withammonium iodide in different molar percentages were carried out over a wavelength range 190-700 nmto determine the optical constants such as direct and indirect band gap. Most of the time, bandwidth divides semiconductors and insulations intotwo main parts, namely direct show energy bandwidth materials and indirect energy bandwidth materials. Valence and conduction bands both are exhibited a very less (zero) crystal momentum indirect bandgap. But in the indirect bandgap, the conduction band doesn't agree to crystal zero momentum and shift of the phonon energy. Shalliday and Davishad explained both the direct and indirect bandgap that occur near the basic edge of the band both direct and indirectand can be observed by plotting $(\alpha h\upsilon)^2$ and$(\alpha h\upsilon)^{1/2}$ as a function of energy hυ. [10]

The analysis of Thutpalli and Tomlin isbased on the following relations [11].

$(\alpha h\upsilon) = \beta_1(h\upsilon - E_{gd})^{1/2}$---------- (1)

$(\alpha h\upsilon) = \beta_2(h\upsilon - E_{gi})^{2}$---------- (2)

For direct and indirect electron transitions respectively, where hυis the photonenergy, $E_{gd}$is the direct band gap, E_{gi} is the indirect band gap, α is the absorption coefficient, and β_1, β_2 are constants. These expressions willbe helpful in the determination of the band structure of materials. To determine thenature and width of the band gaps $(\alpha h\upsilon)^2$ and $(\alpha h\upsilon)^{1/2}$ were plotted as a function ofincident photon energy.The direct band gap values are obtained from the plots of $(\alpha h\upsilon)^2$vs.hυshown in figure 2.

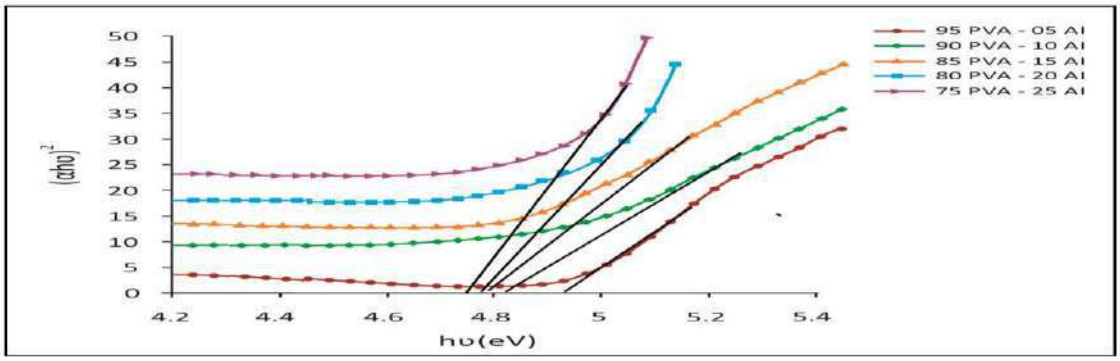

Fig:2 $(\alpha h\upsilon)^2$ as function of photon energy (hυ) for PVA with different ammonium iodide

The direct band gap value is determined byextrapolating the linear portion of the curve on to the energy axis. Theintercept on the x-axis gives the direct band gap energy value. It isshow that band gap decreases with increase in ammonium salt concentration. The direct band gap lies within 4.94ev to 4.74 ev.

For indirect transitions, which require photon assistance, the absorption coefficient has the following dependence on the photon energy

$\alpha h\upsilon = A(h\upsilon - E_g + E_p)^2 + B(h\upsilon - E_g + E_p)^2$

where Ep is the energy of the photon associated with the transition and A and B are constants depending on the band structure. The indirect band gaps were obtained from the plots of $(ahv)^{1/2}$ vs hν (photon energy) plots as shown in Fig 3.

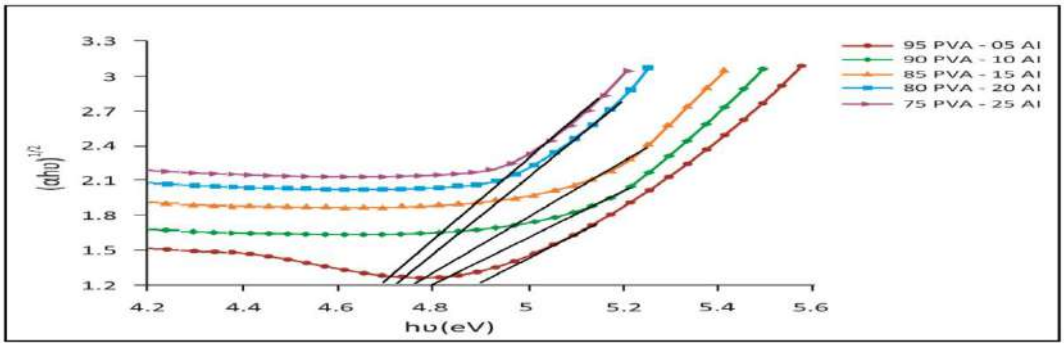

Fig: 3$(\alpha h\upsilon)^{1/2}$ as function of photon energy (hυ)for PVA with different ammonium salt

The indirect band gap value is determined by extrapolating the linear portion of the curve on to the energy axis. The intercept on the x-axis gives the indirect band gap energy value. The indirect band gap lies with 4.92 eV to 4.71 eV.It is observed that as the dopant concentration of polymer electrolyte is increased, thevalues of band gap energy have decreased gradually. This indicates theeffect of complexation on the value of band gap. Ammonium salt beingadded to the PVA polymer to enhance proton conduction. [12-15]

Conclusion:

Proton conductor solid polymer electrolyte of polyvinyl alcohol doped with different concentrationof ammonium iodidehas been successfully prepared by solution cast technique.In this investigation, I-V characteristics of prepared samples were studied. Optical absorption spectra of PVA doped with ammonium iodide in different molar percentages were carried out over a wavelength range 190-700 nmto determine the optical constants such as direct and indirect band gap. It was revealed that the energy band gaps are decreased with the increasing of salts concentrationdueto charge transfer complexes between the dopant and host matrix

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Study of Ac Electrical Conductivity and Dielectric Constant of 1:1 Pmma PVDF Polyblends At Various Temperatures and Frequencies

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Abstract

In the present work dielectric constant and ac conductivity of PMMA and PVDF (1:1) blend sample have been investigated at various constant temperatures ranging from (313K to 343K), in the frequency range of (1KHz to 500KHz).The results have been presented in the form of graphs. It has been found that the dielectric constant increases with increase of temperatures at constant frequencies, the dielectric constant decreases with decrease in temperatures at constant frequencies, the AC conductivity increases with frequencies at various constant temperatures. They attain almost saturation values as the frequency approaches its maximum value.

Index Terms: 'Solution cast method', percentage of amorphousness/crystallinity,1:1 (PMMA+PVDF), AC conductivity, dielectric constants etc.

Introduction

When two or more polymers are mixed together, polyblends or polymer alloys are obtained. This physical mixing or blending of two polymers produces alloys with quite different properties, which can be potentially useful. Two polymers are generally incompatible as they have very low combinatorial entropy of mixing for the components. This is insufficient to overcome the positive heat of mixing of polymers to make the Gibb's free energy of mixing negative. Only in the presence of specific interaction between two polymers (e.g. Hydrogen bonding, acid-base type interaction etc.), heat of mixing is negative that makes the free energy of mixing a negative quantity and then the mixing is spontaneous. Unlike the mixing of small molecules, the dictum like likens like does not hold good for mixing of macromolecules. However, both compatible and incompatible blends are industrially important materials. Two polymers may form the compatible blend, which exists as single phase. The incompatible blends on the other hand exist as two- phase system. Since most blends combine immiscible components and so the material that results contains tiny particles of one polymer in a matrix of the other. Controlled mixing and cooling of the blend makes it possible to form the .particles in the optimum concentration and range of sizes. Blending makes it possible to combine the good properties of several polymers. The most direct method to obtain a polyblend is to mix two component polymers in the molten state (melt mixing). In this case the extent of mixing depends on the rate of diffusion of the molecules. Since such a mixing requires high temperature, the polymer may decompose and undergo chemical changes.

Experimental Technique

Method of preparation of PMMA-PVDF (1:1) Undoped blends film:

Sample Preparation

Preparation of thin films using Pool of Mercury (As shown in fig 1).In the present work, Isothermal Evaporation Technique (Sangawar 1995,Belsare and Deogankar 1998) has been used, as it is best suited to the conditions in the laboratory. The two polymers PMMA-PVDF were taken in the ratio 1:1 were dissolved in the common solvent Dimethyl Formamide (DMF).The solution was kept for 1-2 days to allow polymers to dissolve completely to yield uniform solution. The solution mixture was stirrer with constant slow uniform speed for 1 hour at room temperature to get completely homogeneous solution. A glass plate (15 cm x 15 cm) thoroughly cleaned with water and later with acetone was used as a substrate. To achieve perfect levelling (and uniformity in thickness of the films), a pool of mercury was used (figure given below) in a plastic tray. The solution was poured on the glass plate and was allowed to spread uniformly in all directions on the substrate. The whole assembly was placed in a dust free chamber at room temperature. The solvent in the solution was thus allowed to evaporate completely and get air-dried. The film on the glass substrate was then removed and cut into small pieces of suitable sizes. In this way the films were prepared by isothermal evaporation technique. Further it was dried for 1 day to remove any traces of solvent.

Fig. 1 Pool of mercury

The solution was poured on the glass plate and was allowed to spread uniformly in all directions on the substrate. The whole assembly was placed in a dust free chamber at room temperature. The solvent in the solution was thus allowed to evaporate completely and get air-dried. The film on the glass substrate was then removed and cut into small pieces of suitable sizes. In this way the films were prepared by isothermal evaporation technique. Further it was dried for 3 days to remove any traces of solvent.

Thickness Measurement

The thickness of each sample film was measured at the four different places by using the Digital Micro meter (Mitutoyo Corporation, Japan) as shown in fig 2 . The average of four readings was taken as the sample thickness.

Fig 2. Digital Micrometer

Measurement of AC Electrical Conductivity and Dielectric Constant

The sample holder with temperature controlled electric oven supplied by **Pushpa Scientific, Hyderabad**, in conjunction with **4284 A Precision LCR meter (20 Hz - 1MHz) supplied by Agilent Technology, Singapore** has been used for the measurement of AC electrical conductivity and dielectric constant.

Fig.3 LCR meter and sample holder for the measurement of AC conductivity

The film sample was loaded into the sample holder in an oven. The entire experimental set up is as shown in fig 3.The AC frequencies were applied (in the range 1 KHz -1 MHz) across the sample by using the 4284 A precision LCR meter (20 Hz -1 MHz). The corresponding dielectric constants were measured by using LCR meter. From the dielectric data, the AC conductivity of the samples was calculated by using the relation [Rao, 2000],

$$\sigma_{ac} = \frac{f \cdot \varepsilon_r \cdot tan(\delta)}{1.8 \times 10^{10}}$$

Where,

f = Frequency applied in Hz

ε_r= Dielectric Constant at frequency f

$tan(\delta)$ = Dielectric loss tangent**.**

Results And Discussion

Several researchers [Shukla and Gupta 1987 , , Aziz and Aggour 1999, Khaled et al. 2003, Raghvendra et al. 2003, Muhammad Akram 2005] have studied the AC electrical conduction / Dielecrtic properties of various polymers composites . In the present work dielectric constant and ac conductivity of 1:1 PMMA-PVDF blend sample have been investigated at various constant temperatures ranging from (313K to 343K), In the frequency range of (1KHz to 500KHz).The results have been presented in the form of graphs (Fig no. 4, 5, 6, 7).

The graphs have been plotted for the variation of

1) *AC conductivity with frequencies at various constant temperature.*

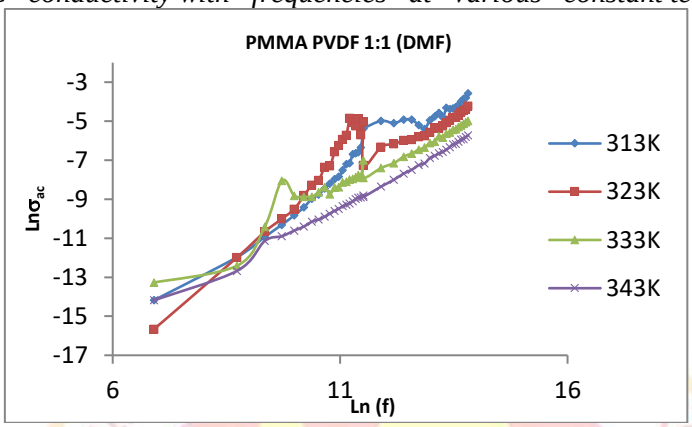

Fig. 4 $\log_e(\sigma_{ac})$s versus $\log_e(f)$

2) *Dielectric constant ε_r with frequency at various constant temperature.*

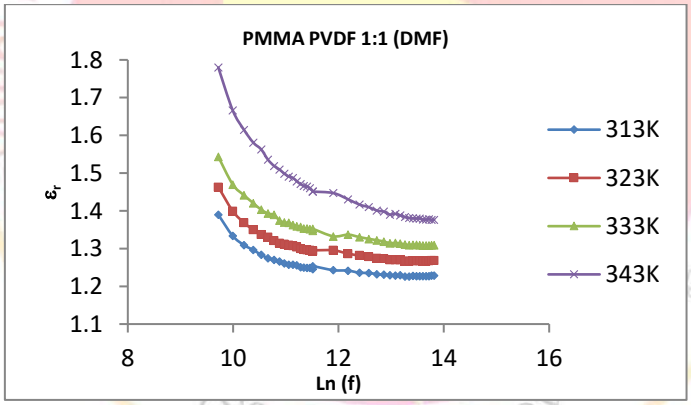

Fig. 5 ε_r *versus* $\log_e(f)$

3) *Dielectric constant with temperature at various constant frequencies.*

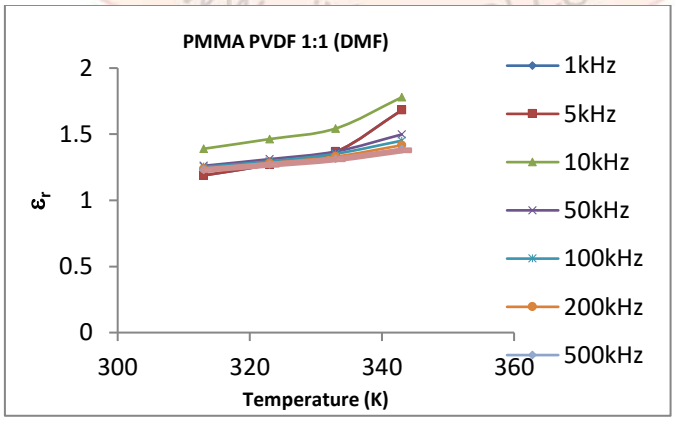

Fig. 6 ε_r versus temperature

4) *AC conductivity with temperature at various constant frequencies*.

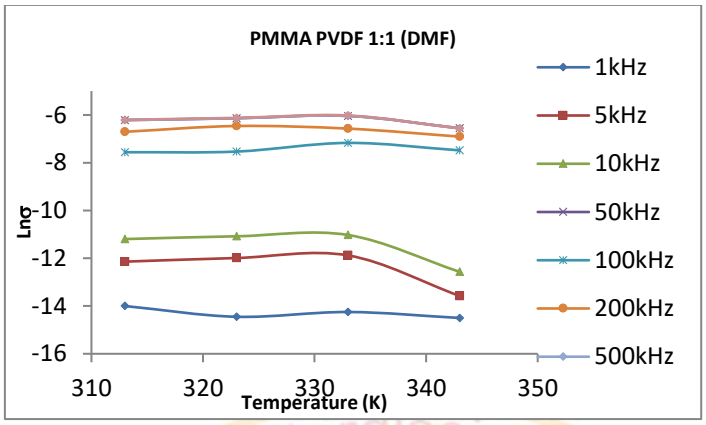

Fig. 7 $\log_e(\sigma_{ac})$s versus temperature

The following parameters have been consider for discussion
1) Dielectric constant(ε_r)
2) AC electrical conductivity(σ_{ac})

1) The Dielectric Constant (ε_r)
i) Increases with the increase of temperature
ii) Decreases with the increase of frequency

2) The AC conductivity (σ_{ac})
i) increases almost linearly with frequency above 1KH at the various constant temperatures and it attains almost constant saturation values as the frequency approaches its maximum value 1MH.
ii) At the constant frequency, seems to remain almost constant with the increases of temp in the range 313K to 363K.

Effect of temperature on dielectric constant:

It has been noticed that, there is an increase in the value of dielectric constant with the increase of temperature in case of 1:1 PMMA and PVDF polyblend samples.
Among two polymers used to form a blend system PVDF is non- polar while PMMA is weakly polar polymer. The introduction of polar polymer into the non-polar one is reported to reduce its resistance and hence increases the conductivity and also the dielectric constant.

Effect of frequency on dielectric constant:

The microscopic behaviour of the dielectric material under the influence of ac electric field can be understood from the polarization which constitutes a dielectric or which is introduced during its preparation. The polarization effect is dependent on the nature of dipoles and the frequency of the applied electric field.
As stated earlier, under the static electric field or the ac field of low frequency, the net polarization of the sample is contributed by electronic polarization, atomic polarization and orientational polarization. As the frequency is increased, orientational polarization becomes unable to follow field variation at higher frequencies. As a result dielectric constant decreases with the increase of frequency [Muhd. Akram et al.,(2005); Reda,(2006); Rao et al., (2000)].

Effect of frequency and temperature on ac conductivity:

The ac conductivity has been measured by increasing the frequency from 1KH to 1MHz at various constant temperatures 313K, 323K, 333K, and 343K for the blend system. It has been noticed that the ac conductivity increases with the increase in frequency. [Tripathi S. K. and Gupta A. (2012)]

Conclusions

1) The dielectric constant increases with increase of temperatures at constant frequencies
2)The dielectric constant decreases with decrease in temperatures at constant frequencies
3)The AC conductivity increases with frequencies at various constant temperatures
4)They attain almost saturation values as the frequency approaches its maximum value.
5) The dielectric constant does not significantly vary with temperature in the temperature range from (313K to 343K).

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Thermal Studies Of Thiazole Schiff Base Complexes Of Vo(Iv), Zr(Iv) And Uo_2(Vi)

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Abstract:

Newly synthesized product thiazole Schiff base was derived from the condensation of thiazole and 2-hydroxy-5-chloro-3-nitro acetophenone. The Schiff bases behaved as charge bidentade ligand. The ligand was characterized by elemental analysis and spectral methods. The coordinating ability of the ligand is investigated by preparing its metal complexes with VO(IV), Zr(IV) and UO_2(VI) have been prepared and characterized by elemental analysis, conductance measurements, molecular weight determinations, spectral and thermal studies. The synthesized products are coloured solids, soluble in DMF, DMSO and THF.

Keywords: *Schiff base, Magnetic susceptibility, Thermal*

Introduction :

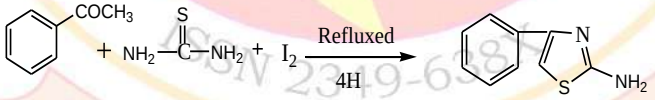
The newly synthesized Schiff bases, 2-acetylthiophene thiosemicarbazone and thiophene-2-aldehyde thiosemicarbazone and their metal complexes with Co(II), Cu(II), Zn(II) and Ni(II) complexes and Their Schiff bases metal complexes were tested for antibacterial activity[1] The Schiff bases play a significant role in the area of coordination chemistry. Synthesis, characterization and antifungal activity of manganese (II) complex with Schiff Base derived from acetylacetone andl leucine[2] and Spectral and thermal characterization of metal complexes containing schiff Base ligands.[3] Compounds containing an azomethine group (CH=N), known as Schiff bases, were formed by the condensation of a primary amine with a carbonyl compound. Schiff bases of aliphatic aldehydes were relatively unstable and were readily polymerizable. Schiff bases and their complexes are shows good progress in thermal analysis[4]. The thermogravimetric technique has been great significance research method on thermal stabilsation and thermal decomposition. Thermogravimetric could provide theory for material heating treatment and application.[5,] The aim of present investigation is to synthesize various transition metal complexes of Schiff base derived from 2-hydroxy-5-chloro-3-nitro acetophenone and 2-amino-4-phenylthiazole

Experimental ;

All the chemicals were of A.R. grade and used as received. 2-hydroxy-5-chloro-3-nitro acetophenone (HCNA) and 2-amino-4-phenylthiazole was prepared by known methods[6-9]. The solvents were purified by standard methods[10].

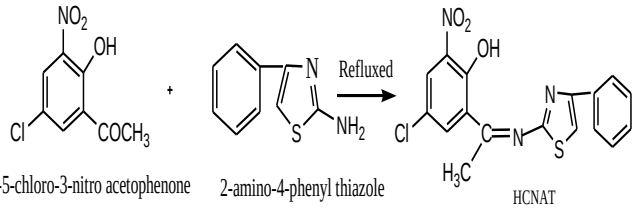
Synthesis of 2-amino-4-phenylthiazole;

The synthesis of 2-amino-4-phenylthiazole prepared by known method[7-9]. The product was filtered and crystallized from 70% ethanol, after several minutes the golden coloured product of 2-amino-4-phenylthiazole was separated out. Yield: 9g (75%); m.p.: 148-150^{0}C



Acetophenone 2-amino-4-phenylthiazole

Synthesis of 2-hydroxy-5-chloro-3-nitroacetophenone 4-phenyl-2 imino thiazole [HCNAT]: A solution of 4-phenyl-2 imino thiazole (0.02M) in 25ml of ethanol was added to an ethanolic solution(25ml) of 2-hydroxy-5-chloro-3-nitro acetophenone (0.02M) and the reaction mixture was refluxed on a water bath for 4h. After cooling a pale yellow coloured crystalline solid was separated out. It was filtered and washed with ethanol, crystallized from DMF and dried under reduced pressure at ambient temperature. The purity of ligand was checked by elemental analysis and m.p. It was also characterized by IR and ^{1}H NMR spectral studies. Yield:75%; m.p. 305^{0}C



2-hydroxy-5-chloro-3-nitro acetophenone 2-amino-4-phenyl thiazole HCNAT

Table1. Analytical data of the Ligands.

Ligand	Molecular Formula	Formula Weight	Color and nature	Elemental Analysis			
				C% found (Cal.)	H% Found (Cal.)	Cl% Found (Cal.)	S% Found (Cal.)
HCNAT	**$C_{17}H_{12}N_3O_3SCl$**	**373.06**	**Yellow Crystalline**	**52.35 (52.20)**	**03.20 (03.34)**	**9.22 (9.38)**	**08.34 (08.46)**

Preparation of complexes: All the metal complexes were prepared in a similar way by following method. To a hot solution of ligand HCNAT (0.02M) in 25ml of ethanol a suspension of respective metal salts was added drop wise with constant stirring. The reaction mixture was refluxed on a water bath for 3-5 h. The precipitated complexes were filtered, washed with ethanol followed by ether and dried over fused calcium chloride. Yield : 55-60%

The complexes are soluble in DMSO and DMF but insoluble in water and common organic solvents. The metal chloride content of complexes were analyzed by standard methods11,12 The 1H NMR spectra of ligand was recorded and obtained from RSIC Chandigarh. IR spectra of the compounds were recorded on Perkin Elmer 842 spectrophotometer in the region 400-4000cm-1, Carbon, Hydrogen and Nitrogen analysis were carried out at RSIC, Punjab University, Chandigarh. The molar conductance of the complexes at 10-3 M dilution in DMF were determined using equiptronic digital conductivity meter EQ-660 with a cell constant 1.00 cm-1 at room temperature. The magnetic moment measurement were made on a Gouy balance at room temperature using [HgCo(SCN)4] as the calibrant. The thermogravimetric analysis were performed on laboratory set up apparatus in air atmosphere at 100 C min-1 heating rate. The molecular weights of the complexes were determined by Rast method

Table 2. Analytical data and molar conductance of the compounds.

Ligand	Formula weight g $mole^{-1}$	Colour	Elemental Analysis Found (Calcd.)				μ_{eff} B.M	Λ_M (Ω^{-1} cm^2 mol^{-1})
			M%	C%	H%	Cl%		
$[VOL_2]$	812.2	Green	5.65	48.23	2.35	8.42	1.5	12.1
			(6.09)	(48.29)	(2.86)	(8.69)		
$[ZrL_2(OH)_2]\ 2H_2O$	906.4	Yellow	9.42	43.23	3.26	7.46	Dia	16.8
			(9.61)	(43.68)	(3.39)	(7.64)		
$[UO_2L_2]$	1015.3	Orange	22.34	38.58	2.12	6.52	Dia	14.7
			(22.62)	(38.63)	(2,22)	(6.86)		

Result and Disscution :

The Schiff base HCNAT and its complexes have been characterized on the basis of ^{1}H NMR, IR spectral data, elemental analysis, molar conductance, magnetic succeptibility measurements and thermogravimetric analysis data .

All these values and analytical data is consistent with proposed molecular formula of ligand . All the compounds are coloured solid and stable in air. They are insoluble in water but soluble in coordinating solvents like DMF and DMSO. The molar conductance values in DMF(10-3 M) solution at room temperature (Table2) shows all the complexes are non electrolytes.

The 1H NMR spectra of ligand shows signals at δ 12.14,(1H, s phenolic OH), δ 7.56, 7.54, 7.53 and 7.52 (4H, m, phenyl) δ 6.81,6.80, and 6.78 (3H, s, Phenyl), 6.68 (1H,s, thiophene), and 2.56 (3H, s, methyl) 11,13-15.

IR spectra of ligand and metal complexes shows (C=N) peaks at 1622 cm-1 and absence of C=O peak at around 1700 – 1750 cm-1 indicates the Schiff base formation16-19.

3. IR spectra of ligand and metal complexes

Compound	(O H) hydrogen bonded	(C=N) imine	(C O) phenolic	(M O)	(M N)	(C S)
HCNAT (LH)	3119	1622	1514	--	--	1126
$[VOL_2]$	--	1595	1508	515	438	1092
$[ZrL_2(OH)_2]\ 2H_2O$	--	1605	1499	448	418	1102
$[UO_2L_2]$	--	1590	1448	542	485	1074

Thermogravimetric studies: Thermogravimetric study indicates all the complexes are stable up to 60-700C. All the complexes shows half decomposition temperature(Table 4). The Thermal activation energy was calculated by Freeman-Carroll,20 Horowitz-metzger21 and Broido22 method.

Table 4. Thermal decomposition data of HCNAT and its complexes.

Compounds	**Half Decompo-sition** Tempera-ture **(°C)**	**Activation Energy (kJ mole^{-1})**			**Frequency Factor** Z **(sec^{-1})**	**Entropy Change -ΔS (J mol^{-1} K^{-1})**	**Free Energy Change ΔF (kJ mol^{-1})**
		B*	H-M**	F-C***			
HCNAT (LH)	260.46	3.22	5.47	4.31	87.28	211.42	118.65
$[VOL_2]$	400.35	5.22	8.62	6.36	138.82	211.82	148.78
$[ZrL_2(OH)_2]\ 2H_2O$	711.30	7.43	18.56	11.18	222.62	208.72	217.68
$UO_2L_2]$	800.00	19.88	22.16	17.69	353.24	207.74	239.69

Conclusions :

There is synthesized new ligand 2-hydroxy-5-chloro-3-nitro acetophenone 4-phenyl-2 imino thiazole and their metal complexes. Ligand was found to bind the metal ion monobasic (ON) bidentate manner. Conclusion of thermal decomposition temperature and activation energy of synthesized Schiff base metal complexes

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Investigation on Ionic Conductivity of PVA-PEG with NH_4Br Polymer Electrolyte

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Abstract:
A solid polymer film based on polyvinyl alcohol (PVA) and polyethylene glycol (PEG) complexed with ammonium bromide (NH_4Br) was prepared using solution cast technique. The ionic conductivity of the films was measured in the temperature range 323K–363 K. Dielectric constant and temperature dependant values of PVA –PEG poly blend film with NH_4Br where measured in the frequency range 20Hz-1MHz. The decrease in dielectric constant was observed with increase in frequency and also observed increase in temperature.
Keywords: PVA-PEG, NH_4Br, Ionic conductivity.

Introduction

In recent year, electrical conduction in polymer have been studied to understand the nature of charge transport. Polymer is a good insulating material with low ionic conductivity. PEG are synthetic water soluble polymers. They have a wide range of applications, including use in pharmaceutical experiments, food additives and plasticizers [1-2]. Polyvinyl alcohol (PVA) are commercial availability, dopant dependent electrical and optical property, good film forming ability, mechanical strength, low cost etc. It has carbon chain backbone with hydro-oxyl group attach to the methane carbon. PVA is a nontoxin and water soluble polymer having good charge storage capacity [3]. To increase the ionic conductivity depend on the addition of some dopant (ammonium salts) in polymer. Ammonium salts have been a very good proton doner to the polymer matrix system and to increase the conductivity [4-6]. Over the course of a year, a number of approaches were tested to increase the ionic conductivity of these polymeric electrolytes in the addition to developing new electrolytes **[7-9].** This system has been studied on account of the fact that both polyethylene glycol (PEG) and polyvinyl alcohol (PVA) are separately reported to form highly amorphous complexes and gels with salts and acids [10–13].

Eperimental technique

In the present study, polyvinyl alcohol, polyethylene glycol, ammonium bromide and deionized water were used to prepare solid polymer electrolyte. A solid polymer electrolyte system based on polyvinyl alcohol (PVA) and polyethylene glycol (PEG) complexed with ammonium bromide (NH_4Br) was prepared using solution cast technique. The film of pure and different composition of PVA-PEG-NH_4Br has been prepared by solution cast technique. In this technique, appropriate amount of PVA-PEG and NH_4Br have been dissolved individually in double distilled water .These solution have been mixed together in different molar ratio and stirred well by using magnetic stirred for 10-12 hr to obtained homogenous mixture. The obtained mixture is casted in petri dish. The whole assembly was placed in dust free chamber. The solvent was allowed to evaporate slowly at room temperature for 3-4 days. The films have been formed with uniformed thickness.

Result and discussion

Ionic conductivity

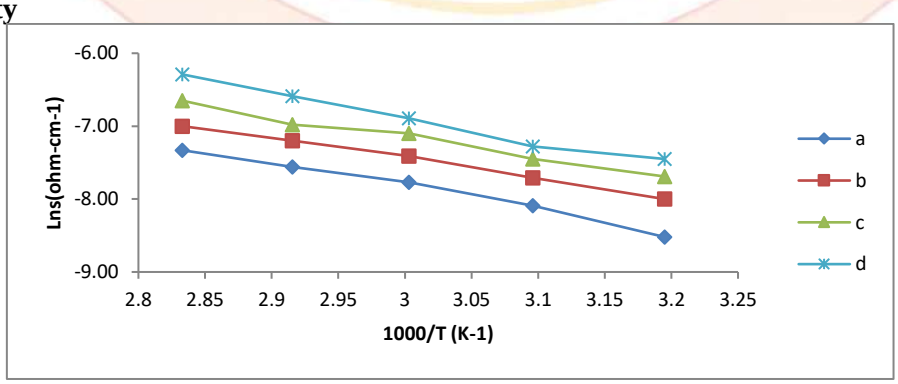

Fig 1:Variation of conductivity ln (σ) with temperature (Arrhenius plots) for (a) PVA-PEG with different (b) 5 mole %, (c) 15 mole %, (d) 25 mole % of NH_4Br.

The temperature dependence conductivity, lnσ verses 1000/T as shown in fig 1. The conductivity of solid polymer electrolyte PVA-PEG-NH_4Br is mostly depend on temperature. The temperature increases conductivity also increases in accordance with Arrhenius equation is given by -

$\sigma_T = \sigma_0 \exp(-Ea\backslash kT)$

Where σ_0 is the pre exponential factor, E_a is the activation energy and k is the Boltzmann constant [11-12]. The ionic conductivity is enhanced with increase of temperature and added with mole percent of ammonium bromide which suggest that the free volume around the polymer chain system increases causes the mobility of ions and polymer segments [13]. The segmental motion either allows the ions to hop from one side to another side. Hence ionic motion in polymer electrolyte is due to hopping of ions from one side to another site and the dynamic segmental motion of polymer , and accordingly the conductivity of polymer electrolyte becomes high. The ionic conductivity studies shows that the conductivity has been greatly affected by the addition of salt and the maximum conductivity has been observed for 25 mole % of salt doped in poly blend electrolyte.

Dielectric constant:

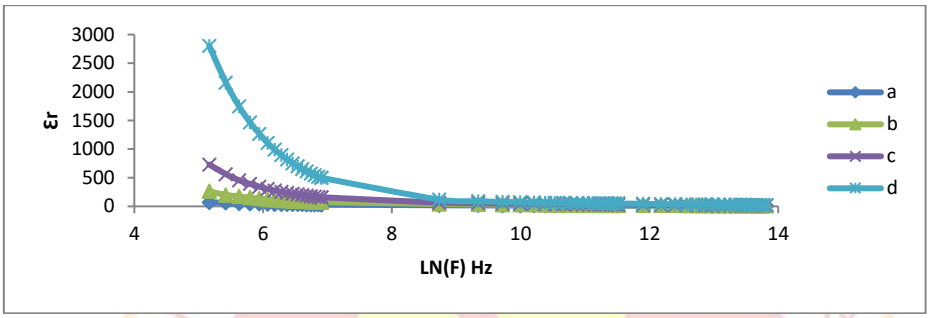

Fig 2: Variation of Dielectric constant with frequency (a) PVA-PEG (b) 5 mole %, (c) 15 mole %, (d) 25 mole % of NH_4Br.

The frequency dependent dielectric constant of PVA-PEG-NH_4Br mole % as shown in (figure 2) . It is observed that dielectric constant is high at low frequency. Due to contribution of charge accumulation at electrode-electrolyte interface. But in high frequency dielectric constant decreases and nearly constant value with increases in frequency. This is due to the dipole not being able to follow apposite of electric field variation at higher frequency [14-15].

Conclusion

A solid polymer electrolyte system based on polyvinyl alcohol (PVA) and polyethylene glycol (PEG) complexed with ammonium bromide (NH_4Br) was prepared using solution cast technique. The frequency dependant dielectric constant decreases with increase in frequency. It is reveal that electrical conductivity of PVA-PEG doped with NH_4Br increases with increasing salt concentration as well as temperature, which is attributed to the formation of charge transfer complexes.

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Magnetite Iron Oxide/Activated Charcoal (Fe_3O_4-AC) Composite for Arsenic Removal

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Abstract:

The article focuses on the development of magnetic Fe_3O_4 over the activated charcoal for the removal of arsenic (III) from synthetic aqueous solution. Chemical activation of activated charcoal was done using HNO_3 at 200°C to enhance the adsorption capacity of activated charcoal. Again, to enhance its adsorption capacity it was loaded with magnetic Fe_3O_4 which was synthesized by hydrothermal process. Batch study was conducted in which effect of pH, effect of contact time, effect of adsorbent dose on the arsenic adsorption were studied. The results shows that the activated charcoal loaded with magnetic Fe_3O_4 could remove arsenic very effectively at pH 8 at maximum adsorbent dose 1.2 g/L with the contact time 45 min at room temperature. Furthermore, the adsorption data were studied with Langmuir and Freundlich adsorption isotherm to analyze the equilibrium of the experiment. Langmuir model best fitted with the experimental results with the maximum adsorption capacity 7.28 mg/g. this finding indicated that the activated charcoal loaded with magnetic Fe_3O_4 could be used for the removal of trivalent arsenic from aqueous solution.

Keywords: Arsenic (III), Fe_3O_4, Activated charcoal, Langmuir model, Freundlich model

Introduction:

The whole countries in the world facing a problem of waste water contamination and its purification [1]. The government agencies around the world searching out the solution of wastewater contamination and its treatment by making various policies and in that Indian government specially focus on the swachchabharatabhiyan through that the treatment water of ganga river is the mainline task now a days. For the treatment of wastewater and also for the removal of toxic metal ions, organic and inorganic pollutants there are many methods available like reverse osmosis, physico-chemical treatment, advance oxidation treatment, coagulation-flocculation process, ion exchange, membrane filtration etc [2]. But treatment of wastewater is not an easy task because many facts have to be considered if we are looking for the treatment of wastewater. In to that first one is the process should be feasible, it should be carryout at any suitable workplace, it should be cost effective and as the green parameter consist it should not generate waste [3]. Looking in to that view the current work was carries out in which the removal of toxic metal i.e., arsenic from the synthetic aqueous solution onto the Magnetite Iron Oxide/Activated Charcoal (Fe_3O_4-AC). The activated charcoal is well known for the purification of wastewater because of its high porosity, easy availability, cost effective and Regenerability [4-6]. Furthermore, is surface is available for the modification by using surface active agents, nanomaterial, polymers etc. which will enhance its BET surface area and ultimately the adsorption capacity increases. Arsenic contamination is the major concern the various parts of the India [7]. As per the WHO guideline the maximum permissible limit for the arsenic in groundwater is 10 µg/L but in India highest concentration of arsenic was found to be in the range 0.003 - 3700µg/L. Usually inorganic arsenic is more toxic than the organic arsenic. In natural water arsenic persist in two oxidation state: arsenite (+3) and arsenate (+5). Long-term exposure to arsenic from drinking-water can cause diverse types of cancers, including skin, lungs, urinary bladder, kidney liver, and prostate cancers [8-9]. In developing countries two methods are widely used for the arsenic removal from wastewater one is precipitation and another is adsorption. A large amount of chemicals is required in precipitation method which finally creates sludge in the form of arsenic sulfide, calcium arsenate or ferric arsenate. On the other hand, adsorption method is easy to handle, cost effective and efficient and can be applied for the treatment of wastewater containing trace amount of pollutants [10]. Hence, the objective of this study was to find out the adsorption capacity of Magnetite Iron Oxide/Activated Charcoal (Fe_3O_4-AC) composite for the removal of As (III) from aqueous solutions

Material and Method

Synthesis of Adsorbent (Fe_3O_4-AC Composite)

Magnetic Fe_3O_4 was prepared by dissolving 0.8 g of $FeCl_3.6H_2O$ in 40 ml deionised water to it 2 ml ammonia solution were added under constant magnetic stirring at room temperature stir this mixture for about 30 min. Chemical activation of activated charcoal was done using HNO_3 at 200°C to enhance the adsorption capacity of activated charcoal.In beaker 0.1 g of activated charcoal were dissolve in 20 ml distilled water and 8 ml ethanol. Both this mixture was then transferred to Teflon crucible. For the hydrothermal treatment at 120°C, Teflon crucible was inserted in to stainless steel autoclave for 3 h. After the hydrothermal reaction, the autoclave was cooled down to room temperature. After that, the product was filtered, washed with deionised water and ethanol several times. The sample was dried in an oven at 60°C for 10 h Then, the obtained product designated as Fe_3O_4-AC composite and kept in cold condition for further studies.

Batch Adsorption Experiment

In the batch study various parameter like effect of pH, adsorbent dose, contact time were studied for the removal of Arsenic on Fe_3O_4-AC composite. A known concentration of Arsenic (III) solution was taken in a stoppered bottle to which definite amount of Fe_3O_4-AC composite were added and shaken at 500 rpm on rotary shaker for 1 h. After equilibrium the reacting solution was then filter and concentration of As(III) before and after was determine by molybdenum blue method at 840 nm using spectrophotometer.

Result And Discussion

Effect of pH: To study the effect of pH on As(III) removal in pH range 1-12 on Fe_3O_4-AC composite using 1.2 g of adsorbent, 5 mg/L initial As concentration and contact time 60 min are kept constant. 0.1 N HCl and 0.1 N NaOH was used to adjust the desired pH.

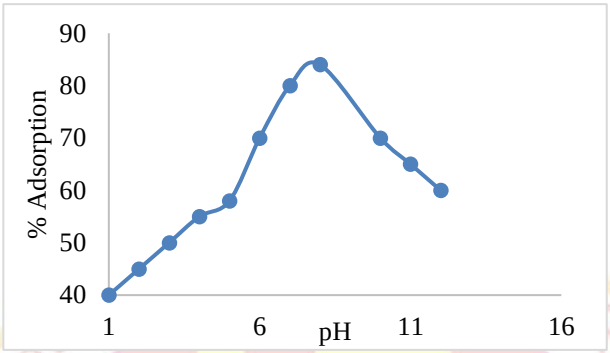


Fig. 1: Effect of pH

Effect of dose: To study the effect of adsorbent dose on As(III) removal on Fe_3O_4-AC composite by varying the dose of adsorbent from 0.1 g to 1.2 gm. pH 8, 5 mg/L initial As concentration and contact time 60 min are kept constant

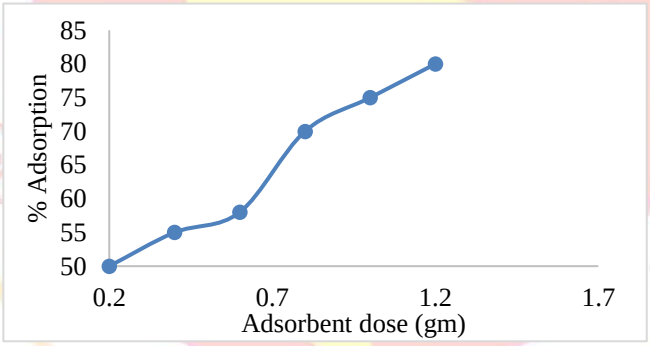


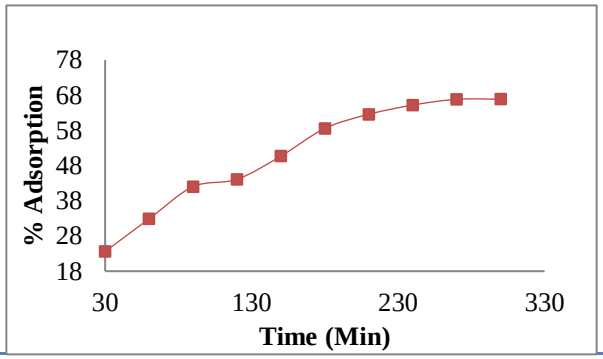
Fig. 2. Effect of adsorbent dose

Effect of contact time: The effect of contact time on the percentage of As(III) removal by Fe_3O_4-AC composite adsorbent was studied at different contact time from 5 to 120 min. Other parameters were kept constant,such as the adsorbent dose 0.5 g/L, initial As(III) concentration 5 mg/L, and pH 8. All the experimentswere carried out at room temperature. The percentage removal of As (III) adsorbed was calculated byusing the following equation.

$$\%\ \mathrm{As(III)Removal} = \frac{(\mathrm{Co} - \mathrm{Ce}) \times 100}{\mathrm{Co}}$$

Where Co = Initial concentration of Arsenic (mg/L) and Ce= final concentration of Arsenic (mg/L).

Fig.3. Effect of contact time



Adsorption Isotherm

To study the interaction between As(III) and magnetite Fe_3O_4-AC composite the equilibrium data was scrutinized and studied by using Langmuir and Freundlich adsorption model.TheresultsinAs(III)removal experimental datatobothFreundlichandLangmuirequation

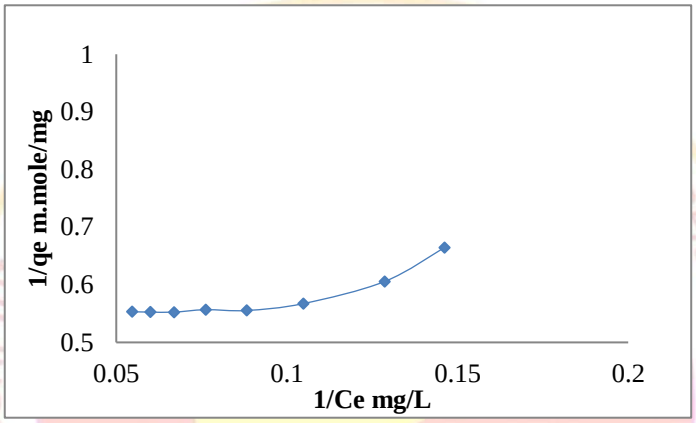
Isotherm Modelling

***Langmuir Adsorption Isotherm*: -**The Langmuir isothermmodel can be given as:

$$\frac{1}{q_e} = \frac{1}{Q^0 b} \times \frac{1}{Ce} + \frac{1}{Q^0}$$

The Langmuir constant Q^o is a measure of adsorption capacity and b is the measure of energy of adsorption. In order to observe whether the adsorption is favourable or not, a dimensionless parameter 'R_L' obtained from Langmuir Isotherm. The values of Q^o and b were evaluated from the intercept and slope of linear plots of $1/q_e$ vs. $1/C_e$ respectively.

***Freundlich Adsorption isotherm*: -** It is most commonly used adsorption isotherm model which describes adsorption on heterogeneous surfaces with interactions among adsorbed molecules. It helps to investigate the nature of adsorption and the adsorption capacity of an adsorbent. The linear form of Freundlich isotherm model is



$$\log q_e = B.\log C_e + \log K_f$$

Fig.4: Langmuir Adsorption Isotherm

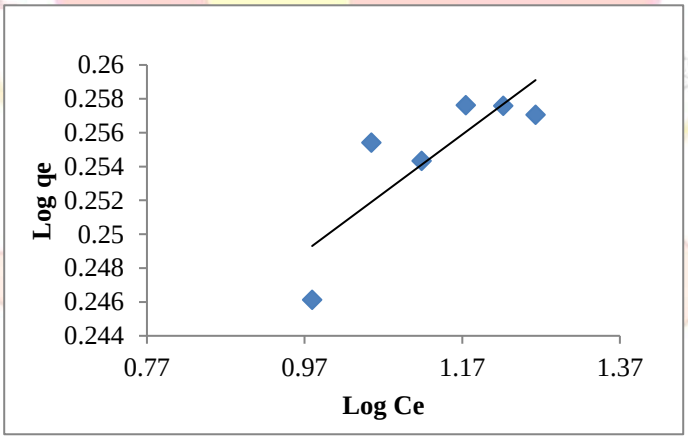


Fig. 5: Freundlich Adsorption Isotherm

Conclusion

Fe_3O_4-AC composite shows good adsorption efficiency for the removal of As (III). The removal efficiency was found to be rapid at initial stage and then slow down because it is depending upon the concentration of metal ions and active sites on the adsorbent for the binding of metal ions. The adsorption isotherm data was best revealed by the Langmuir adsorption isotherm. The maximum removal efficiency was found to be at pH 8. Batch study indicates that as the adsorption dose, contact time increases adsorption capacity increases.

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Conflict of interest: Nil

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A Efficient Synthesis of Nanoparticleof Some Benzothiazoles Derivative of Glucose

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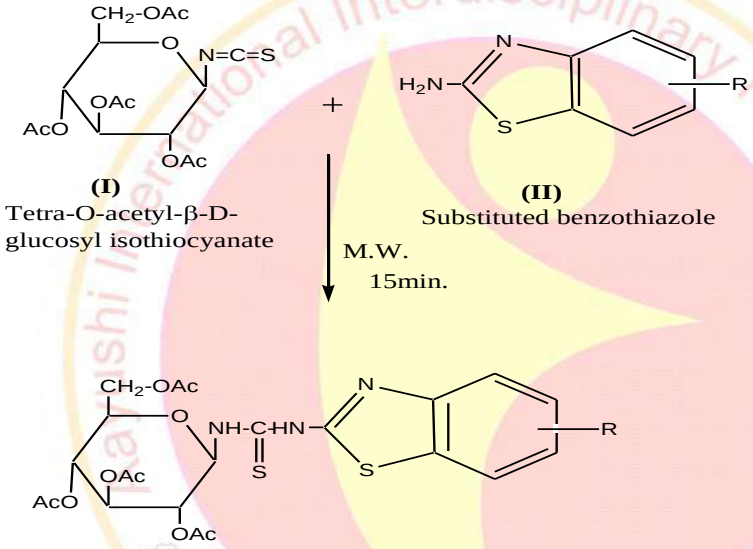
Abstract :-

Benzothiazoles have played an important role in the field of biochemistry and medicinal chemistry due to their highly pharmaceutical and biological activity. The development of synthetic processes is undoubtedly one of the most significant problems facing researchers.Nanotechnology also involves the synthesis of nanoparticles. These compounds arouse interest as potential biologically active substances and versatile intermediates for preparing various derivatives. To achieve the principle of green chemistry process, it leads to in search of green synthesis of nanoparticles.Here we havesynthesized 1-Tetra-O-acetyl- β -D-glucosyl-3-(2)- benzothiazolyl thiocarbamides by reaction of Tetra-O-Acetyl-B-D-glucosyl isothiocyanate with various substituted benzothiazole. The identities of newly synthesis compounds have been established based on usual chemical transformation and U.V, IR, NMR, Mass and Partical Size analysis Analytical studies.

Keywords: *TAG Isothiocyanate , substituted benzothiazoleand 1-Tetra-O-acetyl- β -D-glucosyl-3-(2)- benzothiazolyl thiocarbamidesnanoparticles.*

Graphical Abstract :-



Introduction :-

Benzothiazole is a representative class of sulfur-containing heterocycles and involves a benzene ring fused to a thiazole ring. The benzothiazole ring system was originally found in various marine and terrestrial natural compounds, which is widely used as vulcanization accelerators, antioxidants, plant growth regulators, anti-inflammatory agents, enzyme inhibitors, imaging reagents, fluorescence materials, and electroluminescent devices due to its highly pharmaceutical and biological activity [1,2,3,4]. Especially, benzothiazole plays an important role in the field of medicinal chemistry and renders an extensive range of biological activities including anti-cancer [5,6], anti-bacterial [7,8], anti-tuberculosis [9,10], anti-diabetic [11], anthelmintic [12], anti-tumor [13,14,15], anti-viral [16,17], anti-oxidant [18], anti-inflammatory [19,20], anti-glutamate and anti-parkinsonism [21], anticonvulsant [22], muscle relaxant activities [23], neuroprotective [24], inhibitors of several enzymes and so on [25]. Hence, the synthesis of benzothiazoles is of considerable interest due to their potent and significant biological activities and great pharmaceutical value.

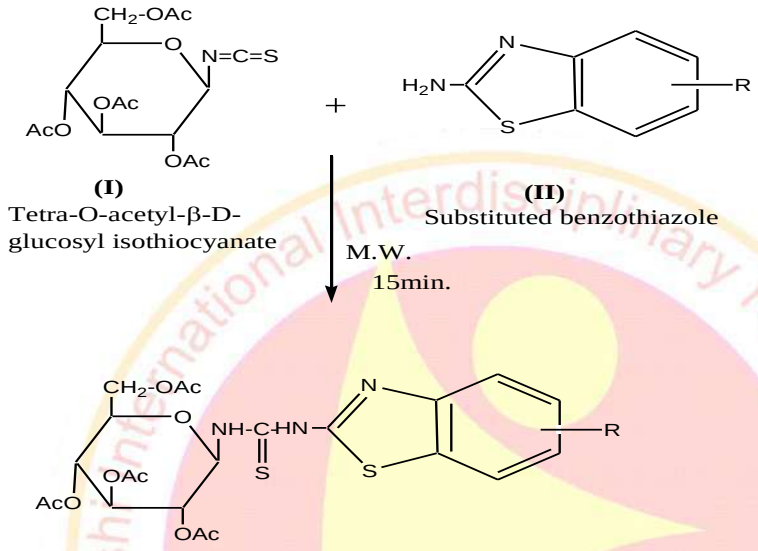
Nanotechnology, as defined by size, is naturally very broad, including the field of science as diverse as surface science, organic chemistry, molecular biology, semiconductor physics, energy storage, microfabrication, molecular engineering, etc. The associated research and applications are equally diverse, ranging from extensions of conventional device physics to completely new approaches based upon molecular self-assembly, from developing new materials with dimensions on the nanoscale to direct control of matter on the atomic scale. Nanotechnology may create many new materials and devices with various applications, such as in Nanomedicines, Nanoelectronics, and biomaterial energy production and consumer products.

Results And Discussion:

Nanoparticles:

A nanoparticle isa sub-classification of the ultrafine particle with lengths in two or three dimensions greater than 0.001 micrometer (1 nanometer) and smaller than about 0.1 micrometer (100 nanometers) and which may or may not exhibit a size-related intensive property. This term is a subject of controversy regarding the size range and the presence of a size-related property. Current usage emphasizes size and not properties in the definition. The length scale may be a hydrodynamic diameter or a geometric length appropriate to the intended use of the nanoparticle. The chemistry of thiourea of carbohydrates is extensively elaborated and well documented. These compounds arouse interest as potential biologically active substances and versatile intermediates for preparing various derivatives

Reaction Scheme:-



(I) Tetra-O-acetyl-β-D-glucosyl isothiocyanate

(II) Substituted benzothiazole

(III)

1-tetra-O-acetyl-β-D-glucosyl -3-substituted benzothiazolyl thiocarbamides

Here Tetra-O-Acetyl-β-D-Glucosyl-3-substitute benzothiazolyl thiocarbamide was synthesized by both methods; conventional and Microwave method.Tetra-O-acetyl-β-D-glucosyl isothioyanate was react with Substitute benzothiazole in benzene medium after that reaction mixture was titurate several times with petroleum ether . The product is confirmed based onthe melting point and other studies.

Experimental

Melting points were recorded on electro thermal melting point apparatus are uncorrected. Specificrotations were measured on Equip-Tronic digital polarimeter model no. EQ 800 at 30^0C in $CHCl_3$. IRspectra were recorded on a Perkin Elmer spectrometer. ^{1}H NMR were obtained on a Bruker DRX-300(300 MHz FT NMR) NMR spectrometer in $CDCl_3$ solution with TMS as an internal reference. The massspectra were recorded on a DART mass spectrometer were recorded. Partical Size was analysis by Malvern particalsizeanalysizer.

I) Preparation of Tetra-O-acetyl-β-D-glucopyranosyl isothiocyanate :

This has been prepared by the interaction of tetra-O-acetyl-α-D-glucopyranosyl bromide and lead thiocyanate, the former was prepared according to the procedure described earlier. Details of typical experimental are as follows :

a) Microwave assisted preparation of glucose penta acetate :-

Peracetylation of glucose to give the acetyl derivative with small excess of acetic anhydride under the catalyst of either Potassium or Sodium acetate (anhydrous) was found practically quantitative in less than 15 min with microwave heating.

Herein, we reported first time peracetylation of glucose in molecular proportion of acetic anhydride (30 ml) using catalyst sodium acetate 0.8 gm. Under Microwave heating the reaction was complete less than 10 min. Product was isolated by pour in ice cold water with constant stirring and cooling.

The glucose penta acetate is separated out; purification of product was done under water, ethanol system. Melting point of Glucose penta acetate was found to be 110°C.

b) **Synthesis of Tetra-O-acetyl-α-D-glucopyranosyl bromide** :

The finely powdered glucose pentaacetate (21.0g) was added gradually to the brominating reagent. After the addition the flask was kept for 2 hr. at room temperature. The reaction mixture was mixed with chloroform (50 ml) then the mixture was shaken vigorously for about 15 min. The resultant mixture was pour in ice cold water.

The chloroform layer was then separated. It was washed several time with aqueous sodium bicarbonate to removed excess of acetic acid followed by the aqueous sodium meta-bisulphate to remove the excess of bromine and finely 2-3 times with water. To the chloroform layer addition of petroleum ether afforded a solid (15 g). This solid was expected tetra-O-acetyl-ά-D-glucopyranosyl brominde, it was crystallized from ethanol, m.p. 88-90°C.

d) **Preparation of lead thiocyanate :**

Lead thiocyanate was prepared by mixing aqueous solution of lead nitrate and ammonium thiocyanate. The white granular lead cyanate was filtered washed with distilled water and dried at 50°C.

Preparation of Tetra-O-acetyl-β-D-glucopyranosyl isothiocyanate :

To a suspension of tetra-O-acetyl-α-D-glucopyranosyl bromide (21 g) in sodium dried xylene (80 ml) was added lead cyanate (15g). The reaction mixture was refluxed gently for 3 hr. with frequent shaking. This solution was then cooled and liberated lead bromide was removed by filtration. The xylene filtrate was then treated with petroleum ether (60-80°) with stirring, a pale yellow solid obtained (12 g). This solid was expected tetra-O-acetyl-β-D-glucopyranosyl isocyanate. It was purified by dissolving it in a minimum quantity of chloroform and reprecipitating with petroleum ether. m.p 115-120°C

Table No-2-: Study of synthesis of 1-tetra-*O*-acetyl-β-D-Glucosyl isothiocyanate under microwave irradiation[11]

Sr. No.	Amount of G-Bromide	Amount of Xylene	Time	Power in watt	Temp. °C	% Yield
1	10.0 gm	80 ml	35 min	P-70	120-130	**90%**
2	20.0 gm	120 ml	40 min	P-80	130-140	**80%**
3	**30.0 gm**	**150 ml**	**40 min**	**P-80**	**135-145**	**65%**

- Lead thiocyanate was taken in equimolar proportion of G-Bromide.
- G-Bromide :- 1-tetra-*O*-acetyl- -D-Glucosyl-Bromide

Experiment No. 1:- Tetra-O-acetyl-β-D-glucosyl-(3)-2-substituted benzothiazolylthiocarbamides

A benzene solution of tetra-O-acetyl- β -D-glucosyl isothiocyanate (0.005 M, 1.9 g, in 20 ml) was mixed with the suspension of 2-amino benzothiazole (0.005 M, 0.75 g in 10 ml) and mixture was under microwave irradiation After, benzene was distilled off and sticky mass obtained as a residue was triturated several time with petroleum ether to afford white solid. It was crystallized from ethanol water, m.p. 135-142°C. [Found: C, 52.00; H, 4.85; N, 8.14; S, 6.23, $C_{22}H_{25}O_{10}N_3S$. requires; C, 52.07, H, 4.93; N, 8.28; S, 6.31%].

The product was found soluble in ethanol, acetone, chloroform and benzene while insoluble in water and petroleum ether. It charred when heated with conc. sulphuric acid. It was non-desulphurisable when boiled with alkaline plumbite solution. It was found to be optically active and its specific rotation $[\alpha]_D^{29}$ = +74.46° (c, 0.94 in chloroform). The purity was checked by TLC and recorded Rf value 0.86 (CCl_4 : EtOAc, 3:2.1).

Analytical And Spectral Data Of Compounds:

Synthesis of 1-Tetra-O-acetyl-β -D-glucosyl-3-(2)- amino benzothiazolyl thiocarbamides (IIIa).

(IIIa) IR (KBr) : ν 3374 (N-H), 2969 (Ar-H) 1743 (C=O), 1588 (C=N), 1382 (C-N), 1239 (C-O) and 753 cm-1 (C-S); 1H NMR (CDCl3) : δ 7.57-7.20 (m, 5H Ar-H), 6.3-6.2 (s 1H N-H), 5.1-5.5 (m, 7H Glucopyranosyl ring), 2.1-1.9 (m, 12 H, 4COCH3); Mass : m/z 508 (M+), 331, 169, 109, Anal. Calcd. for C22H25N3O8S2; C, 48.97; H, 4.63; N, 8.24; S, 6.31; found C, 48.84; H, 4.59; N, 8.45; S 6.51%

Synthesis of 1-tetra-O-acetyl-β -D-glucosyl-3(2)-4-chloro benzothiazolyl thiocarbamide (IIIb).

(IIIb) IR (KBr) : ν 3340 (N-H), 2966 (Ar-H), 1745 (C=O), 1615 (C=N), 1378 (CN), 1231 (C-O) and 753 cm-1 (C-S) ; 1H NMR (CDCl3) : δ 7.7-7.6 (m, 1H, N-H), 7.4 - 7.1 (m, 4H, Ar-H), 5.1-4.7 (m, 7H, glucopyranosyl ring), 2.2-1.9 (m, 12H, 4 COCH3); Mass : m/z 544 (M+), 331, 169, 109; Anal. Calcd., C22H24N3O8S2-Cl, C, 46.07; H, 4.18; N, 7.72; S, 5.88 Found C, 46.13; H, 4.23; N, 7.21; S, 5.98%

Synthesis of 1-Tetra-O-acetyl-β -D-glucosyl-3-(2)-4-methyl benzothiazolyl thiocarbamide (IIIe) :

(IIIe) IR (KBr) : ν 3468 (N-H), 2997 (Ar-H), 1743 (C=O), 1610 (C=N), 1383 (C-N), 1238 (C-O) and 845 cm-1 (Glucopyranosyl ring); 1H NMR (CDCl3) : δ 7.4-7.0 (m, 4H, ArH), 5.15 (s, 1H , N-H), 2.3 (m, 3H, Ar-CH3)

5.4-5.5 (m, 7H, Glucopyranosyl ring), 2.2-1.8 (m, 12H, 4COCH3) Mass: m/z (Not predictable) 331, 109; Anal. Calcd. for C23H27N3O8S2; C, 49.90; H, 4.33; N, 8.04; S, 6.13; Found C, 4997; H, 4.26; N8.22; S , 6.21%.

Preparation of Nanoparticles of 1-tetra-O-acetyl-β-D-glucosyl-3-(2)-methyl benzothiazolyl thiocarbamide:

Take about 1 gm of 1-tetra-O-acetyl-β-D-glucosyl-3-*(2)*-methyl benzothiazolyl thiocarbamide and dissolve it completely in the 20ml of solvent in a 250 ml beaker and add poly vinyl alchole as a stibilizer 1.5ml . Now put this beaker in a sonicator. The highly penetrating acoustic waves are passed through the mixture, which creates high-pressure bubbles in the beaker due to which breakdown of the bulk material took place and desired sized nanoparticles are formed. Then stirred mixture about 6hr. in magnetic stirrer at room tempeture. The size determination of nanoparticlesis done by the partical size analysizer studies

Characterization of Nanoparticles:

1. Characterization using UV-Spectrophotometer: Single Beam UV-Spectrophotometer with software BI/CI/SP/SB-S-03 of Bio Era make. The UV-Visible Spectroscopy reveals the formation of Nanoparticles Characterization of Nanoparticles was done using a visible Spectrophotometer by using a model by showing different absorption those from bulk material.

2. Size determination ofGlucose Penta Acetate, Nanoparticles by X-ray Diffraction studies(Particle Size Analysis): From the X-ray diffraction, it comes to know that size of nano Glucose Penta Acetate is 97.57 nm.

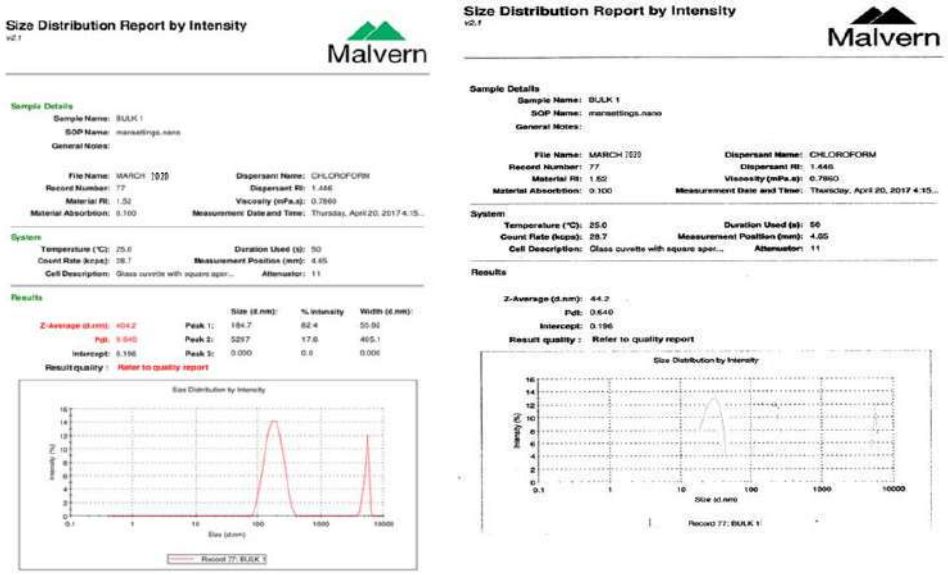


Table No. 2:- Tetra-O-acetyl-β-D-glucosyl-(3)-2-substituted benzothiazolylthiocarbamides

Sr.No.	-Nano of synthesis of Tetra-O-acetyl-β-D-glucosyl-(3)-2-substituted benzothiazolyl thio carbamides	M.P. °C	Particle Size
1	1-Tetra-O-acetyl- β -D-glucosyl-3-(2)- amino benzothiazolyl thiocarbamides	135-142	122.2nm
2	Synthesis of 1-tetra-O-acetyl- β -D-glucosyl-3(2)-4-chloro benzothiazolyl thio carbamide	112-120	153nm
3.	Synthesis of 1-Tetra-O-acetyl- β -D-glucosyl-3-(2)-4-methyl benzothiazolyl thio carbamide	152-155	97.57nm

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A three component synthesis of fused 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido [1,6-*a*]pyrimidine-3,9-dicarbonitriles with evaluation of their antioxidant activity

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Synthesis of novel fused 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives (4a-7d) have been accomplished via three-component reaction of 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3), ethyl-2-cyano-3,3-bis(methylthio)acrylate and nucleophiles such as substituted anilines/phenols/ hetryl amines/compounds containing active methylene group by using anhydrous K_2CO_3 as catalyst and DMF as solvent. Compound (3) was prepared by reaction between, simple condensation product of acetamidine hydrochloride (1) and bis(methylthio)methylene malononitrile (2) with same reaction condition which is used for title compounds. The chemical structures of newly constructed derivatives were corroborated by IR, ^{1}H-NMR, ^{13}C-NMR and Mass spectral analysis. Furthermore, these synthesized fused heterocycles were examined for their plausible antioxidant activity.
Keywords: Antioxidant, Bis(methylthio)methylene malononitrile, DMF and Potassium carbonate.

Introduction

Heterocyclic chemistry play a vital role in modern society and posses varied application in different fields due to which unabated research has been going on to synthesize new organic compounds including derivatization of naturally occurring scaffolds such as alkaloids, nucleic acids, vitamins, proteins and hormones etc. Synthetic heterocyclic compounds which contain N, S and O have enormous potential in the field of agrochemicals and medicinal chemistry.

Pyrimido[4,5-*d*]pyrimidines and pyrido[2,3-*a*]pyrimidines undoubtedly belong to the most ubiquitous heterocycles in nature. They are an important class of annulated uracils of biological importance [1], because of their connection with purine pteridine system [2]. Several patent have been reported for the synthesis of these fused heterocycles, derivatives of these are useful as antiallergic [3],vasodilators [4], bronchodilators [5], antihypertensive [6] agents. Fused pyrimido[4,5-*d*]pyrimidine ring system represent attractive target owing to divers pharmacological applications of these molecule that includes potent inhibitory properties regarding the tyrosine kinase domain of epidermal growth factor receptor [7], dihydrofolate reductase [8], 5-phosphoribosyl-1-pyrophosphate synthetase [9], antimicrobial [10], antitumor [11], antifungal [12], antiviral [13], antioxidant [14], hepatoprotective [15] activities.

Multicomponent reactions (MCRs) have been proved as simple and convenient way to produce diverse chemical libraries of 'drug like' molecules for biological screening, since the combination of three or more small molecular weight building blocks in a single operation leads to high combinatorial efficacy. In last decades many synthetic methods have been reported for the synthesis of pyrimido[4,5-*d*]pyrimidines and its derivatives [16-21]. Recently our research group have reported synthesis and antimicrobial activity of fused pyrido pyrimido pyrimido derivatives [22]. Hence in present investigation by considering the application of multicomponent reactions, it was thought to construct a novel multifunctionalized ring system such as 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives with evaluation of their antioxidant activity.

Material And Methods

All compounds were purchased from SD-Fine, Spectrochem and Avra chemical companies and used without any additional purification. Melting points of synthesized compounds were determined by Electrothermal IA 9000 SERIES digital melting point apparatus and were uncorrected. Purity of all the products were routinely checked by thin layer chromatography (TLC) on pre-coated sheets of silica gel-C plates of 0.25 mm thickness. FT-IR spectra were recorded in Nujol or as KBr pallets on infrared spectrophotometer. Brukner advance spectrophotometer 400 MHz was used to record ^{1}H-NMR and ^{13}C-NMR spectra using tetramethylsilane (TMS) as internal standard, Mass spectra were recorded on FT-VC-7070 H Mass spectrometer using the EI technique at 70 eV.

General procedure:

Synthesis of 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3)

A mixture acetamidine hydrochloride (1) (0.01mol) and bis(methylthio)methylene malononitrile (2) (0.01mol) in 10 ml of DMF and anhydrous potassium carbonate (10mg) was refluxed for 6 hours. The progress of the reaction was monitored by thin layer chromatography (TLC). After completion of reaction, the reaction

mixture was cooled to room temperature and poured into ice cold water. The separated solid product was filtered, washed with water and recrystalized from DMF-ethanol mixture to give pure compound (3).

Synthesis of 8-substituted derivative of 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives (4a-7d).

A mixture of compound (3) (0.001mol) and ethyl-2-cyano-3,3-bis(methylthio)acrylate refluxed independently with substituted anilines/ phenols/ hetryl amines/ compound containing active methylene groups (0.001mol) in 10 ml of DMF and anhydrous potassium carbonate(10mg) for 5-6 hours. The reaction progress was checked by TLC. The reaction mixture was cooled to room temperature and poured into ice cold water. The separated solid product was filtered, washed with water and recrystalized from DMF-ethanol (2:8) mixture to give pure compounds (4a-4d, 5a-5d, 6a-6d & 7a-7d).

Table 1. Physicochemical data.

Com.No.	MolecularFormula	Mol. Wt.	Colour	Yield %	M.P °C
3	$C_7H_8N_4S$	180	Gray	72.17	135-36
4a	$C_{18}H_{14}N_6OS$	362	Brown	68.31	184-85
4b	$C_{18}H_{14}N_6O_2S$	378	Brown	77.47	178-79
4c	$C_{17}H_{11}N_6OSCl$	382	Brown	56.82	136-38
4d	$C_{17}H_{11}N_7O_3S$	393	Yellow	62.24	181-82
5a	$C_{18}H_{13}N_5O_2S$	363	Brown	70.11	147-48
5b	$C_{17}H_{10}N_5O_2SCl$	383	Yellow	82.33	192-93
5c	$C_{17}H_{10}N_5O_2SBr$	426	Brown	61.65	206-07
5d	$C_{17}H_{10}N_6O_4S$	394	Yellow	63.94	173-74
6a	$C_{15}H_{14}N_6OS$	326	Brown	69.42	155-57
6b	$C_{16}H_{16}N_6OS$	340	Yellow	75.81	134-35
6c	$C_{15}H_{15}N_7OS$	341	Brown	72.56	139-40
6d	$C_{15}H_{14}N_6O_2S$	342	Brown	68.05	174-76
7a	$C_{14}H_7N_7OS$	321	Brown	65.89	197-98
7b	$C_{16}H_{12}N_6O_3S$	368	Brown	62.17	211-12
7c	$C_{16}H_{13}N_5O_3S$	355	Brown	54.46	160-61
7d	$C_{17}H_{15}N_5O_4S$	385	Brown	66.94	143-44

Spectral Analysis:

4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3).

IR (KBr/cm^{-1}) 2206 (CN), 3359 (NH_2): ^{1}H-NMR (400 MHz,DMSO-d_6): δ 2.38 (s, 3H, CH_3), 2.53 (s, 3H, SCH_3), 7.5 (s, 2H, NH_2): ^{13}C-NMR (DMSO-d_6): δ 11.84 (SCH_3), 25.98(CH_3), 81.79 (C-CN), 114.54 (CN), 162.59 (C=N), 168.04 (C=N), 172.10 (C-SCH_3) EI-MS(m/z: RA%): 180 (M^+).

8-(4-chlorophenylamino)-6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile (4c).

IR (KBr/cm^{-1}) 1631 (N-C=O), 2210 (CN), 3356 (NH): ^{1}HNMR (400 MHz,DMSO-d_6): δ 2.51 (s, 3H, CH_3), 2.80 (s, 3H, SCH_3), 6.82 (s, 1H, NH), 7.12-7.39 (m, 4H, Ar-H): EI-MS(m/z: RA%): 382 (M^+).

8-(4-chlorophenoxy)-6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile (5b).

IR (KBr/cm^{-1}) 1650 (N-C=O), 2221 (CN): ^{1}HNMR (400 MHz,DMSO-d_6): δ 2.50 (s, 3H, CH_3), 2.73 (s, 3H, SCH_3), 6.97-7.66 (m, 4H, Ar-H): EI-MS(m/z: RA%): 383 (M^+).

6-methyl-2-(methylthio)-8-morpholino-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile (6d)

IR (KBr/cm^{-1}) 1673 (N-C=O), 2204 (CN): ^{1}HNMR (400 MHz,DMSO-d_6): δ 2.37 (s, 3H, CH_3), 2.64 (s, 3H, SCH_3), 3.42 (S, 4H, NCH_2), 4.26-4.28 (S, 4H, OCH_2): EI-MS(m/z: RA%) : 342 (M^+).

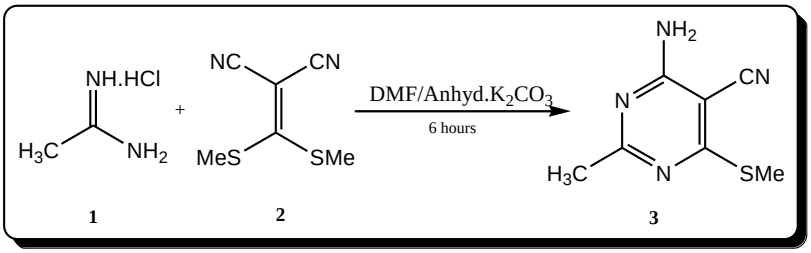
8-(dicyanomethyl)-6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile (7a)

IR (KBr/cm^{-1}) 1640 (N-C=O), 2203 (CN): ^{1}HNMR (400 MHz,DMSO-d_6): δ 2.37 (s, 3H, CH_3), 2.53 (s, 3H, SCH_3), 3.73 (S, 1H, CH): EI-MS(m/z: RA%): 321(M^+).

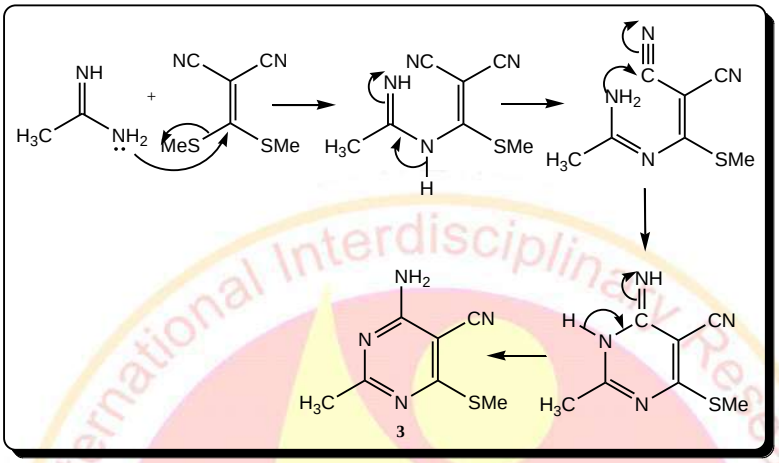
Result And Discussion

In present communication the most promising multicomponent method have been developed for synthesis of novel heterocyclic compound such as 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile its 8-substituted derivatives. Our synthetic plan commences from readily available acetamidine hydrochloride, which offers large number of annulated heterocycles. The requisite

starting material i.e. 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3) was prepared from condensation of acetamidine hydrochloride and bis(methyltio)methylene malononitrile **Scheme-1**.



Scheme-1. Formation of 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile

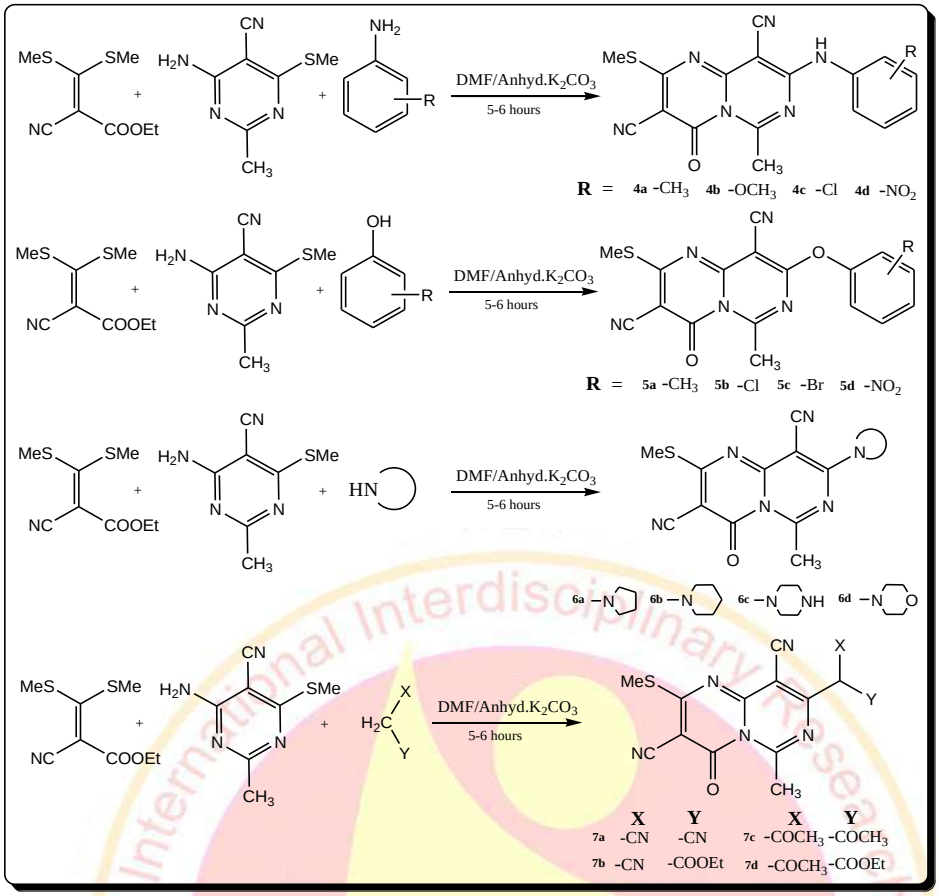


Scheme-1. Plausible mechanism for the formation of compound (3)

The presence of tautomerisable 1,3 nucleophilic positions of 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3) made itself more facile for attack on ethyl-2-cyano-3,3-bis(methylthio)acrylate, simultaneously compound (3) undergo nucleophilic substitution reaction due to presence of good leaving thiomethyl group resulting in the building of fused pyrimido[1,6-*a*]pyrimidine ring system via elimination of simple thiomethyl and ethoxy groups. **Scheme-2.**

The structure of newly synthesized compounds were assigned on the basis of IR, ^{1}H-NMR, ^{13}C-NMR and Mass spectral data. In IR spectrum of compounds absorption bands appear in the region 1675-1630 and 2221-2203 cm^{-1}for N-C=O, -CN respectively. ^{1}H-NMR spectra of compounds shows singlet peaks in the region of 2.30-2.52 and 2.53-2.80 ppm due to -CH_3, -SCH_3 protons respectively . ^{13}C-NMR spectrum of parent compound (3) shows peaks at 11.84, 25.98, 114.54 and 172.10 for –S<u>C</u>H$_3$, -<u>C</u>H$_3$, -<u>C</u>N and -<u>C</u>-SCH$_3$ carbons respectively. MASS spectra shows molecular ion peak which is corresponds to the molecular weight of respective compounds. Spectral studies of all compounds shows that compounds were stable and do not exhibit any tautomerism.

The overall DPPH radical scavenging activity of examined 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives (4a-7d) were in a range of 09.08-37.89 % as compared to the standard ascorbic acid (90.15%). The highest DPPH radical scavenging activity was exhibited by **6a** whereas **5c** demonstrate lowest activity. From the result of present work, it can be concluded that 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives are essential to boost the antioxidant activity.



Scheme-2. Formation of 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives (4a-7d)

Antioxidant activity:

DPPH radical scavenging assay :

The DPPH radical scavenging assay has been used for preliminary screening of the sample for antioxidant activity. The proton radical scavenging action is known as an important mechanism of antioxidants. The odd electron in DPPH radical gives a strong absorption maximum at 517 nm and is purple in colour. The colour turns from purple to yellow when the odd electron of DPPH radical becomes paired with hydrogen from free radicals scavenging antioxidants to form reduced DPPH:H. 1ml (1 mM) of test sample was added in to equal quantity of 0.1 mM solution of DPPH in ethanol. After 10 minutes of incubation at room temperature, the DPPH reduction was measured by reading the absorbance at 517 nm. Ascorbic acid was taken as standard reference. The result of DPPH reduction is summarized in table-2.

Table 2. Antioxidant activity of selected compounds.

Sr. No.	Compounds	Antioxidant activity
		DPPH radical scavenging activity (%)
1	4a	12.82±0.62
2	4b	31.78±0.47
3	5b	15.26±0.03
4	5c	09.08±0.88
5	5d	14.25±0.52
6	6a	37.89±0.93
7	6c	26.84±0.08
8	6d	12.59±0.76
9	7a	23.60±0.18
10	7d	36.32±0.55
6	Ascorbic acid	90.15±0.53

Conclusion

In summary with the aim of have a good contribution to design new heterocyclic compounds, we have developed new proficient multicomponent methodology for the synthesis of novel fused heterocles such as 6-

methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitriles with excellent product yield. The major advantage of this protocol is higher purity of derivatives, operational simplicity and short reaction time.

Acknowledgement

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Development of biobased acids cross linking of tamarind seed polysaccharide films and their coating

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Abstract

In the present study, Tamarind seed polysaccharide (TSP) was obtained by water-based extraction. For characterization of the extracted tamarind seed polysaccharide phytochemical screening was done and micromeritic properties were determined. It was also found that extracted tamarind seed polysaccharide had good flow properties and pH was 6.4, this showed that it can be used in dosage form without any irritation.

Further these tamarind seed polysaccharides modified by reacting with biobased acids such as citric acid and lactic acid and cast a film which can be further used as in packing. It has been used for coatings on various fruits and their effect has been studied and weight loss test.

Introduction

Edible polymers are the polymeric materials which can be easily consumed by human as well as animals without any harm on the health. Edible polymers have appeared as a substitute to synthetic plastic for food applications and have received significant attention in recent years because of their advantages over synthetic polymers. The main advantage of edible polymers over traditional synthetics is that they can be consumed along with the products. Edible polymer coatings can provide replacement and/or fortification of natural layers to prevent moisture losses, while selectively allowing controlled exchange of important gases, such as oxygen, carbon dioxide, and ethylene, which are involved in respiration processes.

Materials and Methods

All laboratory grade chemicals/reagents were acquired either from SD Fine Chemicals and Spectrochem, India and used as such with no further purification. The tamarind was obtained from Local market, Akola, Maharashtra and used as received.

Extraction procedure

Tamarind seeds were purchased from the seeds shop situated in the old Delhi, India. Seeds were boiled and mucilage was taken out to extract xyloglucan. Mucilage was dried, powdered and further passed from sieve # 20 and stored in air tight container until used.

Extraction of tamarind polysaccharide includes two steps:

Step 1: Extraction of tamarind polysaccharide

Xyloglucan extracted by tamarind seeds were done as follows:

Crude tamarind seeds were washed neat and clean then kept for 3 hrs boiling. After completion of boiling, boiled seeds were kept for cooling for 24 hrs so that mucilage is being expelled out from the seeds. Completing 24 hrs of expulsion of mucilage from seeds, heat them for few minutes then set for cooling. Pour seeds with mucilage in the muslin cloth and press till all the mucilage is squeezed from the seeds. Temperature of extraction media was maintained at 70C and duration of extraction was adjusted about 6 hrs [1].

Step 2: Isolation of tamarind seed polysaccharide

In hot water boiled tamarind seeds were kept for 24 hrs so that the mucilage can come out from the seeds. After 24 hrs, boiled the seeds containing xyloglucan for 1 hr. Water extracted juice were squeezed with muslin cloth bag and the concentrated juice was cooled to 4C. Tamarind seed polysaccharide xyloglucan was precipitated by alcohol- juice treatment 2:1(v/v) followed by continuous stirring for 15 min and mixture was further allowed to stand for 2 hrs for better tamarind seed polysaccharide precipitation. This allows filtering of polysaccharide substances because tamarind seed polysaccharide remains float on the surface of alcohol-water mixture. Floating tamarind polysaccharide coagulate was filtered through muslin cloth, washed with alcohol (95%) and squeezed. Squeezed tamarind seed polysaccharide was further dried to constant weight at 35-45°C in hot air oven. Hard tamarind seed polysaccharide cake was ground and sieved through sieve # 20, stored in desiccators for further use [1].

Physicochemical characterization of Xyloglucan consisted in Tamarind Seed Polysaccharide Identification tests for carbohydrates

Extracted mucilage was mixed with Molish's reagent followed by addition of sulfuric acid [4, 5].

Determination of Purity of Xyloglucan in Tamarind Seed Polysaccharide

For determination of purity of extracted xyloglucan test for alkaloids, proteins, gum. Fats tannins and amino acids were performed [1, 2].

Solubility behavior

One part of dry tamarind seed polysaccharide powder was shaken with different solvents and their solubility was determined. Solubility of tamarind seed polysaccharide was determined in basic solvents i.e Acetone, Chloroform, Hexane, Butanol and Water. It has been observed that polysaccharide is soluble in every solvent [1,2,].

pH of Xyloglucan in Tamarind Seed Polysaccharide:

Firstly, extracted Xyloglucan was weighed and then dissolved in water separately to get a 1% w/v solution. The pH of solution was determined using pH meter [1, 2].

FT-IR Study

The FTIR spectral analysis of tamarind seed polysaccharide and cross-linked biopolymers was carried out by KBR pellet technique using FTIR spectrophotometer and the FTIR spectral analysis was scanned between 500 to 4000 cm-1.

Cross-linking of Xyloglucan with Citric acid/ Lactic acid

The preparation of thin film proposed by Reddy et al. was performed with slight modification. The extracted polysaccharide was diluted with distilled water at 25 °C for 10-15 min. Citric acid/ Lactic acid (30% w/w polysaccharide) as a cross linking agent and glycerol (10 % v/w) as a plasticizer were added into the polysaccharide solution for preparing the film. The whole solution was stirred vigorously using a mechanical stirrer (speed 500 rpm) at 85-90 °C for 2-3 hrs. The viscous reaction mixture thus obtained was used for preparation of thin film and coating on fruits and vegetables. Film forming solution was poured immediately on a hot plate and cast film was cured at room temperature for 48-50 hrs [3].

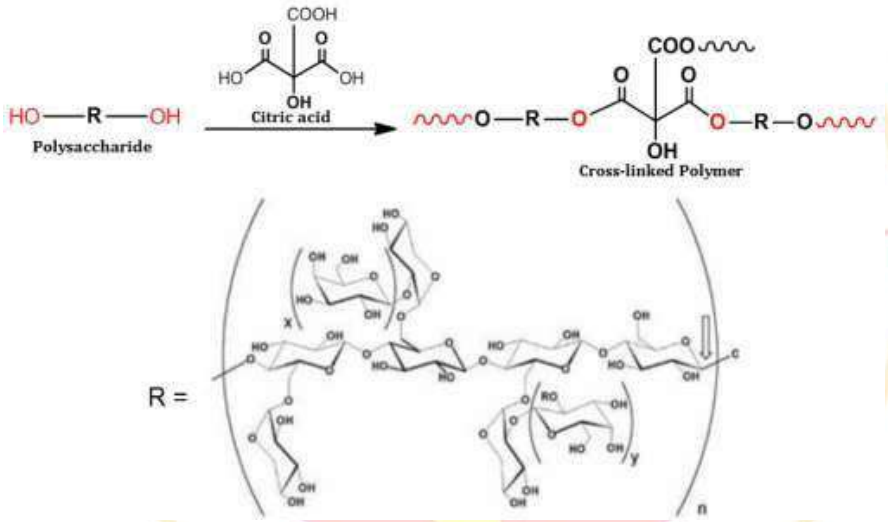


Figure 3.1: Synthesis scheme of cross-linked polymers (TSP-CA/TSP-LA)

Result and Discussion

Determination of purity of isolated tamarind seed polysaccharide

It has been observed that isolated tamarind seed polysaccharide was pinkish brown in color. It consist no odor and taste along with irregular shape as well as hard and rough in sensation and texture. The pH of 1% solution of TSP was found 6.4, which indicated that it should be non-irritating for mucus membrane. Solubility study showed that it was sparingly soluble in cold water, freely soluble and form viscous colloidal solution in warm water [1].

The isolated sample of TSP was subjected to identification. The violet color ring appeared at junction of mixture in test tube that confirms the presence of carbohydrates in sample powder. Confirmation test was also carried out for tamarind seed polysaccharide which gave positive test for mucilage, gums whereas negative for tannins, alkaloids and proteins. Other phyto-constituents were absent in the isolated powder [2]. This can be considered as proof for purity of the isolated tamarind seed polysaccharide as depicted in Table 3.1.

Polysaccharide is use for making edible plastic by using glycerol and CA as a plasticizer and crosslinker. This work investigated and developed the physical and chemical properties of polysaccharide based edible plastics and attempted to determine if they could be alternative to petrochemical plastics in the near future.

Multi-carboxyl structure of CA could induce interaction between CA and polysaccharide which will improve the barrier properties, moisture absorption, solubility of films etc. Modifiers have been used to

plasticized polysaccharide such as glycerol. Plasticizers have hydroxyl groups allowing compatibility with starch granules and they plasticized polysaccharide by breaking the internal hydrogen bonding between the glucose rings in starch. An effective plasticizer needs to be polar, hydrophilic and small enough to fit between the starch chains. Additionally, the boiling point of the plasticizer should be higher than manufacturing conditions so that it does not evaporate.

Table 3.1: Determination of purity of isolated tamarind seed polysaccharide

Test	Present/Absent
Carbohydrates	+
Hexose Sugar	+
Monosaccharides	-
Proteins	-
Fats and oils	-
Alkaloides	-
Amino acids	-
Mucilage	-
Gums	-

+ Present and - Absent

Percentage Yield of Tamarind Seed Polysaccharide

The % yield of the polysaccharide was found to be 70.0% for tamarind. During the processing of tamarind xyloglucan isolation washing is required many times which may result in loss of dissolved polysaccharides. However extraction processes tamarind is easy and hence gives better yield.

Solubility of Tamarind Seed Polysaccharide in various solvents

The solubility was checked in common solvents depending on their polarity such as water, phosphate buffers pH6.8, 0.1N HCl, acetone, ethanol, methanol etc. The polysaccharide was found to be soluble inorganic solvents and is also soluble in the aqueous solvents and swells to make a viscous solution. Hence the polysaccharides are hydrophilic in nature.

Rheological Behaviour of Tamarind Seed Polysaccharide

The viscosities of the different concentration (0.5%, 0.75% and 1%, w/v) of TSP solutions were determined by Brookfield viscometer at different shear. All the solutions showed sufficient viscosity at different shear rate and shows pseudoplastic flow. This was observed that viscosity decreases correspondingly with increasing shear. TSP shows consistent change behavior upon application of pressure

Fourier transforms infrared spectroscopy (FT-IR)

The FT-IR spectroscopy is simple but influential technique to study the curing of cross-linking. The FT-IR spectrum of tamarind seed polysaccharide (TSP), cross linked biopolymers TSP-CA and TSP-LA with citric acid and lactic acid respectively are shown in Figure 3.1.

In the FT-IR spectrum of TSP (Figure 3.1a), the vibration band at 3303.06 cm-1 is represented for the OH stretching. Two highly pronounced bands observed at vibrations 2924.09 cm-1 and 2862.36 cm-1 are result of -CH2 asymmetric and symmetric stretching vibrations respectively. A band observed at vibration 1375.25 cm-1 and corresponds to - CH2 bending vibration. The vibration at 1238.30 cm-1 and 1150 cm-1 is corresponds to - OH plane bending and glycosidic C-O-C stretching respectively. While the other vibration bands such as 945.12 cm-1, 898.83 cm-1 is corresponding to -CH bending.

The FT-IR spectrum of TSP cross linked with citric acid film (TSP-CA) is shown in Figure 3.1b. In FT-IR spectrum, the broad band at 3277.06 cm-1 is assigned for -OH stretching. The main peak of interest occurs at 1712.79 cm-1 and is associated with carboxyl and ester carbonyl bands [3]. The presence of the carbonyl peak confirms the crosslinking reaction between citric acid and polysaccharide. Two highly pronounced bands observed at vibrations 2983.88 cm-1 and 2889.37 cm-1 are result of -CH2 asymmetric and symmetric stretching vibrations respectively. A band observed at vibration 1352.10 cm-1 and corresponds to -CH2 bending vibration.

The vibration at 1276.88 cm-1 and 1143.79 cm-1 is corresponds to -OH plane bending and glycosidic C-O- C stretching respectively. While the other vibration bands such as 945.12 cm-1, 898.83 cm-1 is corresponding to -CH bending.

The FT-IR spectrum of TSP cross linked with lactic acid film (TSP-LA) is shown in Figure 3.1c. In FT-IR spectrum, the broad band at 3296.35 cm-1 is assigned for -OH stretching. The main peak of interest occurs at 1728.22 cm-1 and is associated with carboxyl and ester) carbonyl bands [3]. The presence of the carbonyl band confirms the crosslinking reaction between lactic acid and polysaccharide. A band observed at vibration 1375.25 cm-1 and corresponds to -CH2 bending vibration. The vibration at 1230.58 cm-1 and 1141.86 cm-1 is corresponds to -OH plane bending and glycosidic C-O- C stretching respectively. All other vibrational bands are in their respective region as similar to the TSP and TSP-CA spectrum.

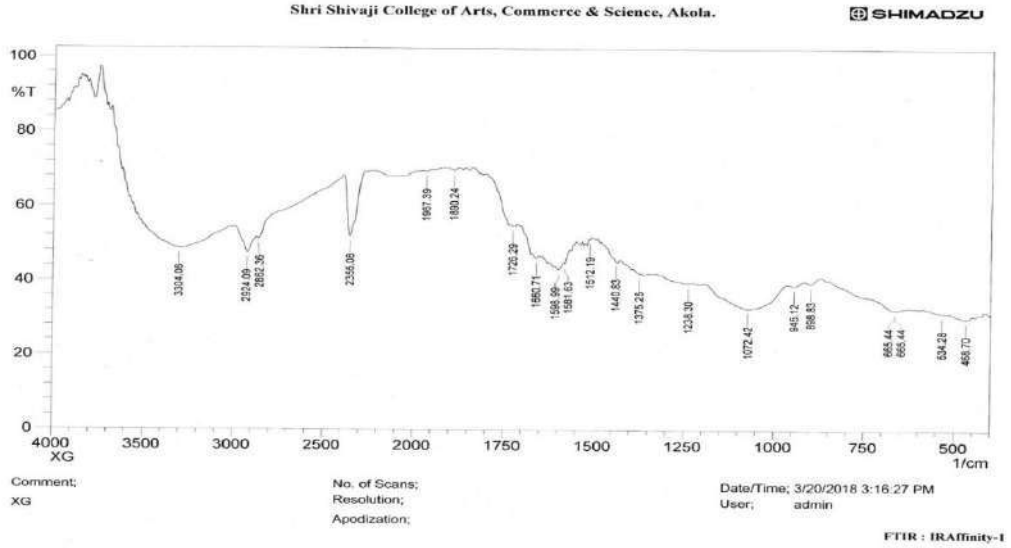


Figure 3.1: a) FTIR Spectrum of Tamarind seed Polysaccharide (Xyloglucon)

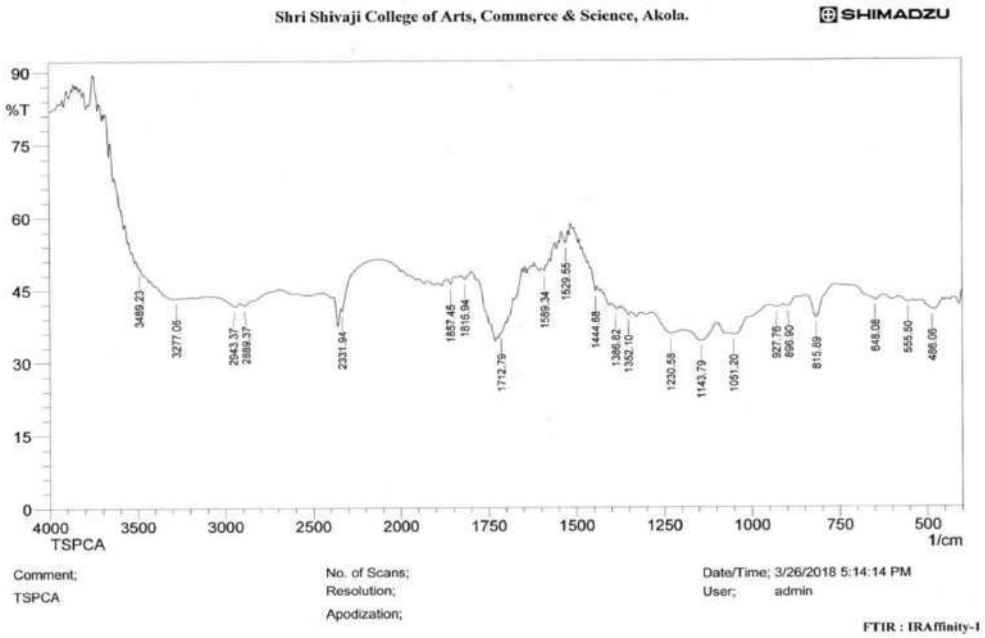


Figure 3.1: b) FTIR spectrum of Tamarind Seed Polysaccharide with Citric acid (TSP-CA)

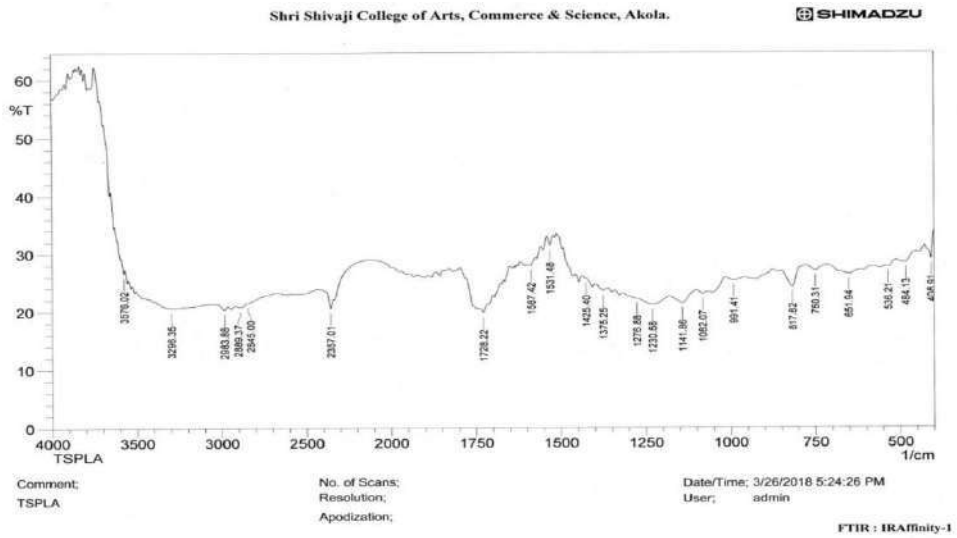


Figure 3.1: c) FTIR spectrum of Tamarind Seed Polysaccharide with Lactic acid (TSP-LA)

Chemical resistivity of cross-linked biopolymers TSP-CA and TSP-LA

The resistances to chemical factor test of TSP-CA and TSP-SA were studied using thin film in range of different protic as well as aprotic solvents such as NaOH, H2SO4, xylene, castor oil, dimethyl sulphoxide etc., The pieces of thin films were placed in different solvent for 5 days in a closed jar and the result were monitored at an interval of 24 h, by observing the change in their weights. The data has been tabulated in Table 3.2.

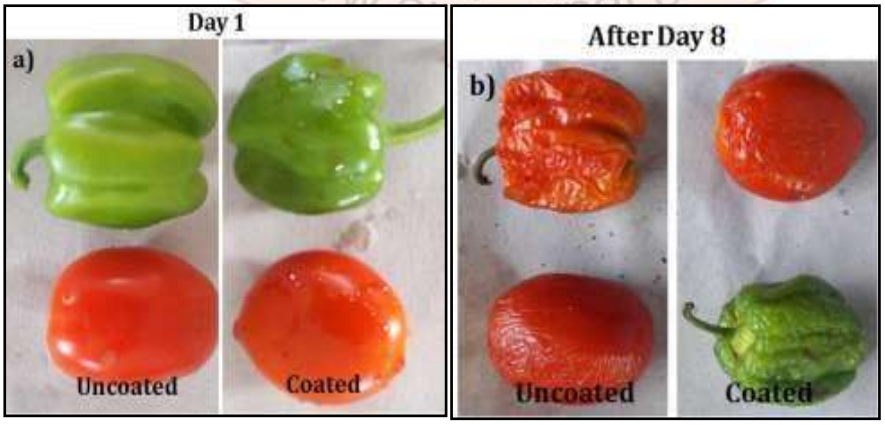
It was found that thin film is solubilized in both H2SO4 and NaOH solution as well as in DMSO and xylene solvent. However, it is resistance in all other solvents such as ethyl methyl ketone, acetone and chloroform etc.

Table 3.2: Determination of Chemical resistivity against different solvents

Solvents	TSP-CA	TSP-LA
Acetone	-	-
Ethyl methyl ketone	-	-
1 M NaOH	+	+
1 M H2SO4	+	+
Xylene	+	+
Castor oil	#	#
Chloroform	-	-
DMSO	+	+
Distilled water	#	#

Note: '+' is Soluble, '-' is Insoluble and '#' is Swelling.

Weight loss study of TSP-CA coating on fruits



The coating of TSP-citric acid crossed linked polymer on fruits and vegetables is shown in Figure 3.2. Coating is carried out to check the shelf life of fruits and vegetable by weight loss method. The weight loss and self life of data of coated fruits and vegetable are as shown in Figure 3.3. The data of weight loss study showed that weight loss is lower and shelf life is higher in case of coated capsicum and tomato compared to the uncoated. A result indicates that shelf life of fruits and vegetables increases by coating.

Figure 3.2: a) Uncoated and coated with TSP-CA cross-linked polymer and b) Uncoated and coated with TSP-CA cross-linked polymers after 6 days.

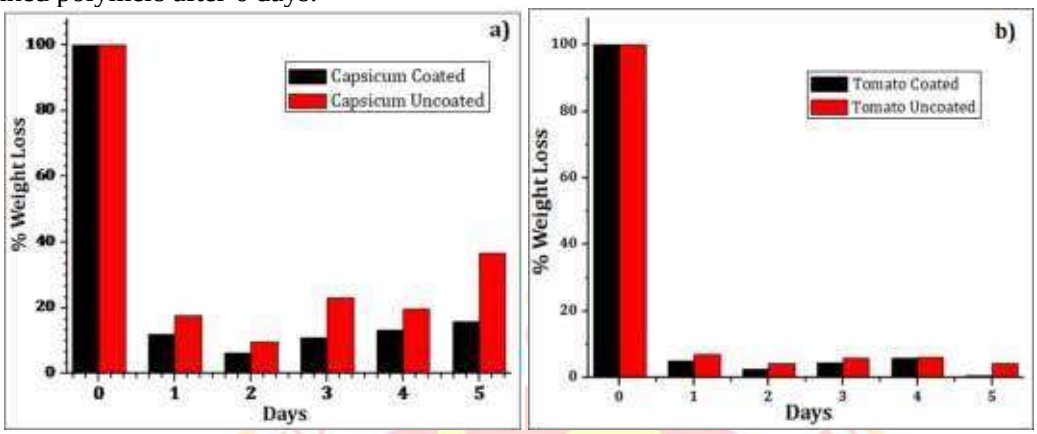


Figure 3.3: a) Comparative % weight moisture loss of Capsicum coated and uncoated and b) Comparative % weight moisture loss of Tomato coated and uncoated against 5 days.

Summary and Conclusion

The increasing interest in biodegradable and edible materials is being developed to solve the disposal of petroleum based conventional synthetic plastic materials. Petroleum based plastics requires lot of time for their degradation and most of them end up overwhelming the environment. In terms of end-use applications, packaging remains one of the major uses of plastics in the world.

Food packaging has become a centre of focus for waste reduction efforts, because in food packaging, a variety of petroleum-derived plastic materials are used at large scale due to their availability in large quantities at low cost and favorable functional characteristics. The use of edible films and coatings is constantly increasing in the food industry. Coatings can help to meet the many challenges involved in the storage and marketing of foods that are nutritious, safe and of high quality, stable and economic. The polysaccharide was isolated and characterized in terms of various physicochemical parameters of powder. From these characterized parameters it was observed that they possess substantial viscosity and very good mucoadhesive property. The mucoadhesive character of TSP may be due to resemblance with mucin structure. The other properties like pH, solubility etc. also found to be satisfactory. The observations showed that TSP exhibited good compatibility, cohesiveness and would be able to produce better flow properties in its granular form. It may be concluded that these polysaccharides can be chosen for the development of cross-linked edible polymeric materials. The tamarind seed polysaccharide was successfully utilized for modification by reacting with biobased acids such as citric acid and lactic acid. The developed cross- linked films are being resistant to most organic solvents whereas susceptible to acid alkali solution respectively. The weight loss study i.e., the coating on fruits and vegetable concluded that there is increase the shelf life of coated fruits compared to uncoated. The cast film can be further used as food packaging materials for future applications.

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Trace Elements Analysis in Ground Water Used for Drinking Purposes

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Abstract:

In this paper, assessment of trace metals in ground water used for drinking purposes in Nagpur city, Maharashtra, was carried out. Samples were collected from 10 Water Bodies supplying drinking water to the inhabitants in the region. All samples were analyzed for 10 trace and macro elements (Al, Pb, Cr, Ni, Cu, As, Cd, Zn, Fe, and Co) and using Inductively Coupled Plasma (ICP) spectrophotometer equipped with an ultrasonic nebulizer. Results recommended that an adequate and suitable treatment must be applied to the water bodies having elevated concentrations of the metals and supplying drinking water to the consumers.

Metal contamination issues are becoming increasingly common, with many documented cases of metal toxicity. Metals are a natural part of our ecosystem occurring in soil, rock, air, water and organisms. A few metals, including Cu, Mn, Zn, Co and Fe are however essential for metabolism in humans & plants in trace amounts. It is only when metals are present in bio- available forms at excessive levels that they have the potential to become toxic. Chronic poisoning occurs due to heavy metal content in the drinking water. Estimation should be made to differentiate between the possible cause and source of such poisoning case.

Keywords: Metal contamination, Drinking water Toxicity, Trace metals in ground water bodies

Introduction:

Providing quality drinking water to all citizens who are deprived of access to water will serve as the breaking point of poverty alleviation in most developing cities. Water supply systems and drinking water inaccessibility in developing countries is a global concern that calls for immediate action. About 884 mil-lion people in the world still do not get their drinking water from approved sources, and almost all of these people are in developing regions [1].

Water related diseases can often be attributed to exposure to elevated heavy metal concentrations of both organic and inorganic contaminants. Many of these compounds exist naturally, but their concentration has increased as a result of anthropogenic activities [2].

Living organisms require trace amounts of some metals including cobalt, copper, iron, manganese, molybdenum, vanadium, strontium and zinc. Excessive levels of these essential metals are detrimental to the organisms [3]. Non- essential metals like cadmium, chromium, mercury, lead, arsenic and antimony are of more concern to surface water system because these metals produce undesirable effects on human and animal life. Once these metals enter in a system, they remain for relatively longer periods [4]. Once absorbed, inorganic metals are capable of reacting with a variety of binding sites in the human body and have strong attraction to biological tissues. Natural water contains toxic metals in traces. All metals exist in surface water in colloidal, particulate and dissolved forms, although dissolved concentrations are generally low [5].

The magnitude of danger of environmental pollution by heavy metals was probably for first time realized with the Minimata disaster in Japan, where thousands of peoples suffered with mercury poisoning after consuming the fish caught in Minimata Bay. The bay got contaminated with mercury released from vinyl chloride plant between 1953 and 1960[6]. Similarly, it was also reported in Japan in 1955 that cadmium caused itai-itai Byo' disease in human beings, mainly in women over forty [7].

Heavy metals are important environmental pollutants and their toxicity is a problem of increasing significance for ecological, evolutionary, and environmental reasons. Heavy metals have played great roles in genesis of present-day civilization. In ancient times, the wealth of Emperors and Kings was attributed to the possession of metals like iron, gold, silver copper etc. in different forms. Still today, the dependence of heavy metals has not decreased as these are very commonly used in agriculture, medicine, engineering etc.

This was due to high level of cadmium in local foodstuffs attributable to irrigation water from soil heaps of an abandoned mine. Minimata raised its ugly head once again, not in Japan this time, but in fishing communities of Amazon rain forest. Heavy metal pollution has been worked out in recent days. Thus, in view of this widely used practice; it was of interest to undertake further investigation on these lines. The purpose of study is to promoting and coordinating activities in the field of environmental chemistry as well as health related water organizations.

Materials And Methods:

Collection of Samples: Assessment of trace metals in water supplied for drinking purposes in Nagpur city, Maharashtra, was carried out. Samples were collected from 10 Water Bodies supplying drinking water to the inhabitants in the region. Water samples were collected in one- liter plastic bottles, which were previously thoroughly washed with tap water and rinsed with distilled water. These were immediately acidified to pH 2 with HNO3 in order to keep metals in solution and prevent them from adhering to the walls of the bottles. All samples were transported to the laboratory in iceboxes and refrigerated at 4°C until analyzed. Sampling protocol was designed in such a way that samples collected in one sampling schedule were analyzed in the shortest possible time.

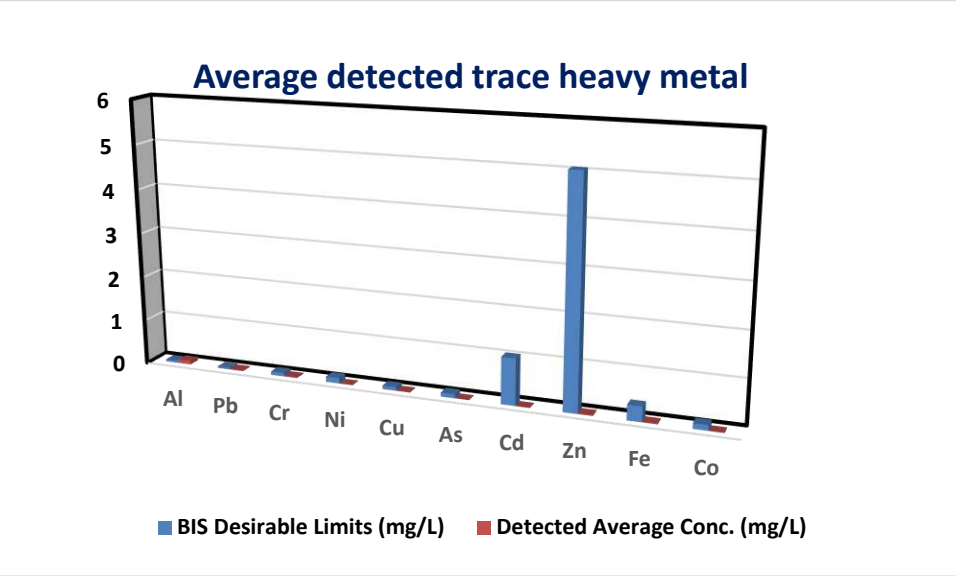
Sample Analysis: All samples were analyzed for 10 trace and macro elements using Inductively Coupled Plasma (ICP) spectrophotometer equipped with an ultrasonic nebulizer. Samples were analyzed for trace metals (Al, Pb, Cr, Ni, Cu, As, Cd, Zn, Fe, and Co) using a Perkin Elmer model 1000 Inductively Coupled Plasma. (ICP) spectrophotometer equipped with an ultrasonic nebulizer model Cetec-U 5000 AT. The use of the ultrasonic nebulizer instead of a pneumatic nebulizer provided a 5-to-50-fold improvement in detection limits and a 10-fold enhancement resulting in better reproducibility on trace metal level determinations. Analysis was carried out in duplicate and average values are reported. The ICP was calibrated with relevant Perkin Elmer Pe-Pure spectroscopy grade standards.

Results And Discussion:

The average detected trace heavy metal concentrations in the drinking water samples obtained from different parts of the Nagpur region has been presented in Table 1 and Fig-1.

Sr. No.	Trace Elements	BIS Desirable Limits (mg/L)	Detected Average Conc. (mg/L)
1.	**Al**	0.05	**0.008**
2.	**Pb**	0.04	**0.017**
3.	**Cr**	0.08	**0.018**
4.	**Ni**	0.12	**ND**
5.	**Cu**	0.08	**0.008**
6.	**As**	0.09	**ND**
7.	**Cd**	1.04	**0.001**
8.	**Zn**	5.06	**0.018**
9.	**Fe**	0.34	**0.014**
10	**Co**	0.12	**0.001**

Table 1



Aluminium (Al) - Soluble, colloidal, and insoluble aluminium may be present in treated water in residual form of coagulation with aluminium-containing material. BIS desirable limit is 0.05 mg/L Average Aluminum concentration in the analyzed drinking water samples was found to be 0.08mg/L.

Lead (Pb) - Tap water that are inherently not corrosive or not suitably treated may contain lead resulting from an attack on lead service pipes, lead interior plumbing, brass fixtures and fittings on solder pipe joints chiefly from galena (PbS). The BIS desirable limit is 0.04 mg/L Average Lead concentration in the analyzed drinking water samples was found to be 0.017mg/L.

Chromium (Cr) - Chromium may exist in water supplies in both the hexavalent and the trivalent state although the trivalent form rarely occurs in potable water. BIS desirable limit is 0.8 mg/L. Average Chromium concentration in the analyzed drinking water samples was found to be 0.018mg/L.

Nickel (Ni) - The average abundance of Ni in the earth's crust is 1.2 ppm; in soils it is 2.5 ppm; in streams it is 1 µg/L, and in groundwater it is <0.1 mg/L. BIS desirable limit is 0.12 mg/L. Arsenic was not detected in the analyzed drinking water samples. Nickel is a well-known human carcinogen and it affects the activity of α-tocopherol, the most common antioxidant in human body.

Copper (Cu) - Corrosion of copper-containing alloys in pipe fitting may introduce measurable amounts of copper into the water in a pipe system. BIS limit for copper is 0.08 mg/L. Average copper concentration in the analyzed drinking water samples was found to be 0.008mg/L.

Arsenic (As) - For the protection of aquatic life, the average concentration of As3+ in water should not exceed 72µg/L. And maximum should not exceed 140 µg/ L. BIS desirable limit is 0.09 mg/L. Arsenic was not detected in the analyzed drinking water samples.

Cadmium (Cd) - A cadmium concentration of 200µg/L is toxic to certain fishes. Cadmium may enter water as a result of industrial discharges or the deterioration of galvanized pipe. BIS desirable limit is 1.04 mg/L. Average cadmium concentration in the analyzed drinking water samples was found to be 0.001mg/L.

Zinc (Zn) - Zinc most commonly enters the domestic water supply from deterioration of galvanized iron and dezincification of brass. Zinc in water also may result from industrial waste
pollution. BIS desirable limit is 5.06 mg/L. Average Zinc concentration in the analyzed drinking water samples was found to be 0.018mg/L.

Iron (Fe) - Elevated iron levels in water can cause stains in plumbing, laundry and cooking utensils and can impart objectionable taste and colour to foods. The BIS standard desirable limit is 0.34 mg/L. Average Iron concentration in the analyzed drinking water samples was found to be 0.014mg/L.

Cobalt (Co)- The samples analyzed showed Co concentration in raw and treated water to be 0.06 and 0.02 ppm. BIS desirable limit is 0.09 mg/L, average Cobalt concentration in the analyzed drinking water samples was found to be 0.001mg/L. Cobalt is an integral part of vitamin B and essential for the production of

red blood cells. Its deficiency is thought to cause megaloblastic anemia called pernicious anemia. Salts of cobalt such as acetate, chloride, and sulphates are highly toxic to human beings.

Overview: In brief, Al exceeded the maximum desirable limits in the drinking water of Nagpur region. The detected average concentrations of Al, Pb, Cr, Ni, Cu, As, Cd, Zn, Fe, and Co did not exceed the maximum desirable limits in any of the drinking water samples in the Nagpur region.

Conclusions And Recommendations:

- Water samples were collected from 10 drinking water sources covering Nagpur.
- The minimum and maximum trace metals concentrations in different areas for Al, Pb, Cr, Ni, Cu, As, Cd, Zn, Fe, and Co ranged between ND-008, ND-0.017, ND- 0.018, ND, ND- 0.008, ND, ND-0.001, ND- 0.018, ND- 0.014 and ND-0.001 mg/L respectively.
- It is recommended to adopt some kind of inexpensive treatment to reduce the levels of trace metal Al in areas supplying water directly to consumers without any type of treatment.
- Further study in this area is required to access the quantity of trace heavy metals in various water bodies supplying drinking water, groundwater bodies as well as other natural water bodies.

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Study And Phytochemical Analysis Of Fenugreek (*Trigonella Foenumgraecum*)

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Abstract-

Fenugreek (*Trigonella foenumgraecum*) is an annual plant belongs to the family Leguminosae. It belongs to the class Magnoliopsida and order Fabales. It is the famous spices in human food. Fenugreek is a legume and it has been used as a spice throughout the world to enhance the sensory quality of foods. It is known for its medicinal qualities such as antidiabetic, anticarcinogenic, hypocholesterolemic, antioxidant, and immunological activities. Beside its medicinal value, it is also used as a part of various food product developments as food stabilizer, adhesive, and emulsifying agent. More importantly it is used for the development of healthy and nutritious extruded and bakery product. The present paper reviews about Phytochemical analysis of Fenugreek.

Keywords- Fenugreek, Seeds & Leaves, Phytochemical screening.

Introduction

Plants possess medicinal and drug activities. Current study on plants primarily focuses on its medicinal uses[1]. Plant can be extracted and used for chronic and infectious diseases[2].

The active drugs which play role are secondary metabolites. The antimicrobial activities of plant extract which produces different components including aldehyde and phenolic compounds[3]. Fenugreek, one of the earliest spices known to man belongs to the bean family trigonella foenumgraecum. It blooms white flowers in the summer and has very aromatic seeds. The herb can grow to be about two feet tall. Small and oblong shaped yellowish brown seeds of the fenugreek plant have a warm and slightly bitter taste. It is rich in vitamins and minerals and is high in protein. It has a long history as both a culinary and medicinal herb in the ancient world. Fenugreek leaves, which are high in iron, are used as a leaf vegetable in curries. The seeds and green leaves of fenugreek are used in food as well as in medicinal application that is the old practice of human history. It has been used to increase the flavoring and color, and also modifies the texture of food materials. Fenugreek (*Trigonella foenum-graecum*) being rich in phytochemicals has traditionally been used as a food, forage and medicinal plant[4]. Seeds of fenugreek spice have medicinal properties such as hypocholesterolemic, lactation aid, antibacterial, gastric stimulant, for anorexia, antidiabetic agent, galactogogue, hepatoprotective effect and anticancer. Fenugreek is a widely used herbal medicine for diabetes[5,6,7].

Phytochemistry

Fenugreek is well known for its fiber, gum, other chemical constituents and volatile contents.

These days it is used as food stabilizer, adhesive and emulsifying agent due to its high fiber, protein and gum content. The protein of fenugreek is found to be more soluble at alkaline pH Fenugreek is having beneficial influence on digestion and also has the ability to modify the food.

Leaves- The leaves contain seven saponins, known as graecunins. These compounds are glycosides of diosgenin. Leaves contain protein, fat, minerals, fiber, and carbohydrates which has therapeutic effects.[8] The mineral and vitamins present in leaves include calcium, zinc iron,phosphorous, riboflavin, carotene, thiamine, niacin and vitamin C.

Seed- Fenugreek is known for its pleasantly bitter, slightly sweet seeds. The seeds are available in any form whether whole or ground form is used to flavor many foods mostly curry powders, teas and spice blend.

List of chemical constituents is shown in table 1. The chemical composition of fenugreek showed that endosperm had the highest saponin and protein content. As against this, husk contains higher total polyphenols[9]. Seeds also contain the saponin (fenugrin B)[9]. Fenugreek seeds have been found to contain several coumarin compounds as well as a number of alkaloids (e.g., trigonelline, gentianine, carpaine). The major bioactive compounds in fenugreek seeds are believed to be polyphenol compounds, such as rhaponticin and isovitexin.

Methodology

Phytochemical test are performed. Extract is prepared then test for carbohydrate, protein amino acids, alkaloids, tannins, flavonoids, saponin, polyphenols are performed.

Materials and Methods

The fresh leaves of Fenugreek were collected. Collected fresh leaves were washed and used for the study of microscopic characteristics. The dried leaves and seeds of the plant were powdered and stored in an airtight container for further use.

Extraction and Isolation-

Near about 500gm leaves of Fenugreek dried and pulverized to powder using pestle and mortar in the laboratory. The plant material was macerated with hexane/methanol at room temperature and the extract store in refrigerator until the need of further study.

Phytochemical screening–

The chemical tests were performed for testing different chemical groups present in n-hexane and methanolic extract of leaves & Seeds of test plants Fenugreek.

Table 1: Qualitative Analysis of Phytochemicals

Sr.No	Test	Observation
1	**Test of Alkaloids**	
	1.0ml of plant extract was taken and then adds 1.0 ml of saturated solution of picric acid was added.	Yellow colour appears
2	**Test of Steroid**	
	About 0.5 g of the extract with few drops of acetic acid anhydride boil and cool .Then conc. H2SO4 was added from the side of the test tube.	Brown ring is formed at the junction two layers and upper layer turns green
3	**Test of Saponins**	
	0.5g of extract was added in 5ml of distilled water in a test tube. The solution was shaken vigorously. The frothing was mixed with 3 drops of olive oil and shaken vigorously.	Stable persistent froth appears. Formation of an emulsion
4	**Test for Flavonoids**	
	5 ml of dil. Ammonia solution were added to a portion of the crude extract followed by addition of conc. H2SO4.	Yellow coloration occurs.
5	**Test of Tannins**	
	About 0.5 g of the extract was boiled in 10 ml of water in a test tube and then filtered. A few drops of 0.1 fecl3 was added	Brownish green or blue- black coloration.
6	**Test for Polyphenol**	
	2 ml of extract was taken and add 2 ml of Folin's reagent.	Appearance of violet or Brown colour.
7	**Test for Amino Acid**	
	2 ml of extract was taken and boiled with 0.5 mL of a 0.1% solution of ninhydrin	Appearance of blue colour.
8	**Test of glycosides**	
	1 ml glacial acetic acid few drop of ferric chloride solution and conc. Sulphuric acid added	Appearance of reddish brown colour at the junction of liquid presence of deoxy sugar.

Conclusion

The preliminary phytochemical screening of Trigonella foenum gracum gives good results in the presence of flavonoids, alkaloids, phenolic compounds, tannins, saponins, carbohydrates and proteins. These phytochemical showed that Trigonella foenum gracum (fenugreek) seeds have good medicinal and therapeutic compounds. By observing the recent research studies it can also be used to reduce the level of glucose levels and can be used as one of the best anti-diabetic component.

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Overview of Recent Advances in Solar Cell Technologies

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Abstract

Earth will be facing the problem of energy crisis in near future. Use of renewable energy sources is the only way to tackle it efficiently. Solar energy is the important aspect of it. This paper reviews the different types of solar cells. Further, with different types of materials' utilization, study is done that how the performance of solar cells is enhanced. This paper consists of comparison between efficiencies of different types of solar cells with different materials. The future technologies in the solar cell technologies are studied briefly. The performance attained by the new technologies is also studied.

Keywords: Solar Cell, Solar Photovoltaics

Introduction

The sunlight which we get from the Sun is directly available to us as a renewable source of energy and it is non-vanishing also in nature. The energy derived from sunlight is also free from the pollutants of environment and noise. It can be easily used to compensate the energy which we draw from other sources like non-renewable sources of energy viz. fossil fuels, petroleum products and deposits found under the earth. To fabricate solar cells with high efficiency it has been put under large number of improvement stages from a long time. Earlier solar cells were developed by fabricating them on a single crystal of Si wafer. Those were regarded as the first generation solar cells. After that due to the development of thin films, organic materials as substitute to silicon, and dye sensitized solar cells the efficiency of conventional solar cells has been increased. The development and progress in the field of solar cell fabrication is generally hindered due to cost and efficiency factors.

The sun provides us daily with a tremendous and huge amount of energy which is in the form of heat and also the radiations known as solar energy. The energy received from the sun is available free of cost and is limitless in nature. It also has numerous advantages as solar energy can be easily harvested and used over other available conventional sources of power generator. The solar energy can be used by harvesting the sunlight in the form of solar energy by using the photovoltaic device called solar cell. The sun is basically a huge mass of gases made up of helium and hydrogen atoms. The hydrogen nuclei combine by emission of huge amount of energy by process called nuclear fusion. During the process of fusion, four of the H atoms unite and release energy to form one He atom. This energy which is released from the fusion reaction is pollutant- free, free from gases or any by product from the reaction.

The solar energy is utilized in two ways 1) photothermal and 2) photovoltaic. In first case the heat from solar radiation is either directly used for applications such as drying, water heating, space heating etc. or is converted into electricity. In photovoltaic conversion, the devices called as solar cells directly convert the solar radiation falling on them into electricity. Increasing the efficiency of solar cells and limiting the production cost is the key factors on which most of the research in this area are based upon.

Different Solar Cell Technologies And Other Efficiencies

Solar cells represent the building block and main component of PV systems. A solar cell is defined as an electrical device that directly converts the energy of photons into direct current (DC) electricity through a chemical/physical phenomenon called the photovoltaic effect. Photons with energy exceeding the cell material band-gap are absorbed causing excitation of charge-carriers and thus electric current and voltage. The conversion efficiency (η) is calculated as the percentage of the incident light power on the cell surface that is converted into electrical energy under standard conditions.

Solar cell technologies can be broadly divided as 1) solar cells based on Silicon 2) thin film solar cells 3) multijunction solar cells and 4) next generation solar cells.

Theoretical maximum solar cell efficiency value for homojunction cells can be about 29% (Sukhatme, S. P. &Nayak, J. K., 2018) assuming incident global radiation to be AM1.5 under a clear sky (1000W/m2) and with band gap energy in the range 1.1eV to 1.7eV. Many semiconductors like Si, GaAs, CdTe have band gap in this range. However, even with sustained research and development the highest reported values (2) from laboratories for solar cells and PV modules can barely reach the maximum theoretical values.

The efficiency values (Green, M.A. et al, 2016; Sukhatme, S.P. &Nayak, J. K., 2018) attained in laboratory with some first generation and second generation solar cells are listed in Table I for comparison purpose.

A. Crystalline Silicon Solar Cells

Single-junction c-Si is currently the dominant cell technology in the global PV market. The wafer-based conventional cells are classified according to their crystalline structure into four main types: Mono-crystalline, Poly-crystalline (i.e. multi-crystalline), Heterojunction with Intrinsic Thin layer (HIT), and Microcrystalline. Both single crystal and multicrystalline, are widely popular because silicon is abundant and non-toxic. With increasing production of solar PV cells and with need to reduce their cost, multicrystalline Silicon is used for commercial modules, though its efficiency is lower.

Due to high cost of making crystalline silicon, thin film cells based on a hydrogenated alloy of amorphous silicon (denoted by a-Si:H) have been commercialized.

Table I. Efficiency values attained in laboratory with some first generation and second generation solar cells. Measurements under global AM1.5 spectrum (1000 W/m2) and at cell temperature 250 C (Green, M.A. et al , 2016; Sukhatme, S. P. &Nayak,J. K., 2018)

Type of Solar Cell	Area (cm2)	Efficiency (%)
Silicon (single crystal)	143.7	**25.6**
Silicon (multicrystalline)	242.74	**21.3**
Silicon (amorphous)	1.001	**10.2**
Gallium arsenide GaAs (multicrystalline)	4.011	**18.4**
Thin Film:		
Cadmium telluride CdTe	1.0623	**21.0**
Copper indium gallium diselenide CIGS	0.9927	**21.0**
Gallium arsenide GaAs	**0.9927**	**28.8**

B. Thin Film Solar cells

To avoid the high economic and environmental cost of c-Si cells (in terms of material and energy) , a second generation of technology has been introduced since 1970s. Thin-film PV cells are manufactured by depositing thin layers of photovoltaic materials (thickness < 2 μm) to form a heterojunction barrier. Due to the direct and wide bandgap of most thin-film semiconductor materials (1.5-1.8 eV), 2G cells have better temperature coefficients as well as a good performance in indirect light. Furthermore, the main advantage of thin-film cells stems from their very small thickness. Accordingly, they can be deposited on flexible substrate materials, they can be connected into modules during the manufacturing process of the cells through laser cutting, and they can be vertically stacked to form the 3G tandem (multi-junction) cells.

Technology has helped to reduce the cost as compared to Silicon wafer based technology due to less material requirement. Other advantages of thin film modules are, they can be made in large sizes and can be mounted on curved surfaces with use of suitable substrates. However, the efficiencies of thin film solar cells are lower as compared to wafer based cells.

C. Multijunction Solar Cells

Based on amorphous silicon as well as compound semiconductors from group III and V elements of periodic table have shown greatly improved efficiencies. However, their manufacturing is expensive. An efficiency of 40.7% has been reported (King, R. R. et al., 2007) for a three-junction GaInP⁄ GaInAs⁄ Ge cell under the standard spectrum for terrestrial concentrator solar cells at 240 suns (24.0W/cm2, AM1.5D, low aerosol optical depth, 25°C). Multijunction cells based on III-V compounds are primarily used with solar concentrators, mainly providing power in space applications.

Gallium arsenide (GaAs) is a compound semiconductor which has replaced silicon in many applications due to high efficiency. GaAs solar cells have been made in various forms: thin film, single crystal, multicrystalline and multijunction. The thin film GaAs single junction solar cells have shown efficiency of 28.8% in laboratory and multicrystallineGaAs solar cells have shown 18.4 %. Thin film GaAs solar cell modules have shown 24.1% efficiency in laboratory (Green, M.A. et al, 2016). Multijunction solar cells with GaAs have shown efficiency of 31.6 % (Green, M.A. et al, 2016). Other advantages of GaAs are: its bandgap 1.42eV is close to ideal value for PV applications, its high performance in high temperature environment and better resistance to radiation. All these characteristics make it suitable for use in space applications and solar concentrators (Sukhatme, S. P. &Nayak,J. K. ,2018).

D. Emerging technologies

1) Pervoskites Solar Cell

Perovskites are a group of compounds having crystal structure similar to a mineral called perovskite which is composed of calcium titanate (CaTiO3). Perovskite solar cells are based on organometallic halides.

They have been recently reported with efficiency 25.5 % in single-junction architectures and 29.1% in silicon-based tandem cells (https://www.nrel.gov/pv/cell-efficiency.html). Perovskite solar cells are the fastest-advancing solar technology with the potential of achieving even higher efficiencies at low production costs. However, the commercialization of this technology faces certain issues, like stability against moisture and oxygen, heating under applied voltage (Yuan, Y., et al, 2016), photo-unstability , mechanical fragility (Rolston, N., et al, 2016) and environmental concerns due to toxicity of lead halides used in perovskite solar cells.

2) Organic Solar Cell

Organic solar cell or plastic solar cell is thin film cells which use organic semiconductors. The advantages of this type of cell are: they are inexpensive, flexible, light weight and involve solution based processing. But these cells suffer from low efficiency. Various architectures and different materials have been tried with organic solar cells. Recently efficiency for organic photovoltaics of 17.3% was reached via tandem structure (Chen, Y., et al, 2018).

3) Dye Sensitised Solar Cells (DSSC)

Dye sensitised solar cells (DSSC) or Gratzel cells are photoelectrochemical cells. The cell consists of photoanode, sensitizer, electrolyte and counter electrode. The sensitizer can be an organic dye, inorganic dye or metal-organic dye. The DSSC has attracted the attention mainly because it is simple to make using conventional roll-printing techniques and most of the materials used are low-cost. Conversion efficiencies of over 11% and 15% have been obtained with single junction and tandem cells, respectively, in the laboratory (Nazeeruddin Md. K., et al, 2011).

4) Kesterite Solar Cells

Kesterite solar cells are based on two synthetic compounds copper zinc tin sulphide (Cu_2ZnSnS_4) (CZTS) and copper zinc tin selenide ($Cu_2ZnSnSe_4$) (CZTSe). The optical and electronic properties of CZTS and CZTSe are similar to CdTe and CIGS. However, the advantage with CZTS and CZTSe is they do not contain toxic or rare earth elements like cadmium and indium respectively. Efficiency of 7.6% has been reported with CZTS cell and 9.8% CZTSe cell (Green, M.A., et al, 2016). Some loss mechanisms limiting the performance of these cells are dominant interface recombination, high series resistance and low minority carrier lifetime .

5) Quantum Dots

Quantum dots are a special class of semiconductors, which are nanocrystals, composed of periodic groups of II-VI, III-V or IV- VI materials. Quantum dot solar cells (QD) are structures with tunable bandgap to match the spectral distribution of solar spectrum, which reduces cost/ watt ratio of solar electricity. QDs offer the advantages like: they can be moulded into a variety of different types, in two-dimensional (sheets) or three-dimensional arrays; they can be processed to create junctions on inexpensive substrates such as plastics, glass or metal sheets; they can easily be combined with organic polymers and dyes. Recently scientists at the University of Queensland achieved 16.6% efficiency by synthesizing a quantum dot solar cell from a halide perovskite. U.S. National Renewable Energy Laboratory (NREL) set the previous record for quantum dot cell efficiency in 2017 at 13.4%, working with a similar lead halide perovskite (Sanehira, E. M. et al, 2017).

Future Trends

Continuous research and development in the field of solar photovoltaics is providing innovative materials to harvest maximum solar energy. Not only the materials but design of the products also plays important role in commercial application of the technology. Many interesting applications have been realised and some are expected in near future like : floating solar farms, where photovoltaic panels floating on reservoirs, dams and other water bodies save on large land area occupied by solar panels (Choi, Y. K., et al, 2016) ; building integrated photovoltaics (BIPV) blend into building architecture in the form of roofs, canopies; photovoltaic glasses act as energy generating device as well as allow natural light inside houses and offices; anti-solar panels working exactly opposite to conventional solar panels i.e. by using heat radiated from earth's surface so that energy can be generated around the clock (Deppe, T. &Munday, J. N., 2020) and perhaps the most promising would be solar paint with quantum dot solar cells and perovskite solar cells.

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Per formic acid: Effective reagent for preparation of Carene diol from Δ^3-Carene

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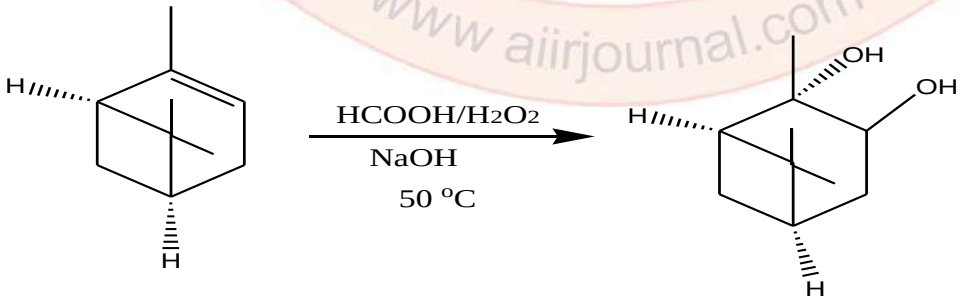
Abstract:
In the natural product, terpenoids are important because of its valuableimportance in various sectors. The terpenoids occur only in the volatile oils and they are normally colourless liquids or solids with pleasant smell and insoluble in water. They are soluble in organic solvents,alcoholand fixed oils. These terpenoids are very sensitive to prepare its various different derivatives. Terpenes are one of that terpenoids which can gives oxygenated derivatives like alcohols, ketones, aldehydes etc. Monoterpene is one of the terpenoids having molecular formula $C_{10}H_{16}$ used to prepare various derivatives. (+)3-Carene is one of the monoterpene which on oxidation by using oxidising agent performic acid which gives epoxide as intermediate product, (epoxidation of carene). Which on hydrolysis, it gives carene diol as final product.
Keyword: *terpenoids, volatile oils, Δ^3-Carene, α- pinene, carene diol.*

Introduction:

In the natural product, terpenoids are valuable natural product because of its importance in various sectors. The terpenoids occur only in the volatile oils they are normally colourless liquids [1] or solids with pleasant smell and are insoluble in water. They are soluble in, organic solvents,alcohols and fixed oils. Terpenoids normally contains one or more double bonds and forms additive compounds with halogens[2-3], nitrosyl chloride[4], and nitrosyl bromide. They are readily volatilise in stem and most of them are optically active [5].Then get oxidized by oxidizing agent. Terpene [No. of isoprene units two, M.F. $C_{10}H_{16}$] by virtue of their pleasant flavour the compounds of terpene [6] used in several industries specially perfumery, cosmetics, soaps, foods, pharmaceuticals [7], beverages and many others. Apart from flavour in food and pharmaceutical industries they are also used as mosquito repellents [8], insecticides, pesticides and deodorant [9] Antibacterial and Antifungal Properties [10]. Therapeutically they owe their action due to several compounds and find applications as antiseptic [11], stimulant, and diuretic, analgesic [12] and for several other purposes.

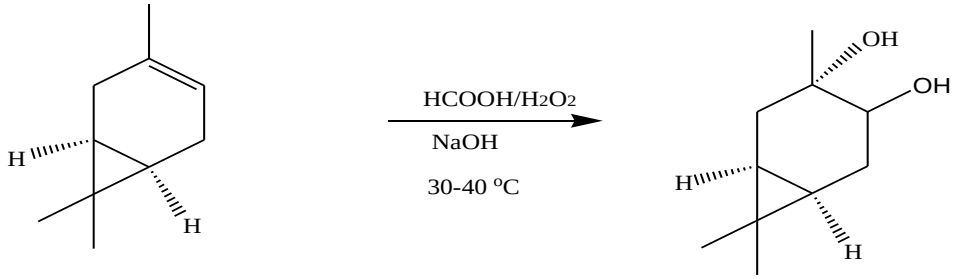
Terpenoids are classified on the basis of no. of isoprene units (C_5H_8).In that monoterpenes or terpene contains two units of isoprene ($C_{10}H_{16}$). Terpene or carene is present in (+) and (-) form. (-) form is isolated from root oil of kaempferia galangal [13-14] and from cedrus deodar oil and (+) form is wide spread plant product found specially in abies, citrus and janipenus oil with pleasant odour B.P.$_{200}$ =123-124°C and $\{\alpha\}_D^{30}$ =5.72, The (+) form of Δ^3-Careneis obtained from geranyl diphosphate[15]. Already recorded reaction of peracid such as Performicacidonterpene such as α-pinene epoxidation [16]takes place andepoxideofα- pinene is obtained. Which on hydrolysis, This epoxide is converted into 2α, 3β-pinenediol [17].The present work was done as same procedure given above on Δ^3-Carenewhich gives final product is 3α, 4β-carenediol.

Scheme I



α- pinene 2α, 3β- pinenediol

Scheme II



Δ^3-Carene3α, 4β-carenediol

General Experimental Procedure:

In the 150 ml three necked round bottom flask,equipped with a mechanical stirrer and dropping funnel was placed formic acid (90% 26 ml) and freshly distilled Δ^3-Carene (10gm)was added with stirring through a dropping funnel H_2O_2(30% 15ml) was then added drop wise maintaining the temperature of the reaction mixture between 30-40°C (2hrs) stirring was continued at that temperature for 6 hrs. And reaction was allowed to stand overnight. The solution of sodium hydroxide (8 gm in 20 mlH_2O) was added slowly to the mixture under stemming keeping the temperature around 25°C(1hrs) the reaction mixture was transpired to 150 ml separating funnel and the layer s were allowed to separate the upper oily layer approximately 13 gm was transferred back to the reaction flask and further amount of solution of sodium hydroxide (2 gm in 40 mlH_2O)was added slowly under vigorous stemming maintaining the temperature at 25°C to 30°Cafter stemming of one half hours and cooling to 5°Cto 10°C the solid diol separate out. It was filtered the residue washed with cold water and dried yield was 7 gm (64%) melting point 68°C. The crude diol was crystallized from pet ether + 5% ethyl acetate to give about 4 gm of diol (45%). Themelting point was87°Cto 88 °C

2.1*Spectral data of obtained compound:*
3,4-Hydroxy-3,7,7-Trimethyl-1- Bicyclo-(4,1,0)-Heptane.
IR(KBr):3448,2900,1460, 1375, 1058, 945 & 815 cm^{-1}

Result and Discussion:

Already recorded reaction of peracid such as Performic acid with terpene such as α- pinene epoxidation of reactant was takes place and epoxide of α- pinene is obtained as intermediate. Which on hydrolysis, This epoxide is converted into 2α, 3β-pinenediol of yield 40% .Whensuchreaction is carried out on Δ^3-Carene by using same reagenti.e.performic acid which is obtained from formic acid (90%, 26 ml) and with constant stirring through a dropping funnel H_2O_2 (30% 15 ml) was then added drop wise maintaining the temperature of the reaction mixture between 30-40°C (2 hrs) stirring was continued at that temperature for 6 hrs. And reaction was allowed to stand overnight. Then solution of sodium hydroxide (8 gm in 20 ml H_2O) was added slowly to the mixture. This mixture then cooling to 5°C to 10°C the solid diol separate out dried yield was 7 gm (64%) melting point 68°C. crude diol was crystallized from pet ether + 5% ethyl acetate to give about 4 gm of diol (45%). the melting point was 87°C to 88 °C

Table- 1

Sr. No.	Terpene			Yield (%)
1	α- pinene			40
2	Δ^3-Carene			45

In the present study preparation of carene diol from Δ^3-Careneby using simple & same procedure, Per formic acid in presence of base as same reagent and maintaining temperature between 30 to 50°C. Which is used for preparation of diol of α- pinene. The yield of product is also nearly equal in range i.e. between 40 to 45 %.

Conclusion:

We have been able to introduce an efficient procedure for preparation of terpene diol by using easily preferable, more efficient catalyst which gives good yield, easy to work up, purification of compounds by simple method are the key advantages of this method.

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Synthesis And Physicochemical Studies of Chalcone

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Abstract:
Chalcone compound is synthesized and its characterization was done byspectroscopic techniques such as IR, NMR and mass spectrometry.Some physicochemical properties such as melting point, density, viscosity, refractive index, etc. have been studied for newly synthesized chalcone in different solvents, different concentration and different temperature.
Keywords- Chalcones, Density, Viscosity, Refractive Index, Concentration, Temperature etc.

Introduction:

Chalcones are one of the most important compounds.The framework 1,3-diphenylprop-2-en-1-one is well known by the generic term ‘‘chalcone,’’ a name coined by Kostanecki and Tambor[1]. It is also known as benzalacetophenone and benzylidene acetophenone. The chalcones has most important properties like anticancer [2], antimalarial[3], antimicrobial[4] and antiinflammatory[5]etc. 2-Hydroxy chalcones are a group of naturally occurring compounds and are used as the intermediates for the synthesis of various other flavanoids[6,7]. The unsaturated carbonyl system in chalcones makes them biologically active[8].Indeed,chalcones constitute an important group of natural compoundsthat are especially abundant in fruits (e.g., citruses,apples), vegetables (e.g., tomatoes, shallots, bean sprouts,potatoes) and various plants and spices (e.g., licorice),many of which have been used for centuries in traditionalherbal medicine.[9]

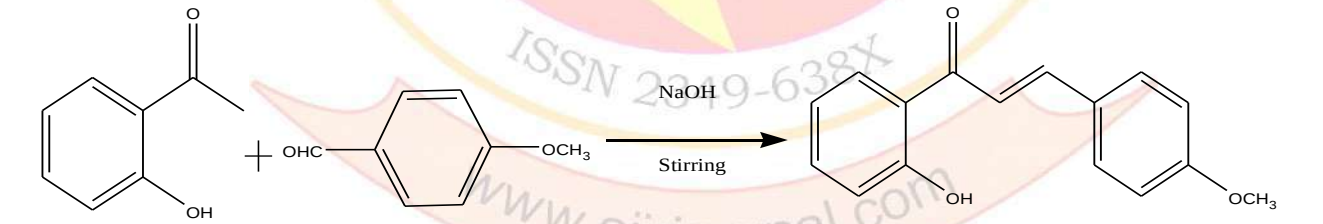
The physicochemical properties has lot of applications. The refractive Index ,density, molecular mass and viscosity are very useful in the evaluation of variousthermodynamics properties of chemical materials. The solubility is a main key factor in pharmaceutical industries.The crystallization process is also helpful in purifications and increases in crystal size.[10-12]

Thus, the present work was undertaken to synthesized new chalcone derivative and study of its physicochemical properties such as density, viscosity, refractive index etc. in different solvents, different concentrations and different temperatures.

Experimental

1. Synthesis

The chalcone was obtained by Claisen-Schmidt Condensation process.It contain equimolar quantity of aromatic ketones that is acetophenone derivatives and aromatic aldehyde as benzaldehyde derivatives will combine together in presence of base like NaOH to produce chalcone derivatives[13-20]. The structure of synthesized chalcone was confirmed by IR, 1H NMR and mass spectral data.



1-(2-hydroxyphenyl)ethanone 4-methoxybenzaldehyde (*E*)-1-(2-hydroxyphenyl)-3-(4-methoxyphenyl)prop-2-en-1-one

Table 1 shows the physical parameters of synthesized chalcone

Sr. No.	Compound	Substitution	Molecular Formula	Molecular Weight	Yield
1	Chalcone	OH & OCH_3	$C_{16}H_{14}O_3$	254	76%

2. Physicochemical studies:

The chlacone is recrystallized with DMF. All physicochemical properties were studied in dimethyl formamide (DMF) and dimethyl sulfoxide (DMSO) solvents.The different concentration of synthesized clacone prepared in DMF and DMSO. The selection of solvents for physicochemical properties on the basis of solubility.

2.1 Density and Viscosity:

The different concentrations of synthesized chalcone were made in DMSO and DMF solvents.The density of different concentration solutions were measured by using pycnometer while viscosity were measured by Ostwald viscometer at differenttemperatures**.**

2.2 Refractive Index:

The different concentrations of synthesized chalcone were made in DMSO and DMF solvents. The Abbe's refractometer was used for the measurement of refractive index of solutions of synthesized chalcone.

Results and discussion

1) Density and Viscosity of synthesized chalcone:-

The experimental values of density (ρ), and viscosity (η), at different temperature and different concentration are mention in fallowing tables

Table-2 Temperature:303.15 K

Conc.	DMSO Solvent		DMF Solvent	
(M).	Density (ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise	Density (ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise
0.05	1.202	13.2924	0.9710	8.3102
0.04	1.1190	13.2507	0.9698	8.2964
0.03	1.1188	13.1962	0.9690	8.2845
0.02	1.1178	13.1626	0.9681	8.2202
0.01	1.1168	13.1104	0.9678	8.1626

Table-2 Temperature: 308.15 K

Conc.	DMSO Solvent		DMF Solvent	
(M).	Density (ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise	Density(ρ) (g.cm^{-3})	Viscosity (η.10^{-3}) poise
0.05	1.206	11.3022	0.9626	7.9422
0.04	1.1194	11.2824	0.9610	6.9125
0.03	1.1186	11.2268	0.9572	6.8947
0.02	1.1174	11.1917	0.9555	6.878
0.01	1.1160	11.1364	0.9518	6.8262

Table-3 Temperature: 313.15 K

Conc. (M).	DMSO Solvent		DMF Solvent	
	Density (ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise	Density(ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise
0.05	1.1190	10.4612	0.9662	7.1522
0.04	1.1184	10.2643	0.9654	6.5844
0.03	1.1180	10.1107	0.9646	6.5005
0.02	1.1152	9.8215	0.9638	6.3863
0.01	1.1138	9.6276	0.9602	6.2084

The density of newly synthesize chalcone is higher in DMSO solvent than DMF solvent. The density decreases by decreasing concentration of solution because density is depend on the amount of substance present in solvent.The density in the two solvents is different.The different values in different solvents suggest that interactions of solute and solvent particles play an important role. In solutions, molecular interactions exist which differ in different solvents. Further, these interactions differ due to different concentration of solute insolution. Due to these interactions, there may be somechanges in mass and volume, which affects density

The viscosity of solution is depends on the interaction between solute and solvent particles, temperature, concentration etc. The viscosity in DMSO solution is higher than DMF due to strong solute solvent interaction in DMSO solvent. Viscosity in each solvent decreases as concentration decreases.

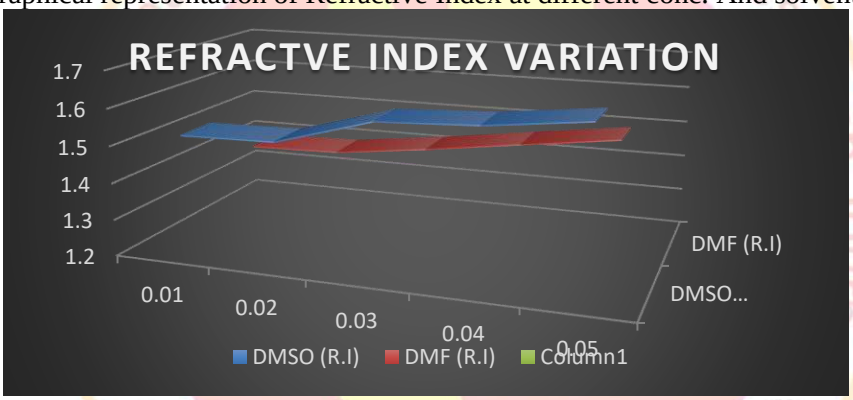
2) Refractive Index of synthesized chalcone:-

The experimental values of refractive index atdifferent concentrations and different solvents are mention in fallowing tables

Table-4

	DMSO	DMF
(M)	R.I.	R.I.
0.01	1.5126	1.3894
0.02	1.5168	1.3946
0.03	1.5914	1.4262
0.04	1.6021	1.4623
0.05	1.6322	1.4975

Graphical representation of Refractive Index at different conc. And solvents



It is observed that refractive index ofcompounds are different in each solvent as well as different concentrations . This again proves that in different solvents, inter molecular interactions are different which affects these parameter. In some solvents, aggregation or hydrogen bonding takes place whereas inothers, breakage of bonds takes place. As refractive index depends not only upon atomic refraction but also on single, double or triple bonds, these parameters are affected by the type of interactions taking place in solution.

Conclusion

It is concluded that physicochemical properties of a compound depends on concentration, temperature, solvents etc. The physicochemical properties play important role to explain the interaction between solute and solvent.

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A Biomonitoring of Plankton And Physico Chemical Properties of Kapileshwar Dam, Ashti, Dist-Wardha

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Abstract

The present study deal with biomonitoring of plankton and physico-chemical parameters of Kapileshwar dam. To cover the whole dam area the study area was divided into five sampling stations, comprehensively during the June 2017 to July 2018. The physico-chemical parameters were observed Temperature, Transparency, pH, Turbidity, Total Dissolved Solid, Total alkalinity, DO, Total hardness, Nitrate, Sulphate and Phosphate during the study. Water temperature exhibited feeble positive correlation with zooplankton. Transparency played an important role in flourishing population of phytoplankton as it established a positive correlation at 1% level of significance (r =0.729).The dissolved oxygen in water of the dam ranged from 5.00mg/l to 9.10mg/l at station I and II characterized as good level of water body. Nutrients like nitrates and phosphate present in the water body were found in the permissible limits as prescribed by WHO, BIS for drinking water quality which confirm that the water is unpolluted and safe for drinking purposes. At present the Kapileshwar dam is of mesotrophic nature.

***Key words**: Physico-chemical parameters, Kapileshwar dam, Plankton and Mesotrophic.*

Introduction

It is necessary that the quality of water should be checked periodically because due to use of contaminated water biotic fauna may suffer from a variety of water born diseases Sunkund and Patil (2004). In recent times limnological studies are often related to fisheries, biodiversity conservation, pollution assessment and rejuvenation of degraded inland freshwater ecosystems (Arlinghaus et al., 2008). Zooplankton diversity is one of the most important ecological parameters in water quality assessment. In many areas,the ecological impacts from human activities will far exceed the impacts from climate change, Scholze et al., (2006) have worked on a climate-change risk analysis for world ecosystems, Islam (2007) in a pond of Rajshahi University, has investigated the effects of abiotic parameters on the variations of zooplankton population. Zooplankton is good indicator of the changes in water quality because they are strongly affected by environmental conditions and respond. Nelson et.al.,(2009)carried out a detailed study on the combined effects of urbanization and climate change on stream ecosystems: from impacts to management options. Similarly, Durance and Ormerod (2009) have investigated existing trends in water quality and the consequent discharge confound long – term warming effects on river macroinvertebrates. The study of plankton and physico-chemical property of water was carried out by various people like

Mishra and Saksena (1991), Kuashik and Saksena (1995). Patel et al., (2013), Vasanthkumar and Vijay Kumar (2011), Garg et al., (2010). The water of Kapileshwar dam is utilized for drinking, irrigation and for fisheries activity. The present study was aimed to evaluate water quality and occurrence of zooplankton and phytoplankton with reference to physico-chemical parameters in a Kapileshwar dam.

Material And Methods

The Kapileshwar dam is a man made reservoir constructed on a river. It is at 780-17'-00" E longitude and 200-12'-00"N .The length of dam is 589 mtrs. and 7.31 meters high with a catchment area of 6.68 square km situated near Ashti Tahsil of Wardha District.Gross storage capacity of the reservoir is about 1.720 Mm3.The study area was divided into 5 sampling sites .Water samples were collected regularly on monthly basis in between 8 a.m. to 10 a.m. Water pH,DO,and TDS observed at sampling site using water analysis kit(Systronic make) while other abiotic components were analyzed at laboratory condition using the method prescribed by APHA(1989).

Result And Discussion

It is fact that maintenance of healthy aquatic ecosystem is dependent on the physico-chemical properties of water. Station wise mean values of physico-chemical parameters are summarized in Table 1.

Water Temperature(WT)

Temperature is one of the most important ecological factors, which controls the physiological behavior and distribution of organisms. In present study, lowest value of water temperature found in January190C and

highest in Jun 31.100C with the mean values 26.110C.that shows the optimum ranged for growth of aquatic fauna and flora. This result agrees with the reported by Swaranlatha and Rai (1998) in Banjara Lake. Salve(2006)also reported similar trends in Wan Prakalp reservoir, Nagpur.

pH

pH regulated most of biological processes and bio-chemical reactions. pH value ranged from minimum 6.05 to maximum 7.48 at station-I. The pH of water tends towards alkaline nature.Minimum pH was found in the month of April(summer) and reached to the maximum in the month of December (winter).This is in agreement with the findings of Manjare et al.,(2010) who studied the Vadgaon tank of Kolhapur.Mean and range pH value of all the five stations observed was 6.98 ± 0.10.

Transparency

Fresh water body in the present investigation showed no typical trend.Average mean value of water transparency evaluated is 47.68 cm. The lower values of transparency during rainy season may be attributed due to the rains which might have brought silt and mud from the catchment area making the water turbid. This is in the conformation with the observation made by Zafar (1966); Kaur et al., (2008). Mwara, (2006) also observed low transparency during rainy season in manmade reservoirs in Kenya.It was found higher in the summer season which might be due to suspended particles accumulated during summer months or may be attributed to human activity like washing and bathing.Jaybhaye (2009) also reported similar trends in Parola dam of Hingoli district.

Total dissolved solids (TDS)

TDS is measure of all the dissolved substances, both organic and inorganic in water. Higher TDS attributes to high dissolved and suspended particles in to the water.At station-I the total dissolved solid was found higher 400mg/l with the mean value considering all five station was 315.71 mg/l. It is in the range of permissible limit. Similar results were also reported by Chaturbhuj et. al.,(2004) in the Jamwa Ramgarh Lake, Jaipur.

Turbidity

The water was less turbid as observed during study period. Monsoon months particularly showed turbid water which is attributed to the surface runoff in the rainy season from the catchment area; recently Manjare et.al.,(2010) have reported higher turbidity in summer season. Average mean turbidity values of the entire sampling site calculated to 39.95 NTU.

Total alkalinity

Total alkalinity of water is the quality of water and kinds of components present in water such as bicarbonate, carbonate and hydroxide. Total alkalinity was in the ranged from 106mg/l to 330mg/l at sampling station –II and sampling station-V (Table-1) respectively. The maximum value recorded in the month of January(winter) and minimum in the month of August(monsoon).The alkaline water was found productive.Spence (1967) classified the lake into three categories based on alkalinity. On the basis of this classification, Kapileshwar dam considered as a nutrient rich dam.

Dissolved oxygen(DO)

Dissolved oxygen is an important limnological parameter indicating level of water quality , organic production and reflects the physical , biological processes prevailing in the dam water. It ranged was 5.00mg/l to 9.10 mg/l. The level of DO was found less during the month of may(summer). This is because of the low solubility of gases at high temperature Hynes,(1978); similarly during summer water volume also decreased and became more concentrated with the pollutants, Decreased DO in summer correlates with the higher solubility of oxygen at lower temperature. This is in agreement with the recent findings of Garg et al.,(2010) who found that dissolved oxygen was less during summer season. Average DO in the present study also exceeded the limit of 5mg/l as per European Environmental Commission Chapman (1997) and mean value observed in the present investigation was 7.91 mg/l. Therefore, it can be concluded that water is safe for human consumption.

Total hardness

The hardness of water is mainly governed by the content of calcium and magnesium which largely combine with bicarbonates & carbonates (temporary hardness) and with sulphate, chlorides and other anions of minerals (permanent hardness).In the present study,mean value of total hardness of five different stations was observed as 127.17 mg/l . The minimum and maximum evaluated was 86 mg/l and 226 mg/l respectively. It was found in permissible limit.

Nitrates

Nitrate is basic nutrient, which is determined the productivity of lake. In the fresh water nitrate content is meager. In the present study the average values of nitrate of all the sampling stations were observed to be 0.48 mg/l. there was no seasonal trend in the concentration of nitrates and minimum concentration was found

0.19mg/l at station-I while maximum 0.87 mg/l at station-IV.Nitrates were estimated more in winter season. This is in agreement with the findings of Islam(2007).

Sulphate

Most of the sulphate ions are probably derived from the solution of calcium & magnesium ions. Sulphate is naturally occurring ion found in all types of water and wide ranges in nature. Occurrence of sulphate in water is due to influx of runoff and leaching process. The average mean of water sulphate content was found to be 12.46 mg/l which is in permissible limit. Bhagat (2008) have also observed minimum sulphate content in Ambadi dam, near Akot Dt.Akola.

Phosphate

The lower and higher values fluctuated from 0.02 mg/l to0.60 mg/l at station- V and station-II respectively. Average mean of all the five stations calculated 0.25 mg/l. Winter months contribute higher concentration as compared to monsoon and summer seasons. Higher values may be due to accumulation of surface agricultural runoff and washing activities that contributed to the inorganic phosphate contents.

Conclusion

The pollution indicators phytoplankton and zooplankton were less in number at all the stations similarly As no industrialization has taken place in the surrounding areas, menace of effluent discharge and subsequent pollution is not evident in the dam. Abiotic components are found in the safe limit which confirms that the water is safe for drinking and also for healthy fish culture. The present status of water body is mesotrophic and unpolluted hence, the water can be utilized for irrigation, drinking and fishery activities.

Table 1 : Physico chemical quality of Kapileshwar dam during June 2017 to July 2018

Parameters	Sampling stations				
	I	**II**	**III**	**IV**	**V**
Water temperature(^{0}c)	25.82	25.36	25.66	26.11	25.76
Transparency(cm)	43.95	70.64	61.29	27.11	25.76
Total Dissolved Solid (mg/l)	251.43	264.29	260.00	315.71	282.86
pH	6.95	6.93	6.82	6.98	7.05
Turbidity(NTU)	41.57	32.40	38.17	44.40	43.20
Total alkalinity(mg/l)	153.00	163.57	158.14	185.14	208.29
DO (mg/l)	7.41	6.47	6.20	7.91	7.12
Total Hardness(mg/l)	128.57	128.57	126.29	117.43	135.00
Nitrate (mg/l)	0.43	0.45	0.49	0.49	0.52
Sulphate (mg/l)	9.68	9.27	13.69	19.89	9.75
Phosphate (mg/l)	0.31	0.29	0.16	0.32	0.18

Table - 2 : Numerical abundance of zooplanktons (org/l) at different stations June2017-July2018

S.No.	**Zooplankton**	**Stations**					Total	**%**
		I	II	III	IV	V		
1	Protozoa	8542	5670	9205	7437	8468	**39322**	15.09
2	Rotifera	14801	13917	14654	15316	14138	**72826**	27.95
3	Cladocera	9646	9204	10383	7878	6185	**43296**	16.61
4	Copepoda	8026	9205	6480	9205	7511	**40427**	15.51
5	Ostracoda	8247	8395	6185	5913	5913	**34653**	13.30
6	Worms & Larvae	5766	6775	4345	7585	5596	**30067**	11.54

Table- 3: Variation in the abundance of Planktons at different during June2017-July2018

Sr..no.	**Zoo planktons**	**Stations**				
		I	II	III	IV	V
1	Acantholeberis	+	+	+	+	-
2	Bosmina	++	+	+	+	-

3	Ceriodaphnia	+	-	-	-	+
4	Chydorrus	+	+	+++	+	+
5	Daphnia	+++	++	+	++	-
6	Diaphanosoma	-	-	+	-	+
7	Disparalona	+	+	++	++	+
8	Graptoleberis	+	-	+	+	+
9	Holopedium	+++	++	+++	+	+
10	Leydigia	+	+	-	+	+
11	Moinodaphnia	-	+	-	-	+
12	Polyphemus	++	+++	+++	+	+
13	Sida crystallina	++	+++	+	+++	++
14	Simocephalus	+	++	++	++	+
	(+)Denotes 500 org/l , (-) Denotes Absent, ( ) Pollution indicator species					

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Green Chemistry and Environment: A need of Current Era

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Abstract:

It is broadly accepted that there is an emergent need for more environmentally acceptable processes in the chemical industry. This tendency gives rise to Green Chemistry. It dictate a exemplar shift from traditional concepts of process efficiency, that focus largely on chemical yield, to one that assigns financially viable value to eliminating waste at source and avoiding the use of toxic and/or hazardous substances. The paper describes the need of Green chemistry and its effect on the environment.

Introduction:

Green chemistry is the design of chemical products and processes that reduce or eliminate the use or generation of hazardous substances. Green chemistry applies across the life cycle of a chemical product, including its design, manufacture, use, and ultimate disposal. Green chemistry (Anastas PT, *et. al*, 2000) is also known as sustainable chemistry. Over the past decade, green chemistry has convincingly demonstrated how fundamental scientific methodologies can be devised and applied to protect human health and the environment in an economically beneficial manner. Significant progress has been made in key research areas, such as atom economy, alternative synthetic route for feedstock's and starting materials, biocatalysis, green solvent, biosorption, designing safer chemicals, energy and waste management.

Role of Green Chemistry in the current Scenario:

Green chemistry addresses the environmental impact of both chemical products and the processes by which they are produced. Green chemistry eliminates waste at source, i.e. it is primary pollution prevention (Anonyms, 2009) rather than waste remediation. There is no doubt that, in the twentieth century, organic synthesis has achieved a high level of sophistication with almost no molecule beyond its capabilities, with regard to chemo-, regio- and stereo selectivity, for example. However, little attention was focused on atom selectivity and catalysis was only sporadically applied. Hence, what we now see is a paradigm change: under the mounting pressure of environmental legislation, organic synthesis and catalysis. It is probably true to say that nowhere is there a greater need for green catalytic alternatives (McKenzie LC, *et.al, 2005*) in fine chemicals manufacture than in oxidation reactions. In contrast to reductions, oxidations are still largely carried out with stoichiometric inorganic (or organic) oxidants such as chromium (VI) reagents, permanganate, and manganese dioxide and periodate. There is clearly a definite need for catalytic alternatives employing clean primary oxidants such as oxygen or hydrogen peroxide. The key to waste minimization is precision in organic synthesis, where every atom counts.

Basic Principals of Green Chemistry:

1. **Prevention:** It is better to prevent the production of waste than to treat or clean up waste after it has been generated.
2. **Atom Economy:** Synthetic methods should be designed to maximize the incorporation of all materials employed in the process into the final product i.e. Reduce waste at the molecular level.
3. **Less Hazardous chemical synthesis:** Wherever possible, synthetic methods should be designed to use and create substance that possesses little or no toxicity to human health and environment.
4. **Designing Safer Chemicals:** Chemical products should be designed to perform their desired function while minimizing their toxicity and environmental destiny throughout the design of the process.
5. **Solvents and auxiliaries:** Safest available solvents must be selected for any given step and organic solvents must be avoided whenever possible.
6. **Design for energy efficiency:** Choose the least energy demanding chemical method. Ambient temperature and pressure are ideal.
7. **Use of renewable feed stocks:** Use chemicals which are made from renewable (i.e. Plant based) resources rather than chemicals obtained from depleting resources.
8. **Reduce derivatives**: Minimize the route of temporary derivation such as blocking group, protecting groups.
9. **Catalysis:** Use catalytic reagents rather than stoichiometric reagents in reactions.
10. **Design for degradation:** Design chemicals that degrade and break down into innocuous substances which do not persist in environment at the end of their function.

11. **Real time pollution prevention:** Monitor chemical reaction in real time, in process and control before the formation of hazardous substance.
12. **Safer chemistry for accident protection:** Choose and develop chemical techniques and substances that are safer and minimize the potential for chemical accidents, explosions and fires.

From the above Principles (Anastas PT, Warner JC., 1998), It is clear that the challenge for the future chemical industry is based on safer products and processes designed by utilizing new ideas in fundamental research. It has been said that the revolution of one day becomes the new orthodoxy of the next Green Chemistry is applied and must involve the successful implementation of more environmentally friendly chemical processes and product design.

Result and Discussion:

In country like India (Kidwai M. 2001), there is a great need of improvement in industries from the environmental point of view. Most of the industries are mainly confined to cost effectiveness rather than being eco effective. Some collaborative work has been done by the academic institutes and some industries to bring the eco friendly lab technologies to the industrial plants (J.H. Clark, D.J. Macquarrie, 2002). The best examples are the applications of enzymes in various industries ranging from drugs to leather. The textile industry (R. A. Sheldon, 1992) is one of the highly revenue generating industries in India, and they are now switching over to microbial Decolorization and degradation. Government can do a lot of good for the cause of green chemistry by increasing public awareness and by bringing and enforcing strict environmental legislations. One of the recent examples of government initiative is the conversion of diesel vehicles to compressed natural gas (CNG) and use of Electric vehicles (EV) in order to reduce pollution in the Country.

Conclusion:

Green Chemistry is new philosophical approach that through application and extension of the principles of green chemistry can contribute to sustainable development. Great efforts are still undertaken to design an ideal process that start from non-polluting materials. Though many exciting green chemical processes are being developed but there is far greater number of challenges lies ahead. A lot of efforts are being undertaken to design nonpolluting starting materials and to get safer products without side products. Development of better machines and fuels which produce lesser amount of polluting exhaust gases such as CO, CO2, SO2, nitrogen oxides etc. leading to air pollution and ultimately ocean acidification, has been proposed. Use of good fuel and modified green processes will also reduce the addition of heavy toxic metals and other toxic substances to the environment. Solvent free chemical processes or replacement of organic solvents by water reduces the addition of volatile organic compounds (VOC) in the environment. Use of microwave for chemical processes has reduced reaction time as well as amount of heat energy. Reduce, reuse and recycling, the principles of green chemistry will result in decrease of marine debris also in addition to pollution in surrounding environment. The greatest challenge is too incorporate the green chemistry in industrial, laboratory and day to day processes in order to control environmental pollution and hence ocean pollution at source. Many successful efforts have been made but still a lot has to be done. This can be achieved by training and educating new generation of chemists. Green chemistry has to be introduced in the syllabus of the students at all levels, so that each individual is made aware to choose greener ways in his or her life. Most importantly we need the relevant scientific engineering so, we can say that this approach in chemistry is helpful in protecting human health and environment and it represents a significant departure from the traditional methods previously used.

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GC-MS Analysis of *Colebrookeaoppositifolia* stem in acetone extract

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Abstract

The Lamiaceae (Labiatae) is one of the most important angiospermic aromatic families with wide application in term of traditional knowledge. The family is represented by 236 genera and 7,200 species with 256 endemic species, the members of family found in temperate regions worldwide. Colebrookea is an important genus in the Lamiaceae, first described in 1806. It includes only one known species Colebrookeaoppositifolia Smith. The plants are commonly known as Indian Squirrel Tail (English). The indepth phytochemical examination of stem extracts revealed the presence of phytoconstituents in stemsnamely Resorcinol,Octanenitrile, Acetone extract

Key words :*Colebrookeaoppositifolia, GC-MS analysis,*

Introduction

The *Lamiaceae (Labiatae)* is one of the most important angiospermic aromatic families varying greatly in terms of ethno-medicine (Sarac*et al.*, 2007). The family is represented by 236 genera and 7,200 species with 256 endemic species, the members of family found in temperate regions worldwide (Cantino 1992).The members of this family are well known as aromatic species, as they contain large quantities of the essential oils (Kremer*et al.*, 2012). *Colebrookeaoppositifolia* is a monotypic genus of *Lamiaceae,* first described in 1806. The plant is evergreen, densely woolly shrubs or small tree, 1.2 to 3.6 m distributed mostly in subtropical regions of the world such as India, Pakistan, Nepal, Myanmar, Thailand, South west, China and in India widely in Northern and Southern slopes of the Himalayan range of Sikkim at elevation ranging between 3000-5000 ft. It also grows wild on hills and plains throughout India mainly occupying subtropical Madhya Pradesh and Deccan Peninsula (Rana*et al.*, 2009).It has been extensively used in the traditional system of Indian medicine for the treatment of various ailments such as headache, fever, dysentery, peptic ulcer, dermatitis, wounds, haemostatic, antifungal, as anti-fertility agent and the roots of the plant has been most widely used for the treatment of epilepsy (Kritikar*et al.*, 2007).

Collection of plant material

Collection of plant material was carried out from Chikhaldaraforest locality in the month ofSeptember. Frequent visits were made throughout the season to know the phenological events and collect the plant parts. Collected plant parts separated and washed with tap water followed by distilled water. Stem of plant grinded and converted to the fine powder and this stem powder used for the soxhlet extraction.

Preparation of Extract

5 gmair dried powder was extracted with four solventsnamely Petroleum ether, Acetone, Benzene and Water respectively. The extract so obtained was concentrated at room temperature and carried out preliminary phytochemical analysis. It revealed that, acetone solvent shows more positive results as compared to other solvents. Due to this reason acetone solvent was chosen for GC-MS analysis.

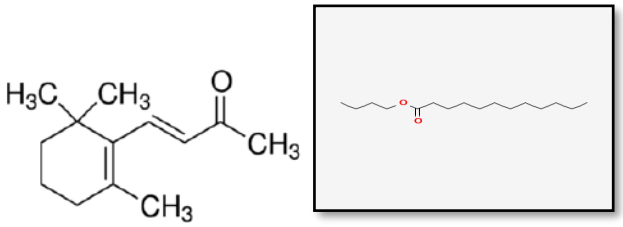
Gas Chromatography-Mass Spectroscopy (GC-MS) analysis.

The GC-MS analysis of stemin acetone extract was carried out using gas chromatography-high resolution mass spectrophotometer. 2 µl of sample was employed for GC -MS analysis. Analysis was carried out using AlegentHp 7880 with Colum 25m. Helium gas was used as carrier gas at constant flow rate.

Observation table

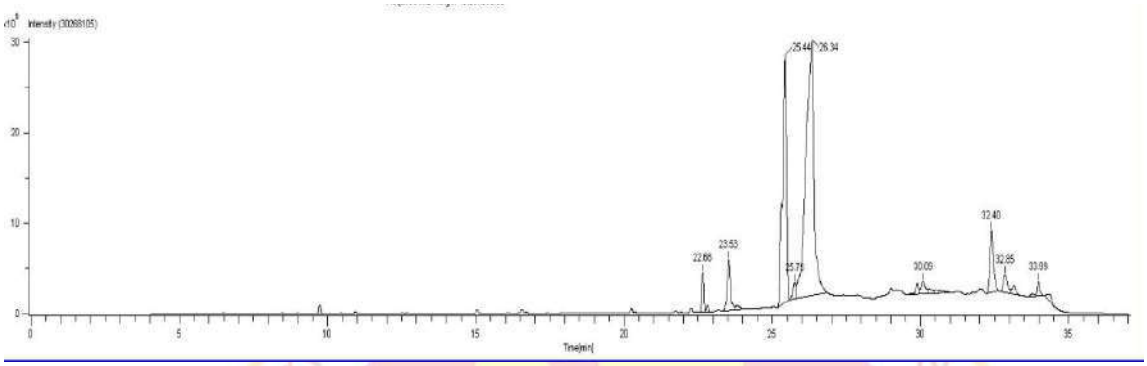
Sr. No.	R. T.	Compound	Percentage (%)	Mass	MF
1.	9.73	Resorcinol	0.48	110.10	$C_6H_6O_2$
2.	15.03	B-Ionone	9.66	192.15	$C_{13}H_{20}O$
3.	20.25	Octanenitrile	7.24	125.13	$C_8H_{15}N$
4.	23.53	n-Butyllaurate	2.41	256.24	$C_{16}H_{32}O_2$

Identified compounds in sample of*Colebrookeaoppositifolia*stemin acetoneextract

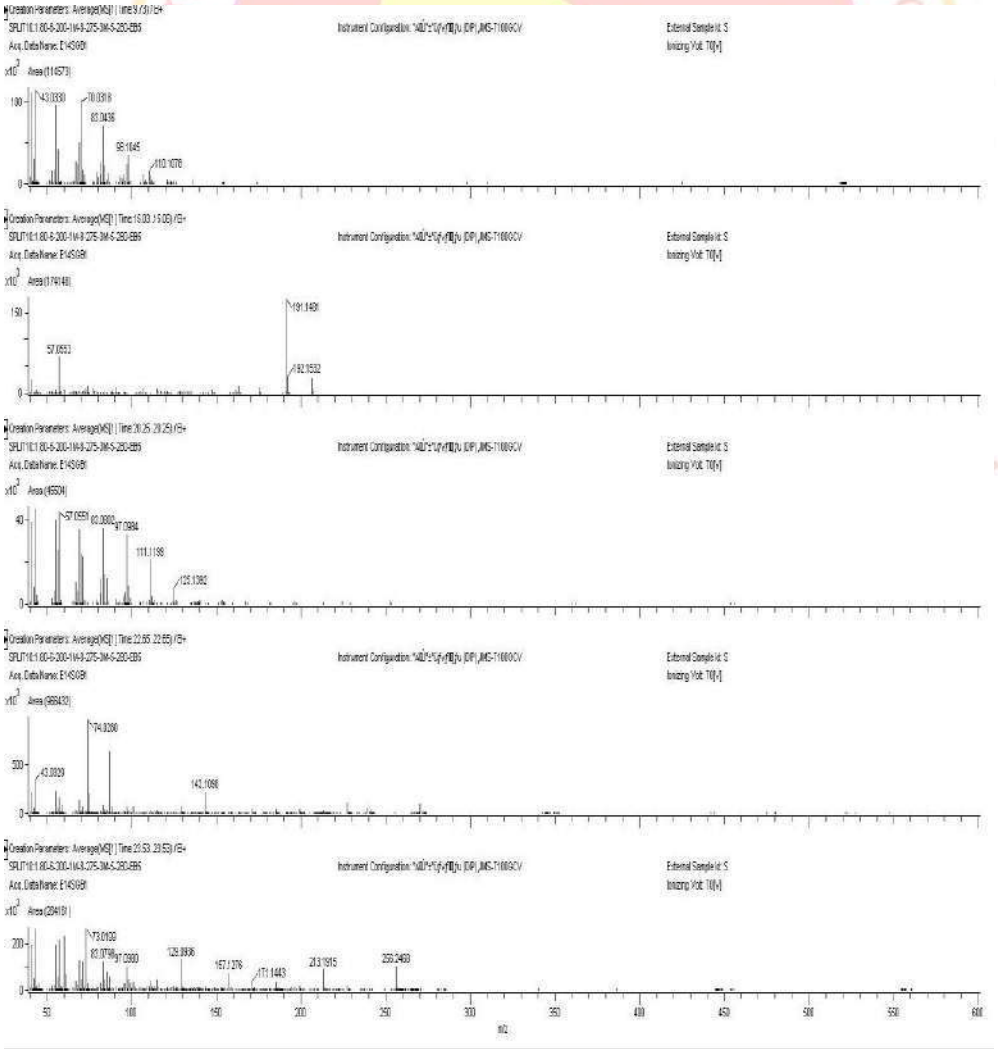


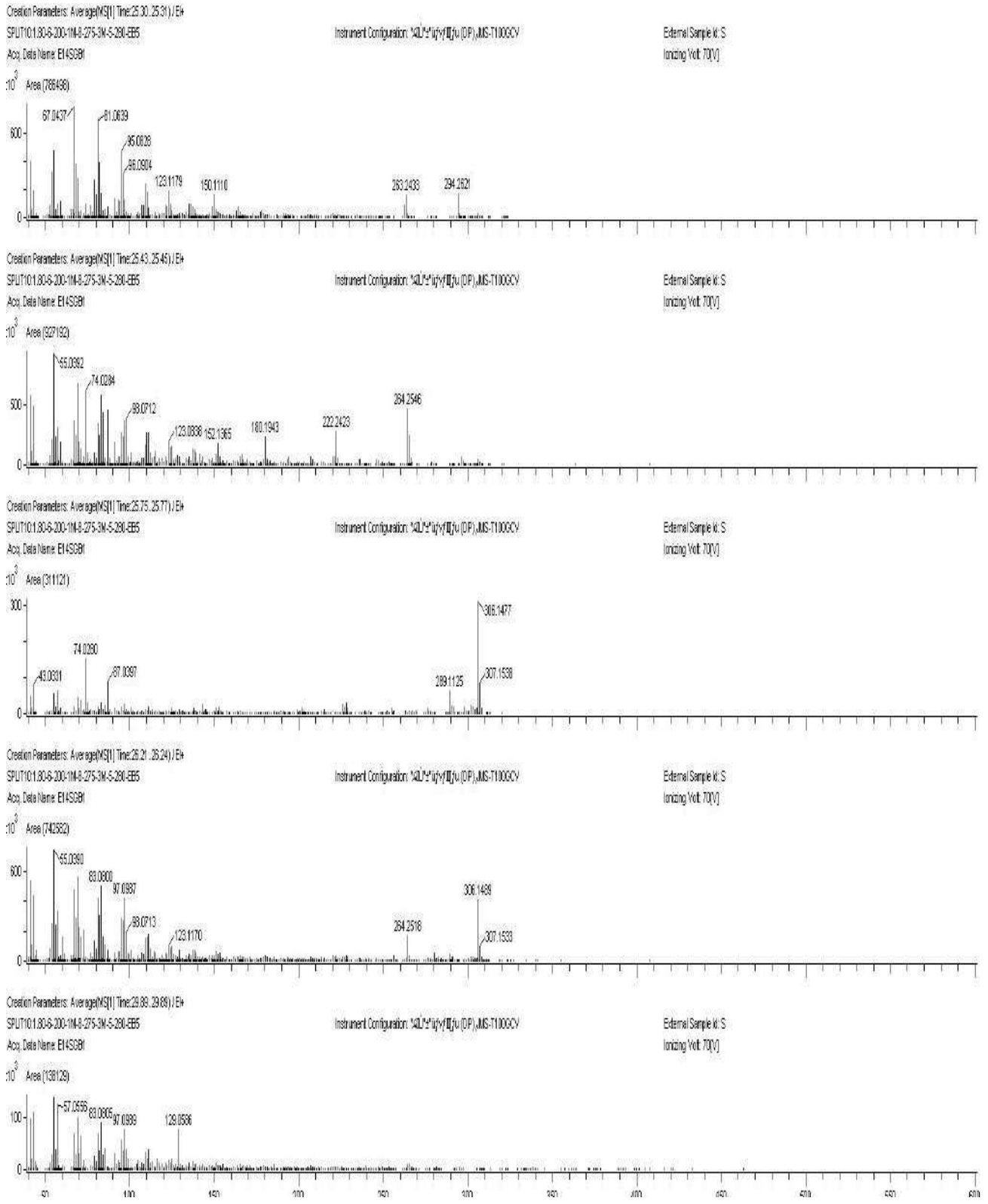
Resorcinoln-Butyl laurate

Fragmentation patterns of identified compounds



Chromatogram of *Colebrookeaoppositifolia* stem in acetone extract




Creation Parameters: Average(MS[1] Time:25.30..25.31) ,El+
SPLIT10:1.80-6-200-1M-8-275-3M-5-280-EB5
Instrument Configuration: %ÃÙ"ÿ°ÿ¡ÿ'ÿ¶ÿ[]ÿ¡ÿu (DP),MS-T100GCV
External Sample Id: S
Acq. Data Name: El+SGBf
Ionizing Volt: 70[V]
Area (766498)
67.0437
81.0639
95.0826
96.0904
123.1179
150.1110
263.2433
294.2821
Creation Parameters: Average(MS[1] Time:25.43..25.45) ,El+
Area (927192)
55.0392
74.0284
88.0712
123.0838
152.1365
180.1943
222.2423
264.2546
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74.0280
43.0331
87.0397
289.1125
305.1427
307.1538
Creation Parameters: Average(MS[1] Time:26.21..26.24) ,El+
Area (742552)
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83.0600
97.0397
88.0713
123.1170
264.2518
306.1498
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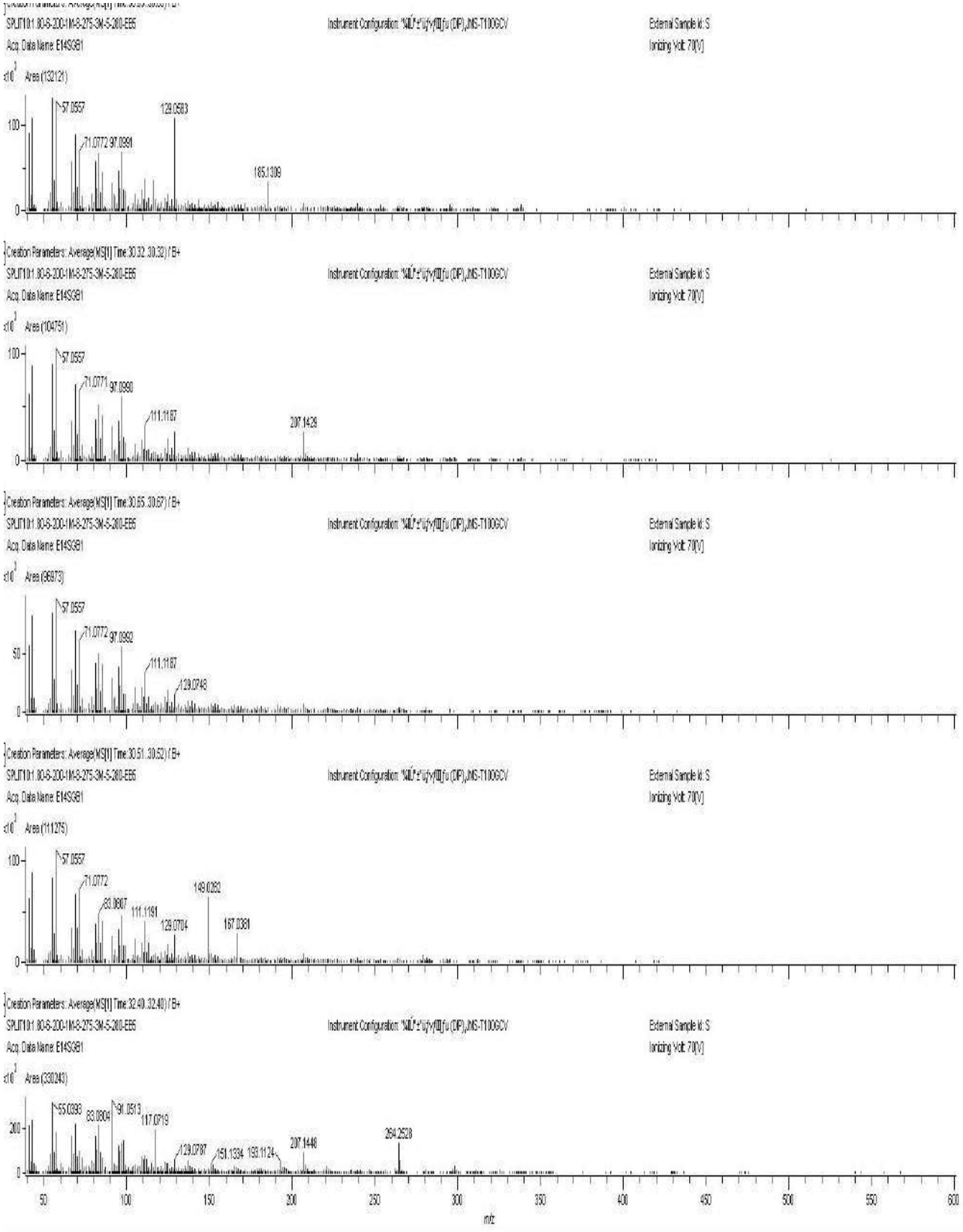
83.0605
97.0399
128.0536


SPLIT10:1 80-6-200-1M-8-275-3M-5-280-EE6
Acq. Data Name: E14S681
External Sample Id: S
Ionizing Volt: 70[V]
Area (132121)
57.0557
129.0583
71.0772
97.0991
185.1309
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Area (104751)
57.0557
71.0771
97.0990
111.1167
207.1429
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Area (96973)
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71.0772
97.0992
111.1187
129.0748
Creation Parameters: Average(MS[1] Time:30.51..30.52) / B+
Area (111275)
57.0557
71.0772
83.0607
111.1191
129.0704
149.0282
167.0381
Creation Parameters: Average(MS[1] Time:32.40..32.40) / B+
Area (330243)
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151.1334
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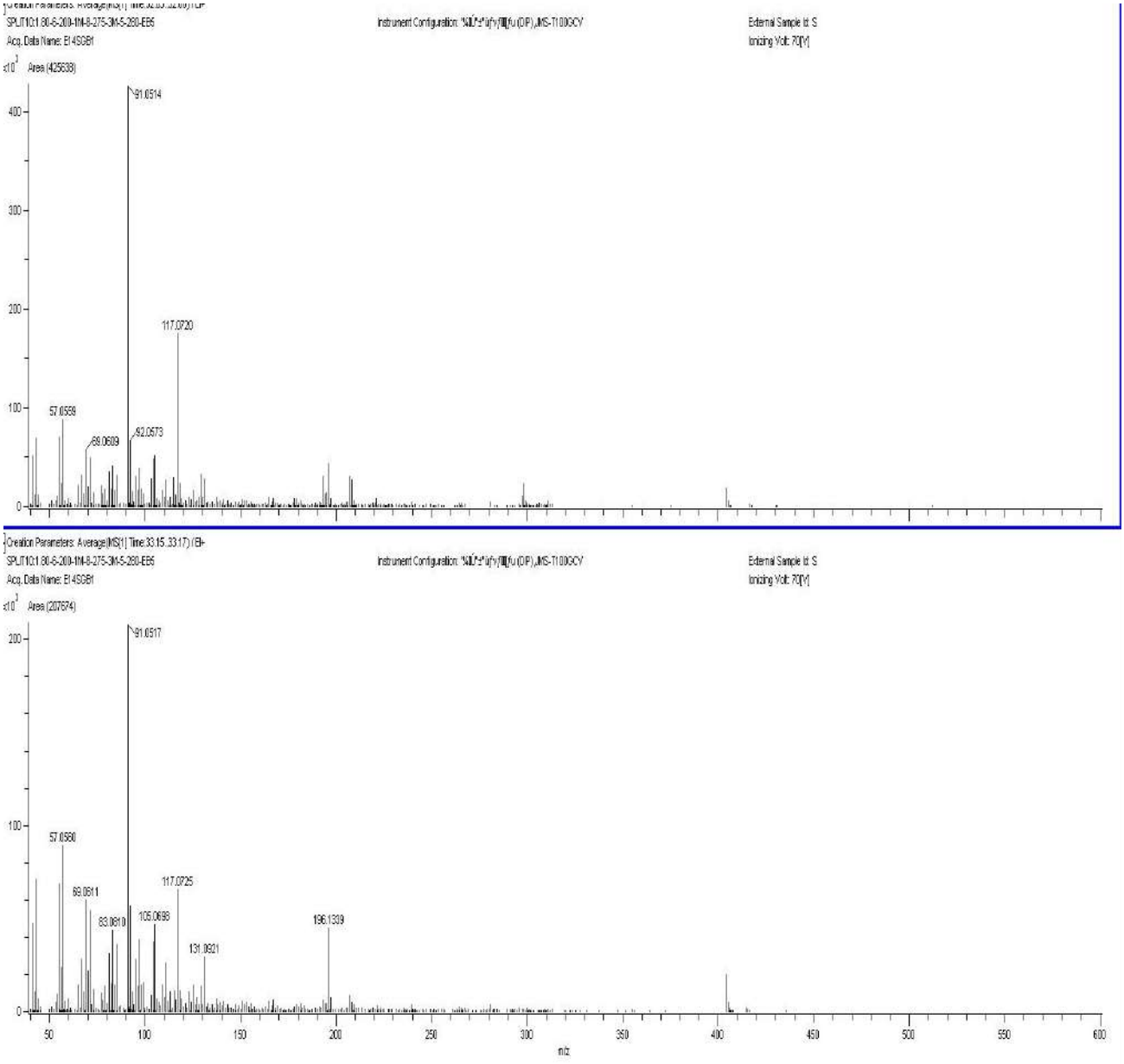
m/z



Mass-Spectra *Colebrookeaoppositifolia*stem in acetone extract

Result and Discussion

GC-MS analysis of stem of *Colebrookeaoppositifolia* in acetone extract revealedvarious compounds. These compoundswere confirmed on the basis of base peak and mass peak and compared with NIST mass spectrum. The percentage of various compounds was calculated by the use of gas chromatogram and mass spectra. Stem contain Resorcinol (0.48%), B-Ionone (9.66%), Butyl laurate (2.41%) and Octanenitrile (20.25%).

Resorcinol does not appear to occur naturally in the Free State. It is used for topical acne treatments at 2% or less concentration (Lander *et al.*, 1945). In most of the hospitals resorcinol paste applied directly to the skin for chronic acne.**B-Ionone** (9.66%) is aroma compounds found in a variety of essential oils, including rose oil. B-Ionone is a significant contributor to the aroma of roses, it is an important fragrance chemical used in perfume. The combination of α-ionone and β-ionone is characteristic of the scent of violets and used with other components in perfumery and flavouring to recreate their scent (Baldermann*et al.*, 2010).Butyl butyratealso called butyl butanoate,is an organic compound that is an ester formed by the condensation of butyric acid and n-butanol. It is a clear, colorless liquid that is insoluble in water, but miscible with ethanol and diethyl ether. Like other volatile esters, butyl butyrate has a pleasant aroma. It is used in the flavour industry to create sweet fruity flavours that are similar to that of pineapple. It occurs naturally in many kinds of fruit including apple, banana, berries, pear, plum and strawberry (CINF 2018)

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Assessment of Physico-chemical Properties of Farmland Soil From Different Village of Umarkhed, Dist. Yavatmal (Maharashtra) India

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Abstracts

Soil is a main source of nutrients needed to plants for growth.Soil provides structural stability for plants and retains and relinquishes water and the nutrients necessary for plant growth.Soil analysis provides information which is important for maximizing nutrient use efficiency and agricultural productivity. Soil properties that are sensitive to change in the management can be used as indicator. In the present study it was preferred to analyse the nutrients contain in soil sample of UmarkhedTahsil. The five samples were collected from different sites of the study area of UmarkhedTahsilin December 2021. The analysis of soil was carried out for the study of various parameters like Nitrogen, Potassium, Phosphorous, Magnesium, Calcium, Moisture, pH, EC, &Organic Carbon.

The study revealed that all the five samples of selected area of UmarkhedTahsilare medium to high in mineral content. The pH of the soilsamples were on slightly alkaline side, ranged from 7.80 to 8.21 but within the limit of 6.5-8.5 which is optimum for crops. OC contentall the samples were of medium rating ranged from 0.32% to 0.47%. Available nitrogen ranged from 559 kg/ha to 710kg/ha; available phosphorous ranged from 18.96 kg/ha to 36.12 kg/ha. Potassium ranged from 340 kg/ha to 589 kg/ha and twosamples were rich in potassium.

***Key words**: UmarkhedTahsil, Soil quality, Micronutrients, Physico-chemical parameters.*

Introduction

Soilis main and fundamental component of agricultural activityso that it is important and necessary to understand the basicneeds of soil.Soil productivity encompasses soil fertility plus the inherent and management-related factors affecting plant growth and development.The productivity of soil is mainly depending upon physico-chemical properties and nutrient content in it. Soil provide medium for many of the ecological processes that improve water and air quality and that promote plant growth. The physic chemical properties ofsoil play an important role in activities of microorganism in soil.Soil filters water, decomposes waste, stores heat and exchanges gases and hence has great bearing on environmental balance.The quality and health of soil is important for both agricultural sustainability and environmental quality which connected to the plant, animal and human health.

Soil analysis is well recognized as a sound scientific tool to assess the status of available micronutrients in soils and their relationship with various physico-chemical properties Considerable research work has been done regarding the study of Nutrients and Physico-Chemical assessment of various types of soil in Maharashtra as well as in India have been attempted by several investigators[3,4,5]. Khadake P.A. reportedsoil analysis and its environmental impact on Nanded city of Maharashtra State [6].

The status of micronutrients in soils district Bhimber and their relationship with various physico-chemical properties were investigated by WajahatNazif,et.al[7].It is a real time to carry out the physico chemical analysis of soil because as with the increasing use of chemical fertilizer to the soil, it is difficult to control the adverse effect of the chemical fertilizer to the soil, land, animal and the human being.[1,2]Soil fertility and productivity are the key pillars for food production and soil quality is of equal significance in the background of soil degradation caused by many factors.Soil is a naturally occurring porous medium that supports thegrowth of plant and roots by retaining air, heat, water andnutrients and provides mechanical support to the plant.[12] Factors that affect the availability of soil nutrients include leaching. Soil erosion, soil pH, denitrification , volatilization, nitrogen immobilization and crop nutrient uptake. Crop growth is influenced by aerial and soil environment.

Suitable environment is necessary for better germination, growth and yield of crops. The soil is a complex organization being made up of some six constituents' namely inorganic matter, organic matter, soil organisms, soil moisture, soil solution and soil air. Roughly, the soil contains 50-60%mineral matter, 25-35% water, 15-25% air and little percentage of organic matter.[11]The higher nutrient availability is favorable when soil has higher water holding capacity, proper aeration and less soil strength or mechanical resistance. The six elements nitrogen, phosphorous, potassium, magnesium, calcium and sulphurwhich are required in large quantities are labeled as macronutrients. Most of the soils supply enough calcium, magnesium and sulphurhence thesoil scientists called these elements as secondary nutrient elements. The other three elements nitrogen, phosphorous and potassium are called as primary nutrients and are not usually available in large amounts which is enough for best growth and therefore are added through fertilization.It is well known fact that the periodical analysis of soil provides the up-to date information about the nature and the composition of the

soil.Considerable research work has been done in Maharashtra as well as in India, regarding the study of Nutrients and Physico-Chemical assessment of various types of soil,A.A.Patil[8], R.P.Ganorkar[9],R.P.Ganorkar.[10]Therefore, the present work was undertaken for the study of impact of physic chemical properties of soil on soil quality and its productivity.

Material And Methods

Study Area

Soil sample iscollected from five different village ofUmarkhedTahsil in Yavatmal District of Maharashtra State, India; which is shown in Fig.-1. It belongs to Vidarbha RegionAmravatiDivision. Moderate rain fall in this region and well known for cotton,soya bean, Tur, SugerCaneand other rabi crops. The sources of water for this area is Penganga river, well water and tube wellwater.

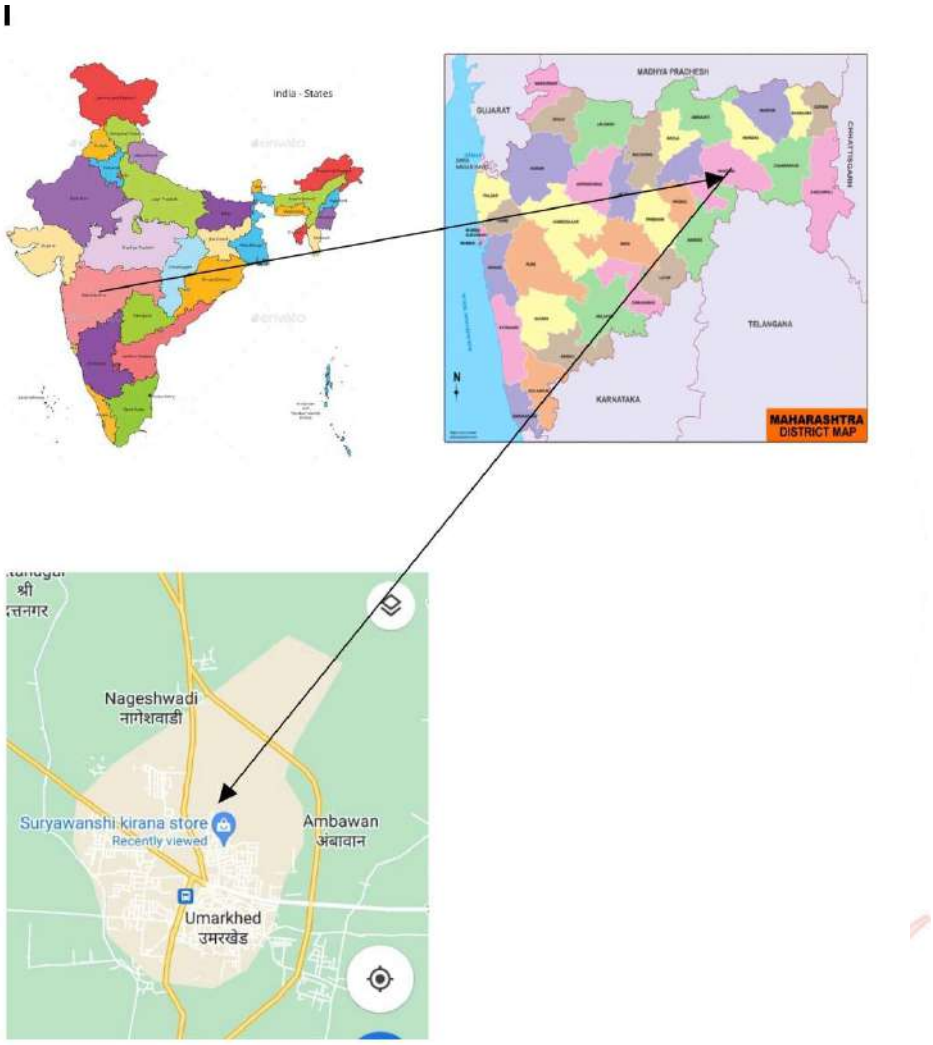


Figure1:-Location map of Study area UmarkhedTahasil District Yavatmal.

Sample Collection

Five samples were collected from the study area (farmer's field) in the month of December2021. Soil samples were collected randomly at 5 to 15 cm depths with five plots, in well sterilized polythene pouches. Soil sample were collected from following Village fields-

Sample-1 collected from VidulVillage.
Sample-2 collected from PophaliVillage.
Sample-3 collected from DahagaonVillage.
Sample-4 collected from Marlegaon.Village.
Sample-5 collected from Chili Village.

Physicochemical Analysis Of Soil Samples

The soil sample were Collected and dried for about 24hrs.Grinded more finely.Methods use for estimation of various parameters is as fallows, like Determination of pH by Digital pH Meter, EC by Conductometer, OC, Ca, N,P,by Titration Method, Determination of Mg was done by EDTA Titration Method.Determination of Potassium (K) by FlamePhotometry.

Result And Discussion

Color of Soil

The soil sample S1, S2, S3 and S4 were Black and S5 Faint Black in color.

pH

The range of pH is found in between 7.80 – 8.21. The sampleS1,S3 and S5 are slightly alkaline sample as compare toS2 and S4 soil sample which is in medium alkaline nature.

Organic Carbon

Organic carbon were recorded in the range of 0.32-0.47 %.The soil sample S2,S4, has high percentage of organic carbon. Sample S1,S5 have moderateandsample S3 has less organic carbon.

Nitrogen

Nitrogen content in the soil ranged from 710-559 kg/hector. The sample S3 & S5 has highnitrogen content as compared to other sample.

Phosphorous

The amount of Phosphorous content in the soil sample ranged between 18.96- 36.12 kg/hector. The soil sample S1 hasmore and soil sample S2 has very low phosphorous content.

Potassium

Potassium content in the soil sample ranged between 340 – 589kg/hector. The soil sampleS1havemore potassium content as compared to other samples.

Magnesium

The Magnesium content in the soil sample ranged from 8.75 – 11.45 %. It is seen in sequenceS1<S5<S3<S4<S2.

Electric Conductance

The Electric Conductance values varies from 0.090 – 0.242ms. It is seen that soil sample S2 have more value ofElectric Conductance as compared to other sample.

Calcium

The Calcium content in soil sample ranges from 49.10 – 60.90 %.It is seen in sequence S5<S3<S1<S2<S4.

Sodium

The Calcium content in soil sample ranges from 7.65 – 8.21 %.It is seen in sequence S5<S4<S2<S3<S1.

W.H.C.

The water holding capacity was observed in the sequence S5<S4<S2<S3<S1.

Calcium Carbonate

The Calcium Carbonate content in soil samples ranges from 6.02-8.35 %.It is seen that soil sample S1have more amount of Calcium Carbonate as compared to other soil samples.It is seen in sequence S2<S4<S5<S3<S1.

Density

The density of soil samples ranges from 1.45-1.63 %.It is seen that soil sample S2 &S4 have more density as compared to other soil samples.It is seen in sequence S4<S1<S3<S4<S2.

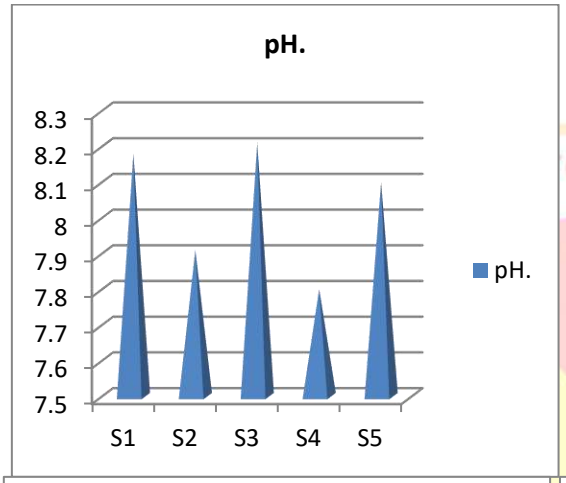
Conclusion

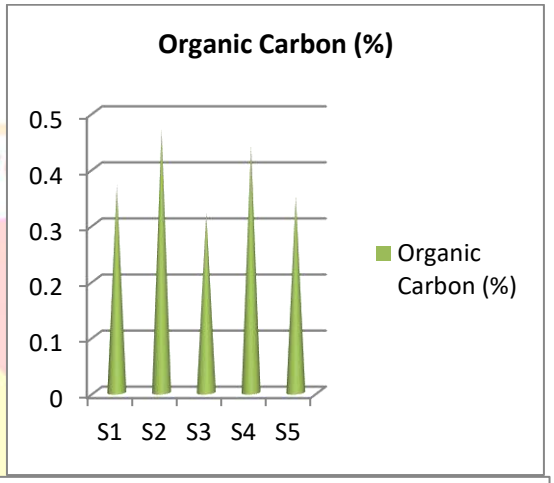
The physico chemical analysis of soil provides necessary information to set the target of nutrient application. The soil samples are slightly alkaline and the pH is in S4<S2<S5<S1<S3 order hence the Suggestion to use of compost manure.All the soil sample is low to modaret in organic carbone. In the soil sample S1 and S2 the Potassium is high as compare to other sample.

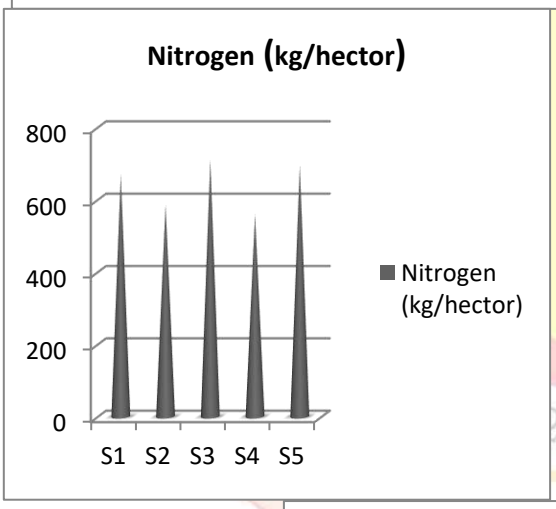
Table 1 :Physico chemicals parameters of soil samples

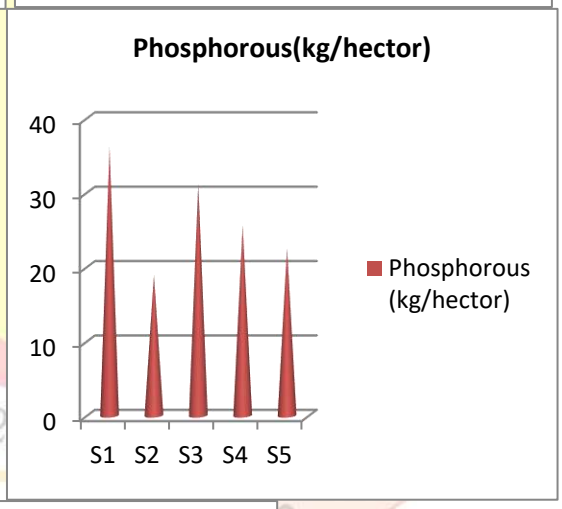
S. No.	Parameters	S1	S2	S3	S4	S5
1	Color	Black	Black	Black	Black	**Faint Black**
2	pH.	8.18	7.91	8.21	7.80	**8.1**

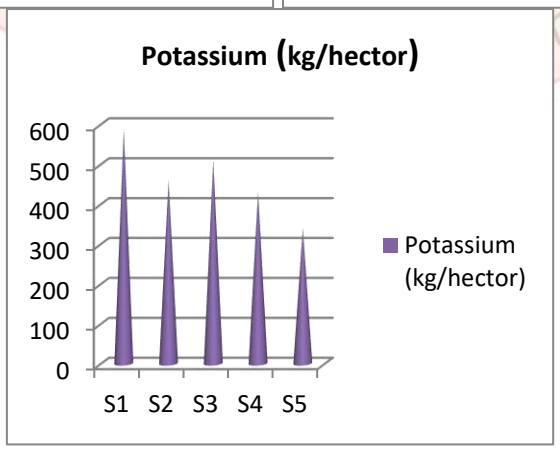
3	Electro Conductance(ms)	0.096	0.132	0.090	0.242	**0.112**
4	Organic Carbon (%)	0.37	0.47	0.32	0.44	**0.35**
5	Nitrogen (kg/hector)	670	585	710	559	**695**
6	Phosphorous(kg/hector)	36.12	18.96	31.20	25.60	**22.54**
7	Potassium (kg/hector)	589	460	510	430	**340**
8	Magnesium (%)	8.75	11.45	9.15	10.30	**9.10**
9	Calcium (%)	54.91	59.08	52.90	60.90	**49.06**
10	Sodium(%)	8.21	7.91	8.15	7.83	**7.65**
11	CaCo3(%)	8.35	6.02	8.26	6.35	**6.90**
12	M.W.H.C.	52.90	45.5	49.0	43.6	**42.50**
13	**Density**	**1.51**	**1.63**	**1.55**	**1.61**	**1.45**











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An Assessment of Water Sample for its Physico-Chemical Parameters of Umarkhed Tahsil, District Yavatmal (MH)

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Abstracts

Study of physico chemical parameter of water is very important to get exact idea about the quality of water and we can compare results of different physico-chemical parameter values with standard values and show present status of water.The Physico-Chemical parameter like pH, EC, TDS, Alkalinity, Mg&Ca have been analyzed.

The range of pH of water sample was found that 7.5-8.6.The range of EC was 354-642.TDS of tap water was law as compare to hand pump &Borewell water. Alkalinity varies between 135-565.Concentretion of Mg was found slight high in borewell water and Concentration of Ca was found in an average range.

***Key words**:Physico-chemical parameters, Tap water, Hand Pump, Borewell Umarkhed Tahashil.*

Introduction

Water is one of the most important and abundant compounds of the ecosystem.Groundwater is an important source of drinking water supply throughout the world[1-2] Urbanization and the unregulated growth of the population have altered the surface and sub-surface terrains of the many areas. Changes in local topography and drainage system directly affect both quality and quantity of the ground water. Groundwater quality depends on the quality of recharged water, atmospheric precipitation, inland surface water and sub-surface geochemical processes.[3]

As per WHO, any change in the physical, chemical and biological properties of water that has a harmful effect on living things is termed as water pollution. Rapid growth of population, urbanization and industrialization exerts pressure on water resources and unregulated or illegal discharge of effluents results in water pollution.The quality of water is characterized by a range of physical, chemical and biological parameters, which arise from a variety of natural and human influences.[4-7]

The quality of ground water depends on various chemical constituents and their concentration, So Study of physico-chemical parameter of water is very important to get exact idea about the quality of water and we can compare results of different physico-chemical parameter values with standard values and show present status of water.

Material And Methods

Study Area

The Six Water sample were collected in January month. The S1 and S2 sample were collected from tap water, S3 and S4 sample from hand pump and S5,S6 fromBorewell in UmarkhedTahsil in Yavatmal District of Maharashtra State, India; which is shown in Fig.-1. It belongs to Vidarbha RegionAmravati Division, The sources of drinking water for this area is Municipal tube water system,Bore well water, well water,and dam water.

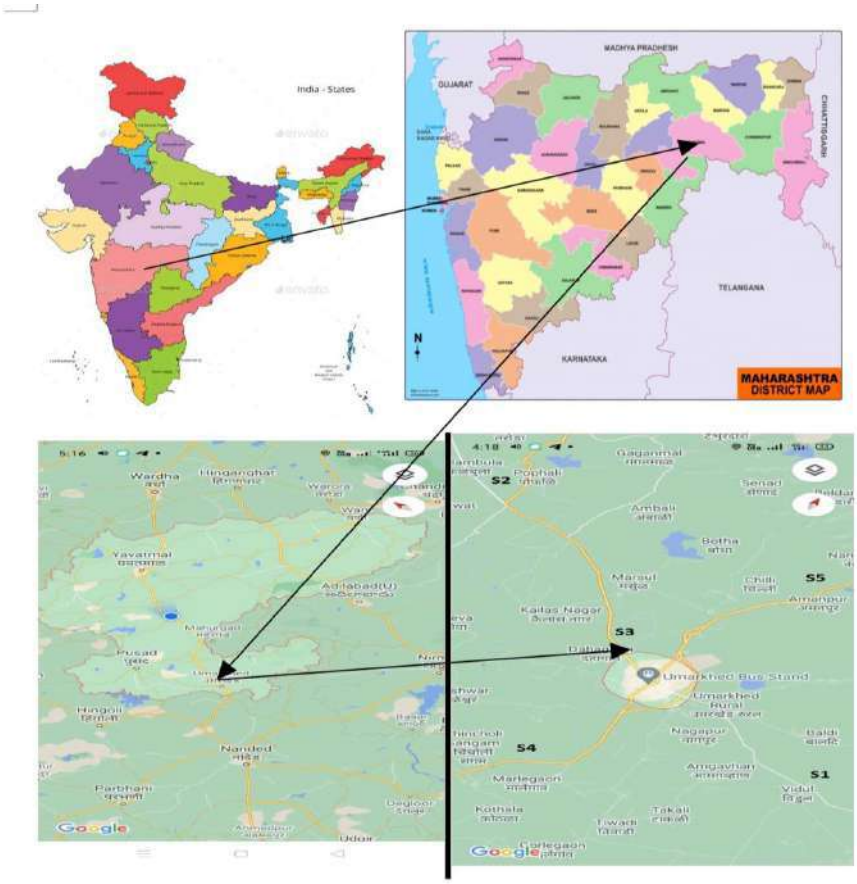


Figure1:-Map of Study area Umarkhed Tehsil

Sample Collection

Six samples were collected randomly from the study areaUmarkhedTahsil in Yavatmal District of Maharashtra State, India in the month of January 2022. Water sample ware collected in sterilized plastic bottle. Water sample were collected from following Source-

Sample-1 collected from Tap Water.
Sample-2 collected from Tap Water.
Sample-3 collected from Hand Pump.
Sample-4 collected from Hand Pump
Sample-5 collected from Bore well
Sample-6 collected from Bore well

Physicochemical Analysis of Water Samples

The Water sample ware collected in sterilized plastic bottle.Methods use for estimation of various parameters is as fallows, like Determination of, pH by Digital pH Meter, EC by Conductometer, TDS by TDS meter,Alkalinity , Mg and Ca, by Titration Method.

Result And Discussion

pH

The rangee of pH is found in between 7.5 – 8.140. The sample S4,S6 are slightly alkaline sample as compare toS1,S2,S3,S5 soil sample which is in medium alkaline nature.

Electric Conductance

Electric Conductivity were recorded in the range of 345 – 642 The watersample S5,S6 show high EC as compare to other sample.

TDS

TDS were recorded in the range of 220-660 The TDS was found that in water sample S1,S2 low as compare to other and it is seen in the sequence S2<S1<S5<S3<S4<S5.

Alkalinity

Alkalinity ware recorded in the range of 135-565. The water sample S1 and S2Showlow alkalinity it is seen in the sequence S2<S1<S6<S5<S3<S4

Magnesium

Magnesium content in the Water sample rangedbetween 10 – 35. The Water sampleS1has low and S4 hasmore concentration of Mg as compared to other samples.

Calcium

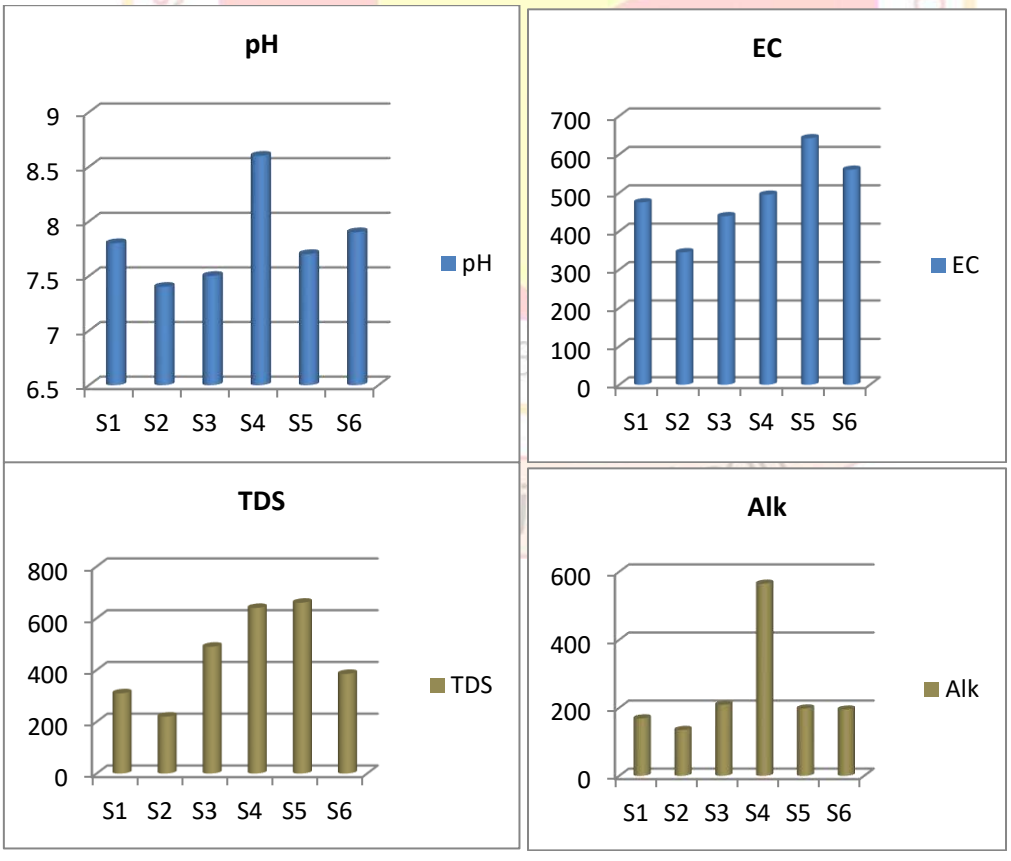
Calcium content in the Water sample ranged between 35 – 64. The Water sample S3 has low and S4 has more concentration of Ca as compared to other samples.

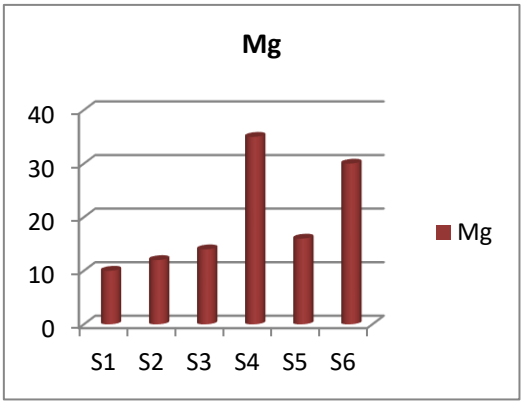
Conclusion

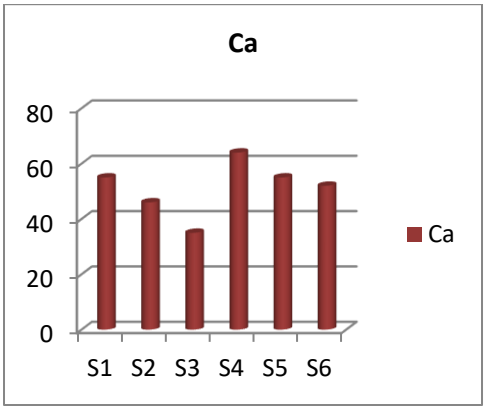
The physico chemical analysis of Water provides necessary information about quality of drinking water which gave idea to set the target of water treatment. The water samples are slightly alkalineand the pH is in S2<S3<S5<S1<S6<S4 order hence do not require special treatment to control pH.TDS of water is the most important properties to measure the quality of water and affected by other parameter like Hardness, EC, Alkalinity of water sample.

Table 1 :Physico chemical parameters of Water samples

Sample	S1	S2	S3	S4	S5	S6
pH	7.8	7.4	7.5	8.6	7.7	**7.9**
EC	475	345	439	495	642	**560**
TDS	310	220	490	640	660	**385**
Alk	169	135	209	565	198	**195**
Mg	10	12	14	35	16	**30**
Ca	**55**	**46**	**35**	**64**	**55**	**52**







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Induced frequency of chlorophyll chimeras in M_1 generation of kidney bean

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Abstract

Healthy and dwell dried seeds of kidney bean (Phaseolus vulgaris L.) were treated with various doses of chemical mutagens EMS and SA. The treated seeds were sown to raise the M_1 generation following randomized block design. The M_1 generation was screened for various chlorophyll chimeras. The plants carrying chlorophyll chimeras were counted and frequency of chlorophyll chimeras was determined.

Key Words: *Kidney bean, EMS, SA, chlorophyll chimeras*

Introduction

Kidney bean botanically described as *Phaseolus vulgaris* L. It is also called as haricot bean, common bean and navy bean (Singh, 1999; Pandey 2003). It comprises a good source of protein and also contains large quantities of complex carbohydrates, fibers and isoflavonoids (Anderson *et al.*, 1999). Mutagenesis is simple, relatively cheap to perform, applicable to all plant species and equally usable on small and large scale and therefore used to induce genetic variability in a great number of crops (Swaminathan 1995; Siddiqui and Khan, 1999). The objective of present studies was to study the effect of Ethyl methanesulphonate and Sodium azide on induction of chlorophyll chimeras in M_1 generation of kidney bean.

Materials And Methods

Healthy and uniform seeds of kidney bean variety HPR-35 were surface sterilized with 0.1% mercuric chloride solution for about one minute and washed thoroughly with distilled water. The seeds were presoaked in distilled water for 6 hours. Then seeds were later immersed in the mutagenic solution for 5 hours and treatment was given with intermittent shaking. All the treatments were given at room temperature of 25±2 °C. Seeds soaked in distilled water for 13 hours served as control. The different concentrations used for chemical mutagenic treatment were 0.05%, 0.10% and 0.15% for Ethyl methanesulphonate and 0.01%, 0.015% and 0.02% in case of Sodium azide. Immediately after the completion of treatment, the seeds were washed thoroughly under running tap water to remove excess of mutagens. Later on treated seeds were post soaked in distilled water for 2 hours. The post soaked seeds were dried in folds of filter paper. 360 seeds were used for each treatment, 60 seeds from each treatment were kept on moist blotting paper in petriplates to record germination percentage. Remaining 300 seeds of each treatment were sown in the field following randomized block design (RBD) with three replications each. M_1 generation was thoroughly screened for induced chlorophyll chimeras. Plants carrying chlorophyll chimeras were counted. Frequency of chlorophyll chimeras was determined.

Results And Discussion

Different types of chlorophyll chimeras were observed in mutagenic population. The chlorophyll chimeras could be detected in all the treatments. The different types of chlorophyll chimeras observed were *xantha* (yellow), *chlorina* (yellow green) and *viridis* (dull green). Among all concentrations the highest frequency of the various types of concentration the highest chlorophyll chimeras was observed in 0.15% concentration. And very least number of chlorophyll chimeras could be recorded in 0.10% concentration.

In present investigation three types of chlorophyll chimeras were noted sin M_1 generation of kidney bean after mutagenic treatments. Frequency of such chlorophyll chimeras was more at higher concentration. Motto *et al.*, (1975) also reported chlorophyll chimeras in kidney bean after EMS treatments. According to Gaul (1958) differential response of the embryonic cells to mutagen causes chimerism.

Table-1: Effect of mutagens on frequency of plants carrying chlorophyll chimeras in M_1 generation of kidney bean variety HPR 35.

Sr. No.	Treatment	Frequency of plants carrying chlorophyll chimeras (%)	± SE
1	**Control**	**-----**	**-----**
2	**0.05%**	8.00	3.0
3	**0.10%**	05.00	2.8
4	**0.15%**	16.00	0.3

Conclusion

Both the mutagens EMS and SA were effective in inducing chlorophyll chimeras in kidney bean at all concentration treatments with varied frequencies.

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Comparative Study On Total Dissolved Solids (Tds) Of Groundwater Of Arni Town, District-Yavatmal (Ms) India For Period Of 2 Year During Covid-19 Pandemic

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Abstract-

Water is life. Groundwater is considered as purest and majorly available source of water. It is used to fulfill 50% urban and 80% ruler water demand in India besides irrigation. Total Dissolved Solids, also known as TDS, are inorganic compounds that are found in water such as salts, heavy metals and some traces of organic compounds that are dissolve in water. Total dissolved solids (TDS) are a measure of the combined total of organic and inorganic substances contained in a liquid. This includes anything present in water other than the pure H_2O molecules. These solids are primarily minerals, salts, and organic matter that can be a general indicator of water quality. Arni is a town (Taluka) with (Administrative Division) & Tahsil in Yavatmal district of Maharashtra State in India. As groundwater is prominently used to fulfill domestic demands hence quality of groundwater must be checked time to time in order to supply safe drinking water. In this paper, one attempt has been made to study of variation in total dissolved solids of water of Arni Town, District-Yavatmal (MS) India over a period of 2 year during covid-19 pandemic.

Keyword- *total dissolved solids, groundwater, variation in total dissolved solids of water of Arni Town, District-Yavatmal (MS) India, period of 2 year during covid-19 pandemic.*

Introduction-

Water is colourless, odourless and transparent substance. Water is the important, precious and indispensable natural resources of the earth, covering approximately three-forth of the earth surface. Water is life. Water is an essential element of human being. Approximately 60-65% of human body is composed of water (1). Groundwater has excellent natural quality, usually free from pathogens, color and turbidity and can be consume directly without treatment. It does not require large storage, treatment and distribution system, can be frequently developed incrementally at point near water demand. Generally, groundwater is mostly chemically and microbiologically non-polluted so it is safe for drinking and cooking in addition to agriculture or industrial use. Groundwater is used to irrigate around two fifth of India's total agricultural land. Groundwater is considered as purest and majorly available source of water. It is used to fulfill 50% urban and 80% ruler water demand in India besides irrigation (2).

Total Dissolved Solids, also known as TDS are inorganic compounds that are found in water such as salts, heavy metals and some traces of organic compounds that are dissolve in water. Excluding the organic matters that are sometimes naturally present in water and the environment, some of these compounds or substances can be essential in life. But, it can be harmful when taken more than the desired amount needed by the body. The total dissolved solids present in water are one of the leading causes of turbidity and sediments in drinking water. When left unfiltered, total dissolved solids can be the cause of various diseases.

Arni is a town (Taluka) with (Administrative Division) & Tahsil in Yavatmal district of Maharashtra State in India. It is situated on the banks of the Arunavati River. It Connected with National Highway-361. Nearest Railway Station is a Dhamangaon which is located 90 km approximately & Nearest Airport is a Dr. Babasaheb Ambedkar International Airport, Nagpur is around 187 km from Arni. Location of Arni in Maharashtra, India Coordinates: 20°07′40″N 77°55′39″E. In Arni town, main source of drinking water is groundwater. As groundwater is prominently used to fulfill domestic demands hence quality of groundwater must be checked time to time in order to supply safe drinking water (3).

In this paper, one attempt has been made to study of variation in total dissolved solids of water of Arni Town, District-Yavatmal (MS) India over a period of 2 year during covid-19 pandemic.

Methodology – Water samples were collected from different location of Arni town during investigation period of June 2020 to May 2021. Sample is collected in polyethylene bottle. Within 10 minute total hardness is measured. For measurement of hardness of the sample, used Tds meter whose details are as follows:

Brand	: HM
Model Number	: AP-1
Type	: Digital
Range	: 0-5000 ppm
Temperature Range	: -5+50 degree C degree C
Accuracy	: +-2%
Battery Life	: 1000
Power Features	

Power Requirement : 3v

Dimensions
Width : 3 cm
Height : 15 cm
Weight : 0.1 kg
Manufacturer : HM DIGITAL PVT LTD SOUTH KOREA
Importer : HM DIGITAL INDIA PVT LTD DELHI

Source-www.Flipkart.com

For the study purpose, we had selected six different groundwater sources of Arni. Water samples are collected every month and Tds is measured with the help of digital Tds meter. Following table shows details of the water sample source:

Sr. No.	Sample	Area of sample	Groundwater source	Depth
1.	Sample 1	Madhav Nagar	Borewell	125 ft
2.	Sample 2	Old Tahsil Area	Borewell	100 ft
3.	Sample 3	Datta Nagar	Borewell	125 ft
4.	Sample 4	Mathura Nagar	Borewell	110 ft
5.	Sample 5	Sambhaji Nagar	Borewell	150 ft
6.	Sample 6	Swami Samarth Nagar	Borewell	200 ft

Following table shows Tds of different samples under study-

Sr. No.	Month	Sample 1 TDS (in ppm)	Sample 2 TDS(in ppm)	Sample 3 TDS (in ppm)	Sample 4 TDS (in ppm)	Sample 5 TDS (in ppm)	Sample 6 TDS (in ppm)
1	March 2019	565	833	681	503	484	363
	June 2020	545	803	621	453	444	343
2	April 2019	568	890	658	536	580	380
	July 2020	535	800	566	485	526	406
3	May 2019	555	790	690	594	520	394
	August 2020	511	721	620	522	499	394
4	June 2019	634	750	620	520	603	406
	September 2020	604	720	598	499	600	410
5	July 2019	675	843	540	497	637	396
	October 2020	500	705	510	506	605	346
6	August 2019	605	867	530	457	702	384
	November 2020	611	854	524	455	600	400
7	September 2019	535	830	526	502	664	419
	December 2020	505	730	476	456	624	401
8	October 2019	528	750	495	535	634	399
	January 2021	508	700	455	505	604	319
9	November 2019	528	651	510	504	558	409
	February 2021	508	601	500	458	498	380
10	December 2019	480	608	504	507	512	320
	March 2021	508	600	413	503	495	312
11	January 2020	402	605	470	498	375	377
	April 2021	431	522	355	500	446	301
12	February 2020	407	600	431	436	325	309
	May 2021	400	565	421	411	380	396

According to World Health Organization (WHO) and Bureau of Indian Standard some parameter are as follows:

Sr. No.	Water quality parameter	Bureau of Indian Standard (IS-10500:1994)	WHO International Standard (1983)
1.	pH	6.5-8.5	7.0-8.5
2.	Total Dissolved solids (ppm)	500-2000	500
3.	Total hardness (ppm)	300-600	100

TDS- The mineral constituents dissolved in water constitute total dissolved solids. The concentration of dissolved solids in natural water is usually <500 ppm while water with more than 500 ppm is undesirable for drinking and industrial use. It is reported that TDS value of 500 ppm is desirable limit and 2000 ppm is the maximum permissible limit and that water containing more than 500 ppm of TDS causes gastrointestinal irrigation (4). High value of TDS influences taste, hardness and corrosive property of water (5, 6). Drinking water should contain sufficient minerals to keep you healthy and should not contain excess minerals that become overloaded in the body. In this article, we will provide details about the acceptable minimum and maximum TDS (Total dissolved solids) Limits for drinking water.

Variation in hardness and minimum, maximum hardness of sample over a period of 2 year during covid-19 pandemic are summarized in the following table:

Sr. No.	Sample	Maximum TDS		Minimum TDS		TDS Range (in ppm)	Variation in TDS (Max.-Min)		Average TDS variation Range in ppm	
		Before Covid-19	In Covid-19	Before Covid-19	In Covid-19		Before Covid-19	In Covid-19		
1.	Sample 1	675	611	402	400	400-675	63	2	9-78	2-78
2.	Sample 2	890	854	600	522	522-890	36	78		
3.	Sample 3	690	621	431	355	355-690	69	77		
4.	Sample 4	594	522	436	411	411-594	72	25		
5.	Sample 5	702	624	325	380	325-702	78	55		
6.	Sample 6	419	410	309	301	301-419	9	8		

Conclusion-

From the variation of hardness table over a period of 2 year during covid-19 pandemic it is observed that the minimum TDS of groundwater Arni city is 301 ppm and maximum is 890 ppm. In period of covid-19 pandemic Tds is found to be decreases by 100-200 ppm. Average TDS variation Range of groundwater arni is found to be same. These samples Tds range have acceptable value according to Bureau of Indian Standard (IS-10500:1994) which has range 500-2000 ppm. Sample which has value below 500 ppm which has acceptable value according to WHO International Standard (1983). TDS range of groundwater in Arni city is found to be acceptable and fair over a period of 2 year during covid-19 pandemic.

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Assesment of Plastic pollution awareness and impact of Plastic Pollution on Environment among peoples

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Abstract-

Plastic pollution has become one of the biggest environmental issues. Understanding the knowledge and attitudes of peoples about plastic pollution and its impact on Environment is very important to battle against plastic pollution. This study set out to investigate knowledge and attitudes towards plastic pollution awareness. This was a mixed study approach, where both qualitative and quantitative data were derived. Data were collected using a questionnaire asking about participants' plastic pollution knowledge, behaviors, and opinions about plastic usage. Data collected from group discussion and interviews gives idea about peoples knowledge about environmental impact of Plastic pollution and plastic waste management. The majority of participants understood how harmful plastic pollution is to the environment. Our results revealed that participants' knowledge and awareness were at high levels about plastic pollution. The most common current actions toward reduction in plastic pollution reuse, reduce, recycle, educate and replacement of plastic with sustainable alternatives

Keywords- Plastic pollution, awareness, plastic waste management, reuse, recycling of Plastic.

Introduction

Plastic waste arises from our homes and offices to dustbins, landfills and bodies of water, causing contamination. Plastic pollution is the accumulation of plastic objects and particles in the Earth's environment that adversely affects humans, wildlife and their habitat Plastics come in a variety of shapes and sizes, and they are commonly used in our everyday lives. Today, it's difficult to find a substance that isn't made of plastic. Plastics are inexpensive, simple to manufacture, and extremely durable and very adaptable for different uses. Due to these qualities of plasic manufacturers choose to use plastic over other materials.

There are three major forms of plastic that contribute to plastic pollution: micro-, macro-, and mega-plastics. Plastic pollution has also greatly negatively affected our environment. "The pollution is significant and widespread, with plastic debris found on even the most remote areas. Plastic pollution on land poses a threat to the plants and animals – including humans who are based on the land. Plastic pollution has several negative effects on our climate, but the three most important are air pollution, water pollution, ocean pollution, land pollution and food pollution.

For the sake of health and the environment, it is important to properly dispose of such plastic waste and to reduce its widespread use.

Need of present study

Plastic pollution is a major global issue aries from last few decades. Plastic pollution really requires a global and comprehensive solution . There is need to rethink about production, usage and plastic waste management system. Increasing awareness about plastic pollution is important in todays situation. Many peoples are not much aware about the Plastic pollution and Plastic pollution management. So present study is the attempt to find out awareness of peoples towards Plastic pollution and Plastic waste management and impacts of plastic pollution on environment..

Objectives of research

To find the knowledge of peoples about Plastic Pollution.
To find the knowledge of peoples about impact of Plastic Pollution on environment.
To find the peoples attitude towards Plastic waste management.

Material and method:-

The purpose of present paper was to study Plastic Pollution and Plastic waste management awareness among peoples. For this random sample of 100 peoples of different sex, different age group and different educational qualification were selected. The area which is selected to study Plastic Pollution awareness is mainly restricted to Pandharkawada dist Yavatmal Maharashtra. This was a mix study approch. Collection of data was done through self developed questioner, group discussion and interviews of different age group peoples. Both qualitative and quantitative data was colected. Self developed questioner is mainly consist of questions about knowledge of peoples about use of plastic, Plastic Pollution, impact of Plastic Pollution on environment and peoples attitude towards Plastic waste management. Raw data is collected and after processing

data final conclusions are drawn. Questioner consist of questions having answers in rating scale and yes/no type questions.

Results and discussion-

Demographic Details of Respondents.

The demographic details regarding age, gender, highest level of education were collected from the respondents and they are as given below

Table 1

Age Group	No. of respondres	Percentage
18-28	67	67 %
29-38	14	14 %
39-48	13	13 %
49-58	06	06 %
Male	56	56 %
Female	44	44 %
Education of the respondents		
Below Graduation	11	11 %
Graduation or pursuing graduation	73	73 %
Post Graduation and above	16	16 %

In present study 94 % of study participants responded plastics causes the pollution to environment. 0 % responders respond that plastic will not cause pollution and 6 % responded that they don't know about plastic causing pollution to environment.

Table 2

According to responders the main source of plastic pollution are

Food Wrappers & Containers	**26 %**
Bottle & Container Caps	22 %
Plastic Bags	20 %
Plastic cups and Plates	11 %
Takeout Containers	09 %
Straws and Stirrers	05 %
Toys	04 %
other	03 %

Table 3

Number of participant aware about different types of pollution caused by Plastic waste are as follows

Air Pollution	**92 %**
Water Pollution	84 %
Soil Pollution	73 %
Marine Water Pollution	39 %
E Pollution	32 %

85 % participants responded burning of plastic will cause lung problem and 15 % were not aware about that. Among the study participants 73 % participants replied plastic can cause cancer, and 27 % were not aware about that. 64 % participants answered plastic using in food package will cause health problem and 10 % are not agreed with packing of food in plastic causing any health hazards. 26 % were not aware about packing of food in plastic causing any health hazards.

Number of participant responded to following options to control Plastic Pollution

Table 4

Recycle when possible	**43 %**
Use alternative packaging	07 %
Avoid single-use plastics	21 %
Find reusable options	11 %
Carry own cloth bag to market	18 %

From group discussion and interviews of responders following information is collected

Responders are aware about following impacts of Plastic Pollution such as Plastic Pollution disturbs the natural ecosystem, it disturbs the food chain, it affects the water supply. Plastic Pollution can be harmful to human health, It is harmful to animals and Clearing areas of plastic waste is difficult and expensive. From study it is observed that many responders have no clear idea about plastic waste management and recycling of plastic.

Findings –

From the study following major findings are obtained about Plastic Pouution

- Many responders were well known about plastic pollution and its impact on Environment.
- Awareness about Plastic waste management yet not properly developed among the responders.
- They are unknown about proper Plastic waste management and recycling of Plastic waste.
- As compared to air , water and soil pollution caused by Plastic, many responders are unknown about the impact of Plastic pollution on marine pollution and E pollution.
- Responders are familiar to adverse health effect of pastic on human health.
- Many Responders are well known about Reduce and Reuse of Plastic abut the are not much aware about recycling of pastic.

Conclusion -

Present paper highlights the plastic pollution and its impact on Environment among 100 peoples of different sex, different age group. It focus on Present condition of plastic pollution awareness, From the findings which are obtained about plastic pollution and its impact on Environment it is observed that Many responders were well known about plastic pollution and its impact on Environment. Many Responders are well known about Reduce and Reuse of Plastic abut the are not much aware about recycling of pastic. Peoples are unknown to many environmental consequences of plastic pollution. So there is a need of proper education to make aware peoples about plastic pollution and its impact on Environment. Reduce , Reuse, Recycle and Educate are the best ways to control the plastic polltion.

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Study of Water Quality Parameters of Pimpalkhuti Dam in TalukaRalegaon, District-Yavatmal

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Abstract:

Water resources are essential and equally important for natural eco system and human development. All eco system on earth depends on the water. Fresh water is finite, critical, renewable, vulnerable the resource on the earth plays as important role in living environment without its life is impossible. Thepresent study is focus on the determination of Physico- chemical parameter such as hardness, chlorides, alkalinity, DO, BOD, COD, temperature, pH, TDS, phosphate, and sulphate of water sample. Where analyzed for periods of twelve months from 1st February 2021 to 31st January 2022. All parameter where within the permissible limits. The result indicates that the corresponding dam is non-polluted and can be used for irrigation, fishculture, and domestic purpose.

***Keywords**: Physico- chemical parameters, permissible limits, living environment.*

Introduction:

Water is most indispensable requirements for all living organism. Unsafe drinking water is one of the main concerns in developing countries. In order to deal with this problem, physico- chemical parameters were determined in order to identify the contamination problems and suggest appropriate solution. The good quality of water is essential for living organism. The quality of water can be assessed by studying its physical and chemical characteristic. Because of vast population[1] highly used fertilizers[2], pesticides, insecticides, and negligence of human being [3], the quality of water is being deteriorated day by day. Regarding the quality of drinking water, microbiological contamination is primary concern of developing countries[4]. In addition, inorganic contaminants[5], concerning both health and aesthetic aspect can be present in the water. Fluoride and arsenic are a great health problem worldwide [6,7].The natural aquatic resources are causing heavy and varied pollution in aquatic environment leading to water quality and depletion of aquatic Biota. It is there for necessary that the quality of drinking water should be checked at regular time interval because due to use of contaminated drinking water. In present study includes the analysis of water quality in terms of physico- chemical parameters of Pimpalkhutidam talukaralegaon district,Yavatmal (Maharashtra). The dam water is basically used for Domestic, Agriculture purpose, Fisheries activity and Various Animal water drinking purpose. In Yavatmal region still now several researchers have done study on physicochemical parameters of various water resources [8, 9, 10].

Materials and Methods:

Surface water sample were collected from pimpalkhutidam. Water sample from all site were collected in sterile glass bottles in the morning Hours between 9 to 11 am, regularly for every month, brought to the laboratory, processed within 1-3 hrs for the estimation of various physico- chemical parameters like water temperature, pH, and Total Dissolved Solids were recorded at the time of sample collection by using Thermometer, pocket Digital pH meter and pocket Digital TDS meter. Transparency was measured with the help of Secchi Disc. While other parameters such as DO, Free CO_2, Hardness, Chlorides, Alkanity, Phosphate and Nitrate were estimated in the laboratory.

Result and Discussion: The monthly variation in physico-chemical parameters are represented in following table

Months	Temperature ^{0}C	TDS	pH	Turbidity NTU	Total Hardness mg/l
January	24	722	7.8	9.40	81.0
February	24.5	701	8.1	11.90	90.5
March	27	648	8.3	11.93	160
April	27	645	8.3	11.92	160
May	27.5	652	8.4	11.02	157
June	25	958	8.0	10.5	150
July	25.5	965	7.3	1.35	73

August	25	961	7.2	2.3	84
September	25.5	940	7.1	2.2	100
October	24.5	810	7.2	0.5	67
November	23.5	760	7.5	1.45	106
December	23.5	743	7.6	1.90	83

Table No. 2

Months	DO	Free Co_2 mg/l	Chloride	Alkalinity	Transparency Cm
January	8.90	0.0	42.32	118.25	14.3
February	9.10	0.0	33.08	122.50	6.9
March	12.32	0.0	42.06	182.50	6.8
April	15.5	0.0	55.08	160.25	6.6
May	15.4	3.5	55.59	205	6.7
June	12.08	7.6	41.18	169.0	9.4
July	10.02	8.4	43.32	153.25	60.1
August	9.08	7.3	48.59	191.0	61.4
September	9.15	21.0	37.12	192.0	57.2
October	7.96	15.7	41.09	173.25	92.0
November	6.55	25.3	43.57	150.50	92.4
December	6.40	25.3	47.61	141.25	66.25

Water Temperature:

Water temperature can exert great control over aquatic communities. Temperature of water may not be as important in pure water, but in polluted water, temperature can have profound effects on dissolved oxygen (DO) and biological oxygen demand (BOD). The fluctuation in dam water temperature usually depends on the season and sampling time. In this present study of the water temperature ranges from 23.5 ^{0}C to 27.5^{0}C. The maximum (27.5 ^{0}C) temperature was recorded in the month of May (summer) and minimum (23.5 ^{0}C) in the month of December (winter). It shows that higher temperature in summer and relatively lowers in winter. Similar study has done at Kapileshwar Dam AshtiDist- Wardha [11], observed that water temperature was high during summer season due to low water level, and clear atmosphere.

Total Dissolved Solid (TDS): The TDS in water consist of inorganic salts of calcium, magnesium, sodium etc. Small amount of organic matter and dissolved material present in the water. In this study TDS fluctuate from 645 ppm to 965 ppm. The maximum value of TDS was found to be 965 ppm in the month of July. It is due to heavy rainfall in rainy season and the minimum value of TDS 645 ppm was recorded in the month of April. Similar result reported by IoryueIjah Silas et al [12]

pH: The pH is an indicator of the existence of biological life. The pH of dam water was found to alkaline character throughout the study period. Were most of the water samples collected in different months of the year, tested in the present study were found to be in permissible range of pH value recommended by several health and pollution control organization eg. WHO, (the permissible value of pH is 6.5 to 8.5). The maximum pH value (8.4) was recorded in the month of May (summer season) and minimum pH value (7.1) was recorded in the month of September. pH of water directly affect the biochemical and chemical reaction as well as pH of water is increased by reducing the percentage of $Co_2$and biocarbonate which is happened due to photosynthetic activities. Apart from above some other factors such as air and temperature bring about changes the pH of water. K. Bheemappa et al [13] reported that the maximum value of pH was found in pre- monsoon season.

Turbidity: Turbidity may be due to the organic or inorganic constituents. The turbidity of water fluctuates from 0.5 NTU to 11.93 NTU during the year. The maximum values (11.93 NTU) was recorded in month of March

(summer) it is mainly due to the decrease in the water level and suspended particulate matter and minimum value of turbidity (0.5 NTU) was founded in the month of October.

Total Hardness: The amount of dissolved salts of calcium and magnesium in the water is generally known as hardness of water. Hardness of water is an important consideration to determining the suitability of water for industrial and domestic uses. The value of the hardness fluctuates from 67 mg/l to 160 mg/l. the maximum value (160 mg/l) was recorded in the month of March to April (summer) and minimum value (67 mg/l) in the month of October. Similar result were reported by H. V. Vyas and V. A. Sawant [14]

Dissolve oxygen (DO): Thedissolved oxygen content is essential for aquatic life. Its deficiency directly affects the ecosystem of dam or river low dissolved oxygen (less than 2 mg/l) would indicate poor water quality. The value of DO is generally average from 6.40 mg/l to 15.5 mg/l.

The maximum values of DO (15.5 mg/l) was recorded in month of April (summer) and minimum values of DO (6.40 mg/l) was recorded in month of December (winter).

Free CO_2: The value of free CO_2 ranges from 0.0 mg/l to 25.3 mg/l. The maximum value (25.3 mg/l) was found in the month of November to December (winter) and minimum value (0.0 mg/l) was found in the month of January to April.

Chloride: The value of chloride ranges from 33.08 mg/l to 55.59 mg/l. The maximum value (55.59 mg/l) was found to be in the month of May (summer) and the minimum value (33.08 mg/l) in the month of February.

Alkalinity: Due to increase in the percentage of bicarbonates in the month of March to May (summer) alkalinity was found to be maximum. Total alkalinity ranges from 118.25 mg/l to 205 mg/l. The highest value of alkalinity (205 mg/l) was recorded in the month of May (summer) and lowest value of alkalinity (118.25 mg/l) in the month of January (winter).

Transparency: Transparency of water fluctuates from 6.6 cm to 92.4 cm. The maximum water transparency 92.4 cm was recorded in the month of November (winter) and minimum 6.6 cm in the month of April (summer).Similar result were reported by Rachel M. Pilla et al [15]

Conclusion:

The thermal decomposition of the complexes is not simple and involves different stage decomposition. It is assumed that dehydration of the complexes containing water occurs within an active reaction interface. The compensation effect of thermal decomposition of the complexes indicating the change of sample mass on the estimated values of activation energy. The structural changes of all complexes have marked effect on the sensitivity and sensitivity varies with organisms.

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Study of Some Chemical Parameters of Water From Shahanoor Dam.

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Abstract-
Water is the most important or vital factor for the existence of all living organisms. Reservoirs are also the main sources of drinking water supply. Man has used water bodies as most convenient and cheapest refuse disposal system for domestic and industrial waste which leads to pollution. So its necessary to know chemical parameter of the water. In the present investigation chemical parameters of water from shahanoor dam was studied to assess the quality of water for, irrigation, fishing, industrial processing and so on. In the present study an attempt has been made to detect the Ph, Alkalinity and Acidity , Conductivity, Dissolved Oxygen, Carbon-di-oxide, Hardness, Calcium, Phosphate, Nitrate, Fluoride etc. water samples were collected per season from Shahanoor dam. Samples were analysed regularly for 3 years in the laboratory from Jan. 2011 to Dec. 2013. The observations were recorded. The pH turbidity were recorded at the site. All the chemical parameters of the dam are within permissible limit of World Health Organization (WHO) standards. This means chemical status of the dam is suitable for biodiversity of life. It showed that there are some, physical, chemical and biological processes which self-purify the dam.
Keywords- Shahanoor dam, Chemical Parameters, Oxygen, Carbon-di-oxide, Hardness, Calcium, Phosphate, Nitrate, Fluoride.

Introduction-

Human activities have the great impact on the environment, ecosystems, and economical sensitive areas. Medudhula. T. *et. al*. (2012). Environmental monitoring studies provided the information about any damage to the ecosystem. Harney, N. V., et. al. (2013). It assesses how affected ecosystems changes over time and thus determine the best means of prevention. Hulyal, S.B. (2011),

Environmental monitoring describes methods and processes to monitor the quality of the environment. It provides information about changes in structure and function of ecosystems which can be used in environmental protection or management, as well as in many circumstances in which human activities carry a risk of harmful effects on the natural environment. Ahangar I. A. *et. al*. (2012). From ancient time, civilizations depend on fresh water bodies like lakes, reservoirs, rivers and wetlands. Fresh water is essential not only to sustain human life but also to support the activities that form the basis for thriving economies. At the same time water resources are essential to human societies and the activities of these societies can pollute and degrade water resources. Barot C. , et. al. (2014). Water has unique property of dissolving large amount of substances in it. (Choudhari, 1995) This property of water brings about changes in its physical as well as chemical properties and ultimately the pollution. (Kaushik and Saksena 1999) It has long been recognized that regular monitoring of the physical, chemical and biological parameters characterizing water quality in river, lakes and reservoirs used for water supply is essential for protecting public health and assuring the long term reliability of these substances. (Banerjee, K., *et. al*. (2006).

Freshwater becomes a critical natural resource due to number of reasons . India receives about 1400-1800 mm of rainfall annually. It is estimated that the 85% of water is used for agriculture ,10% for industries and 5% for domestic use. Analysis conducted in 1982 revealed that about 70% of all available water in our country is polluted. (Chandrashekhar and Kodarkar, 1996) Dams are the major part of freshwater resources. A dam is manmade reservoir have been constructed for irrigational needs ,drinking purposes ,industrial and domestic use etc. Gopalkrishna, M.H. (2011).

Shahanoor dam selected in the present study is situated at a site nearly 10 km towards North-West from Achalpur Tahsil and 85 km from Amravati. It is build up on the Shahanoor river. It is an earthen dam with 6.9 km length and is situated in the midst of Satpuda hills.

Aquatic pollution thus brought about by human activities causing alteration in the chemical properties of water. APHA (1998). Water get polluted due to the discharge of chemical water pollutants such as mercury from mining activity, certain nitrogen compounds used in agriculture and chlorinated organic compounds arising from sewage water treatment plants. (Richardson *et al.* 2007) There for evaluation of physico-chemical parameters of water is essential to assess the quality of water for, irrigation, fishing, industrial processing and so on. (Rajgopal *et al.*,2010)

Chemical Paramaters -

Ph, Alkalinity and Acidity -

Alkalinity, acidity and buffering capacity are the important characteristics of water. pH is defined as the intensity of acidic or basic characters of a solution. pH of water affects its suitability for biota and also influence chemical reactions. Bade, B. B., *et. al.* (2009)**.** The largest variety of freshwater aquatic organisms prefer a pH range between 6.5 to 8.0.

- **Conductivity :**

Conductivity is a measure of a solution such as water of lake, dam or stream to pass an electric current. This is an indicator of dissolved electrocytes ions in the water.

- **Dissolved Oxygen :**

The presence of dissolved oxygen is essential to maintain the higher forms of biological life and to keep the proper balance of various populations thus making the water body healthy.

- **Carbon-di-oxide :**

Free carbon-di-oxide in the waters accumulates duo to microbial activity and respiration. This impart the acidity to the water because of the formation of carbonic acid. In an aquatic ecosystem sources of CO2 are commonly respiration and decomposition.

- **Hardness :**

Hardness is the property of water which prevents the lather formation with soap and increases the boiling point of waters. The major cautions imparting hardness are calcium and magnesium. Ecologically temporary hardness plays a key role in buffering capacity and this has a great effect on biotic diversity and biomass in an ecosystem

- **Calcium :**

Calcium is one of the most abundant elements found in the natural water. It is an important ion in imparting the hardness to the waters. At high pH much of its quantity get precipited as caco3.

- **Phosphate :**

The phosphates is generally considered as the critical nutrient for the growth of algae in water. The enrichment of this nutrient leads to the process of eutrophication. The most important sources of phosphates are discharge of detergents and agricultural run-off.

- **Nitrate :**

Like phosphorus nitrate is also one of the critical nutrient for the growth of algae and helps accelerating the eutrophication. Domestic sewage, natural run-off and agricultural wastes are the important sources of it. The determination of nitrate in drinking water is of prime importance because of the disease methamoglobonebia caused by its excessive presence.

- **Fluoride :**

Fluoride originates from weathering of fluoride containing minerals and enters surface waters from run-off and ground waters. Significant sources of fluoride are found in coke, glass and ceramics, electronics, pesticides, and fertilizer manucturing, steel and aluminium processing and electroplating industries.

Material And Methods

Description of the study area :

- **Shahanoor Dam :**

Shahanoor dam selected for the present study is situated near Anjangaon Surji, Amravati district, state of Maharashtra, India. This dam was constructed as a part of irrigation projects by the Government of Maharashtra in the year 1990. It is an earthfill dam built using soil and stones with a capacity of 45 MCUM on the Shahanoor river.

The dam is located in the hill ranges of Satpuda. Human activities like washing of clothes and vehicles, bathing are rare as the dam is far away from the adjoining villages. Water from the dam is used for irrigation and hydroelectricity. The net irrigation area is 7455 hectors. Water from the dam is supplied for drinking for 156 villages and 2 towns in Anjangaon Surji, Daryapur, and Bhatkuli Talukas of Amravati district.

Morphometry of the catchment area :

Shahanoor dam is located at latitude 21.15’21” and longitude 77.19’30”. The total catchment area of the dam site is 53.74 sq. miles (139.187Km^2). All the catchment area is through hill ranges of Satpuda and lies in Maharashtra state only. The length of the dam is 795 meters and height of the dam is 56.45 meters. An ogee type waste weir of 57 meter length having 4 radial gates on the left

bank saddle. The live storage capacity of the reservoir is 46.04 Km^3 and gross storage capacity is 47.85 km^3.

The drainage area receives rainfall 781.81 mm mainly from the southeast monsoon from June to October. The monsoon precipitation generally commences in the 2nd week of June and continues throughout the year. The soil in the area varies from grayish black to deep black.

chemical Analysis :

Water samples were collected once per season in well labeled, polythene sampling bottles which were tightly stoppered and brought to the laboratory for analysis.

pH - The determination of pH is important due to its effect on chemical and biological properties of liquids. On field pH was recorded with the help of standard pH paper strips. The paper was dipped in a sample water and colour developed was compared with standard colour code given. In the laboratory pH was recorded with the help of pH meter.

- **Free Carbon dioxide : (Titration Method)**

Free CO_2 was determined by titrating the sample using a strong alkali to pH 8.3. At this pH all the free CO_2 is converted into bicarbonates.

- **Total Hardness : (EDTA Method)**

Hardness is generally caused by the calcium and magnesium ions present in water. Hard water is unsuitable for cooking, washing and bathing.

- **Calcium : (EDTA method)**

Calcium is the major cation present in natural waters, its main source being leaching rocks in the catchment. Its concentration restricts water use while it is an important component in the exoskeleton of Arthropod and shells in Molluscs.

- **Chlorides : (Argenometric Method)**

Natural water normally has a low chloride content.

- **Total Phosphates : (Photometric method)**

The presence of phosphates in water is due to detergents, fertilizers.

- **Nitrates : (Phenoldisulphonic acid method)**

Nitrate is normally the most common form of combined inorganic nitrogen in aquatic system.

- **Fluoride : (SPADANS Method)**

Fluorides have dual significance in water supplies. High concentration causes dental fluoris and lower concentration (< 0.8 mg/l) causes dental caries. A fluoride concentration of approximately 0.1 mg/l is recommended. They are frequently found in certain industrial processes resulting in fluoride rich waste waters. It was calculated by SPADANS method.

- **Dissolved Oxygen : (Winkler's Method)**

Oxygen dissolved in water is very important parameter in water analysis as it is an indicator of the physical, chemical and biological activity. Generally high DO is found in the ecosystem which is free from pollution, while its values are negligible in case of polluted water due to the presence of NH_3, H_2S, Nitrites etc.

- **Bicarbonates (HCO_3) :**

Bicarbonates imparts the alkalinity to the natural waters. In natural waters CO_2 is responsible for alkalinity.

- **Magnesium : (EDTA Method)**

Magnesium is dominant cation in natural water which added in the ecosystem by the leaching of rocks in the catchment. Potable water got an unpleasant taste due to the high concentration of Mg.

RESULT

In the present study, seasonal variation of the physico-chemical paramaters of Shahanoor dam for the period of Jan. 2017 to Dec 2019 were studied. Water samples were analysed for 3 years at regular interval and the obtained data is presented in tables.

pH :

pH plays important role in the life of aquatic animals. During the present study pH ranges obtained were between 7.12 to 7.52 in 2017. In the year 2018 pH was highest 7.26 during monsoon and minimum during winter. In 2019, it was maximum 7.65 in monsoon and minimum 7.09 in winter. Seasonal variation in pH shows that it was maximum during monsoon followed by summer and winter for the successive two years 2018 and 2019. (Table 2-3)

Dissolved Oxygen :

Dissolved oxygen is the most important parameter of the aquatic ecosystem which can directly affect the survival and distribution of aquatic organisms.

In the present study, dissolved oxygen (mg/l) in water from dam varies from 6.81 to 9.07 mg/l. The maximum value 9.07 was recorded during winter and minimum value 7.8 recorded during summer in the year 2017. In the winter season of the year 2018 and 2019 it was maximum (8.72,9.07) respectively. But was minimum in the summer of 2018 and monsoon of 2019. (Table 2-3)

Free carbon-oxide :

In an aquatic ecosystems free CO_2 is essential for the photosynthetic activities. Free CO_2 of the water from Shahanoor dam varies from 0 to 0.51. The free CO_2 was absent during summer and monsoon season in the 2017. In winter of 2017, it was recorded 0.51mg/l. (Table 1) Again it was totally absent during summer in 2018 and during monsoon and winter in 2019. Its values were 0.51 during winter in 2017, 0.12 and 0.19 mg/l during during monsoon and winter in 2018 and 0.13 during summer of the year 2019. (Table 2-3)

Total Hardness :

Hardness of water is mainly imported by alkaline earth metallic cations mainly calcium and magnesium present in it.

Total hardness of Shahanoor dam was determined seasonally during the present study. The range of total hardness was found between 68 to 152 mg/l. Total hardness was found to be more (150, 152) during winter, followed by summer (132, 150) and minimum during the monsoon(88,188) respectively in the year 2017 and 2018 . While in 2019 total hardness was more than 148 mg/l in summer followed by monsoon and minimum during winter.

Total Alkalinity :

Total alkalinity of Shahanoor dam was found to vary in different seasons. The minimum and maximum values were noted as 24 mg/l and 150 mg/l respectively. In the year 2017 it showed highest 44 mg alkalinity in summer and lowest 32 mg/l in monsoon. Similar seasonal variation was found in the year 2018 and 2019 i. e. highest alkalinity during summer (52, 64mg/l) and lowest during monsoon (24,36) respectively (Table 2-3)

Bicarbonates :

The carbon-di-oxide that is dissolved by naturally circulating water appears a21s carbonates and bicarbonate ions. Seasonal variation was recorded in bicarbonate of the dam water throughout the study period. Bicarbonate values were maximum 40 mg/l during monsoon and minimum 26 mg/l during summer, for the year 2017. (Table 1) In 2018, 2019 higher carbonate occurred in monsoon 51, 65 and 29, 35 mg/l during winter season and moderate in summer. (Table 2-3)

Chlorides :

Chloride concentration from the studied dam ranged between 10 to 18 mg/l. The maximum chloride values were found to be 13, 14, and 18 mg/l found in monsoon season of the year 2017, 2018, and 2019 respectively. While the minimum value in the winter season of the year 2011 and 2013 was found to be 10 mg/l. The seasonal trend throughout the study was maximum in monsoon season. (Table 1-2-3)

Calcium :

Calcium is an important ion which impart hardness to the water. Calcium ion concentration in the water of the Shahanoor dam varied from 9mg/l to 30mg/l during the study period 2017 to 2018. Calcium values recorded were more in the monsoon season, followed by summer and winter seasons. (Table 1-2-3)

Magnesium :

Magnesium is an important cation which gives hardness to the water. High value of magnesium 15mg/l was found in summer season, while low value i.e. 9 mg/l was found in winter season in the year 2017. Similar pattern of seasonal variation was found in 2018 and 2019 i.e. maximum Mg in summer and minimum in winter season. Data of the study is presented in tables (Table 1-2-3)

Nitrates :

Nitrate content of the water from the Shahanoor dam was studied for the period 2017 to 2019. The nitrate content ws found to be maximum 5.17 mg/l during monsoon season and minimum 2.14 mg/l. in summer season. The nitrate value 2.68 mg/l and 7 mg/l were during winter season respectively. (Table 1-2) During the year 2017 and 2018, the nitrate values were found to increase from that of 2019, as recorded as 11.4 mg/l and 15.16 mg/l during summer season.

Phosphates :

Phosphates of Shahanoor dam was calculated seasonally during the present investigation period. Phosphate values were recorded as 0.03 mg/l during summer, 0.05 mg/l during monsoon season and 0.06 mg/l during winter season in the year 2017. In the year 2018, 0.06 mg/l during summer, 0.01 mg/l during monsoon season and 0.03 in winter season. (Table 1-2-3)

Fluoride :

The Fluoride values of Shahanoor dam were recorded as 0.20 mg/l and 0.11 mg/l in the monsoon and winter season of 2017 respectively. It was absent during the summer. 0.16mg/l,0.20mg/l and 0.07mg/l fluoride was found respectively during summer, monsoon and winter season in 2018. In the year 2019, 0.163mg/l, 0.112mg/l and 0.07mg/l fluoride were found during summer, monsoon and winter season respectively. All the data is presented in the table (Table 1-2-3)

Table 1
Seasonal Variation And Mean ± Se Of Chemical Parameters Of Shahanoor Dam.
JAN 2017 – DEC 2017

Sr. No.	Parameters	anges	Seasons		
			Summer	Monsoon	Winter
1.	pH	7.4 - 8.1	7.14 ± 0.15	7.16 ± 0.27	**7.52 ± 0.19**
2.	Dissolved Oxygen (mg/l)	5.30 - 9.00	6.81 ± 1.7	7.40 ± 1.11	**8.90 ± 0.5**
3.	Carbon dioxide (mg/l)	0 – 0.60	-	-	**0.51 ± 0.7**
4.	Total Hardness (mg/l)	120 - 155	132 ± 10.62	88 ± 5.12	**150 ± 9.36**
5.	Total Alkalinity (mg/l)	30 – 45	44.66 ± 4.1	32.19 ± 1.16	**36.71 ± 5.6**
6.	Total dissolved Solids (mg/l)	155 - 195	162 ± 9	180 ± 8.1	**168 ± 6.1**
7.	Bicarbonate (mg/l)	2.02 - 45.6	26 ± 5.8	40.08 ± 1.42	**32.21 ± 4.3**
8.	Chlorides (mg/l)	9.5 - 16.2	11.03 ± 1.02	13.16 ± 2.03	**10.47 ± 1.07**
9.	Calcium (mg/l)	11.6 - 35.09	18.09 ± 4.69	25.13 ± 3.1	**14.1 ± 5.49**
10.	Magnesium (mg/l)	7.06 - 18.65	15.01 ± 3.30	1.5 ± 1.69	**9 ± 5**
11.	Nitrates (mg/l)	1.67 - 13.5	11.14 ± 0.42	9.5 ± 0.16	**2.68 ± 0.54**
12.	Phosphates (mg/l)	0.01 - 0.08	0.03 ± 0.01	0.05 ± 0.03	**0.06 ± 0.01**
13.	**Fluoride (mg/l)**	**0.08 - 0.25**	**---**	**0.20 ± 0.01**	**0.01 ± 0.02**

Table 2
Seasonal Variation And Mean ± Se Of Chemical Parameters Of Shahanoor Dam.
JAN 2018 - DEC 2018

Sr. No.	Parameters	Ranges	Seasons		
			Summer	Monsoon	Winter
	pH	7.1 - 7.9	7.25 0.31	7.26 ± 0.26	**7.6 ± 0.39**
	Dissolved Oxygen (mg/l)	4.6 - 11.2	7.54 ± 2.09	8.09 ± 1.01	**$8.^{1/2}$ ± 2.2**
	Carbon dioxide (mg/l)	0.09 - 0.25	-	0.12 ± 0.01	**0.19 ± 0.05**
	Total Hardness (mg/l)	95 - 146	150 ± 5.8	118.05 ± 72	**152 ± 8.7**
	Total Alkalinity (mg/l)	20.55	52 ± 5.7	24 ± 2.4	**39 ± 4.17**
	Total Dissolved Solids (mg/l)	250 - 420	240 ± 10.1	404 ± 14.6	**243 ± 6.9**
	Bicarbonate (mg/l)	33.6 - 52.8	39.2 ± 2	51.8 ± 0.23	**29.9 ± 3.07**
	Chlorides (mg/l)	9.6 - 175	11 ± 1.6	14 ± 3	**12 ± 1.27**
	Calcium (mg/l)	18.8 - 36.5	19 ± 3.8	30 ± 6.5	**17 ± 1.18**
	Magnesium (mg/l)	4.6 - 18.90	13 ± 4.4	9 ± 2.9	**8.5 ± 3.5**
	Nitrates (mg/l)	4.9 - 17.01	15.16 ± 1.4	8.20 ± 0.89	**7 ± 2.1**
	Phosphates (mg/l)	0.01 - 0.09	0.06 ± 0.02	0.01 ± 0.02	**0.03 ± 0.01**
	Fluoride (mg/l)	**0.03 - 0.30**	**0.16 ± 0.03**	**0.20 ± 0.04**	--

TABLE 3
Seasonal Variation And Mean ± Se Of Physico-Chemical Parameters Of Shahanoor Dam.
JAN 2019 - DEC 2019

Sr. No.	Parameters	Ranges	Seasons		
			Summer	Monsoon	Winter
1.	pH	6.86 - 7.95	7.20 ± 0.35	7.65 ± 0.13	**7.09 ± 0.67**
2.	Dissolved Oxygen (mg/l)	6.8 - 13.6	8.8 ± 2.3	9.2 ± 0.34	**9.07 ± 3.93**
3.	Carbon dioxide (mg/l)	0.00 - 0.15	0.13 ± 0.01	-	-
4.	Total Hardness (mg/l)	67.13 - 53.2	148 ± 4.2	114 ± 8.65	**6.8 ± 0.13**
5.	Total Alkalinity (mg/l)	122 - 157	64 ± 10.59	36 ± 11.04	**56 ± 3**
6.	Total dissolved Solids (mg/l)	154.8 - 465.7	163 ± 8.8	163 ± 4.07	**216 ± 6.6**
7.	Bicarbonate (mg/l)	34.19 - 77.71	49 ± 3.05	65 ± 4.77	**35 ± 0.18**
8.	Chlorides (mg/l)	27.7 - 20.6	12 ± 0.094	18 ± 1.9	**10 ± 2.6**
9.	Calcium (mg/l)	7.4 - 26.5	20 ± 21	23 ± 3.4	**9 ± 2.4**
10.	Magnesium (mg/l)	8.00 - 24.09	19 ± 4.46	17 ± 1.89	**9 ± 1.01**
11.	Nitrates (mg/l)	0.26 - 5.92	2.14 ± 1.87	5.17 - 0.22	**3.03 ± 2.9**
12.	Phosphates (mg/l)	0.06 - 0.20	0.5 ± 0.5	0.09 ± 0.002	**0.12 ± 0.20**
13.	**Fluoride (mg/l)**	**0.04 - 164.9**	**0.163 ± 0.09**	**0.112 ± 0.06**	**0.07 ± 0.03**

Summary And Conclusion

In the present study chemical parameters was investigated.

pH ranged between 7.6 to 7.65. pH was maximum during monsoon and minimum during winter for 2012 and 2013. For 2011 pH was highest during monsoon and lowest during summer season.

Dissolved oxygen (mg/l) was found more (9.07) in the winter season throughout the 3 years, but it was minimum during summer season of 2011 and 2012 and monsoon of the year 2013.

Free CO2 of Shahanoor dam varied from 00 to 0.51 mg/l. The free CO2 was absent from the Shahanoor water during summer season of 2011 and 2012. Again it was absent during monsoon of the year 2011 and 2013. In the winter of the year 2011 and 2012 CO2 was recorded 0.51 mg/l and 0.19 mg/l respectively and 0.12 mg/l during monsoon of 2012.

Total hardness was found to be more (150, 152) during winter and minimum during the monsoon (88, 118) respectively for the year 2011 and 2012.

Total alkalinity varied between 24 mg/l during monsoon of 2012 and 64 mg/l during summer of 2013. Seasonal trend for alkalinity of Shahanoor dam was maximum during summer and minimum during monsoon throughout the study years.

Total dissolved solid of the dam ranged from 162 mg/l to 404 mg/l, and showed maximum values during monsoon seasons for the three year study.

Bicarbonate values of studied water body was maximum (40) during summer and minimum (26) during monsoon of the study years.

Maximum chloride values were recorded during monsoon season throughout the study years.

Maximum calcium content of the Shahanoor dam were recorded in the monsoon seasons for the three study years and minimum in the winter season.

Magnesium values of the dam were recorded higher in summer and lower in winter season for the year 2012 and 2013.

Nitrates values for the year 2011 and 2012 was found to be more during summer season and less during winter season.

Phosphate content of the Shahanoor dam varied between 0.03 mg/l and 0.06 mg/l maximum phosphate values recorded during winter season.

Fluoride values of Shahanoor dam was found to very between 0.07 and 0.163mg/l.

Conclusion :

From the present investigation of the dam following conclusions were drawn.

All the chemical parameters of the dam are within permissible limit of World Health Organization (WHO) standards.

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Aurone : Synthesis of Active Compound And Experimental Study In Physical Aspects.

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Abstract:

Aurones, constitute a subclass of naturally occurring compounds which are structurally isomeric to flavones, biogenetically related to chalcones, and are responsible for imparting beautiful yellow colors to some of the flower petals[1-4].Recent investigations have shown that these compounds have potent and promising biological activities, in some cases even more potent than chalcones and flavones[5-7] .

This paper aims to study physical properties with experimental data such as density, refractive index and viscosity of Aurone.

Keywords:Aurone,Density.Viscocity,Refractive index etc.

Introduction:

Actually,to date, the chemical structures of more than 100 different aurones have been identified, characterized by distinctive hydroxylated, methoxylated, and glycosylated substitution patterns. Moreover, their effective potential to predict viable therapeutic uses has begun to be unveiled[8-11] .Therefore, they represent a worth deepening class of natural compounds intended to provide bioactive compounds in the near future.

The first examples of aurones were characterized in 1940 in Asteraceae[12],the family of sunflowers, which synthesize the most common 4-deoxy-derivatives of the family including sulfuretin , maritimetin , leptosidin and their corresponding glycosides. The species *variabilis* and *sulphureus* mainly express sulfuretin and its glycosylated counterparts in leaves and petals. In the *bidens* species, maritimetin has been isolated while, in the genus Coreopsis, compounds such as sulfuretin, maritimetin, but also leptosidin may be found.

The chalcone are accessed through synthesis by the Claisen-Schmidt reaction of 2-hydroxyacetophenone and benzaldehyde or their derivatives in the presence of aqueous NaOH, KOH or Ba(OH)2[12-16].This chalcone further cyclized in various solvent to get desired substituted aurone . Aurone provides intense yellow pigmentation to some fruits and flowers [17].Aurones are found in flowers of Scrophulariaceae and Compositae family. However, they are also found in leaves, barks, seeds and woods of various plants. Aurone derivatives show various range of pharmacological activities such as antiviral, antifungal, antioxidant, anticarcinogen, antidiabetes[18,19].

Experimental

I.Synthesis :

Substituted Aurone have been synthesized by cyclization of substituted chalcone in presence of various solvents and their general structures were confirmed by IR, 1H NMR and mass spectral data. Table 1,Table 2, and Table 3 shows the various physical parameters of synthesized Aurone.

II.Physicochemical studies:

The synthesized Aurone was recrystallized from DMF. The solvent A.DMF and B.DMSO were used for the physicochemical studies.

III.Density and Refractive index:

Abbe refractometer was used to determine the refractive index of all the solutions. Table 1 shows the refractive index of synthesized Aurone at various temperatures and various concentrations.

Results and Discussions:

I. Refractive Index of synthesized Aurone:

Table 1 : shows the dynamic values of refractive index.

Concentrations	R.I. in solvent A	R.I. in Solvent B
0.05	1.492	1.553
0.04	1.485	1.541
0.03	1.469	1.534
0.02	1.458	1.531
0.01	1.453	1.529

II. Density and Viscosityof synthesized Chalcone:

The table below shows the dynamic experimental values of density (ρ), and viscosity (η), at different temperature and different concentrations.

Table:2 (Temperature: 303.15 K)

Conc.	Solvent A Density(ρ) ($g.cm^{-3}$)	Solvent A Viscosity Centipoise	Solvent B Density(ρ) ($g.cm^{-3}$)	Solvent B Viscosity Centipoise
0.05	1.1410	1.2754	0.9779	0.8510
0.04	1.1406	1.2601	0.9772	0.8478
0.03	1.1403	1.2522	0.9768	0.8398
0.02	1.1401	1.2497	0.9766	0.8257
0.01	1.1398	1.2453	0.9764	0.8201

Table:3 (Temperature: 313.15 K)

Conc.	Solvent A Density(ρ) ($g.cm^{-3}$)	Solvent A Viscosity Centipoise	Solvent B Density(ρ) ($g.cm^{-3}$)	Solvent B Viscosity Centipoise
0.05	1.1352	1.2455	0.9557	0.8212
0.04	1.1349	1.2398	0.9553	0.8191
0.03	1.1345	1.2342	0.9550	0.8129
0.02	1.1341	1.2292	0.9541	0.8087
0.01	1.1340	1.2231	0.9538	0.8002

Conclusions:

From above experimental values it is concluded that densities,viscosities and refractive index of solution are changes by changing temperatures and by changing the solvent due to solute-solvent interaction.

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Studies on Assessment of Physico-chemical Parameters of Drinking Water in Schools of Akola District

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Abstract:

Water is essential in every stage of life for any living organism. The quality of water is of vital concern for mankind since it is directly linked with human welfare. The water resources now days as consequences of population explosion coupled with industrialization, urbanization and green revolution. Water related diseases have remained a major concern in much of the developing world. The World Health Organization (WHO) estimated in the 2000 assessment that there are four billion cases of diarrhea each year in addition to millions of other cases of illness associated with the lack, of access to clean water. Therefore, this study is focused on analysis of physico-chemical parameters of water is essential for all living organisms.

Keywords: Water, Hardness, pH, COD, BOD, Chloride, Conductance, Acidity, Alkanality etc.

Introduction

Water:

Water is the most abundant compound on Earth's surface, covering about 70 percent of the planet. In nature, water exists in liquid, solid, and gaseous states. It is in dynamic equilibrium between the liquid and gas states at standard temperature and pressure. At room temperature, it is a tasteless and odorless liquid, nearly colorless with a hint of blue. Many substances dissolve in water and it is commonly referred to as the universal solvent. Because of this, water in nature and in use is rarely pure and some of its properties may vary slightly from those of the pure substance [1]. However, there are also many compounds that are essentially, if not completely, insoluble in water. Water is the only common substance found naturally in all three common states of matter and it is essential for all life on Earth. Water usually makes up 55% to 78% of the human body [2].

Clean, fresh drinking water is essential to human and other lifeforms. Access to safe drinking water has improved steadily and substantially over the last decades in almost every part of the world. However, some observers have estimated that by 2025 more than half of the world population will be facing water-based vulnerability. A recent report (November 2009) suggests that by 2030, in some developing regions of the world, water demand will exceed supply by 50%[3,4].

Forms of water:

Like many substances, water can take numerous forms that are broadly categorized by phase. The liquid phase is the most common among water's phases (within the Earth's atmosphere and surface) and is the form that is generally denoted by the word "water." The solid phase of water is known as ice and commonly takes the structure of hard, amalgamated crystals, such as ice cubes, or loosely accumulated granular crystals, like snow[5]. The gaseous phase of water is known as water vapour (or steam), and is characterized by water assuming the configuration of a transparent cloud. (Note that visible steam and clouds are, in fact, water in the liquid form as minute droplets suspended in the air.) The fourth state of water, that of a supercritical fluid, is much less common than the other three and only rarely occurs in nature, in extremely uninhabitable conditions. When water achieves a specific critical temperature and a specific critical pressure (647°K and 22.064°MPa), liquid and gas phase merge to one homogeneous fluid phase, with properties of both gas and liquid.

Contamination of Water :

Water is a chemical substance with the chemical formula H_2O. Its molecule contains one oxygen and two hydrogen atoms connected by covalent bonds. Water is often co-exists on Earth with its solid state ice, and gaseous state, water vapour or steam. According to researchers, water covers 70.9% of the earth's surface, and is vital for all known forms of life. On Earth, it is found mostly in oceans and other large water bodies, with 1.6% of water below ground in aquifers and 0.001% in the air as vapour, clouds (formed of solid and liquid water particles suspended in air), and precipitation. Research also claims that oceans hold 97% of surface water, glaciers and polar ice caps 2.4%, and other land surface water such as rivers, lakes and ponds 0.6%. A very small amount of the Earth's water is contained within biological bodies and manufactured products. Water on earth moves continually through a cycle of evaporation or transpiration (evapotranspiration), precipitation, and runoff, usually reaching the sea. Over land, evaporation and transpiration contribute to the precipitation over land.

Drinking water is never pure. Water naturally contains minerals and microorganisms from the rocks, soil, and air with which it comes in contact. Human activities can add many more substances to water. But drinking water does not need to be pure to be safe. In fact, some dissolved minerals in water can be beneficial to health. For example, the National Research Council (National Academy of Sciences) states that drinking water containing dissolved calcium and magnesium generally contributes a small amount toward calcium and magnesium human dietary needs. Fluoride, either naturally occurring or added to the water supply, can help protect against tooth decay. Whether or not drinking water is safe will depend on which substances are present and in what amounts.

Water Is Essential to Life:

Water is second to oxygen as being essential for life. People can survive days, weeks, or even longer without food, but only about four days without water. The average adult consumes and excretes two or more quarts of water each day. Some of this water is supplied through foods but most is consumed through beverages. It is generally recommended that adults consume 6 to 8 cups (48 to 64 ounces) of liquids daily. Some beverages, such as coffee, tea, soda with caffeine, and alcohol are diuretic and increase urine excretion. These beverages, if consumed in large quantities, can upset the body water balance [6].

Water is essential in every stage of life for any living organism. The quality of wateris of vital concern for mankind since it is directly linked with human welfare. The waterresources now days as consequences of population explosion coupled with industrialization, urbanization and green revolution. Water related diseases have remained a major concern in much of the developing world. The World Health Organization (WHO) estimated in the 2000 assessment that there are four billion cases of diarrhea each year in addition to millions of other cases of illness associated with the lack, of access to clean water. Therefore, analysis of physico-chemical parameters of water is essential for all living organisms [7].

Sources of water Supply:

Water resources are of critical importance to both natural ecosystem and human development. It is essential for agriculture, industry and human existence. The healthy aquatic ecosystem is depended on the physico-chemical and biological characteristics. The quality of water in any ecosystem provides significant information about the available resources for supporting life in that ecosystem. Good quality of water resources depends on a large number of physicochemical parameters and biological characteristics [8].

To asses that monitoring of these parameters is essential to identify magnitude and source of any pollution load

Sources of fresh water

a) Surface water

Surface water is water in a river, lake or fresh water wetland. Surface water is naturally replenished by precipitation and naturally lost through discharge to the oceans, evaporation, evapo-transpiration.

Human activities can have a large and sometimes devastating impact on these factors. Humans often increase storage capacity by constructing reservoirs and decrease it by draining wetlands. Humans often increase runoff quantities and velocities by paving areas and channelizing stream flow[9,10].

Nevertheless, over the long term the average rate of precipitation within a watershed is the upper bound for average consumption of natural surface water from that watershed.

Natural surface water can be augmented by importing surface water from another watershed through a canal or pipeline. It can also be artificially augmented from any of the other sources listed here; however in practice the quantities are negligible. Humans can also cause surface water to be "lost" (i.e. become unusable) through pollution [11,12].

b) Under river flow

Throughout the course of a river, the total volume of water transported downstream will often be a combination of the visible free water flow together with a substantial contribution flowing through sub-surface rocks and gravels that underlie the river and its floodplain called the hyporheic zone [13].

c) Ground water

Sub-surface water, or groundwater, is fresh water located in the pore space of soil and rocks. It is also water that is flowing within aquifers below the water table. Sometimes it is useful to make a distinction between sub-surface water that is closely associated with surface water and deep sub-surface water in an aquifer (sometimes called "fossil water").

The natural input to sub-surface water is seepage from surface water. The natural outputs from sub-surface water are springs and seepage to the oceans[14].

d) Desalination

Desalination is an artificial process by which saline water (generally sea water) is converted to fresh water. The most common desalination processes are distillation and reverse osmosis. Desalination is currently expensive compared to most alternative sources of water, and only a very small fraction of total human use is satisfied by desalination.

e) Frozen water

The Himalayas, which are often called "The Roof of the World", contain some of the most extensive and rough high altitude areas on Earth as well as the greatest area of glaciers and permafrost outside of the poles. Ten of Asia's largest rivers flow from there and more than a billion people's livelihoods depend on them [15].

Material And Methods: In proper Akola district, numbers of different schools are there such as primary schools, high schools, Junior colleges, convents etc. The drinking water samples were collected from different schools. The various physico-chemical parameters of these samples were assessed.

Ten such samples were collected from following schools

Table 1 : Names of schools from which water samples were collected.

Sr. No.	Names of Schools from which samples collected	Area
1	Shri. Shivaji Vidyalaya, Akola	Deshmukh Peth, Akola
2.	Jubilee English Convent, Akola	Ramdas Peth, Akola
3	Savitribai Phule Kanya School, Akola	Santoshi Manta Mandir, Akola
4	New English School, Akola	Ramdas Peth, Akola
5	B. R. High School, Akola	New Bus Stand, Akola
6	Jagruti Vidyalaya, Akola	Ranpise Nagar, Akola
7	Aadarsh Vidyalaya, Akola	Aadarsh Colony, Akola
8	D. R. Patil Vidyalaya, Akola	Sahakar Nagar, Akola
9	Jyoti Vidyalaya, Akola	Azad Colony, Akola
10	Swami Vivekanand Vidyalaya, Akola	Gurukul Nagar, Akola

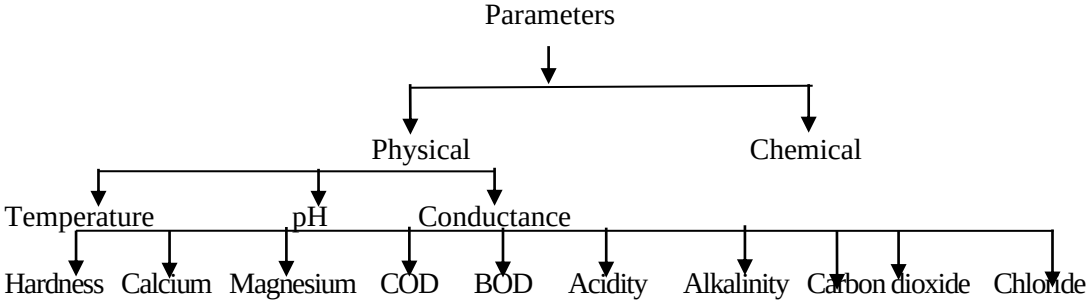
The water samples were collected from handpump, cement tank, plastic tank (PVC), Rajans from ten different schools. Drinking water samples collected in 250 ml sterilized glass bottle.

The standards (Maximum permissible limits) of physico-chemical parameters for drinking water as recommended by World Health Organization (WHO) are given in following table.

Sr. No.	Physico-chemical parameters	Limits
1	Colour	--
2	Odour	--
3	Taste	--
4	Temperature	10 – 15.6°C
5	Conductance	300 – 600 mg/lit.
6	Hardness	300 mg/lit.
7	Chloride	Not to exceed 600 mg/lit
8	Calcium	75 – 100 mg/lit.
9	Magnesium	50 – 150 mg/lit.
10	Alkalinity	200 mg/lit.
11	Acidity	--
12	Free CO_2	--
13	COD	Not to exceed 250 mg/lit.
14	BOD	Not more than 8 mg/lit.
15.	pH	6.5 – 8.5

Analysis of Water

Following are the parameters which are to be analyzed for the water samples.



Physical Analysis

1) Temperature

In wastewater various chemical reactions occur. The rate of chemical reactions increases with increasing temperature provided the higher temperature does not affect the reactant or catalyst. The temperature was recorded with the help of thermometer.

2) pH

pH of different sample was measured by pH meter. This measurement provides a very quick and easy obtain appraisal of the acid base equilibrium in an ecological system. It indicates the acidic and basic character of samples.

As per the standards set by Indian Council of Medical Research (ICMR, 1975), Drinking Water Protection Act (USA, 1973) p^H should be within 6-8.0 units. The standards set by other agencies are 6.5 – 8.5 units.

Importance of pH measurement

It may be evident from the forgoing discussion that pH of unpolluted natural waters occur within a narrow range of values and major deviations from that range caused by natural or anthropogenic sources, may have very strong impact of the aquatic ecosystems[16]. Physical, chemical and biological processes associated with water supply and sanitary engineering are also strongly pH dependent. Besides practically every analytical procedure associated with aquatic ecology and water pollution studies requires determination of pH.

pH Measurement

Connect the calomel and glass electrodes to the pH meter. Clean the electrodes with distilled water and dry it. Dip the electrodes in the 4.00 pH buffer solution. Adjust the temperature knob. Push the p^H button of function switch panel. Adjust the display to 4.00 p^H with calibration knob. Now pH meter is thus calibrated.

Wash the electrode, dry it and put in the solution whose pH is to be determined. Take the reading of pH.

3) Conductance

Electrical conductance is the ability of a substance to conduct the electric current. In water, it is the property caused by the presence of various ionic species.

The term specific conductance is also used in place of electrical conductivity, but it is an absolute term. The unit of conductivity measurement is Siemens. The older unit mhos/cm is now rarely used.

Importance of Conductivity Measurement

1. Conductivity is used to estimate total dissolved solids in water/wastewater.
2. It is useful in the rapid assessment of the salinity of water.
3. It is useful to assess the degree of mineralization of distilled and deionised water.
4. It is useful in checking the performance of water deionized and other ion-exchange resins.
5. It is useful to determine the amount of ionic reagent needed in certain precipitation and neutralization reactions and to determine end points in titrimetry.

4) COD

The amount of chemical oxidation required converting organic matter in water and wastewater to carbon dioxide in water and waste water is called as Chemical Oxygen Demand (COD). This test involves measuring the amount of oxidizing agent such as permanganate i.e. consumed when the organic matter in a water sample is oxidized completely to carbon dioxide. Organic matter in a sample also can be reacted directly with oxygen at a high temperature produce carbon dioxide. Too much organic matter addition to the lentic and lotic systems increases the levels of COD and changes the composition of oxygen requiring organisms. Variation in the organic matter in turn. Changes COD levels show diversity in the autotrophic and heterophic populations and decreases the productivity status. The energy budgets of the aquatic bodies also directly related to the levels of chemical oxidation in prescribed periods.

Procedure

50 ml of wastewater sample was taken and a mixture of added 10 ml of $KMnO_4$ and 10 ml H_2SO_4, H_2O was added into in to it then it was incubated for 4 hours, a few crystals of KI was added which turned the entire solution to yellow colour. After addition of few drops of starch indicator to above prepared solution until it turns colorless. Simultaneously distilled water bland was prepared and analyzed COD[12] (mg/L) using the formula.

$$COD(mg/L) = \frac{8\,xCx\,(B-A)}{Sx\,1000}$$

Where,

C = Concentration of titrant (N/80)

A = Volume of titrant used for blank (ml)

B = Volume of titrant used for sample (ml)
S = Volume of water sample taken (ml)

5) Biochemical Oxygen Demand (BOD)

Biochemical Oxygen Demand (BOD) is the measure of the degraded organic material present in a water sample, and can be defined as the amount of oxygen required by the microorganisms in stabilizing the biologically degradable organic matter under aerobic condition. Hence, BOD approximates the amount of oxidizable organic matter present in the solution and the BOD value can be used as a measure of waste strength. It is highly important to know the amount of organic matter present in the waste treatment system and that the quantity of oxygen required for its stabilization.

It can be determined by BOD bottles after five days.

BOD = (Do – Ds) x Dilution factor mg/lit.

6) Alkalinity

Reagents

A. Hydrochloric acid, 0.1 N
B. Methyl orange indicator, 0.05%
C. Phenolphthalein indicator
D. Sodium carbonate 0.1 N.

Procedure

1. Take 100 ml of sample in a conical flask and add 2 drops of phenolphthalein indicator.
2. If the solution remains colourless, PA = 0, and total alkalinity is determined as described in step 4.
3. If the colour changes to pink after addition of phenolphthalein titrate it with 0.1 N HCl until the colour disappears at end point. This is phenolphthalein alkalinity (PA).
4. Now add 2-3 drops of methyl orange to the same sample and continue the titration further, until the yellow colour changes to pink at end point. This a total alkalinity (TA).

Calculation

$$PA\ as\ CaCO_3, mg/L = \frac{(A \times Normality) of HCl \times 1000 \times 50}{ml\ of sample}$$

$$TA\ as\ CaCO_3, mg/L = \frac{(B \times Normality) of HCl \times 1000 \times 50}{ml\ of sample}$$

Where,

A = ml of HCl used with only phenolphthalein
B = ml of total HCl used with phenolphthalein and methyl orange
PA = phenolphthalein alkalinity
TA = Total alkalinity

7) Acidity

Reagents

A. Sodium hydroxide, 0.05 N
B. Methyl orange indicator
C. Phenolphthalein indicator

Procedure

1. Take 100 ml of colourless sample in a conical flask and add 2-3 drops of methyl orange indicator.
2. If the solution turns yellow, the methyl orange acidity is absent. In case the content turn pink, titrate it with 0.05 NaOH. At the end point colour changes from pink to yellow.
3. Now add few drops of phenolphthalein indicator to the same sample and titrate further with NaOH until the content turn to pink.

Calculation

$$Methyl\ orange\ acidity\ mg/L\ as\ CaCO_3 = \frac{A \times N of NaOH \times 1000 \times 50}{ml\ of sample}$$

$$Phenolphthalein\ acidity\ mg/L\ as\ CaCO_3 = \frac{B \times N of NaOH \times 1000 \times 50}{ml\ of sample}$$

Where,

A = Volume of NaOH used with methyl orange in titrating the sample to pH 3.7
B = Volume of NaOH used with phenolphthalein in titrating the sample to pH 3.7 to pH 8.3

8) Carbon Dioxide

Reagents

A. Sodium hydroxide, 0.05 N
B. Phenolphthalein indicator

Procedure

1. Take 100 ml of sample in a conical flask and add few drops of phenolphthalein indicator.
2. If the solution turns pink, free CO_2 is absent. If the sample remains colourless, titrate it against 0.05 N NaOH. At the end point pink colour appears.

Calculation

$$Free\ CO_2\ mg/L\ = \frac{(ml \times N)\ of\ NaOH \times 1000 \times 44}{ml\ of sample}$$

9) Chloride

Reagents

A. Silver nitrate, 0.02 N
B. Potassium chromate, 5%

Procedure

1. Take 50 ml of sample in a conical flask and add 2 ml of K_2CrO_4 solution..
2. Titrate the contents against 0.02 N $AgNO_3$ until a persistent red tinge appears.

Calculation

$$Chloride\ mg/L\ = \frac{(ml \times N)\ AgNO_3 \times 1000 \times 35.5}{ml\ of sample}$$

9) Hardness

Reagents

A. EDTA solution, 0.01 N
B. Buffer solution
C. Ferrochrome Black T (Solo chrome Black T) indicator
D. Sodium sulphide solution.

Procedure

1. Take 50 ml of sample in a conical flask. If sample is having higher calcium takes a smaller volume and dilute to 50 ml.
2. Add 1 ml of buffer solution.
3. If the sample is having higher amounts of heavy metals add 1 ml of Na_2S solution.
4. Add 100-200 mg of Eriochrome Black T indicator, the solution turns wine red.
5. Titrate the contents against EDTA solutions; at the end point colour changes from wine red to blue.

Calculation

$$Hardness\ as\ mg/L\ CaCO_3\ = \frac{ml\ EDTA\ used \times 35.5}{ml\ of sample}$$

10) Calcium

Reagents

A. EDTA solution, 0.01 M
B. Sodium hydroxide, 1 N
C. Murexide indicator.

Procedure

1. Take 50 ml of sample in a conical flask. If sample is having higher alkalinity, use smaller volumes diluted to 50 ml.
2. Add 2.0 ml of NaOH solution in the sample.
3. Add 100-200 mg of murexide indicator a pink colour develops.
4. Titrate against EDTA solutions until the pink colour changes to purple. For better judgement of end point, compare the purple colour with the distilled water blank end point.

Calculation

$$Calcium, mg/L\ = \frac{x \times 400}{ml\ of sample}$$

Where,

x = Volume of EDTA used.

11) Magnesium

Reagents

A. EDTA solution, 0.01 M
B. Buffer solution
C. Eriochrome Black T indicator

Procedure

1. Find out the volume of EDTA used in calcium determination.

Calculation

$$Mg^{++}, mg/L = \frac{y - x \times 400.8}{Volume\ of\ sample\ x\ 1.645}$$

Where,
y = EDTA used in hardness determination.
x = EDTA used in calcium determination for the same volume of the sample

OBSERVATIONS AND RESULTS

Observations

Water analysis Report

Table 1 : Quality Index of Drinking water of different schools in Akola district

Sr. No.	Samples ID	pH	Temp.	Colour	Odour	Taste
1	1	6.92	23°C	Clear	Odourless	Tasteless
2	2	6.77	24°C	Clear	Odourless	Tasteless
3	3	6.86	25°C	Clear	Odourless	Tasteless
4	4	7.00	23°C	Clear	Odourless	Tasteless
5	5	7.22	24°C	Clear	Odourless	Tasteless
6	6	7.33	25°C	Clear	Odourless	Tasteless
7	7	7.21	23°C	Clear	Odourless	Tasteless
8	8	7.23	24°C	Clear	Odourless	Tasteless
9	9	7.21	24°C	Clear	Odourless	Tasteless
10	10	7.37	23°C	Clear	Odourless	Tasteless

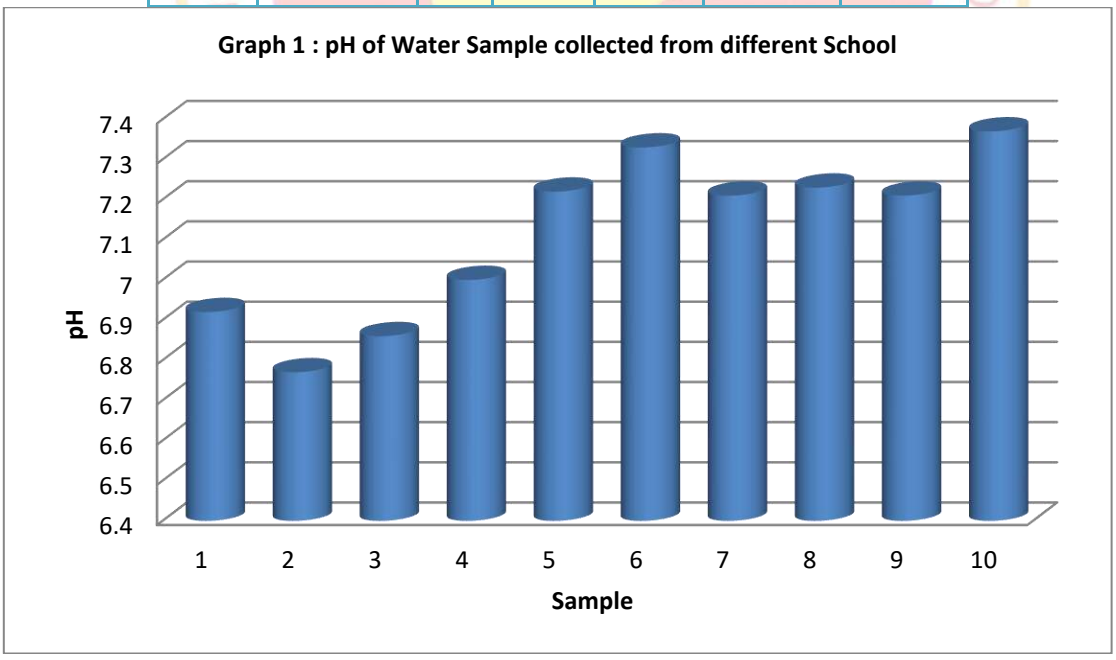


Table 2 : Conductance of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Conductance mg/l
1	1	415
2	2	310
3	3	310
4	4	425
5	5	305

6	6	417
7	7	610
8	8	306
9	9	504
10	10	425
11.	Standard by WHO	300-600

Graph 2 :- Conductance of Drinking water of different schools in Akola district

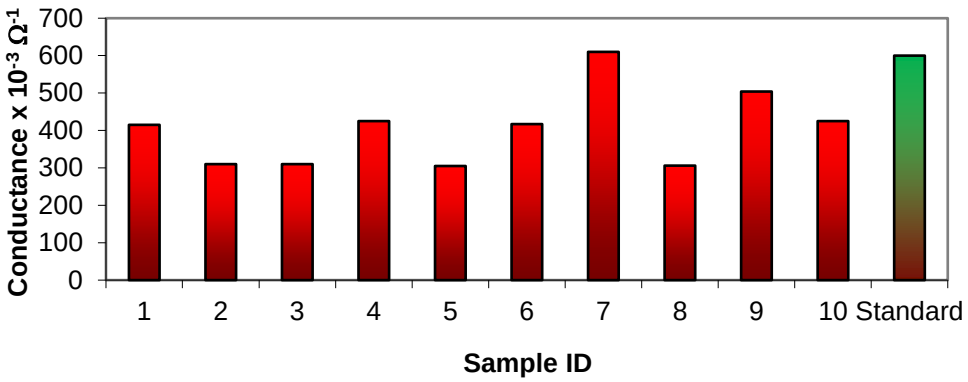


Table 3 : Hardness of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Hardness ppm
1	1	304
2	2	380
3	3	684
4	4	516.8
5	5	684
6	6	668.8
7	7	760
8	8	212.8
9	9	349.6
10	10	212.8
11	Standard by WHO	300

Graph 3 :- Hardness of Drinking water of different schools in Akola district

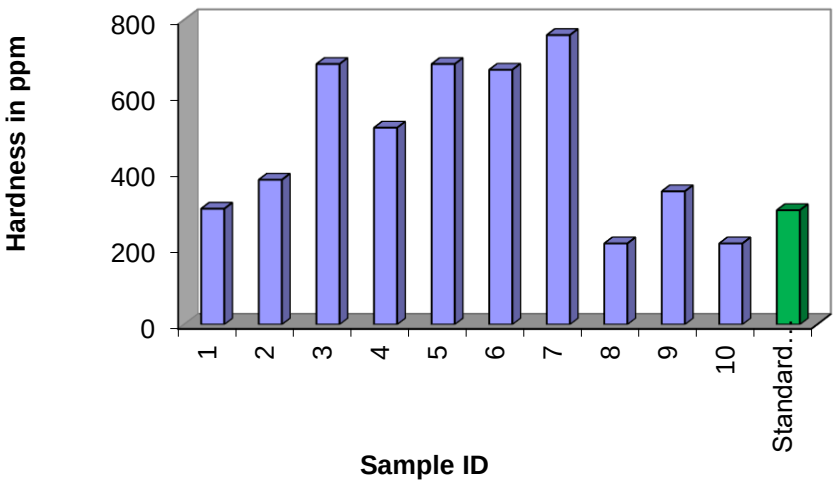


Table 4 : Calcium of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Calcium ppm
1	1	45.6
2	2	136.8
3	3	121.6
4	4	106.4
5	5	152
6	6	152
7	7	167.2
8	8	60.8
9	9	30.4
10	10	15.2
11	Standard by WHO	75 – 100

Graph 4 : Calcium of Drinking water of different schools in Akola district

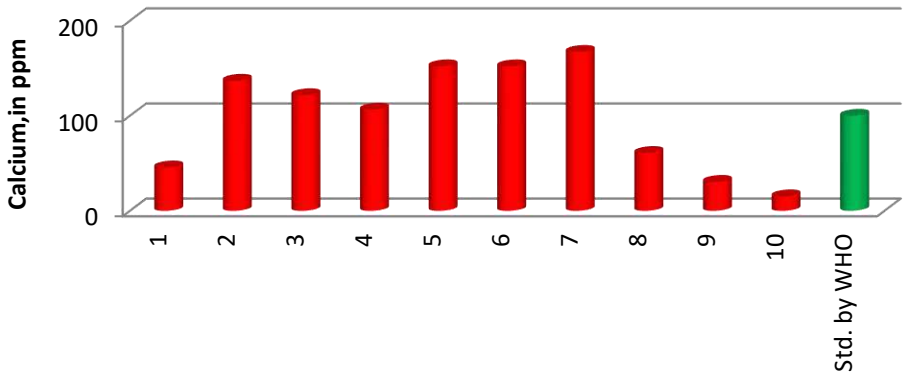


Table 5 :Magnesium of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Magnesium ppm
1	1	258.4
2	2	243.2
3	3	562.4
4	4	410.4
5	5	532
6	6	516.8
7	7	592.8
8	8	152
9	9	319.2
10	10	197.6
11	Standard by WHO	50 – 150

Graph 5 :- Magnesium of Drinking water of different schools in Akola district

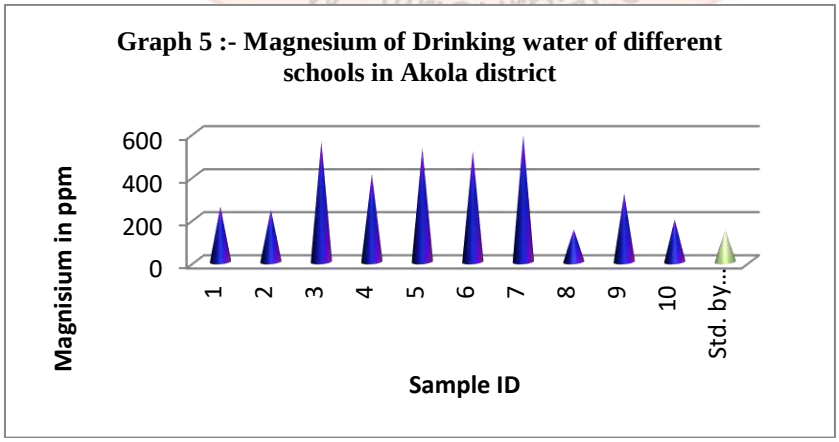


Table 6 : Chloride of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Chloride mg/l
1	1	183.18
2	2	140.438
3	3	134.332
4	4	702.19
5	5	106.855
6	6	100.749
7	7	131.279
8	8	146.544
9	9	732.72
10	10	427.42
11	Standard by WHO	Not to exceed 600

Graph 6 : Chloride of Drinking water of different schools in Akola district

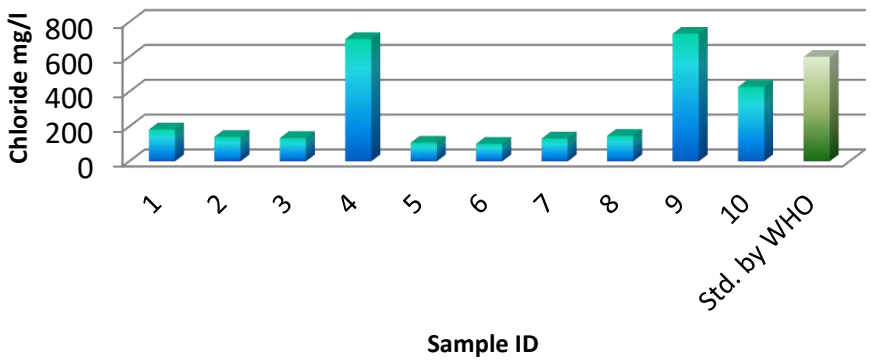


Table 7 : Alkalinity of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Alkalinity mg/l
1	1	300
2	2	400
3	3	350
4	4	350
5	5	500
6	6	650
7	7	1000
8	8	400
9	9	250
10	10	200
11	Standard by WHO	200

Graph 7 : Alkalinity of Drinking water of different schools in Akola district

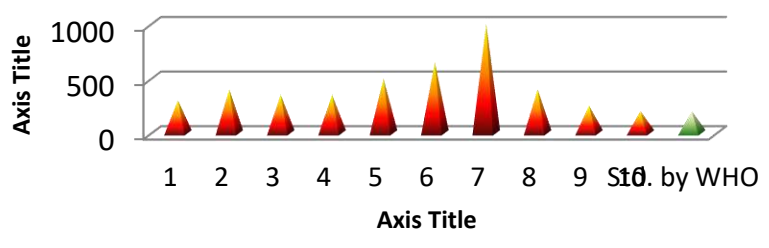


Table 8 : Acidity of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Acidity mg/l
1	1	50
2	2	125
3	3	175
4	4	125
5	5	150
6	6	225
7	7	250
8	8	100
9	9	75
10	10	50

Graph 8 : Acidity of Drinking water of different schools in Akola district

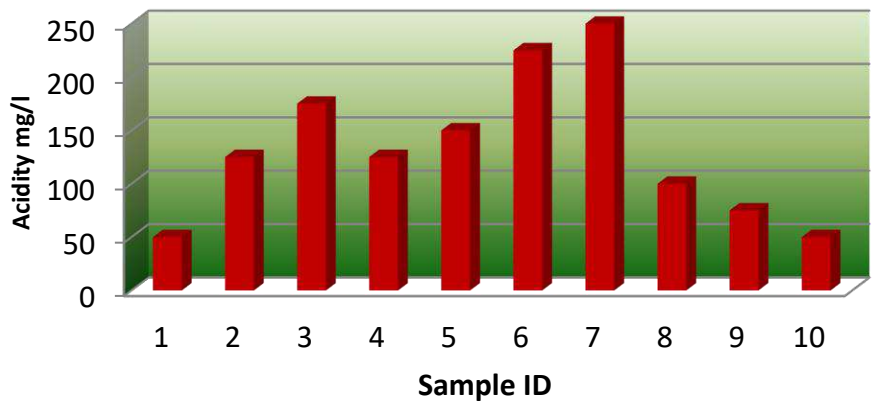


Table 9: Free CO_2 of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Free CO_2 mg/l
1	1	110
2	2	44
3	3	22
4	4	44
5	5	44
6	6	44
7	7	66
8	8	22
9	9	22
10	10	44

Graph 9 : Free CO_2 of Drinking water of different schools in Akola district

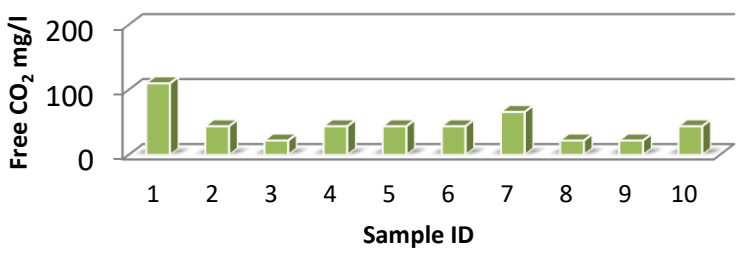
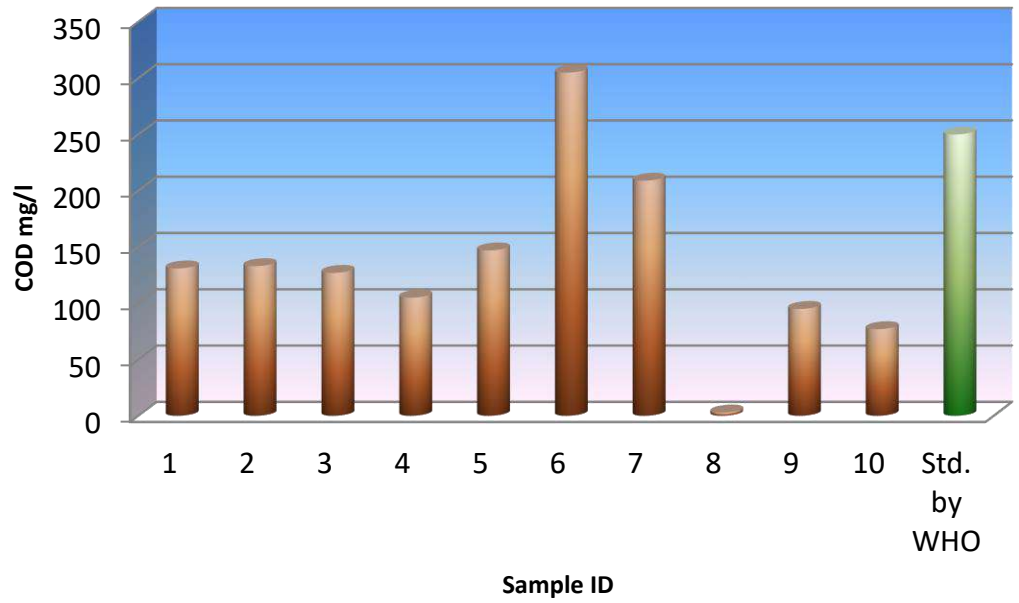


Table 9: COD of Drinking water of different schools in Akola district

Sr. No.	Samples ID	COD mg/l
1	1	131
2	2	133
3	3	127
4	4	105
5	5	147
6	6	305
7	7	209
8	8	3
9	9	95
10	10	77
11	Standard by WHO	Not to exceed 250

Graph 9 : COD of Drinking water of different schools in Akola district



CONCLUSION AND SUGGESTION

Conclusion

1) The study shows that better class and reasonably better quality water should provided at school and maintain its hygienic condition properly.
2) Storage of drinking water in Rajan and Drum was highly contaminated due to its direct contacts of hands and fingers.
3) The study also indicates that daily washing of storage means least coliform count. So we have low contamination in water.
4) The study shows that poor hygienic condition, improper method of storage, improper handling of drinking water makes drinking water more contaminated.
5) Hazen (1998) studied on drinking water and diarrhea diseases due to *E. coli* and reported that, prevention of fecal, contamination prevents water born outbreaks.

Suggestions

1) It is important to maintain the hygienic conditions of children's health.
2) Personal hygiene conditions
   a) Students should wash hands properly before drinking the water.
   b) Regular washing of water tanks/storages in schools.
   c) Water tanks/Rajan should be placed at the hygienic conditions.

d) Good quality purifier should be used in school.
e) Children should be guided serve drinking water properly from water storage (rajan, etc)
f) Children should aware about hygienic conditions related to drinking water.

3) Prevention from water born diseases
a) Regular checkout the pipeline leakage of water supply.
b) Water chlorination is the best and ultimate method of purification. Because chlorine reduces the germ and bacterial growth from water. Ferrous ions, magnesium ions and hydrogen sulphide from water oxidized by chlorine and it reduces the taste and odor from water.
c) Keep surrounding clean and animals away from the sources of water.

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Synthesis And Antimicrobial Activity Of 3, 5, 7 Trisubstituted -1, 2, 4-Triazolo-[3, 4-*B*] Benzothiazoles

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Abstract

4-Methoxy acetanilide on treatment with bromine in acetic acid, followed by hydrolysis with dil. HCl/NaOH solution, yielded 2-bromo-4-Methoxy aniline (1) which on treatment with sodium thiocyanate in acetic acid afforded 2-amino-4-bromo-6-Methoxy benzothiazole (2). Compound (2) in ethylene glycol was heated at 150 ^{0}C with 80% hydrazine hydrate to get 4-bromo-6-Methoxy-2-hydrazino benzothiazole (3). This hydrazino compound (3) on heating with 2-hydroxy-3-methoxy-benzaldehyde/4-methoxy benzaldehyde/4-hydroy-3-methoxy benzaldehyde/ 2-hydroxybenzaldehyde /4-hydroy benzaldehyde /4-dimethyl aminobenzaldehyde to obtain corresponding hydrazones (4a-4f). [4-bromo 2(substituted phenyl)-6-methoxy benzothiazolyl hydrazone]. These hydrazones (4a-4f) in unhydrous benzene independently were refluxed on water bath for three hours with Attenburrow's MnO_2[14] to obtain corresponding 3-substituted phenyl- 5-bromo-7-methoxy-1 ,2, 3-triazolo benzothiazoles (5a-5f). All these newly synthesized compounds were screened for antimicrobial activity against E.Coli (Gram –ve), B. subtilis (Gram +ve), E. Carotovara and xanthomonas citri using Ampicillin, Streptomycin and penicillin as a standard for comparison.

***Key Words** : Hydrazone, triazolobenzothiazole, biological screening*

Introduction:

1,2,4-triazole and their derivatives are important class of organic compounds with diverse agriculture, industrial and biological activities[1-3], including antimicrobial[4-5] anti-convulsant[6-7] and antiinflamatory[8]. Similarly benzothiazoles are known to posses different activities such as anticancer[9],anthelmintic activity[10], antitubercular activity[11].

A survey of literature reveals such fused substituted tricyclic triazoles are prepared by different methods[12 13] but little work is carried out on bromo methoxy derivative of such fused tricyclic triazoles. Hence it was thought worthwhile to synthesize 5-bromo-7-methoxy as a substituent on benzene moiety in the 1,2,4-triazolo-[3,4-*b*]-benzothiazole system by following series of reactions and study the chemistry and biological activity of these compounds.

As the first step, 2-bromo 4-methoxy aniline (1) was prepared by treating 4-methoxy acetanilide with bromine in acetic acid, followed by hydrolysis with dil. HCl / NaOH solution.To the solution of sodium thiocynate in glacial acetic acid, 2-bromo-4- methoxyyl aniline (2) was added .The mixture was stirred well and bromine in glacial acetic acid was added drop by drop action maintaining the temp. below 5 ^{0}C. The obtained residue filtered, dissolved in hot water and neutralized by 20% alkali. The obtained product 2-amino-4-bromo-6-methoxy benzothiazole (2) was recrystlised by using ethanol.

On the basis of elemental analysis and spectral data the obtained product (2) has assigned the structure 2-amino-4-bromo-6-methoxy benzothiazole. The I.R. spectrum showed absorption bands at 3440 cm^{-1} and 3340 cm^{-1} due to asymmetric and symmetric stretching of -NH_2 group respectively. The PMR spectrum exhibited singlet at δ 3.4 due to -OCH_3, broad peak of δ 6.0 due to -NH_2 protons and two singlets in the region δ 7.0 - 7.5 due to two Ar-H protons. The mass spectrum reveals molecular ion peaks at 260 (M+2, 98%) and 258 (M^+, 100%). It also confirmed the presence of one bromine atom.

2-Amino-4-bromo-6-methoxy benzothiazole (2) in ethylene glycol as solvent was heated with 80% hydrazine hydratehydrochloride for three hours by using oil bath and maintaing temp. at 150°C to 160°C to get 4-bromo-6-methoxy-2-hydrazino benzothiazole (3). The I.R. spectrum of compound (3) showed absorption bands at 3320 cm^{-1} and 3203 cm^{-1} due to -NH_2 asymmetric and symmetric stretching respectively. The mass spectrum exhibits molecular ion peaks of equal intensity at 275 (M+2) and 273(M^+) which also confirming the formation of product with one bromine atom.

Compound (3) in ethanol was heated with 2-hydroxy-3-methoxy-benzaldehyde/4-methoxy benzaldehyde/4-hydroy-3-methoxy benzaldehyde /2-hydroxybenzaldehyde/4-hydroxybenzaldehyde /4-dimethyl aminobenzaldehyde sperately on water to obtain corresponding hydrazones (4a-4f). The I.R. spectra of hydrazones showed stretching absorption bands in the region 3450-3100 cm^{-1} due to –N-H stretching. The presence of broad singlet in their PMR spectra in the region δ 2.5 to δ 4.5 confirmed the presence of -NH proton. The mass spectrum of the compound (4a) shows molecular peak at 377 (M^+.) which corresponds to molecular weight of the compound.

These hydrazones (4a- 4f) in benzene were refluxed on water bath for three hours with Attenburrow's MnO_2[1] independently to obtain 3-(2'-hydroxy-3'-methoxy phenyl/4'-methoxy phenyl / 4'-hydroxy-3'-methoxy phenyl /2'-hydroxy phenyl/ 4'-hydroxy phenyl /4'-dimethyl amino phenyl-5-bromo-7-methoxy-1,2,4-triaz-

olo[3,4-*b*]-benzo- thiazoles respectively (5a-5f). The I. R. spectra of these triazolo benzothiazoles observed the absence of strong bands in the region 3450cm^{-1} - 3100 cm^{-1} due to -NH stretching , however the absence of broad singlet in PMR spectra of these triazolo benzothiazole in the region δ 2.5 - δ 4.5 confirms the formation of cyclised products.

The mass spectrum of compound (5f) exhibits molecular peak at 403 which corresponds to its molecular weight. It confirms the formation of 5-bromo-3-(4'- dimethyl amino phenyl)-7-methoxy 1,2,4-triazolo-[3,4-*b*]-benzothiazole products

Experimental:

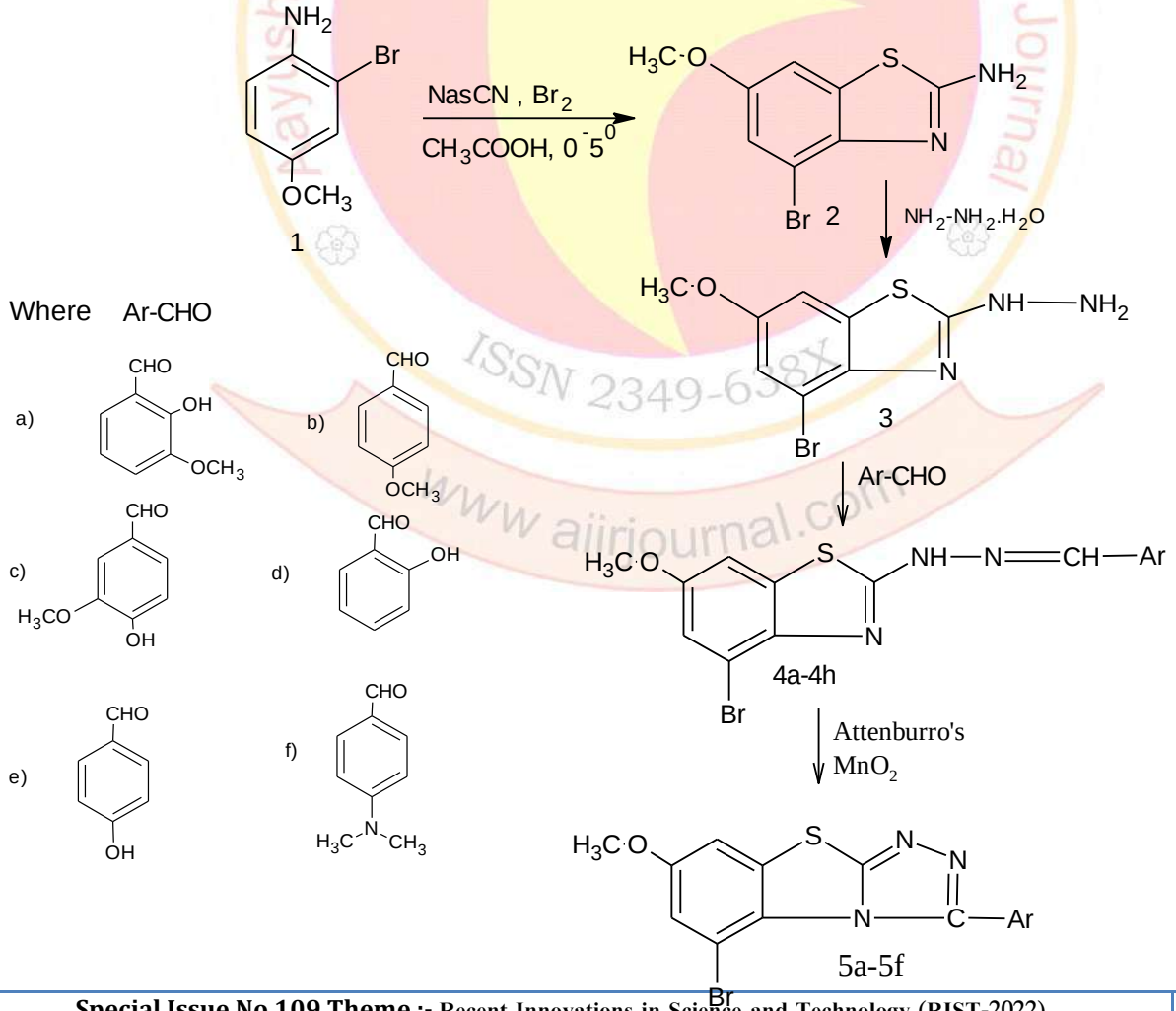
Melting points were determined in open capillaries and are uncorrected. Infrared spectra were recorded in Nujol / potassium bromide pellets on Bomen MB 104FT infrared spectrophotometer. ^{1}HNMR spectra were obtained on a Gemini 200 Mz specrtometer with TMS as an internal standard and mass spectra on FT VG-7070H mass spectrometer using the GI technique at 70 ev. Elemental analysis was carried out on a Heraeus CHN-O Rapid analyser. Purity of the compound was checked by TLC.

Synthesis of 2-Amino-4-bromo-6-methoxy benzothiazole (2)

2-Bromo-4-methoxy aniline (10.8 gm, 0.1 M) and sodium thiocynate (8 gm, 0.1 M) were dissolved in glacial acetic acid (75 ml). The solution was cooled in freezing mixture. Bromine (16 gm, 5 ml, 0.1 M) in glacial acetic acid (20 ml) was added with stirring and maintaining temperature below 25°C. The mixture was allowed to stand for overnight at room temp. The resulting hydrobromide was dissolved in hot water and neutralized with 20 % NaOH to obtain base. The amine thus obtained was filtered, washed with water and recrystallized in aq. alcohol to get the product 6.5 gm.

(60 %), M.P 160 °C., IR (KBr): 3440 cm^{-1} (Asymmetric stretching of -NH_2), 3340 cm^{-1}(N-H Symmetrical stretching of -NH_2), 3052cm^{-1} (Ar-H stretching), 1630 cm^{-1} (-C=N stretching), 1325 cm^{-1} (Ar–C-O stretching), ^{1}HNMR ($CDCl_3$) : δ 3.4 (singlet, 3H, CH_3) due to -OCH_3, δ 6.0 (broad, 2H, NH_2), δ 7.0-7.5 (two singlet, 2H, Ar-H), m/z 230 (M+2, 98 %), 228 (M^+,100%),

Scheme-1



4-Bromo-2-hydrazino -6-methoxy-benzothiazole (3)

Hydrazine hydrate (80%, 9 ml) was taken in a round bottom flsk, cooled the solution to 5°C and added conc. HCl (6 ml) in dropwise fashion with constant stirring. The flask was kept at room temperature for half an hour. 2-amino-4-bromo-6-methoxy benzothiazole (6 gm) and ethylene glycol (24 ml) was added in portions. The contents of the flask were heated at 150 °C to 160 °C on an oil bath for three hours and then cooled. The obtained product, 4-bromo-6-methoxy-2-hydrazino benzothiazole was filtered, washed with cold water and crystallized from ethyl alcohol to give 3.6 gm (62%), M. P. 172°C, IR (KBr) : 3320 cm^{-1} (asymmetric N-H stretching of $–NH_2$), 3203 cm^{-1} (symmetric N-H stretching of $–NH_2$) m/z: 275 (M+2), 273 (M^+)

General procedure for Synthesis of hydrazone of 2-hydrazino-4-bromo -6-methoxy benzothiazole and substituted aromatic aldehyde (4a-af)

2-hydrazino-4bromo-6-methoxy benzothiazole (0.01 M) and aromatic substituted aldehyde is suspended in ethanol seperatly.the mixture of these suspended solution was refluxed on water bath for three hours. The reaction mixture was cooled and obtained solid filtered by using vaccume pump. The obtained product washed with ethyl alcohol and recrystallised from hot benzene.

4a. 2.5 gm , M. P. : 150 °C, IR(KBr) : 3185 cm-1 (-OH Stretch), 3160 (N-H) stretch), 1584 (C= N Stretch), 1290, (C-N Stretch),

4b. : Yield : 2.4 gm, M. P. : 130 °C. IR (KBr) : 3200 cm^{-1} (-OCH_3 Stretch), 3167 cm^{-1} (N-HStretch), NMR shows 3.4 Singlet due to OCH_3 group.

4c. : Yield : 2.6 gm , M. P. : 115 °C. IR (KBr):3180 cm-1 (-OH Stretch), 3174 cm-1 (N-H Stretch).

4d. : Yield : 2.5 gm, M. P. : 140 °C. I.R. (KBr) : 3389 (N-H stretching) 3053 (= C-H stretch in aromatic ring), 1541 (C=N stretch), 1290 (C-N stretch),

4e. Yield : 2.5 gm , M. P. 182 °C, IR (KBr):3423 cm-1 (O-H) stretching), 3209 cm-1 (N-Hstretching),.

4f. Yield : 2 gm , M. P. : 138 °C, IR (KBr) :, 3200 cm-1 (N-H stretching),

General procedure for synthesis of 3-Substituted-5-bromo-7-methoxy 1,2,4 triazolo [3,4-b]-benzothiazole. (5a-5f)

4-Bromo-2-substituted -6-methoxy benzothiazolyl hydrazone (0.002 M) was taken in dry benzene (50 ml). To this was added Attenbarrow's active manganese dioxide[1] (2.0 gm, 0.016 M) and the mixture was refluxed on water bath for three hours. Contents were poured on hot condition in petridish, benzene solvent was removed by evaporation. Obtained solid product was recrystallized from hot ethanol,

All compound (5a-5f) shows absence of N-H streatching in IR specrum, which confirms the formation of cyclised product. Compound 5a shows absorption signal at 3200 cm^{-1} due to O-H streatching while it is absent in compound 5b and 5f because absence of O-H substituent on aromatic ring.

Table : 1

Sr. No.	Compound	Molecular formula	Molecular formula Weight	Yied In gm	M. P In ^{0} C.
1	5a	$C_{16}H_{12}BrN_3O_3S$	406	1.2	183
2	5b	$C_{16}H_{11}BrN_3O_2S$	390	1.3	170
3	5c	$C_{16}H_{12}BrN_3O_3S$	406	1.5	102
4	5d	$C_{15}H_9BrN_3O_2S$	376	1.0	182
5	5e	$C_{15}H_9BrN_3O_2S$	376	1.2	118
6	5f	$C_{17}H_{14}BrN_4OS$	403	1.4	103

Antimicrobial screening: Result and discussion:

Table-2: Evaluation of antimicrobial activity of 3-substituted 5-bromo 7-methoxy 1,2,4 triazolo [3,4,-b] benzothiazole.

Sr. No.	Comp.	Antimicrobial activity (zone of inhibition)			
		E.coli	***Erwinia cartovora***	***Bacillus subtilis***	***Xanthomo-nas. citri***
1	5a	+++	+++	++	++
2	5b	++	+++	+++	++
3	5c	++	++	+++	+
4	5d	+	-	-	+
5	5e	+	+	+	+
6	**5f**	+++	+++	++	++

The compounds (5a-5f) were tested for their antimicrobial activity by cup plate agar diffusion method against *E.coli* (Gram –ve) *B.subtilis* (Gram +ve), *E. carotovara* and *Xanthomonas citri* using ampicillin, streptomycin. and penicillin as a standard for comparison. The antibacterial screening data of the compounds is presented in table No.1. Dimethyl sulphoxide was used as a control (solvent). Compound 5a and 5f is active against *E. coli* and *E. carotovara* species while 5c compound is more active against *Bacillus subtilis* species. compound 5b active against *Bacillus subtilis* and *E. carotovara* species. Compound 5d and 5e are inactive against all four species tested.

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Role Of Physicochemical Properties in Drugs

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Abstract

A complete knowledge of the relevant therapeutic and physicochemical properties of the drug is required to determine the proper formulation and delivery method of a drug. In pharmacology, a drug is a chemical substance typically of known structure, which when administered to a living organism produce a biological effects. Pharmaceutical drugs also called a Medicine. Medicine which is a chemical substance used to treat, cure, prevent or diagnose a disease to promote well. The drugs were obtained through extraction from Medicinal Plants. Pharmaceutical formulation is the multistep process where the active drug is mixed with all other components by considering the factors of particle size, polymorphism, pH, and solubility and becomes the final beneficial medicinal product, the effect of a drug in the human body is mediated by specific interactions of the drug molecule with biological macromolecules. The present paper is based on the literature survey on the Physiochemical properties of drugs studied by various scientists. Physical properties of drugs are responsible for its action. The drug react extra cellular according to simple chemical reactions like neutralization, chelating, oxidation, etc.

Keywords*: solubility, Pharmaceutical, properties, drugs etc*

Introduction:

Physical properties, solvation properties related to interactions with different media, properties or molecular attributes that define intrinsic chemical reactivity. A drug is a chemical substance that interacts with proteins in the body to affect a physiological function. This is the general idea behind all medicine. Once these substances are absorbed into the systemic circulation they bind with certain proteins changes the functioning of the cell slightly.

Physical and chemical properties of substances are very important in identifying and studying chemical compounds. Physical properties are different from chemical properties of a substance. The main difference between physical and chemical properties is that physical properties can be observed without changing the chemical composition of a substance whereas chemical properties can be observed by changing the chemical composition of a substance [1]. The physical characteristics impact the passage of a drug molecule from the administered dose to the site of action, profoundly influencing its pharmacokinetics and pharmacology [1]. Chemical properties are properties that can be measured by changing the chemical composition of a substance. The chemical composition of a substance is like the identity of that substance

Why to study Physicochemical Properties of Drugs?

A complete knowledge of the relevant therapeutic and physicochemical properties of the drug is required to determine the proper formulation and delivery method of a drug. Avdeef A. etal [2]discuss that in addition to providing a basic understanding of the importance of solubility and stability to drug delivery, methods to enhance solubility and physical and chemical stability are described. They also focus on the processes required for the proper drug formulation. Since most drugs are administered in the solid state, the formulation process for tablets is described in detail. They also discuss on some basic drug delivery methods, with an emphasis on the physicochemical properties that impact those methods [2]. For Example: The various Physicochemical properties of the drug that affect drug dissolution and its rate are solubility, particle size, polymorphism, salt form, pseudo polymorphism, complexation, wettability, etc. Pharmaceutical formulation is the multistep process where the active drug is mixed with all other components by considering the factors of particle size, polymorphism, pH, and solubility and becomes the final beneficial medicinal product. Pharmaceutical drugs are usually categorized into drug classes. A group of drugs will share a similar chemical structure, or have the same mechanism of action, the same related mode of action or target the same illness or related illnesses [3]. The Anatomical Therapeutic Chemical Classification System (ATC), the most widely used drug classification system, assigns drugs a unique ATC code, which is an alphanumeric code that assigns it to specific drug classes within the ATC system [4].

Principle of drug action:

Goldstein A. etal [5] focus on the appearance of a text which is almost completely devoted to the theory of drug action, and in fact covers no particular drug in a systematic fashion, emphasizes the remarkable growth of pharmacology as a science. At a molecular level and in an orderly manner it dissects and demonstrates the logic by which man has attained the ability to control living processes of all types by the use of chemicals

How do Physicochemical Properties affect Drugs Absorption?

Avdeef A. etal [2] studied on solubility and permeability are considered as the major physicochemical factor that affect the rate and extent of oral drug absorption, moreover

other physicochemical properties always show their effects to drug absorption via affecting solubility and permeability [6].

Factors affecting on drugs solubility:

a) Drug solubility & dissolution rate b) Particle size & effective surface area c) Polymorphism & amorphism d) Pseudopolymorphism (hydrates/solvates) e) Salt form of the drug f) Lipophilicity of the drug (pH- Partition-hypothesis) g) pKa of drug & gastrointestinal pH h) Drug stability

Kerns EH. etal [7] focused on all drugs can be administered via number of routes Bolus is the administration of the medication, drug and other compound that is given to raise its concentration in blood to an effective level. Inhaled as an aerosol, vape, inhaler or dry powder. Injection as a solution, suspension or emulsion. Orally as a liquid or a solid, that is absorbed through the intestines. Sublingually, diffusing into the bloodthrough tissues under the tongue. Rectally as a suppository, that is absorbed by the rectum or colon [8].

Physicochemical properties of drugs

The ability of a chemical compound to elicit a pharmacological/ therapeutic effect is related to the influence of various physical and chemical properties of the chemical substances on the bio molecules that is interacted with. Physical properties of drugs are responsible for its action. Chemical properties of drug react extra cellularly according to simple chemical reactions like neutralization, chelation, oxidation, etc.

Types of physicochemical properties of drugs

A. Solubility
B. Partition co-efficient
C. Hydrogen bond
D. Chelation / Complexation
E. Ionization of drugs
F. Surface activity
G. Protein Binding

Solubility:

C. D. Rangel-Yagui. Etal[8] studied on the solubility of the substance at a given temperature. Solubility depends on the nature of solute and solvent as well as temperature, pH of pressure. The solubility of drug may be expressed in terms of its affinity or repulsion for either an aqueous or organic solvent [9]. Kerns EH. and C. D. Rangel-Yagui [8] focused on Solubility is based on the highest-dose strength of an immediate release product. A drug is considered highly soluble when the highest dose strength is soluble in 250 mL or less of aqueous media over the pH range of 1 to 7.5. Solubility improvement techniques can be categorized in to physical modification, chemical modifications of the drug substance, and other techniques. Physical Modifications includes Particle size reduction like micronization and nanosuspension, modification of the crystal habit like polymorphs, amorphous form and cocrystallization, drug dispersion in carriers like eutectic mixtures, solid dispersions, solid solutions and cryogenic techniques. Chemical Modifications includes Change of pH, use of buffer, complexation, and salt formation.

Partition co-efficient

Leo A. etal [10] explained on the chemical and pharmaceutical sciences, both phases usually are solvents. Most commonly, one of the solvents is water, while the second is hydrophobic, such as 1-octanol. Hence the partition coefficient measures how hydrophilic or hydrophobic a chemical substance. Partition coefficients are useful in estimating the distribution of drugs within the body. Hydrophobic drugs with high octanol-water partition coefficients are mainly distributed to hydrophobic areas such as lipid bi layers of cells. Hydrophilic drugs are found primarily in aqueous regions such as blood serum. Edwards MP, etal [11] studied on drug's distribution coefficient and how easily the drug can reach its intended target in the body, how strong an effect it will have once it reaches its target, and how long it will remain in the body in an active form. Log P is an octanol -water Partition co-efficient and measure the degree of hydrophobicity playing vital role in drug absorbtion.

Hydrogen Bond:

Edwards MP, etal [11] studied on the hydrogen bond which is a special dipole – dipole interaction between the hydrogen atom in a polar bond such as N-H, O-H or F-H and electronegative atom O, N, F atom. Dipoles result from unequal sharing of electrons between atoms within a covalent bond. These are weak are capable of forming hydrogen bonding is also soluble in water [1]. A number of motifs, several of which are clearly underutilized in drug discovery are analyzed in more detail by comparing small molecules and protein ligand X-ray structure. The effects on physiochemical properties, sets of closely related structures with and without the ability to form intra molecular hydrogen bonds were designed, synthesized and characterized with respect to membrane permeability, water solubility and lipophilicity [9].

Chelation / Complexation:

Drug complexation can lead abeneficial properties such as enhanced aqueous solubility and stability. In some instances, complexation also can lead to poor solubility or decreases absorption of drug in the body. For some drugs, complexation with certain hydrophilic compounds can enhance excretion.

Ionization of drugs:

Allen R. I., etal studied on the drugs are either weak acids or bases and can exist in either ionized or unionized state. Ionization = Protonation and deprotonation resulting in charge molecules. The ionization of the drug depend its pKa and pH. As the majority of drugs are weak acid and base of the dissociation constant in each case helps in understanding the ionic form a molecule will take across a range of pH values. The pKa of a drug influences lipophilicity, solubility, protein binding and permeability which in turn directly affect pharmacokinetic (PK) characteristics such as absorption, distribution, metabolism and excretion. The association between pKa and PK has also resulted in the requirement for pKa values to be measured for regulatory compliance. Allen R. I., etal [12] focused on the rate of drug adsorption is directly proportional to the concentration of the drug at absorbable form but not the concentration of the drug at the adsorption site. Ionization form imparts good water solubility to the drug which is required of binding of drug and receptor interaction. Unionized form helps the drug to cross the cell membrane **[12]**.

Surface Activity:

Surfactant is defined as a material that can reduce the surface tension of water at very low concentration. Surface active agents affect the drug adsorption which depends on:

- The chemical nature of surfactant
- Its concentration
- Its affect on biological membrane and the micelle formation.

In lower concentration of surfactant enhanced the rate of adsorption because amphiphiles reduces the surface tension and better adsorption. In higher concentration of surfactant reduced the rate of adsorption

Protein Binding:

Haupt V. J, etal [13] explained on the reversible binding of protein with non specific and non functional site on the body protein without showing any biological effect is called as protein binding. Protein + Drug⇌Protein – drug complex. Depending on the whether the drug is a weak or strong acid, base or neutral, it can be bind to single blood proteins to multiple proteins. The most significant protein involved in the binding of drug is albumin, which comprises more than half of blood proteins. The degree of protein binding can greatly affect the pharmacokinetics of drugs acid drugs such as non steroidal anti-inflammatory drugs (NSAIDs) tend to bind predominantly to albumin. Albumin is the most abundant plasma protein and it is critical to maintaining the colloidal entotic pressure in the vascular system. As a negative acute phase protein, albumin concentration decreases during inflammation. Other proteins, including corticosteroid binding globulin are important for binding of some specific drugs but are less important in overall drug protein binding. There is equilibrium between free and bound drug, just like the relationship of ionized and non ionized drug molecule. Protein binding is most clinically significant for antimicrobial therapy. Changes in protein binding caused by drug interactions are assumed to instantaneously change free drug concentrations and have been frequently cited as a cause of adverse drug reaction.

Conclusion:

From literature survey it is concluded that study of physiochemical properties are to be studied before the drugs are provided in market. The physicochemical properties of compounds that determine their interaction with transport proteins and the enzymes involved in drug clearance. Lipophilicity is an important physicochemical property resulting in interaction and, in particular, inhibition of both transport proteins and enzymes. Solubility is one of the important parameters to achieve desired concentration of drug in systematic circulation for achieving required pharmacological response. Partition Coefficient is useful in estimating the distribution of drugs within the body. The partition coefficient measures how hydrophilic or hydrophobic a chemical substance is one of the solvent is water while the second is hydrophobic, such as 1- octanol. Hydrogen bonding plays a crucial role in determining the specificity of ligand binding. Hydrogen bonding holds complementary strands of DNA together, and they are responsible for determining the three dimensional structure of folded proteins including enzymes and antibodies Chelation therapy is the preferred medical treatment for reducing the toxic effects of metals. Complexation is an extensively used technique in the pharmaceutical field to improve solubility of several pharmaceutical ingredients and subsequently the

bioavailability of poorly water soluble drugs. Ionized drugs are not absorbed as efficiently as unionized drugs. A drug that is a weak acid will be adsorbed primarily in acidic environment, whereas, a drug that is a weak base will be absorbed in the alkaline environment of small intestines. The action of surface activity in drug as a liquid membrane hypothesis of drug action for surface active drugs. Protein binding can influence the drugs biological half life. The bound portion may act as a reservoir or depot from which the drug is slowly released as the unbound form. The pKa of a drug influences lipophilicity, solubility, protein binding and permeability which in turn directly affects pharmacokinetic characteristics such as absorption, distribution, metabolism and excretion (ADNE)[1-5]. The modern drug discovery involves the identification of screening hits, medicinal chemistry and optimization of those hits to increase the affinity, selectivity, efficacy and oral bioavailability. The effect of a drug in the human body is mediated by specific interactions of the drug molecule with biological macromolecules, led scientists to the conclusion that individual chemicals are required for the biological activity of the drug.

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Green Chemistry,Nanotechnology,Environmental Chemistry and Synthetic Organic Chemistry.

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Abstract:-

Nano material are important in many diverse areas,from basic research to various application in Electronics,biochemical sensors catalysis energy.Bridge between homogeneous & Heterogeneous catalysis.Close to Homogeneous catalyst.Microwave assisted Nano catalysis in aqueous medium,in last fews years, Microwave assisted chemistry has blossomed in to a matured and useful Technique for a variety of applications. In India, agriculture plays an important role for development in food production. In our country, agriculture are depends on the monsoons which is not sufficient source of water. So the irrigation is used in agriculture field. In Irrigation system, depending upon the soil type, water is provided to plant. In this paper, automatic irrigation system based on GSM module is studied. The developed system is a machine based system, which automates the irrigation of land by combining various software and hardware approaches together to find exact field information and to provide instant across the field. This involves some sensors, LCD display, buzzer, artificial lights and GSM.Here we are using sensors to monitor the field condition. Those are Temperature, humidity, soil moisture, and fire and light sensors. All these devices are connected to the microcontroller.GSM is used for communication purpose only

Key words:- *Nanoparticles synthesis, icrobial synthesis, Phytonanotechnology, UV–visible spectroscopy.*

Introduction:-

Green chemistry is also known as environmentally benign chemistry or sustainable chemistry ,Paul Anastas and John Warner, who defined green chemistry as the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances.Chemical developments also bring new environmental problems and harmful unexpected side effects, which result in the need for 'greener' chemical products. Green chemistry looks at pollution prevention on the molecular scale and is an extremely important area of Chemistry due to the importance of Chemistry in our world today and the implications it can show on our environment. The Green Chemistry program supports the invention of more environmentally friendly chemical processes which reduce or even eliminate the generation of hazardous substances. Anastas and Warner formulated the twelve principles of green chemistry in 1998. These serve as guidelines for chemists seeking to lower the ecological footprint of the chemicals they produce and the processes by which such chemicals are made.The invention, design and application of chemical products and processes to reduce or to eliminate the use and generation of hazardous substances.

Green Chemistry Is About

- Waste Minimisation at Source
- Use of Catalysts in place of Reagents
- Using Non-Toxic Reagents
- Use of Renewable Resources
- Improved Atom Efficiency
- Use of Solvent Free or Recyclable Environmentally Benign Solvent systems

Principles Of Green Chemistry

1. **Prevention of Waste or by-products**
   It is better to prevent waste than to treat or clean up waste after it is formed
2. **Atom Economy**:-
   Atom economy (atom efficiency) describes the conversion efficiency of a chemical process in terms of all atoms involved (desired products produced).

$$Atom\ Economy = \frac{Mol.\ weight\ of\ Desired\ product}{Mol.\ weight\ of\ all\ reactants} \times 100$$

3. Minimization of hazardous products

Wherever practicable, synthetic methods should be designed to use and generate substances that possess little or no toxicity to people or the environment.

4. Designing Safer Chemicals

Chemical products should be designed to effect their desired function while minimising their toxicity

5. Safer Solvents & Auxiliaries

"The use of auxiliary substances (e.g. solvents, separation agents, etc.) should be made unnecessary wherever possible, and innocuous when used"

6. Design for Energy Efficiency

Energy requirements of chemical processes should be recognized for their environmental and economic impacts and should be minimized. If possible, synthetic methods should be conducted at ambient temperature and pressure. Developing the alternatives for energy generation (photovoltaic, hydrogen, fuel cells, bio based fuels, etc.) as well as continue the path toward energy efficiency with catalysis and product design at the forefront.

7. Use of Renewable Feedstock

"A raw material or feedstock should be renewable rather than depleting whenever technically and economically practicable."

8. Reduce Derivatives

Unnecessary derivatization (use of blocking groups, protection/de-protection, and temporary modification of physical/chemical processes) should be minimized or avoided if possible, because such steps require additional reagents and can generate waste. More derivatives involve ,Additional Reagents ,Generate more waste products More Time ,Higher Cost of Products .Hence, it requires to reduce derivatives.

9. Catalysis

Catalytic reagents (as selective as possible) are superior to stoichiometric reagents. e.g. Toluene can be exclusively converted into p-xylene (avoiding o-xylene & m-xylene) by shape selective zeolite catalyst.

10. Designing of degradable products

Chemical products should be designed so that at the end of their function they break down into innocuous degradation products and do not persist in the environment.

11. New Analytical Methods

"Analytical methodologies need to be further developed to allow for real-time, in-process monitoring and control prior to the formation of hazardous substances."

12. Safer Chemicals For Accident Prevention

"Analytical Substances and the form of a substance used in a chemical process should be chosen to minimise the potential for chemical accidents, including releases, explosions, and fires."

Microwave assisted Reaction: An approach to green Chemistry

Microwave assisted organic synthesis is defined as the preparation of desired organic compound from available starting material via some procedure involving microwave irradiation. As it is less hazardous it is a potential tool of green chemistry. Microwave Synthesis opens up new opportunities to the synthetic chemist in the form of new reaction that are not possible by conventional heating. It is an enabling technology for accelerating drug discovery and development processes.

Nanoparticles

Nanoparticles are particles which lie in dimensions between 1-100 nm. Nano derived from the Greek word Nanos which means dwarf or extremely small It can be used as a prefix for any unit to mean a billionth of that unit. For example, nanoseconds (billionth of a second), nanometer (billionth of a meter), nanoliter (billionth of a liter). They consist of micro molecular materials in which the active ingredients (drug or biologically active material) is dissolved, entrapped, encapsulated, adsorbed or attached

Methods For Synthesis Of Nano Particles

Physical method; time and energy consuming, synthesis at high temperature, and pressure.

Chemical method; simple, inexpensive, and low temperature, use of toxic reducing and stabilizing agents make it harmful.

Green method; Easy, efficient and eco-friendly. eliminates the use of toxic chemicals, consume less energy and produce safer products and by products.

Major Limitation Of Microbial Synthesis

Microbial synthesis is of course readily scalable, environmentally benign and compatible with the use of the product for medical applications, but production of microorganisms is often more expensive than the production of plant extracts.

Techniques For Synthesis Of Nano Particles

The methods for making nanoparticles can generally involve either a “top down” approach or a “bottom up” approach

Phytonanotechnology

Phytonanotechnology is actually the synthesis of Nano particles using fresh plants or plant extracts. Plant derived nanoparticles produced by readily available plant materials. The nontoxic nature of plants are suitable for fulfilling the high demand for nanoparticles with applications in the biomedical and environmental areas.Recently, successfully synthesized gold and silver nanoparticles using the leaf and root extract from the medicinal herbal plant Panax ginseng. Additionally, various plant parts, including leaves, fruits, stems, roots, and their extracts, have been used for the synthesis of metal nanoparticles. It has been proposed that proteins, amino acids, organic acid, vitamins, as well as secondary metabolites, such as flavonoids, alkaloids, polyphenols, terpenoids, heterocyclic compounds, and polysaccharides, have significant roles in metal salt reduction and, furthermore, act as capping and stabilizing agents for synthesized nanoparticles.

Phytochemical Screening

It refers to the extraction, screening and identification of the medicinally active substances found in plants. Some of the bioactive substances that can be derived from plants are flavonoids, alkaloids, carotenoids, tannin, antioxidants and phenolic compounds. Color changes or precipitation formation is the indication of presence of these phytochemicals.

Preparation Of Plant Extract For Phytochemical Screening

Take Fresh plant. An ethanol extract of sample can be prepared by milling 50 gram of the desired part of plant in an electric blinder. Then mixed paste of plant with 200 ml ethanol in conical flask by shaking it with hand and placed for three days or by mixing it with magnetic stirrer. Now filter the Ethanoic extract of plant. Placed the filtrate on rotary evaporator at 60 degree centigrade to remove ethanol. The extract will be concentrated by placing it on water bath at 75 degree centigrade. Now the sample is prepared for the phytochemical screening.

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Future aspects of 5G Technology in India- A Review

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Abstract

5G is the fifth-generation digital cellular network which will completely revolutionize digital cellular technology. We have seen from the past several years that how digital cellular network technology changed from 1G to 4G. This technology was widely accepted and spread in our country in a short span of time. As due to increasing dependency on technology we need much more high-speed internet with high data download capacity and low latency. In the future we will see how machine to machine communication, unman machine with artificial intelligence will change our way of life. Already we are using 4G cellular networks which are not enough with growing demand due to vast changing technology. In India very soon department of telecommunication will roll out auction of spectrum for 5G digital cellular network which is likely to be start in the beginning of 2022. Many private players like Reliance Jio, Bharti Artel and Vodafone Idea is ready to provide 5G network. Although department of telecommunication is all ready to go for 5G. But many users still unaware about 5G technologies. It is because due to increasing technology over the years we have seen lot of changes in nature and its effect ultimately on the human body. Hence, there is a palpable sense of fear among users related to its effect on health. This current paper provides comprehensive study of 5G technology, its implementation and myths related to health.

Keywords: 5G, 4G, Frequency, Millimeter wave, Radiation.

Introduction

5G is the fifth-generation digital cellular technology which is having capability of providing high speed internet connectivity, high downloading data with low latency. Although 4G is widely used in our country but it needs to update due to vast increasing and developing technology. It is believed that around 2025 there will be more than 5.7 billion mobile users around the world and 5 billion internet users [1]. We have seen from the last several years how there is an increasing dependence on technology. Today for anything we need internet through cell phones from calling taxi to order meal as well as using GPS for searching location. In the last decade there has been a tremendous increase of internet users. According to recent data there are 4.72 billion people around the world use the internet in April 2021, that's more than 60 percent of the world's total population. Internet users are currently growing at an annual rate of 7.6 percent. The average global internet user spends almost 7 hours online each day [2].

In India the number of smartphone users was estimated to reach over 760 million in 2021 [3]. This figure is growing day by day due to the majority of mobile users are going towards digital. Mostly youngsters are using digital payment option from paying bills for electricity to ordering meals and also for shopping. During covid-19 pandemic lockdown 2020-21 internet usage increased by 60%. From students to employees everyone was using the internet for working at home and to spend some time. This will not stop here we will see in future how our dependency will enhance on internet. Everything will be control by internet through Artificial intelligence such as driver less cars, house appliances, security cameras, smartwatches and machine to machine communication, like a high-speed vehicle on road or highway will communicate with another car on highway and provide safer journey. It will not only save our time but also avoid accidents. Another most significant aspect is its use within the medical field now a days we've seen how this pandemic realized the importance of doctors. Many countries don't have proper medical facility with specialized doctors. This pandemic emphasized the requirement of more specialized doctors. Available statistics show that, as of 2020 over 55% of WHO Member States report back to have but 20 medical doctors per 10000 populations (almost 40 countries within the WHO African region). Medical experts are distributed unevenly across the world. Countries with very cheap relative need have the best numbers of physicians, while those with the greatest burden of disease must manage with a far smaller health workforce. The African Region suffers quite 22% of the world burden of disease but has access to only 3% of medical examiners and less than 1% of the world's financial resources [4].

Even in our country position is additionally not good many remote areas don't have specialized doctors. Most of the specialized doctors are working in cities, only a few doctors are working in rural areas but most of them are not specialized. In such cases patients have to visit a nearby city hospital. The doctor to population ratio in India is 1:1456 against the WHO recommendation of 1:1000 [5]. To solve this problem either we've got to extend no of qualified doctors which isn't possible in less time like current situation of pandemic or we have to

use technology like 5G. Within which 5G digital network allow telemedicine service through which doctors can treat patients at remote area and do surgery from anywhere any time without delaying in time [6]. 5G technology isn't only useful for consumers but also very essential for our growing economy. Due to pandemic 2020-2021 government of India suffered huge loss of revenue. India's growth fell to 3.1 percent within the fourth quarter of the financial year 2020, as per the Ministry of Statistics [7]. The 140 million people lost employment during this lockdown, and others got salaries cut. During the primary phase of lockdown, the Indian economy was expected to lose $4.5 billion on a daily basis [8]. But 5G technologies may well be a game changer it can create lot of revenue to government of India and large no of jobs especially in private sector. Department of Telecommunications (DoT) is expected to auction spectrum for 5G in next year 2022, it delayed because of pandemic. Many companies like Jio, Bharti Airtel, Vodafone, BSNL and MTNL is geared up to go for 5G networks. It is estimated that 5G will deliver $150 billion in additional GDP for India [1].

On the other hand, there are some misconceptions related to 5G technology among the general public. The misperception is related to health, some believe that 5G cellular technology will create lot of radiation due to which it will cause to health. As radiofrequency EMFs at sufficiently high-power levels can adversely affect health. The International Commission on Non-Ionizing Radiation Protection (ICNIRP) published Guidelines in 1998 for human exposure to time-varying EMFs up to 300 GHz, including the radiofrequency EMF spectrum. This commission is regulating 5G network frequency to make sure safety to individual and environment. During this pandemic also some were believed that the second wave of coronavirus has been caused by testing of 5G technology. The ministry of communication issued an announcement they said that there's no relationship between coronavirus and testing of 5G network. They urged public not to believe on such fake news [9]. The study of 5G digital cellular network technology in this paper is to analyse its future aspects on Indian consumers.

Comprehensive information about 5 G technologies

Wireless communication and transmission of data is possible by the use of Radio frequency (RF) waves. It is the electromagnetic wave frequencies that lie in the range extending from around 3 kHz to 300 GHz in the electromagnetic spectrum. We are using this radio frequency from navigation of ship to satellite communication. Some frequency is reversed only for government agencies such as space and research or defence forces in countries. In wireless communication our journey starts from the analog world and now we come to the digital world. The first generation mobile communication start from 1G it had provided bandwidth 2.4 Kbps with frequency 30 KHz, 2G had provided bandwidth 64 Kbps with frequency 1.8 GHz, 3G had provided bandwidth 100 kbps-2 Mbps speed with frequency 2 GHz and 4G currently provided 100 Mbps-1 Gbps speed with frequency 8 GHz and is based on LTE (Long term evolution) Technology [10]. LTE developed by 3Gpp (Third generation partnership project). It was used to speed up the device like cell phone, tablet, Wi-Fi etc. We can observe that how bandwidth and frequency had increased from 1G to 4G with increasing technology and its uses. Following table-1 shows the development in technology [11].

Generation	Year of development	Technology	Frequency	Bandwidth
1G	1982	AMPS, NMT, TACS	30KHz	2Kbps
2G	1992	GSM	1.8 GHz	14.4-64 Kbps
3G	2001	CDMA	1.6-2 GHz	2Mbps
4G	2012	LTE, WiMAX	2 - 8 GHz	2Mbps to 1Gbps

Table-1 (Development of network from 1G to 4G)

5G is the fifth-generation digital cellular technology which will use higher Radio frequency of electromagnetic spectrum for high speed internet, high data downloading with low latency. 5G is technology designed to meet the requirements of IMT-2020 set by the International Telecommunication Union (ITU-R).

IMT-2020 (5G) is meant to supply way more enhanced capabilities than those provided by IMT Advanced (4G). Compare to 4G network its speed will 10 times higher. 5G will provide data speed 1 GB/sec and peak data speed will be 2-20 GB/sec. 5G will provide 1 milli second low latency which is far lesser than 4G having 100 milli second. 5G network uses higher frequency range from electromagnetic spectrum called as millimeter wave (mm Wave). Millimeter waves have a shorter range than microwaves, this millimeter wave is completely new for transmission of signal or data. But due to the use of higher frequency of millimeter wave it

affects the range of network. Hence, 5G network service area is divided into small geographical areas called cells. Small cells are low powered cellular radio access nodes in which it has a range of 10 meters to a few kilometers. These small cells are connected to macro cells or large tower to receive and emit signal See. 5G technology used Multiple bitstreams technique to transmitted data simultaneously. A technique called as beamforming, in which the base station computer will continuously calculate the best route for radio waves to reach each wireless device and will organize multiple antennas to work together as phased arrays to create beams of millimeter waves to reach the device.[13] [14].

To increase its capacity 5G used Massive MIMO (multiple input and multiple output) technique in which large number of antennas employed in transmitter and receiver. Each antenna is individually-controlled and will embed radio transceiver components. All 5G devices in a cell are connected to the internet and telephone network by radio waves through a local antenna in a cell. For wide 5G network service, it operates on three frequency bands-Low, Medium and High. Spectrum requirement for 5G network lies around three key frequencies ranges: Sub-1 GHz, 1-6 GHz and above 6 GHz. The selection of spectrum among these ranges will depend upon the capacity and coverage requirement of the region [17]. Low-band 5G uses the identical frequency range to 4G cell phones, 600–850 MHz, giving download speeds a little higher than 4G: 30–250 megabits per second (Mbit/s).[12] Low-band cell towers have a range and coverage area just like 4G towers. Mid-band 5G uses microwaves frequency from 2.5–3.7 GHz, allowing speeds of 100–900 Mbit/s, with each cell tower providing service up to many kilometers in radius. High-band 5G uses frequencies of 25–39 GHz, near the underside of the millimeter wave band. Since millimeter waves (mm Wave or mm W) have a more limited range, it requires many small cells.[15] Hence, millimeter signal waves could be impeded or blocked by materials in walls or windows [16]. Hence, 5G network service is planning to deploy cells only in dense urban environments and areas where crowds of people congregate like sports stadiums and convention centres. By deploying small cells, operators are able to support significantly higher capacity in dense areas, as well as improve coverage in areas where building blockage otherwise reduces the signal strength. Since 5G capabilities rely on hyper dense network, small cells are going to be required to be deployed at every 200-250 meters on many varieties of infrastructure like electric utility poles, street light poles, bus stands, roof tops, traditional cell towers, etc. [17]. The industry standards group 3GPP chose the 5G NR (New Radio) standard along with LTE as their proposal for submission to the IMT-2020 standard [18][19]. 5G NR include lower frequencies (FR1), below 6 GHz, and higher frequencies (FR2), above 24 GHz.

World position at 5G Technology

South Korea was the first country to adopted 5G network at her own country on a large scale. Swedish telecoms giant Ericsson predicted that 5G internet will cover up to 65% of the world's population by the end of 2025.[20] Also, it plans to invest 1 billion reals ($238.30 million) in Brazil to add a new assembly line dedicated to fifth-generation technology (5G) for its Latin American operations.[21].

India's preparation in the direction of 5G

A 5G High Level Forum (5G HLF) was founded by the Union Government of India in September 2017 to articulate the vision for 5G in India and to recommend policy initiatives & action plans. In August 2018 (5G HLF) released a report ''Making India 5G ready'' suggesting measures within the area of Spectrum Policy, Regulatory Policy, Education and Awareness Promotion Program, Application & Use Case Labs, Development of Application Layer Standards, Major Trials and Technology Demonstration and Participation in International Standards. The Government has launched a program titled 'Building an End-to-End 5G Test Bed' to advance innovation and research in 5G. The program envisages close collaboration between universities and small technology companies. The goal of the program is to make proof-of-concept 5G prototypes that are broadly compliant with the 3GPP standards [17]. On the standards front, the Low Mobility Large Cell (LMLC) use case accepted in the International Mobile Telecommunications-2020 (IMT-2020) requirements. Low Mobility Large Cell (LMLC) is a standard use to provide better coverage of internet in rural areas and other places of country. The base station in rural areas will cover up to 6 km range. According to 5G High Level Forum due to 5G roll out there will be an economic advantage of USD 1 trillion on India by 2035.

The National Digital Communication Policy-2018 (NDCP-2018), released on 26th September 2018 with the target of fulfil the information and communication needs of citizens and enterprises through the establishment of a ubiquitous, resilient, secure, accessible and affordable Digital Communications Infrastructure and Services; within the process, support India's transition to a digitally empowered economy and society. The three mission of NDCP are as following: -

1. Connect India- To push Broadband for All as a tool for socio-economic development, while ensuring service quality and environmental sustainability.
2. Propel India- To harness the facility of emerging digital technologies, including 5G, AI, IoT, Cloud and Big Data to enable provision of future ready products and services; and to catalyse the fourth industrial revolution (Industry 4.0) by promoting Investments, Innovation and IPR.
3. Secure India- To secure the interests of citizens and safeguard the digital sovereignty of India with paying attention on ensuring individual autonomy and selection, data ownership, privacy and security; while recognizing data as an important economic resource.

To support the digital economy and achieving objectives of National Digital Communication Policy there is a need of implementing 5G technology as early as possible. Department of Telecommunication (DoT) most probably in the beginning of 2022 will allow companies to conduct 5G trials and DoT wish to implement 5G technology in urban as well as rural areas. Dot will provide spectrum to companies like Reliance Jio, Bharti Airtel, Vodaphone idea and MTNL for a period of six months to conduct trials of 5G network across the country. Many cities like Delhi, Mumbai, Kolkata, Bangalore, Hyderabad and some part of Gujarat are companies first choice for conducting 5G trials. DoT also allowed Nokia, Samsung, Ericsson and C-DOT [22]. Companies got permission for the frequency 700 MHz, 3.3-3.6 GHz and 24.25-28.5 GHz to conduct trials. The base price for purchasing bandwidth per hertz is 492 crores (Source-media).

Effect of Radiation from 5G tower on Health

In India, there has always been a public concern on possible adverse health effects from the Electro-Magnetic Field (EMF) Radiation from mobile towers. Due to this people oppose the erection of telecom towers on rooftops of houses and in densely populated areas. For clearing the misunderstanding of public on mobile towers emissions, DoT in May 2017, launched Tarang Sanchar. It is a web portal for Information sharing on Mobile Towers and EMF Emission Compliances [12].

The ICNIRP issued some guidelines on Limiting Exposure to Electromagnetic Field are for the protection of humans exposed to radiofrequency electromagnetic fields (RF) within the range 100 kHz to 300 GHz. The rules cover many applications like 5G technologies, Wi-Fi, Bluetooth, mobile phones, and base stations. The rules periodically revised and updated as advances are made in the relevant scientific knowledge [23]. There is no any current evidence to confirm the existence of any health consequences from exposure to low level electromagnetic field [4]

EMF Radiation Norms in India

Department of Telecommunications have prescribed stricter precautionary norms for exposure limit for the Radio Frequency Field (Base Station Emissions) which is 1/10th of the present limits prescribed by ICNIRP and recommended by WHO [24]. The present limits/levels for antennae (Base Station) EMF emissions for general public exposure are detail below

Frequency Range	E-Field Strength (Volt/Meter (V/m))	H-Field Strength (Amp/Meter (A/m))	Power Density (Watt/Sq.Meter (W/Sq.m))
400MHz to 2000MHz	0.434f ½	0.0011f ½	f/2000
2 GHz to 300GHz	19.29	0.05	1

In addition to norms for mobile towers, government of India also released precautionary guidelines for mobile users [25].

1. Keep distance-hold the cell phones faraway from body to the extent possible.

2. Use a headset (wired or Bluetooth) to keep the handset off from your head.
3. Do not press the phone handset against your head. Radio frequency (RF) energy is inversely proportional to the square of the distance from the source.
4. Limit the length of mobile calls.
5. Use text as compared to voice wherever possible.
6. If the radio signal is weak, a mobile phone will increase its transmission power. Find a strong signal and avoid movement, use your phone where reception is good.
7. Let the call connect before putting the handset on your ear or start speaking and listening-A mobile phone first make the communication at higher power and then reduces power to an adequate level. More power is radiated during call connecting time.
8. If you have an option, use a landline (wired) phone. Not a mobile phone.
9. People having active medical implant should preferably keep the cell phone a minimum of 15 cm faraway from the implant.
10. While purchasing a mobile handset check the SAR value of the mobile phone.

Conclusion

As telecom sector is growing tremendously from last several years. Today, India is amongst top three of largest and one of the fastest growing telecom markets in the world. Also, India is very large country and installation of such 5G base stations or network will only be in certain small areas, not everywhere in country at least for some years. Hence, there is a need of large investment in telecom sector to achieve goal of digital India such smart cities, complete digital transaction etc. Adopting 5G technology will also benefit to our economy. According to various reports increase in 10% penetration of mobile broadband leads to more than 1% increase in GDP of country. Public safety is one of the important issues in our country and govt of India must convince to public and make sure that there are no any adverse health effects.

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An overview of study of basics of Artificial Intelligence (AI)

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Abstract

According to McKinsey, AI has the potential to create 600 billion dollars of value in retail bring 50 per cent more incremental value in banking compared with other analytics techniques. In transport and logistics, the potential revenue jump is 89% more. AI automates redundant jobs allowing a worker to focus on the high level, value-added tasks.

Introduction to AI

The new technology Artificial intelligence that can augment human intelligence, amplify human capabilities, and provide actionable insights that drive better outcomes for employees, customers, partners, and communities.[1]

Nowadays, AI is used in almost all industries, giving a technological edge to all companies integrating AI at scale. If an AI uses for its value purpose, it can automate mundane and repetitive tasks, allowing the sales representative to focus on relationship building, lead nurturing, etc. If a company XYZ provides a conversation intelligence service.[2] Each time a Sales Representative makes a phone call, the machine records, transcribes and analyzes the chat. The VP can use AI analytics and recommendation to formulate a winning strategy.
In a nutshell, AI provides cutting-edge technology to deal with complex data that a human being cannot handle. When AI is implemented at scale, it leads to cost reduction and revenue increase.

History of Artificial Intelligence

Artificial Intelligence is a buzzword today, although this term is not new. In 1956, avant-garde experts from different backgrounds decided to organize a summer research project on AI. Four bright minds led the project; John McCarthy (Dartmouth College), Marvin Minsky (Harvard University), Nathaniel Rochester (IBM), and Claude Shannon (Bell Telephone Laboratories).[3]
Here, is tabulated history of Artificial Intelligence:

Innovation	Year
Karel Čapek plays named "Rossum's Universal Robots, the first use of the word "robot" in English.	1923
Foundations for neural networks laid.	1943
Isaac Asimov, a Columbia University alumni, use the term Robotics.	1945
John McCarthy first used the term Artificial Intelligence. Demonstration of the first running AI program at Carnegie Mellon University.	1956
Danny Bobrow's dissertation at MIT showed how computers could understand natural language.	1964
Scientists at Stanford Research Institute Developed Shakey. A robot equipped with locomotion and problem-solving.	1969
The world's first computer-controlled autonomous vehicle, Stanford Cart, was built.	1979
Significant demonstrations in machine learning	1990
The Deep Blue Chess Program beat the then world chess champion, Garry Kasparov.	1997
Interactive robot pets have become commercially available. MIT displays Kismet, a robot with a face that expresses emotions.	2000
AI came into the Business world in the year 2006. Companies like Facebook, Netflix, Twitter started using AI.	2006
Google has launched an Android app feature called "Google now", which provides the user with a prediction.	2012
The "Project Debater" from IBM debated complex topics with two master debaters and performed exceptionally well.	2018

Subsystems of Artificial Intelligence

Here, are some important Subsystems of Artificial Intelligence:

Machine Learning: Machine learning is the art of studying algorithms that learn from examples and experiences. Machine learning is based on the idea that some patterns in the data were identified and used for future predictions. The difference from hardcoding rules is that the machine learns to find such rules.

Deep Learning: Deep learning is a sub-field of machine learning. Deep learning does not mean the machine learns more in-depth knowledge; it uses different layers to learn from the data. The depth of the model is represented by the number of layers in the model. For instance, the Google LeNet model for image recognition counts 22 layers.[4]

Natural Language Processing: A neural network is a group of connected I/O units where each connection has a weight associated with its computer programs. It helps you to build predictive models from large databases. This model builds upon the human nervous system. You can use this model to conduct image understanding, human learning, computer speech, etc.[5]

Expert Systems: An expert system is an interactive and reliable computer-based decision-making system that uses facts and heuristics to solve complex decision-making problems. It is also considered at the highest level of human intelligence. The main goal of an expert system is to solve the most complex issues in a specific domain.

Fuzzy Logic: Fuzzy Logic is defined as a many-valued logic form that may have truth values of variables in any real number between 0 and 1. It is the handle concept of partial truth. In real life, we may encounter a situation where we can't decide whether the statement is true or false.[6]

Types of Artificial Intelligence

There are three main types of artificial intelligence: rule-based, decision tree, and neural networks.

- Narrow AI is a type of AI that helps you perform a dedicated task with intelligence.
- General AI is a type of AI intelligence that can perform any intellectual task efficiently like a human.
- Rule-based AI is based on a set of pre-determined rules that are applied to an input data set. The system then produces a corresponding output.
- Decision tree AI is similar to rule-based AI in that it uses sets of pre-determined rules to make decisions. However, the decision tree also allows for branching and looping to consider different options.
- Super AI is a type of AI that allows computers to understand human language and respond in a natural way.
- Robot intelligence is a type of AI that allows robots to have complex cognitive abilities, including reasoning, planning, and learning.

How AI is different from Machine Learning?

The terms machine learning and artificial intelligence are often used interchangeably, but they don't mean the same thing. Most of our Smartphone, daily device or even the internet uses Artificial Intelligence. Very often, AI and machine learning are used interchangeably by big companies that want to announce their latest innovation. However, Machine learning and AI are different in some ways.[7]

AI- artificial intelligence- is the science of training machines to perform human tasks. The term was invented in the 1950s when scientists began exploring how computers could solve problems on their own.

Artificial Intelligence is a computer that is given human-like properties. Take our brain; it works effortlessly and seamlessly to calculate the world around us. Artificial Intelligence is the concept that a computer can do the same. It can be said that AI is a large science that mimics human aptitudes.

Machine learning is a distinct subset of AI that trains a machine to learn. Machine learning models look for patterns in data and try to conclude. In a nutshell, the machine does not need to be explicitly programmed by people. The programmers give some examples, and the computer is going to learn what to do from those samples.[8]

Machine Learning (ML)

When we talk about machine learning, we're referring to a specific technique that allows a computer to "learn" from examples without having been explicitly programmed with step-by-step instructions. Currently, machine learning algorithms are geared toward answering a single type of question well. For that reason, machine

learning algorithms are at the forefront of efforts to diagnose diseases, predict stock market trends, and recommend music.

Artificial Intelligence (AI)

Artificial intelligence is an umbrella term that refers to efforts to teach computers to perform complex tasks and behave in ways that give the appearance of human agency. Often they do this work by taking cues from the environment they're embedded in. AI includes everything from robots who play chess to chatbots that can respond to customer support questions to self-driving cars that can intelligently navigate real-world traffic.

AI can be composed of algorithms. An **algorithm** is a process or set of rules that a computer can execute. AI algorithms can learn from **data**. They can recognize patterns from the data provided to generate rules or guidelines to follow. Examples of data include historical inputs and outputs (for example, input: all email; output: which emails are spam) or mappings of A to B (for example, a word in English mapped to its equivalent in Spanish). When you have trained an algorithm with training data, you have a **model**. The data used to train a model is called a **training dataset**. The data used to test how well a model is performing is call **test dataset**. Both training datasets and test datasets consist of data with input and expected output.[9] You should evaluate a model with a different but equivalent set of data, the test dataset, to test if it is actually doing what you intended.

Bias Challenges in AI

So far, we've discussed the broad ethical implications of developing technology. Now, let's turn our attention to AI. AI poses unique challenges when it comes to bias and making fair decisions.

Opacity

We don't always know why a model is making a specific prediction. Frank Pasquale, author of *The Black Box Society*, describes this lack of transparency as the black box phenomenon. While companies that create AI can explain the processes behind their systems, it's harder for them to tell what's happening in real time and in what order, including where bias can be present in the model.[10]

Speed, Scale, and Access to Large Datasets

AI systems are trained to optimize for particular outcomes. AI picks up bias in the training data and uses it to model for future predictions. Because it's difficult if not impossible to know why a model makes the prediction that it does, it's hard to pinpoint how the model is biased. When models make predictions based on biased data, there can be major, damaging consequences.

Machine learning techniques have improved since 1979. But it's even more important now, as techniques become more opaque, that these tools are created inclusively and transparently. Otherwise, entrenched biases can unintentionally restrict access to educational and economic opportunities for certain people. AI is not magic; it learns based on the data you give it. If your dataset is biased, your models will amplify that bias.

Developers, designers, researchers, product managers, writers—everyone involved in the creation of AI systems—should make sure not to perpetuate harmful societal biases. (As we see in the next module, not every bias is necessarily harmful.) Teams need to work together from the beginning to build ethics into their AI products, and conduct research to understand the social context of their product. This can involve interviewing not only potential users of the system, but people whose lives are impacted by the decisions the system makes. We discuss what that looks like later in this module.

Why is AI booming now?

Now in this Artificial Intelligence testing tutorial, let's learn why AI is booming now. Let's understand by the below diagram.

A neural network has been out since the nineties with the seminal paper of Yann LeCun. However, it started to become famous around the year 2012. Explained by three critical factors for its popularity are:

1. Hardware
2. Data
3. Algorithm

Machine learning is an experimental field, meaning it needs data to test new ideas or approaches. With the boom of the internet, data became more easily accessible. Besides, giant companies like NVIDIA and AMD have developed high-performance graphics chips for the gaming market.

Hardware

In the last twenty years, the CPU's power has exploded, allowing the user to train a small deep-learning model on any laptop. However, you need a more powerful machine to process a deep-learning model for computer vision or deep learning. Thanks to the investment of NVIDIA and AMD, new generations of GPU (graphical processing unit) are available. These chips allow parallel computations, and the machine can separate the computations over several GPUs to speed up the calculations.[1-3]

For instance, with an NVIDIA TITAN X, it takes two days to train a model called ImageNet against weeks for a traditional CPU. Besides, big companies use clusters of GPU to train deep learning models with the NVIDIA Tesla K80 because it helps to reduce the data center cost and provide better performances.[4]

Data

Deep learning is the structure of the model, and the data is the fluid to make it alive. Data powers artificial intelligence. Without data, nothing can be done. The latest Technologies have pushed the boundaries of data storage, and it is easier than ever to store a high amount of data in a data center.

Internet revolution makes data collection and distribution available to feed machine learning algorithms. If you are familiar with Flicker, Instagram or any other app with images, you can guess their AI potential. There are millions of pictures with tags available on these websites. Those pictures can train a neural network model to recognize an object on the picture without the need to collect and label the data manually.

Artificial intelligence combined with data is the new gold. Data is a unique competitive advantage that no firm should neglect, and AI provides the best answers from your data. When all the firms can have the same technologies, the one with data will have a competitive advantage. To give an idea, the world creates about 2.2 exabytes, or 2.2 billion gigabytes, every day.[7]

A company needs exceptionally diverse data sources to find the patterns and learn in a substantial volume.

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An IoT Enabled Colorimetric Technique Based Soil Fertility Detection System

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Abstract:

Agriculture is a wide economic sector and plays a vital role within the overall economic development of the nation. Technological advancements in the sector of agriculture can ascertain to enhance the ability and quality of assured farming activities. Bad quality crop production is often because of either unnecessary use of fertilizer or insufficient addition of fertilizer. The intend of our developed system is to detect the N(nitrogen), P(phosphorus) and K(potassium) contents of soil and based on the result, farmers will used the necessary fertilizers as per need. For this we proposed IoT enabled colorimetric techniques based soil fertility detection system. Based on a color sensor (TCS 3200) as a soil fertility detection sensor, microcontroller (Arduino Nano V3) and Esp8266 Wi-Fi module for transferring data to cloud.

Keywords: Color Sensor, Soil Fertility, NPK nutrients, ESP8266, Internet of things, Arduino.

I. Introduction:

Agriculture is the only source for crop production. Soil is a valuable resource in agriculture. The physical and chemical conditions of soil play a most important role in the crop production cycle. In addition to this farmers can also add organic or inorganic nutrients to the soil in a precise proportion. Thus soil fertility detection plays a major role for better crop growth as well as yield [1]. Continuous cropping without enough measurement of soil nutrients may lead decrease in soil fertility and yield. Soil nutrient identification is greatly required for proper plant growth and effective fertilization [2], [3]. Farmer's follows traditional techniques still today which commonly make used of approximations i.e. unbalance feeding of fertilizer without knowing the actual necessity of nutrient to a specific crop, results in low productivity [4]. In order to improve the farm meadow, the fertility of soil is an important factor in increasing the crop production. The soil fertility is, amount of nutrients content available in the soil. There are 17 nutrients available in the soil classified into two classes namely macronutrients and micronutrients. Nitrogen (N), Phosphorous (P), Potassium (K) are some of the main macronutrients, which usually required in large quantity in the soil and zinc, copper, iron, boron are some examples of micronutrients which required in comparatively small amounts. The quantity of macronutrients defines the soil fertility [5]. Depending upon the deficiency of a particular nutrient for a particular crop in a given region the amount of fertilizer is determined. Thus the quantity of fertilizer to be used depends upon the soil fertility, crop to be grown and type of soil [6].

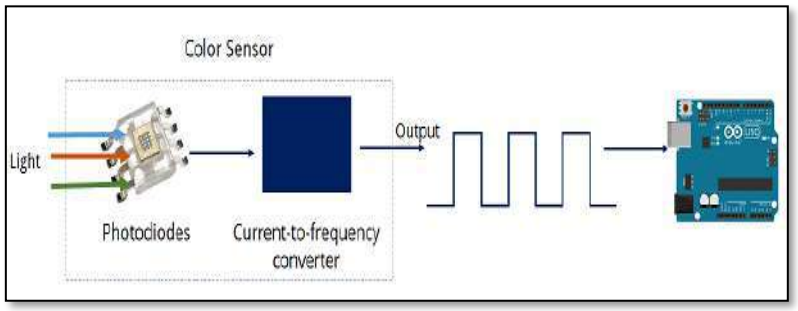
The general soil testing is take place in laboratories which are maximum available at district level also it take a considerable time to generates the results. Hence this process is time consuming and costly too [7]. Moreover the overall soil fertility changes with change in weather conditions. Thus a system required which will detect the soil nutrients in real time.

This system is based on colorimetric technique. In this, color sensor is used as a soil nutrient sensor, an aqueous solution of soil under test has been added different reagents which will eventually change its color depending on the concentration of the present micro nutrients values. Light emitted from a color detecting sensor will fall on the solution and the reflected light is received by color detecting sensor will convert the (R, G, B) values to electrical signals. Further using the threshold values which were earlier saved in the database of the microcontroller helps to detect the levels of micronutrients present in the soil sample.

II. Methodology

As we discuss the above said issue to resolve we design, Colorimetric Technique Based Soil Fertility Detection System. In this system, the color sensor works by illuminating white light on soil aqueous solution sample and measure the intensity of reflected light with the help of 8x8 photo-diode chip available in TCS3200

sensor. The microcontroller helps to uphold the intensity of light which is falling on soil sample, also helps to store the resultant values to cloud with the help of ESP8266 Wi-Fi module.



System Block Diagram

To detect the presence of nutrients in the soil by using colorimetric technique. First we make the aqueous solutions with the help of different chemicals regents. Then using color sensor we detects the nutrients present in the soil.

A. **SYSTEM REQUIREMENT**

Arduino Nano V3:

Arduino NANO V3 is the open source tiniest Embedded Development board launched by Arduino based on Atmega328 SMD Package Microcontroller. Also, is a Surface stand Breadboard Friendly board integrated with Mini USB Port.

Specifications:-

- Operating Voltage: 5 V
- Digital I/O Pins: 14, Analog Input Pins: 08
- DC Current per I/O Pin: 40 mA
- Flash Memory: 32 KB

Color Sensor TCS3200:

The TCS3200, Color Sensor programmable color light-to-frequency converters that comes with silicon photodiodes and a current-to-frequency converter on a single CMOS IC. The output is a square wave and frequency directly proportional to light intensity. [8]

The colors of the visible light spectrum

Color	Wavelength interval	Frequency interval
Red	~ 700–635 nm	~ 430–480 THz
Orange	~ 635–590 nm	~ 480–510 THz
Yellow	~ 590–560 nm	~ 510–540 THz
Green	~ 560–520 nm	~ 540–580 THz
Cyan	~ 520–490 nm	~ 580–610 THz
Blue	~ 490–450 nm	~ 610–670 THz
Violet or Purple	~ 450–400 nm	~ 670–750 THz

Table 1. Pin values for activation of Photodiode filters. [8]

S2	S3	PHOTODIODE TYPE
L	L	Red
L	H	Blue
H	L	Clear (No Filter)
H	H	Green

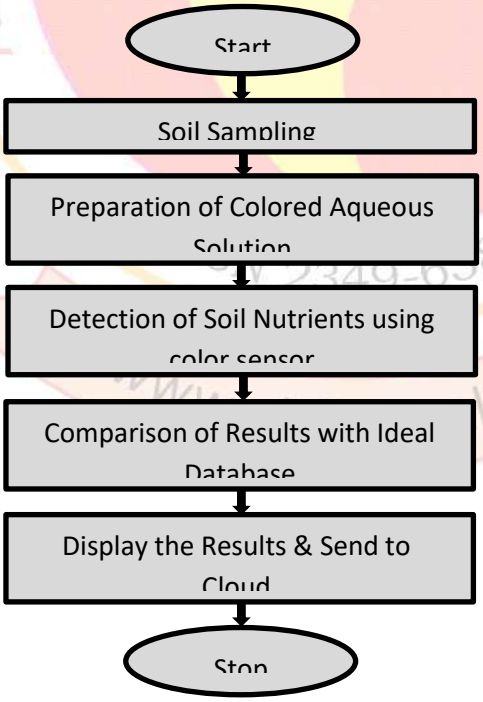
ESP8266 Wi-Fi Module:

The ESP8266 is a low-cost Wi-Fi module, have built-in TCP/IP networking software, and microcontroller capability. Each ESP8266 module comes pre-programmed with an AT command can be change its baud rate by calibrating it with the help of AT commands.

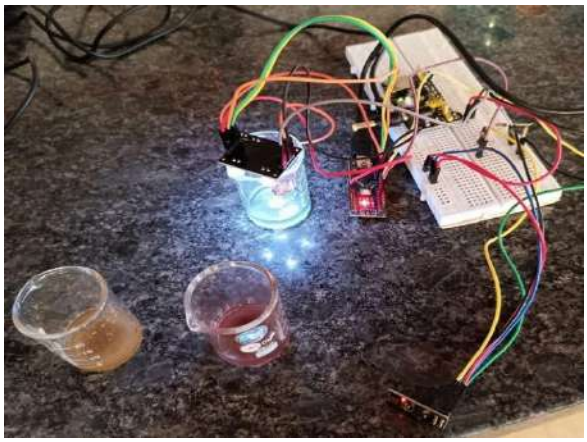
B.**Making Of Aqueous Solutions**

The aqueous solution is made with the help of soil testing kit with standard procedure.

C. WORKING FLOW CHART:



D.CIRCUIT DESIGN

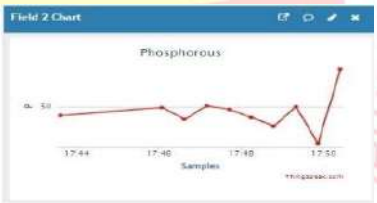


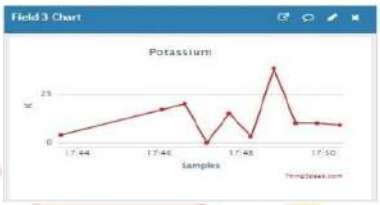
III.Results & Discussion

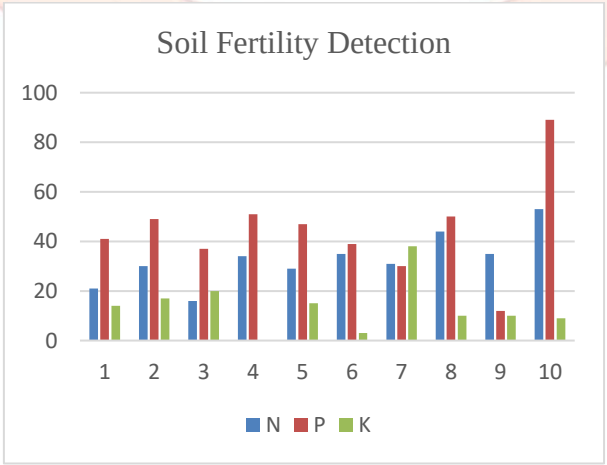
Table 2. Threshold color intensity values. [6]

Nutri.	Low	Medium	High
N	$x < 15$	$15 < x \leq 20$	$20 < x \leq 25$
P	$16 < x \leq 20$	$20 < x \leq 35$	$35 < x \leq 50$
K	$20 < x \leq 25$	$25 < x \leq 40$	$50 < x \leq 60$

By taking all adaptive measures we have used 2cm fixed distance between sensor & solution and we get sample results as below.







The above bar graph shows the different samples we have tested from different areas & found NPK values are changes from one area to another area.

Also the threshold color intensity values for N, P, K contents in the soil are described in Table 2. Which provides the scope of color intensity values in form of low, medium and high for N, P, K.

IV.Conclusions

This research concludes that, we have successfully developed a real time IoT enabled soil fertility detection system. This research will definitely reduce the farmer's time as well as money for soil fertility testing. Also help them to decide amount of fertilizers to be added in the soil according to the real time availability of the nutrients like N, P and K in the soil.

V.Future Scope

By extending this research can be possible to predict suitable crops according the nutrients are available in the soil. Also an atmospheric parameters effect can be observed on soil fertility. Therefore, the farmers can take necessity action towards their crop yield.

VI.Acknowledgement

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A Comparative Analysis on Energy Conservation in Wireless Sensor Networks Using NLP, Naive Bayes, and SVM Classifications

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Abstract:

A fundamental goal in the design of wireless sensor networks (WSNs) is to optimize their lifetime. Designers can use intelligent energy management models to help them reach this goal. These models strive to minimize the number of sensors used to report atmospheric measurements and, as a result, achieve improved energy economy while retaining the appropriate level of measurement precision. We compare three intelligent models based on Naive Bayes, Multilayer Perceptrons (MLP), and Support Vector Machine (SVM) classifiers in this research. For the identical WSNs Lifetime Extension Factor, simulation results prove that Linear-SVM selects sensors that yield higher energy efficiency than MLP and Naive Bayes.

A wireless sensor network (WSN) is a network of sensor nodes that are linked together. These sensors are low-cost, tiny devices with limited functionality. In a typical setting, every node in a sensor network must continuously monitor and gather information such as temperature, sound, and humidity, as well as physical conditions like pressure, vibration, motion, and light. Sensors may collaborate based on the circumstances to meet the sensor network's purpose of performing specific jobs. Furthermore, the information gathered is extremely significant. Because of the vast number of sensors placed, they are interconnected depending upon the nature of the analyzed measures. This paper analyses three smart models based on Naive Bayes, Multilayer Perceptrons (MLP), and Support Vector Machine (SVM)

1. Introduction

Well-known algorithms in the area of machine learning, neural networks, and artificial intelligence include Naive Bayes, Multilayer Perceptron (MLP), and Support Vector Machine (SVM). For starts, MLP can successfully conduct the classification operation [7, 8]. MLP neural network training, on the other hand, is difficult due to its structure's intricacy [7]. In the realm of data mining, SVM is also viewed as a very powerful algorithm.

It's been used successfully in a number of scientific applications [9]networks, for example. artificial intelligence, etc. MLP can, for starters, do the following tasks. A successful classifying operation [7, 8]. On the other hand MLP neural network training, on the other hand, is difficult due to the the structure's complexity [7]. In the area of data mining, SVM is also viewed as a very powerful algorithm.It's been used in a variety of scientific applications [9]networks, for example. artificial intelligence, etc. For beginnings, MLP can meet all the requirements of the classification operation [7, 8]. MLP neural network training, on the other hand, is difficult due to its structure's complexity [7]. In the realm of data mining, SVM is also regarded as a very powerful algorithm. It's been used successfully in a variety of research application.

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Despite the significance of machine learning algorithms for WSN applications [5], there has been little consideration paid to offering comparative studies between different algorithms, particularly when it comes to WSN energy management. Additionally, there have been little contributions to identifying an effective intelligent energy management paradigm for these networks. Except for the one we disclosed in our prior study [11], there is no previous work that supports the usage of a certain intelligent algorithm compared to others for WSNs [10]. We present an intelligent and efficient energy management model for WSNs leveraging MLP rather than Naive Bayes in that paper. MLP and Naive Bayes were compared in order to see how well they performed in terms of performance.

In comparison to Naive Bayes, MLP demonstrates a considerable improvement in selection accuracy when given the same Lifetime Extension Factor. Due to its complexity and the updating process in the sequence of weights, MLP takes longer to train the network. As a result, sensor nodes may use a little more energy during the deployment phase.

Considering the significance of machine learning techniques for WSN applications [5], comparison investigations between these methods have received little attention. Especially as it pertains to WSN energy management. .Furthermore, there have been little contributions to specify a model for intelligent energy management that is appropriate for these interconnections There hasn't been anything like this before, as far as we know.

work that serves to reinforce the application of a particular clever algorithm except for the one we have, comparable to others for WSNs [10]. A paradigm for effective and efficient energy management Instead of Naive Bayes, WSNs use MLP. A comparison is possible to correlate MLP and Naive Bayes, a study was conducted.MLP achieves a higher Lifetime Extension Factor when given the same Lifetime Extension

Bayesian naivety. MLP, on the other hand, takes longer to train.Due to its complexity and the updating procedure in the network a set of weights As a result, sensor nodes may use energy.

First, relying on intelligent machine learning models and algorithms, we have provided a detailed state-of-the-art associated energy management in WSNs. Second, we used three real labeled evaluation metrics to conduct a thorough comparison of three clever neural network classifiers. Third, using a confusion matrix, the effectiveness of these three intelligent classifiers is evaluated. Finally, an intelligent paradigm for enhancing the energy in WSNs has been proposed. We used statistical ranking and selection strategies to address this model not only at the classification level, but also at the processing level. These two strategies, as well as the use of Linear-SVM as an intelligent classifier, are crucial in the development of the model.

The largest Contributions of this work is arranged as follows. Preliminaries are presented in Section 2: which examines the latest advances in the field of intelligent models for energy management in WSNs. The context of the classification methods employed in this study, particularly Naive Bayes, MLP, and SVM, is presented in Section 3.

2. Related Work

In order to achieve energy efficiency of WSNs, several sophisticated models have been developed. Thiemjarus et al. [17] suggested a sensor selection algorithm that can aid in discovering the network's optimum number of sensor nodes. The number of sensors can be reduced without degrading the decision-making process, and the network's lifetime can be enhanced. For sensor selection, the Bayesian strategy was chosen, as this filtering method aids in the detection of the best sensors in the network. A classifier was also employed, which was the Self-Organising Map (SOM). The authors of [18] developed a selection technique for optimizing WSN energy use. Sensors were ranked from most to least important in their scheme, considering the importance of their utilization in WSNs. Thereafter, the Naive Bayes classification approach was utilized to classify the data. This method was put to the test on three well-known real-world sensor datasets. The analysis indicated that as more sensors are employed, more energy is spent, and the sensor network's lifetime is shortened. The lifetime of the sensor network can be prolonged if the sensors are ranked, as the selection algorithm is used first, pursued mostly by intelligent classifier. This is due to the fact that the number of sensors used is limited. Similarly, [19] suggested a method to reduce energy use while extending the sensor network's lifetime. This would be focused on a feature/sensor selection that reduces the number of utilised sensors to the minimum level. It does, however, use a different selection technique by using K-Nearest Neighbor (KNN) method.

The segmentation problem is considered as a classification problem in [20], with clusters being constructed using Least Squares.SVM (LS-SVM) using a hybrid kernel (a blend of SVM and LS-SVM)Kernels with polynomial and Radial Basis Function (RBF) functions. Results demonstrated that combining LS-SVM with hybrid clustering was effective.

When compared to LS-SVM with a single input, kernel produced better results.Kernel was visible in the situation of a multiclass system. In the clustering problem, there is a classification challenge.

CDLSVM, a clustering-based distributed Linear-SVM methodology that varies from previous parallel SVM algorithms in its ability to obtain a global optimal classifier, was developed. The results suggest that the proposed method is effective for large-scale WSNs since it minimizes data interchange and energy usage.

Forero et al. [22] addressed distributed classification by creating techniques for training SVM in a distributed architectural environment where communication between nodes via a centralised processing unit is banned. The distributed forms of operation demonstrated how energy might be preserved.

The DFP-SVM (Distributed Fix Partition SVM) and the WDFP-SVM (Weighted Distributed Fix Part SVM) are two energy-efficient distributed learning techniques for WSN.SVM [23, 24] has been proposed. The aim was to develop an expert in the field.

SVM in a distributed and efficient manner. As a result, it is better. On the test data, classification results were reached with Compared to the standard SVM, it uses the least amount of energy. Several classification techniques based on SVM have recently been proposed. For example, Rajasegarar et al. [25] proposed a Centered Hyperellipsoidal Support Vector Machine (CE-SVM) and a distributed Quarter-Sphere Support Vector Machine to address the problem of anomaly identification in WSNs (QS-SVM). Using four datasets that correlated to wireless sensor datasets, a comparison study using CESVM and QS-SVM was performed. For the evaluation, four datasets were used: GDI, Ionosphere, Banana, and Synth.

In addition, three distinct kernel functions were considered: RBF, polynomial, and linear. When compared to QSSVM, the results showed that CESVM used to have a higher detection accuracy. Zhang et al. [26] introduced two online outlier identification and distribution strategies for WSNs, the key contribution of which is to build livestream intelligent classifying techniques in order to find outliers in the typical behaviour of sensor data in real time. The hyperellipsoid one-class SVM is used in the proposed intelligent approaches. EOOD (ellipsoidal SVM-based online outlier detection) and EOOD (ellipsoidal SVM-based adaptive outlier detection) are the two approaches (EAOD). In order to detect abnormalities in a WSN, both EOOD and EAOD evaluate the correlation between sensor data features. The simulation results suggest that EAOD has a higher detection accuracy than other methods.

Dutta and Terhorst [27] proposed a multisensor fusion and integration strategy based on artificial intelligence. To solve the challenge, the researchers focused on the categorization level of the embedded sensor fusion system.

Most frequent sensor flaws and problems Intelligent people in particular.For aggregate soil moisture estimation, classification approaches are used.To get optimal outcomes, cosmic ray sensors were introduced.Estimations that are fault-tolerant Four classifiers were used in this study.Adaptive Neuro-Fuzzy Inference System was examined. (ANFIS), Probabilistic Neural Network (PNN), Radial Basis Network (RBN), Radial Basis Network (RBN), Radial Basis Network (RBN), Radial Basis The RBF network and the Multilayer Perceptron constitute two types of networks (MLP) network

Experiments were conducted on three datasets, and the results demonstrated that ANFIS exceeds all other classifiers in terms of correct classification percentages. To detect intervals of food intake, Sazonov and Fontana [14] designed a sensor system, as well as signal processing and pattern recognition approaches. The analysis and classification of jaw movements was used in this investigation.

The researchers have chosen the most relevant aspects, which represented sensor signals, using the forward selection method.

The SVM was also employed as the chewing detecting classification technique. Furthermore, the linear kernel activation function was applied (Linear-SVM). The experts were able to attain a high mean accuracy of 80.98 percent for that application by implementing an intelligent classifier.

Furthermore, the linear kernel is the easiest of all the kernel functions for SVM, according to Karatzoglou et al. [28]. Linear-SVM also outperforms other machine learning classifiers, according to Ham et al. [29]. This classifier is now receiving greater attention because to its superior classification accuracy when compared to other machine learning classifiers. As a result, this efficient classifier has been used in a number of applications. A moving human motion detection system was proposed by Yun and Song [30].

Pyroelectric Infrared (PIR) sensors and intelligence classification techniques were used to build the system. The data for this investigation was acquired by recording PIR sensor signals while a person was walking. The dataset's size and memory cost were lowered by extracting and choosing identifiable features from it. In addition, Bayes Net, C4.5, decision table, KNN algorithm, Naive Bayes, MLP, and SVM were employed as intelligent classification methods.

The Linear-SVM was considered for SVM because its kernel needed less computing time than other kernels. Experiments on decreased feature sets indicated that Linear-SVM is the most efficient classifier for this application.

3. Preliminaries

This section gives a quick overview of the classification methods employed in this investigation, as well as the datasets used in the experiment.

3.1 Algorithms for Classification. Below is a brief description of the categorization algorithms employed in this study..

3.1.1 Naive Bayes Classifier. Naive Bayes is a well-known type of classifier that is based on the application of Bayes' theorem with strong independence assumptions. It is considered to be a simple probabilistic classifier that computes conditional class probabilities and then predicts the most probable class [31]. In other words, it will assign a class for an object based on the values of the descriptive attribute probability model.

3.1.2 Multilayer Perception is a type of perceptron that has multiple layers (MLP). MLP is composed of a large number of highly densely interconnected that work together to solve a specific problem. With a feed-forward information flow, it is organised in layers. Signals flow progressively through the several layers from the input to the output layer in the main topology of an MLP network.

3.1.3 Intermediate layers exist between the input and output levels. Because they are not noticeable at the input or output, they are also known as hidden layers. Each unit is used to determine the difference between a weights vector and the vector given by the previous layer's outputs. A transfer function, also known as activation, is applied to the result to produce the input for the following layer.

The following are the main steps in an MLP network's training phase: First, given a dataset's input pattern X, this pattern is forward to all the MLP's output.

second, the network is examined and the desired output is compared; third, the network is evaluated and the desired output is compared.the signal of mismatch between the network's output and the The network is notified of the desired response; and Finally, modifications to synaptic weights are performed [34].

This technique is continued for each subsequent input vector until all of the input vectors have been processed.The network is used to pass on training patterns.Support Vector Machine (SVM) 3.1.3 (SVM). The dataset is segmented into two classes by SVM, which is separated by a linear border between the normal and attack classes that maximises the margin. SVM seeks out the hyperplane with the greatest distance between it and the closest positive and negative samples [35, 36]. The basic construction of an SVM network is similar to that of a regular RBF network, except that the kernel activating function is used instead of the exponential activating function (which is commonly Gaussian). A polynomial kernel, Gaussian radial basis kernel, or two - layered feed-forward neural network kernel can all be used to activate the kernel.

3.2 The three datasets used in this study are briefly described in this section.

3.2.1. Ionosphere.The ionosphere dataset was gathered using radar in Goose Bay, Labrador. Radar signals are divided into two categories: good and bad. The data that reveal indications of some form of construction in the ionosphere are good data. Those returns that do not let transmission signals to penetrate over the ionosphere are considered bad [18]. There are 34 readings and 351 records in this collection.

3.2.2. Forest CoverType is a type of forest cover. At the University of Colorado, the Forest CoverType dataset was created. It's made to estimate the type of forest cover in unknown areas. It's been used in a series of data stream classification studies. There are 581, 012 occurrences and 54 attributes in this dataset [18, 37]. It is regarded as one of the most extensive datasets. Because of restricted memory capacity, the number of features in our sample was reduced to 25000.

Sensor Discrimination (section 3.2.3). This set of data contains 12 numerical values for samples of an unknown chemical.

There are three classifications in this labelled dataset: group A, group B, and false alarm [38]. The receiver node is used to establish which class an unknown sample belongs to after receiving 12 numerical values.

To put it another way, the receiver should say whether this unknown sample belongs in group A or group B. Whenever the sample does not fall into either of the first two groups, it is termed false alarm. There are 12 readings and 2211 records in this collection.

4.Proposed Methodology:

The classification algorithm is used to develop an intelligent neural network architecture for efficient energy management in WSNs in this paper. The selection sensor algorithm used in [18] is utilized in our work. The Ionosphere, Forest CoverType, and Sensor Discrimination datasets were utilised to assess the performance of the three intelligent algorithms in terms of classification accuracy in this work. Furthermore, for all completed experiments, 30% of the dataset is used for training data, with the remaining 70% used for testing. By establishing the shared and common parameters, we can give a fair comparison between the three classifiers, namely Naive Bayes, MLP, and Linear-SVM..

The Lifetime Extension Component is calculated as follows:

LEC=Total Sensor node/Number of sensor consumed

Two key actions were taken in [11] in order to reduce energy usage and increase the lifespan factor. The following are the two steps:

(1) The most prominent sensor nodes in WSNs were chosen after ranking them from most to least important in terms of utilisation, and

(2) Naive Bayes and MLP classification methods were used to classify them. It is important to note that in our research, we introduce an intelligent model for efficient energy management in WSNs utilising a classification approach based on SVM with linear kernel, which would be a polynomial kernel with exponent 1.

The following are the four parts of our proposed method:

(1) Preprocessing
(2) Processing:
  (a) Ranking:
  (i) Determine the feature/relevance sensor's level.
  (ii) Sort the items in ascending order.
(3) Machine Learning
(4) Evaluation of performance

Sensor Discrimination, ionosphere, and Forest CoverType The input dataset must be cleaned and formatted before moving on to the preprocessing stage. In the processing block, On the chosen dataset, two functions are applied. The The first is the Rank function, which ranks the features/sensors in order of importance. The significance level computation process as well as the sorting process are two consecutive procedures included in this function. The independent significance features test is a built-in procedure in MATLAB [39] that is used to calculate the significance level of a feature/sensor. This approach is known as the independent significance features test, according to Weiss and Indurkhya [40]. (IndFeat).

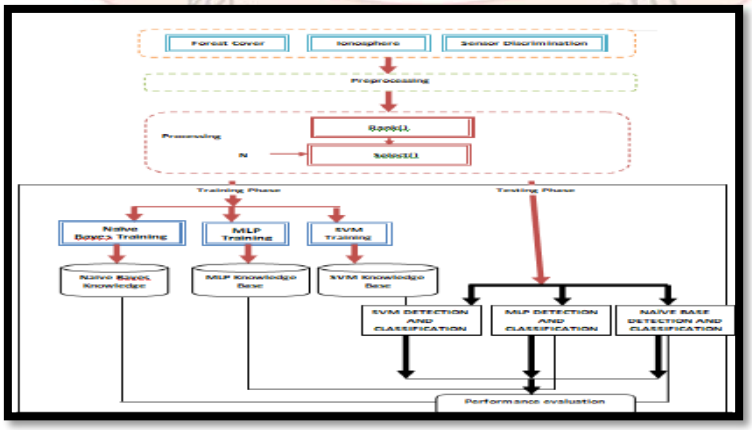

Figure: Structure of Proposed System

This method is commonly used in artificial intelligence engineering applications to quickly detect and remove poor features. To put it another way, the number of inputs that must be considered during the selection procedure will be drastically reduced. As a result, it can be utilised as a preliminary step in the selection process. Furthermore, it cuts down on the amount of time it takes to complete the final selection procedure. The sorting process, on the other hand, sorts the output of the level of significance calculation operations in descending order.

The Rank function returns an array of features/sensors that are organized from most significant to least significant. The Rank function's job is to figure out how significant each feature/sensor is. Then it sorts them in descending order, with the most key features or sensors at the top and the least important at the bottom.

On the Sensor Discrimination dataset, Figure 2 illustrates an example of the output while calculating the significant level procedure and sorting process. The diagram shows how the Ranking function's processes will be carried out in a sequential order. The Select function is then used to choose the first N features/sensors. If N = 10, for example, this method will return the numbers of the first 10 features/sensors.
Similarly, if N = 20, the first 20 features/sensors' numbers are returned, and so on.

The machine learning block is the fourth block, which applies the specified classifier (Naive Bayes, MLP, or Linear-SVM) to the N features/sensors.

Two steps are done in this block: the first is the training or learning phase, which allows the intelligent system to construct the appropriate knowledge base. The intelligent system picks up on existing relationships/correlations in the built environment.

Table 1: Experimental parameters Simply

Factor	Value
%Testing	65%
%Training	35%
Learning rate for MLP	0.35
Number of epochs for MLP	600
Number of hidden layers for MLP	1
Number of hidden neurons for MLP	(# selected sensors + # classes)/2
Kernel for SVM	Linear kernel (polynomial kernel with exponent being 1)

expressed, the training phase is a process of the intelligent system evolving to provide the optimum possible response in the testing phase. The testing phase involves putting the proposed system to the test with test datasets. This phase's output data demonstrate the system's performance and efficacy in terms of classification and computational speed.

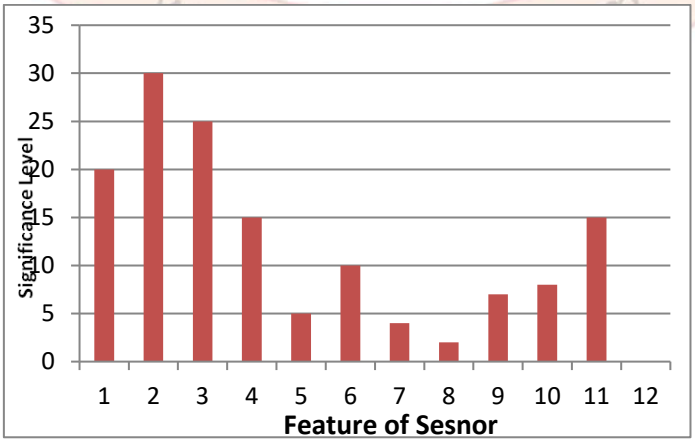

Figure:1 The result of the significance process calculation

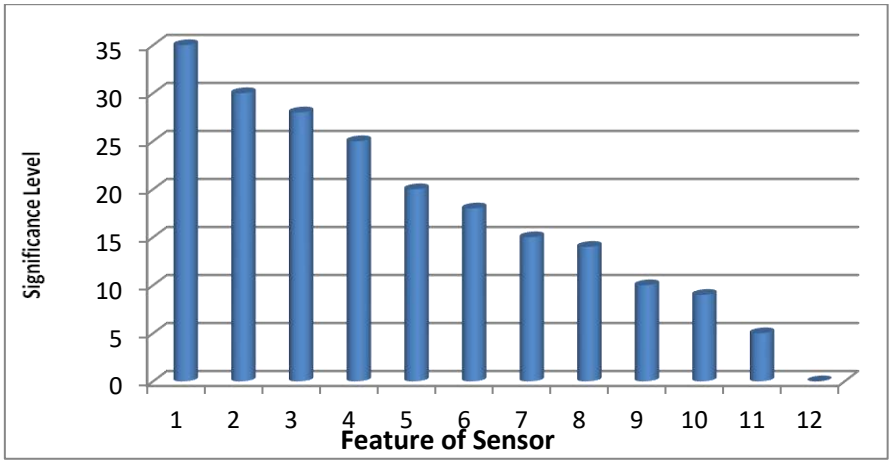

Figure:2 The result of a descending order sorting method

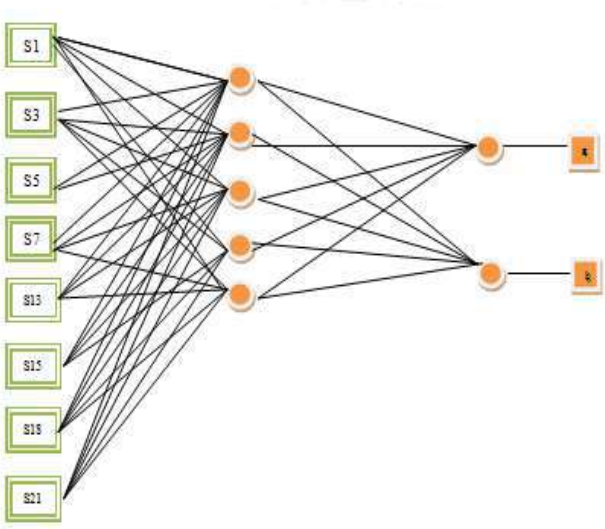

Figure 3: Experiment 1, NN structure for the selection of 10

5. Hands-on Experience:

The Ionosphere dataset, which is a radar dataset collected from 34 widely different sensor nodes, was used in this experiment. The selection algorithm presented in [18] was applied in MATLAB. This algorithm (shown in Figure 3) prioritized the sensors according to the importance of their data.

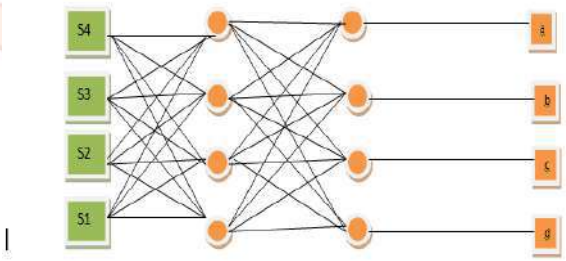

Figure 4: Experiment 3, NN structure for the selection of 4

The Forest CoverType dataset, which was created at the University of Colorado, was used in this experiment. The Forest CoverType of unknown regions, which has 581,012 records and 54 incoming values, can be predicted by studying the received data from the sensors.

6. Results Discussion

The confusion matrix [30, 42] is used to assess the performance of the three intelligent classification algorithms.

False positive (FP), true positive (TP), false negative (FN), and true negative (TN) are the four possible outcomes [42, 43], where (1) FP occurs when the actual class of test sample is negative and is classified incorrectly as positive; (2) TN occurs when the actual class of test sample is negative and is classified correctly as negative; (3) FN occurs when the actual class of test sample is positive and is classified incorrectly as negative; and (4) TP occurs when the actual class of test sample is positive

7. Conclusions

An intelligent model for efficient energy management in WSNs is presented in this paper. It examines the differences between Naive Bayes, MLP, and Linear-SVM. The goal is to figure out which intelligent categorization model is best for efficient energy management in WSNs. Different tests were run on three benchmarking datasets in order to evaluate the performance of the three classifiers.

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Hip Implant by Cluster Analysis of Anthropometry Parameters of Femur

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Abstract:

Background and Objective: A range of research told that there is extensive variations in the sizes and shapes of femur bone across different ethnic groups and geographical locations, thus particular bone-implant fit is challenging to achieve. Prosthesis of mismatched sized can caused serious problems for patients. Thus aim of the study was to design standard hip implant based on anatomical parameter of respective population. Materials and Methods: Eleven osteological parameter of femoral prosthesis of 125 patient (67 male and 59 female) were evaluated, these eleven parameter were grouped to obtain scatter diagram. Then cluster analysis in SPSS software V25 was carried out by using slink clustering method. Results: After studying scatter diagram it was found that 15% population had irregular anatomy then rest of population. So, remaining data put under cluster analysis gives 8 (4 for men and 4 for women) sets of standard anatomical parameter for designing hip implant. Conclusion: These eight standard hip implant satisfy 85% population of Vidarbha region.

Index Terms *- Hip implant, standard anatomical parameter, femoral prosthesis, mismatched sized, cluster analysis, Slink method, osteological parameter.*

I. Introduction

Importance of hip geometry has been well defined in previous studies1-5. Due to wide variation in anatomy of femoral prosthesis, it is difficult to achieve precise bone implant fit. Asians have a smaller distal femur size than that of the western population6,7. But maximum artificial femoral prosthesis are standardize and manufacture in European and North American region8 and currently available western orthopaedic implants do not match the dimensions of the proximal femoral of Indian population. The usage of these over-sized and unsuitable implant affect outcome of the surgery reported with problems such as stress shielding, micro-motion and loosening9-12. This standard hip implant were not useful for population of Vidarbha region because they were not based on anthropometry of respective population13.

The variations in dimensions may need to be considered when designing the appropriate implant14. To eliminate mismatch between femur and implant and to attain suitable fitment, it was necessary to design a few standard implant based on shape and size of proximal femur of respective population. So, objective of the study was to design standard hip implant based on anatomical parameter of Vidarbha region population.

II. Materials And Methods

Present study was carried out since 2014 in Vidarbha region central part of India. An eleven anatomical parameter of femur were identified from X-ray image of 125 patients, in the age group of 50-70 years. Out of total patients 67 were male and 58 were female. Each X-ray image of 125 patients was processed in DICOM Viewer 4.2.1 software. By means of linear and angular measure tool in software all anatomical parameter of femur were measured. The exact position of each anatomical parameter from where its value was measured shown in Fig. 1 and the measured value of each anatomical parameter designated by alphabets in Fig. 1 exposed in Fig. 2. Following were the anatomical measurements used for study:

C Femoral head diameter (FHD): Diameter of femoral head in frontal plane

C Femoral neck diameter (FND): Diameter of femoral neck in frontal plane

C Horizontal offset (HO): The horizontal distance between the centre of the femoral head and the shaft axis in frontal plane.

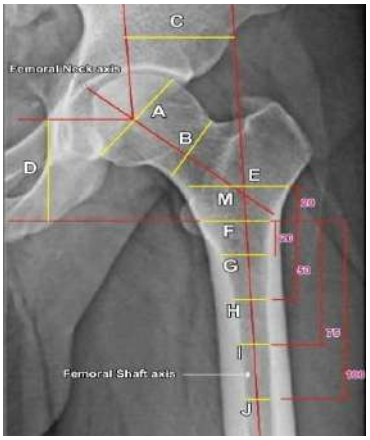

Fig. 1: Anatomical parameter on femur

Fig. 2: Measured value of anatomical parameter on femur

C Vertical offset (VO): The vertical distance between the center of the femoral head and the middle of lesser trochanter level

C Canal width (CW): The CW 20 mm above from lesser trochanter at E in frontal plane of femur

C Canal width (CW): The CW in frontal plane, passing through the middle of the lesser trochanter

C Canal width (CW): The CW 20 mm below from lesser trochanter at G in frontal plane of femur

C Canal width (CW): The CW 50 mm below from lesser trochanter at H in frontal plane of femur

C Canal width (CW): The CW 75 mm below from lesser trochanter at H in frontal plane of femur

C Canal width (CW): The CW 100 mm below from lesser trochanter at J in frontal plane of femur

C Neck-shaft angle (NSA): The angle between the shaft axis and the neck axis

III. Grouping of anatomical parameter: The measured value of anatomical parameter of femur were divided into three groups for prosthesis designing purpose (i) A, B, E, F and G were important for deciding Anterior-Posterior cross section of prosthesis (ii) H, I, J, used for determine distal length and (iii) C, D and M for orientation of neck of the prosthesis.

IV. Finding out dissimilar set of object: Aimed at finding dissimilar set of data a standard deviation of each parameter was calculated and on the basis of standard deviation scatter diagram of each parameter was plot. After examining scatter diagram it was found that some set point were not in range because anatomical parameters of some patients were irregular i.e., there anatomy not in range with rest of patients and they requisite customized hip implant. Such patients were omitted and remaining patient was used for cluster analysis.

V. Cluster analysis: Romesburg defined cluster analysis is mathematical method, can be used to find out which objects in a set are similar. Cluster analysis has an endless list of user because classification (which object in set are similar and dissimilar) are essential building blocks in field of research. Cluster analysis carried out using following six steps: (1) Obtain data matrix, (2) Standardize data matrix, (3) Calculate resemblance matrix, (4) Implement clustering method, (5) Reposition data and resemblance matrix and (6) Compute cophenetic correlation coefficient. In existing study IBM SPSS Statistic software (Version 25) was used to execute hierarchical clustering with slink clustering method for four cluster and standard deviation ranging from -1 to 1. A slink clustering method calculate closest members of two cluster. After completing cluster analysis in SPSS software input data was split on basis of fourth cluster.

Results

The database of the measured values of each anatomical parameters for first 10 patients out of 125 patients were presented in Table 1. To find out dissimilar data base total 22 scatter diagram was obtained, few of them given below in Fig. 3 as a sample. After analyzing scatter diagram it was found that 15% patients (In male category 12 patients out of 67 patients and 7 patients out of 59 patients from female) had abnormal anatomy. These patients were omitted and listed in Table 2.Remaining 85% database of patient was used for

cluster analysis. After completing cluster analysis in SPSS software forecast values of each parameter were summarized in Table 3. Total 8 (4 Male and 4 Female) sets of standard anatomical parameters provide standard sizes hip implant designs, which was found suitable for Vidarbha region population. In this study conventional X-ray technique has been used for understanding the femur bone geometry. The outcome of current study make available eight set of standard anatomical parameter for hip implant design which satisfy maximum population of Vidarbha region. Equally they achieve proper fitment because they were standardize on anthropometry of respective population and reduces chance of revision surgery. It also reduces operating time and achieve successful positioning in hip joint.

Discussion

Surgeon who perform hip replacement surgeries must depend on implant manufacture to provide proper implants

Parameters	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	H (mm)	I (mm)	J (mm)	M (deg)
1	51.1	34.3	47.0	66.4	52.4	32.1	19.6	13.2	11.5	11.5	**131.3**
2	51.6	39.5	51.8	61.8	51.1	31.1	20.4	14.3	13.4	12.9	**120.3**
3	43.7	27.7	46.6	59.0	47.7	30.7	19.8	15.7	15.1	12.0	**125.7**
4	44.7	31.9	43.5	70.3	41.3	27.8	18.8	15.0	14.4	10.5	**134.9**
	40.5	27.1	37.8	48.9	44.4	25.1	18.0	14.0	3.6	11.5	**124.2**
	49.6	29.6	47.6	59.6	51.2	29.6	19.2	14.3	13.6	12.3	**123.5**
	49.3	36.2	34.9	54.6	49.2	30.7	20.6	12.7	11.6	10.4	**141.8**
	51.2	34.1	37.8	53.2	50.5	32.4	22.1	15.7	14.4	13.3	**124.3**
	53.8	35.1	44.4	55.0	60.0	33.7	19.4	15.3	14.9	12.2	**124.0**
	45.4	**28.3**	**40.1**	**41.8**	**51.0**	**34.4**	**23.4**	**18.3**	**15.0**	**14.9**	**132.0**

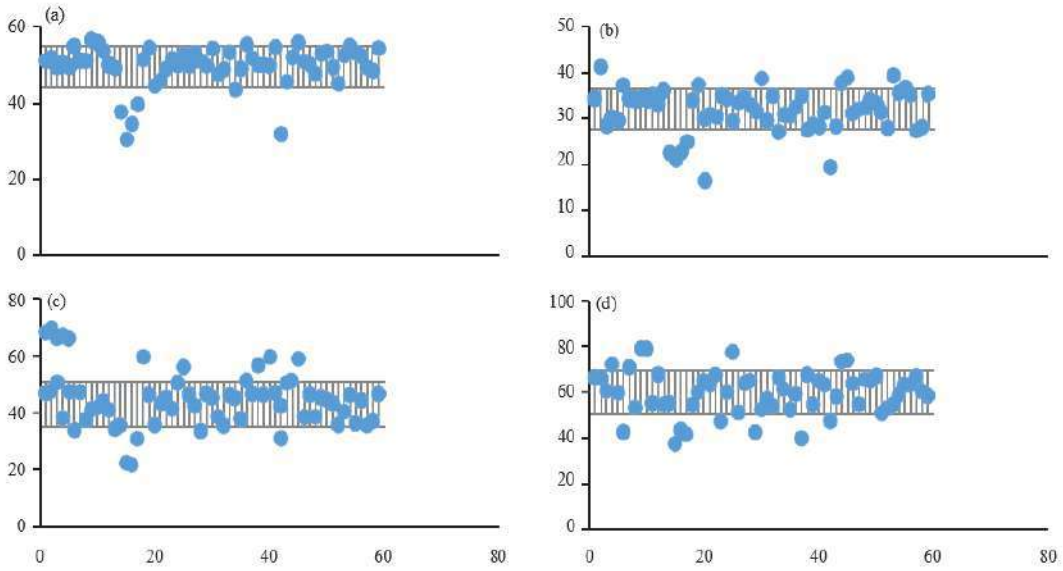

Fig. 3(a-d): Dissimiam of measured anatomical parameter as per, (a) Femoral head diameter, (b) Femoral neck diameter, (c) Horizontal offset and (d) Vertical offset.

Table 2: Irregular anatomical parameter of femur Patients having irregular anatomical parameters

	Male												Female						
AP	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
A (mm)		58	58	38	31	35	40	32	59					40	53	53			**34**
B (mm)	37			23	21	23	25	20	39					23	34	33	23	32	
C (mm)	34				23	22	31	31	59				46	30		33			**30**
D (mm)	43	79	79		38	44	41	47	74	40			37		66	64		43	**37**
E (mm)	37	56		36	35	38	40	36		57		57		34	37		54		
F (mm)	18	40	40	22	17		21	17			42	42		21			36	39	**22**
G (mm)	11	29	29		8	15	14	12		30	32	27		15			28	32	**15**
H (mm)	11	20	19	11	6	9	10	10		20	28	21		12			20	22	**10**
I (mm)		17		10	5	7	9	9		18	25	19		11			17	22	**9**
J (mm)				9	6	7	9	8		18	25			9.5				20	**7**
M (deg)	118					142			117				118			141			

Table 3: Anatomical parameter for designing standard implant

		Male				Female			
AP	N	1	2	3	4	1	2	3	**4**
A (mm)	106	55.7	49.5	47.1	53.4	51.0	45.7	43.1	**48.4**
B (mm)	106	36.5	34.0	31.8	35.2	29.1	27.7	26.0	**26.9**
C (mm)	106	50.2	43.6	40.6	47.6	43.9	41.5	39.6	**43.1**
D (mm)	106	70.3	61.2	56.7	65.8	59.9	57.2	52.7	**54.9**
E (mm)	106	51.0	47.4	43.4	54.4	58.3	54.1	44.6	**49.8**
F (mm)	106	32.3	30.3	27.8	34.8	38.1	35.3	29.0	**32.4**
G (mm)	106	22.3	21.2	19.4	23.4	26.5	24.3	20.2	**22.3**
H (mm)	106	16.2	15.1	13.8	16.9	19.8	18.9	15.1	**17.4**
I (mm)	106	14.3	13.3	12.2	15.2	17.2	16.4	13.1	**14.8**
J (mm)	106	12.3	11.5	10.5	13.2	14.8	12.1	11.4	**13.6**
M (deg)	**106**	**141.0**	**126.0**	**120.0**	**133.0**	**135.5**	**130.5**	**120.0**	**125.0**

Sized but there were limitation in design of implant. The proposed approach for standardize a hip implant was simplest and quite accurate. The proposed implant improve longer term outcome and clinical functionality for Vidarbha region population by reducing loosening rate and complication rate. There was inconsistency in measurement parameter. Thus it was challenging to attain specific bone implant fit. Statistical analysis showed no significant differences between left and right femora but significant differences were found between male and female subjects8,16. Also, the neck shaft angle varies17 from 125-132E. It was noted that Nigerians were taller than average Indians so their femoral heads were bigger than that of Indians18. The femoral neck diameter and neck shaft angle for Hong Kong Chinese population were small when compared with their western counterpart19. The undersized and overhanging hip implant could lead to replace soft tissue and patella20. Improper choice of implant could create serious problem for patient in long period21,22. There is a deficiency of literature relating to the effect of improperly sized implants on patient outcome.

However, forecast result are based on measured anthropometric data, it is some time subject to variation by the system utilized. This study will help medical practitioner in particular and common population in general.

Significance Statement

It was disclosed that the current finding (eight standard hip implant) can provide suitable fitment to the majority of the population. It is innovative step and more purposeful to prevent general complications like prosthetic loosening and dislocation. While a small percentage of population will always be requiring the customized prosthesis for exact fitment. The current outcome will also assist and enhance facts of hip region for the clinicians or thopaedicians and radiologists.

Conclusion

To validate the need of designing a hip implant based on particular location, an effort has been made for collection of data (Anatomical Parameter) of vidhrabha region population and scatter diagram is formed on basis of standard deviation. After examine a scatter diagram it found that 15% population had irregular shape of hip prosthesis. Cluster analysis was carried out on remaining dataset, which offered 8 set of standard anatomical parameter, on this basis 8 standard hip implant could design for population of the study region. These 8 set of standard hip implant serve 85% of population.

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Technical Review on Educational Data Mining

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Abstract-

Importance of education is to develop good society in terms of cultural, social and economic. Educational data mining (EDM) is a new area for knowledge discovering from large amount of educational data. Researchers from the glob are trying to search the outline and elements which give betterment of education. This paper shows the review of data present in the world and methodology used for collecting and clearing them before applying data mining techniques. It represents different techniques used by different research for educational data mining. It gives kind of result for selecting proper technique for proper data mining in educational data.

Keywords: Educational Data Mining, Dropout, Data Mining, Decision Trees

1. Introduction

Education has different meaning as per the situation. Education is very broad term for considering individual. Basically it is a character appearance of a single person known as education. The education reflected from the society of different persons who represent their culture. In education sector the schools, colleges and universities and so on represent education. The newly education system which will be implemented from 2022-2023 by the Indian government for focusing the aim regarding education system by 2040 with equitable access to the highest-quality education for all learners regardless of social or economic background [1]. The system divides the education parts such as Fundamental, Preparatory, Middle, Secondary and Higher education. Education gives the development of the persons or society. It gives good impact on the society and the nation. The development may be attitudes, modern values and economic growth of a person by education due to which equality and social justice is occurring.

Data is important for any sector. We are living around the data, now a days we are using World Wide Web (WWW), Whatsapp, Facebook etc. which having lot of important data around us. The person tries to find out the meaningful data from the huge data by applying knowledge discovery from data or KDD process. Data mining technique can be applied for meaningful data [2]. In educational field, Data Mining is used to understanding of learning process of students. Educational Data Mining (EDM) is growing area for data mining to better understand students [3].

2. Layout For Drop-Out Learner

Different scholars have used different model or layout for drop out learner. The architecture [4] used is based on ETL process. The abbreviation of ETL is Extract, Transform and Load.

It is business oriented system in which author study the operational system to support business. The model [5][6] which predicting students result at school level which are failure. It involved the stages Data collection, Preprocessing, Data mining and Interpretation. Early student success prediction is also layout by the authors by showing the model [7].

Layout of primary involvement of elements, database creation, processing and output of educational data using Data Mining is as follows in Fig. 1.

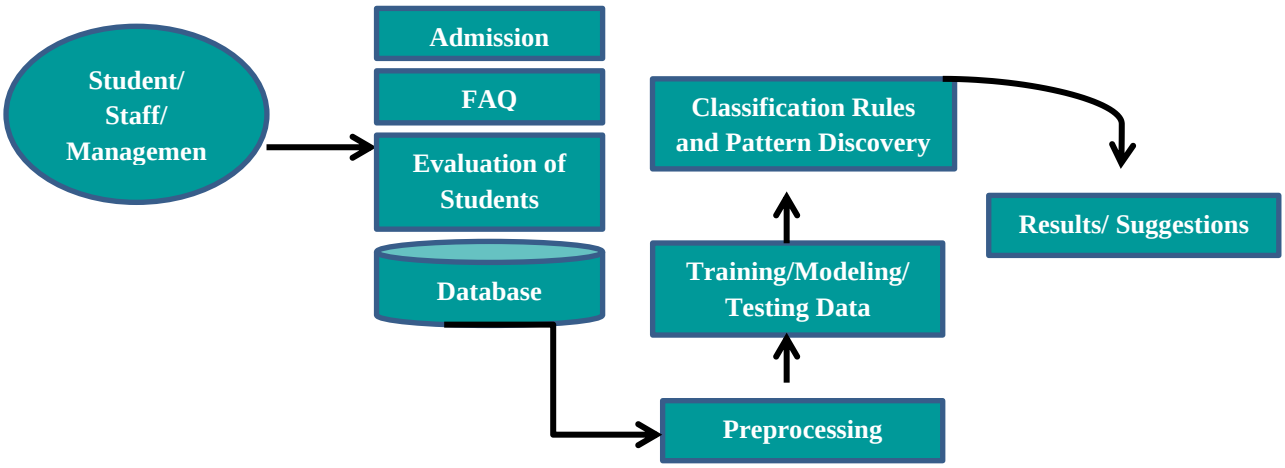

Fig. 1. Educational System Layout

i. Data-Variable-Users

To predict probability of drop out student or performance of student from educational institutional data from different sources are compulsory. Researcher focuses on outcome in particular course such as information system in open polytechnic based on admission data [7]. By using white box data mining technique, researcher predicts student failure in school level [6]. In this study the highly imbalance data is focuses and the students which are on high risk will be detecting so that they can be early guided. The aim [4] study the variables that responsible for the drop out as well as to develop a model of predication which identifying drop out students.

The questionnaire supplied to the three university students for two continuous years from which data is collected [8]. The EDM models and results of the project carried out from the Thailand University. The aim of research is to predicting student performance and dropout based on characteristics before admission, admission details and initial exam performance in the university. Objective of the research is to reduce the number of features, remove irrelevant, redundant data and reduce the size of data set for feature selection algorithm [9]. The less educational qualification [10] decreases possibility of getting good employment in the company or private sectors. Thus dropout students identify as early as possible.

ii. Preprocessing

Pre-processing of data is one of the important steps in data mining process. Generally incomplete, noisy and inconsistent data are received from various sources such as web and social media [2]. The Quality decisions will be taken on quality data. The WEKA software is used to remove noisy data i.e. data cleaning techniques. [11][12][13]. Cleaning process in which missing values will be fill out using data approach. Before applying mining technique the preprocesses data work is done by the researcher [14][15]. Data cleaning and transformation process were manually done by replacing missing values with the standard values.

iii. Data Mining Techniques

Decision Trees, Genetic Algorithm, Artificial Intelligence, Neural Networks, Classification, Clustering, Regression, Association Rules, Nearest Neighbor method etc. are the algorithms and techniques used for knowledge discovery from databases [16]. These techniques are used for Educational Data Mining purpose also. Algorithm [6] are used for feature selection dataset, number of algorithms are applied for features ranking higher in multiple algorithms. 15 important features are selected from original 77 features. Some of the authors also use WEKA for performing out data mining techniques. Association rule mining is used to identify causes of student dropout [11][16].

The researcher [17] constructed a CHAID prediction system in which 7-class response variable by using predictive variable to obtained feature selection technique. In this simple linear regression technique was used to construct a regression model.

The researcher [9] applies feature selection before applying data mining techniques. Researcher uses filter model, hybrid model and wrapper models for features selection. Different studies [18] focus mainly on feature selection like investigating the familiar subset features with little cardinality for gaining good predictive performance with techniques of data mining and calculating better subsets with different cardinality. The basic steps namely subset generation, subset evaluation, stopping criterion and validation are used for feature selection procedure in early days.

3. Conclusion

The major problem for a research is unavailability of global dataset. Various techniques will be applicable for preprocessing of noisy data. Every day Data mining techniques are perform their performance nicely with the EDM and now a days different dimensional and not properly arrange data can also properly arrange. The survey of this paper show that educational data mining is even a large field for research in the education sector which uses more techniques to mining the educational data as well as to plan or develop new education effective for the educator and nation.

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Artificial Intelligence Using Neural Network Based D. S. S. For Iris Detection

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Abstract:-

Neural network-based decision support system, is used for persons identification from IRIS recognition. In this case DECISION SUPPORT SYSTEM (D.S.S.) will work as a classifier estimate non linear and complex decision boundaries between different classes. The neural network configuration using MLP, RBF, SVM. The various parameter of neural network will be varied carefully in order to obtained the optimal configuration in view of minimum mean square error and maximum classification accuracy and simplicity of neural network model, the available data set ratio of these partition will varied gradually. In each of neural network configuration. The variable parameter test and train by neural solution software.

Finally an optimal neural network based D.S.S. will be designed in each category of neural network and then shall be overall comparison among different neural network configuration. In this case of decision support system confusion matrix and classify accuracy are important to identify person iris image.

Keywords: *Iris recognition, neural network-based decision support system, Classify accuracy. MLP ,RBF, SVM*

Introduction:-

Today's E-Security are in critical need of finding accurate, Secure and cost-effective alternatives to passwords and personal identification numbers as financial losses increase dramatically year over year from computer-based fraud such as computer hacking and identity theft. Biometric solutions address these fundamental problems, because an individual Biometric data is unique and cannot be transferred Biometric is automated methods of identifying a person or verifying the identity of a person based on physiological or behavioral characteristic.

For Example, of physiological char. Include hand, finger image and facial characteristic and iris recognition behavioral char. Are trends which can be learn or acquired dynamic signature verification, speaker verification and key stroke dynamic are example of behavioral char. Biometrics system uses a hardware to capture the Biometric information and software to maintain and manage the system in general, the system translates these Biometric profile known as template that templates is stored in a data base the Biometric system then compares this templates to the new image created every time a user accesses system then compares this templates to the new image created every time a user accesses the system for an enterprise Biometric provides value into two ways Biometric adds a unique identification to network authentication, one that is extremely difficult to duplicate smart cards and token also provides a unique identifier but an Biometric has an advantage over these devices a user cannot lose or forget his or her finger print, retina or voice the practical application for Biometric are diverse and expanding and range from healthcare to govt, financial services, transportation and public safety and justice. Such application are on line identification for E-commerce access control of a certain building or restricted area, offline personal identification, financial automated teller machine (ATM), online ticket purchase etc.

Feature Extraction

In order to provide an accurate recognition of an individuals, the most discriminating information present in an iris pattern has been extracted. Only the significant features of the iris have been encoded so that comparison between templates is done. the feature extraction stages.

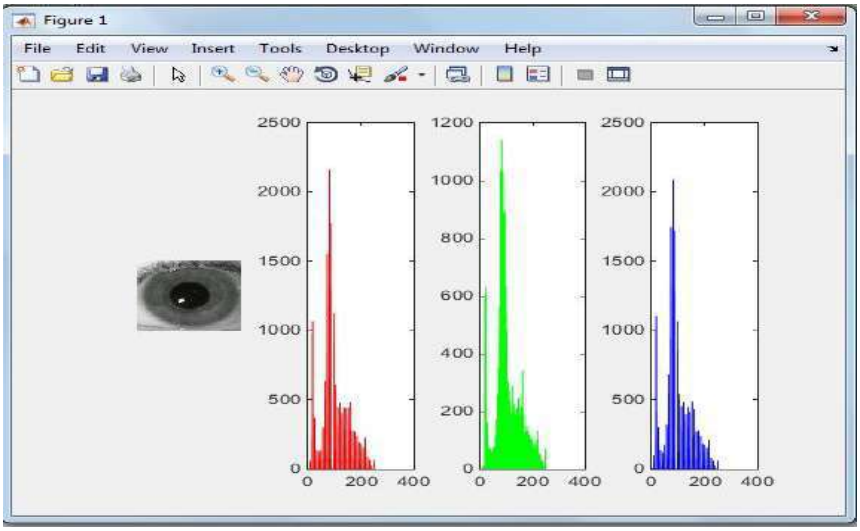


Fig , Histogram of Iris

Problem Formulation :- In this paper preliminary part of the work is given .
Neural network based decision support system, is used for persons identification from IRIS recognition.In this case the D.S.S. (DECISION SUPORT SYSTEM) will work as a classifier estimate non linear and complex decision boundaries between different classes. The neural network configuration to be used for this research work are as

1) Multilayer Perceptron (MLP)
2) Radial based function network (RBF)
3) Self Organizing map (SOM)
4) Support Vector Machine.

The various parameter of neural network will be varied carefully in order to obtained the optimal configuration in view of minimum mean square error and maximum classification accuracy and simplicity of neural network model, the available data set ratio of these partitions will varied gradually. For e.g. 70% training, 20% testing, 10% cross validation and various possible combination like permutation and combination like this will be form. The order of testing and training will be swapped for reverse tagging. The different data partitioning ensures that the trained neural network s not dependent on any specific data partition to produce the best results and the learning is almost independent of data is essential. In each of the neural network configuration. The variable parameters are as Hidden layer, Number of neurons in each hidden layer, Transfer function of neurons output layer, Learning rule or training algorithm to be used such as standard back propagation algorithm, conjugate gradient algorithm, delta algorithm and quick propagation , Number of cluster Centers, Learning rate and value of step size and momentum. All possible Variable parameter of neural network will be varied systematically until the most optimal configuration is reached, where mean square error on the training, testing and cross-validation data set is the lowest regardless of data partitions and classification accuracy for cross validation and testing data set will approach 100% ideally. Finally an optimal neural network based D.S.S. will be designed in each category of neural network and then shall be overall comparison among different neural network configuration. In this case of decision support system confusion matrix and classify accuracy are important to Identify person iris image. In this case mean square error is not very important digestive parameter, it is only used to control and monitor learning algorithm and training of neural network, neural network is trained on the different data partition and it is tested on a separate data partition that was never presented to neural network, while training. This is done for proper generalization and true learning.

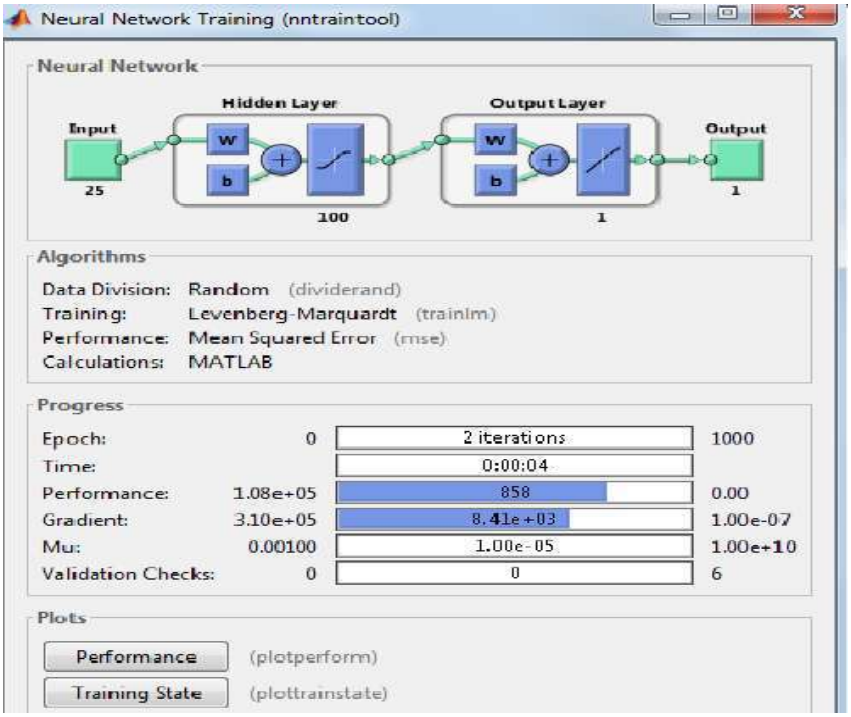
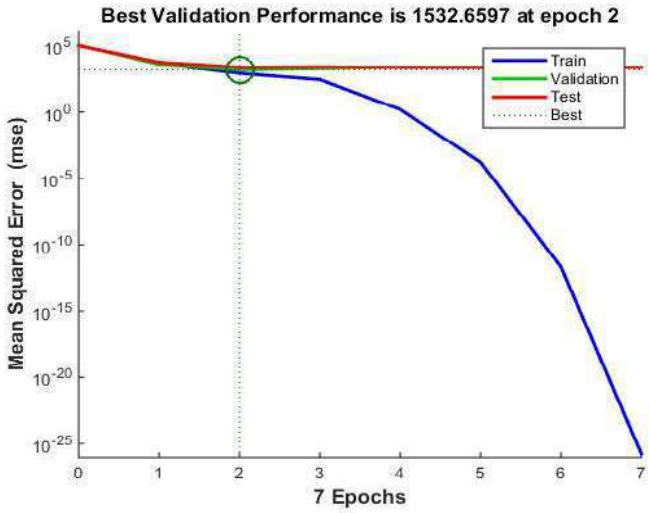


Fig. neural network training

If the train button is pressed on the menu the neural network traing (nntraintool) would be activated from the neural network toolbox. The result of train network is shown in fig 4.1

In this figure the neural network algorithm would be displayed with 25 input two layers with weight and bias .Hiden layer are 100 and one output layer. According to the present result of training system the epoch is 2 iteration for 1000 epochs. Running time is 0.004 hours .The performance is 858 for 1.08e+05 target. The gradient is 8.41e+03 for 1.00e-07 and validation check is 0 for 6 must be displayed on the command window.

According to the fig 4.1 the neural network training system has been accomplished and known by the user neural network toolbox is very useful to simulation of this right iris recognition .



The result is found by the algorithm and we can get the number of epochs used and which epoch gives the best result as shown in fig 4.2.As shown in fig 4.2 a plot fo epochs MSE has been plotted .The epochs gets the best validation performance at epoch no. 2 . The MSEW is the lowest at this point and hereafter no significant changes takes place and no further decrease takes place. Hence this is the best validation performance is 1532.6597 at epoch

Conclusion:-

In this the iris preprocessing steps that includes iris localization, normalization and enhancement and then applied to the small singular program on MATLAB. Software converts that image into the numerical data.

Numerical data then applied to the Neural solution and then trained the Network and classify the images using multilayer perception (MLP), Radial based function Network (PDF) and the images and gives the accuracy of that images. In this work, Iris recognition system based on neural networks base decision support system is used for persons identification from iris images. Multilayer perceptron network is one of the best techniques to identify Iris images of a person.

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Competency Development and Mapping of An Engineering Graduates Employability Skills

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Abstract:

Hiring fresh engineering graduates for Industry has become a crucial task for the industry as well as for the agencies. At the commencement of employment, graduate engineer training is essential, additional training is both time consuming and costly for the industry. Industry work on three main elements man machine and money. Among these three the main element of industry is man i.e., humans. The existing economic globalization demands novel methods to workforce management. Nowadays industry is in need of high skilled workforce, thus the skilled graduates demand is increasing day by day, and low skilled employees demand is increasing and is on declining side. Multi-tasking role are expected by the employees to be performed. More agility is required, proactive, self-disciplined, organized, Creative etc. are the recruiters from the upcoming graduates. The practice of determining critical competencies for a company is called skill mapping or competency mapping. Competency mapping is a growing HR approach that focuses on the characteristics that are necessary for job success and matches them to the skills of the current workforce. Its is expected by the academicians and the Engineering institutes to focus more towards the competency development and mapping of engineering graduate. It can be achieved by imparting various technical and non-technical trainings, providing internship opportunities, conducting workshops, Seminars etc.

Keywords: *Competency mapping, Skill, Employability, Globalization, Gap, Graduates, Engineering.*

Introduction:

Process of identifying key competencies of employees for an organization is termed as Competency mapping of skill mapping. Competency mapping is an evolving HR practice focusing on factors required for success at any job and matching it with skills of workforce available.[1] It Involves various skills which are related and expected to be performed in the job. It reveals the working capabilities, ingenious, adaptability, stress handling capacity, forecasting skills, problem solving abilities, decision making sills and many more. This analysis helps the industry and the perspective candidate to compare suitability of engineer for the respective job. Its also help in reducing the training or the on-job training cost of the industry. More reliable workforce can be developed for future. In order to remain in alive and active in today's competitive environment, every industry is striving for maximum efficiency and effectiveness. Industry is divided into two categories: production and service. They are making every effort to make their system more efficient. All of their strategies and approaches for increasing the performance and efficiency of their operations point to one fundamental factor: "Skill and Competency." As a result, firms that want to improve their performance turn to skills and competencies as a key area. Every sector, particularly those in manufacturing, places a premium on ability and competency.[2] Individuals must have convenient capacities in order to be 'employable.' Employers frequently describe a set of abilities that they expect from an employee, in addition to solid technical understanding and subject knowledge. It's like Team working, Problem solving, Self-management, Knowledge of the business, Literacy and numeracy relevant to the post, ICT knowledge, Good interactive and communication skills, Ability to use own initiative but also to follow instructions and Leadership skills where necessary are some skills needed.[3]

Importance of Competency Mapping:

Using a competency map to drill down to the specific skills, knowledge, abilities, and behaviors required for the job is beneficial. Competency mapping has the advantage of establishing criteria for employee training and development that are especially matched to our company's needs. It involves exploring the skills which are required for particular job position and role while performing duty. The goal of applying competency mapping is to ensure the organization's competitiveness, efficiency, and effectiveness[4]. These ability marking necessities serve as the indicator for employees. Employees' performance assessment forms are properly filled out depending on their degree of talents, which qualifies them for a certain function in the organization. Human resource department is responsible for analyzing the strengths and weaknesses of personnel after they have been assigned based on their competency.[5] The finest organizations always coming up with new methods to interact with their employees on a personal level. Building a more personal relationship with employees is becoming increasingly popular among the greatest places to work. It increases the productivity at workplace, reduces the work pressure, increases the quality of work, workplace environment[6]. Competency mapping has the advantage of establishing criteria for staff training and development that are precisely matched to your company's requirements[7]. It is a rapid and effective process that concentrates on and analyses how workers operate, and it normally takes one or two days to complete. Making a competence map can help you drill down to the specific skills, knowledge, abilities, and behaviors needed for each unit of work[7]. The competence map becomes a very helpful and practical tool for enterprises because of this approach.

Advantage of Competency Mapping for Industry:

- Increased Productivity
- Better workplace environment
- Increased Job Retention
- Better achievement of goal
- Sense of Responsibility

Figure 1 Advantage of Competency Mapping for Industry:

Advantage of Competency Mapping for Employee:

- Performance Excellence
- Improves clarity in work
- Job Satisfaction
- Better appraisal
- Better understanding of Job Role

Figure 2 Advantage of Competency Mapping for Industry

Competency Mapping & Development

Boyatzis(1980) – "A capacity that exists in a person that leads to behavior that meets the job demands within parameters of organizational environment, and that, in turn brings about desired results".[8] Unless the industry is not ready for competency mapping, it would become very difficult to get a better achievement at the workplace. competency mapping is also one of the leading concepts which is accepted worldwide[9]. It has shown

a tremendous increase in the qualitative approach towards achieving the Vision and Mission of any organization. It also gets in line with the organization goal as well as with the individual Goal. it is giving a wider spectrum for a better career enhancement and performance appraisal.[10] A capacity to recognize, interpret, and apply emotional information about oneself that leads to or causes successful or exceptional performance is an emotional intelligence skill[11]. The capacity to notice, analyses, and apply emotional information about others that leads to or causes successful or superior performance is referred to as social intelligence[12]. An intellectual intelligence competence is the dimensions to think critically about and evaluate information and circumstances in a way that leads to or causes successful or exceptional performance.

Figure 3 Competency Mapping & Development

HR Planning: Human resource planning (HRP) it is an incessant progression of disciplined scheduling ahead to ensure that an organization's most important asset—quality employees—is utilized to its full latent. Human resource planning certifies that personnel and occupations are a good match, while preventing manpower shortages or surpluses.

Competencies can be developed

One of the main recompenses of the ability or behavioural tactic to talent is that we reach an area of human talent that may be developed later in life. Although our understanding of skills has grown, one of the most noteworthy advances made in the prior years[13].

- an ageing and increasingly diversified workforce requiring greater employer support to remain productive at work
- increasing levels of chronic disease in the general population
- rising costs of ill-health in the workplace associated with increased absenteeism and reduced performance
- external societal pressures such as growing expectations that employers will promote wellness programmes as a duty of corporate social responsibility[14]
- a need for employers to distinguish their offerings to attract recruits in an increasingly competitive labor market
- attempts by government to reduce public health expenditure

Government is also planning to increase the presence of for universities in a global ranking our country is planning to have almost more than 20 universities and the list of top 200 universities of world. It will definitely attract the focus of top Global recruiters towards India. As when the Global recruiters come out for recruitment they especially focus on the top universities of the world If these top universities are being targeted for the Global recruitment it is a mandatory to make and raise a standard of university to this top level which will ultimately increase the growth[11].

Employability Skill development for Competency Mapping.

Employability skills are those skills which are required by and fresh graduate to start their company in organisation. These are the skills which will help the graduate to attend his or her first employment of their life[15]. Employers for the recruiters are always in search of such skills which are beyond your experience and qualification. When it comes to experience and qualification it has certain limitations because you cannot learn the things beyond your qualification and beyond your expectation it is expected by industry. Employability skill

is something which comes between your qualification and expectations it is more over incline toward the self-initiative, or self-learning, for proactiveness of an individual to learn new skills which will help them for a smooth working at workplace[16]. As your education and your qualification along with your experience will only make you eligible for the recruitment process of any organisation based on your qualification and education you will be able to appear in the recruitment process of an organisation but once you have not cleared the organisation recruitment process you want to be able to get a selection. The selection of a candidate in any recruitment process is purely based on the employability skill which acquired and which is shown to the employer during the screening process[17]. In general company is always ready to train the fresh graduates on the required skills. Skills may vary from organisation to organisation and sector 2 sector. They always are in search for such candidates who initially purchase certain soft skill interpersonal skills before hiring because once they identify that you already possess certain skills which are expected by the recruiter it will help them to train the graduate[18]. On the other hand, the fresh graduates who is not having any of the above-mentioned skills it is very difficult and it is very harder for the industry to train such a graduate on a required skill. Soft skill for employability skills is also considered as the building blocks for your future they will help you to get an acquaint yourself with better career and the candidate having a good command on soft skill definitely will get more opportunities in the state as compared to any other candidate. There are many different employability skills some among them are most important are in the areas of as mentioned below[19]:

- Creating a good Repo with co-workers: it is very important whenever you are working in an organisation you have to create a good rapport with your co-workers. having a good tune with your co-workers will definitely help you to create healthier and more supported work environment.
- Being more trustworthy and independent: following the deadlines and fulfilling the given task in a given set of time definitely makes you more Independent and dependable in organisation. it reflects that the said employee is more reliable when it comes to following the deadlines.
- Proactiveness: proactiveness is an attribute which is expected from every employee nowadays. organizations now are in search of such candidates those who to apply their own logic and skills to get the job done in the set time. employers don't want such candidate who always wait for someone else to instruct them and get the work done from them[20].

Apart from this some of the most important employability skills which are expected in a job market are listed below:

- ✓ Communication skill
- ✓ Emotional intelligence
- ✓ Aptitude skills
- ✓ Team building
- ✓ Negotiation skill
- ✓ Persuasion Skill
- ✓ Influencing skill
- ✓ Conflict Resolution Skill
- ✓ Mediation skill
- ✓ Problem Solving Skills
- ✓ Decision making Skills Etc

Conclusion:

Competency Mapping is a need of hour. Regular assessments and mapping of engineering graduates must be practiced. As a result, skills are a crucial aspect of an individual's personality that should be examined in order to assess their potential. To do so, we'll need to use competence mapping, which is a useful method for identifying an employee's work and behavioural abilities. Various employability skills listed above can be considered as a quality parameter for reference check. All the stake holders of the industry including Employer, Employee and Academician must take initiatives. These initiatives will surely help towards building and developing of knowledge economy for the nation.

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Introduction to the Quantum Computing: A Comparative Study with Classical Computing

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Abstract:

The flow of electrons is referred to as electricity. Because electrons can transport themselves to the other side of a blocked passage through a process called quantum tunnelling, transistors cannot be utilized as switches as their size shrinks to the size of a few atoms. Quantum mechanics is a field of physics that investigates the physical universe at the atomic level. At this level, particles behave differently than in the classical universe, taking on multiple states at once and interacting with particles that are thousands of miles away. Superposition and entanglement are examples of the phenomena. At the crossroads of mathematics, computer science, and physics, quantum computing is a novel and interesting field. It is concerned with the use of quantum physics to improve compute performance. Quantum computing is a novel type of computing that is based on quantum mechanics and interacts with a probabilistic and unpredictable physical reality. Because quantum mechanics is a more general model of physics than classical mechanics, it leads to a more generic model of computing, quantum computing, which has the ability to tackle challenges that classical computing cannot.

Keywords: *Computers, Classical computation, Quantum computing, Bits and Qubits, Quantum computing challenges*

Introduction:

Today's developments in computing are resulting in powerful tiny integrated circuits. The capacity of a chip doubles every two years, according to Moore's law. As we go closer to 10 nm, strange things happen with the electrons, revealing quantum nature, and the laws of classical physics are no longer respected at such scales. As a result, either new semiconductor devices must be developed that can sidestep quantum nature or quantum nature must be embraced. Scientists are currently opting to embrace quantum nature, i.e., to use quantum mechanics principles to develop innovative computers known as quantum computers [1-4].

Any type of calculation that contains both arithmetical and non-arithmetical processes and follows a well-defined paradigm (e.g. an algorithm) is referred to as computation. Computers are mechanical or electronic machines that do computations [1-5]. In today's world, most personal computers calculate 64 bits of data at a time. A 64-qubit quantum computer would be 2 to the 64th power quicker or 18 billion billion times faster. (It's worth noting that billion billion is correct). We wanted to explore the fundamental concepts of computation, how they are achieved using transistors in classical computing, the speed limitations of classical computing, the difference between classical and quantum computing, and the introduction and challenges of quantum computing to a general audience in this paper.

Computation: (Classical approach)

Binary computing is also known as classical computing. Information is stored in the form of classical bits, which are logically represented by either a 0 (OFF) or a 1 (ON) in this traditional approach to computing. It's analogous to turning on an ON or OFF a light switch. All current computers are built around the transistor. We regard this event to represent the 1(ON) when the transistor allows the current to travel through it, and we consider this activity to represent the 0 (OFF) when the transistor blocks the current from passing through it. We can manipulate the state of a bit in traditional computers by employing various combinations of transistors connected to each other. They're known as logic gates. In classical computing, we know that logic gates can perform logical operations. AND, OR, NOT, NAND, NOR, and other logic gates are examples. Transistors are small semiconductor devices that are used to amplify and also switch electric or electronic signals. They were used to manufacture integrated circuits on a piece of silicon (IC). In traditional computers, the number of transistors has a 1:1 connection with power. As a result, in order to enhance computation power, the number of transistors must be raised while the size of the chip must be reduced [2-6].

Limit of Classical computation:

Computers are getting smaller and faster day by day because electronic components are getting smaller and smaller. But this process is about to meet its physical limit.

Gordon Moore, the co-founder of Intel, discovered in 1965 that the number of transistors on a silicon microprocessor chip had doubled every year since its discovery, while the prices had been cut in half. Moore's Law is the name given to this phenomenon. Moore's Law is significant because it indicates that computers are becoming smaller and more powerful with time.

This leads to the concept of creating the tiniest computer by shrinking the circuit down to the size of an atom. Due to the "Quantum tunnelling" phenomenon, an electron can cross the barrier and appear on the other side when the size is lowered at the atomic level. As a result, these circuits will be unable to function as switches. It demonstrates that beyond 5–7 nanometres, the size of the circuits in a traditional computer has hit its limit. As a result, the power of classical computing can only be increased up to a limit [3-5].

Quantum computing: (An introduction)

Quantum computing is a sort of computer that uses the collective properties of quantum states to accomplish calculations, such as qubits, superposition, interference, and entanglement. The devices that perform quantum computations are known as quantum computers. A quantum computer is a machine that performs calculations based on the laws of quantum mechanics, which is the behaviour of particles at the sub-atomic level. Unlike traditional classical computers, which utilize binary bits 0 and 1 independently to store and manipulate the information, they use their own quantum bits, also known as 'Qubits,' to store and manipulate data. The computers using such type of computing are known as ‘Quantum Computers'. Circuits using transistors, logic gates, and Integrated Circuits are not possible in such small computers. As a result, it uses subatomic particles such as atoms, electrons, photons, and ions as bits, together with their spins and states of information. They can be stacked on top of one other to create new combinations. As a result, they may execute in parallel and efficiently use memory, making them more powerful. Quantum computing is the only model that can challenge the Church-Turing thesis, allowing quantum computers to dominate classical computers exponentially faster in speed [7-12].

Quantum Bits (Qubits): Representation of Data

A qubit, or quantum bit, is the fundamental unit of quantum information in quantum computing. The quantum bit can represent 0, 1, or both at the same time. A quantum bit can exist in superposition, which means that it can exist in multiple states at once. A single atom is used to represent a bit of data, and it can be in one of two states: |0> and |1>.

Qubits includes

- An atom in an excited or ground state.
- Polarisation of a single photon, in which the two states are vertical polarisation and horizontal polarisation.
- Spin of the electron, in which the two levels are spin up and spin down.

A linear superposition of a qubit's two orthonormal basis states can be used to represent its general quantum state in quantum mechanics (or basis vectors). |0> and |1> are the most common symbols for these vectors. They are pronounced "ket 0" and "ket 1," respectively, and are written in the traditional Dirac or "bra–ket" notation. The computational basis, which consists of the two orthonormal basis states {|0>,|1>}, is said to cover the two-dimensional linear vector (Hilbert) space of the qubit. In 2^n-dimensional Hilbert space, ‘n’ qubits are represented by a superposition state vector [7-12].

Qubits have unique qualities that enable them to solve complex problems considerably more quickly than traditional bits. Superposition is one of these qualities, which states that a qubit can store a combination of "0" and "1" at the same time. It refers to a quantum system's ability to exist in several states at the same time. A quantum bit can be in superposition, meaning it can be in multiple states at the same time [7-12].

Entanglement is a quantum particle-to-quantum particle correlation that is extremely strong. Quantum systems' ability to display correlations between states within a superposition is known as entanglement. Consider two qubits, each of which is in the state |0> + |1> (a superposition of the 0 and 1). We can entangle the two qubits so that one qubit's measurement is always correlated with the other qubit's measurement [7-12].

Comparison between Quantum computing and classical computing:

Classical Computing	Quantum Computing
1) Conventional computing is based on the classical phenomenon of electrical circuits being in a single state at a given time, either on or off.	1) Quantum computing is based on the phenomenon of Quantum Mechanics, such as superposition and entanglement, the phenomenon where it is possible to be in more than one state at a time.
2) Information storage is bit based on voltage or charge etc.	2) Information storage is Quantum bit based on direction of an electron spin.
3) Classical computers use binary codes i.e. bits 0 or 1 to represent information.	3) Quantum computers use Qubits i.e. 0, 1 and both of them simultaneously.
4) No restrictions exist on copying or measuring signals.	4) Severe restrictions exist on copying and measuring signals.
5) Power increases in a 1:1 relationship with number of transistors.	5) Power increases exponentially in proportion to number of qubits.
6) Can operate at room temperature.	6) Requires ultra-cold environment.
7) It has low error rates.	7) It has high error rates.
8) Circuit behaviour is governed by classical physics.	8) The circuit behaviour is governed by quantum physics or quantum mechanics.
9) Well suited for everyday processing.	9) Well suited for tasks like optimization problems, data analysis, simulation, etc.
10) Information processing is carried out by logic gates e.g. NOT, AND, OR etc.	10) Information processing is carried out by Quantum logic gates. E.g. Hadamard, controlled-NOT, Pauli's X, etc.
11) It is large scale integrated multi-purpose computer.	11) It is high speed parallel computer based on quantum mechanics.
12) CMOS transistors are the basic building blocks of conventional computers.	12) Superconducting Quantum Interference Device or SQUID or Quantum Transistors are the basic building blocks of quantum computers.
13) Logic gates are not reversible.	13) Quantum logic gates are reversible.

Advantages of Quantum computing:

1) **They can tackle complex problems-** Quantum computers, according to researchers, will be able to solve complex mathematical problems that ordinary computers are unable to accomplish in a reasonable amount of time.
2) **They are quick-** In the end, quantum computers may be able to provide processing power on a scale that ordinary computers may never be able to equal. Google, for example, claimed in 2019 that it could perform a calculation in approximately 200 seconds that would take a traditional supercomputer 10,000 years to complete.
3) **Computer power beyond imagination-** It provides computing power capable of processing massive volumes of data (2.5 Exabyte per day, equivalent to 5 million laptops) generated all over the world and extracting meaning from it.
4) **Lower power consumption-** Due to the teleportation phenomena known as 'quantum tunnelling,' it can work in parallel and consume less electricity, reducing power consumption by 100 to 1000 times.
5) **Greatest for simulation-** Quantum computers are the best for simulating data. Many algorithms have been developed to simulate diverse phenomena such as weather forecasts, chemical simulations, and so on.
6) **Medicine creation-** These computers are more effective in the medical industry. They have the ability to detect ailments and formulate drug formulas. These computers can be used to diagnose and test a variety of ailments in scientific laboratories.
7) **High privacy-** These computers have strong encryption capabilities and are adept at cryptography. The security of quantum computers cannot be breached. China just launched a satellite that employs quantum computing, claiming that the satellite cannot be hacked.

8) **Employed in the manufacture of radar missiles-** Quantum computing is also used in the manufacture of radar missiles. This technique can help increase the accuracy of radar weapons.
9) **Used in artificial intelligence-** These computers are excellent at artificial intelligence. They can make more precise judgements than regular computers. These computers will allow scientists to do more effective study.
10) **Machine learning-** Machine learning techniques are an excellent way to apply quantum computing. Users can write less code and rely on machine learning to improve results.
11) **No overheating-** It can handle complex problems without overheating since the quantum system is kept cold up to 0.2 Kelvin for stability.
12) **Optimization-** It can quickly handle problems like determining the optimum route and scheduling trains and aircraft. It would also be capable of processing 1 trillion chess moves per second. Quantum computers will be able to break even the most secure and impenetrable encryption systems. It would, however, create hack-proof alternatives.
13) **Industrial revolution-** It has the potential to revolutionise industries ranging from pharmaceuticals to petroleum. It will be able to develop new medications. Financial institutions' marketing algorithms can be enhanced. Artificial intelligence can be improved in the near future.

Quantum Computing's Drawbacks: (Challenges)

1) **Low security and high mistake rate**- the systems are not very secure, and there is always a threat. Furthermore, the mistake rate is extremely high and must be reduced.
2) **The security of the present Internet of Things (IoT) might fall down** due to quantum computer advancements. Databases of government and commercial large corporations, banks, and defence systems can all be hacked using cryptographic techniques. Given these factors, quantum computers have the potential to be disastrous for humanity's future. ***Considering these facts, quantum computers can be terrible for our future.***
3) Secure communication or any type of internet transaction could be cracked, with the data being misused or resold.
4) Today's quantum computers are mostly prototypes that are still huge, difficult, and costly. At the same time, they continue to have a number of issues that their developers have yet to fully resolve.
5) The Quantum Computer will function as a separate device and will not be able to completely replace traditional computers. Because classical computers are superior at certain tasks to quantum computers, such as email, excel, and so on.
6) It has not yet been fully conceived, as only portions of it are being executed and people are still imagining how it will look.
7) Qubits are unable to disregard noise in their native state. As a result, the quantum system is more prone to errors. It has a problem with decoherence. The most difficult problem is figuring out how to deal with any unwanted deviations or noise in quantum computers.
8) It is extremely delicate and prone to errors. Subatomic particles such as atoms and electrons are affected by all kinds of vibrations. Noise, malfunctions, and even failures are conceivable as a result. It causes "Decoherence," or the loss of quantum coherence.
9) **Algorithm creation-** For each type of calculation, a separate algorithm must be written. Quantum computers cannot function in the same way as traditional computers; they require specific algorithms to complete jobs in their environment.
10) **The low temperature required-** Because the processing in these computers is done at a very deep level, a temperature of minus 460 degrees F is required. This is the universe's coldest temperature, and maintaining it is extremely difficult.
11) **Software development-** In addition to hardware, further software development is necessary to construct.

Applications of Quantum computing:

1) **Healthcare sector:**
   a) Research
   b) Diagnostics
   c) Treatment
   d) Drug Design & Development
   e) Full-speed DNA sequencing and analysis
   f) Developing the ideal decision-making aid
   g) Improving imaging solutions
   h) Creating the safest medical data systems ever

2) Cryptography & Cybersecurity

Due to the increasing number of cyber-attacks that occur daily around the world, the online security environment has become rather vulnerable. Quantum computing, along with machine learning, can aid in the development of various strategies to combat these cyber-threats. Quantum computing can also aid in the development of encryption systems, commonly known as quantum cryptography.

3) Finance and Banking:

a) High-frequency automated trading
b) Fraud detection
c) Big data analytics
d) Business optimization, including risk management and compliance
e) Risk profiling, trading optimization, and targeting and prediction.

4) Weather Forecasting:

Currently, typical computers take longer to analyse weather conditions than the weather itself. However, a quantum computer's capacity to crunch large volumes of data quickly and accurately. Meteorologists will be able to develop and analyse more precise climate models with quantum computers, which will provide more insight into climate change and strategies to mitigate it.

5) Machine Learning and Artificial Intelligence

Quantum computing could bring up new possibilities in artificial intelligence, which frequently includes the combinatoric processing of enormous amounts of data to produce better predictions and choices (think facial recognition or fraud detection). Quantum machine learning is an emerging topic of research that identifies ways that quantum algorithms can speed up AI.

6) Automotive sector
7) Energy
8) Advanced Manufacturing
9) Computational chemistry
10) Entertainment and Quantum gaming industry
11) Logistics optimisation
12) Traffic optimisation
13) Industry specific applications
14) Biotechnological development
15) Defence and security sector
16) Various engineering fields applications

And may there be many more.....

Conclusion:

Quantum computing will spawn a slew of new technical applications, opening up new commercial opportunities and assisting in the resolution of some of the world's most pressing problems. Quantum theory's previously unexplored effects can now be employed as a resource in technologies with far-reaching applications, such as secure communication networks, ultra-precise sensors, pharmacological studies of chemical reactions, innovative materials, and fundamentally new computing paradigms. Governments and organizations all around the world, including Google, Microsoft, Intel, Toshiba, and IBM, have been investing heavily in order to realize this potential in recent years. Despite tremendous advances, quantum computing has a number of hurdles, including the difficulty of manufacturing a large-scale quantum computer, the development of novel quantum algorithms, and the cost of construction. Quantum computers have the potential to transform computation by allowing for the solution of previously unsolvable problems. While no quantum computer has yet been developed to perform calculations that a classical computer cannot, significant progress is being made.

Quantum computing encompasses a wide range of concepts, including quantum physics, superconductivity, nanotechnology, and others. Each of them is a complex field that is still in its early stages of development. As a result, creating a physical system that follows the principles of all of these professions is a

monumental task. Quantum computing has enormous potential, allowing us to achieve things that were previously thought to be unachievable with traditional computers.

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Sports Results Prediction Using Supervised Learning

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Abstract-

Different Machine Learning techniques are used to predict the score and outcome of various sports. We have analyzed different model design hypotheses to assess our model's performance which helped us choose the best algorithm to predict the winner of the match. The main algorithm used is logistic regression however, for collating, Support VectorMachine (SVM) and Naïve Bayes has been used.

Predictive analysis has enforced the prediction of success rate of each team depending on the statistics of previous matches or tournaments which would help others to see where they stand andwho their competitors are. Sports managers are striving to model appropriate strategies that can work well for assessing the opponent's potential in a match. The challenge of predicting sports results is based on several parameters and it differs from sport to sport. So, it is important to consider all the essential ones in order to increase the accuracy rather than just focusing on the score to predict the outcome. Also, this area has always been something interesting for sports fanatics, magazine makers and others who are interested in approximating the odds of a game in advance. This system would aid in easy generation of results, display of ranking and regulating the selection of the tournament dates.

Keywords- Logistic regression, Support Vector Machine (SVM), Predictive Analysis

I. Introduction

A system for predicting the results of various sports matches that are based on previous results ofthe team's performance and conduct. We also strive to find accurate probabilities for a home win,a draw, or an away win for each match.

A particularly important element of Data Science in sports like football and cricket is the ability to evaluate a team's performance in games and use that information to attempt to predict the resultof future games based on this data. Outcomes from sports matches can be difficult to predict, withsurprises often popping up. Football is an interesting example as matches have fixed length. It alsopossesses a single type of scoring event: goals that can happen an infinite amount of times duringa match, and which are all worth 1 point. The possible outcomes for a team taking part in a footballmatch are win, lose or draw. Similarly, in cricket, the possible outcomes are same as football. Butthere are many parameters for consideration like teams, runs per over, overall runs, run rate etc. Normally, predictions are done based on goals or runs for respective sport and it can therefore seem quite straightforward to predict the outcome of a game. Traditional predictive methods havesimply used match results to evaluate team performance and build statistical models to predict theresults of future games. For instance, a team with many scoring opportunities could be unlucky and convert none of their opportunities into goals or runs, whereas a team with a single scoring opportunity could score a point. This makes match results an imperfect measure of a team's performance and therefore an incomplete metric on which to predict future results.

Our primary goal is to create a model that predicts outcome of a sports match with sufficient accuracy. This accuracy can be determined by attaining 70% precision when predicting results of the match. More specifically, every match consists of characteristics of the players and thematch and based on these features our algorithms predict the outcome. The outcome is, for example in tennis where zero bit (0) corresponds to a win for Player 1 and one bit (1) a win for Player 2. No draw is possible here. In sports where a draw is possible, other representationsare necessary. In contrast to tennis, a draw is possible in football and cricket, and we have shroud both the scenarios.

Proposed System:

Deliberating the existing system, we have come up with the idea of using multiple classification and regression techniques namely Logistic Regression, SVM, Naïve Bayes, etc and with the helpof few technologies like Weka to anticipate the results. We have considered the factors like scores,home and away team (for any sport), strategies used, time, location (city and country) etc. Using such methods, we have compared as to which

algorithm gives efficient results. As we used previous data sets to train it, the methods would help us easily identify trends and patterns as it understands behavior and historical data. There is no human intervention(automation) in this approach. There is continuous improvement as the algorithm learns to make more accurate predictions faster. It can also handle multi-dimensional and multi-variety of data, and they can dothis in dynamic and uncertain environment. Our research will hopefully be informative and use tothose performing future research in this application area.

Challenges

The following are several challenges on the path to achieving the objectives:

- Data availability & quality.
  Finding a public database of the sports data with the necessary statistical depth to generate expected goals metrics is an essential part of the project. However, the leading sports data providers do not make their information publicly available. We did scour various public databasesto find one that is suitable for us to use. The alternative approach in the case where we do not finda suitable database would be to find websites displaying the required data and using web scrapingtechniques to create our own usable database.
- Research and understanding of prediction landscape.
  In order to design our models and test different hypotheses, we undertook a thorough backgroundresearch of prediction techniques and develop a mathematical understanding of various Machine Learning algorithms that have been used for our predictions.
- Testing different models and parameters.
  An important challenge has been to make the model training and testing tasks as quick and easy as possible, in order to test and compare different models. A robust pipeline will have to be builtto enable us to find the best possible models.

II. Literature Survey

Machine learning (ML) is one of the intelligent methodologies that have shown promising resultsin the domains of classification and prediction. One of the expanding areas necessitating good predictive accuracy is sport prediction, due to the large monetary amounts involved in betting. In addition, club managers and owners are striving for classification models so that they can understand and formulate strategies needed to win matches. These models are based on numerousfactors involved in the games, such as the results of historical matches, player performance indicators, and opposition information.

One of the common machine learning tasks, which involves predicting a target variable in previously unseen data, is classification. The aim of classification is to predict a target variable (class) by building a classification model based on a training dataset, and then utilizing that modelto predict the value of the class of test data. This type of data processing is called supervised learning since the data processing phase is guided toward the class variable while building the model. Some common applications for classification include loan approval, medical diagnoses, email filtering, among others. Sport prediction is usually treated as a classification problem, with one class (win, lose, or draw) to be predicted.

In sport prediction, large number of features can be collected including the historical performanceof the teams, results of matches, and data on players, to help different stakeholders understand theodds of winning or losing forthcoming matches. The decision of which team is likely to win is important because of the financial assets involved in the betting process; thus bookmakers, fans, and potential bidders are all interested in approximating the odds of a game in advance. Once a predicted result for the match is obtained, an additional problem is to then decide whether to bet on the match, given the bookmaker's odds. In addition, sport managers are striving to model appropriate strategies that can work well for assessing the potential opponent in a match. Therefore, the challenge of predicting sport results is something that has long been of interest to different stakeholders, including the media. The increasing amount of data related to sports that is now electronically (and often publicly) available, has meant that there has been an increasing interest in developing intelligent models and prediction systems to forecast the results of matches.

In this proposal, a critical survey of the literature on ML for sport result prediction, focusing on the use of Logistic Regression for the given problem is provided. Several studies have used many otherapproaches but using classification model and comparing them with other efficient algorithms likeBayesian networks, K Means, Support Vector Machine, Generalized boosted models(GBM) etc helped us in providing which is the best way to achieve the predicted outcome in order to derive highly accurate classification models in other domain.

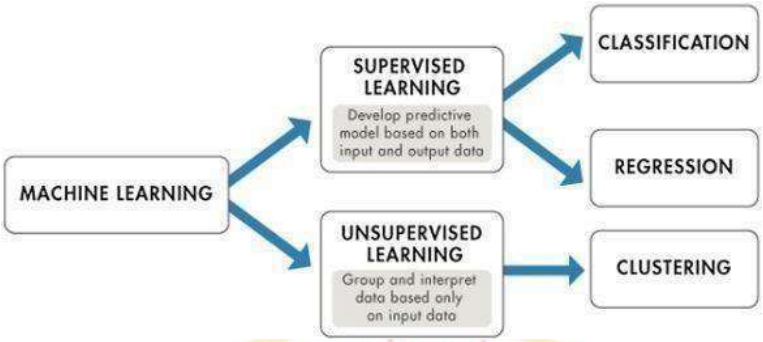


Fig1: Machine learning Algorithms: The above diagram shows different algorithms insupervised learning and unsupervised learning.

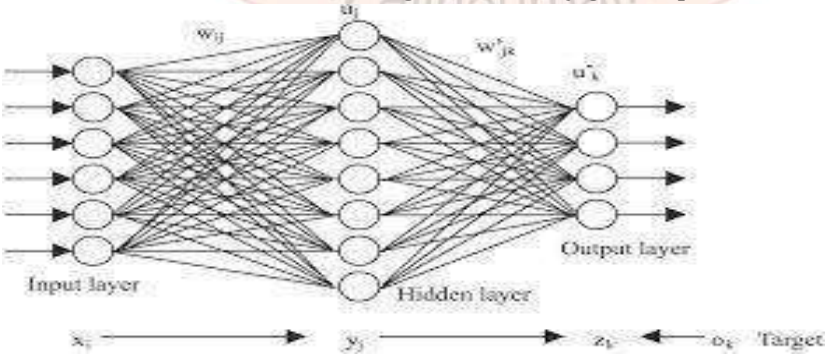
Existing Solutions

This paper's objective by authors Li Yan-Xia, Li Lin, Wang Qiang is to improve the managementlevels of college sports work in the new era, that will proportionally affect the party's education policy, if it is extensively implemented. It also strives to improve the scientific level of college sports management work to achieve maximum operation by providing a useful reference.

Design and development of this system allows us to enter the world of office automation. In the system described above; it is composed of seven modules: sports teaching, physical fitness tests, sports competitions, extra-curricular sports activities, files management, professional team training, venues and equipment management, etc.

Rory P.Bunker and Fadi Thabtah have developed via ANN i.e., Artificial neural networks recentlywhich showed good results. They have used unsupervised learning methods as well to distinguishbetween good and poor teams.

Artificial Neural Networks (ANNs) are perhaps the most applied approach among ML mechanisms to the sport result prediction problem. An ANN usually contains interconnected components (neurons) that transform a set of inputs into a desired output. The power of ANN comes from the non-linearity of the hidden neurons in adjusting weights that contribute to the finaldecision. ANN output often relies on input features and other components associated with the network, such as these weights. Weights associated with interconnected components are continuously changing to accomplish high levels of predictive accuracy. These changes are performed by the ANN algorithm to fulfil the desired model's accuracy given earlier by the user.An appealing feature of ANNs is that they are quite flexible in terms of how the class variable is defined whether it is probability of victory or whether two classes are used with home goals and away goals represented in the two various classes.



(Fig: 2.2.1) Artificial Neural Networks: The above diagram represents a simple artificial neural network with one hidden layer.

Data from the first eight rounds of the competition and five features were used, consisting of yardsgained, rushing yards gained, turnover margin, time of possession, and betting line odds. Unsupervised methods based on clustering were used to distinguish between good and poor teams.An ANN with backward propagation (BP) was then used.

Purucker achieved 61% accuracy compared with 72% accuracy of the domain experts. The BP algorithm was found to be the most effective approach. A limitation of this study is that only a relatively small number of features were used.

Kahn extended the work of Purucker and achieved greater accuracy, performing slightly better than experts in the NFL who were making predictions on the same games. Data on208 matches inthe 2003 season were collected. The features that were used were total yardage differential, rushingyardage differential, turnover differential, away team indicator and home team indicator. There were two classes: away team outcome and home team outcome – a value of1 indicating that the team lost the match, and a value of +1 indicating that the team won the match. The problem was treated as a classification problem. The first 192matches were used as the training data set, and the remaining rounds (week 14 and 15) were used as the test set. Through testing, a network structure of 10-3-2 was found to be optimal. Accuracy of75% was achieved across the week 14 and 15 matches. The results were compared to the predictions of eight sports casters fromESPN.com. Across the same matches, the domain experts predicted an average of 63% of matches correctly.

Related Work Classified by Sport

FOOTBALL

Football is perhaps the World's pre-eminent sport, so it is not surprising that there has been a substantial amount of research on football prediction. Among all sports, football prediction is oneof the most widely and deeply researched area. We thus survey prediction related researches for football, a representative of the sports as our target domain, and categorize them into a few groups. These studies mostly deal with mathematical/statistical models or methods but there are a few researches based on machine learning techniques.

Statistical analysis has been done on football prediction. Many researchers suggested their own models or processes to analyze the results of football matches. They usually showed that their methods represent the results of football matches well. Many models and methods, like Poisson regression models, a logistic regression model using seed positions, and an updating process for the intra-match winning probability, were used to analyze the results of football matches. Most ofthese works also give some predictions as well, but they are more focused on statistical analysis of the results of football matches. The technique was based on a Poisson regression model but wascomplicated by the data structure and the dynamic nature of teams' performances.

The author study multiple techniques in data mining and result prediction to devise a good modelfor predicting matches. They use these major models: GBM (Generalized Boosted Models) and NB (Naive Bayes).

II. Naive Bayes

For Bayesian networks, we handle the uncertainty and formulize the sports strategies using a rule-based reasoner, but at the same time the strategies of a team or a player can be represented by crisplogic rule through which highly scholastic results are obtained.

All these studies relied on previous match results that is win/draw/lose or scores as training data and forecasted the results of a league or tournament matches. The expert NB also relied on information about the playing status of key players and on home ground advantage.

Their results of football prediction using FC Barcelona in 2008- 2009 they split their data set intonon psychological factors such as record of 5 previous matches weather conditions, results for or against team, players mean age, number of key players injured, mean number of goals scored in home and away fixtures.

III.GBM

Using GBM they attain 60% accuracy on an average, while the other models weren't accurate. Tofurther improve the results, more data and statistics can be considered such as opponent's team overall form in that season. Head to Head results and info about each team previous games.

They proposed a logistic regression model in 2016 Barclay's premier league match results with anaccuracy of 40.5. This was developed using4 significant variables: Home defines, home offense, away offense, away defense. The only limitation is only, one team was taken into consideration for predicting the outcomes. The author presents an approach to estimate football match results with neural networks, initially they classified the match into different categories using learning vector quaternization.

Neural Network has been used to determine the strength contrast between two opponents. They used specific Back propagation networks on data that have been designed according to classifyingresult.

We proposed a model to predict outcomes of football matches in English premier league. We trainthe final dataset on various machine learning classifiers and compare the performances of each classifiers and choose the one which yields the best results. We could bring in sentiment analysisand features such as individual player and team performance metrics, studying the trending hashtags on Twitter on match day to further enhance the accuracy of the model.

Statistical analysis forms one of the major strands on football predictions, they generally aim to show that their models or methods represent the results of football matches well; they should fit well. Many models and methods such as Poisson Regression Model, Logistic Regression Model using seed positions were used to analyze and interpret the results. Some of the works in this areatook more statistical approaches in predicting football matches. They use littleknowledge/information and are heavily based on pure statistical models, such as an ordered probity model and Poisson models.

A critical analysis of the literature in machine learning focusing on the application of artificial neural networks is done through this paper. In doing so, we identify the various data sources, learning methodologies, appropriate means of model evaluation and finally the specific challengesof predicting sports results. This is also one of the expanding areas which provide us a good predictive accuracy due to the large monetary amounts involved in betting and gambling.

CRICKET

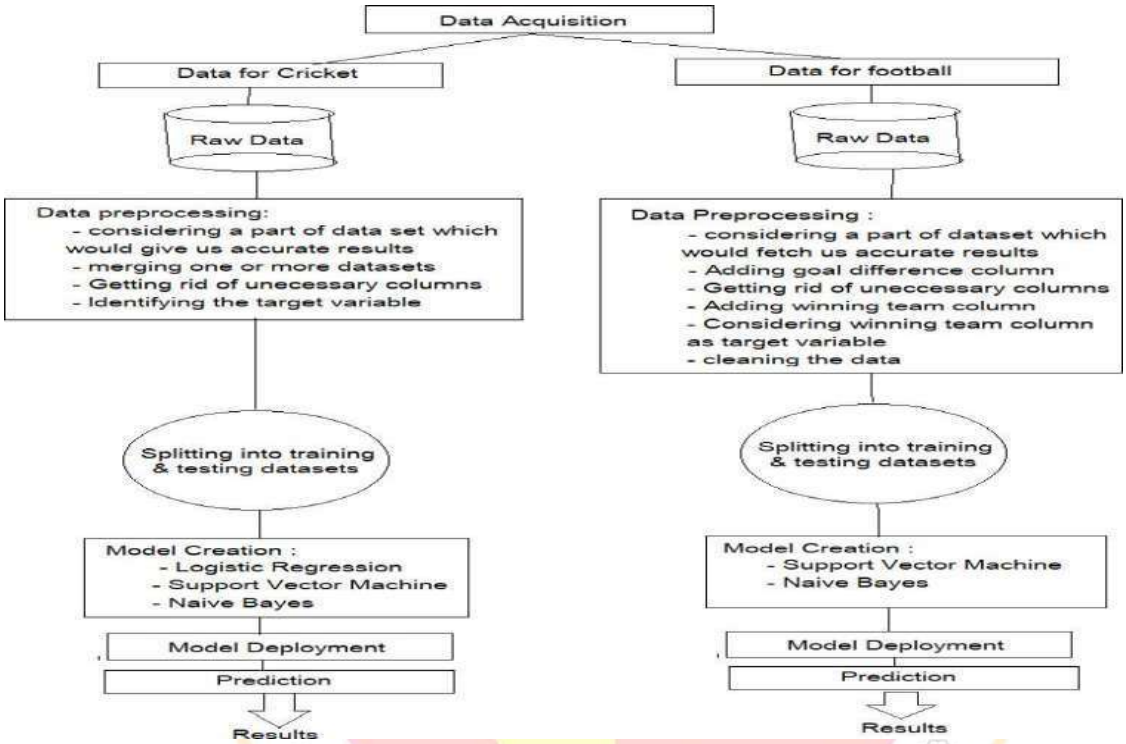
In literature, Duckworth and Louis proposed a solution called DL method to reset targets in rain interrupted matches which was adopted in the international cricket council 1998. It also consists of players performances, optimal batting order, strength of the opponent team and the performanceof their batsmen and bowlers. Various factors affecting the game, including home team advantage,day and night effect, toss etc. uses Bayesian classifier to predict the outcome of the match. We have modern classification techniques- Naive Bayes, Random Forest, Support Vector Machines.

Linear regression and nearest neighboring clustering algorithms conducted a comparative study based on their outcomes and performances. They take both the historical data and instantaneous state of the match while the game is in progress. A separate model for each team is prepared in which each team is analyzed. Random Forest is an ensemble method used for classification, regression and other tasks that operate by constructing many decision trees during training phase in classification, the output is the class which is the mode of the classes predicted by the individualtress. While in regression, mean prediction of individual trees is given as final output. This has anadvantage of correcting the flaw of decision trees which tend to overfit the training set with respectto every other team. The reason behind this is to avoid any duplicate data entry.

III Design Of The Proposed System

System Design (Block Diagram)

We explain the general design of our model and how we attacked the problem, providing a few flowcharts to help simplify the representation. Once the input dataset has been pre- processed, it is split into two features sets; one feature set that concerns features related to thehome ground and another one for the away team features. Once the dataset is split, a numberof different learning algorithms are applied on the two feature sets to derive predictive models for the match result. These models are then compared to seek the one that can be utilized for forecasting upcoming match results.



Data Set Description

Football

We have considered 4 datasets, to predict the FIFA 2018 Tournament match results. Theyare, namely: Fifa_rankings, World Cup 2018 Dataset, Fixtures and the Results datasets. Wehave obtained them from Kaggle, which has an abundant amount of data and resources, and played a huge part in achieving our goal.

i. **Fifa_rankings**: This dataset contains all available FIFA men's international soccerrankings and includes 211 teams. It includes features like the position, team name and the points scored by each team and has a size of 4.23KB with 3 columns and 211 rows.

ii. **World Cup 2018 Dataset**: This is the dataset that contains the history of all previous matches, scores and titles of all participating teams to help us predict whowill qualify and predict who will win. It also has all the participating teams, and thematch schedule with orders of the matches. The dataset contains 32 entries, each team will have 3 matches in the group stage, so each match is mentioned vs whom,the history between those 2 teams with wins minus losses. It has a size of 3KB.

iii. **Fixtures**: This dataset has all the individual match locations, the home team and away team names, the date the match took place and which group they belong to. Ithas 6 columns and 64 rows, amounting to a size of 1MB.

iv. **Results**: This dataset includes 38,903 results of international football matches starting from the very first official match in 1972 up to 2019, totaling up to 2.63MB.The features exists are date, home_team, away_team, home_score, away_score, tournament, city, country, and the matches range from FIFA World Cup to FIFI Wild Cup to regular friendly matches.

Cricket

In the case of cricket, we have reviewed three datasets, to predict the IPL 2016 match results. They are, namely: Matches, Deliveries, and Results. Like football datasets, we haveobtained them from Kaggle.

i. **Matches:** This dataset describes features like city, date, team1, team2, toss_winner, toss_decision, result, winner, win_by_runs, win_by_wickets, venue, and the umpires. It contains 636 rows and 15 columns having a total size of 114 KB.

ii. **Deliveries:** This particular dataset has the innings, batting and bowling team, overs, balls, batsman, bowler, the various kinds of runs scored, and the players dismissed.It has more than 1.5Lakh records with 20 columns and a size of 15MB.

Description of modules

Steps followed to obtain the results are.

i. Importing packages
ii. Loading the dataset
iii. Performing data exploratory analysis for semifinal
iv. Training and Testing the dataset
v. Prediction based on criteria

IV Results

Detailed report of the result going for semifinals

Brazil and Portugal
Winner: Brazil
Probability of Brazil winning:0.348
Probability of Draw: 0.262
Probability of Portugal winning: 0.191

Germany and Argentina
Winner: Germany
Probability of Draw:0.243
Probability of Argentina winning: 0.242
Detailed report of the result going for semifinals
Germany and Brazil
Winner: Germany
Probability of Germany winning: 0.200
Probability of Draw: 0.280
Probability of Brazil winning: 0.519
The winner is predicted as Germany using support vector machine (SVM)

V Conclusion And Future Scope

In this report, we presented a sports data mining approach to predict the winners of various games. Instead of using the traditional approach of comparing the statistics of the two competing teams and projecting the outcome, our approach predicts the outcomes based on the historical results of games. The competing teams are compared to other teams and game results are pulled from thosesimilar teams and used in predicting their winning probability.

In the future, this project can be extended by taking player's statistics for more accurate analysis on the algorithms we have worked on and we can also use many other algorithms and approachesto improve the

accuracy of the prediction like Naive Bayes algorithm with principle component analysis, artificial neural networks, and many other algorithms. We can also improve the performance of the current implementation related to both, feature creation and model training aswell as the prediction. In terms of future addition to the project, this project could be implementedas a web application and the same strategy for predicting the results can be used for other sports as well. In coming years, E-sports will be the biggest sports around, hence, predictions play a major role to keep the audience engaged.

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Compressing and de-noising of Biomedical Signals

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Abstract

Compressing and de-noising signals of ECG (Electrocardiograph), EEG (Electroencephalograph), GSR (Galvanic skin response), EOG (Electrooculography) and EMG (Electromyograph) is important in signal processing. Several steps are involved to process biomedical signals, among which the first step related to pre-processing, in which a noisy signal is processed for generating noise-free signal, which can be utilized for further operations. This work gives a detailed understanding of de-noising techniques those have been used. These techniques utilize the benefits of artificial neural networks (ANN), adaptive filtering, Remez Exchange Algorithm and finite impulse response (FIR) filtering. These techniques have been implemented for de-noising of biosignals, individually as well as combining with other techniques, for better results. The application of the method to simulated and biomedical signals shows its potential.
Keywords : Biomedical signals, anolog, digital, FIR Filters, Remez Exchange Algorithm

1 Introduction:

Biomedical instrumentation is the branch of Medical Sciences where the medical instruments are to be studied. Biomedical instruments are used to record, analyze & process the biomedical signals. Biomedical signals are extracting the information from biological systems like brain, muscles or heart etc, under investigation. The extracting information may be so simple to note the pulse rate of a person from wrist or so complex like analyzing the information from heart by using ECG. There are various sources for extracting signals from the biological system [1-2].

They are:

i. Bioelectric signal:- ECG (Electrocardiograph), EEG (Electroencephalograph), GSR (Galvanic skin response), EOG (Electrooculography) and EMG (Electromyograph) are the bioelectric signals. These signals are generated from the nerve cells or muscle cells. These signals are collecting from the cell membrane potential which may be excited under certain conditions to generate an action potential.

ii. Bioacoustic Signals:- Lung sounds, heart sounds, bowel sounds, and joint sounds are the bioacoustic signals generated from the human body in easy and noninvasive way during its working.

iii. Biochemical Signals:- Neurotransmitters are the chemical messengers from the body that control and regulate the body. These signals are extracted from the chemical measurement of living tissues & samples which are taken from living being.

iv. Biomechanical Signals:- This signals are extracted from some mechanical function of the biological system. The flow of blood & pressure signals, all types of motion & displacement signals are the example of the biomechanical signals.

v. Biomagnetic Signals:- MMG (Mechanomyogram) or MEG (Magneto-encephalogram) are the examples of biomechanical signals which are observed from the surface of muscles when it is contracted. Biomagnetic signals are obtained from the magnetic field produced by electrical currents occurred naturally in the brain of the living things.

vi. Bio-optical Signals:- Bio optical signals can observe either naturally or the signals may be introduced to measure a biological parameter with an external light medium.

vii. Bio-impedance Signals:- An electrical impedance signal can be obtained due to the changes in blood volume or blood resistivity from human being.

The biomedical signals are extracted from the biomedical instruments. Therefore it is useful to study of biomedical instruments.

2. Significance of Biomedical Signals

Biomedical signals are the collection of electrical signals acquired from any organ. This signal is normally a function of time. It may be in terms of its amplitude, frequency and phase. The analysis of these signals is very important for researchers as well as for careful medical diagnosis. It is also essential for proper treatment of

patients. If the signals are not properly diagnosed and analyzed, it will lead to wrong diagnosis and can be dangerous for the lives. Careful analysis of biomedical signals such as ECG, EMG, and EEG are very important for proper diagnosis of disease. These signals are noisy as well as artefacts which have to be removed for proper treatment of a patient. Presently, extensive efforts and research have been done in this area for developing better algorithms, upgrading existing methodologies, improving detection techniques to reduce noise, and to acquire accurate biosignals [3-4].

3. Sources of errors and significance of reduction of noise

Accurate measurement of biomedical signals depends on the properties of electrodes and its interaction with the skin, amplifier design and the conversion and subsequent storage of the biomedical signal from analog to digital form. Biomedical signals are influenced by electrical noise and some other factors.

3.1 Electrical noise and factors influencing biomedical signal:

The amplitude of biomedical signals is very small before being amplified. Biomedical signals collecting from any organ acquire noise while traveling through different tissues or blood vessels. Therefore it is important to understand the characteristics of the electrical noise. The electrical noise, which will be affected biomedical signals, can be categorized into the following types [5-6]:

i. Power line interference
ii. Base line drift
iii. Electrode contact noise
iv. Motion artifacts
v. Muscle contraction
vi. Instrumentation noise generated by electronic devices
vii. Electrosurgical noise

Power line interference and base line drift: This noise could be occurred due to stray effect of the alternating current and loose contact of the electrodes to the patient as well as faulty electrodes. This error can cause due to power line interference or not properly earthen measuring instruments and the patients. This noise is reduced by using notch filter [7].

Inherent noise in electronics equipment: This noise is induced by the electronics equipments and cannot be eliminated. But it can be reduced by using high quality electronic components.

Ambient noise: This type of noise is procreated by the electromagnetic radiation from the surfaces of our body. It is almost impossible to avoid this. The ambient noise may have the amplitude that is one to three orders of magnitude greater than the biomedical signal.

Motion artifact: There are two major sources of motion artifact:

1) The electrode contact with the surface of our body and
2) The cable of electrode.

Motion artifact can be reduced by properly designed set up of the electronic circuitry.

Inherent instability of signal: The amplitude of biomedical signal is random in nature. It is influenced by the firing rate of the motor units. In most of the situation, firing frequency region is of the order of 0 to 20 Hz. This class of noise is considered to be unwanted and therefore there is a need of removal of the noise [4].

Electrosurgical noise: Electrosurgical noise is procreated by different medical equipment present within the patient care environment at frequencies between 100 kHz and 1 MHz, lasting for about 1 to 10 seconds [8]. The electrosurgical noise completely destroys the ECG signal and is presented in large amplitude [5].

The specific requirement of biomedical amplifiers [9];

- ECG amplifier
  - Frequency range is about 0.05- 100Hz.
  - Safety and protection: leakage current below safety standard limit of 10 μA.
  - Electrical isolation from the power line and the (earth) ground.
  - Safety against high defibrillation voltages.

- EEG amplifier
  - Gain must deal with microvolt or lower levels of signals.
  - Components must have low thermal and electronic noise.
  - Other factors are similar to ECG.
- EMG amplifier
  - Slightly improved amplifier BW suffices.
  - Post-processing circuits are always needed (e.g. rectifier and integrator).
- EOG amplifier
  - High gain with very good low frequency or even DC response.
  - DC-drifting electrodes should be selected with great care.
  - Often active DC or drift cancellation or correction circuit may be necessary.

From the above background, it seems that the quality of biomedical signal can be improved by-

a) Design the instrumentation amplifier with increase in Signal to Noise ratio (SNR), high common mode rejection ratio (CMRR), low input referred noise voltage and low dc offset as well as very low power consumption.

b) The distortion of biomedical signal must be as small as possible by avoiding unnecessary filtering, notch filters and distortions of signal peaks.

4. Techniques used for reduction of noise

The amplitude of biomedical signals is very small. Therefore it is easily contaminated by noise. Due to noisy signal, there may be misleading of diagnosis and hence it is necessary to reduce noise from the original signals. Exclusive amplifiers designed with specific features and various filter circuits are used for reduction of noise from the biomedical signals.

***Table 1.1: Electric potentials of biomedical signals* [9]**:

Biopotential	Frequency Range	Signal Amplitude	Electrode
Electrocardiogram (ECG)	0.05 - 100 Hz	1 - 5 mV	Surface
Electromyogram (EMG)	20 - 2000 Hz	0 - 10 mV	Surface, needle
Electroencephalogram (EEG)	0.5 - 40 Hz	0.001 - 0.01 mV	Surface
Electro-oculography (EOG)	DC -10 Hz	0.01 - 0.1 mV	Contact
Action potential of neurons	0 -10 KHz	50 - 90 mV	Glass pipette

4.1 Exclusive amplifiers:

The biomedical signals are extracted from organ of human beings and it is the input to the amplifier. This input consists of five components:

i. The desired biopotential,
ii. The undesired biopotential,
iii. A power line interference signal of 50 Hz (60 Hz in some countries) and its harmonics,
iv. Interference signals generated by the tissue/electrode interface, and
v. Noise.

Essential factors to be considered for measuring equipments [8]:

- High amplification
- High CMRR (High differential gain and low common mode gain)
- High input impedance
- Low Noise
- Stability against temperature and voltage fluctuations
- Electrical safety, isolation and defibrillation protection.

Therefore proper design of the amplifiers is the extensive task. Table 1.2 shows the biopotential amplifiers design consideration for various biomedical signals.

Table 1.2 Biopotential amplifiers design consideration [10].

Biopotential	Exclusive amplifier design consideration	Additional features desired
ECG	Moderate gain, Bandwidth, noise, CMRR, Input Impedance	Electrical safety, isolation, defibrillation protection
EEG	High gain, very low noise filtering	Safety, isolation, low electrode-skin resistance
EMG	Gain and bandwidth of Op-Amps	Post acquisition data processing
EOG	DC and low drift	Electrode-skin junction potential. Artifact reduction

Now many companies are used CMOS technology for designing of high performance amplifiers, which provides increase in gain and CMRR along with low power consumption [4]. Along with high performance amplifiers, various filter circuits are also used for reduction of unwanted signals or noise. These filter circuits are classified in number of ways:

i. Analog or digital Filters
ii. Passive or active filters
iii. Audio (AF) or radio frequency (RF) filters

4.2 Analog filters

Analog filters are designed to processed analog signals, while digital filters are processed analog signals using digital techniques. Op Amp based active filters are called analog filters. Passive filter uses passive elements such as resistors, capacitors and inductors, while active filter employs transistors or operational amplifiers in addition to the resistors and capacitors. RC filters are commonly used for low frequency signals or audio signals, whereas LC or crystal filters are used for high frequency signals or radio frequency signals. The crystal provides more stable operations at high frequency due to high value of figure of merit. In audio frequencies, inductors are not used because it is bulky, expensive and may dissipate more power. It also emits magnetic field [11].

Active filters offer the advantages over passive filters:

a) Gain and frequency adjustment: The operational amplifier is capable of providing desired gain. Therefore input signal is not attenuated. Frequency response of active filter is excellent.
b) No loading problem: The active filter uses Op Amp having high input resistance and low output resistance and therefore it does not cause any loading effect.
c) Cost: Usually active filter is more economical than the passive filter. Because the circuit uses Op Amp which is not expensive and the absence of inductor.

Although active filters are most widely used in communication system and signal processing. Active filters are more extensively used in telephone, radio, television, radar, space satellites and **biomedical instruments**. The most commonly used filters are;

i. Low pass filter
ii. High pass filter
iii. Band pass filter
iv. Band reject filter
v. All pass filter

4.3 Digital Filters

Digital filters are important class of Linear Time Invariant (LTI) digital signal processing (DSP) systems. It is designed to modify the frequency characteristics of the input signal x (n). Digital filters are extensively used because of certain advantages over Analog filters. Digital filters have the potential to achieve much better signal to noise ratio than Analog filters. Digital Filters have emerged as a strong option for removing noise, shaping spectrum and minimizing Inter-Symbol Interference (ISI) in communication architectures.

Digital Signal Processing (DSP) is used in video compression, digital set-top box, cable modems, digital versatile disk, portable video systems/computers, digital audio, multimedia and wireless communications, digital radio, digital still and network cameras, speech processing, transmission systems, radar imaging, acoustic beam formers, global positioning systems, and biomedical signal processing. The field of DSP is always been driven by the advances in DSP applications and in scaled Very-Large-Scale-Integrated (VLSI) technologies [12].
The design of digital filter involves five steps [13]:

i. Filter Specification
ii. Coefficient calculation
iii. Realization
iv. Analysis of Finite word length Effects
v. Implementations

Digital Signal Processing Systems (DSPS) relate input signals x (n) to the output y (n). The relationship between the output sequence of this system and may be represented by the operator as y (n) = F [x (n)]. The Fig. 1.1 shows Discrete-time signal representation.

Figure 1.1: Discrete-time signal representation.

4.4 FIR Filter [14];

FIR filter is a digital filter without feedback. The block diagram of FIR filter is shown in the Fig. 1.2. If x (n) is the input at n^{th} time, and $x\,(n-1)$ is the delayed input then the filter output $y\,(n) = x\,(n) + x\,(n-1)$,

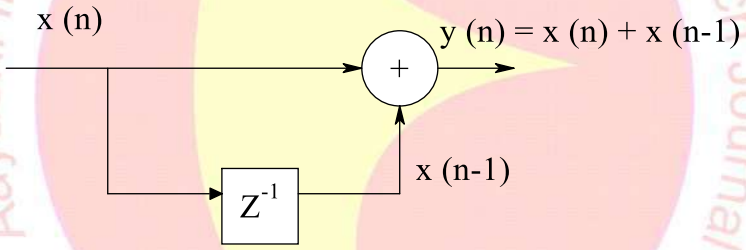

Figure 1.2: *A simple FIR filter*

The general transfer function of an FIR filter in the z transform is given by

$$H(z) = \sum_{l=0}^{M} b_l z^{-l} = H_0 z^{-M} \prod_{l=0}^{M} (z - z_l) \qquad (1)$$

A filter with the above transfer function will be always stable, i.e. an input of finite amplitude will lead to an output that is also finite. This can be inferred from the location of the poles in the z-plane (the two-dimensional plane formed by plotting the real part of z along the abscissa, and the imaginary part along the ordinate). The poles correspond to the points in the z-plane where the denominator of *H (z)* is zero; their counterparts are the zeros, where the numerator becomes zero. For the FIR filters, all poles are at the origin (z= 0), and the zeros are at the z_l in the equation above. When the poles of a transfer function are within the unit circle (i.e. $|z| < 1$), then filter is stable; this clearly stated that the case of FIR filters.
The advantage of FIR filters is that they can be designed to have linear phase. FIR filters have a linear phase response if and only if its impulse response is symmetric or anti-symmetric, that is $h\,(n) = \pm\, h\,(M - n)$. Such filters may introduce delay in the output signal with respect to corresponding input signal, but all frequencies are delayed by the same amount. These filters thus distort the features of the signal that are not linear in their phase-response.

FIR filters can be designed by using optimization packages or by using approximations to the ideal infinite-impulse responses by cutting the finite length using the different types of tapered windows. The main drawback of FIR filters is that in order to satisfy demanding specifications, FIR filters require a relatively high

number of multiplications, additions and storage elements or large memory space. This makes FIR filters potentially more expensive than IIR filters in applications where the arithmetic operations or storage elements are costly, or need to be limited in number. FIR filters has the benefit of achieving linear phase, this motivates the widespread use of it.

4.5 FIR Filter Designing Methods:

Basically FIR Filter has three methods of designing [15] :

i. Window Method
ii. Frequency Sampling Method
iii. Optimal Method (Remez Exchange Method)

4.5.1 Window Method:

The impulse response *h (k)* is related to the inverse Fourier transform of *H (ω)*. In this case, the pair of transformation is used which couples discrete time domain signals (sequence of samples) with a continuous spectral description.

Discrete Time Fourier Transformation is represented by the equation,

$$H(\omega) = \sum_{k=-\infty}^{\infty} h(k) e^{-j2\pi fTk} \qquad (2)$$

There are many types of window functions:

i. Kaiser Window
ii. Hamming Window
iii. Hanning Window
iv. Rectangular window
v. Blackmann window

By using Kaiser Window, it is quite possible to obtain separate control upon length or order of Filter. In Kaiser Window, there are two main parameters, the length of window and the shape parameter β. An important advantage of the window method is its Simplicity. It is simple to understand and simple to apply. It involves a minimum amount of computational efforts. The major disadvantage of it is its lack of flexibility.

The window method uses the Fourier series in conjunction with a class of functions known as window functions.

4.5.2 Frequency Sampling Method [15]**:**

When a desired frequency response has been specified, then the frequency-sampling method for FIR filter design is used which is the simplest and most direct technique. It consists of uniform sampling of the desired frequency response, and an inverse DFT technique is used to obtain the corresponding finite impulse response. But the results are not optimal because the response generally deviates from what is desired between the samples. When the desired frequency-response is under sampled then the resulting impulse response will be time aliased to some extent. It is important to evaluate the final impulse response by the use of a simulated DTFT (FFT with lots of zero padding) comparing to the originally desired frequency response.

4.5.3 Remez Exchange Algorithm [16]:

The Remez Exchange Algorithm is a standard method for filter designing. It minimizes the filter length and error between desired frequency response and actual frequency response. The Error function is defined as the difference between the ideal filter response and the practical filter response.

The magnitude of the error $|E(\omega)| = |W(\omega)[D(\omega) - P_c(\omega)]|$

Where

$D(\omega)$ is the ideal filter response or desired filter response,
$P_c(\omega)$ is the actual or practical filter response and (3)
$W(\omega)$ is the weight function.

The Remez algorithm is not a general linear programming approach, but it is very robust, converges very rapidly to the optimal solution, and is widely used.

Optimal Filter Design Method is used to design a filter, in which filter coefficients are adjusted again and again until a particular error is minimized. The various methods of optimal filter design are as follows:

i. Least square method.

ii. Equiripple method.
iii. Maximally flat.
iv. Generalized equiripple.
v. Constrained band equiripple.

5. Results and discussion

We started working with digital filter like FIR filter. We found that the source of noise doesn't have any fix band of interference, so we were planned for adaptive filtering algorithms. The algorithms differentiate in a way of updating the coefficient (h) of filter sample by sample inputs. After an extensive experimentation over the adaptive algorithms, it is observed that the performance of filters depend on the SNR values of input signal, μ value (Step size), number of taps and other factors. Finally, we choose Artificial Intelligent based filtering algorithms for dynamic solution. These techniques have only two processes- training and testing. Training process based on subset outcomes of adaptive filtering algorithm in initial stages, which may not require in later time even on change of source input as well, called trained filter / smart filter. Such intelligent filters give the freedom of selection of signal with different SNR values; also not bother about number of parameter settings which lead one more step towards the auto filter concept. The goal of our proposed work is to develop an algorithm which will use for removing noise excellently.

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Noise Reduction of Electromyography (EMG) signals by Artificial Neural Network (ANN) Technique

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Abstract

Electromyography (EMG) signals can be used for clinical/biomedical application and modern human computer interaction. EMG signals acquire noise while traveling through tissue, inherent noise in electronics equipment, ambient noise, and so forth. In this paper, it is shown that a Focused Artificial Neural Network ANN can elegantly solve to reduce the noise from EMG signal. It is seen that the performance of the proposed ANN clearly outperforms the best techniques. It is observed that ANN Filters work excellently as compared to adaptive filters and also observed that as the number of testing samples of biomedical signals.

Keywords: EMG, SNR, MSE, MATLAB, ANN

1 Introduction:

Biomedical signals are the collection of electrical signals and analysis of these signals is very important for researchers as well as for careful medical diagnosis. It is also essential for proper treatment of patients. If the signals are not properly diagnosed and analyzed, it will lead to wrong diagnosis and can be dangerous for the lives. Careful analysis of biomedical signals such as ECG, EMG, and EEG are very important for proper diagnosis of disease. These signals are noisy as well as artefacts which have to be removed for proper treatment of a patient. Presently,extensive efforts and research have been done in this area for developing better algorithms, upgrading existing methodologies,improving detection techniques to reduce noise, and to acquire accurate bio-signals [1-4].

The EMG signal is a biomedical signal that measures electrical currents generated in muscles during its contraction representing neuromuscular activities. The nervous system always controls the muscle contraction and relaxation. Hence, the EMG signal is a complicated signal, which is controlled by the nervous system and is dependent on the anatomical and physiological properties of muscles. EMG signal acquires noise while traveling through different tissues. The main reason for the interest in EMG signal analysis is in clinical diagnosis and biomedical applications. So far, research and extensive efforts have been made in the area, developing better algorithms, upgrading existing methodologies, and improving detection techniques to reduce noise and to acquire accurate EMG signals. Noise removal from noisy EMG signal is a filtering problem. Here the Neural Network model is trained to separate known noise from EMG signal. Neural Networks (NNs) have been efficiently used for nonlinear multivariable function approximation [5-7].

The main objective of our research work is to develop artificial intelligent model for reduction of noise from biomedical signal. This paper deals with intelligent removal of noise from the EMG signal using ANN-based Techniques.

2. Experimental : Performance measures by using following two factors**;**

i) Signal to Noise Ratio (SNR):

The output SNR (SNR_{out}), is calculated from power of the input signal x (n) and an noise signal e (n) and is given by,

$$SNR_{out} = 10 \ Log_{10} \left[\frac{\text{Signal Power}}{\text{Noise Power}} \right]$$

Where, SNR_{out} is the ratio of the two powers expressed in decibels.

ii) Mean Square Error (MSE)

The formula for the mean square error is given by,

$$MSE = \frac{1}{N} \sum_{i=1}^{N} \left(\hat{y}_i - y_i \right)^2$$

Where, N = number of samples in the set of data,

y_i = Actual network output, and

$\hat{y}_i$ = Desired network output.

2.1 Experimental Arrangement

i) Database Descriptions:

To design ANN Model, a sufficiently large amount of data is required for training and testing. We have collected standard data bases for biomedical signal from the https://physionet.org, http://www.emglab.net and etc.

ii) Software Specification Requirement: MATLAB:

MATLAB is very rich in command toolbox. Although MATLAB is intended primarily for numerical computing, an optional toolbox uses the MuPAD, symbolic engine, allowing access to symbolic computing capabilities. Matlab for designing artificial intelligent model. MATLAB has enormous Toolboxes. Out of which, we used Signal processing toolbox, Neural network toolbox, Fuzzy logic toolbox, Filter design toolbox, Curve fitting toolbox, and Data based toolbox for design the filters [8-9].

In this paper, we have simulated the MATLAB codes for the data conversion, adaptive filter algorithm, artificial intelligent ANN Model training and its testing.

iii) Software Implementation details:

The GUI has been constructed by using Matlab codes. Other set of codes have been used to run the various algorithms for noise removal in Matlab simulator. The main GUI contains four parts as shown in the following Fig. 1.1.

1] File input and its conversion
2] Adaptive filter algorithm and its Input parameter section
3] Output parameters section
4] Artificial intelligent noise removal section.

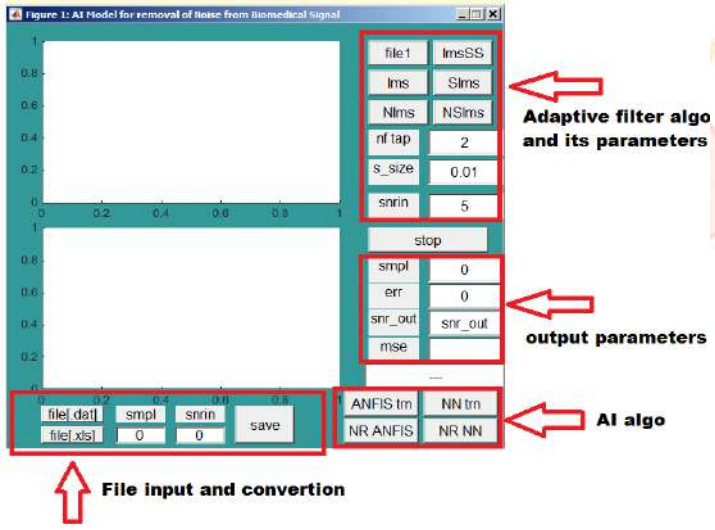


Figure 1.1: Artificial Intelligent Model for reduction of biomedical signal

2.2 Artificial intelligent noise removal algorithm: We have designed an artificial intelligent model for removal of noise from the biomedical signal by using Matlab coding on the basis of Sugeno architecture and run the

programme which creates graphical user interface. The Fig. 1.2 shows the block diagram of proposed artificial intelligent model.

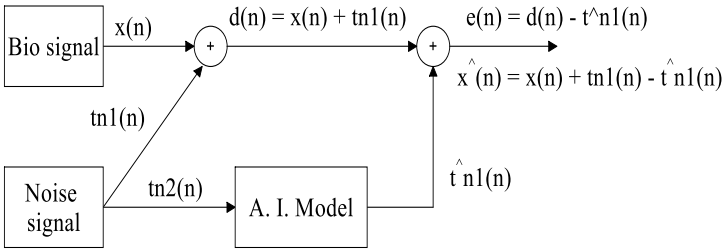


Figure 1.2: Block diagram of proposed A. I. Model

2.3 ANN based Noise Removal Algorithm:

Similar basic steps have been processed for training and weight storage of Neural Network Model as like an ANFIS. First we have trained the Neural Network by processing flowchart shown in Fig. 1.3 using 'allwe' file of relevant algorithm. Then processed the same steps used in ANFIS Model to save the weights, MF and MFT parameters. Once parameters have been saved then network was ready to test. Then we have tested neural network by performing steps as given in Flowchart of Fig. 1.4 on various biomedical signals.

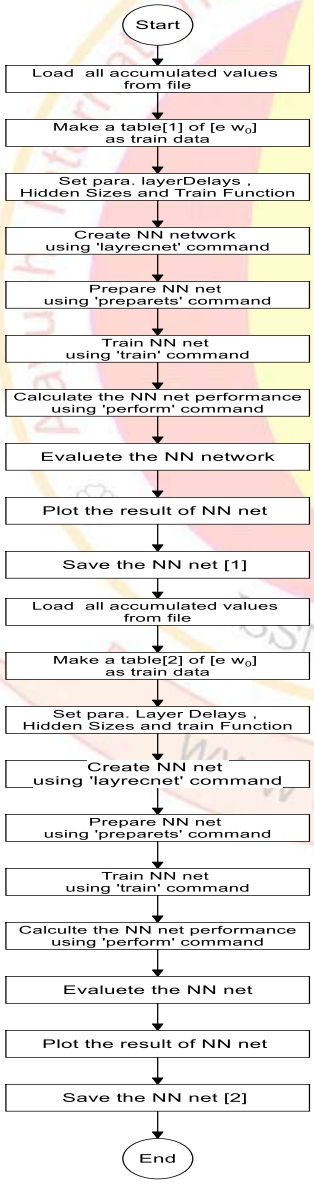


Fig.1.3: Flow chart of training of ANN Model

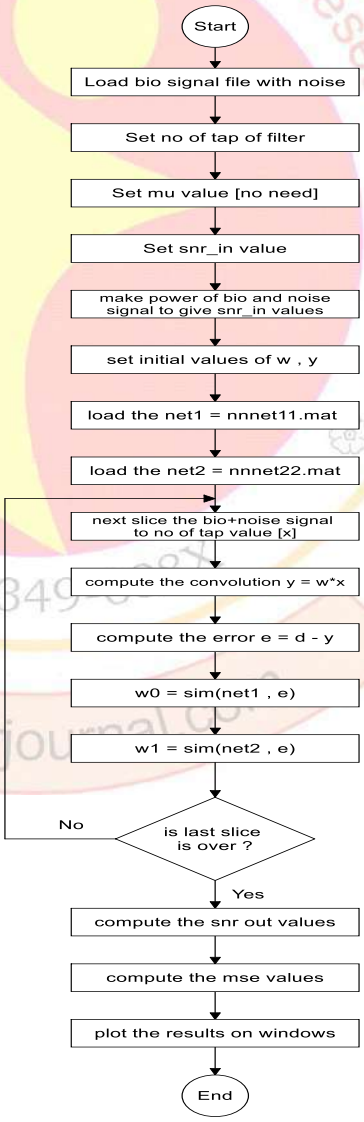


Fig.1.4: Flow chart of testing of ANN Model

2.4 Simulations

The major objective of this study was to investigate a noise removal filters. For this, simulations are carried out on EMG signals. The results are obtained on the output parameter section of MATLAB based GUI for removal of noise from biomedical signals [10-15].

We have taken various data-based files of EMG from cited resources given in database descriptions. First, we have converted these files into MATLAB format file that is .mat format for further processing and saved as .mat files.

Then we processed the adaptive filters on saved files. We have used LMS related algorithms namely LMS, Sign LMS, Sign LMS, Normalized LMS and Normalized LMS Sign for different step sizes, tap values and different SNR in values.

For the illustration of all these simulation process, in shortest way, we have taken the screen snap for LMS related algorithm mentioned above for ANN Model. After application of adaptive filtering process, we have gathered all needful data in the allwe_algo_name .mat file for the further training and testing of artificial intelligent algorithm such as noise removal Neural Network.

During the adaptive filtering, training and testing process, the all information regarding input parameters, output parameters and process status along with plots, etc. have available on the GUI panel. For ready outcome in notable way, we have summarized all the observations in tabular form.

The adaptive Filters based on LMS algorithms have been trained on ECG and EMG (Blue lines) signal (File name- 100.mat) of samples = 500. It is shown in Fig. 1.3

The various biomedical signals having sample size= 500: ECG and EMG (Blue lines) and biomedical signals with noise (Red lines) have been used for testing of Artificial intelligent and ANN model as shown in Fig. 1.4. a,b,c,d,. The performance parameters such as signal to noise ratio and MSE have been observed from GUI for various step sizes using different adaptive algorithms on ECG1 Signal as given in Table 1.1 and Table 1.2.

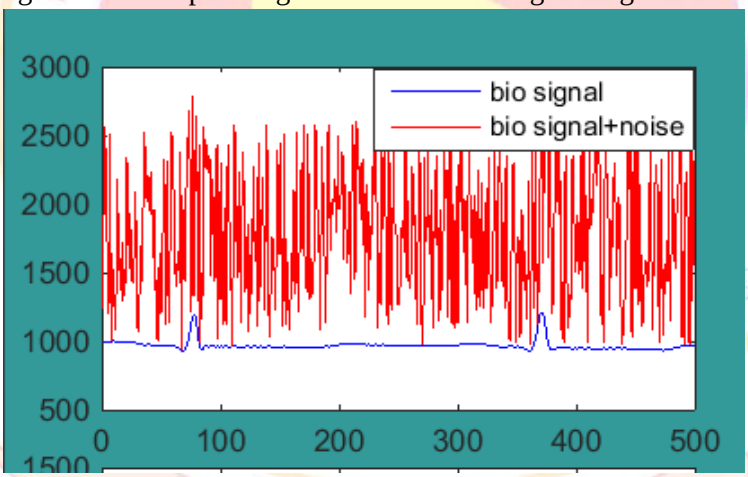
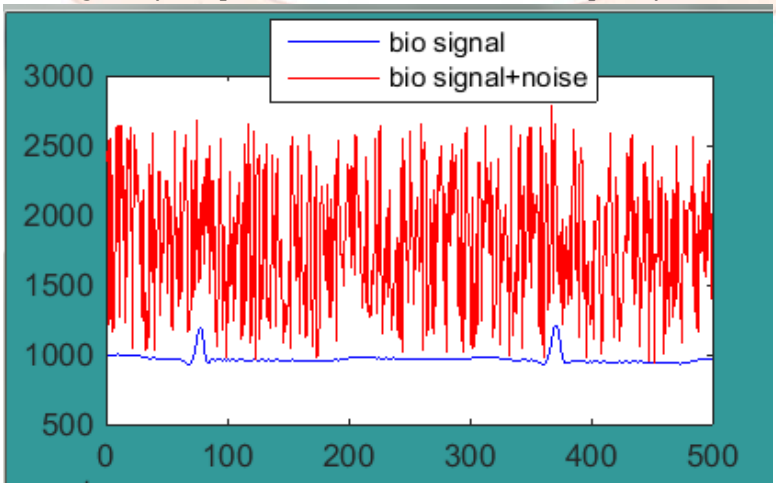


Figure 1.3: ECG signal of Samples= 500 used to train the adaptive filters LMS algorithms



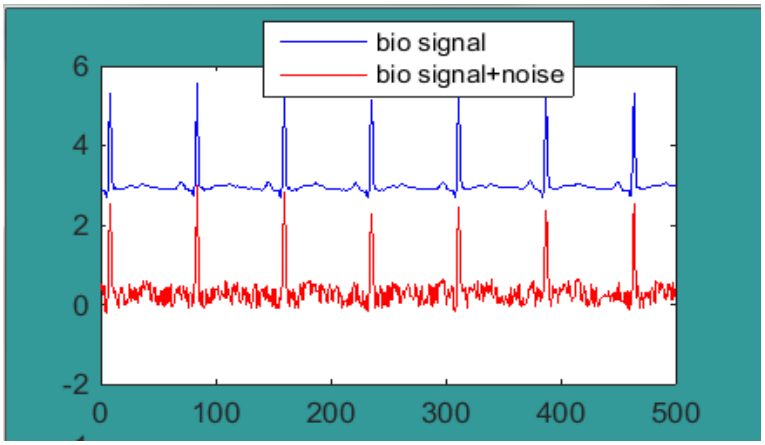


Figure 1.4 .a,b.: Blue line shows biomedical signals (ECGs and EMGs) and Red line shows biomedical signals with noise

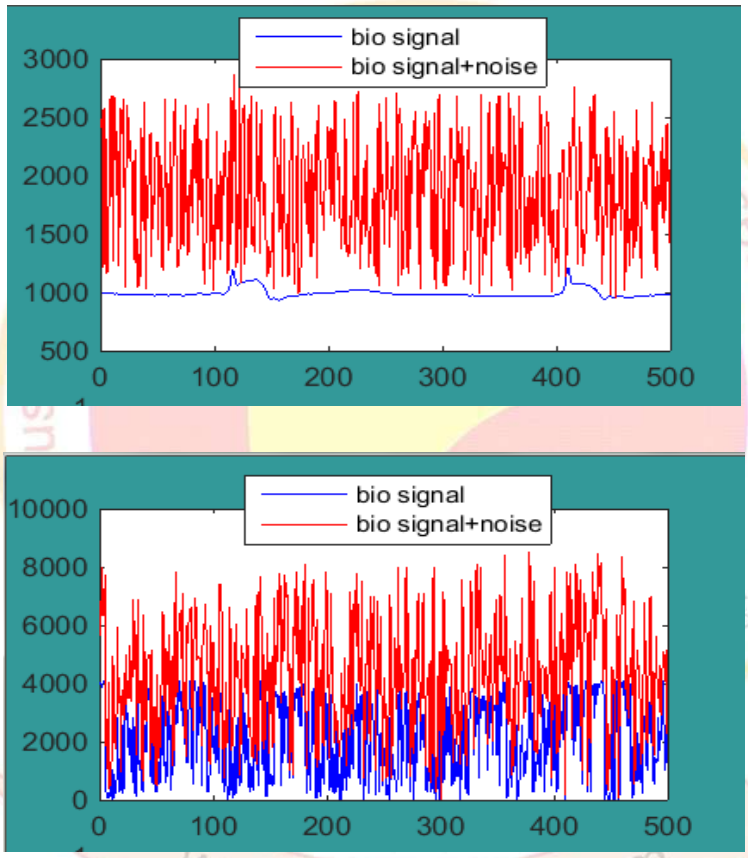


Figure 1.4.c,d: Blue line shows biomedical signals (ECGs and EMGs) and Red line shows biomedical signals with noise

Simulation Result for various Step under Adaptive Filters:

Table 1.1: Signal to noise ratio for various step sizes using different adaptive algorithms (on ECG1 Signal).

Step Size	SNR_out				
	LMS	**NLMS**	**NSLMS**	**SLMS**	**SSLMS**
1e-7	-0.19906	26.7339	26.7339	7.97304	26.7338
1e-8	0.21109	26.7339	26.7339	24.324	26.7339
1e-9	1.23573	26.7339	26.7339	26.7018	26.7339
1e-10	10.2783	26.7339	26.7339	26.7336	26.7339
1e-11	24.5255	26.7339	26.7339	26.7339	26.7339

1e-12	26.7039	26.7339	26.7339	26.7339	26.7339
1e-13	26.7336	26.7339	26.7339	26.7339	26.7339
1e-14	26.7339	26.7339	26.7339	26.7339	26.7339
1e-15	26.7339	26.7339	26.7339	26.7339	26.7339

Table 1.2: Mean square error for various step sizes using different adaptive algorithms

Step Size	**MSE**				
	LMS	**NLMS**	**NSLMS**	**SLMS**	**SSLMS**
1e-7	977169	1980.05	1980.05	148854	1980.09
1e-8	889108	1980.05	1980.05	3448.79	1980.05
1e-9	702247	1980.05	1980.05	1994.74	1980.05
1e-10	87545	1980.05	1980.05	1980.20	1980.05
1e-11	3292.4	1980.05	1980.05	1980.05	1980.05
1e-12	1993.78	1980.05	1980.05	1980.05	1980.05
1e-13	1980.19	1980.05	1980.05	1980.05	1980.05
1e-14	1980.05	1980.05	1980.05	1980.05	1980.05
1e-15	1980.05	1980.05	1980.05	1980.05	1980.05

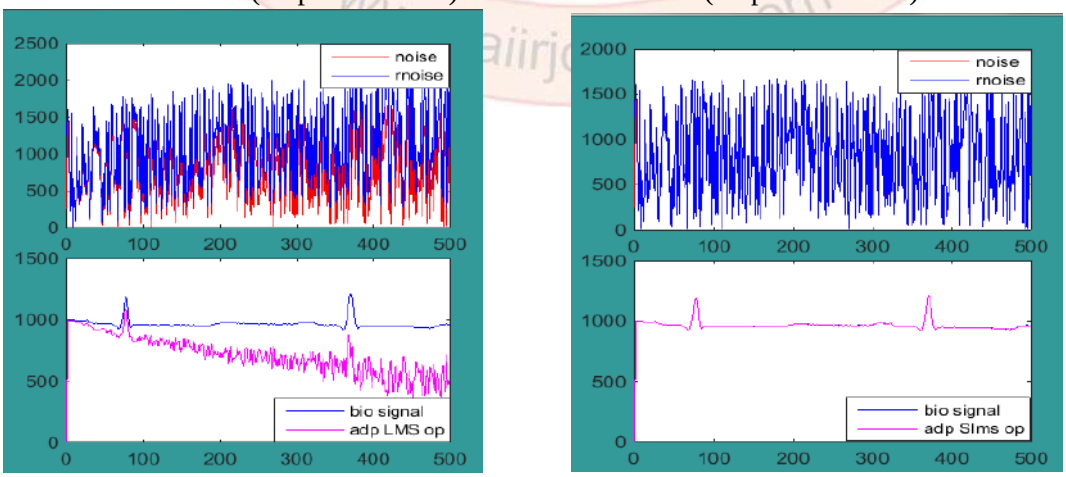
Table 1.1 shows that SNR_out for various step sizes on LMS related algorithms. From this, we have observed that NLMS and NSLMS performed better at step sizes from 1e-07 to 1e-15. But overall, all algorithms have good performance on step size 1e-10, which governs the rate of convergence and speed of tracking ability.
However, use of small step size is to ensure a small steady state error but it may decreases the convergence speed of the adaptive filter. However, increase in step size is to improve the convergence speed of the adaptive filter, but it might cause the adaptive filter to become unstable, so we have to select optimum value of step size [15,16]. The adaptive filter processed on LMS related algorithms using ECG 1 (100.mat file). The outcomes are depicted on GUI in Fig. 1.5.
Number of Samples used for Adaptive filters = 500.

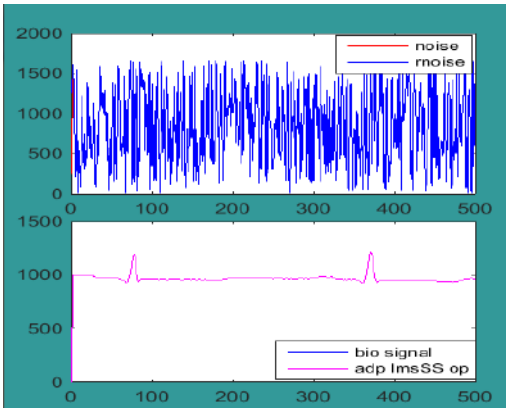
The Percent Root mean square Difference (PRD) indicates the reconstruction fidelity by point wise comparison with the original data. Another definition of error measure is called PRD and is given by:

$$PRD = \sqrt{\frac{\sum_{n=1}^{N}[x[n]-\hat{x}[n]]^2}{\sum_{n=1}^{N}[x[n]-\bar{x}]^2}} \times 100$$

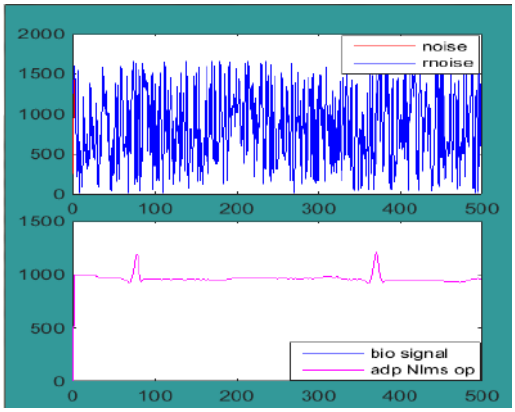
Where x[n] and x [n] are the original and reconstructed signals of length N, respectively and x is the average value of the signal. PRD provides a numerical measure of the residual root mean square (RMS) error and the observed value of prd_val = 0.0461 [10-11].

LMS (Step size=1e-10) SLMS (Step size= 1e-10)





SSLMS (Step size= 1e-10)



NLMS (Step size= 1e-10)

NSLMS (Step size= 1e-10)

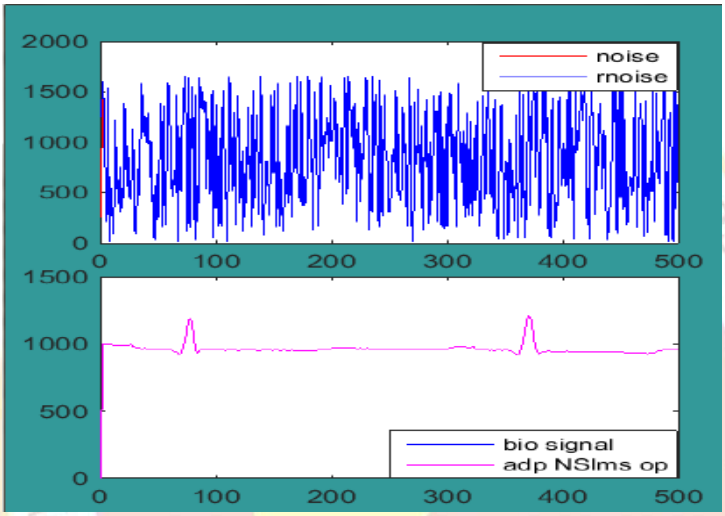


Figure1.5: Simulation Result of Adaptive Filters for the ECG 1 signal (LMS, Sign LMS, Sign Sign LMS, Normalized LMS & Normalized LMS Sign algorithms)

Table1.3: Report of Adaptive filters for various algorithms.(No. of Samples = 500)

Algorithm	**Parameters [μ =1e-10 and No. of Taps= 2]**		
	SNR in	SNR out	MSE
LMS	0	10.333	86450.1
SLMS	0	26.7336	1980.19
SSLMS	0	26.7339	1980.05
NLMS	0	26.7339	1980.05
NSLMS	0	26.7339	1980.05

From the Tables 1.1 and 1.2, we have to select proper value of step size which gives the good SNR out and minimum MSE. Thus we have preferred optimum value of step sizes which shows the best fit of straight line. Then we have developed adaptive filters for various LMS algorithms. The SNR out and MSE of various adaptive filters is shown in the Table 1.3.

3. Results and Discussion

The higher level of noise reduction is possible by performing adaptive noise cancellation techniques, otherwise this level of reduction of noise is difficult to achieve by using conventional filtering methods. As per the simulation results, it is observed that LMS algorithm has some limitations such as instability when the power

of input signal changes or the value of step size varies resulting in change of the rate of convergence. Thus SSLMS, NLMS and NSLMS algorithms are evolved from LMS algorithm to overcome the above-mentioned limitations. From the Table 1.1 and 1.2, it is inferred that the SSLMS, NLMS and NSLMS algorithm shows far greater stability with different step size. This combined with good convergence speed and relative computational simplicity. Thus, the SSLMS, NLMS and NSLMS algorithms are ideal for the real-time adaptive noise cancellation system. The amount of variation in non-stationary signals is difficult to control. LMS and SLMS have relatively poor performance for non-stationary as compared to SSLMS, NLMS and NSLMS and if we have to improve the performance of LMS and SLMS, the step size should have to reduce resulting in long convergence time. It is observed that ANN Filters works excellently as compared to adaptive filter and also observed that as the number of testing samples of biomedical signal (100.mat file) increases then the SNR value increases, while that of MSE decreases.

Thus, from the overall observations, we have concluded that the artificial intelligent networks ANN can be used to reduce noise from various biomedical signals intelligently. The SSLMS, NLMS and NSLMS are more precise and consistence as compared LMS and SLMS algorithms for wide range of step sizes [17-21].

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Adaptive Neural-Based Fuzzy Inference System (ANFIS) : A Survey

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Abstract

The main aim of this study is to develop a flow prediction method, based on the adaptive neural-based fuzzy inference system (ANFIS) coupled with stochastic hydrological models. In comparison with the Mamdani model, the Sugeno model is based on automatic learning from the data and can accurately approximate a function using few rules. It has a stronger and more flexible illustration capability than the Mamdani model.

Keywords: ANFIS, Fuzzy Systems, Mamdani, Sugeno , Membership Function

Introduction: Fuzzy Systems

Fuzzy systems suggest a mathematical system that interprets the subjective human knowledge of the real time processes. This is a way to manipulate practical knowledge with some level of uncertainty. Fuzzy sets theory was introduced by Lofti Zadeh in 1965. The general architecture of a fuzzy system is depicted in Figure 1.1 The behavior of these systems is described by using a set of fuzzy rules such as *IF <premise> THEN <consequent>*. These system uses linguistics variables with symbolic terms. Each term represents a fuzzy set. The terms of the input space compose the fuzzy partition. The fuzzy system consists of three stages [1-4]:

1. The values of numerical inputs are mapped by a function according to a degree of compatibility of the respective fuzzy sets. This operation is called fuzzification.
2. The fuzzy system processes the rules in accordance with the firing strengths of the inputs.
3. The resultant fuzzy values are transformed again into numerical values. This operation is called defuzzification.

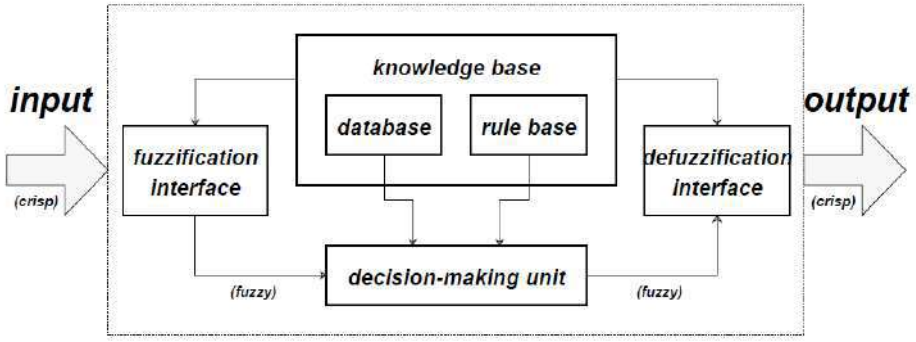

Figure1.1: Basic Components of Fuzzy System

In an FIS, the knowledge base is comprised of the fuzzy rule base and the database. The database contains the linguistic term sets considered in the linguistic rules and the MFs defining the semantics of the linguistic variables, and information about domains. The rule base contains a collection of linguistic rules that are joined by AND/OR operator. Expert can provide his knowledge in the form of linguistic rules *(Hao Yu et al.)*. The fuzzification process collects the inputs and then converts them into linguistic values or fuzzy sets. The decision logic which is called as fuzzy inference which generates output from the input, and finally the defuzzification process produces a crisp output for control action.

Interpretations of a certain rule or the rule base depend on the FIS model. The Mamdani and the Tagaki-Sugeno-Kang (TSK) or simply Sugeno model are two popular FISs. TheMamdani model is a non-additive fuzzy model that aggregates the output of fuzzy rules using the maximum operator, while the Sugeno model is an additive fuzzy model that aggregates the output of rules using the addition operator [1-4].

Mamdani inference model

Fuzzy variables are pasteurized by fuzzy logic rules with MIN and MAX operators. The fuzzy logic can be interpreted as the extended Boolean logic: for binary 0 and 1, the MIN and MAX operators, AND and OR

operators in Boolean logic, respectively. This has been depicted in the Table 1.1 and for fuzzy variables, the MIN and MAX operators [1-4].

Table 1.1: Binary Operations Using Boolean Logic and Fuzzy Logic

A	B	A AND B	MIN (A,B)	A OR B	MAX (A, B)
0	0	0	0	0	0
0	1	0	0	1	1
1	0	0	0	1	1
1	1	1	1	1	1

Table 1.2: Fuzzy Variables Operations Using Fuzzy Logic

A	B	MIN (A,B)	MAX (A, B)
0.3	0.5	0.3	0.5
0.3	0.7	0.3	0.7
0.6	0.4	0.4	0.6
0.6	0.8	0.6	0.8

In Mamdani model, let's assume that we have two fuzzy control rules:
R1: if *x* is *A1* and *y* is *B1* then *z* is *C1* and also
R2: if *x* is *A2* and *y* is *B2* then *z* is *C2*
Fact: *x* is *x0* and *y* is *y0*
Consequence: *z* is *C*
The inference procedure of the Mamdani model with the min (AND) and max (OR) operators and fuzzy inputs is shown in Figure 1.2.

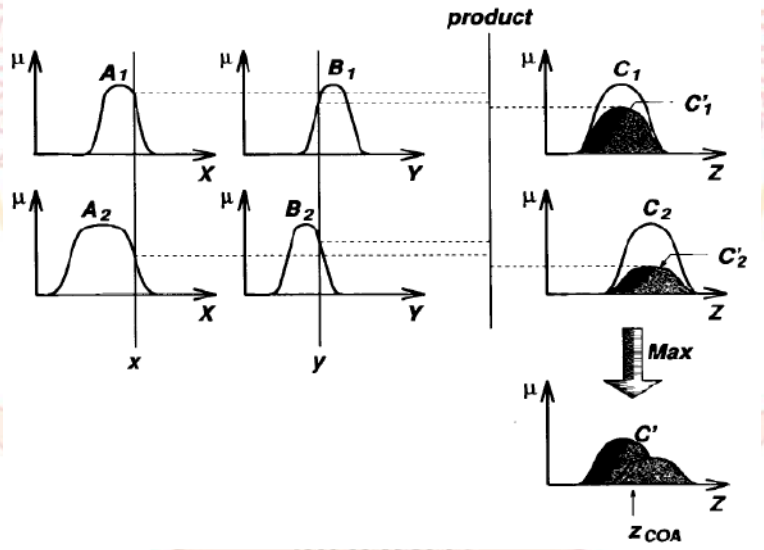

Figure 1.2: Mamdani Inference Model

The fuzzy implication is modeled by Mamdani's minimum operator and the sentence connective is also interpreted as propositions and defined by max operator[4].
The firing levels of the fuzzy rules denoted by α_i, i = 1, 2, are computed by
$\alpha_1 = A_1(x_0) \wedge B_1(y_0)$, $\alpha_2 = A_2(x_0) \wedge B_2(y_0)$
The individual rule outputs are obtained by
$C'_1(w) = (\alpha_1 \wedge C_1(w))$, $C'_2(w) = (\alpha_2 \wedge C_2(w))$
Then the overall system output is computed by the individual rule outputs

$C(w) = C'_1(w) \vee C'_2(w) = (\alpha_1 \wedge C_1(w)) \vee (\alpha_2 \wedge C_2(w))$

Finally, to obtain a deterministic control action, employ any defuzzification strategy. For the instance, defuzzified value of fuzzy set is defined as its fuzzy centroid:

$$Z_o = \frac{\int z\, C(z)\, dz}{\int C(z)\, dz}$$

The Mamdani Model consists of five layers as depicted in Fig. 1.3.

Details are given below*;*

Layer 1: Input layer

Layer 2: Input membership or fuzzification layer

- Neurons represent fuzzy sets used in the antecedents of fuzzy rules determine the membership degree of the input.
- Activation function: The membership function.

Layer 3: Fuzzy Rule Layer

- Each neuron corresponds to a single fuzzy rule.
- Conjunction of the rule antecedents: *product*
- Output: the firing strength of fuzzy rule R_i ,$\mu_{Ri} = \mu_{Aj} \times \mu_{Bk}$
- The weights in layer 3 and layer 4 : the normalized degree (certainty factors) of confidence of the corresponding fuzzy rules.

They are adjusted during training.

Layer 4: Output membership layer

- Disjunction of the outputs: $\mu_{C\,i} = \mu_{Rj} \oplus \mu_{Rj} = \sum \mu_{Rj}$*: sum.*
- The integrated firing strength of fuzzy rule neurons R_j and R_k.
- Activation function: The output membership function.

Layer 5: Defuzzification layer

- Each neuron represents a single output. (Ex.- Centroid Method).

Learning:

- A various learning algorithm may be applied: Back propagation.
- Adjustment of weights and modification of input/output membership functions.
- Sum-Product composition and centroid defuzzification was adopted; a corresponding ANFIS was constructed easily.
- Extra complexity with max-min composition – no better learning capability or approximation power.

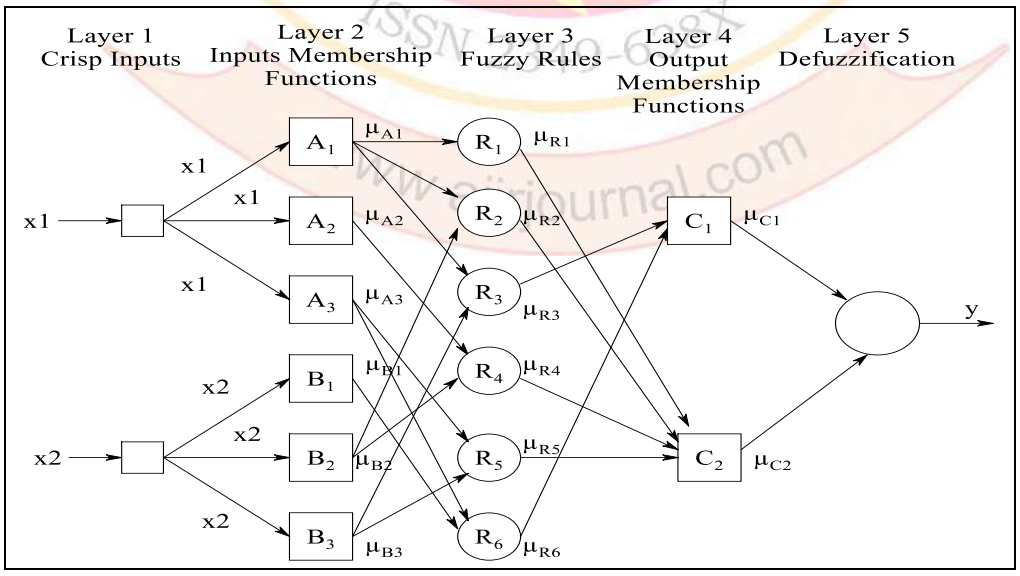

Figure1.3: Neuro Fuzzy Equivalent System

The Mamdani model offers a high semantic level and a good generalization capability. It contains fuzzy rules built from expert knowledge. However, FISs based only on expert knowledge may result in insufficient accuracy. For accurate numerical approximation, the Sugeno model can usually generate a better performance.

Sugeno inference model

However, TSK or Sugeno architecture is more popular than Mamdani architecture where the defuzzification layer was replaced by normalization and weighted average. The TSK architecture does not require MAX operators, but a weighted average is applied directly to regions selected by MIN operators. TSK architecture is actually very straightforward method, in which the output weights are proportional to the average function values at the selected regions by MIN operators. The TSK fuzzy system works as a lookup table. Sugeno and Takagi use the following architecture which is graphically represented in Figure 1.4.

R_1: if x is $A_1$and y is B_1then $z_1 = p_1x + q_1y + r_1$

R_2: if x is $A_2$and y is B_2then $z_2 = p_2x + q_2y + r_2$

Fact: x is $x_0$and y is y_0

Consequence: z

The firing levels of the fuzzy rules are computed by

$w_1 = A_1(x_0) \wedge B_1(y_0)$, $w_2 = A_2(x_0) \wedge B_2(y_0)$

Then the crisp control action is demonstrated as

$$Z_0 = \frac{w_1 z_1 + w_2 z_2}{w_1 + w_2}$$

If we have n rules in our rule-base system then the crisp control action is calculated as

$$Z_0 = \frac{\sum_{i=1}^{n} w_i z_i}{\sum_{i=1}^{n} w_i}$$

Where w_i denotes the firing level of the i^{th} rule, i= 1, 2 . . . , n

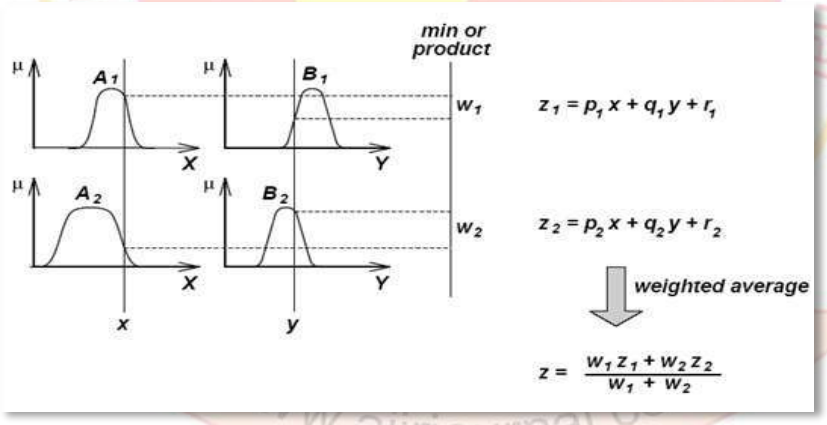

Figure 1.4: Sugeno Fuzzy Model

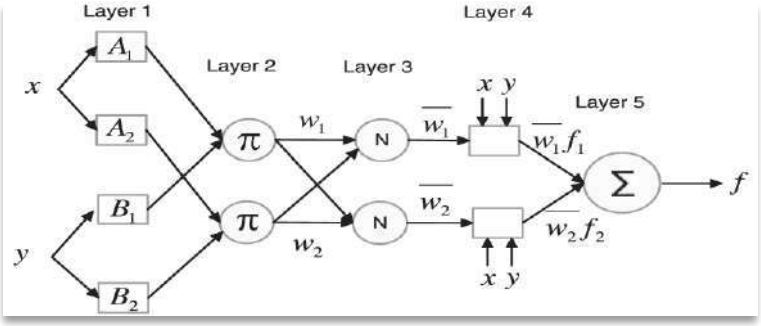

Figure 1.5: Equivalent ANFIS architecture

The TSK model normally selects *z* as first-order polynomial, hence the model is also called the first-order TSK model. When *z* is selected as constant, it is termed as the zero-order TSK model and can be regarded as a special case of the Mamdani model.

In comparison with the Mamdani model, the Sugeno model is based on automatic learning from the data and can accurately approximate a function using few rules. It has a stronger and more flexible illustration capability than the Mamdani model. In the Sugeno model, rules are extracted from the data, but the generated rules may have no meaning for experts. The Sugeno model has found more successful applications in building the fuzzy systems.

The Sugeno Model consists of five layers as depicted in Fig. 1.5, called ANFIS architecture. Details are given below;

Layer 1: Fuzzification layer

Every node I in the layer 1 is an adaptive node with a node function.

$O_{1,I} = \mu_{Ai}(x)$ for i=1,2 or : membership grade of a fuzzy set A1,A2 $O_{1,I} = \mu_{Bi-2}(y)$ for i=3,4.

Parameters in this layer: premise (or antecedent) parameters.

Layer 2: Rule layer

A fixed node labeled as Π where the output is the product of all the incoming signals: $O_{2,I} = w_i = \mu_{Ai}(x)\ \mu_{Bi}(y)$ *for i=1,2….,* firing strength of a rule.

Layer 3: Normalization layer

A fixed node labeled N.

The i-th node calculates the ratio of the i-th rule's firing strength to the sum of all rules' firing strength: $O_{3,I} = \underline{w_i} = w_i / (w_i + w_i)$ for*i=1,2.*

Outputs of this layer are stated as normalized firing strengths.

Layer 4: Defuzzification layer

An adaptive node with a node fn$O_{4,I} = \underline{w_i} f_i = \underline{w_i}\ (p_i x + q_i y + r_i)$ for*i=1,2,……..,* where $\underline{w_i}$is the normalized firing strength from layer 3 and $\{p_i\ ,\ q_i\ \ r_i\}$ is the set of parameter pf this node are called the Consequent Parameters.

Layer 5: Summation neuron

A fixed node which computes the overall output as the summation of all incoming signals.

Overall output = $O_{5,1} = \sum \underline{w_i} f_i = \sum \underline{w_i} f_i / \sum \underline{w_i}$.

ANFIS learning:

A learning algorithm of the least-squares estimator including the gradient descent method.

Forward Pass: adjustment of *consequent parameters, pi, qi, ri.*

Rule consequent parameters are known by the least-square estimator.

Find a least-square estimate of $k=[r_1\ p_1\ q_1 .. r_2\ p_2\ q_2\ ..r_n p_n q_n]$, k^*, that minimizes the squared error $e=|O_d - O|^2$.

$E = e^2 / 2 = (O_d - O)^2 / 2$.

The consequent parameters are adjusted while the antecedent parameters remain fixed.

Backward Pass: adjustment of antecedent parameters.

The antecedent parameters are tuned while the consequent parameters are kept fixed.

(Ex.) Bell activation function: $1/ [1 + ((x-c)/a)^{2b}]$.

Membership Function:

A fuzzy set is wholly characterized by its membership function (MF). Since most fuzzy sets in use have a universe of conversation X consisting of the real line R, it would not be practical to list all the pair defining a membership function. A more convenient and brief way to define an MF is to express it as a mathematical formula *[5].*

1. Triangular MF:

$$traingle\ (x; a,\ b,\ c) = \max \left[\min \left(\frac{x-a}{b-a}, \frac{c-a}{c-b} \right), 0 \right]$$

2. Trapezoid MF:

$$trapezoid\ (x;a,\ b,\ c,\ d) = \max\left(\min\left(\frac{x-a}{b-a}, 1, \frac{c-a}{c-b} \right), 0 \right)$$

3. Gaussian MF:

$$gaussian\ (x;\ 6\ ,\ c) = \exp\left\{ -\left[\frac{x-c}{6} \right]^{2} \right\}$$

1. Generalized Bell MF:

$$bell\ (x;\ a,\ b,\ c) = \frac{1}{1 + \left| \frac{x-c}{a} \right|^{2b}}$$

2. Sigmoidal MF:

$$sigmoid\ (x;\ a,\ b,\ c) = \frac{1}{1 + \exp\left[a\ (x - c\ ) \right]}$$

In the proposed model, we have used Generalized Bell Membership Function. So, brief discussion is given here. Figure1. 7.6 depict the meaning of parameters in Generalized Bell Function. These parameters are referred as premise parameters.

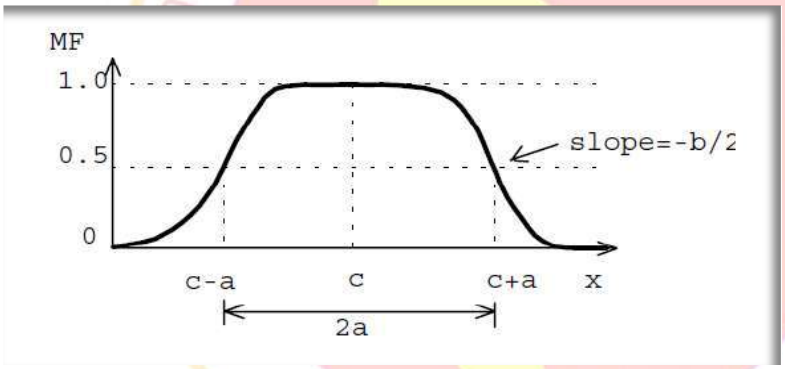

Figure1.6: Meaning of parameters in Generalized Bell Function

The parameter b is usually positive. If it is negative, the shape of this MF becomes an upside-down bell. However, each of these parameters has a physical meaning: *c* determines the centre of the corresponding membership function; *a* is the half width; and *b* (together with *a*) controls the slopes at the crossover points.

Note that this MF is the overview of Cauchy distribution used in probability theory, so it is also referred to as the Cauchy MF. Because of their smoothness and concise notation, Gaussian and bell MFs are becoming increasingly popular for specifying fuzzy sets [2-3].

Advantages and disadvantages of Fuzzy Systems [8-10]:

The advantages of the fuzzy systems are:

- It has capacity to represent inherent uncertainties of the human knowledge with linguistic variables.
- It has ability to interact with the expert of the domain with the engineer designer.
- It represents the natural rules, so it can easily interpret the results.
- It can easily widen the base of knowledge through the addition of new rules.
- It is robust method in relation with the possible disturbances in the system.

Disadvantages of fuzzy system are:

- It is incapable to generalize or answer to what is written in its rule base.
- It is not robust in relation to the topological changes in the system. Topological changes will have to demand alterations in the rule base.
- It has to depend on the existence of a expert to determine the inference logical rules.

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Importance of Artificial Intelligence in Healthcare: A Review

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Abstract

Artificial intelligence (AI) has been developing very rapidly in the various area of biomedical software's algorithms, hardware implementation, and etc. In this review, we summarize the importance of AI, role of AI, in the various branches of biomedical research. The aim of this review is to keep track of new scientific accomplishments, to understand the availability of technologies, to appreciate the tremendous potential of AI. New progress and breakthroughs will continue to push the frontier and widen the scope of AI application, and fast developments are envisioned in the near future.
Keywords: AI, Necessity, Role, Importance

1. Introduction:

Artificial Intelligence (AI), where computers perform tasks that are usually assumed to require human intelligence, is currently being discussed in nearly every domain of science and engineering. Major scientific competitions like Image Net Large Scale Visual Recognition Challenges are providing evidence that computers can achieve human-like competence in image recognition. AI has also enabled significant progress in speech recognition and natural language processing. All of these advances open questions about how such capabilities can support, or even enhance, human decision making in health and health care. Two recent high-profile research papers have demonstrated that AI can perform clinical diagnostics on medical images at levels equal to experienced clinicians, at least in very specific examples [1,2].

Artificial intelligence (AI) is defined as the intelligence of machines, as opposed to the intelligence of humans or other living species. AI can also be defined as the study of ‘‘intelligent agents”—that is, any agent or device that can perceive and understand its surroundings and accordingly take appropriate action to maximize its chances of achieving its objectives. AI also refers to situations wherein machines can simulate human minds in learning and analysis, and thus can work in problem solving. This kind of intelligence is also referred to as machine learning (ML). Typically, AI involves a system that consists of both software and hardware. From a software perspective, AI is particularly concerned with algorithms. An artificial neural network (ANN) is a conceptual framework for executing AI algorithms. It is a mimic of the human brain—an interconnected network of neurons, in

which there are weighted communication channels between neurons . One neuron can react to multiple stimuli from neighboring neurons and the whole network can change its state according to different inputs from the environment [3-9].

The role of artificial intelligence in healthcare has been a huge talking point in recent months and there's no sign of the adoption of this technology slowing down, well, ever really. AI in healthcare has huge and wide reaching potential with everything from mobile coaching solutions to drug discovery falling under the umbrella of what can be achieved with machine learning. That being said, many healthcare executives are still too shy when it comes to experimenting with AI due to privacy concerns, data integrity concerns or the unfortunate presence of various organizational silos making data sharing next to impossible. However, the future of healthcare & the future of machine learning and artificial intelligence are deeply interconnected.

2. The Necessity of Artificial Intelligence:

“Artificial intelligence will be an important tool to help us all end the injustice in the uneven distribution of healthcare, and to make it more accessible and affordable for every person on Earth."

The use of Artificial Intelligence, or AI, is growing rapidly in the medical field, especially in diagnostics and management of treatment. To date there has been a wide range of research into how AI can aid clinical decisions and enhance physicians' judgement. In recent years, AI and machine learning have emerged as powerful tools for assisting diagnosis. This technology could revolutionise healthcare by providing more precise diagnoses.

The importance of AI as a component of the diagnostic process has been steadily increasing since building systems became more practical. There is ongoing enthusiasm for and hype about AI and both researchers and practitioners focus equally on this technology from multiple perspectives. There is no uniform definition for the term AI, but considered as "the ability of a machine to perform cognitive functions that we associate with human minds, such as perceiving, reasoning, learning, interacting with the environment, problem solving, decision-making, and even demonstrating creativity". AI is generally associated with human-like behavior and covers a wide range of research areas, such as natural language processing or robotics. However, current practical applications, including healthcare and disease diagnostics, are narrowed down to a specific task, and are being developed using machine learning. Algorithms exploit medical data to generate predictions and continuously learn and develop over time by constantly processing new and updated data. Algorithms acquire information through different types of knowledge and input or over multiple years of experience. Therefore, AI empowered systems are able to process more knowledge compared with humans, possibly outperforming them for certain medical tasks [10-12].

Role of Artificial Intelligence

The field of healthcare is evolving at an increasing speed, and this is accompanied by a significant increase in the amount of data and challenges in terms of cost and patient outcomes, so AI applications have been used to reduce these challenges. Artificial Intelligence is very useful in solving problematic healthcare challenges and offers a number of advantages over traditional data analytics and clinical decision-making techniques.

The following are the most important examples of the role of artificial intelligence (AI) in healthcare and medicine:

AI in Medical Diagnosis:

Artificial Intelligence has the potential to revolutionize medical diagnostics. Unnecessary routine laboratory testing increases unnecessary financial costs. Therefore, artificial intelligence applications have been used to narrow the circle of laboratory analyzes that the patient may need. AI can detect the presence of early disease as soon as possible as it can automate a large portion of the manual work and speed up the diagnosis process.

Improving Clinical Workflow:

Artificial intelligence is currently being used to efficiently manage workflow and analyze imaging. AI can be used to improve clinical workflow, support better clinical insights, reduce clinical variability, aid in setting study priorities, and minimize physician burnout.

Artificial intelligence has the power to take over the time-consuming task of data input so that clinicians can focus on improving labor utilization, increasing daily productivity and providing the highest quality of care to patients.

Predicting ICU Transfers:

Unplanned transfer of patients to the ICU can have poor outcomes and sometimes even death in patients. Therefore, artificial intelligence has been used to reduce the percentage of these cases, by finding patients with severe cases.As artificial intelligence systems use patients 'medical records, laboratory results, and their vital signs to manage patients' condition before it deteriorates, and forcing them to be transferred to the intensive care unit. Artificial intelligence systems can guide clinicians on where to start treatment.

Predicting Hospital Acquired Infections:

Artificial intelligence can standardize the diagnosis of infections with Infection Prevention and Control (IPC) implications, and facilitate the dissemination of IPC expertise. AI provides opportunities to improve diagnosis through objective pattern recognition. Using AI-driven models, clinicians can monitor high-risk patients, predict which patients are most likely to develop central-line infections and intervene to reduce risk.

Developing the Next Generation of Radiology Tools:

Artificial intelligence can help develop the next generation of imaging tools that will provide accurate information and detailed enough to replace the need for tissue samples in some cases. The next generation of artificial intelligence is expected to be more effective in the healthcare system and there will be further

improvements in performance. All of these developments promise to increase accuracy and reduce the number of routine tasks that exhaust time and effort [13-18].

3. Pros & Cons of Artificial Intelligence

- **Provides Real-Time Data**
  Real-time analytics can help improve physician-patient relationships. Making vital patient data available through mobile devices can engage patients in their treatments. Mobile alerts can inform doctors and nurses of urgent changes in patient statuses and emergencies.
- **Streamlines Tasks**
  For example, intelligent radiology technology is able to identify significant visual markers, saving hours of intense analysis. Other automated systems exist to automate appointment scheduling, patient tracking and care recommendations.
  AI essentially allows hospitals to accept a wide array of plans, benefiting potential and existing patients.
- **Saves Time and Resources**
  As more vital processes are automated, medical professionals have more time to assess patients and diagnose illness and ailment. AI is accelerating operations to save medical establishments precious productivity hours. In any sector, time equals money, so AI has the potential to save hefty costs.
- **Assists Research**
  AI enables researchers to amass large swaths of data from various sources. The ability to draw upon a rich and growing information body allows for a more effective analysis of deadly diseases. Related to real-time data, research can benefit from the wide body of information available, as long as it's easily translated.
- **May Reduce Physician Stress**
  Some latest research reports over half of the primary physicians feel stressed from deadline pressures and other workplace conditions. AI helps streamline procedures, automate functions, instantly share data and organize operations, all of which help relieve medical professionals of juggling too many tasks.

4. Limits of Ai In Medicine

- **Needs Human Surveillance**
  Although AI has come a long way in the medical world, human surveillance is still essential. For example, surgery robots operate logically, as opposed to empathetically. Health practitioners may notice vital behavioral observations that can help diagnose or prevent medical complications.
- **May Overlook Social Variables**
  Patient needs often extend beyond immediate physical conditions. Social, economic and historical factors can play into appropriate recommendations for particular patients. For instance, an AI system may be able to allocate a patient to a particular care center based on a specific diagnosis. However, this system may not account for patient economic restrictions or other personalized preferences.
- **May Lead To Unemployment**
  Although AI may help cut costs and reduce clinician pressure, it may also render some jobs redundant. This variable may result in displaced professionals who invested time and money in healthcare education, presenting equity challenges.
- **Inaccuracies are Still Possible**
  Medical AI depends heavily on diagnosis data available from millions of cataloged cases. In cases where little data exists on particular illnesses, demographics, or environmental factors, a misdiagnosis is entirely possible. This factor becomes especially important when prescribing particular medicine.
- **Susceptible To Security Risks**
  As AI uses data to make systems smarter and more accurate, cyber-attacks will incorporate AI to become smarter with each success and failure, making them more difficult to predict and prevent. Once damaging threats out-maneuver security defences, the attacks will be much more challenging to address [19-22].

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Semi-Static Thermal Stress Analysis of A Medium Thick Disk With A Time- Dependent Heat Source

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Abstract

This paper survey the semi-static thermal stresses of medium thick discs with time-dependent heat source investiture. The lower and upper faces of the plate are kept at zero temperature, while the inner and outer circular curved surfaces are thermally insulated. Laplace transformers have been found to be convenient for obtaining special temperature distribution solutions, which satisfy the time-dependent heat conduction equation.The function of the thermoelastic air and the harmonic potential functions are used to obtain the components of displacement and the stress associated with it. The results are obtained in the form of a basal function. The results of temperature, displacement, and stress are numerically calculated and graphed according to specific functions.

Keywords*: Heat conduction equation, medium thick disk, thermal stress, Laplace transform*

1. Introduction

Many studies have appeared in the literature about the transient response of the plate and its associated thermal stresses. The following references are chosen because they include mathematical methods for deriving the response formulas contained in present description. In classical papers, Nowacki [1] has determined steady-state thermal stresses in a thick circular plate subjected to an axisymmetric temperature distribuion on the upper face with zero temperature on the lower face and the circular edge. Further Roy Choudhuri [2] has succeeded in determining the quasi-static thermal stresses in a circular plate subjected to transient temperature along the circumference of a circle over the upper face with lower at zero temperture and the fixed circular edge thermally insulated.Nasser [3, 4] proposed the concept of heat sources in generalized thermoelasticity and applied to a thick plate problem.In all aforementioned investigations an axisymmetrically heated thick plate has been considered and its results are more useful in engineering problems. Recently, Kulkarni and Deshmukh [5] present paper deals with the determination of a quasi-static thermal stresses in a thick circular plate subjected to arbitrary initial temperature on the upper face with lower face at zero temperature and the fixed circular edge thermally insulated using Lapalce method. Similarly, Kulkarni and Deshmukh [6]has also determinated the transient heat conduction and thermal stresses of a thick annular disc subjected to arbitrary heat flux on the upper and lower surfaces where as the fixed circular edges are at zero temperature, using integral transform technique.Varghese and Lalsingh [7] has determined the thermo-elastic stress in a thick disc due to interior heat generation within the solid, under thermal boundary condition, which is subjected to arbitrary initial temperature on the upper and lower face at zero temperature, and the fixed circular edges with additional sectional heat supply, using unconventional integral transform.Okumura [8] has analysed the thermal-bending stresses in an annular sector by the theory of moderately thick plates.Saidi and Baferani [9] investigated the thermal buckling of simply supported moderately thick functionally graded annular sector plate using first order shear deformation plate theory and obtained the solution by using an analytical method.Hu et al. [10] presented a set of high order partial differential equations for elastic rectangular thick plate with four edges completely clamped support base on Mindlin theory and solved by the double finite integral transform method.Saheb and Aruna [11] developed a simple and efficient coupled displacement field method to study the buckling load parameters of the simply supported moderately thick rectangular plates.Genckal et al. [12] studied the dynamic responses of composite plates on elastic foundation subjected to impact and moving loads by using Galerkin's method, then the equations are solved by using the Runge-Kutta method.However, they did not consider a thermoelastic problem in which a source is generated on the basis of a linear function of temperature that satisfies the time-dependent heat conduction equation. Based on previous literature on moderately-thickness annular disks, the authors observed that no analytical procedure was established in view of the generation of

internal heat sources in the body. Due to the lack of research in this area, the author was motivated to conduct this research. Theoretical calculations have been studied using dimensional parameters, while the graphical calculations are carried out using dimensionless parameters. The success of this novel research lies in new mathematical procedures that have adopted a simpler optimized design approach in terms of material utilization and technical performance, particularly in determining the thermoelastic behavior of moderately-thickness disks engaged as the foundation of pressure container, furnaces, etc.

2. Formulation of the Problem

We consider a moderately thick annular plate occupying the space $D:\{(r,z)\in R^2:\ a<r<b,\ 0<z<l\}$ under unsteady-state temperature field with a time-dependent internal heat sources within it.

2.1 Unsteady-state temperature field

The governing equation for heat conduction in isotropic solids is given as follows

$$\left\{\nabla^2-\frac{1}{\kappa}\frac{\partial}{\partial t}\right\}T(r,z,t)=-q_0\,l\,\Phi(t)[H(r-r_0)-H(r-r_1)],\ r_0<r<r_1 \qquad (1)$$

in which $T=T(r,z,t)$ is the temperature change,

$$\nabla^2\equiv\frac{\partial^2}{\partial r^2}+\frac{1}{r}\frac{\partial}{\partial r}+\frac{\partial^2}{\partial z^2}$$

and

$$\Phi(t)=\begin{cases}(\Phi_0/T_0)\,t, 0\le t\le t_0\\ \Phi_0, \qquad t>t_0\end{cases} \qquad (2)$$

subjected to the boundary conditions

$$T\big|_{t=0}=T\big|_{z=0}=T\big|_{z=l}=\left.\frac{\partial T}{\partial r}\right|_{r=a}=\left.\frac{\partial T}{\partial r}\right|_{r=b}=0 \qquad (3)$$

2.2 Displacement and stress field

Let u_r and u_z be components of displacement is expressed as

$$\begin{aligned}2Gu_r&=\frac{\partial}{\partial r}\left[r\frac{\partial\phi_1}{\partial r}+z\frac{\partial\phi_3}{\partial z}-4(1-\upsilon)\phi_1\right]+\frac{\partial\chi}{\partial r},\\ 2Gu_z&=\frac{\partial}{\partial z}\left[r\frac{\partial\phi_1}{\partial r}+z\frac{\partial\phi_3}{\partial z}-4(1-\upsilon)\phi_3\right]+\frac{\partial\chi}{\partial z}\end{aligned} \qquad (4)$$

in which G and υ denote the shear modulus and Poisson's ration, respectively, and

$$\nabla^2\phi_1=0,\ \nabla^2\phi_3=0,\ \nabla^2\chi=\frac{\alpha E}{1-\upsilon}\tau. \qquad (5)$$

where ϕ_1, ϕ_3 are harmonic functions, χ is a thermoelastic potential function, $\tau=T-T_i$ is temperature change with T_i as initial temperature,respectively.

The components of stress taking account of heat is as follows

$$\begin{aligned}\sigma_{rr}&=2G\left(\varepsilon_{rr}+\frac{\upsilon}{1-2\upsilon}e\right)-\frac{\alpha E\tau}{1-2\upsilon},\ \sigma_{\theta\theta}=2G\left(\varepsilon_{\theta\theta}+\frac{\upsilon}{1-2\upsilon}e\right)-\frac{\alpha E\tau}{1-2\upsilon},\\ \sigma_{zz}&=2G\left(\varepsilon_{zz}+\frac{\upsilon}{1-2\upsilon}e\right)-\frac{\alpha E\tau}{1-2\upsilon},\ \sigma_{rz}=2G\varepsilon_{rz}\end{aligned} \qquad (6)$$

in which

$$\varepsilon_{rr}=\frac{\partial u_r}{\partial r},\varepsilon_{\theta\theta}=\frac{u_r}{r},\varepsilon_{zz}=\frac{\partial u_z}{\partial z},\varepsilon_{rz}=\frac{1}{2}\left(\frac{\partial u_r}{\partial z}+\frac{\partial u_z}{\partial r}\right) \quad (7)$$

$$e=\frac{\partial u_r}{\partial r}+\frac{u_r}{r}+\frac{\partial u_z}{\partial z}$$

where $\sigma_{rr},..,\sigma_{rz}$ are the components of stresses, $\varepsilon_{rr},..,\varepsilon_{rz}$ are the components of strain, α represent the coefficient of linear thermal expansion and E is Young's modulus and e is the cubical dilation, respectively.For thetraction-free surfaces the stress functions

$$\sigma_{rz}\big|_{z=0}=\sigma_{zz}\big|_{z=0}=\sigma_{rz}\big|_{z=l}=\sigma_{zz}\big|_{z=l}=0 \quad (8)$$

The equations (1) to (8) constitute the mathematical formulation of the problem.

3. Solution tothe Problem

3.1 Solution for the temperature distribution

Applying the Laplace transformation in Eqs. (1) and (4)

$$\left\{\nabla^2-\frac{p}{\kappa}\right\}\bar{T}(r,z,p)=-\frac{q_0\Phi_0 l}{p^2 t_0}(1-e^{-pt_0})[H(r-r_0)-H(r-r_1)] \quad (9)$$

$$\bar{T}\big|_{z=0}=\bar{T}\big|_{z=l}=\frac{\partial\bar{T}}{\partial r}\bigg|_{r=a}=\frac{\partial\bar{T}}{\partial r}\bigg|_{r=b}=0 \quad (10)$$

in which the symbol ($\bar{}$) represents a function in the transformed domain and $\bar{T}(r,z,p)$ is the transformed function of $T(r,z,t)$ with Laplace parameter as p.

Now applying the finite Fourier sine transform in Eqs. (9) one obtains

$$\left\{\frac{\partial^2}{\partial r^2}+\frac{1}{r}\frac{\partial}{\partial r}-\beta_m-\frac{p}{\kappa}\right\}\bar{\bar{T}}(r,m,p)=-\frac{q_0\Phi_0 l}{p^2 t_0}(1-e^{-pt_0})[H(r-r_0)-H(r-r_1)] \quad (11)$$

$$\frac{\partial\bar{\bar{T}}}{\partial r}\bigg|_{r=a}=0,\ \frac{\partial\bar{\bar{T}}}{\partial r}\bigg|_{r=b}=0 \quad (12)$$

where $\bar{\bar{T}}(r,m,p)$ is the transform of $\bar{T}(r,z,p)$ with respect to nucleus is $\sin(m\pi z/l)$.

To obtain the expression for the temperature $\bar{\bar{T}}(r,m,p)$ of Eqs. (11)-(12), we assume

$$\bar{\bar{T}}(r,m,p)=\sum_{n=1}^{\infty}A_n J_0(\alpha_n r) \quad (13)$$

Assume

$$H(r-r_0)-H(r-r_1)=f(r)=\sum_{n=1}^{\infty}B_n J_0(\alpha_n r) \quad (14)$$

Putting Eq. (13) and (14) in Eq. (11), one obtains

$$A_n=\frac{\kappa q_0 l(1-e^{-pt_0})}{t_0 p^2(p+\gamma_{mn})}B_n \quad (15)$$

in which

$$\gamma_{mn}=\beta_m^2\kappa+\alpha_n^2\kappa.$$

Taking the theory of Bessel function on Eq. (15), one obtains

$$B_n \int_a^b r[J_0(\alpha_n r)]^2 dr = \int_a^b r\, f(r)\, J_0(\alpha_n r) dr = \int_{r_0}^{r_1} r\, J_0(\alpha_n r) dr \qquad (16)$$

since

$$f(r) = \begin{cases} 1 \text{ for } r_0 < r < r_1 \\ 0 \text{ for } a < r < r_0 \text{ and } r_1 < r < b \end{cases}$$

Hence

$$B_n = \frac{2}{\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} \qquad (17)$$

Using Eqs. (13), (15), (17) we get,

$$\bar{\bar{T}}(r, m, p) = \frac{2\kappa q_0 l}{t_0} \sum_{n=1}^{\infty} \frac{(1 - e^{-pt_0})}{p^2(p + \gamma_{mn})\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} J_0(\alpha_n r) \qquad (18)$$

Now applying the inverse Fourier sine transform to Eq. (18), one yield

$$\bar{T}(r, z, p) = \frac{4\kappa q_0}{t_0} \sum_{n=1}^{\infty}\sum_{m=1}^{\infty} \frac{(1 - e^{-pt_0})}{p^2(p + \gamma_{mn})\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} \qquad (19)$$
$$\times J_0(\alpha_n r)\sin(m\pi z / l)$$

Applying the Laplace inversion theorems on Eq. (19),one yield

$$\tau = T(r, z, t) = \frac{4\kappa q_0}{t_0} \sum_{n=1}^{\infty}\sum_{m=1}^{\infty} \frac{1}{\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} J_0(\alpha_n r)\sin\left(\frac{m\pi z}{l}\right) \qquad (20)$$
$$\times\{\Phi_n(r, z, t) - \Phi_n(r, z, t - t_0) H(t - t_0)\}$$

where

$$L^{-1}\left\{\frac{1 - e^{-t_0 p}}{p^2[p + \gamma_{mn}]}\right\}$$
$$= L^{-1}\left\{\frac{1 - e^{-t_0 p}}{\gamma_{mn}}\left[\frac{1}{p^2} - \frac{1}{\gamma_{mn}}\left(\frac{1}{p} - \frac{1}{p + \gamma_{mn}}\right)\right]\right\}$$
$$= \Phi_n(r, z, t) - \Phi_n(r, z, t - t_0) H(t - t_0)$$

in which

$$\Phi_n(r, z, t) = \frac{1}{\gamma_{mn}}\left(t - \frac{1 - e^{-\gamma_{mn} t}}{\gamma_{mn}}\right)$$

3.3 Solution for potential functions and thermal stresses

Now assume ϕ_1, ϕ_3 are harmonic functions and χ is a thermoelastic potential function that satisfies Eq. (5) as

$$\chi(r, z, t) = \frac{\alpha E}{1 - \upsilon}\frac{4\kappa q_0}{l\kappa t_0} \sum_{n=1}^{\infty}\sum_{m=1}^{\infty} \frac{\gamma_{mn}}{\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} J_0(\alpha_n r)\sin\left(\frac{m\pi z}{l}\right) \qquad (21)$$
$$\times\{\Phi_n(r, z, t) - \Phi_n(r, z, t - t_0) H(t - t_0)\}$$

$$\phi_1(r, z, t) = \frac{\alpha E}{1 - \upsilon}\frac{4\kappa q_0}{l\kappa t_0} \sum_{n=1}^{\infty}\sum_{m=1}^{\infty} \frac{\gamma_{mn}}{\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\}$$
$$\times\{C_1 J_0(\alpha_n r) + D_1(\alpha_n r) J_1(\alpha_n r)\}\sin(m\pi z / l) \qquad (22)$$
$$\times\{\Phi_n(r, z, t) - \Phi_n(r, z, t - t_0) H(t - t_0)\}$$

$$\phi_3(r,z,t)=\frac{\alpha E}{1-\upsilon}\frac{4\kappa q_0}{l\kappa t_0}\sum_{n=1}^{\infty}\sum_{m=1}^{\infty}\frac{\gamma_{mn}}{\alpha_n}\left\{\frac{r_1J_1(\alpha_n r_1)-r_0J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2-a^2[J_0(\alpha_n a)]^2}\right\}$$
$$\times\{E_1J_0(\alpha_n r)+F_1(\alpha_n r)J_1(\alpha_n r)\}\sin(m\pi z/l) \quad (23)$$
$$\times\{\Phi_n(r,z,t)-\Phi_n(r,z,t-t_0)H(t-t_0)\}$$

Using Eqs. (21)-(23) in Eq. (4),onegetsthe required displacement components.The components of stress given in Eq. (6) can be obtained using displacement componentsand strain components given in Eq. (7). Finally C_1, D_1, E_1 and F_1 are the unknown constants which can to be determined using traction free conditions given in Eq. (8) as

$$X_1C_1+Y_1D_1+Z_1E_1+T_1F_1=R_1,\ X_2C_1+Y_2D_1+Z_2E_1+T_2F_1=R_2,$$
$$X_3C_1+Y_3D_1+Z_3E_1+T_3F_1=R_3,\ X_4C_1+Y_4D_1+Z_4E_1+T_4F_1=R_4 \quad (24)$$

where,

$$X_1=-a_1J_1-a_2J_{0,2}+a_3,\ Y_1=(a_1J_{0,2})/2+J_0(a_4-a_3+a_5)-a_6J_{1,13}$$
$$Z_1=-a_1J_1+2\beta\alpha_nJ_1a_3-\alpha_n^2J_2,\ T_1=-a_7J_2+(a_1/2-a_8)J_{0,2},$$
$$R_1=[a_1J_1(a)+J_0(a)/2-a_9][a],$$
$$X_2=-a_1J_1-2\Im_{12}(a_4-a_5)-a_2J_{0,2}C_L+aS_L\alpha_n^2J_{1,13}/2+\Im_{11}[-1+2(1-\nu)$$
$$-3aa_4+aa_5]-\Im_{13},$$
$$Y_2=(a_1C_L/2+a_4S_L-a_5S_L\alpha_n)J_{0,2}+[-a_2C_L/\alpha_n+S_L\alpha_n+2(1-\nu)S_L\alpha_n$$
$$+6\Im_{14}+a_3]J_{1,13}+(1/4+\Im_{14})J_{2,24},$$
$$Z_2=J_1[a_{10}S_L+\Im_{15}-C_L(a_1+La_1/a-2a_8)]-(\alpha_n+\Im_{16})2L\Im_{16},$$
$$T_2=\Im_{16}(2\Im_{14}+a_4-aa_5)-\Im_{15}J_{0,2}-(1/2+\Im_{14})K,$$
$$R_2=a\{a_1J_1C_L+2a_4\Im_{12}+(1+4\Im_{14})K1+a_8(C_L)'+(1/a)[4\Im_{14}(J_0S_L)']$$
$$+(1+4\Im_{14})2(J_1S_L\alpha_n)'+(1+4\Im_{14})(J_1S_L)''\},$$
$$X_3=2\alpha_n\beta[J_{1r}(12-16\nu)-2r\alpha_n(J_{0r}-J_{2r})],$$
$$Y_3=\alpha_n[(-J_{0r}+J_{2r})\beta(12-16\nu)+2r\beta\alpha_n(3J_{1r}-J_{3r})],$$
$$Z_3=8\alpha_n\beta J_{1r},\ T_3=4\alpha_n\beta(-J_{0r}+J_{2r}),$$
$$R_3=8[-\Im_{11}\beta J_{1r}-(1/2)\Im_{11}J_{0r}+(\Im_{11}\beta J_{0r})'][r],$$

$$X_4=2\alpha_n\beta[J_{1r}C_L(12-16\nu)-(2r\alpha_n\beta C_L-4S_L\alpha_n)(J_{0r}-J_{2r})+rS_L\alpha_n^2(J_{1r}-J_{3r})],$$
$$Y_4=\alpha_n[(-J_{0r}+J_{2r})\beta C_L(12-16\nu)+2r\beta\alpha_nC_L(3J_{1r}-J_{3r})+4S_L\alpha_n(3J_{1r}-J_{3r})$$
$$+rS_L\alpha_n^2(3J_{0r}-4J_{2r}+J_{4r})],$$
$$Z_4=4\alpha_n[2\beta J_{1r}(C_L-\beta LS_L)+L\beta\alpha_nC_L(J_{0r}-J_{2r})-4S_L\alpha_n((1-\nu)J_{0r}+(1-\nu)J_{2r})],$$
$$T_4=2\alpha_n[(2L\beta^2S_L+\beta C_L)(J_{0r}-J_{2r})+L\beta\alpha_nC_L(3J_{1r}-J_{3r})-12\alpha_nC_L],$$
$$R_4=8[-\Im_{11}\beta J_{1r}-(1/2)\Im_{11}J_{0r}+(\Im_{11}\beta J_{0r})'][r],$$

$$a_1=\beta\nu\alpha_n/(1-2\nu),\ a_2=a\beta\nu\alpha_n^2/[2(1-2\nu)],\ a_3=2(1-\nu)\nu/(1-2\nu),a_4=\nu/[2a(1-2\nu)],$$
$$a_5=[2(1-\nu)\nu]/[a(1-2\nu)],a_6=a\beta\nu\alpha_n^2,a_7=\alpha_n/[2a(1-2\nu)],a_8=2\beta\nu(1-\nu)\alpha_n/(1-2\nu),$$
$$a_9=\beta\nu J_0'/(1-2\nu),a_{10}=\alpha_n/(1-2\nu),S_L=\sin(L\beta),C_L=\cos(L\beta),$$
$$\Im_{11}=J_{0,2}S_L\alpha_n^2,\Im_{12}=J_1S_L\alpha_n,\Im_{13}=a\nu\alpha_n^2S_LJ_{1,13}/[2(1-2\nu)],$$
$$\Im_{14}=\nu/[4(1-2\nu)],\Im_{15}=L\beta^2\nu\alpha_nS_L/(1-2\nu),\Im_{16}=\beta J_{0,2}C_L\alpha_n,$$

$$J_{0,2}=J_0(a\alpha_n)-J_2(a\alpha_n), J_{2,4}=J_2(a\alpha_n)-J_4(a\alpha_n),$$
$$J_{1,3}=J_1(a\alpha_n)-J_3(a\alpha_n), J_{1,13}=J_1(a\alpha_n)+[J_1(a\alpha_n)-J_3(a\alpha_n)]$$
$$J_{2,24}=-[J_0(a\alpha_n)-J_2(a\alpha_n)]-(1/2)[J_2(a\alpha_n)-J_4(a\alpha_n)],$$
$$J_{(0,2)r}=J_0(r\alpha_n)-J_2(r\alpha_n)$$

Using Cramer's Rule, one obtains constants as

$$C1=\frac{\Delta_2}{\Delta_1};D1=\frac{\Delta_3}{\Delta_1};E1=\frac{\Delta_4}{\Delta_1};F1=\frac{\Delta_5}{\Delta_1} \quad (25)$$

where

$$\Delta_1=\begin{vmatrix} X1 & Y1 & Z1 & T1\\ X2 & Y2 & Z2 & T2\\ X3 & Y3 & Z3 & T3\\ X4 & Y4 & Z4 & T4 \end{vmatrix},\Delta_2=\begin{vmatrix} R1 & Y1 & Z1 & T1\\ R2 & Y2 & Z2 & T2\\ R3 & Y3 & Z3 & T3\\ R4 & Y4 & Z4 & T4 \end{vmatrix},\Delta_3=\begin{vmatrix} X1 & R1 & Z1 & T1\\ X2 & R2 & Z2 & T2\\ X3 & R3 & Z3 & T3\\ X4 & R4 & Z4 & T4 \end{vmatrix},$$

$$\Delta_4=\begin{vmatrix} X1 & Y1 & R1 & T1\\ X2 & Y2 & R2 & T2\\ X3 & Y3 & R3 & T3\\ X4 & Y4 & R4 & T4 \end{vmatrix},\Delta_5=\begin{vmatrix} X1 & Y1 & Z1 & R1\\ X2 & Y2 & Z2 & R2\\ X3 & Y3 & Z3 & R3\\ X4 & Y4 & Z4 & R4 \end{vmatrix}$$

The resulting equation of stresses can be obtained by substituting the unknown constant obtained from Eq. (25). The equations of stresses are rather lengthy, and the same has been omitted here for the sake of brevity but have been considered during graphical discussion using MATHEMATICA software.

4. Numerical Results, Discussion and Remarks

For the interests of simplicity of calculation, we introduce the following dimensionless values

$$\bar{r}=r/b,\ \bar{z}=z/b,\ \bar{\tau}=\kappa t/b^2,\bar{T}=T/T_0, \quad (26)$$
$$\bar{u}_i=u_i/E\alpha T_0,\bar{\sigma}_{ij}=\sigma_{ij}/E\alpha T_0\,(i,j=r,\theta)$$

Substituting the value of Eq. (26) in Eqs. (20) and components of stresses, we obtained the expressions for the temperature distribution and thermal stresses respectively for the numerical discussion. The numerical computations have been carried out formoderately thick diskhavingthe thermo-mechanical properties: modulus of elasticity E = 70 GPa, Poisson's ratio υ = 0.35, thermal expansion coefficient α = 23×10^{-6}/^{0}C, thermal diffusivity κ = 84.18×10-6 m^{2}s^{-1} and thermal conductivity λ = 204.2 Wm^{-1}K^{-1}.The physical parameter for the plate as $a=0.2\,\text{m}$, $b=1\,\text{m}$, $\text{l}=0.08\,\text{m}$ and $T_0=150^0$C.In order to examine the influence of internal heat source on the moderately thick diskplate, the numerical calculations were performed for all the variables, and numerical calculations are depicted in the following figures with the help of MATHEMATICA software. Plotted Figs. 1-2 illustrate the numerical results of temperature distribution and the thermal stresses of the moderately thick disk due to internal heat generation within the solid.From the Fig.1(a) it is noted that the behaviour of temperature trend is decreasing along redial direction in different value of time due to the available internal heat supply.

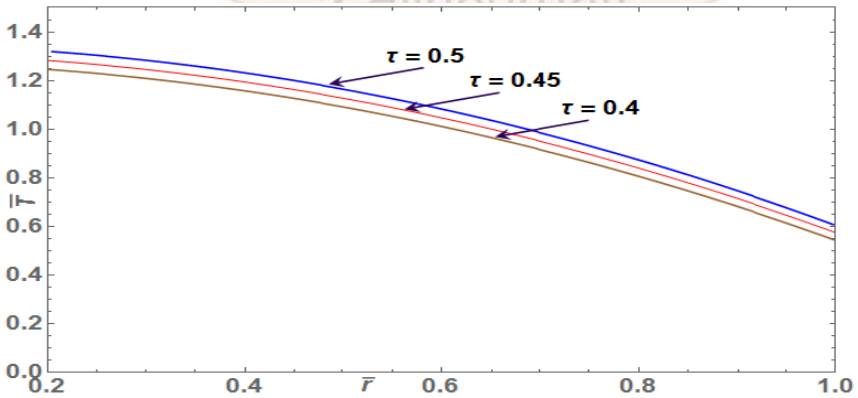

Fig. 1(a): Temperature distribution along $\bar{r}$ -direction for different values of time

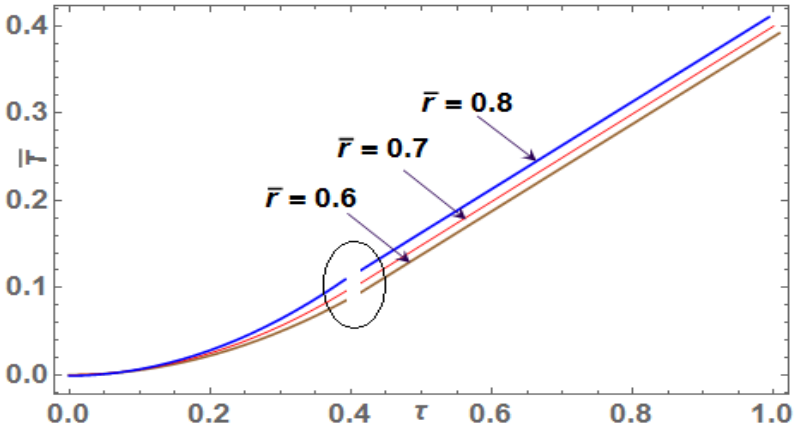

Fig. 1(b): Temperature distribution along time for different values of $\bar{r}$

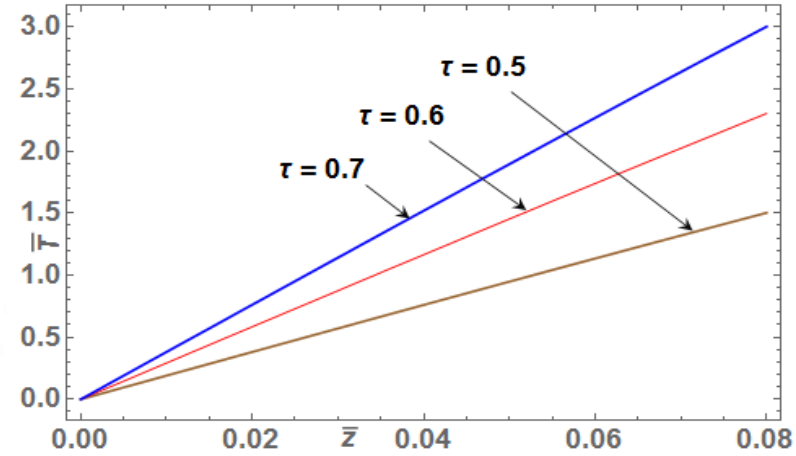

Fig. 1(c): Temperature distribution along $\bar{z}$ *-direction for different values of time*

Fig. 1(b) shows the temperature distribution with increase of time trend for different radius value. In this figure, temperature increases gradually towards the outer end to the internal heat energy, but a discontinuity in temperature was observed at $\bar{\tau} = 0.4$, and it may be due to the fixed time parameter $\bar{\tau}_0 = 0.4$ .In the Fig. 1(c), it is observed that the temperature increaseslinearly along the axial direction for different value of time due to the thickness.

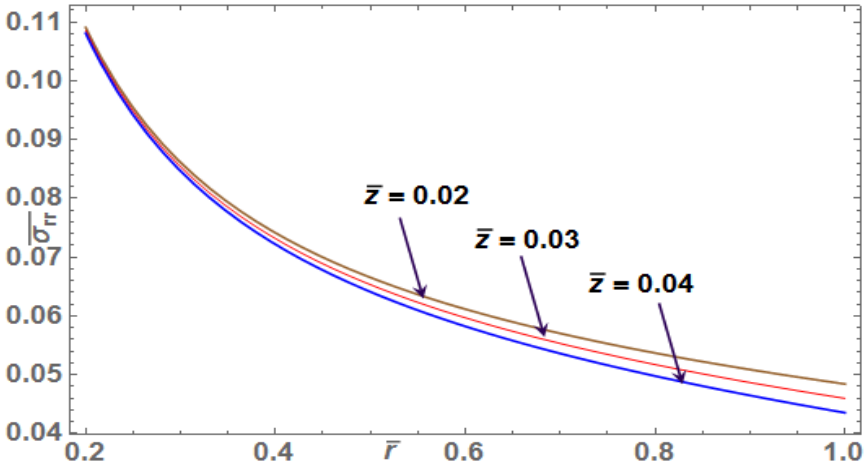

Fig. 2 (a): Radial Stress $\bar{\sigma}_{rr}$ *along* $\bar{r}$ *-direction for different values of* $\bar{z}$

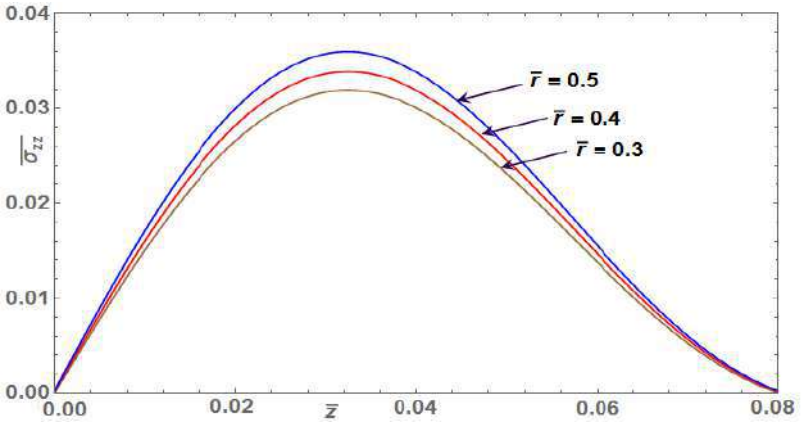

Fig. 2 (b): Axial Stress $\bar{\sigma}_{ZZ}$ along $\bar{z}$ -direction for different values of $\bar{r}$

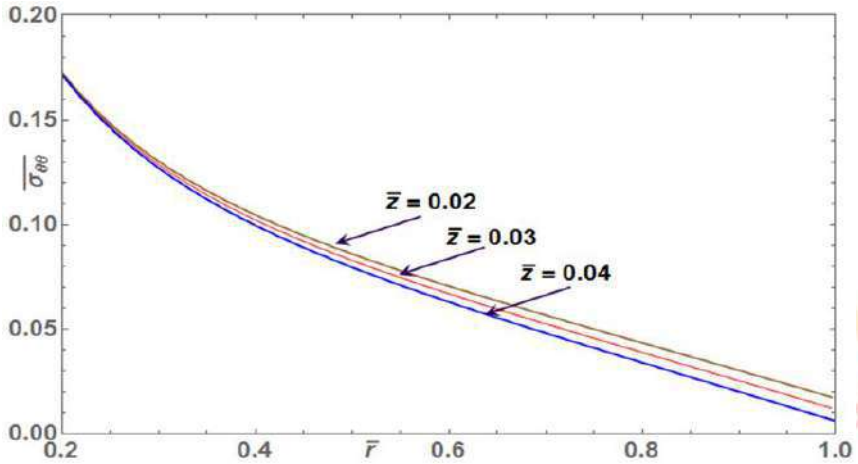

Fig. 2 (c): Tangential Stress $\bar{\sigma}_{\theta\theta}$ along $\bar{r}$ -direction for different values of $\bar{z}$

Fig. 2(a) explains that the stresses are initially on the higher side which goes on decreasing asalong the radial directionat different values of $\bar{z}$. Fig. 2(b) shows the distribution of axial stress along the $\bar{z}$ -direction. It is noted from the figure that the stress along axial direction attains amaximum at centreportion due to the accumulation of heat energy whereas at both boundaries the stress is zero.From Fig. 2(c), it can be concluded that tangential stress will be more at the initial point and gradually decreases along the radial direction.

Conclusion

The proposed analytical solution of the temporal thermal stress of a medium thick plate was stored in a cylinder coordinate system with the presence of an internal heat source. To the best of the author's knowledge, so far there have been very few reports compiling sources according to a linear function of temperature in the medium for a medium-thick plate of finite height with boundary conditions of the Direchletttype.The Using Laplace integral transformation techniques and classical methods, the thermal distribution, thermal stress, is resolved. Compared to other methods proposed by the researchers, the integral transformation technique presented here is relatively simple and widely applicable. This is how our search results can be described astemperature plate is assumed to satisfy the general quasi-static heat conduction equation with a ramp-type internal heat source. The advantage of this method is its versatility and mathematical ability to handle various types of mechanical and thermal boundary conditions.

1. The advantage of this method is its simplicity and its mathematical power to handle a variety of mechanical and thermal boundary conditions.
2. The maximum stress in the region outside the central core may be due to heat, stress, concentration, or internal heat sources available under the region considered.

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Strength of the Singularity in Radiating Dyon Solution on anti-de Sitter Background.

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Abstract:

Here we study the structure of space-time singularities formed during the radial in-fall of a coherent stream of charged "photons"-a piece of the radiating dyon metric. we study the strength of singularities which develop in the space time on the anti-de-sitter background. It is shown that the singularities formed in gravitational collapse of radiating dyon solution in anti-de-sitter background are not hidden inside the event horizon. It is also shown that final outcome of collapse gives naked singularity arising in space-time is gravitationally strong, therefore naked singularities are strong in Tripler's sense.

I Introduction

It would be interesting to study whether the singularity forming at the end of gravitational collapse is observable by external observer. One important conjecture related to the singularities known as cosmic censorship hypothesis (CCH) given by Roger Penrose [1]. This states that the collapse of a physically reasonable initial data yields a space-time singularity which is always hidden inside the event horizon. It has two conjecture , i.e., weak and strong. According to the weak conjucture, singularity formed by gravitational collapse is not visible to a far away observer. The strong cosmic censorship hypothesis states that the singularity cannot be observed even by an observer who is very close to it. Wald [2] discussed some examples to justify the validity of weak form of CCH.

When a massive star is on the verge of completing its nuclear cycle, then the thermonuclear reactions in the interior of the star cannot counter balance the immense gravitational pull of the star. Under most general conditions general relativity predicts that such a collapse must end in a singularity, which may or may not be clothed by an event horizon. A singularity may be physically described as a region in the space-time with extreme curvature, vanishing volume and unbounded gravitational forces. However, general relativity remains silent on the nature (BH or NS) or physical properties of such a singularity. This is basically due to the fact that mathematical structure breaks down preventing analysis at and beyond the singularity. This has triggered extensive research on Gravitational collapse during the past few decades. After all one would always like to know whether, and under what conditions gravitational collapse leads to the formation of a black hole (BH). A few decades back R. Penrose (1969) proposed the cosmic censorship hypothesis (CCH), which states that the singularities formed in gravitational collapse of physically reasonable matter cannot be seen by any distant observer in the universe. It implies that the singularities formed in asymptotically flat space-times are always bounded by event horizons and hence are destined to be black holes. With the announcement of this proposal, study of gravitational collapse has gained special importance, because one would always like to know that whether there exists any physical collapse solutions that lead to naked singularities (NS), which will serve as counterexamples of CCH [3]. Important cases of naked singularities analyzed so for include dust collapse [4-9], radiation collapse [10-17] and strange quark matter [18-19].

A.Chamorro and K.S.Virbhadra have obtained an exact solution of the Einstein- Maxwell equations which are a magnetic charge generalization to the Bonnor-Vaidya solution and describe the gravitational and electromagnetic fields of a non-radiating massive radiating dyon [20]. The paper is based on the composite charges i.e. an electric charge and a magnetic charge bound together by their gravitational interaction. Hence it would be interesting to study the nature of the singularities formed in the gravitational collapse of such composite space-time [21]. In this paper, we study the strength of singularity in Radiating Dyon solution on anti-de-sitter background. We also show that gravitational constant does affect the nature of singularity.
We conclude the paper in V section by some concluding remarks.

II Radiating Dyon Solution in Anti-de-sitter space-time

The metric, which describes the gravitational field of non-rotating massive radiating dyon as found by Chamorro and Virbhadra [20] is

$$ds^2 = -\left(1 - \frac{2m(v,r)}{r}\right)dv^2 + 2dvdr + r^2(d\theta^2 + sin^2\theta d\emptyset^2), \quad (1)$$

Where

$$m(v,r) = f(v) - \frac{\left(q_e^2(v)+q_m^2(v)\right)}{2r} - \frac{\Lambda r^3}{3} \quad (2)$$

Here $f(v)$ is the standard Vaidya mass, $q_e(v)$ and $q_m(v)$ are electric and magnetic charge parameters respectively. These parameters depend on the Eddington advanced time coordinate v.

The model considered in this paper is obtained from an energy-momentum tensor of the form

$$G_i^k = R_i^k - \frac{1}{2}Rg_j^k = 8\pi(E_i^k + N_i^k) \quad (3)$$

Where

$$\{x^\mu\} = \{v,\ r,\ \theta,\ \emptyset\}, \qquad (\mu = 0,\ 1,\ 2,\ 3).$$

E_i^k is related to the electromagnetic tensor F_{ki} in the familiar way

$$E_i^k = \frac{1}{4\pi}\left[-F_{im}F^{km} + \frac{1}{4}g_i^k F_{mn}F^{mn}\right] \quad (4)$$

$$N_i^k = V_i V^k \quad (5)$$

is the energy-momentum tensor of the null fluid. V^k is the null fluid current vector satisfying $g_{ik}V^iV^k = 0$. Electric current vector $J_{(e)}^i$ and magnetic current vector $J_{(m)}^i$ are given by

$$\frac{1}{\sqrt{-g}}\frac{\partial}{\partial x^k}\left(\sqrt{-g}F^{ik}\right) = 4\pi J_{(e)}^i \quad (6)$$

$$\frac{1}{\sqrt{-g}}\frac{\partial}{\partial x^k}\left(\sqrt{-g}\,{}^*F^{ik}\right) = 4\pi J_{(m)}^i \quad (7)$$

Where ${}_{*F^{ik}}$ is the dual of the electromagnetic field tensor F^{ik} and is given by

$${}^*F^{ik} = \frac{1}{2\sqrt{-g}}\in^{iklm} F_{lm}\ , \quad (8)$$

Where $\in^{iklm}$ is the Levi-Civita tensor density.

The non-vanishing components of the Einstein tensor for the above metric are given by

$$G_0^0 = G_1^1 = -G_2^2 = -G_3^3 = \frac{\left(q_e^2(v)+q_m^2(v)\right)}{r^4}\ , \quad (9)$$

$$G_0^1 = k^2\ , \quad (10)$$

Where

$$k^2 = \frac{2(q_e\dot{q_e} + q_m\dot{q_m} - \dot{f}r)}{r^3} \quad (11)$$

Here the over dot denotes the derivative with respect to the retarded coordinate v.

Energy-momentum tensor of the electromagnetic field and null fluids are given by

$$E_0^0 = E_1^1 = -E_2^2 = -E_3^3 = \frac{\left(q_e^2(v)+q_m^2(v)\right)}{8\pi r^4}\ , \quad (12)$$

$$N_0^1 = \frac{k^2}{8\pi} \quad (13)$$

III Nature of the Singularities in Monopole-Radiating Dyon Solution

The physical solution is for < 0 **,** the space-time becomes flat with $f(v) = 0$, $q_e(v) = 0$, $q_m(v) = 0$**.** At $v = T$, Say, the radiation is turned off. For$v > T$, $\dot{f}(v) = \dot{q_e}(v)\,\dot{q_m}(v) = 0$, i.e. $f(v), q_e^2(v)\ and\ q_m^2(v)$ are positive definite . Thus the metric for $v = 0\ to\ v = T$ is radiating dyon solution and for $v > T$ it becomes a static dyon solution [22].

To investigate the structure of the collapse, we need to consider the radial null geodesics define by $ds^2 = 0$. $\left(k^\theta = k^\emptyset = 0\right)$. The equation for outgoing radial null geodesic for metric (1) is given by

$$\left(1-\frac{2m(v,r)}{r}\right)dv^2-2dvdr=0$$

i.e.

$$\frac{dr}{dv}=\frac{1}{2}\left(1-\frac{2m(v,r)}{r}\right).$$

Using the mass function (2) , above equation becomes

$$\frac{dr}{dv}=\frac{1}{2}\left(1-\frac{2f(v)}{r}+\frac{q_e^2(v)+q_m^2(v)}{r^2}+\frac{\Lambda r^2}{3}\right) \quad (14)$$

In general, Eq. (14) does not yield an analytic solution. However, if $f(v)\propto v$, $q_e^2(v)\propto v^2$, $q_m^2(v)\propto v^2$,Eq. (14) becomes homogeneous and can be solved in terms of elementary functions[23].

In particular, we take

$$f(v)=\lambda v, \quad (15)$$

and

$$q_e^2(v)=\begin{cases}0\ , & v\le 0\\ \frac{\mu^2v^2}{2}\ , & 0<v\le T\\ \mu^2T^2(const)\ , & v>T\end{cases} \quad (16)$$

$$q_m^2(v)=\begin{cases}0\ , & v\le 0\\ \frac{\delta^2v^2}{2}\ , & 0<v\le T\\ \delta^2T^2(const)\ , & v>T\end{cases} \quad (17)$$

Where λ, μ^2 and δ^2 are some positive constants. Inserting the expressions for $f(v)$, $q_e^2(v)$ and $q_m^2(v)$ into Eq.(2) we obtain the mass function for monopole radiating dyon solution as

$$m(v,r)=\lambda v-\frac{\mu^2v^2+\delta^2v^2}{4r}-\frac{\Lambda r^3}{6} \quad (18)$$

It follows that with the choice of above mass function, the metric (1) becomes self-similar [1] (a spherically symmetric space-time is a self similar if $g_v(ct,cr)=g_v(t,r)$ and $g_{rr}(ct,cr)=g_{rr}(t,r)$ for every >0) admitting a homothetic killing vector ξ^a given by

$$\xi^a=v\frac{\partial}{\partial v}+r\frac{\partial}{\partial r} \quad (19)$$

and satisfies

$$L_\xi g_{ab}=\xi_{a;b}+\xi_{b;a}=2g_{ab}\ , \quad (20)$$

Where L denote the Lie derivative.

Defining $k^a=dx^a/dk$ as a tangent to radial null geodesics, where k is an affine parameter, it follows that $\xi^a k_a$ is constant along radial null geodesics.

Thus

$$\xi^a k_a=uk_u+rk_r=C, \quad (21)$$

Where C is a constant. Radial null geodesic equations of metric (1), on using the null condition $k^ak_a=0$, takes the simple form

$$\frac{dk^v}{dk}-\left(\frac{m'}{r}-\frac{m^2}{r^2}\right)(k^u)^2=0,$$

$$\frac{dk^r}{dk}+\left(\frac{\dot{m}}{r}-\frac{m'}{r}+\frac{m^2}{r^2}+\frac{2mm'}{r^2}-\frac{2m^2}{r^3}\right)(k^v)^2+2\left(\frac{m'}{r}-\frac{m^2}{r^2}\right)k^vk^r=0 \quad (22)$$

Let

$$k^v=\frac{dv}{dk}=\frac{P(v,r)}{r}, \quad (23)$$

Then from the null condition $k^ak_a=0$ we obtain

$$k^r=\left(1-\frac{2m}{r}\right)\frac{P}{2r},$$

Also

$$k_r=k_1=g_{1j}k^j=g_{10}k^0$$

$$k_r = \frac{P}{r} \tag{24}$$

And

$$k_v = k_0 = g_{0j}k^j = g_{00}k^0 + k^1$$

Therefore

$$k_v = -\frac{P}{2r}\left(1 - \frac{2\lambda u}{r} - 2a + \frac{\mu^2u^2+\delta^2u^2}{2r^2} + \frac{\Lambda r^2}{3}\right) \tag{25}$$

Eq. (21), (24) and (25) yields

$$P = \frac{12C}{12+(12-2\Lambda r^2-6)X+12\lambda X^2-3(\mu^2+\delta^2)X^3} \tag{26}$$

Where X is a self-similarity variable defined by $X = v/r$. The singularity occurring at $r = 0$ is naked if the outgoing radial null geodesic equation has atleast one real positive root [24]. In the case of pure Vaidya space-time it has been shown that for a mass function $m(u) = \lambda v/2$, the central singularity is naked for $\lambda \leq 1/8$, and the collapse ends into black hole if $\lambda > 1/8$ [25].

Hence it would be interesting to investigate whether the gravitational collapse of Vaidya space-time could yield a naked singularity under the influence of the gravitational constant and composite field produced by electric and magnetic charges.

With the help of Eq. (18), the equations of the outgoing radial null geodesics for the metric (1) are given by

$$-\left(1 - \frac{2m}{r}\right)dv^2 + 2dvdr = 0$$

Therefore

$$\frac{dr}{dv} = \frac{1}{2}\left(1 - \frac{2m}{r}\right)$$

i.e.

$$\frac{dr}{dv} = \frac{1}{2}\left(1 - \frac{2\lambda v}{r} + \frac{\mu^2v^2+\delta^2v^2}{2r^2} + \frac{\Lambda r^2}{3}\right) \tag{27}$$

Let

$$X_0 = \lim_{\substack{u\to 0\\ r\to 0}} \frac{v}{r} = \lim_{\substack{u\to 0\\ r\to 0}} \frac{dv}{dr}$$

Hence Eq. can be written as

$$X_0 = \lim_{\substack{u\to 0\\ r\to 0}} \frac{dv}{dr} = \frac{2}{1 - 2\lambda X + \frac{\mu^2}{2}X^2 + \frac{\delta^2}{2}X^2 + \frac{\Lambda r^2}{3}}$$

i.e.

$$X_0 = \frac{12}{6-12\lambda X+3(\mu^2+\delta^2)X^2+2\Lambda r^2}$$

$$3(\mu^2 + \delta^2)X^3 - 12\lambda X^2 + (6 + 2\Lambda r^2)X - 12 = 0 \tag{28}$$

The above equation governs the nature of the singularity. If this equation has at least one real and positive root, then the singularity will be naked. If the equation has no positive root, then the collapse ends into a black hole.

In particular, for $\lambda = 0.1,\ \mu = 0.01,\ \delta = 0.02,\ \Lambda = 0.1,\ r = 0.1$, one of the roots of Eq. (28) is $X_0 = 794.9794$, indicating that the gravitational collapse in this case ends into a naked singularity.

IV Strength of the naked singularity

It has seen the nakedness of the singularity in the previous section; in this section we study the strength of singularity. The Clark and Krolak Criterion the strength of singularities has been analyzed and shown that these naked singularities are gravitationally strong. If the naked singularity is not strong then it cannot be considered as a physically reliable singularity and hence such naked singularities may not be considered as counter examples to CCH. A naked singularity is said to be strong if at least along one radial null geodesic with affine parameter k, with k = 0 at the singularity, one should have

$$\Psi = \lim_{k\to 0} k^2 R_{ab}k^a k^b > 0 \tag{29}$$

Where k^a is tangent to the null g**e**odesics and R_{ab} is the Ricci tensor

using Eq. (22) and (23) we write

$$\Psi = \lim_{k\to 0} k^2 R_{ab}k^a k^b = \lim_{k\to 0} k^2 \frac{2\dot{m}}{r^2}(k^v)^2 \tag{30}$$

$$= [4\lambda - X(\mu^2 + \delta^2) \lim_{k\to 0} \left(\frac{kP}{r^2}\right)^2 \quad (31)$$

as singularity is approached, $k \to 0, r \to 0$ *and* $X \to X_0$ and using L-Hospital's rule, we find that

$$\Psi = \frac{4\lambda - (\mu^2+\delta^2)X_0}{1+\frac{\Lambda r^2}{3} - 2\lambda X_0 + \frac{1}{2}(\mu^2+\delta^2){X_0}^2} \quad (32)$$

Thus the singularity is strong if $4\lambda - (\mu^2 + \delta^2)X_0 > 0$

For our particular case (i.e. λ=0.1, μ=0.01, δ=0.02, Λ=0.1, r=0.1, $X_0 = 794.9794$)

We have $4\lambda - (\mu^2 + \delta^2)X_0 = 0.00251$. Thus the naked singularity arising in the radiating dyon solution in the anti-de-sitter space-time is a strong curvature singularity.

V Concluding Remarks

Here we studied the appearance of singularity that is not hidden by horizon this singularity is called a naked singularity. In the present work we have studied strength of singularity in radiating dyon solution on anti-de-sitter background. It has been shown that the singularities formed in gravitational collapse of radiating dyon solution in anti-de-sitter background are not hidden inside the event horizon. Thus one can argue that composite charged field (electric and magnetic charges) and gravitational constant does not affect to gravity and cannot prevent a naked singularity from forming completely, so that CCH actually violets.

Also, using the clark and krolak criteria [25] the strength of singularities has been analyzed and shown that the naked singularities in the composite solution in anti-de-sitter background are gravitationally strong.

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Fractional Derivative Models for Large Deflection of Beams and Plates: A Review Article

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Abstract:

The article investigates the present review of the fractional order thermoelastic problem for large deflection with homogeneous material properties within a finite length plate. The fractional time derivative heat conduction differential equation is mostly solved using numerical or integral transformation technique. The large deflection of a plate when placed on the elastic foundation is formulated from the potential energy equation neglecting the second strain invariant.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords: *temperature distribution, large deflection, fractional order, thermal stress*

1. Introduction:

Although thermo-mechanical phenomena in the majority of practical engineering applications are adequately simulated with the classical Fourier heat conduction equation, there is an important body of problems that require due consideration of thermo-mechanical coupling: it is appropriate in these cases to apply the generalized theory of thermoelasticity. Serious attention has been paid to the generalized thermoelasticity theories in solving thermoelastic problems in place of the classical uncoupled/coupled theory of thermoelasticity. The absence of any elasticity term in the heat conduction equation for uncoupled thermoelasticity appears to be unrealistic since due to the mechanical loading of an elastic body, the strain so produced causes variation in the temperature field. Moreover, the parabolic type of the heat conduction equation results in an infinite velocity of thermal wave propagation, which also contradicts the actual physical phenomena.

2. Research Background :

The equation of equilibrium for the large deflection of a heated plate as derived by Basuli [1] on the basis of Berger's approximations is givenunder uniform load and stationary distribution [i.e. $T(r,\theta,z) = T_0(r,\theta) + g(z)T(r,\theta)$] as

$$D\nabla^2(\nabla^2 - \beta_1^2)\, w(r,\theta,t) = -\frac{E\alpha\, f(\mathrm{l})}{1-\upsilon}\nabla^2 T \tag{1}$$

where

$$f(\mathrm{l}) = \int_{-1/2}^{1/2} z\, g(z)\, dz$$

and β_1^2 is a normalising constant of integration.

In deriving the large deflection equation of a heated plate, we have generalized the aforesaid equation of equilibrium for the transient temperature distribution, as

$$\nabla^2(\nabla^2 - \beta_1^2)\, w(r,\theta,t) = -\frac{\nabla^2 M_T}{D(1-\upsilon)} \tag{2}$$

where $w(r,\theta,t)$ is the normal transverse deflection along the *z*-direction, ∇^2 indicates the two-dimensional Laplacian operator in (r, θ), the constant υ denotes the Poisson's ratio of the plate, $D = E\mathrm{l}^3/12(1-\upsilon^2)$ is the flexural stiffness of the plate and β_1^2 is to be determined from

$$u_{,r} + u/r + [w(r,\theta,t)_{,r}]^2/2 + v_{,\theta}/r + [w(r,\theta,t)_{,\theta}]^2/2r^2 = \beta_1^2 l^2/12 + (1+\upsilon)\alpha N_T \quad (3)$$

The result of the above heat conduction gives thermally induced resultant moment and resultant force as [2, pp. 381]

$$M_T = \alpha E \int_{-l/2}^{l/2} z\,T(r,\theta,z,t)\,dz \quad (4)$$

$$N_T = \alpha E \int_{-l/2}^{l/2} T(r,\theta,z,t)\,dz \quad (5)$$

with α as the coefficient of linear thermal expansion and *E* symbolize Young's Modulus of the material of the plate, respectively.

Eqs. (5) and (6) have to be solved for heated thin simply supported annular sector plate along the edges for which the boundary conditions are

$$w(r,\theta,t)\big|_{r=a} = w(r,\theta,t)_{,r}\big|_{r=a} = 0 \quad (6)$$

$$w(r,\theta,t)\big|_{r=b} = w(r,\theta,t)_{,r}\big|_{r=b} = 0 \quad (7)$$

3. Literature Review:

The development of this theory was accelerated by the advent of second sound effects observed experimentally. In heat transfer problems involving very short time intervals and/or very high heat fluxes, it has been revealed that the inclusion of second sound effects in the original theory yields results that are realistic and very much different from those obtained with the classical theory of elasticity. Analytical approaches have been developed many decades ago for one-dimensional multilayer heat conduction problems based on variables separation and methods of finite integral transformation [3-6]. De Monte [7] applied the eigenfunction expansion approach to solve the unstable heat conductivity problem on a two-dimensional two-layered isotropic slab with homogeneous boundary condition.Recently, on a three-layered solid aerosol particle heated by laser energy, a series of solution have beenobtained for heat conduction [8]. The concise preliminary study in the review is by no means comprehensive. Considering a few typical examples, Benjeddou and Andrianarison [9] introduced the equivalent of the Reissner's mixed variational theorem for thermoelastic media by introducing the transverse thermal field-temperature increase relationship as a restriction through a Lagrange multiplier. Few classical cases of quasi-static and steady-state that contribute to uncoupled heat transfer and thermal stress analysis were also investigated. Blanc and Touratier [10] studied the Discrete Layer approach for thermoelastic responses in linearly elastic multi-layered composite plates using quadratic Lagrangian interpolations to establish the one-dimensional finite displacement. Pelassa and Massabo [11] derived the generalized displacements and stresses on simply supported multi-layered wide plates and beams subjected to steady-state thermal and mechanical loading and obtained the closed-form solutions using a multi-scale homogenized model. Sayyad et al. [12] used an exponential shear deformation concept to intervene the thermal stress analysis of cross-ply laminated composite plates in which Navier's solutions for simply supported boundary conditions subjected to thermal loads varying linearly across the thickness were considered. Li et al. [13] developed a semi-analytical model to predict the evolution of stress within a multilayered coating system during cyclic thermal loading in which temperature gradient through each layer thickness was obtained using finite element analysis. Darban and Massabo [14] used the matrix method to formulate the problems of two-dimensional thermoelasticity in simple supported multi-layered beams and plates having an arbitrary number of layers that may be in imperfect mechanical and thermal contact. Kreja and Sabik [15] developed their finite element software based on the first-order shear deformation principle, incorporating several modifications including the correction of transverse shear rigidity and the deployment of zig zag-type functions. In all previous studies, the

aim was to maximize the structural support's load-carrying capacity either by locating the supports or by adjusting their stiffness using a numerical approximation.

The best methodologies for solving these problems have been obtained withboth analytical and numerical approaches. Nevertheless, owing to either non-availability or logical complexity of the corresponding exact solutions, numerical solutions are favoured and widespread in practice. Rather, restricted use of analytical solutions should not minimize their value to numerical solutions; because correct solutions, probably, offer insight into the problem's governing physics, which is seldom prevalent in any numerical solution. Rather, it is comparatively easier to evaluate closed-form solutions to achieve optimal design options for any particular task of interest. But it is not always possible to obtain consistent analytical solutions. However, it is much desired sincegreater information can be achieved through the mathematical process of an analytical solution relative to a discrete numerical solution.It can even be used as a guideline to evaluate and verify the numerical algorithms. Even though useful, analytical approaches are rarely seen in several multi-stacked or multi-layered geometries in multi-dimensional transient thermoelastic problems.

Meanwhile, it has also been discovered that fractional calculus is efficiently used to change several existing models of physical processes, see Hilfer [16], Sherief et al. [17], Tenreiro et al. [18]. It can also be stated that the whole theory of fractional derivatives and integrals was developed in the second half of the 19th century.A good overview of the subject can be noticed in Podlubny [19], Kaczorek [20-21], Sherief and El-Latief [22], Siedlecka and Kukla [23], Abbas [24], Xiong and Niu [25], Mahakalkar et al. [26], Mittal and Kulkarni [27], Hussein [28] and so on.

4. Conclusion:

During the literature review, it was noted that most of the papers on thermoelasticity were taken to derive the temperature, displacement, and stresses in different types of solid due to different thermal loading. Here there is ample possibility of introducing an fractional-order derivative still exist. By intorduing fractional order approach to derive the temperature, displacement and stresses in different types of solid will provide a new dimension in thermoelastic world. Few investigations were cited so far for the determination of the temperature, displacements and its stresses for solid or composite multilayered bodies. The theoretical and experimental studies of the heated structural profile are of considerable practical importance in a wide range of fields such as mechanical, aerospace and food engineering fields throughout the past years. The further analysis of such fractional-order problems may, as it seems, stimulate evaluation of methods. Hence it is strongly desired the rigorous study of fractional-order behaviour of homogenous and nonhomogeneous of different bodies in the different coordinate system with or without an internal heat source.

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Thermoviscoelastic media with fractional-order effect: An overview & prospective

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Abstract:

The article investigates the present review of thermoviscoelastic theories with fractional order derivative effects on different objects. The main theme of the thermoviscoelastic problems is to establish operational methods to solve the governing differential equations. In the thermoviscoelastic problems, we have considered a few practical problems of technical interest, taking into account offractional order derivative effect by using numerical or exact procedures.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords:*temperature distribution, thermal stresses, thermoviscoelastic,fractional order, vibration, deflection, integral transform.*

1 Introduction:

Thermoelasticity investigates the relation between a material's elastic properties and temperature or between its thermal conductivity and thermal stress. Another complex problem faced by engineers and applied mathematicians is finding solutions to the fundamental problems in their field of study, partial differential equations in some cases. Using the well-known principles of classical mechanics and thermodynamics, the body's deformation undergoes the resultant stresses under the combined influence of external loads, body forces, and heat conduction is calculated. This relationship of temperature and displacement fields, where mechanical and thermal causes cause deformation, results in 'Thermoelasticity'. Temperature variations allow the material to undergo thermal effects. Some of these are thermal strains, stress, and deformation. Thermal deformation means that as the thermal energy and/or temperature of the material increases, so does the vibration of the atom or molecules and this changes in vibration resulting in the stretching of molecular bonds, which causes the material to expand, of course, if the thermal energy and temperature of the material decrease, the material will compress or contract. Thermal effects produce heat transfer by conduction within an elastic surface, and this distribution of thermal energy produces a temperature field within the material. Many solids undergo a volumetric transition with variance in temperature, and thus the presence of a temperature range typically causes stresses caused by limit or interval constraints. If the temperature variation is high enough, these stresses can reach levels that can lead to structural failure, especially in brittle materials. Therefore, understanding stress analysis can be helpful for several issues, including high-temperature variation.

The classical coupled dynamical theory of thermoelasticity wasdeveloped by Biot [1] by assuming that the elastic changes affect the temperature and vice-versa. However, this theorywasbasedon the Fourierlaw of heat conduction. Therefore whenthis theorywascombined withthelawofenergy conservation, aparabolic type heat conductione quation was obtained and predicted an infinite speed of the thermal signal, which contradicted the physical fact.The generalized theories of thermoelasticity have come into existence and attracted several researchers during the last few decades. The generalized theories were specially formulated to account for the finite speed of propagation of thermal signals, which waster medas a second sound effect. In this respect, wewould like to mention here one of the earliest development of the second sound theory for ther moelasticity by Fox [2], in which heapplied the principles of modern continuum the rmodynamics. Further, the two well established and well-studied generalized ther mo-elasticity the ories were also developed by Lordand Shulman [3] and Green and Lindsay [4]. Sherief [5] obtained the fundamental solution of generalized thermoelasticity with one relaxation time. To review and present generalized theories, one can refer to Ignaczak [6] and Chandrasekharaiah [7]. The uniqueness theorem for generalized thermo-viscoelasticity withone relaxation

timeunder different conditions is proved by Ezzat and El-Karamany [8,9]. El- Karamany and Ezzat [10,11] investigated the propagation of discontinuities of solutions in this theory. Ezzat [12] introduced a new model of the equations of generalized thermo-viscoelasticity for an electrically conducting is otropic media permeated by a primary uniformmagnetic field, considering the volume's rheological properties. Among the contributions tothe generalized theory are Ezzat et al.[13, 14], Othman et al.[15], Lata et al.[16], Kumari and Mukhopadhyay [17], El-Karamany and Ezzat [18] and Abbas and Kumar [19].

Viscoelasticity is the material property that exhibits viscous and elastic characteristics when undergoing deformation. Viscous materials, like honey, resist shear flow and strain linearly with time when stress is applied. Elastic materials strain when stretched and quickly return to their original state once the stressisre moved. Viscoelastic materials have elements of both of these properties and, assuch, exhibittime-dependent strain. At the same time, elasticity is usually the result of bond stretching a long crystallographic plane in anordered solid; viscosity results from the diffusion of atoms or molecules inside an amorphous material [20]. Linear viscoelastic materials are rheological materials that exhibit time-temperature rate-of-loading dependence. When their response is a function of the current input and the current and past input history, the characterization of the viscoelastic response can be expressed using the convolution (hereditary)integral. The mechanical-model representation of linear viscoelastic behaviour results was investigated by Gross [21]. One can refer to Atkinson and Craster [22] to review fracture mechanics and generalizations to the viscoelastic materials. A general review of time-dependent material properties has been exhibited in Refs. [23–26]. A further literature review has been described as 'the foundation and inspiration for substantive, useful research' will be done in later sections.

2 Research Background :

The system of governing equations of the linear theromoviscoelasticity theory with fractional order of heat transfer consists of the following [27]:

i. The equation of motion

$$\sigma_{ji,j} = \rho u_{i,tt} \tag{1}$$

ii. The constitutive equation

$$S_{ij}(x,t) = \int_0^t R(t-\xi)\frac{\partial e_{ij}(x,\xi)}{\partial \xi}d\xi = \hat{R}(e_{ij}) \tag{2}$$

in which

$$S_{ij} = \sigma_{ij} - \frac{\sigma_{kk}}{3}\delta_{ij}, \varepsilon_{ij} = \frac{1}{2}(u_{i,j} + u_{j,i}), e_{ij} = \varepsilon_{ij} - \frac{e}{3}\delta_{ij}, e = \varepsilon_{kk}, x = (x_1, x_2, x_3) \tag{3}$$

and $\hat{R}(t)$ is the relaxation modulus functions such that $R(\infty) > 0$ given by

$$\hat{R}(t) = 2\mu(1 - A\int_0^t f(t)\,dt). \tag{4}$$

The function $f(t)$ is taken in the form

$$f(t) = \exp[-\beta t]t^{a^*-1} \tag{5}$$

where $0 < a^* < 1, \beta > 0, 0 \le A < \Gamma(a^*)$.

iii. The stress-strain temperature relation

Assuming that the relaxation effects of the volume properties of the material are ignored, we have

$$\sigma = K\left[e - 3\alpha_T\left(1 + \frac{\nu^\alpha}{\alpha!}\frac{\partial^\alpha}{\partial t^\alpha}\right)\upsilon\right] \tag{6}$$

iv. The fractional heat equation

$$\kappa\upsilon_{,ii} = \rho C_E\frac{\partial}{\partial t}\left(1 + \frac{\nu^\alpha}{\alpha!}\frac{\partial^\alpha}{\partial t^\alpha}\right)\upsilon + \gamma T_0\frac{\partial}{\partial t}\left(1 + n\frac{\tau^\alpha}{\alpha!}\frac{\partial^\alpha}{\partial t^\alpha}\right)e \tag{7}$$

where n is equal to zero or one, and a comma denotes material derivatives.

3 Literature Review:

Many researchers have studied the development and applications of fractional-order equations. The fascinating and recent applications of fractional differential equations in physics, chemistry, biology, engineering, finance, and other research fields built over the last few decades are now not difficult to find. Some of the applications include: diffusion processes [28,29], mechanics of materials [30,31], combinatorics [32,33], inequalities [34], analysis [35], calculus of variations [36-41], signal processing [42], image processing [43], advection and dispersion of solutes in porous or fractured media [44], modeling of viscoelastic materials under external forces [45], bioengineering [46], relaxation and reaction kinetics of polymers [47], random walks [48], mathematical finance [49], modeling of combustion [50], control theory [51], heat propagation [52], modeling of viscoelastic materials [53] and even in areas such as psychology [54,55]. It is easy to find hundreds, if not thousands, of new applications in which the fractional calculus approach is more than welcome.

Differential equations of fractional order have been the focus of many studies because of their continuous appearance in different applications in fluid mechanics, viscoelasticity, science, material science and building. Ezzat [56] recently established a new fractional heat conduction equation model utilizing the Taylor–Riemann series expansion of time-fractional order. Sherief etal.[57] introduced afractional formula of heat conduction, proved a uniqueness theorem, and derived a reciprocity relation and a variational principle. Onecanreferto Ezzat and Fayik [58]and Ezzatand El-Bary[59] for a survey of fractional calculus applications. Abbas [60] considered the fractional thermoelastic problem in the presence of a constant magnetic field exposed to a moving plane of heat source. Magneto electro-thermoelasticity was studied in the contex to fanewconsiderationoffractional Green–Naghdiheatconduction law without energy dissipation by Hendy et al. [61]. Yu et al. [62] solved a one-dimensional problem in fractional order generalized electro-magneto-thermoelasticity. Boetal.[63] introducedanovelcompactnumericalmethodforsolvingthe two-dimensional non-linear fractional reaction–subdiffusion equations, while Zhangetal.[64]introduced a time-space spectral method for the time-space fractional Fokker–Planck equation and its inverse problem.

A great number of computational techniques may be found in the research of viscoelastic problems in Danyluketal.[65], Vinogradov and Milton[66], Ashishetal.[67],Aldawody etal.[68]and Sheriefetal.[69]. One of the most popular methods is the Laplace transform, which is a viable strategy for viscoelasticity since the equations may be transformed into pseudo-elastic ones. However, this procedure presents some difficulties when viscous parametersvarya longtime or when imposed by complicated time-dependent boundary conditions. Many inverse transforms cannot be solved analytically.Subsequently, the numerical method for the Laplace inverse change is quickly created and connected. De Chant [70]discussed the limitations of the numerical inversion method in the face of discontinuities and asymptotic methods.Syngellakis[71]pointed out that numerical inversions of the Laplace transform by employing the finite-element and boundary element are effective approximate methods.Temel[72]obtained some solutions in the realspacere sorting the Durbin's numerical method of the inverse Laplace transform. Because of the complexity of the constitutive relations, it is challenging to find analytical solutions of viscoelasticity, and the numerical method is taken into accountas of late withth eassistance of the quick advancement of the PC innovation, especially the boundary element method, which is given in El-Karamany and Ezzat [73,74]. WangandAi[75] established an extended precise integration model to analyse the thermo-mechanical behaviour of multi-layered transversely isotropic materials in the Cartesian coordinate system. Aiand Wang[76]introduced ananalytical layer element solution to axisymmetric thermal consolidation of multi-layered porous thermoelastic media containing a deeply buriedheat source.

4 Conclusion:

During the literature review, it was noted that the expected thermal profile addresses thermoviscoelastic media with a fractional-order effect. The literature still fails to provide the exact solution of the fractional heat conduction equation in two or three-dimensional problems using fractional-order derivate. The present work

determines the thermal profile by solving heat conduction equations throughout thermodynamics that provide an exact solution to thermoviscoelastic problems.

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Thermoelastic media with memory-dependent derivative effect: An overview & prospective

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Abstract:

The article investigates the present review of thermoelastic theories with memory-dependent derivative effects on different objects. The main theme of the thermoelastic problems is to establish operational methods to solve the governing differential equations. In the thermoelastic problems, we have considered a few practical problems of technical interest, taking into account of memory-dependent derivative effect by using numerical or exact procedures.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords: *temperature distribution, thermal stresses, memory-dependent derivative vibration, deflection, integral transform.*

Introduction:

In several areas of engineering, solid objects are commonly used as integral structural elements. With thermal loading, such structural elements are likely to be subjected to many forms of static loading or excitation, such as seismic, mechanical, hydrodynamic, blast, aerodynamic, etc. Engineers and scientists worldwide are making unwavering efforts to develop and build economic and productive systems with a very low likelihood of failure. Thermal effects produce heat transfer by conduction within an elastic surface, and this distribution of thermal energy produces a temperature field within the material. Many solids undergo a volumetric transition with variance in temperature, and thus the presence of a temperature range typically causes stresses caused by limit or interval constraints. If the temperature variation is high enough, these stresses can reach levels that can lead to structural failure, especially in brittle materials. Therefore, understanding stress analysis can be helpful for several issues, including high-temperature variation.

Thermoelasticity investigates the relation between a material's elastic properties and temperature, or between its thermal conductivity and thermal stress. Another complex problem faced by engineers and applied mathematicians is finding solutions to the fundamental problems in their field of study, which is partial differential equations in some cases. Using the well-known principles of classical mechanics and thermodynamics, the body's deformation undergoes the resultant stresses under the combined influence of external loads, body forces, and heat conduction is calculated. This relationship of temperature and displacement fields, the situation where mechanical and thermal causes cause deformation, results in the word 'Thermoelasticity'. Temperature variations allow the material to undergo thermal effects. Some of these are thermal strains, stress, and deformation. Thermal deformation means that as the thermal energy and/or temperature of the material increases, so does the vibration of the atom or molecules and this changes in vibration result in the stretching of molecular bonds, which causes the material to expand, of course, if the thermal energy and temperature of the material decrease, the material will compress or contract.

The enormous demand for science and engineering works deals with Fractional-Order Equations' dynamical systems that involve derivatives and non-integer integrals. They explain various substances' memory and hereditary properties and cope with the tremendous demand for science and engineering work. Meanwhile, it is also discovered that fractional calculus is used effectively to modify many current models of physical processes, see Hilfer [1], Sherief et al. [2], Tenreiro et al. [3]. It can also be claimed that the entire theory of fractional derivatives and integrals was established in the second half of the 19th century. A good overview of the subject will be noticed in Podlubny [4], Kaczorek [5-6], Sherief and El-Latief [7], Siedlecka and Kukla [8],

Abbas [9], Xiong and Niu [10], Mahakalkar et al. [11], Mittal and Kulkarni [12], Hussein [13] and so on. The memory effect comes from the convolution operator presented in the most popular Riemann-Liouville fractional integral, which is defined as $I^{RL}_{\alpha,\alpha} f(x) = (1/\Gamma(\alpha))\int_a^x (x-t)^{\alpha-1} f(t)dt = \Phi_\alpha \bigstar f(x)$, where $\bigstar$ denotes the convolution operator, α is the fractional-order and Φ_α is the standard power function given as $\Phi_\alpha(t) = t^{\alpha-1}/\Gamma(\alpha)$. A further literature review has been described as 'the foundation and inspiration for substantive, useful research' will be done in later sections.

Research Background :

The classic heat conduction theory is based on the Fourier law [14,15]

$$q(x,t) = -k\nabla T(x,t) \qquad (1)$$

in which $q(x,t)$ is the heat flux vector, x denotes the point in the considered region, t is the time, k is the thermal conductivity of the material, ∇ is the gradient operator, and $T = T(r,t)$ is the temperature, respectively.

Introduction of single-phase-lag to evade discrepancy between the mathematical model and the observations [16-18]

$$q(x,t+\tau) = -k\,\nabla T(x,t) \qquad (2)$$

in which τ is the phase lag of the heat flux or so-called relaxation time.

Expanding the left-hand side of Eq. (2) into the Taylor series with respect to the variable τ, one obtains [19] as

$$q(x,t) + \frac{\tau^\alpha}{\Gamma(1+\alpha)}\frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\,\nabla T(r,t), 0 < \alpha \le 1 \qquad (3)$$

where α is introduced to keep the dimension in order.

The fractional generalization [20,21] of the classical Cattaneo model by introducing fractional Taylor formula [22] as

$$q(x,t) + \tau^\alpha \frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\,\nabla T(x,t), 0 < \alpha \le 1 \qquad (4)$$

where without losing the generality $\Gamma(1+\alpha)$ appearing in Taylor series is merged in τ^α terms, Γ is the gamma function, α is introduced to keep the dimension in order and $\partial^\alpha / \partial t^\alpha$ is the fractional time derivative based on Caputo fractional definition [23].

For the limiting case of $\tau = 0$ (or $\alpha = 0$), Eq. (4) reduces to classical Fourier heat conduction and the standard Cattaneo heat conduction equation for $\alpha = 1$ as

$$q(x,t) + \tau\frac{\partial}{\partial t} q(x,t) = -k\,\nabla T(x,t) \qquad (5)$$

The heat conduction equation in the context of fractional-order generalized thermoelasticity proposed by Sherief [24] gives

$$q(x,t) + \tau\frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\,\nabla T(x,t), 0 < \alpha \le 1 \qquad (6)$$

Here it should be noted that the estimated ranges [25] of relaxation time (in seconds) usually involves $(10^{-11} : 10^{-14})$ for metals, $(10^{-8} : 10^{-10})$ for gases, and $(10 : 10^{2})$ for porous materials, respectively.

Wang and Li [26] have introduced a memory-dependent derivative (MDD). The first order $(\alpha = 1)$ of function f which is simply defined in an integral form of a common derivative with a kernel function $K(t-\zeta)$ on a slipping interval $[t-\omega, t]$ in the form

$$q(x,t) + \tau D^{(1)}_\omega q(x,t) = -k\,\nabla T(x,t) \qquad (7)$$

where

$$D_{\omega}^{(1)} f(x,t) = \frac{1}{\omega} \int_{t-\omega}^{\omega} K(t-\zeta) f'_{\zeta}(x,\zeta) dx, \ \omega > 0,$$

$D_{\omega}^{(1)} \to \partial / \partial t$, ω is delay time, and $K(t-\zeta)$ is the kernel function.

Heat conduction equation in MDD thermoelasticity introduced by Ezzat [27]

$$q(x,t) + \omega D_{\omega}^{(1)} q(x,t) = -k \nabla T(x,t) \quad (8)$$

By combining Eq. (8) with the energy conservation equation

$$-\Delta \cdot q(r,t) = \rho C_v \frac{\partial T}{\partial t}(r,t) \quad (9)$$

Now combining Eq. (8) and (9) leads to the heat conduction equation as

$$\kappa \nabla T(x,t) = (1 + \tau_{\omega} D_{\omega}) \rho C_v \frac{\partial T}{\partial t}(r,t) \quad (10)$$

where $\kappa = \rho C_v / k$ is the thermal diffusivity, ρ is the density of the material, C_v is the specific heat capacity, and $\Delta = \nabla^2 = \nabla \cdot \nabla$ is Laplace operator is a second-order differential operator.

Literature Review:

Many researchers have studied the development and applications of fractional-order equations. The fascinating and recent applications of fractional differential equations in physics, chemistry, biology, engineering, finance, and other research fields built over the last few decades are now not difficult to find. Some of the applications include: diffusion processes [28,29], mechanics of materials [30,31], combinatorics [32,33], inequalities [34], analysis [35], calculus of variations [36-41], signal processing [42], image processing [43], advection and dispersion of solutes in porous or fractured media [44], modeling of viscoelastic materials under external forces [45], bioengineering [46], relaxation and reaction kinetics of polymers [47], random walks [48], mathematical finance [49], modeling of combustion [50], control theory [51], heat propagation [52], modeling of viscoelastic materials [53] and even in areas such as psychology [54,55]. It is easy to find hundreds, if not thousands, of new applications in which the fractional calculus approach is more than welcome.

Fractional-order derivatives have been successfully used in mechanics to model memory-effect damping forces or to characterize state feedback controllers, as demonstrated by Bagley and Torvik [56]. It is noticed by Wang and Hu [57] that the term fractional-order derivative whose order is between 0 and 2 often acts as a damping force in fractional-order vibration systems with a single degree of freedom. Fractional calculus has therefore been effectively used to change many current physical process models. The first use of fractional derivatives was made by Abel [58], who applied fractional calculus to the solution of the integral equation of the tautochrone problem formulation. Fractional derivatives were used by Caputo [59,60] and Caputo and Mainardi [61,62], and their findings were in substantial agreement with the empirical evidence for describing viscoelastic materials.

Some authors have worked on fractional derivative in the thermoelastic analysis of most recent literature, which can be summarised below: Povstenko [63] proposed a quasi-static uncoupled theory of thermoelasticity based on the heat conduction equation with a time-fractional derivative of order α. Povstenko [64] formulated the theory of diffusive stress based on the time-fractional diffusion equation. Povstenko [65] also obtained the temperature distribution and thermal stresses in an infinite medium with a spherical cavity using the integral transform technique.Youssef and Al-Lehaibi [66] developed a novel theory for the generalized thermoelasticity model based on fractional-order generalized thermoelasticity. Similarly, Youssef and Al-Lehaibi [67] constructed a model of an elastic material with constant parameters in the half-space in the context of the fractional-order generalized thermoelasticity theory. Sherief et al. [68] developed a new theory of thermoelasticity using the methodology of fractional calculus. Ezzat and El-Karamany [69] attempted to generalize these results to include a magnetic field's effects in two-temperature thermoelasticity. Youssef and Al-Lehaibi [70] developed a mathematical model of an elastic material with a cylindrical cavity in the context

of the fractional-order generalized thermoelasticity theory. Povstenko [71] obtained the theory of thermal stresses based on the heat conduction equation with the Caputo time-fractional derivative of order $0 < \alpha \leq 2$. Youssef [72] found a half-space filled with an elastic material taken as constant elastics' parameters in the standard model of thermoelasticity in fractional-order. Sur and Kanoria [73] constructed a new theory of two-temperature generalized thermoelasticity in the context of a new consideration of heat conduction with fractional orders.Youssef [74] considered a half-space filled with an elastic material with constant elastic parameters, and the governing equations were written in the form of the two-temperature generalized thermoelasticity theory of fractional order. Youssef et al. [75] developed a cylindrical nano-beam mathematical model with constant elastic parameters with fractional order heat conduction. Wang e al. [76] studied thermoelastic behaviours involving the effect of thermal inertia during the macro- and micro-scales heat conduction. Bhattacharya and Kanoria [77] obtained the two-temperature thermo-elasto-diffusion interaction inside a spherical shell in the context of fractional order generalized thermoelasticity. Zenkour and Abouelregal [78] determined the thermoelastic displacement, stress, conductive temperature, and thermodynamic temperature in an infinite isotropic elastic body with a spherical cavity based on the two-temperature generalized thermoelasticity theory (2TT). Youssef [79] derived a new theory of thermoelasticity based on the fraction order of strain, which is considered a new modification to Duhamel-Neumann's stress-strain relation. Bachher [80] considered a one-dimensional problem for a homogeneous and isotropic thermoelastic infinite porous material under the dependence of modulus of elasticity and thermal conductivity on reference temperature subjected to periodically varying heat sources in the context of the fractional-order generalized thermoelasticity with one relaxation time parameter. Santra et al. [81] proposed the three-dimensional generalized thermoelastic coupled problem for a homogeneous isotropic and thermally conducting thermoelastic medium under the effect of rotation in fractional context order generalized thermoelasticity.Yadav et al. [82] employed the theory of generalized thermoelasticity with fractional order strain to study the problem of one-dimensional disturbances in a viscoelastic solid in the presence of a moving internal heat source and subjected to a mechanical load. Bassiouny and Abouelnaga [83] investigated the thermoelastic properties of a sandwich structure made of three piezoelectric layers in the context of fractional-order theory two-temperature generalized thermopiezoelasticity. Gupta and Das [84] applied the eigenvalue approach method and Laplace transform, a general solution scheme for the thermoelastic deformation of an unbounded transversely isotropic medium fractional-order generalized thermoelasticity with an instantaneous heat source. Sheoran and Kundu [85] presented a comprehensive review of relevant literature to highlight the role of fractional calculus in thermoelasticity.Abbas [86] investigated the temperature, displacement, and stresses due to thermal shock loading on the inner surface cavity in an infinite medium with a cylindrical cavity in the context of the fractional-order generalized thermoelasticity theory. Bachher and Sarkar [87] studied the theory of generalized thermoelasticity based on the heat conduction equation with the Caputo time-fractional derivative is used to study the magneto-thermoelastic response of a homogeneous isotropic two-dimensional rotating elastic half-space solid. Povstenko et al. [88] studied a control problem of thermal stresses in an infinite cylindrical body in which the time-fractional heat conduction equation defined the temperature distribution with the Caputo derivative of the order $0 < \alpha \leq 2$. Xiong and Niu [89] developed the principle of fractional-order generalized thermoelastic diffusion for anisotropic and linear thermoelastic diffusive media. Chirilă and Marin [90] continued the work on dipolar thermoelastic materials, which are a particular case of multipolar continuum mechanics. The fractional-order derivative effect on a two-dimensional problem with weak, normal and strong conductivity due to thermal shock was examined by Abbas [91].

Conclusion:

The literature reviewed noted that the use of the expected thermal profile addresses thermomechanical problems with the memory response effect. The literature still fails to provide the exact solution of the heat conduction equation in two or three-dimensional problems using memory-dependent derivate. The thermal profile is determined by solving heat conduction equations with memory-dependent derivative effects throughout thermodynamics that provide an exact solution to thermoelastic problems.

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Thermoelastic effect of moving heat source in a hollow cylinder with time-fraction derivatives

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Abstract:

The present analysis comprises the mathematical model designed on thermal response in a thin hollow cylinder by a time-fractional thermo-elasticity of order $0 < \alpha \le 2$ *and confined to a region* $R: a \le r \le b, 0 \le z \le h, 0 \le \phi \le 2\pi$ *. The thin hollow cylinder is further analyzed utilizing an internal moving heat source assumed to be in a circular trajectory of radius* r_1 *, in which* $a \le r_1 \le b$ *around the centre of the cylinder with constant angular velocity* ω *. The mathematical calculation found the solution using integral transform and Greens theorem for the temperature and stress. The resultant of this calculation provides a series form of Bessel function and trigonometric function.*

Keywords*: Thermal stress, hollow cylinder, fractional derivative, internal heat sources, integral transform*

1. Introduction:

The breakdown of classical thermoelasticity countered by Fourier type heat conduction is observed in many physical processes such as medium of amorphous nature materials [1,2] like glass, and having some porosity, colloids etc. The fractional-order derivatives and integral technique are always preferred over the classical approach in constructing a mathematical model. Popovych [3] has discussed a thin thermosensitive plate for making the model on heat fields. Popovych [4] found the solution of the heat conduction equation to deal with the problems of thermo-sensitive bodies with convective heat transfer. Popovych [5, 6] determined solutions of heat-conduction in thermo-sensitive bodies. Youssef [9] established the uniqueness theorem and devised a new construction of analysis of thermoelasticity with respect to a fractional order. Jiang and Xu [10] investigated the time-fractional heat conduction equation with a time-fractional derivative for the general orthogonal curvilinear coordinate.

Meanwhile, Ezzat [11,12] elaborated on the uses of the concept of fractional thermoelasticity for porous asphaltic materials. Kumar and Kamdi [23] worked on finding the temperature distribution and thermal stresses by using the finite Marchi-Zgrablich and Laplace transform technique. An annular fin's two-dimensional thermoelastic problems were designed with the fractional-order derivative. Kumar and Kamdi [24] analyzed a problem on a finite hollow cylinder to evaluate the temperature and thermal stresses in the context of fractional order. Thakare et al. [25] considered nonhomogeneous thick hollow cylinders and obtained time-fractional heat transfer analysis employing internal heat generation and thermal stresses. Thakare and Warbhe [26] attempted to analyze a nonlocal Caputo type time-fractional heat conduction equation with internal moving heat sources and presented a mathematical model of a thin circular plate. The same result and study proof have been depicted in [7, 8, 14-21].

The current article elaborates on thermal behaviour in the thin hollow cylinder by using *h* Robin's boundary condition connected with the internal moving heat source. The solution to the heat conduction equation in the designed problem was obtained with the help of the Integral transform technique and Green's theorem. The resultant solution is found to contain a series form of Bessel function and trigonometric function. This study finds a vital role in an industry where materials are in the vicinity of heat.

2. Formulation:

A thin hollow isotropic cylinder with inner radius *a*, outer radius *b* and thickness *h* is defined in space $R: a \le r \le b, 0 \le z \le h, 0 \le \phi \le 2\pi$. An internal moving heat source along the circular trajectory of the radius r_1 is moving with constant angular velocity ω inside the cylinder. The heat generation by means of moving heat source activity may depend upon position and time in the form $g(r,\phi,z,t)\ w/s^3$. The thermoelastic problem is presented in the form of a time-fractional heat conduction equation of Caputo type of order α . It is defined for the function $f(t)$ by [14] as

$$\frac{d^\alpha f(t)}{dt^\alpha} = \frac{1}{\Gamma(n-\alpha)} \int_0^t (t-\tau)^{n-\alpha-1} \frac{d^n f(\tau)}{d\tau^n} d\tau, \quad t > 0 \ , \ n-1 < \alpha < n, \tag{1}$$

where the Laplace transform rule as given as

$$L\left\{\frac{d^\alpha f(t)}{dt^\alpha}\right\} = s^\alpha L\{\bar{f}(s)\} - \sum_{k=0}^{n-1} f^{(k)}(0^+)\, s^{\alpha-1-k}, \quad n-1 < \alpha < n. \tag{2}$$

in which the transform parameter is *s* and *n* refers to a positive integer.

The equation for temperature distribution in a thin hollow cylinder as a time-fractional differential equation of heat conduction with heat generation term is presented as follows:

$$\nabla^2 T + g_s^i \frac{1}{2\pi k r} \delta(r-r_1)\delta(\phi-\phi')\delta(z-\xi)\delta(t-\tau) = \frac{1}{k'}\frac{\partial^\alpha T}{\partial t^\alpha} \tag{3}$$

where

$$\nabla^2 = \frac{\partial^2}{\partial r^2} + \frac{1}{r}\frac{\partial}{\partial r} + \frac{1}{r^2}\frac{\partial^2}{\partial \phi^2} + \frac{\partial^2}{\partial z^2}$$

and volumetric heat source $g(r,\phi,z,t)$ in cylindrical coordinates is given by

$$g(r,\phi,z,t) = g_s^i \frac{1}{2\pi r} \delta(r-r_1)\delta(\phi-\phi')\delta(z-\xi)\delta(t-\tau)$$

Here g_s^i denotes an instantaneously moving heat source fixed at (r_1, ϕ', ξ) and releasing its energy spontaneously at time τ, $T = T(r,\phi,z,t)$ is temperature distribution, *k* is the thermal conductivity of the material of the cylinder, $k' = k/\rho c_p$ is thermal diffusivity, ρ *is* density, c_p is the specific heat of the material.

Also

$$\phi' = \omega t \tag{4}$$

with initial conditions as,

$$T = f(r,\phi,z) \quad at\ t = 0, r = -\infty;\ 0 < \alpha \le 2$$
$$\frac{\partial T}{\partial t} = 0, \qquad at\ \ t = 0\ , \qquad 1 < \alpha \le 2 \tag{5}$$

and corresponding boundary conditions,

$$k\frac{\partial T}{\partial r} - h_1 T = 0 \quad at\ r = a \tag{6}$$

$$k\frac{\partial T}{\partial r} + h_1 T = 0 \quad at\ r = b \tag{7}$$

$$k\frac{\partial T}{\partial z} - h_1 T = 0 \quad at\ z = 0 \tag{8}$$

$$k\frac{\partial T}{\partial z} + h_1 T = 0 \quad at\ z = h \tag{9}$$

where h_1 denotes the heat transfer coefficient of the cylinder.

The above equations (3) to (9) constitute the mathematical formulation of the problem under consideration.

3. Formulation of thermoelastic Problem

Following [7], on introducing a thermal stress function χwe get

$$\sigma_{rr} = \frac{1}{r}\frac{\partial \chi}{\partial r} + \frac{1}{r^2}\frac{\partial^2 \chi}{\partial r^2} \tag{10}$$

$$\sigma_{\phi\phi} = \frac{\partial^2 \chi}{\partial r^2} \tag{11}$$

$$\sigma_{r\phi} = -\frac{\partial}{\partial r}\left(\frac{1}{r}\frac{\partial \chi}{\partial r}\right) \tag{12}$$

For a traction free surface

$$\sigma_{rr} = 0,\ \sigma_{r\phi} = 0\ at\ r = a\ or\ r = b \tag{13}$$

where

$$\chi = \chi_c + \chi_p \tag{14}$$

in which χ_c and χ_p denotes complementary and particular solutions.

Next,

χ_c Satisfies the equation $\nabla^4 \chi_c = 0$ (15)

χ_p Satisfies the equation $\nabla^4 \chi_p = -\lambda E \nabla^2 \Gamma$ (16)

in which temperature change is given as $\Gamma = T - T_i$, T_i refers for initial temperature. Further, in the case of a thin cylinder, the thickness can be neglected.

We have Laplace operators as

$$\nabla^2 = \frac{\partial^2}{\partial r^2} + \frac{1}{r}\frac{\partial \chi}{\partial r} + \frac{1}{r^2}\frac{\partial^2}{\partial \phi^2}$$

4. Solution

In order to find the solution to the heat conduction equation, we first define the integral transform of $T(r,\phi,z,t)$ as

$$\bar{T}(\beta_m, v, a_n, t) = \int_R T(r,\phi,z,t) R_v(\beta_m r)\cos v(\phi - \phi')\, z(a_n z) dv \tag{17}$$

with its inverse as

$$T(r,\phi,z,t) = \sum_{m,n,v=0}^{\infty} \frac{\bar{T}(\beta_m, v, a_n, t) R_v(\beta_m r)\cos v(\phi - \phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \tag{18}$$

$$R_v(\beta_m r) = J_v(\beta_m r)[\beta_m Y_v'(\beta_m b) + H J_v(\beta_m b)] - Y_v(\beta_m r)[\beta_m Y_v'(\beta_m b) + H J_v(\beta_m b)] \tag{19}$$

where

$$H = \frac{h_1}{k}$$

and

$$z(a_n z) = \alpha_n \cos(a_n z) + H \sin(a_n z) \tag{20}$$

Normalization integral is denoted as

$$N(\beta_m) = \int_a^b r\left[R_v(\beta_m r)\right]^2 dr$$

$$N(\beta_m) = \frac{\frac{2}{\pi^2}\left\{\left[\frac{b^2(H^2+\beta_m^2)-v^2}{\beta_m^2 b^2}\right]\left[\beta_m J_v'(\beta_m a) + HJ_v(\beta_m a)\right]^2\right.}{\left[\beta_m J_v'(\beta_m a) + HJ_v(\beta_m a)\right]^2}$$

$$\left. - \frac{\left[\frac{a^2(H^2+\beta_m^2)-v^2}{\beta_m^2 a^2}\right]\left[\beta_m J_v'(\beta_m \beta) + H J_v(\beta_m \beta)\right]^2\right\}}{\left[\beta_m J_v'(\beta_m a) + H J_v(\beta_m a)\right]^2} \tag{21}$$

Next,

$$N(V) = \int_0^{2\pi}\left[\mathrm{Cos}\, v(\phi - \phi')\right]^2 d\phi = \pi \tag{22}$$

$$N(a_n) = \int_0^h \left[Z(a_n z)\right]^2 dz = \left(a_n^2 + H^2\right)\frac{h}{2} + H \tag{23}$$

where β_m denotes the roots of the transcendental equation

$$\begin{aligned}&[\beta_m J_v'(\beta_m a) + HJ_v(\beta_m a)][\beta_m Y_v'(\beta_m b) + HY_v(\beta_m b)]\\ &-[\beta_m J_v'(\beta_m b) + HJ_v(\beta_m b)][\beta_m Y_v'(\beta_m a) - HY_v(\beta_m a)] \;= 0\end{aligned} \tag{24}$$

and a_n denotes the roots of the transcendental equation

$$\tan a_n h = \frac{2\alpha_n H}{a_n{}^2 - H^2} \tag{25}$$

and $v \in W$, in which W is a set of whole numbers.

By taking the integral transform of equation (3) and using following Green's theorem given in [6], one obtains

$$\int_R \nabla^2 T \varphi_k \, dv = \int_R \nabla^2 T \varphi_k \, dv + \sum_{i=1}^{N}\int_{s_1}\left\{\psi_k \frac{\delta T}{\partial n_i} - T\frac{\delta \psi_k}{\partial n_i}\right\} ds_i \tag{26}$$

$$\frac{d^\alpha \bar{T}}{dt^\alpha} + k'(\beta_m^2 + a_n^2)\bar{T} = \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(a_n \xi)\partial(t - \Gamma) \tag{27}$$

Applying Laplace transform and using its inversion formula to equation (27) by using the initial condition, one obtains

$$\bar{T} = \bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)\left(t-\tau\right)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)\left(t-\tau\right)^\alpha]$$

By taking inverse integral transform, we obtain

$$T = \sum_{m,n,v=0}^{\infty} \frac{R_v(\beta_m r)\cos v(\phi-\phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \quad (28)$$

$$\Gamma = \sum_{m,n,v=0}^{\infty} \frac{R_v(\beta_m r)\cos v(\phi-\phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (29)$$

5. Solution to the thermoelastic problem:

Assume the value of χ_c and χ_c satisfying equation (15), (16), respectively as

$$\chi_c = \sum_{v=0}^{\infty} (Ar^{v+2} + Br^{-v+2})\cos v(\phi-\phi') + (Cr^{v+2} + Dr^{-v+2})\sin v(\phi-\phi') \quad (30)$$

$$\chi_p = \lambda E \sum_{m,n,v=0}^{\infty} \frac{R_v(\beta_m r)\cos v(\phi-\phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (31)$$

using (30), (31) in(14) one obtains

$$\chi = \sum_{v=0}^{\infty} (Ar^{v+2} + Br^{-v+2})\cos v(\phi-\phi') + (Cr^{v+2} + Dr^{-v+2})\sin v(\phi-\phi') + \sum_{m,n,v=0}^{\infty} \frac{R_v(\beta_m r)\cos v(\phi-\phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (32)$$

Using (32) in (10) to (12), one obtains

$$\sigma_{rr} = \sum_{v=0}^{\infty} [A(2+v-v^2)r^v + B(2-v-v^2)r^{-v}]\cos v(\phi-\phi') + (Cr^{v+2} + Dr^{-v+2}) \times\sin v(\phi-\phi') + \lambda E \sum_{m,n,v=0}^{\infty}\left[\frac{\beta_m}{r} R_v'(\beta_m r) - \frac{v^2}{r^2} R_v(\beta_m r)\right] \frac{\cos v(\phi-\phi')\, z(a_n z)}{\beta_m^2 N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (33)$$

$$\sigma_{\phi\phi} = \sum_{v=0}^{\infty} [A(v^2+3v+2)r^v + B(v^2-3v+2)r^{-v}]\cos v(\phi-\phi') + [C(v^2+3v+2r^v) + D(v^2-3v+2)r^{-v})]\sin v(\phi-\phi') + \lambda E \sum_{m,n,v=0}^{\infty}\left[\frac{\beta_m}{r} R_v'(\beta_m r) - \frac{v^2}{r^2} R_v(\beta_m r)\right] \frac{\cos v(\phi-\phi')\, z(a_n z)}{\beta_m^2 N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (34)$$

$$\sigma_{r\phi} = \sum_{v=0}^{\infty}[A(v^2+v)r^v + B(v-v^2)r^{-v}]\sin v(\phi-\phi') + [C(-v^2-v)r^v) + D(v^2-v)r^{-v})]\cos v(\phi-\phi') + \lambda E \sum_{m,n,v=0}^{\infty}\left[\frac{\beta_m}{r}R_v'(\beta_m r) - \frac{v^2}{r^2}R_v(\beta_m r)\right]\frac{\cos v(\phi-\phi')\, z(a_n z)}{\beta_m^2 N(\beta_m) N(v) N(a_n)} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (35)$$

Applying the prescribed condition (13), we have

$$A = \lambda E \sum_{m,n,v=0}^{\infty} \frac{a^{-v-2} z(a_n z)}{\beta_m^2 N(\beta_m) N(v) N(a_n)}\left\{\left(\frac{v+v^2-2-v^2}{2v(v^2-1)}\right)R_v(\beta_m a) - \left(\frac{1}{2v}\right)\beta_m a R_v'(\beta_m a)\right\} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (36)$$

$$B = \lambda E \sum_{m,n,v=0}^{\infty} \frac{a^{-v-2} z(\alpha_n z)}{\beta_m^2 N(\beta_m) N(v) N(\alpha_n)}\left\{\left(\frac{2+v-2v^2-v^3}{2v(v^2-1)}\right)R_v(\beta_m a) + \left(\frac{1}{2v}\right)\beta_m a R_v'(\beta_m a)\right\} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (37)$$

Substituting the above values of *A* and *B* in Eqs. (33) to (35), one obtains

$$\sigma_{rr} = \lambda E \sum_{m,n,v=0}^{\infty} a^{-v-2} r^v \left[\frac{7v^2-3v^4-v^3+v^5-4}{2v(v^2-1)}R_v(\beta_m a) - \frac{2+v\ -v^2}{2v}\beta_m a R_v'(\beta_m a)\right] + \left[\frac{-7v^2-v^3+3v^4+v^5+4}{2v(v^2-1)}R_v(\beta_m a) - \frac{2-v\ -v^2}{2v}\beta_m a R_v'(\beta_m a)\right] + \sum_{m,n,v=0}^{\infty}\left[\frac{\beta_m}{r}R_v'(\beta_m r) - \frac{v^2}{r^2}R_v(\beta_m r)\right]\frac{\cos v(\phi-\phi')\, z(\alpha_n z)}{\beta_m^2 N(\beta_m) N(v) N(\alpha_n)} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (38)$$

$$\sigma_{\phi\phi} = \lambda E\left\{\sum_{m,n,v=0}^{\infty} a^{-v-2} r^v \left[\frac{(v^2+3v+2)(-v^3+2v^2+v-2)}{2v(v^2-1)}R_v(\beta_m a) - \frac{v^2+3v+2}{2v}\beta_m a R_v'(\beta_m a)\right] + a^{v-2} r^{-v}\left[\frac{(v^2-3v+2)(-v^3-2v^2+v+2)}{2v(v^2-1)}R_v(\beta_m a) - \frac{v^2+3v+2}{2v}\beta_m a R_v'(\beta_m a)\right] + \left[\frac{\beta_m}{r}R_v'(\beta_m r) - \frac{v^2}{r^2}R_v(\beta_m r)\right]\frac{\cos v(\phi-\phi')\, z(a_n z)}{\beta_m^2 N(\beta_m) N(v) N(a_n)} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (39)$$

$$\sigma_{r\phi} = \lambda E \sum_{m,n,v=0}^{\infty} a^{-v-2} r^{v} \left[\frac{(-v^5+v^4+3v^3-v^2-2v)}{2v(v^2-1)} R_v(\beta_m a) - \frac{v^2+v}{2v} \beta_m a R'_v(\beta_m a) \right]$$
$$+ a^{v-2} r^{-v} \left[\frac{(v^5+v^4-3v^3-v^2+2v)}{2v(v^2-1)} R_v(\beta_m a) - \frac{v-v^2}{2v} \beta_m a R'_v(\beta_m a) \right]$$
$$+ \left[\frac{\beta_m}{r} R'_v(\beta_m r) - \frac{v^2}{r^2} R_v(\beta_m r) \right] \frac{\cos v(\phi-\phi') z(\alpha_n z)}{\beta_m^2 N(\beta_m) N(v) N(\alpha_n)} \qquad (40)$$
$$\times \left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi) (t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha] \right]$$
$$\times \left\{ E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha] - 1 \right\}$$

6. Numerical calculations:

Dimensions- For the sake of convenience, we choose the inner radius $a = 1m$, outer radius $b = 2.5m$, the thickness of the hollow cylinder $h = 0.2\,m$

Material Properties-

Thermal diffusivity (*m/s*)	Thermal conductivity (*W/mK*)	Density (Kg/m^3)	Specific heat (J/Kg K)	Poisson ratio	CTE (I/K)	Lame's constant
112.34 X 10^{-6}	386	8954	383	0.35	16.5 X 10^{-6}	26.67

Analysis of numerical Solutions

The numerical results and values are summarized and represented by a graph between temperature and stress distribution for weak, normal and strong conductivity. It has been done with MATEMATICA software for the finite hollow cylinder.

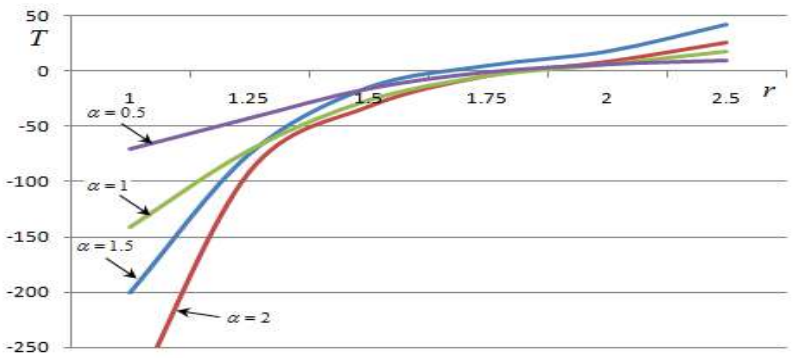

Figure 1: Temperature versus *r* for different values of α

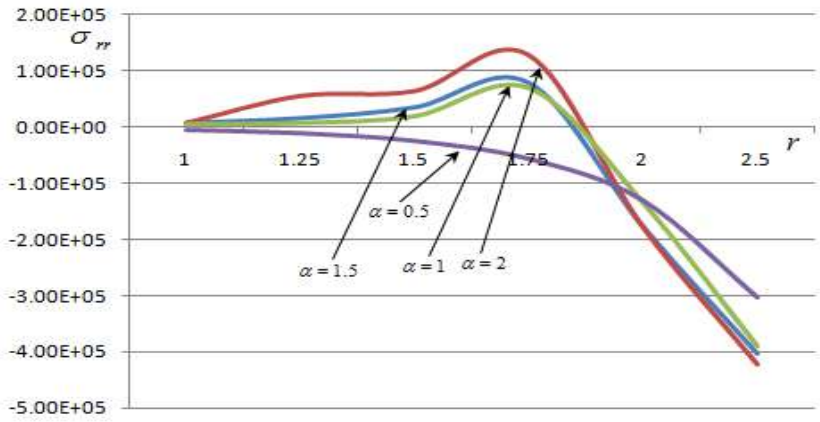

Figure 2: σ_{rr} versus *r* for different values of α

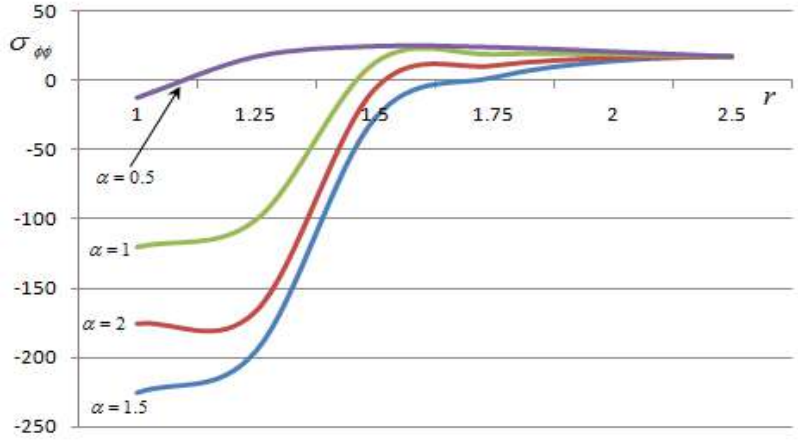

Figure 3: $\sigma_{\phi\phi}$ versus r for different values of α

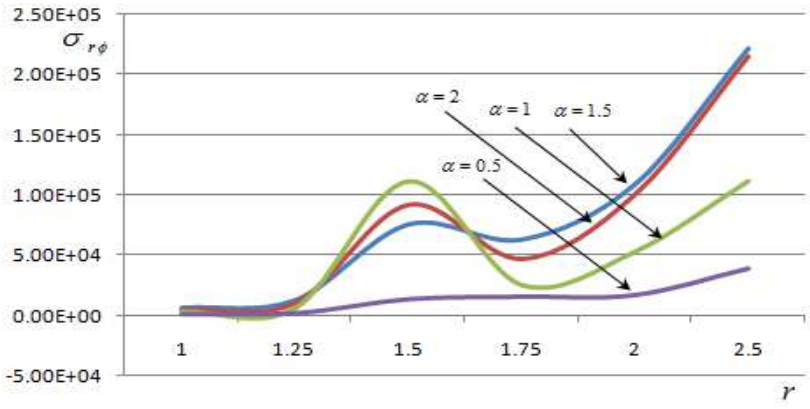

Figure 4: $\sigma_{r\phi}$ versus r for different values of α

Figures 1 to 4: The effect of different values α along the radial direction on temperature and stress distribution variation has been depicted graphically. It indicates the direct impact of the different values of the fractional-order parameter α on the thermal quantities. Studying these parameters helps to understand the properties of any material for domestic and industrial use.

7. Conclusion

In the present analysis, efforts are taken to find a numerical solution to the time-fractional order thermoelastic problem of a thin hollow cylinder that is subjected to an internal moving heat source. The analytical product of temperature change and corresponding stresses has been obtained by using Green's theorem approach and the Integral transform technique. The graphical study established the proportionality relation of wave propagation speed with fraction order. It would provide the base for researchers in thermodynamics and thermoelasticity. This model will be the initial base for designing new materials and applies to real-life situations.

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Hygrothermal Effects On Nanocomposites Objects: A Review Article

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Abstract:

This review article describes the hygrothermal effects on nanocomposite objects. The hygrothermoelastic effects on nanocomposites objects investigation aim to develop operational methods for solving the governing differential equations. In the hygothermoelastic problems, we used numerical algorithms to analyze a few real problems of technical importance while considering the geometry of nanocomposite materials. Few basic equations for hygrothermoelastic problems are discussed.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords:*Hygrothermoelasticity, Nanocomposite objects,Moisture diffusion, Temperature distribution,Thermal stresses.*

Introduction:

Although composites materials are increasingly used in marine, offshore, aeronautics, and civil infrastructures applications, their advantages include lightness, high strength, and high stiffness to weight ratios; however, their durability and long-term integrity are still not comprehensively understood. In such applications, composite materials are exposed to harsh and changing environments ranging from temperature variations and moisture exposure, including elevated temperature immersion and "hot-wet" exposures [1,2,3]. In particular, water diffusion in polymer matrix composite materials may promote material degradation, residual strength reduction, Plasticization, and lowering polymer matrices glass transition temperature, a global decrease in material performance [4, 5]. Thus, it is well known that hygrothermal effects of Polymer Matrix Composites (PMCs) cause degradation of mechanical properties due to the combined effect of moisture and temperature. Given the strong correlation between the rate of deterioration and moisture uptake, the diffusion process in such materials must be understood as a step toward the prediction of long-term durability [6]. Moisture diffusion through polymer or Fibre Reinforced Plastic (FRP) is intrinsically related to its molecular structure, water–polymer interaction, and the degradation processes resulting thereof. The swelling due to moisture absorption leads to the weakening of the fiber/polymer interface and hence affects the long-term durability of the composites [7–11]. Globally research is concentrated on developing PMCs with superior moisture barrier properties. Nanoclay as a filler material in polymers has shown great promise to improve such properties due to increased diffusion path based on tortuosity, which is dependent on the degree of exfoliation in polymers [12]. Thus,the review of the above literature outlines the investigation of the effects of hygrothermal on FRP, and the influence of nano-clay addition on improved mechanical/moisture barrier was well observed.

Literature Review:

The exclusive properties of nanoscale beams are due to their size, and this size plays an essential role in static and dynamic analysis. In front of the difficulties of classical continuum mechanics in considering the size effect in modeling the behaviour of this kind of structure, various size-dependent continuum theories have been developed. These theories include nonlocal continuum theory, strain gradient theory, or a combination of both (nonlocal strain gradient theory), modified couple stress theory, micropolar theory, and the surface elasticity theory.

In this regard, few manuscripts were reviewed like, Karličić et al. [13] used the nonlocal thermoelastic theory to investigate the free banding vibration and stability behaviour of MNBS embedded in Winkler's type of elastic medium and obtained the closed-form solutions for the natural frequencies, and the critical buckling

loads are derived by using the separation of variables method and the trigonometric method. Ebrahimi and Barati [14] developed a nonlocal higher-order beam model for free vibration analysis of magneto-electro-elastic functionally graded nanobeams via Hamilton's principle and solved it using the analytical method. Zarei et al. [15] dealt with the dynamic buckling of a sandwich truncated conical shell composed of polymer–carbon nanotubes–fiber multiphase nanocomposite layers in hygrothermal environments by employing Hamilton's principle. The previously published papers mostly exposed the static and dynamic characteristics of composite or smart material structures to the thermal environment. Recently, a few papers have been published using time-fractional thermoelasticity theory to study the effects of temperature on the material properties under thermal load. For example, Cajić et al. [16] analyzed the free vibration of a nanobeam resting on a viscoelastic foundation using the combined Eringen's nonlocal elasticity and fractional derivative viscoelasticity constitutive equations to model the system and obtained the solution via the Laplace integral transform method. Eyebe et al. [17] studied the nonlinear vibration of a nanobeam resting on the fractional-order viscoelastic Winkler–Pasternak foundation is studied using nonlocal elasticity theory. Thus, several authors (citations are given in the trailing section) have previously investigated the associated hygrothermoelastic problems.

Research Background :

Few basic equations are briefed here are just for reference as

The basic equation for hygrothermoelasticiy:

This subsection summarizes the results of the previous authors' work, namelythe relationship between temperature, dissolved moisture content and vapour concentration, and control equations. As the small variations, σ and ω are related to the mass of absorbed moisture as

$$M = \text{constant} + \sigma C - \omega T \tag{1}$$

Then the equation for moisture diffusion is

$$D''\nabla^2 C = \gamma \frac{\partial M}{\partial t} + \frac{\partial C}{\partial t} \tag{2}$$

and the thermal diffusion is

$$\mathrm{D}''\nabla^2 T = \frac{\partial T}{\partial t} - \varepsilon \frac{\partial M}{\partial t} \tag{3}$$

Now eliminating M from Eqs. (2) and (3) using Eq. (1), one gets

$$D\nabla^2 C = \frac{\partial C}{\partial t} - \psi \frac{\partial T}{\partial t} \tag{4}$$

$$\mathrm{D}\nabla^2 T = \frac{\partial T}{\partial t} - \varphi \frac{\partial C}{\partial t} \tag{5}$$

in which notation is used from the manuscript of Henry [18].

The basic equation for non-simple hygrothermoelasticiy:

Chen and Gurtin [19] propose the classification of real materials into simple and non-simple materials by considering two temperatures viz., thermodynamic and conductive. The respective theory explains that the two temperatures were not identical for non-simple materials, unlike simple materials in which they are identical. The studies were further extended to deformable bodies by Chen et al. [20] and showed that such materials contain an additional term involving the time derivative of the Laplacian of the conductive temperature, and they have shown that the two temperatures are related by

$$\phi = T - b\nabla^2 T,\ b > 0 \tag{6}$$

The key element that sets the two-temperature thermoelasticity theory apart from the classical theory is the material parameter. Therefore, in the case of a non-simple medium, Eq. (2) can be written as

$$D\left(1+\frac{b}{k}\frac{\partial}{\partial t}\right)\nabla^2\phi=\frac{\partial T}{\partial t}-\varphi\frac{\partial C}{\partial t} \qquad (7)$$

The basic equation for hygrothermoelasticiy:

Zhang and Li [21] formulated fractional hygrothermoelasticity theory within the framework of fractional calculus by coupling the classical Fourier's and Fick's laws to anomalous diffusion, which is characterized by the time-fractional diffusion-wave equation

$$D\nabla^2 C=\frac{\partial^\alpha C}{\partial t^\alpha}-\lambda\frac{\partial^\alpha T}{\partial t^\alpha} \qquad (8)$$

$$D\nabla^2 T=\frac{\partial^\beta T}{\partial t^\beta}-\eta\frac{\partial^\beta C}{\partial t^\beta} \qquad (9)$$

Several authors have previously investigated the associated hygrothermoelastic problems. Chang and Weng [22] proposed a linear hygrothermoelastic theory to analyze transient responses in an axisymmetric double-layer annular cylinder subjected to hygrothermal loading using the Hankel transform method. Sugano [23] obtained analytical solutions for the heat and moisture equation and its associated hygrothermal stress in a functionally graded material plate under the prescribed surface temperature and moisture load. Chiba and Sugano [24] analyzed transient heat and moisture diffusion and the resulting hygrothermal stress field in a layered plate subjected to hygrothermal loadings at the external surfaces. Brischetto [25] examined the hygrothermal loading effects in the bending of two-dimensional multilayered composite plates on Carrera's Unified Formulation framework. Ishihara et al. [26] formulated and quantified the hygrothermal field in porous media exposed to heat and moisture, considering nonlinear coupling. Saadatfar and Aghaie-Khafri [27] studied the static behaviour of a functionally graded magnetoelectroelastic hollow sphere subjected to hygrothermal loading in the spherically symmetric state. Ensour [28] presented the interaction of electric potentials, electric displacement, and elastic deformations to describe the hygrothermal responses in inhomogeneous piezoelectric hollow cylinders subjected to both mechanical load and electric potential. Zhao et al. [29] proposed the steady-state solution for three-dimensional hygrothermoelastic media based on the potential theory methodology. Previously published papers exposed the static and dynamic characteristics of composite or smart material structures to the hygrothermal environment. Recently, few papers have been published using time-fractional hygrothermoelasticity theory to study the effects of temperature and moisture concentrations on the material properties under hygrothermal load. Benkhedda et al. [30] evaluated the hygrothermoelastic stress in composite plates during moisture desorption, taking into account the change of mechanical characteristics induced by temperature and moisture variation. Zhang and Li [31] formulated fractional hygrothermoelasticity theory within the framework of fractional calculus by coupling the classical Fourier's and Fick's laws to anomalous diffusion, which is characterized by the time-fractional diffusion-wave equation. Peng et al. [32] presented a hyperbolic diffusion law with different phase lags of thermal and moisture fluxes to simulate coupled heat-moisture diffusion-propagation behaviour and studied transient hygrothermal and elastic response of an infinitely long cylinder subjected to sudden hygrothermal loadings. Zhang et al. [33] proposed a hygrothermal elastic problem within the framework of time-fractional calculus theory for a centrally symmetric sphere subjected to physical heat and moisture flux at its surface by using the integral transform method. Very recently, Zhang et al. [34] investigated the time-fractional diffusion-wave equations introduced to describe the coupled heat conduction and moisture diffusion in a hollow pipe using the separation of variables and the Laplace transform. However, previous researchers have not solved the high-dimensional hygrothermoelastic problems in nanocomposites objects as we know that innovative fibre-reinforced composites have gained extensive use within the region and physical science engineering industries. The benefits of those materials result from their high strength, stiffness, and damping at the side of low concrete weight, though, it is susceptible to hygrothermoelastic stress due to its intrinsic heterogeneity evolving at the microscopic macroscopic level. It reduces construction, operation, and development prices, whereas up structural

responsibility and enhances safety. It's crucial for a decent style of multilayered composite structures to correctly account for hygrothermoelastic stresses; even inside the context of an uncoupled theory, the hygrothermal fields are uncoupled from the strain ones; this task is scarcely unconventional.

Conclusion:

According to the literature study, using hypothesized hygrothermal effects on nanocomposite objects addresses hygrothermomechanical difficulties in many ways. The exact solution of the heat conduction equation in two or three dimensions using memory-dependent derivate has yet to be found in the literature. The thermal profile is determined throughout thermodynamics by solving heat conduction equations with memory-dependent derivative effects that provide a precise solution to thermoelastic problems.

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Thermoelastic problems with fractional order derivative: An overview & prospective

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Abstract:

The article investigates the present review of thermoelastic theories with fractional order derivative effects on different objects. The main theme of the thermoelastic problems is to establish operational methods to solve the governing differential equations. In the thermoelastic problems, we have considered a few practical problems of heat conduction, taking into account of fractional order derivative effect by using numerical or exact procedures.

AMS Subject classifications: 35B07; 35G30; 35K05: 44A10
Keywords:temperature distribution, thermal stresses, fractional order derivative, deflection, integral transform.

Introduction:

In several areas of engineering, solid objects are commonly used as integral structural elements. With thermal loading, such structural elements are likely to be subjected to many forms of static loading or excitation, such as seismic, mechanical, hydrodynamic, blast, aerodynamic, etc. Engineers and scientists worldwide are making unwavering efforts to develop and build economic and productive systems with a very low likelihood of failure.

Thermoelasticity, which is a branch of applied mathematics which specially deals with the study of temperature change and coupling between mechanical deformation and thermal energy calculated in terms of stress. “It can also be defined as it is a branch of science that deals with the analysis of stresses caused by thermally induced strains which are in the elastic range”.It consists of study of heat conduction, thermoelastic displacement and thermal stresses, etc. The most of the material tend to expand if there temperature rises and to a first approximation, the Expansion and Compression is proportional to the temperature change. This temperature changes induced by expansion and compression is based on thermoelasticity.

Thermoelasticity investigates the relation between a material's elastic properties and temperature, or between its thermal conductivity and thermal stress. Another complex problem faced by engineers and applied mathematicians is finding solutions to the fundamental problems in their field of study, which is partial differential equations in some cases. Using the well-known principles of classical mechanics and thermodynamics, the body's deformation undergoes the resultant stresses under the combined influence of external loads, body forces, and heat conduction is calculated. This relationship of temperature and displacement fields, the situation where mechanical and thermal causes cause deformation, results in the word 'Thermoelasticity'.

The convolution operator presented in the most popular Riemann-Liouville fractional integral, which is defined as where denotes the convolution operator, is the fractional-order and is the standard power function given as .

Research Background :

The classic heat conduction theory is based on the Fourier law [27,28] (1)
in which is the heat flux vector, denotes the point in the considered region, is the time, is the thermal conductivity of the material, is the gradient operator, and is the temperature, respectively.

Introduction of single-phase-lag to evade discrepancy between the mathematical model and the observations [29-31] (2)

in which is the phase lag of the heat flux or so-called relaxation time.

Expanding the left-hand side of Eq. (2) into the Taylor series with respect to the variable , one obtains [32] as (3)

where is introduced to keep the dimension in order.

The fractional generalization [20,21] of the classical Cattaneo model by introducing fractional Taylor formula [33] as (4)

where without losing the generality appearing in Taylor series is merged in terms, is the gamma function, is introduced to keep the dimension in order and is the fractional time derivative based on Caputo fractional definition [34].

For the limiting case of (or), Eq. (4) reduces to classical Fourier heat conduction and the standard Cattaneo heat conduction equation for as (5)

The heat conduction equation in the context of fractional-order generalized thermoelasticity proposed by Sherief [35] gives (6)

Here it should be noted that the estimated ranges [36] of relaxation time (in seconds) usually involves for metals, for gases, and for porous materials, respectively.

Literature Review:

fractional calculus is the generalisation of the ordinary differential and integration to non integer order. The fractional order theory of thermoelasticity was derived by Sherief et al [8]. It is a generalisation of both the couple and the generalisation theories of thermoelasticity. Open dimensional problem for a half space was solved by Sherief and Abdellatief in [9]. In this work, a new theory of thermoelasticity is derived using the methodology of fractional calculus. The theories of coupled thermoelasticity and of generalisedthermoelasticity with one relaxation time follow as limit cases.

Biot [10] Formulated the theory of coupled thermoelasticity to eliminate the paradox inherentinthe classical uncoupled theory that elastic changes have no effect of temperature. Lord and Shulman [13] introduced the theory of generalisedthermoelasticity with one relaxation time for the special case of an isotropic body. This theory was extended by Dhaliwal and Sherief [11] to include the anisotropic case. In this theory a modified law of heat conduction including both the heat flux and it's time derivative replaces the conventional Fourier's law. Uniqueness of solution for this theory was proved under different conditions by Ignaczak [24] and Ignaczak [25], Sherief and Dhaliwal [11] and Sherief [23]. The state space approach to this theory was developed by Anwar and Sherief [22], and Sherief. The fundamental solution for this theory was obtained by Sherief [20], Sherief and Hamza [21] have solved some two-dimensional problems. Sherief et al., [8] extended this theory to deal with micropalar materials in .Sherief et al., [18] and Sherief and Saleh [19] developed the theory of Thermoelastic diffusion. Green and Lindsay [12] developed to theory Of generalisedthermoelasticity with two dimensions with two relaxation times which is based on generalised inequality of thermodynamics.

Fractional calculus has been used successfully to modify many existing models of physical processes. The first application of fractional derivatives was given by Abel, who applied fractional calculus in the solution of an integral equation that arises in the formulation of the Tautocrone problem. One can state that the whole theory of fractional derivatives and integrales was established in the second-half of the 19th century. Caputo and Mainardi [2], Caputo [3] found Good agreement with experimental result when using fractional derivative for description of viscoelastic material and established the connection between fractional derivatives and the theory of linear viscoelasticity. Povstenko , [6] determined the solution for cauchy problem for time- fractional quasi-static uncoupled theory of thermoelasticity. Povstenko [7] solved Thermoelastic problems of infinite cylinders with time fractional diffusion-wave equation by applying integral transform technique and several problems with Dirichlrt's equation and Neumann boundary conditions was simplified.

The theory of fractional calculus has been used successfully to model polymers material. In this proposed thesis entitled - " Studies of some thermoelastic problems in context of fractional order theory of thermoelasticity". We will investigate the mathematical model for solving fractional order equations will be presented in a random sequence.

Conclusion:

The literature reviewed noted that the use of thermal profile addresses thermomechanical problems with the fractional derivative effect. The literature still fails to provide the exact solution of the heat conduction

equation in three-dimensional problems using time-dependent fractional derivate. The thermal profile is determined by solving heat conduction equations with fractional derivative effects throughout thermodynamics that provide an exact solution to thermoelastic problems.

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Generalized thermoelasticity with memory-dependent derivative: An overview & prospective

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Abstract:

The article investigates the present review of generalized thermoelastic theories with memory-dependent derivative effects on different objects. The main theme of the thermoelastic problems is to establish operational methods to solve the governing differential equations. In the thermoelastic problems, we have considered a few practical problems of technical interest, taking into account of fractional order derivative effect by using numerical or exact procedures.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords: *temperature distribution, thermal stresses, thermoelastic, memory-dependent derivative, vibration, deflection, integral transform.*

Introduction:

In several areas of engineering, solid objects are commonly used as integral structural elements. With thermal loading, such structural elements are likely to be subjected to various forms of static loading or excitation, such as seismic, mechanical, hydrodynamic, blast, aerodynamic, etc. Engineers and scientists worldwide are making unwavering efforts to develop and build economic and productive systems with a very little likelihood of failure. Thermal effects produce heat transfer by conduction within an elastic surface, and this distribution of thermal energy develops a temperature field within the material. Many solids undergo a volumetric transition with variance in temperature, and thus the presence of a temperature range typically causes stresses caused by limit or interval constraints. If the temperature variation is high enough, these stresses can reach levels that can lead to structural failure, especially in brittle materials. Hence, understanding stress analysis can be helpful for several issues, including high-temperature variation.

Thermoelasticity can be generalized as investigating the relationship between a material's elastic properties and temperature or between its thermal conductivity and thermal stress. Another complex problem faced by engineers and applied mathematicians is finding solutions to the fundamental problems in their field of study, partial differential equations in some cases. Using the well-known principles of classical mechanics and thermodynamics, the deformation that the body undergoes, the resultant stresses under the combined influence of external loads, body forces, and heat conduction is calculated. This relationship of temperature and displacement fields, where mechanical and thermal causesdeformation, results in 'Thermoelasticity'. Temperature variations allow the material to undergo thermal effects. Some of these are thermal strains, stress, and deformation. Thermal deformation means that as the thermal energy and/or temperature of the material increases, so does the vibration of the atom or molecules and this changes in vibration result in the stretching of molecular bonds, which causes the material to expand, of course, if the thermal energy and temperature of the material decreases, the material will compress or contract.

The enormous demand for science and engineering works dealt with Fractional-Order Equations' dynamical systems that involve derivatives and non-integer integrals. They explain various substances' memory and hereditary properties and cope with the tremendous demand for science and engineering work. Meanwhile, it also discovered that fractional calculus is used effectively to modify many current models of physical processes, see Hilfer [1], Sherief et al. [2], Tenreiro et al. [3]. It can also be claimed that the entire theory of fractional derivatives and integrals was established in the second half of the 19th century. A good overview of the subject will be noticed in Podlubny [4], Kaczorek [5-6], Sherief and El-Latief [7], Siedlecka and Kukla [8], Abbas [9], Xiong and Niu [10], Mahakalkar et al. [11], Mittal and Kulkarni [12], Hussein [13] and so on. The memory effect comes from the convolution operator presented in the most popular Riemann-Liouville fractional

integral, which is defined as $I_{\alpha,\alpha}^{RL} f(x) = (1/\Gamma(\alpha))\int_a^x (x-t)^{\alpha-1} f(t)dt = \Phi_\alpha \bigstar f(x)$, where $\bigstar$ denotes the convolution operator, α is the fractional-order and Φ_α is the standard power function given as $\Phi_\alpha(t) = t^{\alpha-1}/\Gamma(\alpha)$. A further literature review has been described as 'the foundation and inspiration for substantive, useful research' will be done in later sections.

Research Background :

The classic heat conduction theory is based on the Fourier law [14,15]

$$q(x,t) = -k\nabla T(x,t) \qquad (1)$$

in which $q(x,t)$ is the heat flux vector, x denotes the point in the considered region, t is the time, k is the thermal conductivity of the material, ∇ is the gradient operator, and $T = T(r,t)$ is the temperature, respectively.

Introduction of single-phase-lag to evade discrepancy between the mathematical model and the observations [16-18]

$$q(x,t+\tau) = -k\nabla T(x,t) \qquad (2)$$

in which τ is the phase lag of the heat flux or so-called relaxation time.

Expanding the left-hand side of Eq. (2) into the Taylor series with respect to the variable τ, one obtains [19] a

$$q(x,t) + \frac{\tau^\alpha}{\Gamma(1+\alpha)}\frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\nabla T(r,t), 0 < \alpha \le 1 \qquad (3)$$

where α is introduced to keep the dimension in order.

The fractional generalization [20,21] of the classical Cattaneo model by introducing fractional Taylor formula [22] as

$$q(x,t) + \tau^\alpha \frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\nabla T(x,t), 0 < \alpha \le 1 \qquad (4)$$

where without losing the generality $\Gamma(1+\alpha)$ appearing in Taylor series is merged in τ^α terms, Γ is the gamma function, α is introduced to keep the dimension in order and $\partial^\alpha / \partial t^\alpha$ is the fractional time derivative based on Caputo fractional definition [23].

For the limiting case of $\tau = 0$ (or $\alpha = 0$), Eq. (4) reduces to classical Fourier heat conduction and the standard Cattaneo heat conduction equation for $\alpha = 1$ as

$$q(x,t) + \tau\frac{\partial}{\partial t} q(x,t) = -k\nabla T(x,t) \qquad (5)$$

The heat conduction equation in the context of fractional-order generalized thermoelasticity proposed by Sherief [24] gives

$$q(x,t) + \tau\frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\nabla T(x,t), 0 < \alpha \le 1 \qquad (6)$$

Here it should be noted that the estimated ranges [25] of relaxation time (in seconds) usually involves $(10^{-11} : 10^{-14})$ for metals, $(10^{-8} : 10^{-10})$ for gases, and $(10 : 10^{2})$ for porous materials, respectively.

Wang and Li [26] have introduced a memory-dependent derivative (MDD). The first order $(\alpha = 1)$ of function f which is simply defined in an integral form of a common derivative with a kernel function $K(t-\zeta)$ on a slipping interval $[t-\omega, t]$ in the form

$$q(x,t) + \tau D_\omega^{(1)} q(x,t) = -k\nabla T(x,t) \qquad (7)$$

where

$$D_{\omega}^{(1)} f(x,t) = \frac{1}{\omega} \int_{t-\omega}^{\omega} K(t-\zeta) f'_{\zeta}(x,\zeta) dx, \ \omega > 0,$$

$D_{\omega}^{(1)} \to \partial / \partial t$, ω is delay time, and $K(t-\zeta)$ is the kernel function.

Heat conduction equation in MDD thermoelasticity introduced by Ezzat [27]

$$q(x,t) + \omega D_{\omega}^{(1)} q(x,t) = -k \nabla T(x,t) \qquad (8)$$

By combining Eq. (8) with the energy conservation equation

$$-\Delta \cdot q(r,t) = \rho C_v \frac{\partial T}{\partial t}(r,t) \qquad (9)$$

Now by combining Eq. (8) and (9) leads to the heat conduction equation as

$$\kappa \nabla T(x,t) = (1 + \tau_{\omega} D_{\omega}) \rho C_v \frac{\partial T}{\partial t}(r,t) \qquad (10)$$

where $\kappa = \rho C_v / k$ is the thermal diffusivity, ρ is the density of the material, C_v is the specific heat capacity, and where $\Delta = \nabla^2 = \nabla \cdot \nabla$ a Laplace operator is a second-order differential operator.

Literature Review:

Many researchers have studied the development and applications of fractional-order equations. The fascinating and recent applications of fractional differential equations in physics, chemistry, biology, engineering, finance, and other research fields built over the last few decades are now not difficult to find. Some of the applications include: diffusion processes [28,29], mechanics of materials [30,31], combinatorics [32,33], inequalities [34], analysis [35], calculus of variations [36-41], signal processing [42], image processing [43], advection and dispersion of solutes in porous or fractured media [44], modeling of viscoelastic materials under external forces [45], bioengineering [46], relaxation and reaction kinetics of polymers [47], random walks [48], mathematical finance [49], modeling of combustion [50], control theory [51], heat propagation [52], modeling of viscoelastic materials [53] and even in areas such as psychology [54,55]. It is easy to find hundreds, if not thousands, of new applications in which the fractional calculus approach is more than welcome.

Fractional-order derivatives have been successfully used in mechanics to model memory-effect damping forces or characterize state feedback controllers, as demonstrated by Bagley and Torvik [56]. It is noticed by Wang and Hu [57] that the term fractional-order derivative whose order is between 0 and 2 often acts as a damping force in fractional-order vibration systems with a single degree of freedom. Fractional calculus has therefore been effectively used to change many current physical process models. The first use of fractional derivatives was made by Abel [58], who applied fractional calculus to the solution of the integral equation of the tautochrone problem formulation. Fractional derivatives were used by Caputo [59, 60] and Caputo and Mainardi [61,62], and their findings were in substantial agreement with the empirical evidence for describing viscoelastic materials.

Some authors have worked on fractional derivatives in the thermoelastic analysis of most recent literature, which can be summarised below: Povstenko [63] proposed a quasi-static uncoupled theory of thermoelasticity based on the heat conduction equation with a time-fractional derivative of order α. Povstenko [64] formulated the theory of diffusive stress based on the time-fractional diffusion equation. Povstenko [65] also obtained the temperature distribution and thermal stresses in an infinite medium with a spherical cavity using the integral transform technique.Youssef and Al-Lehaibi [66] developed a novel theory for the generalized thermoelasticity model based on fractional-order generalized thermoelasticity. Similarly, Youssef and Al-Lehaibi [67] constructed a model of an elastic material with constant parameters in the half-spacein the context of the fractional-order generalized thermoelasticity theory. Sherief et al. [68] developed a new theory of thermoelasticity using the methodology of fractional calculus. Ezzat and El-Karamany [69] attempted to generalize these results to include a magnetic field's effects in two-temperature thermoelasticity. Youssef and Al-Lehaibi [70] developed a mathematical model of an elastic material with a cylindrical cavity inthe context of the fractional-order generalized thermoelasticity theory. Povstenko [71] obtained the theory of thermal stresses

based on the heat conduction equation with the Caputo time-fractional derivative of order $0 < \alpha \leq 2$. Youssef [72] found a half-space filled with an elastic material taken as constant elastics' parametersin the standard model of thermoelasticity in fractional-order. Sur and Kanoria [73] constructed a new theory of two-temperature generalized thermoelasticity in the context of a new consideration of heat conduction with fractional orders.Youssef [74] considered a half-space filled with an elastic material that had constant elastic parameters was considered, and the governing equations were written in the form of the two-temperature generalized thermoelasticity theory of fractional order. Youssef et al. [75] developed a cylindrical nano-beam mathematical model with constant elastic parameters with fractional order heat conduction. Wang e al. [76] studied thermoelastic behaviours involving in the effect of thermal inertia during the macro- and microscales heat conduction. Bhattacharya and Kanoria [77] obtained the two-temperature thermo-elasto-diffusion interaction inside a spherical shell in the context of fractional order generalized thermoelasticity.Zenkour and Abouelregal [78] determined the thermoelastic displacement, stress, conductive temperature, and thermodynamic temperature in an infinite isotropic elastic body with a spherical cavitybased on the two-temperature generalized thermoelasticity theory (2TT). Youssef [79] derived a new theory of thermoelasticity based on the fraction order of strain, which is considered a new modification to Duhamel-Neumann's stress-strain relation. Bachher [80] considered a one-dimensional problem for a homogeneous and isotropic thermoelastic infinite porous material under the dependence of modulus of elasticity and thermal conductivity on reference temperature subjected to periodically varying heat sources in the context of the fractional-order generalized thermoelasticity with one relaxation time parameter. Santra et al. [81] proposed the three-dimensional generalized thermoelastic coupled problem for a homogeneous isotropic and thermally conducting thermoelastic medium under the effect of rotation in fractional context order generalized thermoelasticity.Yadav et al. [82] employed the theory of generalized thermoelasticity with fractional order strain to study the problem of one-dimensional disturbances in a viscoelastic solid in the presence of a moving internal heat source and subjected to a mechanical load. Bassiouny and Abouelnaga [83] investigated the thermoelastic properties of a sandwich structure made of three piezoelectric layers in the context of fractional-order theory two-temperature generalized thermopiezoelasticity. Gupta and Das [84] applied the eigenvalue approach method, and Laplace transform, a general solution scheme for the thermoelastic deformation of an unbounded transversely isotropic medium fractional-order generalized thermoelasticity with an instantaneous heat source. Sheoran and Kundu [85] presented a comprehensive review of relevant literature to highlight the role of fractional calculus in thermoelasticity.Abbas [86] investigated the temperature, displacement, and stresses due to thermal shock loading on the inner surface cavity in an infinite medium with a cylindrical cavity inthe context of the fractional-order generalized thermoelasticity theory. Bachher and Sarkar [87] studied the theory of generalized thermoelasticity based on the heat conduction equation with the Caputo time-fractional derivative is used to study the magneto-thermoelastic response of a homogeneous isotropic two-dimensional rotating elastic half-space solid. Povstenko et al. [88] studied a control problem of thermal stresses in an infinite cylindrical body in which the time-fractional heat conduction equation defined the temperature distribution with the Caputo derivative of the order $0 < \alpha \leq 2$. Xiong and Niu [89] developed the principle of fractional-order generalized thermoelastic diffusion for anisotropic and linear thermoelastic diffusive media. Chirilă and Marin [90] continued the work on dipolar thermoelastic materials, which are a particular case of multipolar continuum mechanics. The fractional-order derivative effect on a two-dimensional problem with weak, normal and strong conductivity due to thermal shock was examined by Abbas [91].

Conclusion:

The literature reviewed noted that the use of the expected thermal profile addresses generalized thermomechanical problems with the memory response effect. The literature still fails to provide the exact solution of the heat conduction equation in two or three-dimensional problems using memory-dependent derivate. The present work determines the thermal profile by solving heat conduction equations throughout thermodynamics that provide an exact solution to generalized thermoelastic problems.

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Thermoelastic vibrations analysis of a thin isotropic solid elliptic cross section

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1.Introduction

The present paper considers the realistic problem of a thin isotropic solid elliptic cross section profile subjected to point-impulsive source on the upper face, zero temperature at lower face, and with simply supported thermally insulated on the curved surface are studied using a typical classical technique. For the theoretical measurements the dimensional parameter was taken, while the dimensionless parameter was used for graphical measurements. In basic equation formulation we have considered the equations of motion, the displacement potential and finally obtained the components of stress in terms of thermoelastic displacement potential function. Finally, by considering a circle as a special kind of ellipse, it is seen that the temperature distribution in a circular solution can be derived as a special case from the present mathematical solution.

2.Formulation of the problem

Taken a thin elliptic isotropic solid assuming the space $D:\{(\xi,\eta,z)\in R^3: 0<\xi<\xi_0, 0<\eta<2\pi, -\ell/2\le z\le \ell/2\}$ in elliptic cylindrical coordinates (ξ,η,z) which is related to the rectangular coordinates (x,y,z) by $x=c\cosh\xi\cos\eta, y=c\sinh\xi\sin\eta, z=z$ (1)

where $c=(a^2-b^2)^{1/2}$ and $2c$ is the length of the interfocal line of the ellipse. The curves $\eta=$ constant denotet a family of confocal hyperbolas while the curves $\xi=$ constant constitute a family of confocal ellipses. Thus, at every point in space, both sets of curves intersect each other orthogonally. Its elliptic cross-section using the semi-major and semi-minor axial lengths a and b, respectively, as shown in Fig. 1. The parameter ξ defines the interfocal line having the range $\xi\in(0,\xi_0)$, and by using Eq. (1), the coordinate ξ_0 of the surface of the elliptic solid is obtained as $\xi_0=\tanh^{-1}(b/a)=(1/2)\mathrm{In}\,[(a+b)/(a-b)]$.

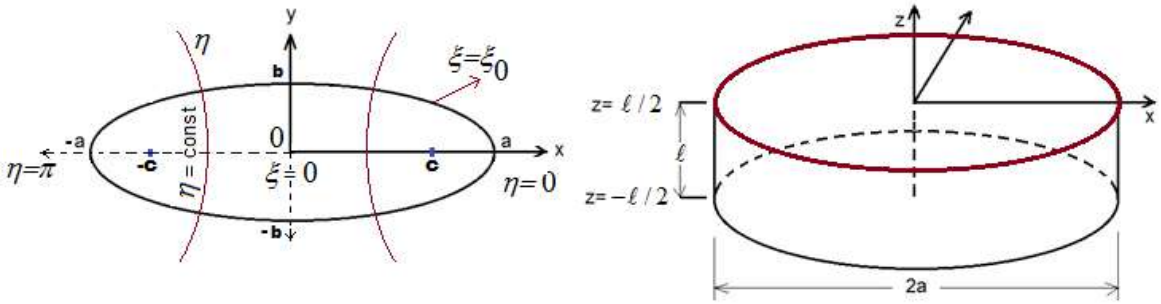

Figure 1: Elliptic solid plate configuration geometry

3. Temperature distribution analysis

We assume that the temperature is given by

$$T(\xi,\eta,z,t)=\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}A_{2n}\,Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\sin\left\{\gamma_{2n}\left[z+\left(\frac{\ell}{2}\right)\right]\right\}e^{-\omega t} \quad (2)$$

in which ω being a constant, $ce_{2n}(\eta,q)$ is the ordinary Mathieu function, $Ce_{2n}(\xi_0,q)$ is a modified Mathieu function, $q_{2n,m}$ is a root of the equation $Ce_{2n}(\xi,q_{2n,m})=0$ and according to McLaclan [26], $ce_{2n}(\eta,q)=\sum_{r=0}^{\infty}A_{2r}^{(2n)}\cos 2r\eta,\ Ce_{2n}(\xi,q)=\sum_{r=0}^{\infty}A_{2r}^{(2n)}\cosh 2r\xi$ (3)

with $A's$ being the functions of q, and the constant A_{2n} can be found from the nature of the temperature prescribed on the upper face. Further assuming that the lower face of the plate is kept at zero temperature as $T(\xi,\eta,z,t)|_{z=-\ell/2}=0$ (4)

while thermally insulated curved surface is expressed as $\frac{\partial}{\partial\xi}T(\xi,\eta,z,t)|_{\xi=\xi_0}=0$ (5)

and the sectional heat supply is impacted over the portion $0 < \xi < \xi_0$ that varying with time according to point-impulsive source as $T(\xi,\eta,z,t)|_{z=\ell/2} = e^{-\omega t}\delta(\xi-\xi_0)f_0(\eta)$ (6)

in which $f_0(\eta) = 1(0 \le \eta \le 2\pi)$ at $\xi = \xi_0$ and $\delta()$ is the Dirac delta function. Now the differential equation governing transient temperature distribution $T = T(\xi,\eta,z,t)$ for an elliptic plate can be defined as $\frac{2}{c^2(\cosh 2\xi - \cos 2\eta)}\left(\frac{\partial^2 T}{\partial \xi^2} + \frac{\partial^2 T}{\partial \eta^2}\right) + \frac{\partial^2 T}{\partial z^2} = \frac{1}{\kappa}\frac{\partial T}{\partial t}$ (7)

where $\kappa = \lambda/\rho C$ is the thermal diffusivity, in which λ is thermal conductivity and heat capacity per unit volume is ρC, with ρ as density and C as specific heat, respectively. Substituting Eq. (2) in Eq. (7), one obtains $\gamma_{2n} = [\alpha_n^2 + (\omega/\kappa)]^{1/2}$ (8)

where $\alpha_n^2 = -4q_{2n,m}/c^2$

Using Eqs. (2), (7) and (8), one obtains

$\delta(\xi-\xi_0) = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\, Ce_{2n}(\xi, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m})\sin\{\gamma_{2n}\ell]\}$ (9)

Here the series quoted on the right-hand side of Eq. (9) is obtained from the well-known theorem of Fourier-Mathieu series [26] for any point within the considered range. Now, multiply Eq. (9) on both the sides by $(\cosh 2\xi - \cos 2\eta)Ce_{2p}(\xi, q_{2p,r})ce_{2p}(\eta, q_{2p,r})$ and integrate with respect to η from 0 to 2π, and with respect to ξ from 0 to ξ_0, then by the orthogonality property [26], all terms vanish except when $p = n, r = m$, therefore, by the theory of Mathieu function, one obtains

$$A_{2n,m} = \frac{\int_0^{\xi}\int_0^{2\pi} Ce_{2n}(\xi,q_{2n,m})\, ce_{2n}(\eta,q_{2n,m})\, \delta(\xi-\xi_0)(\cosh 2\xi - \cos 2\eta)\, d\xi d\eta}{\pi e^{\omega t}\int_0^{\xi} Ce_{2n}^2(\xi,q_{2n,m})[\cosh 2\xi - \Theta_{n,m})\, d\xi} \quad (10)$$

$$\text{Where}\Theta_{n,m} = \frac{1}{\pi}\int_0^{2\pi} ce_{2n}^2(\eta, q_{2n,m})\cos 2\eta\, d\eta$$

Hence inserting the Eqs. (8) and (10) into Eq. (2), one obtains the desired temperature distribution that satisfies the boundary conditions.

At $t = 0$, initial temperature $T_i = T_i(\xi,\eta,z,t)$ is given as

$$T_i(\xi,\eta,z,t) = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\, Ce_{2n}(\xi, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m})\sin\{\gamma_{2n}[z + (\ell/2)]\} \quad (11)$$

Hence the temperature change $\tau = T - T_i$ is obtained as

$$\tau = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\, Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m})\sin\left\{\gamma_{2n}\left[z + \left(\frac{\ell}{2}\right)\right]\right\}(e^{-\omega t} - 1) \quad (12)$$

4. Basic equation formulation

The equations of motion are written as follows

$$\begin{aligned}(\lambda+2\mu)\frac{\partial e}{\hbar\partial\xi} - 2\mu\frac{\partial\tilde{\omega}_z}{\hbar\partial\eta} + 2\mu\frac{\partial(\hbar\tilde{\omega}_\eta)}{\hbar\partial z} - (3\lambda+2\mu)\alpha\frac{\partial\tau}{\partial\xi} &= \rho\frac{\partial^2 u_\xi}{\partial t^2},\\ (\lambda+2\mu)\frac{\partial e}{\hbar\partial\eta} + 2\mu\frac{\partial\tilde{\omega}_z}{\hbar\partial\xi} - 2\mu\frac{\partial(\hbar\tilde{\omega}_\xi)}{\hbar\partial z} - (3\lambda+2\mu)\alpha\frac{\partial\tau}{\partial\eta} &= \rho\frac{\partial^2 u_\eta}{\partial t^2}\end{aligned} \quad (13)$$

in which the scale factor $\hbar$, dilatation e and rotations $\tilde{\omega}_\xi, \tilde{\omega}_\eta, \tilde{\omega}_z$ are represented by

$$\begin{aligned}&\hbar^2 = c^2(\cosh^2\xi - \cos^2\eta) = (c^2/2)(\cosh 2\xi - \cos 2\eta),\\ &\hbar_\xi^2 = \hbar_\eta^2 = c^2\hbar^2, \hbar_z = 1,\ e = \frac{\partial(\hbar u_\xi)}{\hbar^2\partial\xi} + \frac{\partial(\hbar u_\eta)}{\hbar^2\partial\eta},\\ &2\tilde{\omega}_\xi = -\frac{\partial u_\eta}{\partial z}, 2\tilde{\omega}_\eta = \frac{\partial u_\xi}{\partial z}, 2\tilde{\omega}_z = \frac{\partial(\hbar u_\eta)}{\hbar^2\partial\xi} - \frac{\partial(\hbar u_\xi)}{\hbar^2\partial\eta}\end{aligned} \quad (14)$$

and, where λ and μ are the Lame's constants and they are related to Young's Modulus E and Poisson's ratio υ through the equations given below

$$\lambda = \frac{\upsilon E}{(1+\upsilon)(1-2\upsilon)}, \mu = \frac{E}{2(1+\upsilon)}$$

Applying the divergence and curl operation to Eqs. (11), one obtains

$$\begin{aligned}(\lambda+2\mu)\nabla^2 e + \mu\frac{\partial^2 e}{\partial z^2} - (3\lambda+2\mu)\nabla^2\tau &= \rho\frac{\partial^2 e}{\partial t^2},\\ \mu\nabla^2(2\tilde{\omega}_z) + \mu\frac{\partial^2(2\tilde{\omega}_z)}{\partial z^2} - (3\lambda+2\mu)\nabla^2\tau &= \rho\frac{\partial^2(2\tilde{\omega}_z)}{\partial t^2}\end{aligned} \quad (15)$$

in which $\nabla^2 = (1/\hbar^2)(\partial^2/\partial\xi^2 + \partial^2/\partial\eta^2)$

The solution of the previous Eq. (11) without body forces can be expressed by using the displacement potential φ and ψ as

$$\left.\begin{aligned} u_\xi &= \left(\frac{\partial\varphi}{\hbar\partial\xi} - \frac{\partial\psi}{\hbar\partial\eta}\right)\sin\left(\frac{m\pi z}{2\ell}\right)e^{-\omega t} \\ u_\eta &= \left(\frac{\partial\varphi}{\hbar\partial\eta} + \frac{\partial\psi}{\hbar\partial\xi}\right)\sin\left(\frac{m\pi z}{2\ell}\right)e^{-\omega t} \end{aligned}\right\},\ m = 1,3,5,.. \qquad (16)$$

in which the potential functions φ and ψ must satisfy the following governing equations

$$\nabla^2\varphi = K\tau, \nabla^2\psi = 0 \qquad (17)$$

with the initial condition $\varphi = 0 \quad at \quad t = 0, \qquad (18)$

where $K = \alpha\,(1+\upsilon)/(1-\upsilon)$ is restraint coefficient. The components of stress in terms of thermoelastic displacement potential are

$$\begin{aligned} \sigma_{\xi\xi} &= \lambda\left\{\frac{\partial(\hbar u_\xi)}{\hbar^2\partial\xi} + \frac{\partial(\hbar u_\eta)}{\hbar^2\partial\eta}\right\} + 2\mu\left\{\frac{\partial(u_\xi)}{\hbar\partial\xi} + \frac{u_\eta}{\hbar^2}\frac{\partial(\hbar)}{\partial\eta}\right\} - K\tau, \\ \sigma_{\eta\eta} &= \lambda\left\{\frac{\partial(\hbar u_\xi)}{\hbar^2\partial\xi} + \frac{\partial(\hbar u_\eta)}{\hbar^2\partial\eta}\right\} + 2\mu\left\{\frac{\partial(u_\eta)}{\hbar\partial\eta} + \frac{u_\xi}{\hbar^2}\frac{\partial(\hbar)}{\partial\eta}\right\} - K\tau, \qquad (19) \\ \sigma_{\xi\eta} &= \mu\left\{\frac{\partial}{\partial\eta}\left(\frac{u_\xi}{\hbar}\right) + \frac{\partial}{\partial\xi}\left(\frac{u_\eta}{\hbar}\right)\right\} \end{aligned}$$

Eqs. (1) to (19) establishes the mathematical formulation of the problem under consideration.

5.Approach to the problem

5.1 Displacement distribution

By assuming the suitable displacement function φ which satisfies Eqs. (1)-(2) as

$$\varphi = \frac{K\kappa}{\omega}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\, Ce_{2n}(\xi, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m}) \times \sin\{\gamma_{2n}[z + (\ell/2)]\}(1 - e^{-\omega t}) \qquad (20)$$

Now suitable form of ψ satisfying second expression of Eq. (14) is given by

$$\psi = -\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}[C_{2n}\sinh 2\xi + D_{2n}\alpha_n^2\xi\sin 2\eta]Ce_{2n}(\eta, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m}) \times \sin\{\gamma_{2n}[z + (\ell/2)]\}(1 - e^{-\omega t}) \qquad (21)$$

The expressions for displacements may be put as

$$\begin{aligned} u_\xi = \frac{1}{\hbar}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\{K\kappa Ce'_{2n}(\xi, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m}) + \omega[C_{2n}\xi \\ \times Ce_{2n}(\xi, q_{2n,m}) + D_{2n}\alpha_n^2\xi^2]ce'_{2n}(\eta, q_{2n,m})\}\sin(m\pi z/2\ell)e^{-\omega t} \qquad (22) \\ \times \sin\{\gamma_{2n}[z + (\ell/2)]\}(1 - e^{-\omega t}) \end{aligned}$$

$$\begin{aligned} u_\eta = \frac{1}{\hbar}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\{K\kappa Ce_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m}) \\ -\omega\,[C_{2n}\{\xi Ce'_{2n}(\xi, q_{2n,m}) + Ce_{2n}(\xi, q_{2n,m})\} \\ +2D_{2n}\alpha_n^2\xi]ce_{2n}(\eta, q_{2n,m})\}\sin(m\pi z/2\ell)\, e^{-\omega t} \qquad (23) \\ \times \sin\{\gamma_{2n}[z + (\ell/2)]\}(1 - e^{-\omega t}) \end{aligned}$$

5.2 Thermal stresses solution

The expressions for stresses related to displacement as given in Eq. (16) may be put as

(24)

$$\sigma_{\eta\eta} = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\frac{A_{2n}}{\omega\hbar}\Big\langle\frac{1}{\hbar}\Big[[\lambda\{K\kappa Ce''_{2n}(\xi,q_{2n,m})\,ce_{2n}(\eta,q_{2n,m}) - \omega[C_{2n}Ce'_{2n}(\xi,q_{2n,m}) + D_{2n}\alpha_n^2 ce'_{2n}(\eta,q_{2n,m})]\} + (\lambda+2\mu) \times \{\kappa KCe_{2n}(\xi,q_{2n,m})\,ce''_{2n}(\eta,q_{2n,m}) - \omega[C_{2n}Ce'_{2n}(\xi,q_{2n,m}) + D_{2n}\alpha_n^2 ce'_{2n}(\eta,q_{2n,m})]\}\Big] + \frac{1}{\hbar^{3/2}}\Big[\Big[\lambda\sinh 2\xi\{K\kappa\, Ce'_{2n}(\xi,q_{2n,m}) \times ce_{2n}(\eta,q_{2n,m}) - \omega[C_{2n}Ce_{2n}(\xi,q_{2n,m}) + D_{2n}\alpha_n^2\xi ce'_{2n}(\eta,q_{2n,m})]\}\Big]\Big] + (\lambda+2\mu)\sin 2\eta\{\kappa KCe_{2n}(\xi,q_{2n,m})\,ce'_{2n}(\eta,q_{2n,m}) - \omega[C_{2n}\eta \times Ce'_{2n}(\xi,q_{2n,m}) + D_{2n}\alpha_n^2 ce_{2n}(\eta,q_{2n,m})] - K\omega\hbar Ce_{2n}(\xi,q_{2n,m}) \times ce_{2n}(\eta,q_{2n,m})cosec(m\pi z/2\ell)e^{\omega t}\sin\{\gamma_{2n}[z+(\ell/2)]\}\sin(m\pi z/2\ell)\Big\rangle \times e^{-\omega t}\sin\{\gamma_{2n}[z+(\ell/2)]\}(1-e^{-\omega t}) \quad (25)$$

$$\sigma_{\xi\eta} = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\lambda\Big\langle\{K\kappa Ce'_{2n}(\xi,q_{2n,m})\,ce_{2n}(\eta,q_{2n,m}) + D_{2n}\,\omega\alpha_n^2\xi^2 ce'_{2n}(\eta,q_{2n,m})\} + \{\hbar\omega\,[C_{2n}\xi Ce'_{2n}(\xi,q_{2n,m}) + 2D_{2n}\alpha_n^2\xi]ce_{2n}(\eta,q_{2n,m})\Big\rangle\sin(m\pi z/2\ell) \times e^{-\omega t}\sin\{\gamma_{2n}[z+(\ell/2)]\}(1-e^{-\omega t}) \quad (26)$$

6. Special case and numerical calculations

We add the following dimensionless values in order to facilitate the computation

$$\left.\begin{aligned}&\bar{b}=b/a,\ \bar{a}=a/a,\ e=c/a,\ \bar{z}=[z-(-\ell/2)]/a,\ \tau=\kappa t/a^2,\\&\overline{T}(\xi,\eta,t)=T(\xi,\eta,t)/\theta_k,\bar{\phi}(\xi,\eta,t)=\phi(\xi,\eta,t)/E\alpha_t\tau a^2,\\&\bar{\sigma}_{ij}=\sigma_{ij}/E\alpha_t\tau\ (i,j=\xi,\eta)\end{aligned}\right\} \quad (3.27)$$

Substituting the value of equation (27) in equations (12), (16) and (19), we obtained the expressions for the temperature, displacement and stresses respectively for our numerical discussion. The numerical computations have been carried out for Aluminum metal with parameter a = 2.65 cm, b = 3.22 cm, ℓ= 0.08 cm, Modulus of Elasticity $E = 6.9 \times 10^{6}$ N/cm^{2}, Shear modulus $G = 2.7 \times 10^{6}$ N/cm^{2}, Poisson ratio υ = 0.281, Thermal expansion coefficient, $\alpha_t = 25.5 \times 10^{6}$ cm/cm-^{0}C, Thermal diffusivity κ = 0.86 cm^{2}/sec, Thermal conductivity λ = 0.48 cal sec^{-1}/cm^{0}C with $q_{n,m}$ =0.0986, 0.3947, 0.8882, 1.5791, 2.4674, 3.5530, 4.8361, 6.3165, 7.9943, 9.8696, 11.9422, 14.2122, 16.6796, 19.3444, 22.2066, 25.2661, 28.5231, 31.9775, 35.6292, 39.4784 are the positive. The numerical calculations are depicted in the following figures with the help of MATHEMATICA software. Figs.2-11 illustrates the numerical results of dimensionless temperature and stresses of elliptical plate, under thermal boundary condition that are subjected to arbitrary initial temperature on the upper and lower face at zero temperature and boundary conditions. Fig. 2 indicates the angular variation of temperature distribution along radial direction of the plate. Due to extra heat source the optimum amount of temperature is achieved on the outside edge. The distribution of the dimensionless temperature gradient at each time increases towards the heated area of the central part of ellipse boundary.

As shown in Fig. 3, temperature is reached to a minimum at both extreme ends, i.e. at due to more compressive force, while due to tensile force, the temperature at the centre is high, giving an average bell-shaped curve for various values of ξ. Fig. 4 as probable due to less thickness, the temperature along $\bar{z}$ axis for different values of η varies linearly from zero temperature to the highest due to the availability of sectional heat supply at $z = \ell/2$.

Figs. 5 and 7 illustrates that the displacement distribution along η is high due to the sectional heat supply accompanied by the low distribution that exists on the inner centre of the ellipse at the outer side. Fig. 6 shows the displacement distribution beside axial direction and it was observed that with lower angular angle the displacements are little curvy and with higher angle it is following sinusoidal nature.

From Fig. 8, it was noted that the displacement distribution along ξ gets lower value for different values of z. Fig. 9, it was observed that the radial, tangential and shear stresses follows a sinusoidal trend, the large expansion and tensile stress arises at the inner, mid and outer edge, which lies in the axial direction. It was detected from Fig. 10 that the thermal stresses attains zero at ξ=0 and the radial and tangential stresses increases gradually along the radial direction, while the shear stress decreases along ξ direction. But the nature of all stresses behaves oppositely along the time span as observed in the Fig. 11

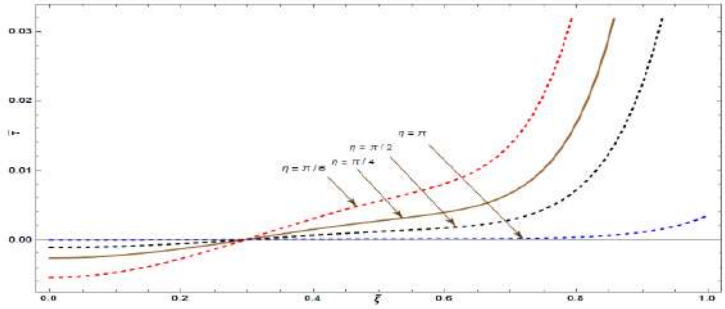

Figure 2: Temperature distribution $\overline{T}$ trending towards ξ for various values of η.

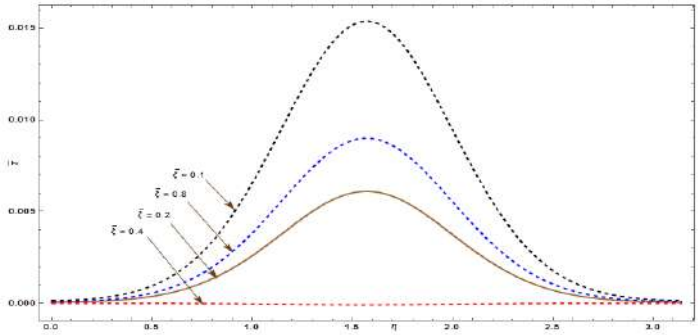

Figure 3: Temperature distribution $\overline{T}$ trending towards η for various values of ξ.

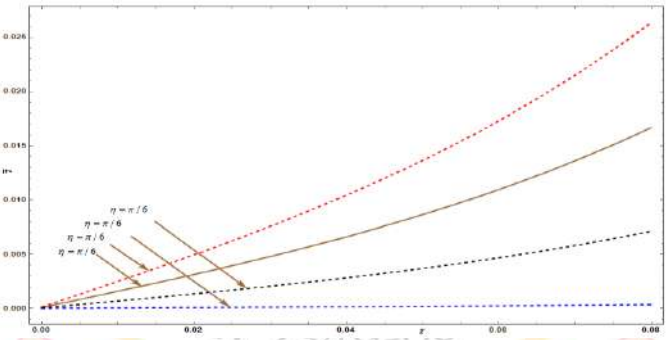

Figure 4: Temperature distribution $\overline{T}$ trending towards z for various values of η.

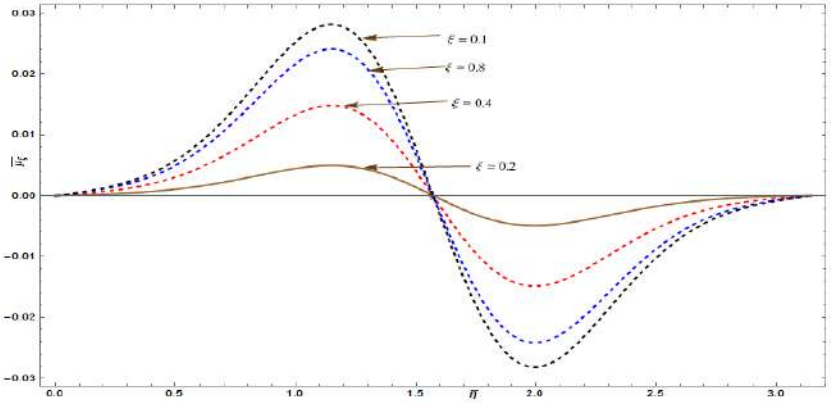

Figure 5: Displacement distribution trending towards η for various values of ξ.

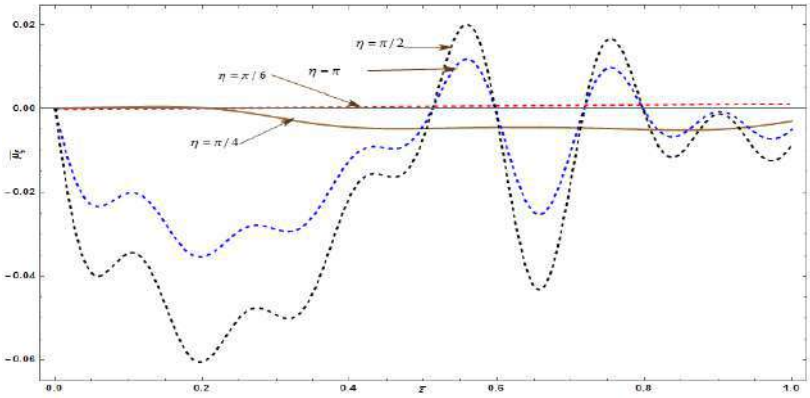

Figure 6: Displacement distribution trending towards z for various values of η.

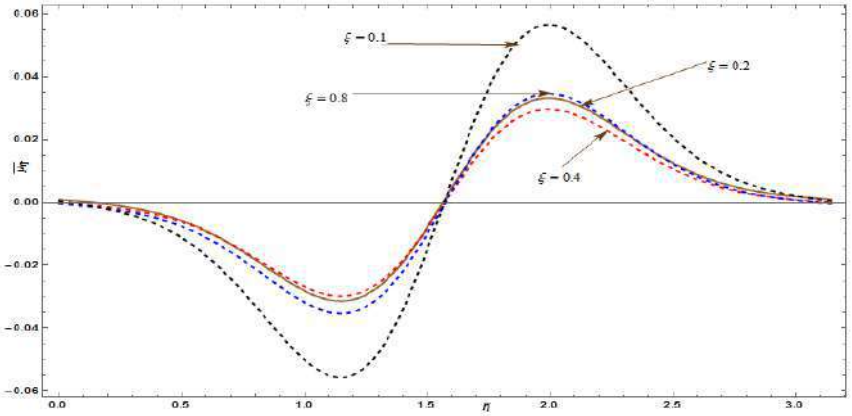

Figure 7: Displacement distribution trending towards η for various values of ξ.

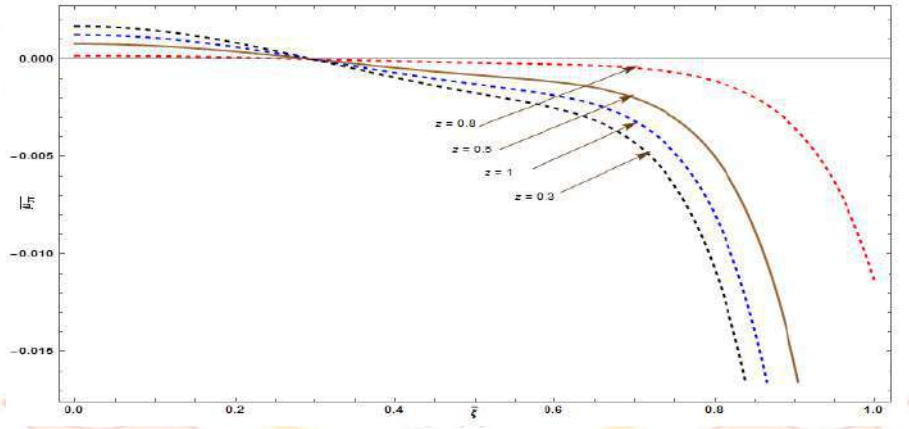

Figure 8: Displacement distribution trending towards ξ for various values of z.

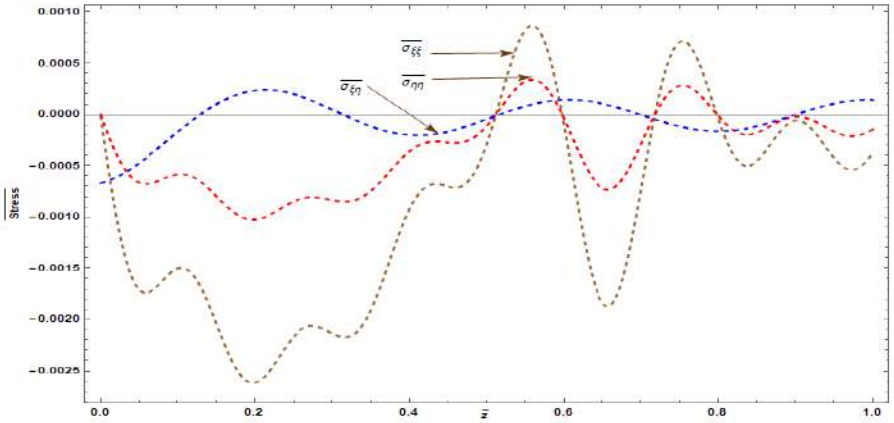

Figure 9: Thermal stresses distribution trending towards z

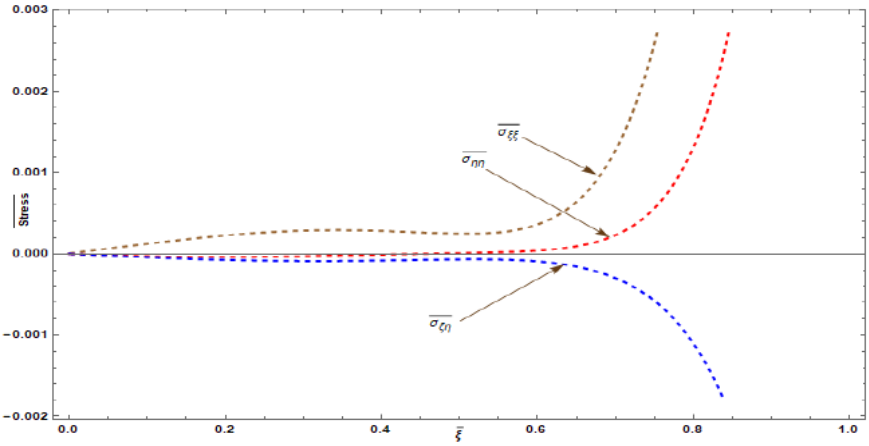

Figure 10: Thermal stresses distribution trending towards ξ

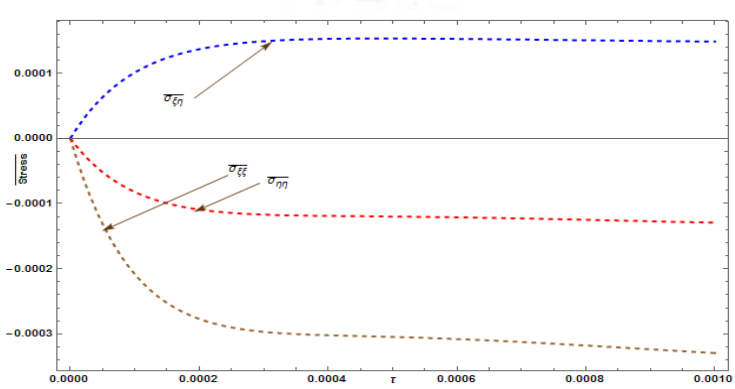

Figure 11: Thermal stresses distribution trending towards τ

7. Conclusion

In this article, we describe the theoretical treatment of thermally induced vibrations and their related stresses. The temperature distribution of the normal and modified Mathieu function forms is used to determine the thermal stress by the proposed classical method. The results obtained during the study are described below.

1. The benefit of this approach is its simplicity and mathematical ability to accommodate various forms of mechanical and thermal boundary conditions in vibration analysis under thermal load.
2. Owing to the maximum expanstion outside the plate, the maximum tensile stress moves from the outer surface and its absolute value increases with radius. This can be due to heat, stress, concentration or available heat source under known temperature fields.

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A short note on Shafer-Fink's double inequality involving Arcsine function

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In this article, we present the very sharp bounds of the form $\left(1-\frac{2}{3}x^2\right)^a$ *for the inverse trigonometric Sinc function* $\frac{sin^{-1}x}{x}$, *which tighten the bounds of this kind in the existing literature, where* a *is some real number.*

Subject Classification: *26A09, 26D05, 33B10.*
Keywords: *Inverse Circular functions, arcsine function, Shafer-Fink type inequality, inverse Sinc function.*

1 Introduction

Shafer introduced the following inequality (1.1), that can be seen in [5]

$$\frac{3x}{2+\sqrt{1-x^2}} < \frac{6(\sqrt{1+x}-\sqrt{1-x})}{4+\sqrt{1+x}+\sqrt{1-x}} < \sin^{-1}x, \ for x > 0. \tag{1.1}$$

The above inequality was generalized by Fink [3] as follows:

$$\frac{3x}{2+\sqrt{1-x^2}} \le \sin^{-1}x \le \frac{\pi x}{2+\sqrt{1-x^2}}, \ for \ 0 \le x \le 1, \tag{1.2}$$

where 3 and π are the best possible constants for (1.2). The above double inequality is termed as the Shafer-Fink's inequality in the literature. The gradual development for the bounds of $\sin^{-1}x$can be seen in [2]-[5] and the references therein.

Recently, Bagul and Dhaigude [2] proved inequality involving simple efficient bounds for $\sin^{-1}x$ as follows:

Theorem 1.1 *[2, Theorem 2] Let* $x \in (0,1)$ *and* $d \in (0,1]$. *Then the function* $f(x) = \frac{ln\left(\frac{sin^{-1}x}{x}\right)}{ln(1-dx^2)}$ *is strictly decreasing if* $d \le 1/2$. *In particular, we have following several inequalities*

$$\frac{1}{(1-dx^2)^{\alpha}} < \frac{\sin^{-1}x}{x} < \frac{1}{(1-dx^2)^{\beta}} \tag{1.3}$$

with the best possible constants $\alpha = 1/6d$ *and* $\beta = \frac{ln(2/\pi)}{ln(1-d)}$.

If we put $d = 1/2$, then 1.3 yields the following inequality

$$\frac{1}{(1-\frac{x^2}{2})^{1/3}} < \frac{\sin^{-1}x}{x} < \frac{1}{(1-\frac{x^2}{2})^{\beta_2}} \tag{1.4}$$

where $\beta_2 = \frac{\ln(2/\pi)}{ln(1/2)} \approx 0.651496.$

Authors in [2] claimed that the inequality given by (1.4) is the sharpest inequality of kind (1.3). Here, in this article, we refine the upper and lower bounds of inequality (1.4) and that will be discussed in the next section.

2 Main Result

This section is dedicated to the main theorem of this article, the statement of which is given below:

Theorem 2.1 *If* $x \in (0,1)$ *and* k *is any real number in* $(0,1)$, *then the following inequality holds good*

$$\frac{1}{(1-\frac{2x^2}{3})^{\eta_1}} < \frac{\sin^{-1}x}{x} < \frac{1}{(1-\frac{2x^2}{3})^{\eta_2}} \tag{2.1}$$

*Corresponding Author

for the best possible constants $\eta_1 = 1/4$ *and* $\eta_2 = \ln\left(\frac{k}{\sin^{-1}k}\right)/\ln\left(1-\frac{2k^2}{3}\right)$.

To prove the above theorem, we need following lemmas:

Lemma 2.2 *([l'Hôpital's rule of monotonicity] [1], [6]) Let* α, β *be two real valued functions which are continuous on* $[a,b]$ *and differentiable on* (a,b)*, where* $-\infty < a < b < \infty$ *and* $\beta'(x) \neq 0$*, for* $\forall x \in (a,b)$*. Let,*

$$r_1(x) = \frac{\alpha(x)-\alpha(a)}{\beta(x)-\beta(a)} \text{ and } r_2(x) = \frac{\alpha(x)-\alpha(b)}{\beta(x)-\beta(b)}.$$

Then

i) $r_1(x)$ *and* $r_2(x)$ *are increasing on* (a,b) *if* α'/β' *is increasing on* (a,b) *and*

ii) $r_1(x)$ *and* $r_2(x)$ *are decreasing on* (a,b) *if* α'/β' *is decreasing on* (a,b).

The strictness of the monotonicity of $r_1(x)$ *and* $r_2(x)$ *depends on the strictness of monotonicity of* α'/β'.

Lemma 2.3 *If* $x \in (0,1)$*, then* $\sigma(x) = 216x^6 - 424x^4 + 190x^2 + 48$ *is positive.*

Proof.

Differentiating $\sigma(x)$ with respect to x and equating to 0, then we get $\sigma'(x) = 1296x^5 + 1696x^3 + 380x = 4x(324x^4 - 424x^2 + 95) = 0$. This implies that either $x = 0$ or $324x^4 - 424x^2 + 95 = 0$. This is quartic equation in x. To solve this equation, we put $x^2 = y$, which gives us $324y^2 - 424y + 95 = 0$ a quadratic equation in y. This can be solved by traditional method. We get $x^2 = y = 0.287$ or $x^2 = y = 1.022$. Now we solve these quadratic equations in x . Finally, we have $\{0, \pm 0.535724, \pm 1.010940\}$, which is the solution set of $\sigma'(x) = 0$.

Now, we check the nature of $\sigma''(x)$ at $\{0, 0.535724, 1.010940\}$, because they all lie in the smallest neighbourhood of $(0,1)$ i.e. the region of investigation. Differentiating $\sigma'(x)$ w.r.t. x, which gives us $\sigma''(x) = 6480x^4 - 5088x^2 + 380$.

$\sigma''(0) = 380 > 0$ $\sigma(x)$ hasminima 48 at 0,

$\sigma''(0.535724) = -546.50516 < 0$ $\sigma(x)$ hasmaxima 72.711763 at 0.535724

and

$\sigma''(1.010940) = 1948.3177 > 0$ $\sigma(x)$ hasminima 29.8 90716 at 1.010940.

From above information, we confirm that the graph of $\sigma(x)$ never touches $x-$axis on $(0,1)$, that means it lies completely inside the strip $(0,1) \times (0,\infty)$ and hence in the first quadrant. Therefore, we conclude that, $\sigma(x)$ is positive on $(0,1)$.

Lemma 2.4 *If* $x \in (0,1)$*, then*

$$\rho(x) = \frac{(24x^6-108x^4+144x^2-45)(\sin^{-1}x)}{\sqrt{1-x^2}} - 48x^7 + 116x^5 - 98x^3 + 45x$$

positive increasing.

Proof. For this, we must show that $\rho'(x) > 0$. First we find the derivative of each term in $\rho(x)$ as follows:

$$\frac{d}{dx}\left(\frac{(24x^6 - 108x^4 + 144x^2 - 45)(\sin^{-1}x)}{\sqrt{1-x^2}}\right)$$

$$= \frac{24x^6-108x^4+144x^2-45}{(1-x^2)} + \frac{(-120x^7+468x^5-576x^3+243x)(\sin^{-1}x)}{(1-x^2)^{3/2}}$$

and

$$\frac{d}{dx}(-48x^7 + 116x^5 - 98x^3 + 45x) = -336x^6 + 580x^4 - 294x^2 + 45$$

With this information, $\rho'(x)$ is given by the following expression

$$\rho'(x) = \frac{(-120x^7+468x^5-576x^3+243x)(\sin^{-1}x)}{(1-x^2)^{\frac{3}{2}}} + \frac{336x^8-892x^6+766x^4-195x^2}{(1-x^2)}$$

i.e.

$$\rho'(x) = \frac{x^2}{(1-x^2)} \cdot \lambda(x),$$

where

$$\lambda(x) = \frac{(-120x^6+468x^4-576x^2+243)(\frac{\sin^{-1}x}{x})}{\sqrt{1-x^2}} + 336x^6 - 892x^4 + 766x^2 - 195$$

Now we use $\frac{\sin^{-1}x}{x} > 1$ and $\frac{1}{\sqrt{1-x^2}} > 1$ in the above expression of $\lambda(x)$, which boils down to

$$\lambda(x) > (-120x^6 + 468x^4 - 576x^2 + 243) + 336x^6 - 892x^4 + 766x^2 - 195,$$

i.e. $\lambda(x) > \sigma(x)$ where $\sigma(x) = 216x^6 - 424x^4 + 190x^2 + 48$. $\sigma(x)$ is a polynomial in x. And we want to show that, $\sigma(x) > 0$ on $(0,1)$. By lemma 2.3, $\sigma(x) > 0$ on $(0,1)$.Therefore, $\lambda(x) > 0$ and hence $\rho'(x)$, because $\frac{x^2}{(1-x^2)} > 0$ on $(0,1)$. So, $\rho(x)$ is increasing and hence positive on $(0,1)$, as $\rho(0) = 0$.

Lemma 2.5 *A real valued function*

$$\mu(x) = \frac{(4x^3-3x)(\sin^{-1}x)}{\sqrt{1-x^2}} + (6-6x^2)(\sin^{-1}x)^2 + 2x^4 - 3x^2$$

is positive increasing on $(0,1)$.

Proof. The first differentiation of $\mu(x)$ with respect to x gives rise to the following:

$$\mu'(x) = \frac{(4x^4-12x^2+9)(\sin^{-1}x)}{(1-x^2)\sqrt{1-x^2}} - 12x(\sin^{-1}x)^2 + \frac{(-8x^5+18x^3-9x)}{(1-x^2)},$$

Again by differentiating w.r.t. x, we get

$$\mu''(x) = \frac{(-28x^5+52x^3-21x)(\sin^{-1}x)}{(1-x^2)^2\sqrt{1-x^2}} - 12(\sin^{-1}x)^2 + \frac{(24x^6-54x^4+33x^2)}{(1-x^2)^2},$$

Another differentiation of above gives us $\mu^{(3)}(x)$, which is given below:

$$\mu^{(3)}(x) = \frac{(24x^6-108x^4+144x^2-45)(\sin^{-1}x)}{(1-x^2)^3\sqrt{1-x^2}} + \frac{(-48x^7+116x^5-98x^3+45x)}{(1-x^2)^3},$$

With slight rearrangement of terms, above equation can be written as

$$\mu^{(3)}(x) = \frac{1}{(1-x^2)^3} \cdot \rho(x),$$

where

$$\rho(x) = \frac{(24x^6-108x^4+144x^2-45)(\sin^{-1}x)}{\sqrt{1-x^2}} - 48x^7 + 116x^5 - 98x^3 + 45x.$$

By lemma 2.4, $\rho(x)$ is positive increasing on $(0,1)$. Also, for $x \in (0,1)$, we have $\frac{1}{(1-x^2)^3} > 0$. This implies that $\mu^{(3)}(x) > 0$, so, $\mu(x)$ is increasing and hence positive. As required.

Proof of Theorem 2.1. Denote,

$$f(x) = \frac{\ln\left(\frac{x}{\sin^{-1}x}\right)}{\ln\left(1-\frac{2x^2}{3}\right)} := \frac{f_1(x)}{f_2(x)},$$

where $f_1(x) = \ln\left(\frac{x}{\sin^{-1}x}\right)$ and $f_2(x) = \ln\left(1-\frac{2x^2}{3}\right)$ with $f_1(0^+) = 0 = f_2(0^+)$.

Differentiating with respect to x, we get

$$\frac{f_1'(x)}{f_2'(x)} = \frac{(2x^2-3)(\sin^{-1}x\sqrt{1-x^2}-x)}{4x^2\sin^{-1}x\sqrt{1-x^2}} = \frac{1}{4}f_3(x) \ say,$$

where

$$f_3(x) = \frac{(2x^2-3)(\sin^{-1}x\sqrt{1-x^2}-x)}{x^2\sin^{-1}x\sqrt{1-x^2}} := \frac{f_4(x)}{f_5(x)} say.$$

Now, we show that $f_3(x)$ is increasing i.e. to show that $f_3'(x) > 0$. For this it is sufficient to show that the numerator $N(x)$ (say) of $f_3'(x)$ is positive.

To get the expression for $N(x)$, we differentiate $f_3(x)$ w.r.t. x

$$\begin{aligned} N(x) &= f_5(x)\cdot f_4'(x) - f_4(x)\cdot f_5'(x) \\ &= \frac{(4x^4-3x^2)(\sin^{-1}x)}{\sqrt{1-x^2}} + (6x-6x^3)(\sin^{-1}x)^2 + 2x^5 - 3x^3 \\ &= x\cdot\mu(x), \end{aligned}$$

where

$$\mu(x) = \frac{(4x^3-3x)(\sin^{-1}x)}{\sqrt{1-x^2}} + (6-6x^2)(\sin^{-1}x)^2 + 2x^4 - 3x^2.$$

By lemma 2.5, $\mu(x)$ is positive on $(0,1)$.

$$\therefore N(x) > 0 \;\; f_3'(x) > 0.$$

This means that $\frac{1}{4}f_3(x) = \frac{f_1'(x)}{f_2'(x)}$ is increasing on $(0,1)$. So, by lemma 2.2 $f(x)$ is increasing on $(0,1)$.

Therefore, for $0 < x < 1$ and some $k \in (0,1)$ we must have $f(0^+) < f(x) < f(k)$, where $\eta_1 = f(0^+) = 1/4$ and $\eta_2 = f(k) = \frac{\ln\left(\frac{k}{\sin^{-1}k}\right)}{\ln\left(1-\frac{2k^2}{3}\right)}$. Hence the result follows.

3 Conclusion

From our findings in this paper depicted in the theorem 2.1, we conclude that the upper and lower bounds in the inequality (2.1) are sharper than that of the inequality (1.4) of kind (1.3).

4 Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical approval This article does not contain any studies involving human participants or animals performed by any of the authors.

Informed consent Informed consent was obtained from all participants in this study.

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Thermoelastic analysis of a semi-infinite cylinder with moving sectional heat supply

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Abstract

The aim of this paper is concerned with the transient thermoelastic analysis of the axisymmetric problem of a semi-infinite solid cylinder having an internal heat source considering a moving boundary. It is assumed that the upper edge of the cylinder is heated with an arbitrary sectional heat supply that moves with a constant velocity. The potential functions, displacements and the associated thermal stress distribution are determined. As an illustration, numerical analysis is carried out for different velocity values of the moving boundary for the temperature and the thermal stresses precisely.
Keywords: *Heat conduction, thermal stresses, homogeneous, potential function, moving heat*

1. Introduction

It is assumed that most materials tend to expand if the temperature rises, and in the first approximation, expansion and compression are proportional to temperature changes. This temperature change caused by expansion and compression is based on thermoelasticity, a branch of applied mathematics specializing in the coupling between temperature and mechanical deformation and thermal energy calculated by stress. It is also assumed that the homogeneous materials and elastic properties are the same at every point in the body and constant during translation. However, the properties do not have to be the same in all directions for homogeneous materials. Isotropic materials have the same elasticity in all directions. Therefore, the material must be uniform and isotropic such that the transverse strain is the same at each point of the particular component. The uniformly loaded homogeneous and isotropic plate has attracted the focus of researchers over the past long time because of its application to various machines and structures.

Some authors have worked on homogeneous materials in the most recent literature, which can be summarised below. Aksoy et al. [1] performed the thermoelastic stress analysis of a cylinder made of laminated isotropic material under thermomechanical loading. Deshmukh et al. [2] investigated the thermoelastic behaviour of circular plates, and the simply supported plates with thermal bending moments caused by moving heat sources and point heat sources were investigated. Janjgava [3] solved the thermoelastic two-dimensional problem by considering the micro-temperature. Kedar et al. [4] discussed the transient heat conduction problem of finite and semi-infinite thick cylinders and determined the thermal stress by the quasi-static method.

Further, it is also noted that the moving heat source is the subject of transient heat transfer and is suitable for engineering problems, especially for welding. At the beginning of the 20th century, welding engineers began to study moving heat sources, both empirically and theoretically [5]. Kim [6] obtained the temperature distribution around a rectangular shape source moving at a constant speed along the axis of a bar using a Fourier series procedure. Shokouhmand and Ghaffari [7] performed the temperature analysis of the nonlinear and transient magneto-thermal coupled problem with moving coils studied by a valid finite element program, which is considered a moving heat source using numerical methods. Deshmukh et al. [2] obtained the most exciting result of dynamic thermal stresses in a circular plate by a moving heat source subject to certain boundary conditions using the integral transform technique. Things become complicated when internal heat persists on the object under consideration and further becomes unpredictable when part of the heat is affected. Both analytical and numerical techniques have proven to be the best way to solve such problems. In previous works, the temperature and stress distributions were analyzed analytically or numerically using a computer code, and this study points out the importance of the topic in a workpiece. This work presents the temperature distributions and associated thermal stresses in a cylindrical profile workpiece with an internal heat source subjected to heated partly-axially from its outer surface by a moving uniform heat source.

Mathematical modelling

For this study, a solid cylinder is heated partly-axially from its outer surface (processed surface) by a moving uniform heat source under stagnant ambient conditions is considered to analyze the transient temperature distributions analytically. As already known, heat is released in a solid subjected to manufacturing processes such as grinding, hardening, cutting, coating, metal forming, etc. Temperature differences occurring in this solid because of non-uniformities of the released heat, cooling and/or thermal properties of the solid material may cause thermal stress. This study also presents the thermal stresses proportional to the temperature differential. The axisymmetric geometric model of the considered cylinder and the coordinate system is shown in figure 1.

2.1 The governing heat conduction equation

The governing equation of temperature distribution is given as follows

$$\frac{\partial^2\theta}{\partial r^2}+\frac{1}{r}\frac{\partial\theta}{\partial r}+\frac{\partial^2\theta}{\partial z^2}+Q=\frac{1}{\kappa}\frac{\partial\theta}{\partial t} \tag{1}$$

subjected to boundary conditions

$$\theta=0 \quad \text{at} \quad t=0 \tag{2}$$

$$\theta=0 \ \text{at} \ \ r=a \tag{3}$$

$$\frac{\partial\theta}{\partial z}-\theta=-\theta_0 \ \text{at} \ \ z=vt \tag{4}$$

in which $\theta(r,z,t)$ is the temperature distribution function, and $\kappa=\lambda/\rho C$, λ is the thermal conductivity of the material, ρ is the density and C is the calorific capacity, assumed to be constant, respectively.

2.2 The governing thermal displacements and stress equations

The Navier's equations without the body forces can be expressed as

$$\begin{aligned}\nabla^2 u_r-\frac{u_r}{r^2}+\frac{1}{1-2\nu}\frac{\partial e}{\partial r}-\frac{2(1+\nu)}{1-2\nu}\alpha\frac{\partial\theta}{\partial r}=0\\ \nabla^2 u_z-\frac{1}{1-2\nu}\frac{\partial e}{\partial z}-\frac{2(1+\nu)}{1-2\nu}\alpha\frac{\partial\theta}{\partial z}=0\end{aligned} \tag{5}$$

where u_r and u_z are the displacement components in the radial and axial directions, respectively and the dilatation e as

$$e=\frac{\partial u_r}{\partial r}+\frac{u_r}{r}+\frac{\partial u_z}{\partial z} \tag{6}$$

The displacement functions represented by the Goodier's displacement potential function $\phi(r,z,t)$ and Michell's function $M(r,z,t)$ is given as

$$\begin{aligned}u_r=\frac{\partial\phi}{\partial r}-\frac{\partial^2 M}{\partial r\partial z},\\ u_z=\frac{\partial\phi}{\partial z}+2(1-\nu)\nabla^2 M-\frac{\partial^2 M}{\partial z^2}\end{aligned} \tag{7}$$

in which Goodier's thermoelastic potential must satisfy the equation

$$\nabla^2\phi=\frac{1+\nu}{1-\nu}\alpha\theta \tag{8}$$

and Michell's function must satisfy the equation

$$\nabla^2\nabla^2 M=0 \tag{9}$$

where

$$\nabla^2 = \frac{1}{r}\frac{\partial}{\partial r}\left(r\frac{\partial}{\partial r}\right)+\frac{\partial^2}{\partial z^2}$$

The component of the stresses can be given as

$$\begin{aligned}
\frac{\sigma_{rr}}{2G} &= \frac{\partial^2\phi}{\partial r^2}-\nabla^2\phi+\frac{\partial}{\partial z}\left(\upsilon\nabla^2 M-\frac{\partial^2 M}{\partial r^2}\right),\\
\frac{\sigma_{\theta\theta}}{2G} &= \frac{1}{r}\frac{\partial\phi}{\partial r}-\nabla^2\phi+\frac{\partial}{\partial z}\left(\upsilon\nabla^2 M-\frac{1}{r}\frac{\partial M}{\partial r}\right),\\
\frac{\sigma_{zz}}{2G} &= \frac{\partial^2\varphi}{\partial z^2}-\nabla^2\phi+\frac{\partial}{\partial z}\left((2-\upsilon)\nabla^2 M-\frac{\partial^2 M}{\partial z^2}\right),\\
\frac{\sigma_{rz}}{2G} &= \frac{\partial^2\phi}{\partial r\partial z}+\frac{\partial}{\partial r}\left((1-\upsilon)\nabla^2 M-\frac{\partial^2 M}{\partial z^2}\right)
\end{aligned} \tag{10}$$

where G is the shear modulus and υ is the Poisson's ratio.

The boundary conditions on the traction free surface are

$$\sigma_{rr}=\sigma_{rz}=0 \text{ at } r=a \tag{11}$$

The equations (1) to (11) constitute the mathematical formulation of the problem under consideration.

2.3 Temperature distribution and its associated stress in dimensionless quantities

For the sake of simplicity, the following dimensionless quantities are introduced as

$$\begin{aligned}
&T=\theta/\theta_0, \tau=\kappa t/a^2, \bar{r}=r/a=\xi, \bar{z}=z/a, \bar{\nu}=\nu a/\kappa,\\
&\bar{M}=\frac{1-\upsilon}{(1+\upsilon)\alpha\theta_0 a^3}, \bar{\phi}=\frac{1-\upsilon}{(1+\upsilon)\alpha\theta_0 a^2}\phi, \bar{u}_i=\frac{1-\upsilon}{(1+\upsilon)\alpha\theta_0 a}u_i\\
&\bar{\sigma}_{ij}=\frac{1}{2G}\frac{1-\upsilon}{(1+\upsilon)\alpha\theta_0}\sigma_{ij}\ (i,j=r,z)
\end{aligned} \tag{12}$$

Substituting the Eq. (12) in Eqs. (1)-(4), (7), (9)-(10) and (11), one obtains the expressions in dimensionless form as

$$\frac{\partial^2 T}{\partial\xi^2}+\frac{1}{\xi}\frac{\partial T}{\partial\xi}+\frac{\partial^2 T}{\partial\zeta^2}+\bar{\nu}\frac{\partial T}{\partial\zeta}+Q=\frac{\partial T}{\partial\tau} \tag{13}$$

$$T=0 \text{ at } \tau=0 \tag{14}$$

$$T=0 \text{ at } \xi=1 \tag{15}$$

$$\frac{\partial T}{\partial\zeta}-T=-1 \text{ at } \zeta=\bar{z}-\bar{\nu}\tau=0 \tag{16}$$

$$\begin{aligned}
\bar{u}_\xi &= \frac{\partial\bar{\phi}}{\partial\xi}-\frac{\partial^2\bar{M}}{\partial\xi\,\partial\zeta},\\
\bar{u}_z &= \frac{\partial\bar{\phi}}{\partial\zeta}+2(1-\nu)\nabla^2\bar{M}-\frac{\partial^2\bar{M}}{\partial\zeta^2}
\end{aligned} \tag{17}$$

$$\Delta^2\bar{\phi}=\bar{T} \tag{18}$$

$$\Delta^2\Delta^2 M=0 \tag{19}$$

$$\bar{\sigma}_{\xi\xi} = \frac{\partial^2\bar{\phi}}{\partial\xi^2} - \Delta^2\bar{\phi} + \frac{\partial}{\partial\zeta}\left(\upsilon\Delta^2\bar{M} - \frac{\partial^2\bar{M}}{\partial\xi^2}\right),$$

$$\bar{\sigma}_{\theta\theta} = \frac{1}{\xi}\frac{\partial\bar{\phi}}{\partial\xi} - \Delta^2\bar{\phi} + \frac{\partial}{\partial\zeta}\left(\upsilon\Delta^2\bar{M} - \frac{1}{\xi}\frac{\partial\bar{M}}{\partial\xi}\right), \qquad (20)$$

$$\bar{\sigma}_{zz} = \frac{\partial^2\bar{\phi}}{\partial\zeta^2} - \Delta^2\phi + \frac{\partial}{\partial\zeta}\left((2-\upsilon)\Delta^2\bar{M} - \frac{\partial^2\bar{M}}{\partial\zeta^2}\right),$$

$$\bar{\sigma}_{rz} = \frac{\partial^2\bar{\phi}}{\partial\xi\partial\zeta} + \frac{\partial}{\partial\xi}\left((1-\upsilon)\Delta^2\bar{M} - \frac{\partial^2\bar{M}}{\partial\zeta^2}\right)$$

$$\sigma_{\xi\xi} = \sigma_{\xi\zeta} = 0 \quad \text{at } \xi = 1$$

$$\sigma_{\zeta\zeta} = \sigma\xi\zeta = 0 \quad \text{at } \zeta = 0 \qquad (21)$$

where

$$\Delta^2 = \frac{1}{\xi}\frac{\partial}{\partial\xi}\left(\xi\frac{\partial}{\partial\xi}\right) + \frac{\partial^2}{\partial\zeta^2}$$

3. The solution to the Problem

3.1 Solution for temperature distribution

In order to solve Eq. (13) under the boundary condition (15), we firstly introduce the integral transform [6] of order $n = 0$ over the variable r, then the integral transform and its inversion theorem are written as

$$H_{0j}\{f(\xi)\} = \bar{f}(\mu_j) = \int_0^1 \xi f(\xi) J_0(\mu_j\xi) d\xi, \; j = 1,2,..\infty$$

$$H_{0j}^{-1}\{\bar{f}(\mu_j)\} = f(\xi) = \sum_{j=1}^{\infty} \bar{f}(\mu_j) J_0(\mu_j\xi), 0 \le \xi \le \xi_0 \qquad (22)$$

in which μ_j are the roots of $J_0(\mu_j\xi) = 0$ and $J_0(\,)$ is the Bessel functions of the first kind of order $n = 0$.

Applying the transform defined by Eq. (22) to the Eqs. (14) and (16), and using Laplace transform, one obtains

$$\frac{\partial^2\bar{T}}{\partial\zeta^2} + \bar{v}\frac{\partial\bar{T}}{\partial\zeta} - (\mu_j^2 + p)\bar{T} + \frac{\delta(\zeta)J_0(\mu_j)}{p+\varpi} = -Q \qquad (23)$$

where $\bar{T}$ is the transformed function of T. The symbol ($\bar{}$) means a function in Hankel transformed domain, ($\tilde{}$) is for the function in Laplace transformed domain and p is Laplace parameter.

The solution of Eq. (23), in conjunction with the condition (16), one finds in the form

$$\tilde{\bar{T}}(\mu_j,\zeta,p) = \frac{Q}{p+\mu_j^2} + \left[1 - \left(\frac{Q}{p+\mu_j^2}\right)\right]\left(\frac{2\exp[-1/2\,\zeta(\nu+\sqrt{4(p+\mu_j^2)+\nu^2})]}{2+\nu+\sqrt{4(p+\mu_j^2)+\nu^2}}\right) \qquad (24)$$

Further taking the inverse transform of Eq. (24) and making use of the convolution theorem, one obtains

$$\bar{T}(\mu_j,\zeta,t) = Q\exp(-\tau\mu_j^2) + 2\exp(-2\zeta(\nu+1)^2)[(-1+\mu_j^2-\nu) \times \int_0^{\tau}\exp[s(1-\mu_j^2+\nu)]ds + Q\int_0^{\tau}\exp[-(\tau-s)\,\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\} \qquad (25)$$

Lastly, by the application of the inverse formulae Eq. (22), one gets the solution of the boundary value problem

$$T(\xi,\zeta,t)=\sum_{j=1}^{0} J_0(\mu_j\xi)\{Q\exp(-\tau\mu_j^2)+2\exp(-2\zeta(\nu+1)^2)[(-1+\mu_j^2-\nu)\times\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[\tau(1-\mu_j^2+\nu)]ds]\} \quad (26)$$

3.2 Solution for Goodier's potential and the Michell's function

Assuming the potential function which satisfies Eq. (18) as

$$\phi(\xi,\eta,\tau)=\sum_{j=1}^{0} A_1 J_0(\mu_j\xi)\exp[-2\zeta(\nu+1)^2]Q\exp(-\tau\mu_j^2)\{\exp[2\zeta(\nu+1)^2]+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (27)$$

Substituting Eq.(25) into Eq. (18), one obtains

$$A_1=8(1+\nu)^2\left[\mu_j^2-\mu_j(\mu_j+1)\frac{1}{\xi}\frac{J_1(\mu_j\xi)}{J_0(\mu_j\xi)}\right] \quad (28)$$

Similarly, assume Michell's function satisfying Eq. () as

$$M(\xi,\zeta,\tau)=\sum_{j=1}^{0}[B_1 J_0(\mu_j\xi)+B_2\mu_j\xi J_0(\mu_j\xi)]Q\exp(-\tau\mu_j^2)\{\exp[2\zeta(\nu+1)^2]+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (29)$$

Substituting Eqs. (27)-(29) into Eq. (20), one obtains

$$\bar{\sigma}_{\xi\xi}=\sum_{j=1}^{0}\{A_1[\mu_j^2(J_0(\mu_j\xi)-\frac{1}{\xi}J_1(\mu_j\xi))-(\mu_j^2J_0(\mu_j\xi)-\frac{\mu_j}{\xi}J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4]-2[B_1+B_2\mu_j]\{\upsilon(\mu_j^2J_0(\mu_j\xi)-\frac{\mu_j}{\xi}J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4-\mu_j^2(J_0(\mu_j\xi)-\frac{1}{\xi}J_1(\mu_j\xi))\}(\nu+1)^2\}\exp[-2\zeta(\nu+1)^2]Q\exp(-\tau\mu_j^2)\{\exp[-2\zeta(\nu+1)^2]+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (30)$$

$$\bar{\sigma}_{\theta\theta} = \sum_{j=1}^{0} \{A_1[-\frac{\mu}{\xi} J_1(\mu_j\xi) - (\mu_j^2 J_0(\mu_j\xi) - \frac{\mu}{\xi} J_1(\mu_j\xi)[\mu+1])4(\nu+1)^4]$$
$$-2[B_1 + B_2\mu_j]\{\upsilon(\mu_j^2 J_0(\mu_j\xi) - \frac{\mu}{\xi} J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4$$
$$+\frac{\mu}{\xi} J_1(\mu_j\xi)\}(\nu+1)^2\}\exp[-2\zeta(\nu+1)^2]Q\exp(-\tau\mu_j^2)\{\exp[-2\zeta(\nu+1)^2]$$
$$+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds$$
$$+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (31)$$

$$\bar{\sigma}_{\zeta\zeta} = \sum_{j=1}^{0} \{A_1[J_0(\mu_j\xi)4(\nu+1)^4 - (\mu^2 J_0(\mu_j\xi) - \frac{\mu}{\xi} J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4]$$
$$-2[B_1 + B_2\mu_j]\{(2-\upsilon)(\mu_j^2 J_0(\mu_j\xi) - \frac{\mu}{\xi} J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4$$
$$-J_0(\mu_j\xi)4(\nu+1)^4\}(\nu+1)^2\}\exp\{-2\zeta(\nu+1)^2\}Q\exp(-\tau\mu_j^2)\{\exp[-2\zeta(\nu+1)^2]$$
$$+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds$$
$$+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (32)$$

$$\bar{\sigma}_{\xi\zeta} = \sum_{j=1}^{0} \{A_1[J_0(\mu_j\xi)4(\nu+1)^4 - (\mu_j^2 J_0(\mu_j\xi) - \frac{\mu_j}{\xi} J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4]$$
$$+[B_1 + B_2\mu_j]\{(1-\upsilon)(-\mu^3 J_1(\mu_j\xi) - 4\mu_j[\mu_j+1](\nu+1)^4$$
$$\times\left[\frac{\mu_j\xi J_0(\mu_j\xi) - J_1(\mu_j\xi)[\mu_j+1]}{\xi^2}\right] + \mu_j J_1(\mu_j\xi)4(\nu+1)^4\}\exp[-2\zeta(\nu+1)^2]Q$$
$$\times\exp(-\tau\mu_j^2)\{\exp[-2\zeta(\nu+1)^2] + (2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)$$
$$\times\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds + Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/4(\nu+1)^4\} \quad (33)$$

Now substituting Eqs. (30) and (33) into Eq. (21), one obtains

$$B_1 = 0$$

$$B_2 = \frac{-A_1[J_0(\mu_j)4(\nu+1)^4 - (\mu^2 J_0(\mu_j) - \mu J_1(\mu_j)[\mu+1])4(\nu+1)^4]}{\mu_j\{(1-\upsilon)(-\mu^3 J_1(\mu_j) - 4\mu[\mu+1](\nu+1)^4\mu\ J_0(\mu_j) - J_1(\mu_j)[\mu+1] + \mu J_1(\mu_j)4(\nu+1)^4\}}$$

4. Numerical Results, Discussion and Remarks

The numerical computations have been carried out for Aluminium (pure) annular sector plate with the thermo-mechanical properties: modulus of elasticity E = 70 GPa, Poisson's ratio υ = 0.35, thermal expansion coefficient α = 23×10^{-6}/^{0}C, thermal diffusivity κ = 84.18×10-6 m^{2}s^{-1} and thermal conductivity λ = 204.2 Wm^{-1}K^{-1}. The physical parameter for the sector plate as $a = 1$m, $b = 1$m, $l = 0.08$ m and $T_0 = 150^0$C. In order to examine the influence of heating on the plate, numerical calculations were performed for all the variables. The numerical calculations are depicted in the following figures with the help of MATHEMATICA software.

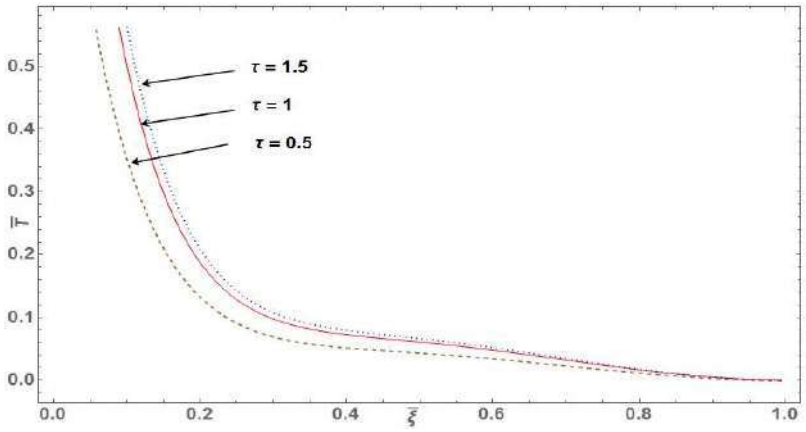

Fig. 1: Temperature distribution along ξ-direction for different time

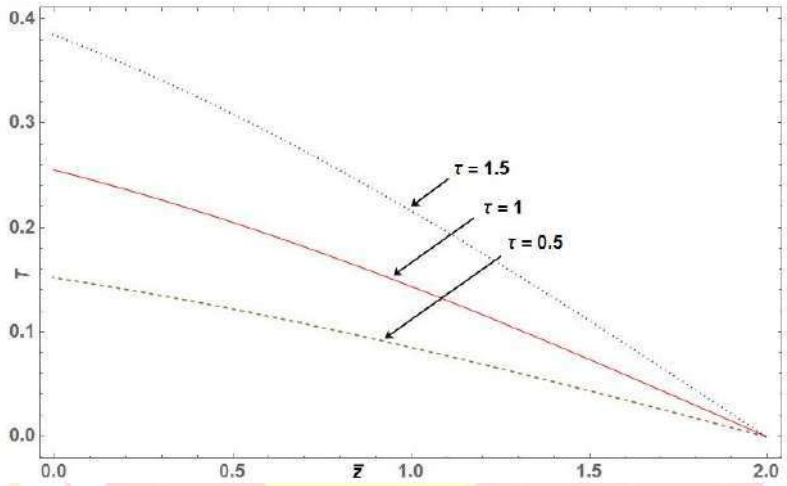

Fig. 2: Temperature distribution along z-direction for different time

Fig. 1 illustrates the temperature distribution along the radial direction for different values of time, and it decreases as the time proceeds along the radial direction but attains its maximum at the inner core. The maximum value of temperature magnitude occurs at the outer edge due to additional heat supply with available internal heat energy throughout the body. Fig. 2 indicates the temperature distribution along the axial direction of the plate for different values of time, but the curve shows a straight line due to the shallowness of the cylinder and the maximum value of temperature magnitude occurring at the edge, that is energized due to sectional heat supply.

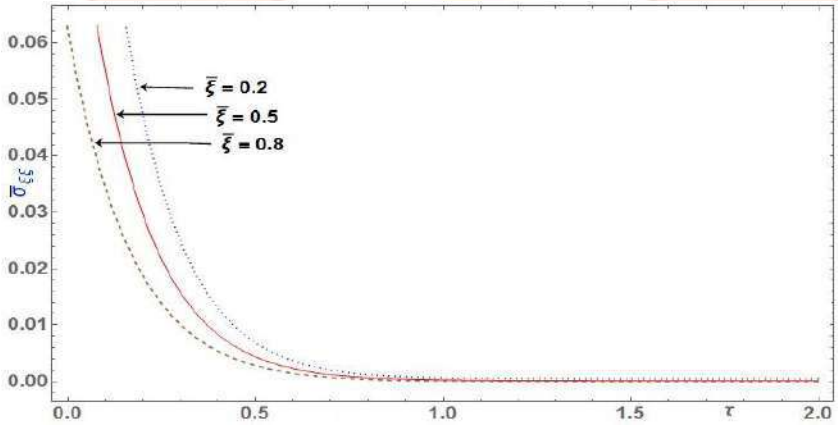

Fig. 3: Radial stress distribution along τ-direction for different ξ

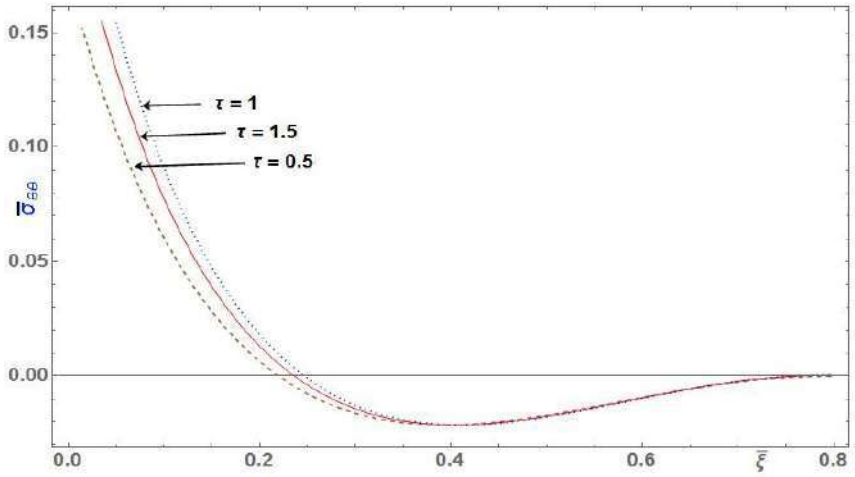

Fig. 4: Tangential stress distribution along ξ-direction for different time

Fig. 3 depicts the thermal radial stress along the axial direction for different values of the time. The expansion occurs, and its magnitude increases at the inner edge; it may be due to compressive force, whereas maximization towards the outer edge may be due to energized heat supply. The tangential stress decreases gradually along the radial direction with the thermal load, as shown in Fig. 4. The stresses attain certain maxima and decrease gradually at the outer edge towards infinity.

1. Conclusion

This study has treated the thermoelastic problem of a semi-infinite cylinder in which sources are generated. We successfully obtained the temperature distribution, displacements and stress functions with additional sectional heating available at the cylinder's edge. Then, the numerical calculations were carried out. We may conclude that the system of equations proposed in this study can be adapted to the design of useful structures or machines in engineering applications to determine thermoelastic behaviour with radiation.

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Magnetized Bianchi Type-III Perfect Fluid Cosmological Model in Brans-Dicke Theory of Gravitation

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Abstract:
In this paper, we investigate the role of relativistic charged perfect fluid in Bianchi type-III cosmological model in Brans-Dicke theory of gravitation. Solutions of the models are obtained by volumetric exponential expansion, power law expansion and power law relation between scalar field ϕ and the scale factor a .Some physical and kinematical properties of the model are also discussed.
Keywords: *Bianchi type-III universe, Brans-Dicke theory of gravitation, electromagnetic field, perfect fluid, constant vector potentials.*

1. Introduction:

Brans and Dicke (BD) theory of gravitation is a well-known modified version of Einstein's theory. (Brans and Dicke 1961) formulated a theory of gravitation in which, besides a gravitational part, a dynamical scalar field is introduced to account for variable gravitational constant and to incorporate Mach's [1]Principle in Einstein's theory. In this theory, the scalar field has the dimension of the universe of a gravitational constant and its role is confined to its effect on gravitational field equations.[2] BD scalar-tensor theory of gravitation is quite important in view of the fact that scalar fields play a vital role in inflationary cosmology. In recent years, there has been a renewed interest of the gravitational constant.[3] The latest inflationary models (Mathiazhagan and Johri 1984),possible "graceful exit" problem (Pimental 1997) and extended chaotic inflations (Linde 1990) are based on BD theory of gravitation.[4-6]

The scalar-tensor theories have been subject of considerable interest in the study of various cosmological models due to their relevance for the inflationary expansion of the universe and to solve many outstanding problems in cosmology. Several aspects of BD cosmology have been extensively investigated by[7] many authors. Bardeen et al. (1983) explored the inflationary universe models which provide a mechanism for galaxy formation by generating small scale density fluctuation in the universe, Banerjee et al.(1990) studied Bianchi type-I string cosmological models with and without a source-free magnetic field, Johri and Desikan (1994) have investigated cosmological models with constant deceleration parameter in Nordtvedt's theory,[8] Bianchi type-III cosmological model with a negative constant deceleration parameter in BD theory of gravity in presence of perfect fluid has been studied by Adhav et al.(2012), Katore et al. (2012) explored plane symmetric space-time filled with dark energy models in BD theory, Bhoyar et al. (2018) studied Bianchi type-III and Kantowski Sachs cosmological model containing magnetic field with variable cosmological constant. [9-11]

Lorenz-Petzold (1982), Kumar et al. (2008), Pawar et al. (2009), Rao et al.(2011), Naidu et al.(2012), Kandalkar et al. (2014),Mete et al. (2018), are some of the authors who have investigated several aspects of BD theory of gravitation.[12-15]

Tikekar and Patel (1992) have obtained some exact Bianchi type-III cosmological solutions of massive string in the presence of magnetic field,[16] Singh and Shri Ram (1996) have presented a technique to generate new exact Bianchi type-II cosmological solutions of massive strings in the presence and absence of the magnetic field, Tripathy et al. (2009) and Pradhan (2007) studied string cosmological models in the presence of the electromagnetic field,[17-20] A detailed discussion of BD cosmology is given by Singh et al. (2010),Singh J. K and Sharma N. K (2010a) have investigated some Bianchi type-II cosmological models in BD theory,

Shamir et al. (2012) explored anisotropic dark energy Bianchi type-III cosmological models in BD theory of gravity, Solanke and Karade (2016,2017) have investigated Bianchi type-I and III universe[21] field with perfect fluid and scalar field coupled with electromagnetic fields in theory of gravity. Recently Katore et al. (2018) have investigated Bianchi type-I dark energy cosmological model with power-law relation in BD theory of gravitation.[22-25]

In this paper, we discuss Bianchi type-III perfect fluid cosmological model with electromagnetic field in BD theory of gravitation.

2. The Metric And Field Equation:

We consider a spatially homogeneous Bianchi Type-III space time in the form

$$ds^2 = -dt^2 + A^2dx^2 + B^2e^{-2mx}dy^2 + C^2dz^2, \quad (1)$$

where A, B and C are functions of t and m is a constant.

Brans-Dicke field equations for the combined scalar and tensor fields are

$$G_j^i = \frac{-8\pi}{\phi}T_j^i - \frac{\omega}{\phi^2}\left(g^{ii}\phi_{,i} - \frac{1}{2}g_j^i\phi_{,k}\phi^{,k}\right) - \frac{1}{\phi}\left(g^{ii}\phi_{i;j} - g_j^i\phi_{;k}^{,k}\right), \quad (2)$$

where G_j^i is Einstein's tensor, ϕ is a dimensionless coupling constant and T_j^i is energy momentum tensor for perfect fluid with conservation equation.

$$\phi_{;k}^{,k} = \frac{1}{\sqrt{-g}}\left[\sqrt{-g}\phi^k\right]_{,k} \quad (3)$$

3. Energy Momentum Sources:

The energy momentum tensor for matter under discussion given by

$$T_j^i = {}^pT_j^i + E_j^i, \quad (4)$$

where ${}^pT_j^i$ is energy momentum tensor for perfect fluid and E_j^i is energy momentum tensor for electromagnetic field is given by

$$E_{ij} = \frac{1}{4}F_{ab}F^{ab}g_{ij} - F_{ai}F_{bj}g^{ab}. \quad (5)$$

Here the electromagnetic field tensor F_{ij} has the expression

$$F_{ij} = \frac{\partial A_i}{\partial x^j} - \frac{\partial A_j}{\partial x^i}. \quad (6)$$

where A_i is a four potential vector.

To achieve the compatibility with the metric (1), we assume electromagnetic vector potential as

$$A_i = [\lambda(x)v_1(t), v_2(t), v_3(t), v_4(t)]. \quad (7)$$

From equations (6) and (7), we deduce

$$F_{14} = \lambda\dot{v}_1,\ F_{24} = \dot{v}_2,\ F_{34} = \dot{v}_3,\ F_{43} = -\dot{v}_3. \quad (8)$$

Using equations (6), (7) and (8), we obtained

$$F_{ab}F^{ab} = -2\left[\frac{\lambda^2\dot{v}_1^2}{A^2} + \frac{\dot{v}_2^2}{B^2e^{-2mx}} + \frac{\dot{v}_3^2}{C^2}\right], \quad (9)$$

The energy momentum tensor for a perfect fluid is given by

$${}^pT_j^i = (\rho + p)u^iu_j - p\delta_i^j, \quad (10)$$

where ρ is the density, p is the pressure of perfect fluid and four velocity u_i is given by

$$g_{ij}u^i u^j = -1.$$

For co-moving coordinate system, we have

$$u_x = 0, \quad u_y = 0, \quad u_z = 0, \quad u_t \neq 0. \tag{11}$$

Accordingly equation (10), provides

$${}^pT_1^1 = {}^pT_2^2 = {}^pT_3^3 = -p, \; {}^pT_4^4 = \rho, \; T_i^j = 0 \quad \forall i, j \tag{12}$$

Using equations (5), (9) and (12), we obtained

$${}^pT_1^1 + E_1^1 = \frac{1}{2}\frac{\lambda^2 \dot{v}_1^2}{A^2} - \frac{1}{2}\frac{\dot{v}_2{}^2}{B^2 e^{-2mx}} - \frac{1}{2}\frac{\dot{v}_3{}^2}{C^2} - p, \tag{13}$$

$${}^pT_2^1 + E_2^1 = {}^pT_1^2 + E_1^2 = \frac{\lambda \dot{v}_1 \dot{v}_2}{A^2}, \tag{14}$$

$${}^pT_3^1 + E_3^1 = {}^pT_1^3 + E_1^3 = \frac{\lambda \dot{v}_1 \dot{v}_3}{A^2}, \tag{15}$$

$${}^pT_2^2 + E_2^2 = -\frac{1}{2}\frac{\lambda^2 \dot{v}_1^2}{A^2} + \frac{1}{2}\frac{\dot{v}_2^2}{B^2 e^{-2mx}} - \frac{1}{2}\frac{\dot{v}_3^2}{C^2} - p, \tag{16}$$

$${}^pT_3^2 + E_3^2 = {}^pT_2^3 + E_2^3 = \frac{\dot{v}_2 \dot{v}_3}{B^2 e^{-2mx}}, \tag{17}$$

$${}^pT_3^3 + E_3^3 = -\frac{1}{2}\frac{\lambda^2 \dot{v}_1^2}{A^2} - \frac{1}{2}\frac{\dot{v}_2^2}{B^2 e^{-2mx}} + \frac{1}{2}\frac{\dot{v}_3^2}{C^2} - p \tag{18}$$

$${}^pT_4^4 + E_4^4 = \frac{1}{2}\frac{\lambda^2 \dot{v}_1^2}{A^2} + \frac{1}{2}\frac{\dot{v}_2^2}{B^2 e^{-2mx}} + \frac{1}{2}\frac{\dot{v}_3^2}{C^2} + \rho. \tag{19}$$

4. Conservation Law:

The Conservation equation is given by

$$\frac{\partial}{\partial x^i}\left(\sqrt{-g}F^{ij}\right) = 0. \tag{20}$$

Equation (20) with different combination of i and j gives following equations

$$\left[\frac{\dot{v}_1}{v_1}\right]^{\bullet} + \frac{\dot{v}_1^2}{v_1^2} + \frac{\dot{v}_1}{v_1}\left[\frac{\dot{B}}{B} + \frac{\dot{C}}{C} - \frac{\dot{A}}{A}\right] = 0, \tag{21}$$

$$\left[\frac{\dot{v}_2}{v_2}\right]^{\bullet} + \frac{\dot{v}_2^2}{v_2^2} + \frac{\dot{v}_2}{v_2}\left[\frac{\dot{A}}{A} + \frac{\dot{C}}{C} - \frac{\dot{B}}{B}\right] = 0, \tag{22}$$

$$\left[\frac{\dot{v}_3}{v_3}\right]^{\bullet} + \frac{\dot{v}_3^2}{v_3^2} + \frac{\dot{v}_3}{v_3}\left[\frac{\dot{A}}{A} + \frac{\dot{B}}{B} - \frac{\dot{C}}{C}\right] = 0, \tag{23}$$

$$\phi^{;k}_{;k} = -\ddot{\phi} - \dot{\phi}\left[\frac{\dot{A}}{A} + \frac{\dot{B}}{B} - \frac{\dot{C}}{C}\right]. \tag{24}$$

From the vanishing components of Einstein's tensor and using (5) and (7), we deduce

$$\frac{\dot{v}_1 \dot{v}_2}{v_1 v_2} = \frac{\dot{v}_1 \dot{v}_3}{v_1 v_3} = \frac{\dot{v}_2 \dot{v}_3}{v_2 v_3} = 0, \tag{25}$$

$$\frac{\dot{v}_1}{v_1} = \frac{\dot{v}_2}{v_2} = \frac{\dot{v}_3}{v_3} = \frac{\dot{D}}{D}, \tag{26}$$

where D is an unknown function of t

Integrating equation (26) with respect to t, we get

$$v_1 = k_1 D,\ v_2 = k_2 D,\ v_3 = k_3 D, \tag{27}$$

where k_1, k_2 and k_3 are constants.

Using equations (25) and (27), we get

$$\left(\frac{\dot{D}}{D}\right)^2 = 0. \tag{28}$$

With an aid of equation (27), we can write the equations (21) to (23) as

$$\left(\frac{\dot{D}}{D}\right)^{\bullet} + \left(\frac{\dot{D}}{D}\right)^2 + \frac{\dot{D}}{D}\left(\frac{\dot{B}}{B} + \frac{\dot{C}}{C} - \frac{\dot{A}}{A}\right) = 0, \tag{29}$$

$$\left(\frac{\dot{D}}{D}\right)^{\bullet} + \left(\frac{\dot{D}}{D}\right)^2 + \frac{\dot{D}}{D}\left(\frac{\dot{A}}{A} + \frac{\dot{C}}{C} - \frac{\dot{B}}{B}\right) = 0, \tag{30}$$

$$\left(\frac{\dot{D}}{D}\right)^{\bullet} + \left(\frac{\dot{D}}{D}\right)^2 + \frac{\dot{D}}{D}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} - \frac{\dot{C}}{C}\right) = 0. \tag{31}$$

We attempt to express the component of T_j^i in terms of T_4^4 already used as in (Solanke and Karade (2016,2017). For this, we consider the expression as

$$\frac{\lambda^2 \dot{v}_1^{\,2}}{A^2} + \frac{\dot{v}_2^{\,2}}{B^2 e^{-2mx}} + \frac{\dot{v}_3^{\,2}}{C^2} = \left[\frac{\lambda^2 v_1^{\,2}}{A^2}\left(\frac{\dot{D}}{D}\right)^2 + \frac{v_2^{\,2}}{B^2 e^{-2mx}}\left(\frac{\dot{D}}{D}\right)^2 + \frac{v_3^{\,2}}{C^2}\left(\frac{\dot{D}}{D}\right)^2\right] = 0 \tag{32}$$

$$\frac{\lambda^2 \dot{v}_1^{\,2}}{A^2} + \frac{\dot{v}_2^{\,2}}{B^2 e^{-2mx}} + \frac{\dot{v}_3^{\,2}}{C^2} = \left[\frac{\lambda^2 v_1^{\,2}}{A^2} + \frac{v_2^{\,2}}{B^2 e^{-2mx}} + \frac{v_3^{\,2}}{C^2}\right]\left(\frac{\dot{D}}{D}\right)^2 = 0 \tag{33}$$

$$T_4^{\,4} = \frac{1}{2}\frac{\lambda^2 \dot{v}_1^{\,2}}{A^2} + \frac{1}{2}\frac{\dot{v}_2^{\,2}}{B^2 e^{-2mx}} + \frac{1}{2}\frac{\dot{v}_3^{\,2}}{C^2} + \rho = \rho, \tag{34}$$

$$T_1^1 = -p = T_2^2 = T_3^3,$$

5. Solution of Field Equations:

Considering the non-vanishing component of Einstein's tensor from equation (3), we derive

$$\frac{\ddot{B}}{B} + \frac{\ddot{C}}{C} + \frac{\dot{B}\dot{C}}{BC} = \frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right), \tag{35}$$

$$\frac{\ddot{A}}{A} + \frac{\ddot{C}}{C} + \frac{\dot{A}\dot{C}}{AC} = \frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right) - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{C}}{C}\right), \tag{36}$$

$$-\frac{m^2}{A^2} + \frac{\ddot{A}}{A} + \frac{\ddot{B}}{B} + \frac{\dot{A}\dot{B}}{AB} = -\frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right), \tag{37}$$

$$-\frac{m^2}{A^2} + \frac{\dot{A}\dot{B}}{AB} + \frac{\dot{B}\dot{C}}{BC} + \frac{\dot{A}\dot{C}}{AC} = \frac{8\pi\rho}{\phi} + \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right), \tag{38}$$

$$\frac{\dot{A}}{A} - \frac{\dot{B}}{B} = 0. \tag{39}$$

Integrating (39) with respect to t, we get

$$A = k_4 B, \tag{40}$$

where k_4 is a constant of integration. Without loss of generality let us assume k_4 as unity so that equation (40) written as

$$A = B. \tag{41}$$

Using equations (41) and (35) to (38), we yield

$$\frac{\ddot{B}}{B} + \frac{\ddot{C}}{C} + \frac{\dot{B}\dot{C}}{BC} = \frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right), \tag{42}$$

$$-\frac{m^2}{B^2} + \frac{2\ddot{B}}{B} + \frac{\dot{B}^2}{B^2} = \frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right), \quad , \tag{43}$$

$$-\frac{m^2}{B^2} + \frac{2\dot{A}^2}{A^2} + \frac{\dot{B}\dot{C}}{BC} + \frac{\dot{A}\dot{C}}{AC} = \frac{8\pi p}{\phi} + \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right). \tag{44}$$

Since the field equations are highly nonlinear with three equations and five unknown. Therefore two extra conditions can be considered to solve the field equations.

Let us choose power law form of metric potential (Katore et al. (2018) given by

$$B = \alpha t^n, \text{ and } C = \beta t^n \tag{45}$$

The power law relation between scalar field ϕ and the scale factor a has already used by Johri and Desikan (2014) in the context of Robertson Walker Brans-Dicke models. Thus the power law relation between ϕ and the scale factor a is $\phi = \eta a^m$, where a is constant of proportionality. The average scalar factor is given by

$$a = (ABC)^{\frac{1}{3}} = k_5 t^n, \tag{46}$$

where $k_5 = \alpha^{\frac{2}{3}}\beta^{\frac{1}{3}}$ is a constant.

Hence scalar field ϕ is obtained as

$$\phi = k_5 t^{mn}$$

$$\phi = k_5 t^s,$$

where $s = mn$ is a constant.

Using equations (24) and (25), we have

$$\frac{\dot{D}}{D} = k_6, \tag{47}$$

where k_6 is a constant of integration.

Integrating equation (47), we deduce

$$D = e^{k_6 t}. \tag{48}$$

Using equations (46) and (27), we have

$$v_1 = k_1 e^{k_6 t}, \tag{49}$$

$$v_2 = k_2 e^{k_6 t}, \tag{50}$$

$$v_3 = k_3 e^{k_6 t}, \tag{51}$$

v_4 remained undetermined.

The metric in (1), with the help of (45), can be redefined in the form

$$ds^2 = \alpha^2 t^{2n}(dx^2 + e^{-2mx})dy^2 + \beta^2 t^{2n} dz^2 - dt^2 . \quad (52)$$

6. Physical and Kinematical Properties of the Model:

The physical and kinematical properties of the model (52) are obtained as follows.

For the investigated model the pressure p and the density ρ are given by

$$p = \frac{k_5 t^s}{8\pi}\left[\frac{2n(n-1)+n^2}{t^2} + \omega\frac{s^2}{2t^2} + \frac{s^2(s-1)}{t^2} + \frac{2sn}{t^2}\right], \quad (53)$$

$$\rho = \frac{k_5 t^s}{8\pi}\left[\frac{4n^2}{t^2} - \frac{m^2}{\alpha t^n} - \omega\frac{s^2}{2t^2} + \frac{3sn}{t^2}\right], \quad (54)$$

where k_5 is a constant of integration.

The physical quantities of observational interest in cosmology are,

The spatial volume is obtained as

$$V = \sqrt{-g} = \left(\alpha^2 \beta t^{3n}\right)e^{-mx}. \quad (55)$$

The expansion scalar become

$$\theta = 3H = \left(2\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right),$$

$$\theta = 3H = \frac{3n}{t}, \quad (56)$$

The shear scalar is given by

$$\sigma^2 = \frac{1}{2}\sum_{i=1}^{3} H_i^2 - \frac{\theta^2}{6} = 0 \quad (57)$$

The mean anisotropic parameter A_m as

$$\Delta = \frac{1}{3}\sum_{i=1}^{3}\left(\frac{H_i - H}{H}\right)^2$$

$$\Delta = 0. \quad (58)$$

The mean Hubble parameter

$$H = \frac{n}{t}. \quad (59)$$

The deceleration parameter is given by

$$q = \frac{d}{dt}(H) - 1 = \frac{1-n}{n} \quad (60)$$

The cosmic Jerk parameter is given as,

$$J = q + 2q^2 - \frac{\dot{H}}{H}$$

$$= \frac{(n-1)(n-2)}{n^2}. \quad (61)$$

7. Conclusion:

In this paper, we have presented Bianchi Type-III charged fluid universe in BD theory of gravitation in presence of perfect fluid with electromagnetic field. The spatial volume V of the model increases with time showing the spatial expansion of the universe. It is observed that Hubble's parameter H vanishes with extremely large value and continue to decrease with time. The scalar expansion and the physical parameters energy density and pressure diverge at $t = 0$ and they all vanish as t approaches to infinity. The scalar field increases with time and at $t = 0$, it vanishes. The recent observations of type Ia supernovae reveal that the present universe is accelerating and the value of deceleration parameter lies somewhere in the range $-1 < q < 0$. It follows that one can choose the value of n in the range $0 < n < 1$ to ensure that the derived model is consistent with observations. It is also seen that the value of the cosmic jerk parameter is positive throughout the entire history of this model. This shows that our model strongly agrees to present day observations.

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The behaviour of Composite Objects Subjected to Hygrothermal Environment : A Review Article

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Abstract:

The article investigates the present review of hyrgrothermoelastic theories with different thermal loading effects on various objects. The main theme of the hyrgrothermoelastic problems is to establish operational methods to solve the governing differential equations. In the hyrgrothermoelastic problems, we have considered a few practical problems of technical interest, considering hygrothermal loading using numerical or exact procedures.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords: *temperature distribution, moisture concentration, thermal stresses, hyrgrothermoelastic, fractional order, deflection, integral transform.*

Introduction:

Compared to usual metal structures, multilayered materials still expertise the amplified application in automobile, marine, aerospace, and civil and mechanical structures because of their higher strength and stiffness to weight ratios. It may be because of material property; analysing and coming up with these materials are a lot of difficult than metallic materials. Most structures, categorically for composite materials, are sometimes subjected to dynamical environmental conditions like temperature and moisture throughout initial manufacture and final practice. The effects of warmth and wetness on the stresses and deformation of those materials and structures are of great interest. Innovative fibre-reinforced composites have gained extensive use within the region and physical science engineering industries. The benefits of those materials result from their high strength, stiffness and damping at the side of low concrete weight, though it is susceptible to hygrothermoelastic stress due to their intrinsic heterogeneity evolving at the microscopic and macroscopic level. It reduces the prices in construction, operation and development, whereas up structural responsibility and enhances safety. A decent style of multilayered composite structures must account for hygrothermoelastic stresses correctly; even inside an uncoupled theory, the hygrothermal fields are uncoupled from the strain ones; this task is scarcely unconventional.

Research Background :

This subsection summarises the previous authors' work results, namely the nonlinear relationship between temperature, dissolved moisture content and vapour concentration, and control equations. Many researchers [1,2] following the alternative microscopic approach proposed by Henry [3] have suggested that slight variations, $\sigma = \partial M / \partial C$ and $\omega = -(\partial M / \partial T)$ are related to the mass of absorbed moisture as

$$M = \text{constant} + \sigma C - \omega T \qquad (1)$$

in a unit mass of solid to the mass of moisture, C, in a unit volume of void space and the temperature, T, and to keep equations readily soluble, we assume σ and ω as constant to avoid mathematical complexity. Now taking the rate of change of C in which mass of moisture is being absorbed or given off by the solid as $\gamma(\partial M / \partial t)$, where $\gamma = [(1-\alpha)/\alpha]\rho_S$, ρ_S is the true density, α is the ratio of the capacities for the diffusing material of equal volumes of the solid and the surrounding medium, D'' is vapour diffusion coefficient under no-absorption condition, respectively. Then the equation for moisture diffusion is

$$D''\nabla^2 C = \gamma \frac{\partial M}{\partial t} + \frac{\partial C}{\partial t} \qquad (2)$$

The rate of evolution of heat per unit volume is $k\rho'(\partial M/\partial t)$, where $\rho' = [(\rho - \rho_p)/(\rho_s - \rho_p)]\rho_s$ is the mass of solid per unit volume of the whole, and the equation for the thermal diffusion is

$$\mathsf{D}''\nabla^2 T = \frac{\partial T}{\partial t} - \varepsilon\frac{\partial M}{\partial t} \tag{3}$$

in which D'' is the thermal diffusion coefficient under the condition of no absorption, $\varepsilon = k/c_v$, with k being the overall thermal conductivity of the material, c_v is the total calorific capacity, and $\kappa = k/c_v\rho$ is representing thermal diffusivity, respectively.

Now eliminating M from Eqs. (2) and (3) using Eq. (1), one gets

$$D\nabla^2 C = \frac{\partial C}{\partial t} - \psi\frac{\partial T}{\partial t} \tag{4}$$

$$\mathsf{D}\nabla^2 T = \frac{\partial T}{\partial t} - \varphi\frac{\partial C}{\partial t} \tag{5}$$

in which ψ is the adiabatic coefficient, φ is isothermal coefficient, D is vapour diffusion coefficient under isothermal condition, D is the thermal diffusion coefficient under the state of constant vapour concentration and it is represented as

$$D = \frac{D''}{\gamma\sigma+1},\ \psi = \frac{\gamma\omega}{\gamma\sigma+1},\ \mathsf{D} = \frac{\mathsf{D}''}{1+\varepsilon\omega},\ \varphi = \frac{\varepsilon\sigma}{1+\varepsilon\omega} \tag{6}$$

Literature Review:

Several authors have previously investigated the associated hygrothermoelastic problems. Chang and Weng [4] proposed a linear hygrothermoelastic theory to analyse transient responses in an axisymmetric double-layer annular cylinder subjected to hygrothermal loading using the Hankel transform method. Sugano [5] obtained analytical solutions for the heat and moisture equation and associated hygrothermal stress in a functionally graded material plate under the prescribed surface temperature and moisture load. Chiba and Sugano [6] analysed transient heat and moisture diffusion and the resulting hygrothermal stress field in a layered plate subjected to hygrothermal loadings at the external surfaces. Brischetto [7] examined the hygrothermal loading effects in the bending of two-dimensional multilayered composite plates on Carrera's Unified formulation framework. Ishihara et al. [8] formulated and quantified the hygrothermal field in porous media exposed to heat and moisture, considering nonlinear coupling. Saadatfar and Aghaie-Khafri [9] studied static behaviour of a functionally graded magneto-electro-elastic hollow sphere subjected to hygrothermal loading in the spherically symmetric state. Ensour [10] presented the interaction of electric potentials, electric displacement and elastic deformations to describe the hygrothermal responses in inhomogeneous piezoelectric hollow cylinders subjected to mechanical load and electric potential. Zhao et al. [11] proposed the steady-state solution for three-dimensional hygrothermoelastic media based on the potential theory methodology. Previously published papers exposed the static and dynamic characteristics of composite or smart material structures to the hygrothermal environment.

Recently, a few papers have been published using time-fractional hygrothermoelasticity theory to study the effects of temperature and moisture concentrations on the material properties under hygrothermal load. Benkhedda et al. [12] evaluated the hygrothermoelastic stress in composite plates during moisture desorption, taking into account the change of mechanical characteristics induced by temperature and moisture variation. Zhang and Li [13] formulated fractional hygrothermoelasticity theory within the framework of fractional calculus by coupling the classical Fourier's and Fick's laws to anomalous diffusion, which is characterised by the time-fractional diffusion-wave equation. Peng et al. [14] presented a hyperbolic diffusion law with different phase lags of thermal and moisture fluxes to simulate coupled heat-moisture diffusion-propagation behaviour and studied transient hygrothermal and elastic response of an infinitely long cylinder subjected to sudden

hygrothermal loadings. Zhang et al. [15] proposed a hygrothermal elastic problem within the framework of time-fractional calculus theory for a centrally symmetric sphere subjected to physical heat and moisture flux at its surface by using the integral transform method. Very recently, Zhang et al. [16] investigated the time-fractional diffusion-wave equations introduced to describe the coupled heat conduction and moisture diffusion in a hollow pipe using the separation of variables and the Laplace transform.

Conclusion:

During the literature review, it was noted that most of the papers on hygrothermoelasticity were taken to derive the temperature, moisture, displacement, and stresses in different types of solid due to hygro-thermal taken for different structures. Few investigations were cited so far to determine the temperature, moisture, displacements, and stresses for composite multilayered bodies. The theoretical and experimental studies of the heated structural profile have been of considerable practical importance in various fields such as mechanical, aerospace, and food engineering throughout the past years. The further analysis of such hygrothermoelastic problems may, as it seems, stimulate the evaluation of methods. Hence, the rigorous study of hygrothermoelastic behaviour of composite homogenous and nonhomogeneous of different bodies with or without an internal heat source is strongly desired.

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Analysis of Thermoelastic Large Deflection Bending in Elliptic Plate on Elastic Foundation due to Thermal Loading

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Abstract

In this paper, the three-dimensional transient asymmetric heat conduction equation comprised of internal source and sectional thermal flux outflow decreasing linearly with time from the surface on an elliptical plate is analysed by means of Laplace integral technique. The associated large deflection of a plate placed on the elastic foundation is formulated from the potential energy equation neglecting the second strain invariant and its expression is obtained in the form of Mathieu functions. The numerical calculations of the distribution of the transient temperature, thermal deflection and the maximum normal bending stress are carried out on the outer elliptical boundary and illustrated graphically. Finally, the corresponding results for circular plates have been presumed when the ellipse degenerates to a circle. The results reveal that the highest tensile stress exists on the major axis of the circular core relative to the elliptical core, which suggests the propagation of low heating due to inadequate heat penetration into the elliptical surface.

Keywords: *Temperature distribution, large deflection, Berger, elliptical, Mathieu function, bending moments, stresses*

1. Introduction

As a result of the increased construction materials are considered in engineering application under server load intensity or thermal environments, the interest in elliptical objects with thermoelastic problems has grown considerably. An extensive investigation has been done on small and large deflections of the plate on an elastic foundation based on the linear theory of elasticity due to its practical interest of their wide applications in structures. The determination of large deflection and its associated bending stress of plates, especially of thin plates, are of vital importance in the design of machine structures, because of excessive deflection may cause undesirable thermal stress. It is well known that the classical large deflection of thin plate problems is very complicated and usually lead to the non-linear differential equation which is difficult to solve exactly.

In this regard, Berger [1] neglected the second invariant from the potential energy equation and was able to furnish a simple fourth-order differential equation. However, there doesn't seem to be any physical justification for this approximation. But in comparison of the outcomes with known solutions indicates that it has a broad scope in simplifying the problem; thus, Berger's approach yields adequately accurate results [2]. Previously also few authors have obtained a large deflection based on the total strain energy concept devised by Berger. Even few reports have been based on the calculus of variation [3], Hamilton's principle [4], and many others have performed large deflection studies for different objects [5, 6] and for various materials [7, 8]. It is also observed that few authors [3, 9] have investigated the large deflection solution when the plates on an elastic foundation are uniformly heated. Recently, Horibe and Asano [10] proposed a solution for the large deflection of beams resting on Pasternak type elastic foundation. Bhad et al. [11,12] have investigated thermoelastic deflection for the elliptic plate, and Dhakate et al. [13] performed thermal stress analysis on an annular sector plate using integral transform techniques.

A brief overview of the theoretical work with the bending analysis on elastic foundations insights of various approximate methods is cited below. Addou et al. [14] used a basic quasi three-dimensional hyperbolic theory to examine the influence of Winkler / Pasternak / Kerr base and porosity on the dynamic behavior of functionally graded plates. Chaabane et al. 2019 [15] used a hyperbolic shear deformation theory to present an analysis of the static and dynamic actions of simply supported functionally graded beams resting on the elastic

base utilizing the method of Hamilton. Mahmoudi et al. [16] derived the governing equations using the principle of virtual displacements, and a refined quasi-threedimensional shear deformation theory has been developed for the thermo-mechanical study of functionally graded sandwiched plates resting on a two-parameter elastic base. Kaddari et al. [17] introduced a new kind of quasi three-dimensional hyperbolic shear deformation theory to address static and free vibration of dynamically graded, elastic-based porous surfaces in which the equations of motion have been derived from the Hamilton principle. Bourada et al. [18] obtained the analytical solutions of the buckling and free vibrational behaviors using the theory of Hamilton and the Navier method. They performed the dynamic and stability analysis of the simply supported single-walled Carbon Nanotubes reinforced concrete beam on elastic-foundation using an integral first-order shear deformationbeamprinciple. Abualnour et al. [19] proposed a novel displacement field to investigate the thermo-mechanical bending action of the antisymmetric cross-ply laminates. Quite recently, few scholars such as Bousahla et al. [20], Bellal et al. [21] and Shariati et al. [22] investigated the structural behaviors of plate resting on elastic foundation using integralfirst shear deformation theory or four variable trigonometric integral plate theory. In the above articles, the aim was to increase the structural support's load-bearing ability either by finding the supports or by adjusting the rigidity. Compared to the freely hinged extreme or simply supported boundaries or point-supported surfaces, the studies on the bending analysis on elastic foundations were limited due to the mathematical difficulties in handling more complicated boundary conditions, and generally, numerical methods have been applied in these studies.

The most recent literature, the research on thermal bending effect was conducted by several scholars, which can be summarized as given below. Eltaher et al. [23] derived the governing equations using Hamilton's principle to study the combined effects of nonlocal elasticity and surface properties on static and vibration characteristics of piezoelectric nano-beams and solved it numerically using the finite-element method. Belbachir et al. [24] used the principle of virtual work to obtain governing equations. They discussed a refined plate theory to explain the reaction of antisymmetric cross-ply laminated plates undergoing uniform nonlinear thermo-mechanical loading. Zarga et al. [25] determined the governing equations based on the principle of virtual work and used the basic theory of quasi-3D shear deformation to study the thermo-mechanical bending of functionally graded material sandwich boards. Belbachir et al. [26] performed the flexural analysis of antisymmetric cross-ply laminated plates under nonlinear thermal loading using a refined plate theory with four variables. Matouk et al. [27] used a novel integral Timoshenko beam theory to analyze the free vibrational action of the functionally graded nano-beams incorporated into the hygro-thermal system and reposed on the elastic base. Refrafi et al. [28] used a novel shear deformation hypothesis to analyze the hygrothermal and mechanical buckling responses of simply supported functionally graded sandwich plate seated on Winkler-Pasternak elastic base. Tounsi et al. [29] proposed a simple four-variable trigonometric integral shear deformation model to study the static behavior of advanced functionally graded ceramic-metal plates supported by a two-parameter elastic foundation. Boussoula et al. [30] developed the governing equations based on the principle of virtual work to perform thermomechanical flexural analysis of functionally graded material sandwich plates. A new principle of refined trigonometric shear deformation is used by Chikr et al. [31] to analyze the buckling nature of material sandwich plates centered on a twoparameter elastic structure under various boundary conditions by applying the theory of abstract displacements. The best approach for solving these problems can be through both theoretical and computational methods. But due to either non-availability or mathematical complexity, numerical solutions are still favored and widespread in practice. It is also noted that previous researchers have not considered the transient distribution of temperature during their thermoelastic bending analysis, captivating the plate mainly in elliptic coordinates.

From the above point of view, this paper is concerned with the analysis for thermalbending maximum stresses of an elliptic plate of uniform thickness, in such a way that the origin coincides with the centee of the plate and the axes are along the major and minor axis of ellipse respectively. In this paper, an elliptical plate placed on the elastic foundation of Winkler type is considered. The foundation is assumed to be such that its reaction is proportional to the deflection. During the problem formulation, we have initially investigated the problem from a different point of view by incorporating inside a thermal source of heat at a rate of

$(\lambda / K)\exp(-\beta t)$ per unit volume in a temperature field differential equation and a thermal flux $(Q_0 / K)(1-\nu t)$ outflow decreasing linearly with time. In the second part following Berger's method, the evaluation of large deflection of a heated clamped plate placed on the elastic foundation has been investigated under transient temperature distribution. Finally, the thermal maximum stress components are obtained based on the concept that bending stresses are distributed linearly over the thickness of the plate. Furthermore, the method is applicable to the bending of the circular plate, which has been deduced when the ellipse degenerates to a circle.

2. Basic thermoelastic deflection formulation

The potential energy obtained taking in account the strain energy due to thermal bending and stretching in mid-surface during transient temperature change is given as

$$V = \frac{D}{2}\iint_s \left\{ \left[(\nabla^2 W)^2 + \frac{12}{l^2} e_1^2 \right] - 2(1-\upsilon)\left[\frac{12}{l^2} e_2 + \frac{\partial^2 W}{\partial x^2}\frac{\partial^2 W}{\partial y^2} - \left(\frac{\partial^2 W}{\partial x \partial y} \right)^2 \right] + \frac{k}{D} W^2 \right\} ds \qquad (1)$$
$$- \frac{E\alpha_t}{1-\upsilon}\iint_s \int_{-l/2}^{l/2} (e_1 - z\nabla^2 W)\,\tau\, ds dz$$

in which W is the lateral displacement, D the flexural rigidity, E Young's modulus, α_t the coefficient of thermal expansion, υ is Poisson ratio, k is the reaction of foundation per unit area per unit deflection, ∇^2 is a Laplacian operator in Cartesian coordinate, s the surface under consideration, e_1 is first invariant and e_2 is second invariant, respectively, and is represented as

$$\nabla^2 = \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}, \qquad ds = dxdy, \qquad e_1 = e_x + e_y, \qquad e_2 = e_x e_y - \gamma_{xy}^2 / 4,$$

$$e_x = \frac{\partial u}{\partial x} + \frac{1}{2}\left(\frac{\partial W}{\partial x} \right)^2, \qquad e_y = \frac{\partial u}{\partial y} + \frac{1}{2}\left(\frac{\partial W}{\partial y} \right)^2, \qquad \gamma_{xy} = \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial W}{\partial x}\frac{\partial W}{\partial y}$$

with u and v is the in-plane displacement in cartesian coordinate (x, y).

By adding potential energy due to the thermal load and of the foundation reaction to the energy expression of Eq. (1) and neglecting the terms containing the second strain invariant, the modified energy expression becomes

$$V = \frac{D}{2}\iint_s \left\{ (\nabla^2 W)^2 + \frac{12}{l^2} e_1^2 - 2(1-\upsilon)\left[\frac{\partial^2 W}{\partial x^2}\frac{\partial^2 W}{\partial y^2} - \left(\frac{\partial^2 W}{\partial x \partial y} \right)^2 \right] + \frac{\kappa}{D} W^2 \right\} dx\, dy \qquad (2)$$
$$- \frac{1}{1-\upsilon}\iint_s [e_1 N_T - \nabla^2 W M_T]\, ds$$

Applying Euler's variational [32] equations to Eq. (2), one yield

$$\nabla^4 W - \alpha^2 \nabla^2 W + \frac{\kappa}{D} W = -\frac{12\alpha}{l^3}\nabla^2 M_T \qquad (3)$$

in which M_T is bending resultant moment, N_T is a resultant force, $\alpha^2 = 12e_1 / l^2$ is a normalised constant of integration.

3. Formulation of the Problem

It is well known that elliptical-cylindrical coordinates (ξ,η) are the most appropriate for elliptic boundary conditions that are expressed in rectangular coordinates which are maintaining the relationship $x+iy=c\cosh(\xi+i\eta)$. into

$$x=c\cosh\xi\cos\eta,\ y=c\sinh\xi\sin\eta,\ z=z \tag{4}$$

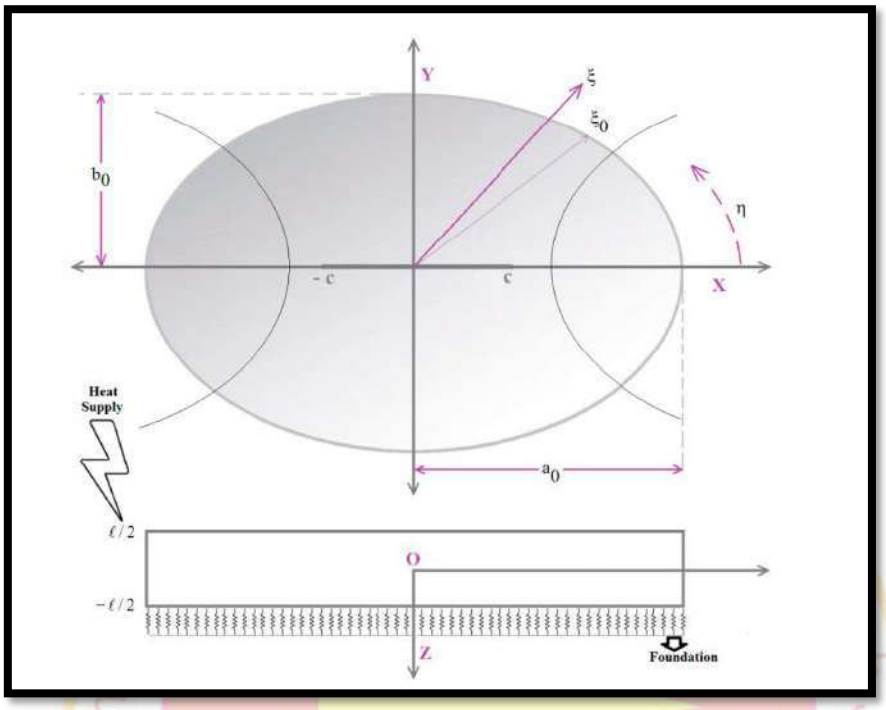

Fig.1 Elliptic plate geometry on an elastic foundation

in which $\xi=$ represents the family of confocal ellipses, $\eta=$ represents the family of confocal hyperbolas and they both in the form of curves interacts each other orthogonally at each instant. Here c being an interfocal distances between two foci of the ellipse and defined as $2c=2(a_0^2-b_0^2)^{1/2}$ with a_0 is the diameter along a semimajor axis and b_0 a diameter along the semiminor axis. The parameter ξ defines the interfocal line having the range $\xi\in(0,\ \xi_o)$, $\xi_o=\tanh^{-1}(b_o/a_o)$ and the parameter η is taken as $\eta\in(0,2\pi)$, as shown in Figure 1.

3.1 Temperature distribution

The modified form of the heat conduction differential equation in the non-simple in accordance with the first law of thermodynamics takes the following form

$$h^2\left(\frac{\partial^2T}{\partial\xi^2}+\frac{\partial^2T}{\partial\eta^2}\right)+\frac{\partial^2T}{\partial z^2}=\frac{1}{\kappa}\frac{\partial T}{\partial t}-\left(\frac{\xi_0}{2\pi l}\right)\frac{\lambda}{K}\exp(-\beta t) \tag{5}$$

subjected to the initial and thermal boundary conditions

$$T\big|_{t=0}=T\big|_{\xi=\xi_0}=T\big|_{z=-l/2}=0 \tag{6}$$

$$T\big|_{z=l/2}=-(Q_0/K)(1-\nu t)h^2(\cosh^2\xi-\cos^2\eta)^{1/2} \tag{7}$$

in which $T=T(\xi,\eta,z,t)$ is the temperature distribution, $\tau=T-T_i$ the temperature change with $T_i=T_i(\xi,\eta,z,t)$ is the initial temperature at $t=0$, $h^{-2}=(c^2/2)(\cosh 2\xi-\cos 2\eta)$ the scalar factor,

$f(\xi,\eta,t) = -(Q_0/K)(1-\nu t)\ h^2(\cosh^2\xi - \cos^2\eta)^{1/2}$ denoted the prescribed surface temperature (i.e. sectional heat supply source) on the upper face, Q_0 is constant heat flux intensity, ν the uniform speed, β represents the surface reflectance, λ is the absorption coefficient of the material, and $\kappa = K/\rho C_V$ representing thermal diffusivity in which K is the thermal conductivity of the material, ρ is the density, and C_V is the calorific capacity, respectively.

3.2 **Transient thermal bending stress**

The resultant bending moments per unit width is given [11] as

$$M_\xi = -Dh^2\left\{\left(\frac{\partial^2 W}{\partial\xi^2}+\nu\frac{\partial^2 W}{\partial\eta^2}\right)-\frac{(1-\upsilon)\sinh 2\xi}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial W}{\partial\xi}+\frac{(1-\upsilon)\sin 2\eta}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial W}{\partial\eta}\right\}-\frac{M_T}{1-\upsilon}$$

$$M_\eta = -Dh^2\left\{\left(\upsilon\frac{\partial^2 W}{\partial\xi^2}+\frac{\partial^2 W}{\partial\eta^2}\right)+\frac{(1-\upsilon)\sinh 2\xi}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial W}{\partial\xi}-\frac{(1-\upsilon)\sin 2\eta}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial W}{\partial\eta}\right\}-\frac{M_T}{1-\upsilon} \quad (8)$$

$$M_{\xi\eta} = D(1-\upsilon)h^2\left\{\frac{\partial W}{\partial\xi}\sin 2\eta+\frac{\partial W}{\partial\eta}\sinh 2\xi-\frac{\partial^2 W}{\partial\xi\partial\eta}(\cosh 2\xi-\cos 2\eta)\right\}$$

The maximum normal bending stresses are distributed linearly over the thickness of the plate is

$$\sigma_{\xi\xi} = \left[\frac{M_{\xi\xi}}{\lambda^2/6}\right]\frac{z}{\lambda/2}, \sigma_{\eta\eta} = \left[\frac{M_{\eta\eta}}{\lambda^2/6}\right]\frac{z}{\lambda/2}, \sigma_{\xi\eta} = \left[\frac{M_{\xi\eta}}{\lambda^2/6}\right]\frac{z}{\lambda/2} \quad (9)$$

The resultant moment and resultant force are represented as

$$M_T = \alpha E\int_{-1/2}^{1/2} z\tau(z)dz,\ N_T = \alpha E\int_{-1/2}^{1/2}\tau(z)dz \quad (10)$$

The boundary condition of the clamped plate is given as

$$W(\xi,\eta,t)\big|_{\xi=\xi_0} = \left.\frac{\partial W(\xi,\eta,t)}{\partial\xi}\right|_{\xi=\xi_0} = 0 \text{ for all } t \quad (11)$$

The Eqs (1) to (11) constitute the mathematical formulation under consideration.

4. **Solution to the problem**

4.1 **Solution for the temperature distribution**

Taking Laplace transform of Eqs. (5)-(7), one gets

$$h^2\left(\frac{\partial^2\bar{T}}{\partial\xi^2}+\frac{\partial^2\bar{T}}{\partial\eta^2}\right)+\frac{\partial^2\bar{T}}{\partial z^2}-\frac{s}{\kappa}\bar{T} = -\frac{\lambda}{K}\frac{1}{s+\beta} \quad (12)$$

$$\bar{T}\big|_{\xi=\xi_0} = \bar{T}\big|_{z=-1/2} = 0 \quad (13)$$

$$\bar{T}\big|_{z=1/2} = -\frac{Q}{K}\left(\frac{1}{p}-\frac{\alpha}{p^2}\right)h^2(\cosh^2\xi-\cos^2\eta)^{1/2} \quad (14)$$

in which $\bar{T}(\xi,\eta,z,p)$ is the transformed function of $T(\xi,\eta,z,t)$ and p the Laplace parameter.

Now to obtain the solution to Eq. (12), we assume

$$\bar{T} = \left(z+\frac{1}{2}\right)\frac{\lambda\kappa}{p(p+\beta)}\sum_{n=0}^{\infty} C_{2n}Ce_{2n}(\xi,q)ce_{2n}(\eta,q) \text{ with } Ce_{2n}(\xi_0,q)=0 \text{ at } \xi=\xi_0 \quad (15)$$

in which $q=\alpha_{2n,m}c^2/4$, C_{2n} will be determined from the nature of sectional heat supply prescribed on the upper face, $ce_{2n}(\eta,q)$ is the ordinary Mathieu function of the first kind of order n and $Ce_{2n}(\xi,q)$ is the modified Mathieu function of the first kind of order n, and denoted [33] as

$$ce_{2n}(\eta,q)=\sum_{r=0}^{\infty}A_{2r}^{(2n)}\cos 2r\eta,\ Ce_{2n}(\xi,q)=\sum_{r=0}^{\infty}A_{2r}^{(2n)}\cosh 2r\xi \tag{16}$$

with A's being the function of q. Now as q has those values $q_{2n,m}$ which makes $Ce_{2n}(\xi_0,q)$ zero and thus $\alpha_{2n,m}$ depends on m and n.

Hence Eq. (15) can be rewritten as

$$\bar{T}=\left(z+\frac{1}{2}\right)\frac{\lambda\kappa}{p(p+\beta)}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m}) \tag{17}$$

which satisfies both boundary condition of Eq. (13).

Now we consider the Eq. (14) using Eq. (17) as

$$\frac{\lambda\kappa l}{p(p+\beta)}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})$$
$$=-\frac{Q_0}{K}\left(\frac{1}{p}-\frac{\alpha}{p^2}\right)h^2(\cosh^2\xi-\cos^2\eta)^{1/2} \tag{18}$$

Using inversion transform of t on Eq. (18), one yield

$$\frac{\lambda\kappa l}{\beta}[1-\exp(-\beta t)]\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})$$
$$=-\frac{Q_0}{K}(1-\nu t)h^2(\cosh^2\xi-\cos^2\eta)^{1/2} \tag{19}$$

Now multiplying Eq. (19) on both sides by $Ce_{2p}(\xi,q_{2p,r})ce_{2p}(\eta,q_{2p,r})(\cosh 2\xi-\cos 2\eta)$ and integrating with respect to η from limits 0 to 2π, and with respect to ξ from 0 to ξ_0. Then by the orthogonal property [33], all terms vanish when $p=n,\ r=m.$

Hence, C_{2n} depends on m as well as on n and further simplifying by taking $h\cosh\xi_0=a$ and $e<1$ as the eccentricity, and considering the theory of uniform convergence, one yield

$$C_{2n}=\frac{-\frac{2a\pi Q}{K}(1-\nu t)h^2\int_0^{\xi_0}Ce_{2n}(\xi,q_{2n,m})\left[A_0^{2n}\left(1-\frac{e^2}{2^2}-\ldots\right)+A_2^{2n}\left(\frac{-e^2}{24}\ldots\right)+\ldots\right]\cosh 2\xi d\xi}{\frac{\lambda\kappa l}{\beta}[1-\exp(-\beta t)]\int_0^{\xi_0}Ce_{2n}^2(\xi,q_{2n,m})[\cosh 2\xi-\Theta_{2n,m}d\xi} \tag{20}$$

Again applying the rules of the Laplace inversion theorem to Eq. (17), one arrives at the required expression for temperature change stated above as

$$\tau=T=\frac{\lambda\kappa}{\beta}[1-\exp(-\beta t)]\left(z+\frac{1}{2}\right)\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m}) \tag{21}$$

4.2 **Solution for the thermal displacement**

Substituting Eq. (21) into Eq. (10), one obtains

$$M_T=\frac{\lambda\kappa l^3}{12\beta}[1-\exp(-\beta t)]\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m}) \tag{22}$$

$$N_T = \frac{\lambda\kappa l^2}{2\beta}[1-\exp(-\beta t)]\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} C_{2n}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \quad (23)$$

Now considering Eq. (3) in elliptic coordinate and taking Eq. (22) in the account, one obtains

$$\nabla_1^4 W - \alpha^2\nabla_1^2 W + \frac{\kappa}{D}W + \frac{\alpha\lambda\kappa}{\beta}[1-\exp(-\beta t)]\nabla_1^2\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} C_{2n}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) = 0 \quad (24)$$

in which ∇_1 is the two-dimensional Laplacian operator in (ξ,η).

In order to find the complete solution of above Eq. (24), one must obtain a solution that comprised of complementary function and the particular integral which satisfies the boundary conditions given in Eq. (11). To obtain the complementary function of Eq. (24) which can be represented as

$$\nabla_1^4 W_c - \alpha^2\nabla_1^2 W_c + \frac{\kappa}{D}W_c = (\nabla_1^2 + \delta_1^2)(\nabla_1^2 - \delta_2^2)W_c = 0 \quad (25)$$

where

$\delta_1^2 + \delta_2^2 = -\alpha^2$

and

$\delta_1^2\delta_2^2 = -\kappa / D$.

Thus, we assume a solution as

$$W_c = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}Ce_{2n}(\xi, q_{2n,m}^1)ce_{2n}(\eta, q_{2n,m}^1) + \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} B_{2n}Ce_{2n}(\xi, -q_{2n,m}^2)ce_{2n}(\eta, -q_{2n,m}^2) \quad (26)$$

in which $q_{2n,m}^i = c^2\delta_i^2/4\ (i=1,2)$, A_{2n} and B_{2n} are constants is determined using boundary conditions given in Eq. (11) as

$$A_{2n} = \frac{1}{2\pi A_0^{2n}\phi_1},\ B_{2n} = \frac{1}{2\pi A_0^{2n}\phi_2} \quad (27)$$

in which

$$\phi_1 = Ce_{2n}(\xi_0, q_{2n,m}^1)C'e_{2n}(\xi_0, -q_{2n,m}^2) - C'e_{2n}(\xi_0, q_{2n,m}^1)Ce_{2n}(\xi_0, -q_{2n,m}^2),$$

$$\phi_2 = C'e_{2n}(\xi_0, q_{2n,m}^1)Ce_{2n}(\xi_0, -q_{2n,m}^2) - Ce_{2n}(\xi_0, q_{2n,m}^1)C'e_{2n}(\xi_0, -q_{2n,m}^2)$$

and the prime dash represents the differentiation with respect to the variable ξ.

The particular integral of Eq. (24) can be obtained as

$$W_p = -\frac{\alpha\lambda\kappa[1-\exp(-\beta t)]}{\beta(\alpha_{2n,m} - \delta_2^2)(\alpha_{2n,m} - \delta_1^2)}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} C_{2n}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \quad (28)$$

Thus, the complete solution of Eq. (24) can be obtained by adding Eqs. (26) and (28).

$$W = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle\{A_{2n}Ce_{2n}(\xi, q_{2n,m}^1)ce_{2n}(\eta, q_{2n,m}^1) + B_{2n}Ce_{2n}(\xi, -q_{2n,m}^2) \times ce_{2n}(\eta, -q_{2n,m}^2)\} - B_{11}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m})\Big\rangle \quad (29)$$

In order to determine the α, the first invariant e_1 is transformed to elliptic coordinates as

$$h_\xi h_\eta\left[\frac{\partial}{\partial\xi}\left(\frac{u_\xi}{h_\eta}\right) + \frac{\partial}{\partial\eta}\left(\frac{u_\eta}{h_\xi}\right)\right] + \frac{h_\xi h_\eta}{2}\left[\left(\frac{\partial W}{\partial\xi}\right)^2 + \left(\frac{\partial W}{\partial\eta}\right)^2\right] = \frac{\alpha^2 h^2}{12} + (1+\upsilon)\alpha_t\tau \quad (30)$$

in which the scale factors is given as $h_\xi = h_\eta = (1/c)(\sinh^2\xi + \sin^2\eta)^{1/2}$, $h_z = 1$.

Here u_ξ and u_η are the displacement in elliptical coordinates with $u_\xi = 0$ at $\eta = \pi/2$, $\xi = \xi_0$ and $u_\eta = 0$ at $\eta = 0$, $\xi = \xi_0$, thus the first term reduces to zero.

Now integrating the reduced Eq. (30), one yield

$$\alpha = \frac{1}{ch}\left\{\frac{6}{\phi_3}\int_0^{2\pi}\int_0^{\xi_0}\left[\left(\frac{\partial W}{\partial \xi}\right)^2 + \left(\frac{\partial W}{\partial \eta}\right)^2\right] d\xi d\eta - 2\phi_3(1+\upsilon)\alpha_t \tau\right\}^{1/2} \tag{31}$$

where

$\phi_3 = \pi \cosh 2\xi_0 \sinh \xi_0$.

4.3 **Solution for the resultant bending moments per unit width**

Substituting Eq. (29) into Eq. (8), one obtains

$$\begin{aligned} M_\xi = -Dh^2 \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle & A_{2n}\{Ce''_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) \\ & + \upsilon Ce_{2n}(\xi, q^1_{2n,m})ce''_{2n}(\eta, q^1_{2n,m}) - A_{11}\{\sinh 2\xi \\ & \times Ce'_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, q^1_{2n,m}) \\ & \times ce'_{2n}(\eta, q^1_{2n,m})\}\} + B_{2n}\{Ce''_{2n}(\xi, -q^2_{2n,m})ce_{2n}(\eta, -q^2_{2n,m}) \\ & + \upsilon Ce_{2n}(\xi, -q^2_{2n,m})ce''_{2n}(\eta, -q^2_{2n,m}) - A_{11}\{\sinh 2\xi \\ & \times Ce'_{2n}(\xi, -q^2_{2n,m})ce_{2n}(\eta, -q^2_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, -q^2_{2n,m}) \\ & \times ce'_{2n}(\eta, -q^2_{2n,m})\}\} - B_{11}\{Ce''_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \\ & + \upsilon Ce_{2n}(\xi, q_{2n,m})ce''_{2n}(\eta, q_{2n,m}) - A_{11}\{\sinh 2\xi Ce'_{2n}(\xi, q_{2n,m}) \\ & \times ce_{2n}(\eta, q_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m})\}\} \\ & - C_{11}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m})\Big\rangle \end{aligned} \tag{32}$$

$$\begin{aligned} M_\eta = -Dh^2 \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle & A_{2n}\{\upsilon Ce''_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) \\ & + Ce_{2n}(\xi, q^1_{2n,m})ce''_{2n}(\eta, q^1_{2n,m}) + A_{11}\{\sinh 2\xi \\ & \times Ce'_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, q^1_{2n,m}) \\ & \times ce'_{2n}(\eta, q^1_{2n,m})\}\} + B_{2n}\{\upsilon Ce''_{2n}(\xi, -q^2_{2n,m})ce_{2n}(\eta, -q^2_{2n,m}) \\ & + Ce_{2n}(\xi, -q^2_{2n,m})ce''_{2n}(\eta, -q^2_{2n,m}) + A_{11}\{\sinh 2\xi \\ & \times Ce'_{2n}(\xi, -q^2_{2n,m})ce_{2n}(\eta, -q^2_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, -q^2_{2n,m}) \\ & \times ce'_{2n}(\eta, -q^2_{2n,m})\}\} - B_{11}\{\upsilon Ce''_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \\ & + Ce_{2n}(\xi, q_{2n,m})ce''_{2n}(\eta, q_{2n,m}) + A_{11}\{\sinh 2\xi Ce'_{2n}(\xi, q_{2n,m}) \\ & \times ce_{2n}(\eta, q_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m})\}\} \\ & - C_{11}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m})\Big\rangle \end{aligned} \tag{33}$$

$$\begin{aligned} M_{\xi\eta} = D(1-\upsilon)h^2 \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle & A_{2n}\{\sin 2\eta Ce'_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) \\ & + Ce_{2n}(\xi, q^1_{2n,m})ce'_{2n}(\eta, q^1_{2n,m})\sinh 2\xi - (\cosh 2\xi - \cos 2\eta) \\ & \times Ce'_{2n}(\xi, q^1_{2n,m})ce'_{2n}(\eta, q^1_{2n,m})\} + B_{2n}\{\sin 2\eta Ce'_{2n}(\xi, -q^2_{2n,m}) \\ & \times ce_{2n}(\eta, -q^2_{2n,m}) + \sinh 2\xi Ce_{2n}(\xi, -q^2_{2n,m}) \\ & \times ce'_{2n}(\eta, -q^2_{2n,m}) - (\cosh 2\xi - \cos 2\eta)Ce'_{2n}(\xi, -q^2_{2n,m}) \\ & \times ce'_{2n}(\eta, -q^2_{2n,m})\} - B_{11}\{\sin 2\eta Ce'_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \\ & + \sinh 2\xi Ce_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m}) \\ & - (\cosh 2\xi - \cos 2\eta)Ce'_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m})\}\Big\rangle \end{aligned} \tag{34}$$

where

$$A_{11}=\frac{1-\upsilon}{\cosh 2\xi-\cos 2\eta},\quad B_{11}=\frac{\alpha\lambda\kappa[1-\exp(-\beta t)]C_{2n}}{\beta(\alpha_{2n,m}-\delta_2^2)(\alpha_{2n,m}-\delta_1^2)},\quad C_{11}=\frac{\lambda\kappa l^3[1-\exp(-\beta t)]C_{2n}}{12(1-\upsilon)\beta}.$$

4.4 Solution for the thermal bending stress

Substituting Eqs. (32)-(34) into Eq. (9), one obtains

$$\begin{aligned}\sigma_{\xi\xi}=&-\frac{12Dh^2z}{l^3}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle A_{2n}\{Ce_{2n}''(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)\\&+\upsilon Ce_{2n}(\xi,q_{2n,m}^1)ce_{2n}''(\eta,q_{2n,m}^1)-A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)-\sin 2\eta Ce_{2n}(\xi,q_{2n,m}^1)\\&\times ce_{2n}'(\eta,q_{2n,m}^1)\}\}+B_{2n}\{Ce_{2n}''(\xi,-q_{2n,m}^2)ce_{2n}(\eta,-q_{2n,m}^2)\\&+\upsilon Ce_{2n}(\xi,-q_{2n,m}^2)ce_{2n}''(\eta,-q_{2n,m}^2)-A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,-q_{2n,m}^2)ce_{2n}(\eta,-q_{2n,m}^2)-\sin 2\eta Ce_{2n}(\xi,-q_{2n,m}^2)\\&\times ce_{2n}'(\eta,-q_{2n,m}^2)\}\}-B_{11}\{Ce_{2n}''(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\\&+\upsilon Ce_{2n}(\xi,q_{2n,m})ce_{2n}''(\eta,q_{2n,m})-A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})-\sin 2\eta Ce_{2n}(\xi,q_{2n,m})\\&\times ce_{2n}'(\eta,q_{2n,m})\}\}-C_{11}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\Big\rangle\end{aligned}\tag{35}$$

$$\begin{aligned}\sigma_{\eta\eta}=&-\frac{12Dh^2z}{l^3}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle A_{2n}\{\upsilon Ce_{2n}''(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)\\&+Ce_{2n}(\xi,q_{2n,m}^1)ce_{2n}''(\eta,q_{2n,m}^1)+A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)-\sin 2\eta Ce_{2n}(\xi,q_{2n,m}^1)\\&\times ce_{2n}'(\eta,q_{2n,m}^1)\}\}+B_{2n}\{\upsilon Ce_{2n}''(\xi,-q_{2n,m}^2)ce_{2n}(\eta,-q_{2n,m}^2)\\&+Ce_{2n}(\xi,-q_{2n,m}^2)ce_{2n}''(\eta,-q_{2n,m}^2)+A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,-q_{2n,m}^2)ce_{2n}(\eta,-q_{2n,m}^2)-\sin 2\eta Ce_{2n}(\xi,-q_{2n,m}^2)\\&\times ce_{2n}'(\eta,-q_{2n,m}^2)\}\}-B_{11}\{\upsilon Ce_{2n}''(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\\&+Ce_{2n}(\xi,q_{2n,m})ce_{2n}''(\eta,q_{2n,m})+A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})-\sin 2\eta Ce_{2n}(\xi,q_{2n,m})\\&\times ce_{2n}'(\eta,q_{2n,m})\}\}-C_{11}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\Big\rangle\end{aligned}\tag{36}$$

$$\begin{aligned}\sigma_{\xi\eta}=&\frac{12D(1-\upsilon)h^2z}{l^3}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle A_{2n}\{\sin 2\eta Ce_{2n}'(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)\\&+\sinh 2\xi Ce_{2n}(\xi,q_{2n,m}^1)ce_{2n}'(\eta,q_{2n,m}^1)-(\cosh 2\xi-\cos 2\eta)\\&\times Ce_{2n}'(\xi,q_{2n,m}^1)ce_{2n}'(\eta,q_{2n,m}^1)\}+B_{2n}\{\sin 2\eta Ce_{2n}'(\xi,-q_{2n,m}^2)\\&\times ce_{2n}(\eta,-q_{2n,m}^2)+\sinh 2\xi Ce_{2n}(\xi,-q_{2n,m}^2)ce_{2n}'(\eta,-q_{2n,m}^2)\\&-(\cosh 2\xi-\cos 2\eta)Ce_{2n}'(\xi,-q_{2n,m}^2)ce_{2n}'(\eta,-q_{2n,m}^2)\}\\&-B_{11}\{\sin 2\eta Ce_{2n}'(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})+\sinh 2\xi Ce_{2n}(\xi,q_{2n,m})\\&\times ce_{2n}'(\eta,q_{2n,m})-(\cosh 2\xi-\cos 2\eta)Ce_{2n}'(\xi,q_{2n,m})ce_{2n}'(\eta,q_{2n,m})\}\Big\rangle\end{aligned}\tag{37}$$

5. Transition to the circular plate

When the elliptical plate tends to a circular plate of radius a, the semi-focal $c\to 0$ and therefore α_m is the roots of the transcendental equation $J_0(\alpha_m)=0.$

Also $e \to 0$ [as $\xi \to \infty$], $\cosh 2\xi\, d\xi \to 2\cosh 2\xi \sinh 2\xi\, d\xi \to 2rdr/l^2$, $\sinh\xi \to \cosh\xi$, $\mathrm{h}\cosh\xi \to r$ [as $h \to 0$], $\cosh\xi\, d\xi \to r\, dr$, $\mathrm{h}\sinh\xi\, d\xi \to dr$.

Using results from [33]

$Ce_0(\xi, q_{0,m}) \to p_0' J_0(\lambda_m r)$, $Ce_0'(\xi, q_{0,m}) \to p_0' J_0'(\lambda_m r)$, $Ce_0''(\xi, q_{0,m}) \to p_0' J_0''(\lambda_m r)$, $ce_0(\eta, q_m) \to 1/\sqrt{2}$, $A_0^{(0)} \to 1/\sqrt{2}, A_2^{(0)} \to 0$, $\Theta_{2m} \to 0$, $\lambda_{0,m}^2 = \alpha_{0,m}^2 / a^2 = \alpha_m^2 / a^2 = \lambda_m^2$, $p_0' = Ce_0(0, q_{0,m})$ $ce_0(2\pi, q_{0,m}) / A_0^{(0)}$.

Eq. (21) degenerates into temperature distribution into a circular plate

$$\tau = T = \left(z + \frac{1}{2}\right) \sum_{m=1}^{\infty} C_m p_0' J_0(\lambda_m r) \tag{38}$$

in which

$$C_m = -\frac{\pi Q(1-\nu t)}{K\mathrm{l}} \left\{ \left[\int_0^a r J_0(\lambda_m r) dr \right] / \left[\int_0^a r J_0(\lambda_m r)^2 dr \right] \right\}$$

The aforementioned degenerated results agree with the results [34].

6. Numerical Results, Discussion and Remarks

Firstly, introduce the dimensionless parameter for numerical computations as follows

$$\left.\begin{aligned} &\bar{\xi} = \xi / \xi_0,\ \bar{z} = [z - (-\mathrm{l}/2)]/\xi_0,\ e = c/\xi_0, \tau = \kappa t / \xi_0^2 \\ &\bar{\theta} = T/T_0, \bar{W} = W/\alpha\theta_0\xi_0, \bar{N}_{ij} = N_{ij}/E\xi_0^3, \bar{F}_{ij} = F_{ij}/E\xi_0^2\theta_0, \\ &\bar{M}_{ij} = M_{ij}/E\xi_0^3,\ \bar{\sigma}_{ij} = \sigma_{ij}/E\alpha\theta_0 \quad (i, j = \xi, \eta) \end{aligned}\right\} \tag{39}$$

The numerical computations have been carried out for an Aluminum elliptic plate with physical parameter as ξ_0 = 1 m, $\lambda = 0.06$ m and reference temperature as 273 K.

The thermomechanical properties[34] take the form as

- Modulus of elasticity E, 70 GPa
- Thermal diffusivity κ, 84.18 m^2/s
- Poisson's ratio υ, 0.35
- Thermal expansion coefficient α, 23 x 10^{-6} / ^{o}C
- Thermal conductivity G, 204.2 W/mK

To study the results of heating on the elliptic plate, numerical calculations for all variables have been performed and the numerical calculations are seen in the following figures with the use of MATHEMATICA software. In Figures (2)-(13) explains that numerical results of the dimensionless temperature distribution, thermal deflection and its associated bending stresses of the elliptic plate under the boundary conditions and that are subjected to sectional heat supply on the upper face, the lower face at zero temperature.

Figure 2 displays the dimensionless temperature field in an elliptic plate along the radial direction for a separate fixed time. The temperature distribution is initially at zero at the right boundary (i.e. $\xi = \xi_0$), and then increases along the radial direction towards the left boundary (i.e. $\xi = 0$). It may be due to the available internal heat generation and sectional prescribed temperature. Initially, the end of the plate is at compressed state, and gradually tensile force increases towards the mid-plate.

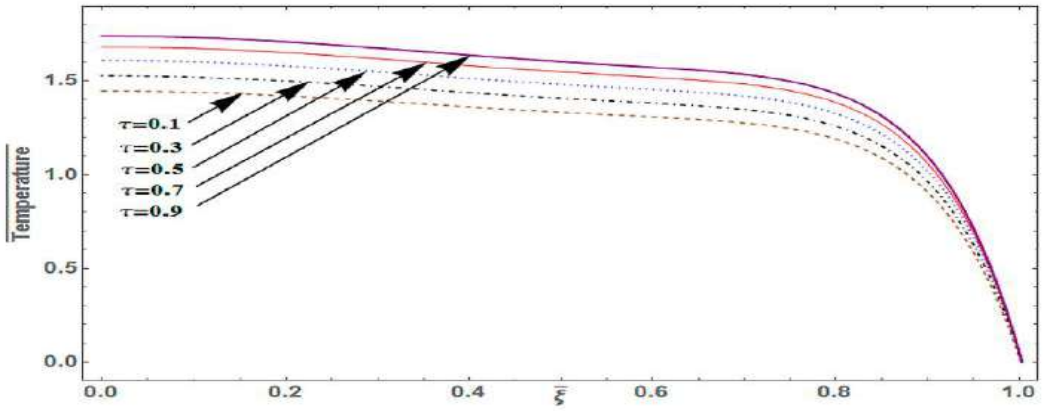

Figure 2. The dimensionless temperature in an elliptic plate along $\bar{\xi}$ *for various locations of* τ.

Figure 3 illustrates the dimensionless temperature distribution along the angular direction for different values of $\bar{\xi}$. In the central part of the elliptic plate, thermal expansion is more significant, thereby giving high tensile force, while at both endpoints, temperature decreases to the minimum. Probably, due to an internal heat source, the temperature variation is more stable, and energy storage is more responsive to the heat sources.
Figure 4 demonstrates the distribution of the temperature along the thickness direction of the plate. Due to the external heat supply, the maximum values of temperature magnitude increase from the upper face and at each instance reduces towards the axial direction; and attains minimum on the lower face at zero temperature.

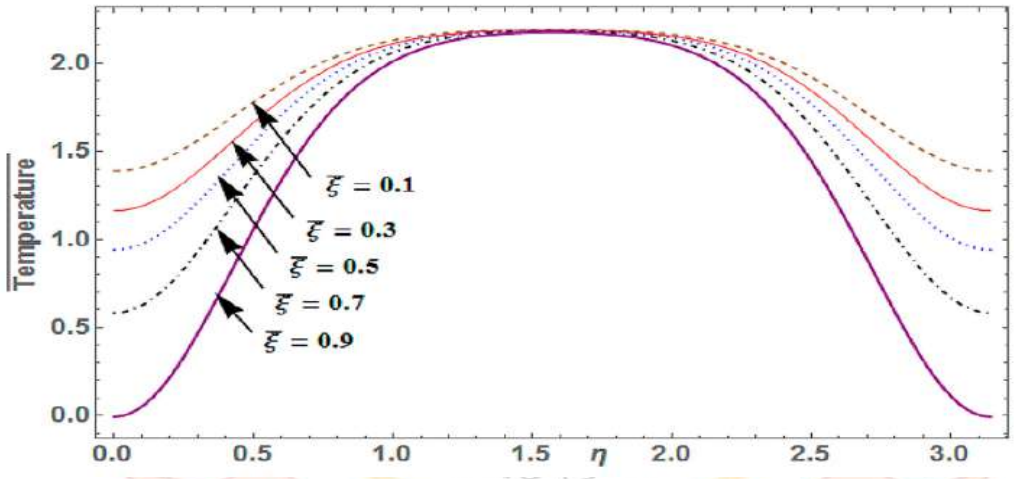

Figure 3. The temperature in an elliptic plate along η *for various locations of* $\bar{\xi}$.

Figure 5 indicates thermal deflection along the $\bar{\xi}$ direction for different values of η and fixed value of $\bar{z} = 0.06$, and reaches the outer limit at zero to satisfy the condition $\overline{W} = \partial\overline{W}/\partial\bar{\xi} = 0$ at $\bar{\xi} = \bar{\xi}_0$. The dimensionless large deflection is maximum at the center of the plate due to accumulation of heat source at the inner core. Figure 6 shows that initially, the deflection is zero at $\tau = 0$ and gradually increases along the timeline up to $\tau = 0.25$, and finally, its uniformity is attained. Figure 7 and 9 depicts the dimensionless radial $\bar{\sigma}_{\xi\xi}$ and tangential stresses $\bar{\sigma}_{\eta\eta}$ in the η direction at fixed $\bar{\xi} = 0.6$ and $\tau = 0.6$. The facts shows that radial and tangential stress achieves its highest possible tensile stress at left and right boundaries while the compressive stress is higher at the central part. The resulting finding shows that the two stress produces the same thermal effect apart from small magnitude variation.

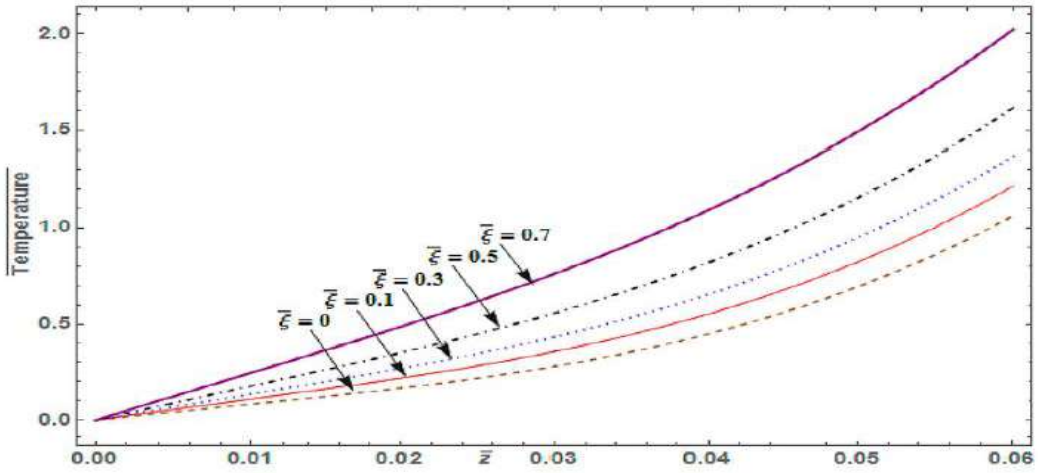

Figure 4. The dimensionless temperature in an elliptic plate along $\bar{z}$ for various locations of $\bar{\xi}$.

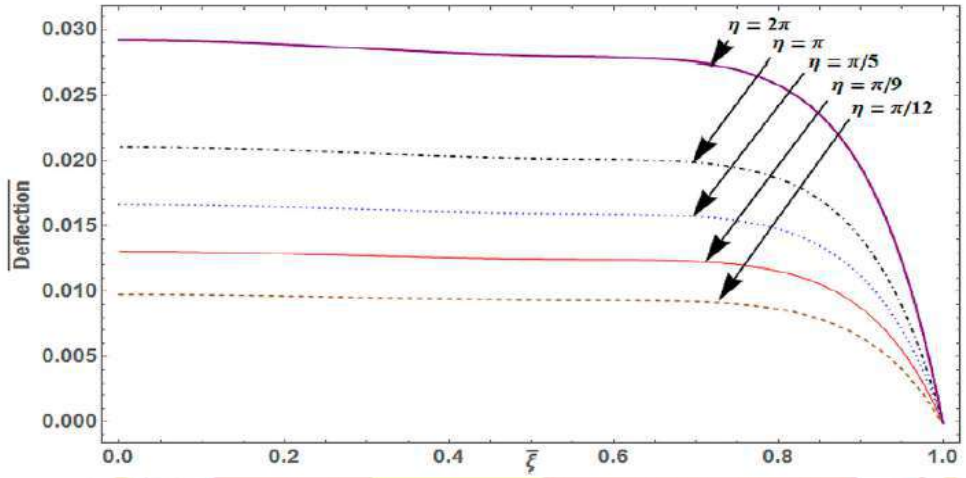

Figure 5. The dimensionless deflection along $\bar{\xi}$ for various locations of η.

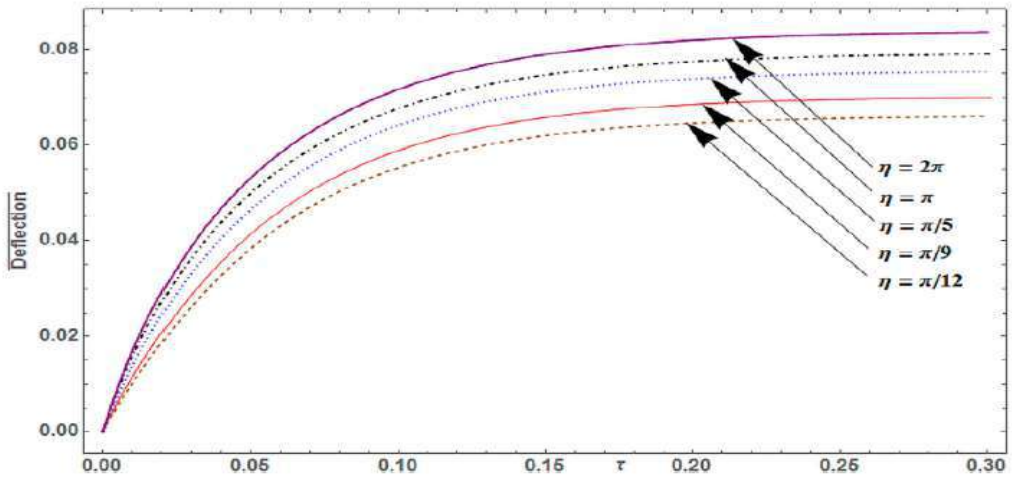

Figure 6. The dimensionless deflection along τ for various locations of η.

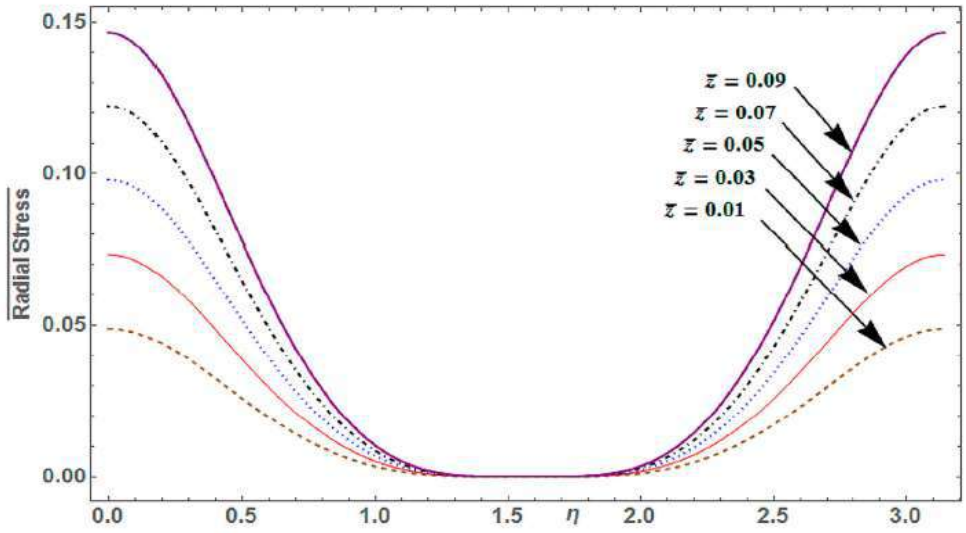

Figure 7. The dimensionless thermal radial stress along η for various locations of $\bar{z}$.

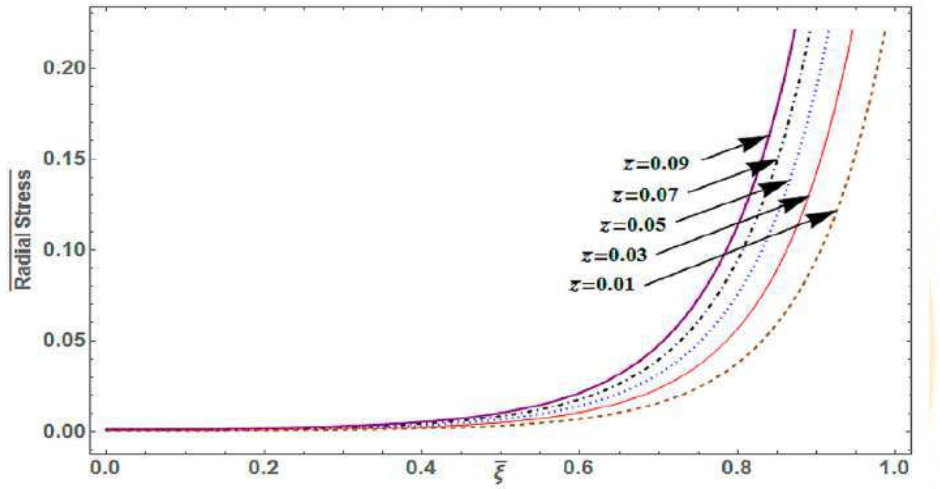

Figure 8. The dimensionless thermal radial stress along $\bar{\xi}$ for various locations of $\bar{z}$.

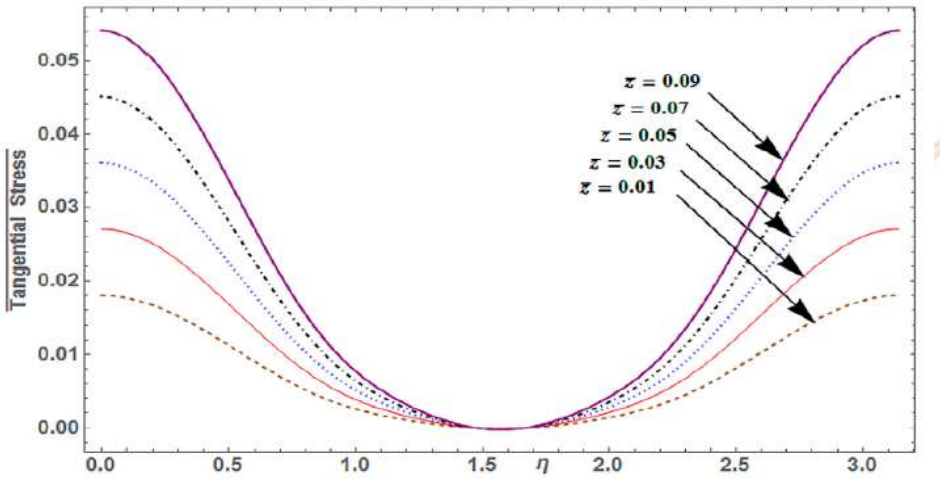

Figure 9. The dimensionless thermal tangential stress along η for various locations of $\bar{z}$.

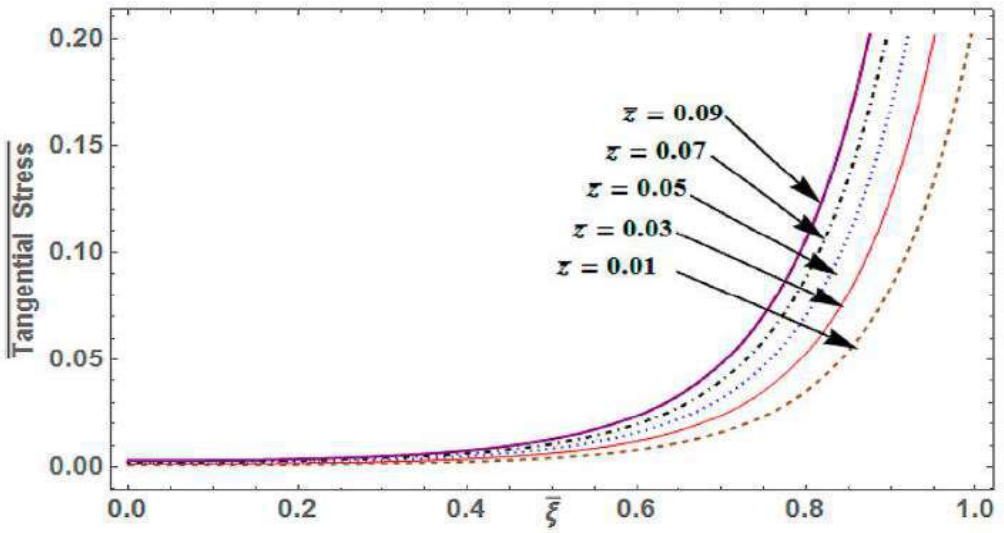

Figure 10. The dimensionless thermal tangential stress along $\bar{\xi}$ for various locations of $\bar{z}$.

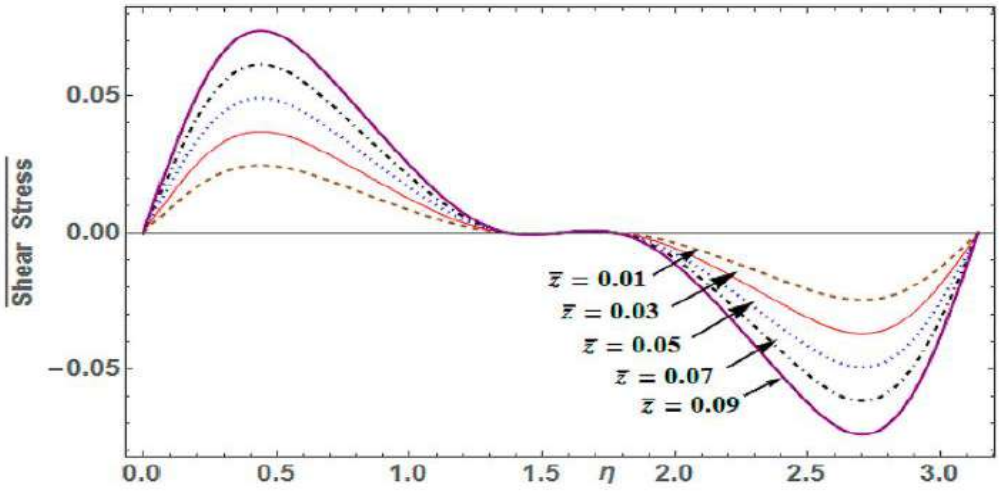

Figure 11. The dimensionless thermal shear stress along η for various locations of $\bar{z}$.

Figure 8 and 10 shows the distribution of radial $\bar{\sigma}_{\xi\xi}$ and normal stress $\bar{\sigma}_{\eta\eta}$ along the $\bar{\xi}$- direction at fixed $\eta = \pi/3$ and $\tau = 0.6$. The nature of stress gradually increases along the radial direction and attains maximum magnitude towards the outer edge. This could probably be due to the sectional prescribed temperature.

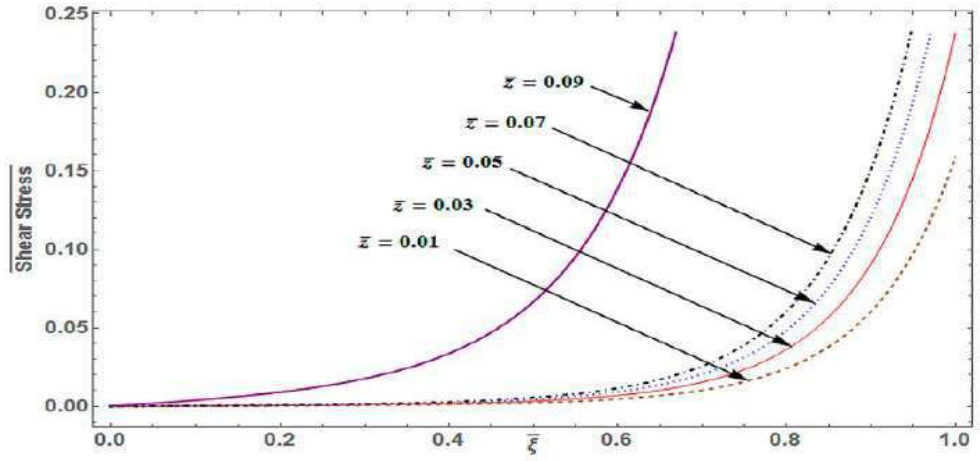

Figure 12. The dimensionless thermal shear stress along $\bar{\xi}$ for various locations of $\bar{z}$.

Figure 11 shows a plane sinusoidal heat propagating along the angular direction, and it attains zero when they are odd. The behavior may be due to the absorption of heat dissipated by sectional heat and internal heat supply. Figure 12 shows the distribution of shearing stress $\overline{\sigma}_{\xi\eta}$ along the $\overline{\xi}-$ direction at fixed $\eta = \pi / 3$ and $\tau = 0.6$. The result demonstrates that the influence of radius on $\overline{\sigma}_{\xi\eta}$ is more than those on $\overline{\sigma}_{\xi\xi}$ and $\overline{\sigma}_{\eta\eta}$. Figure 13 shows that the resulting moment reveal patterns that vanishes in the middle of the plate, but changes its characteristics as $\overline{\xi} \to 1$. This may be due to the distribution of internal heat supply available and the transfer of thermal energy into the outer curve. The residual bending moments ($\overline{M}_{\xi\xi}$, $\overline{M}_{\eta\eta}$) trend is maximum and displays positive values on the outer side, while the resultant moment ($\overline{M}_{\xi\eta}$) drops towards the negative magnitude value. The $\overline{\sigma}_{\xi\xi}$, $\overline{\sigma}_{\eta\eta}$ and $\overline{\sigma}_{\xi\eta}$ has maximum compressive stress inside the plate, whereas, the tensile stress occurs on the outer surface of the plate.

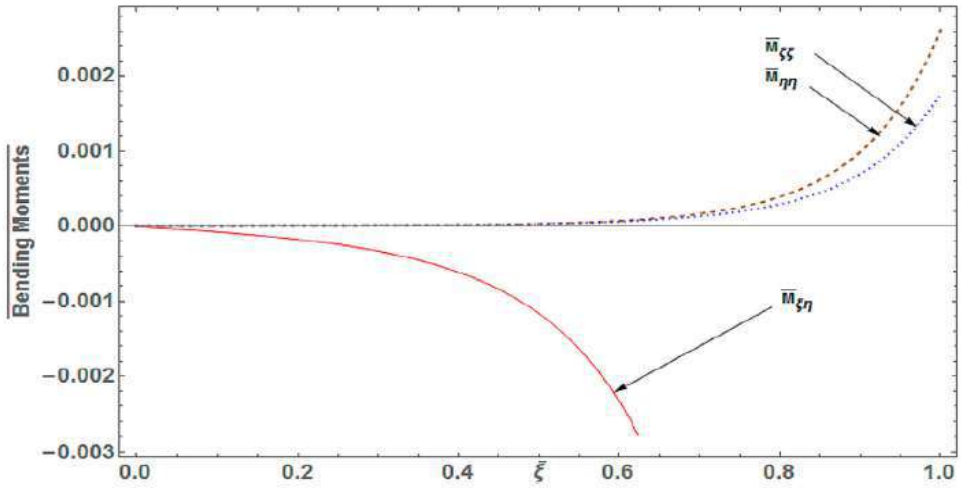

Figure 13. Bending Moments along $\overline{\xi}$ for a fixed value of $\eta = \pi / 4$.

7. Conclusion

In this paper, we have described the theoretical treatment of stress analysis distribution for the thermosensitive elliptic plate with a clamped edge. The temperature distribution and the deflection in the form of ordinary and modified Mathieu functions are used to determine thermal stresses by proposed classical methods. The analytical technique proposed here is relatively simple and widely applicable compared with methods proposed by other researchers. The advantage of this approach is its generality and its mathematical power to handle different types of mechanical and thermal boundary conditions during small deflection under thermal loading. The aforementioned thermo-sensitivity concept can be very well applicable in the field of hybridizing metallurgy, ceramics, solid state physics and chemistry. They have a lot of application in the biomedical field and so forth.

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State-space approach to the thermoelastic problem of a one-dimensional semi-infinite rod

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Abstract

In this paper, a transient of generalised thermoelasticity in an isotropic homogeneous elastic infinite rod which is unstrained and unstress initially and has uniform temperature distribution, is tackled by solving the coupled one dimensioned equation of heat conduction and equation of motion by following the state space approach of modern control theory in Laplace transform domain for small value of time. The subsequent temperature distribution and deformation from which stresses are calculated. The results are explained by numerical calculation and illustrated graphically.
Keywords: *Transient Temperature, Isotropic Homogeneous, Coupled Thermoelasticity, Thermal Displacement*

1. Introduction

Chandrasekharaiah and Srinath [1] explained that the linear theory of thermoelasticity without energy dissipation for homogeneous and isotropic materials is used to study plane waves in a half-space. Abbasi [2] obtained the Finite Element Method (FEM) solution of the vibration behaviour of a Functionally Graded Material (FGM) Timoshenko beam under lateral thermal shock with coupled thermoelastic assumption. Adams and Bert [3] obtained the results using the interaction between the strain and temperature fields and further investigated the effect of accounting for the orthotropic material properties in the governing elastic and thermal equations. Sharma and Grover [4] derived a closed-form expression for the transverse vibrations of a homogeneous isotropic, thermoelastic thin beam under clamped and simply supported conditions based on the Euler-Bernoulli theory. Okumura [5] has analysed the thermal-bending stresses in an annular sector by the theory of moderately thick plates. Kawamura [6] has analysed the equations of motion governing thermally induced vibration of plates with inhomogeneous material properties through the thickness direction are presented. Kar [7] problem deals with the thermo-elastic interaction due to step input of temperature on the boundaries of a homogeneous isotropic spherical shell in the context of generalised theories of thermo-elasticity. This paper deals with the study of waves propagation in an infinite rod by following state-space approaches using the Laplace transform.

2. Formulation of the problem

Consider a bounded isotropic homogeneous elastic material undergoing small temperature variation. The displacement component and the small temperature variation from an equilibrium temperature are connected by following differential equations

$$\mu u'_{j,kk} + (\lambda + \mu) u'_{k,kj} = (3\lambda + 2\mu)\alpha\theta'_{,j} + \rho\ddot{u}_j \tag{1}$$

$$\theta'_{,ii} = \frac{C_v}{k}(\dot{\theta}' + \tau\ddot{\theta}') + \frac{1}{k}(3\lambda + 2\mu)\alpha T_0(\dot{u}'_{i,i} + \tau\ddot{u}'_{i,i}) \tag{2}$$

and the stress is

$$\sigma'_{ij} = E\varepsilon'_{ij} - E\alpha(\theta' - T_0) \tag{2a}$$

where i and j take value $1, 2$ and 3 and few other notations are given below

- λ and μ are Lame's constants.
- α is the coefficient of linear thermal expansion.
- C_v is the specific heat at a constant volume
- κ is the thermal conductivity
- T is the relaxation time

- T_0 is the temperature in the equilibrium state
- , (comma) denote partial differentiation to space coordinates
- . (Dot) denote partial differentiation w.r.to time

Now define the following dimensionless quantities,

$$x_i = \frac{\kappa}{C_v C} x_i' \ , \ u = \frac{\kappa u'}{C_v C} \ , \ \theta = \theta' T_0 \ , \ t = \frac{\kappa}{C_v C} t' \ , \ \sigma_{ij} = \frac{\sigma'_{ij}}{\mathrm{E}\,\alpha(\theta' - T_0)}$$

where

$$C^2 = \frac{(\lambda + 2\mu)}{\rho} \tag{3}$$

Introduction the above quantities in Eq. (1) and (2) and suppressing the primes, one obtains

$$\mu u_{j,kk} + (\lambda + \mu) u_{k,kj} = \eta \theta_{,j} + \rho C^2 \ddot{u}_j \tag{4}$$

$$\theta_{,ii} - \dot{\theta} + m\ddot{\theta} = \beta(u_{\kappa,\kappa} + m\ddot{u}_{\kappa,\kappa}) \tag{4}$$

$$\sigma_{ij} = E\,\varepsilon_{ij} - E\alpha(\theta - \mathrm{T}_0) \tag{5}$$

where

$$\beta = \frac{(3\lambda + 2\mu)\alpha}{C_v} \ , \ m = \frac{T\,C^2 C_v}{\kappa} \ , \ \text{and} \ \ \eta = T_0(3\lambda + 2\mu)\alpha$$

From Eq. (4) and Eq. (5), one deduces the one-dimensional equations as follows

$$(\lambda + 2\mu)\frac{\partial^2 u}{\partial x^2} - \eta \frac{\partial \theta}{\partial x} = \rho C^2 \frac{\partial^2 u}{\partial t^2} \tag{6}$$

$$\frac{\partial^2 \theta}{\partial x^2} - \beta \frac{\partial^2 u}{\partial t\,\partial x} - \beta m \frac{\partial^3 u}{\partial t^2\,\partial x} - m\frac{\partial^2 \theta}{\partial t^2} = \frac{\partial \theta}{\partial t} \tag{7}$$

$$\sigma_x = E\,\varepsilon_x - E\alpha(\theta - \mathrm{T}_0) \tag{7a}$$

In this paper, the general case of wave prorogation in thermoelastic couple half-space is considered, the boundary conditions are expressed as

$$\left.\frac{\partial u}{\partial x}\right|_{x=0} = \exp[-\alpha t] \ , \tag{8}$$

$$\theta(x,t)\big|_{x=0} = 0 \ , \tag{9}$$

$$\sigma_x\big|_{x=0} = 0, \tag{9a}$$

3. Solution to the heat conduction equation

Define Laplace Transform as follows

$$\bar{u}(x,s) = \int_0^\infty u(x,t)\exp[-st]dt \tag{10}$$

$$\bar{\theta}(x,s) = \int_0^\infty \theta(x,t)\exp[-st]dt \tag{11}$$

Taking Laplace Transform of Eq. (6) and Eq. (7), one obtains the resulting equations in the form

$$\frac{\partial^2 \bar{u}}{\partial x^2} = \frac{\rho C^2 s^2}{\lambda + 2\mu}\bar{u} + \frac{\eta}{\lambda + 2\mu}\frac{d\bar{\theta}}{dx} \tag{12}$$

$$\frac{\partial^2 \theta}{\partial x^2} = s(1 + ms)\bar{\theta} + \beta s(1 + ms)\frac{d\bar{u}}{dx} \tag{13}$$

One can write Eq. (12) and Eq. (13) as

$$\frac{d\bar{u}(x,s)}{dx} = \bar{u}', \quad \frac{d\bar{\theta}(x,s)}{dx} = \bar{\theta}', \tag{14}$$

$$\frac{d^2\bar{u}(x,s)}{dx^2} = A\bar{u} + B\bar{\theta}', \quad \frac{d^2\bar{\theta}(x,s)}{dx^2} = C\bar{\theta} + D\bar{u}', \tag{15}$$

The homogeneous matrix form of Eq. (14) and Eq. (15) is expressed as

$$\frac{d}{dx}\begin{bmatrix} \bar{u}(x,s) \\ \bar{\theta}(x,s) \\ \bar{u}'(x,s) \\ \bar{\theta}'(x,s) \end{bmatrix} = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ A & 0 & 0 & B \\ 0 & C & D & 0 \end{bmatrix}\begin{bmatrix} \bar{u} \\ \bar{\theta} \\ \bar{u}' \\ \bar{\theta}' \end{bmatrix} \tag{16}$$

where the prime indicates differentiation w.r.to x and

$$A = \frac{\rho C^2 s^2}{\lambda + 2\mu}, \quad B = \frac{\eta}{\lambda + 2\mu}, \quad C = s(1 + ms), \quad D = \beta Q \tag{17}$$

One can write Eq. (16) as

$$\frac{\partial \upsilon(x,s)}{\partial x} = Q(s)\upsilon(x,s) \tag{18}$$

Substituting $\upsilon(x,s) = \chi(s)\exp[\gamma x]$ in Eq. (18), one obtains

$$\frac{\partial \chi(s)}{\partial x}\exp[\gamma x] = Q(s)\chi(s)\exp[\gamma x] \tag{19}$$

$$Q\chi = \gamma\chi,$$

where γ is a scalar.

Thus, one obtains the eigenvalue problem

$$\chi(s)\exp[\gamma x] = Q(s)\chi(s)\exp[\gamma x] \tag{20}$$

Here $Q\chi = \gamma\chi$, where γ is the eigenvalue and χ is the corresponding eigenvector of Q.

The characteristic equation corresponding to the matrix Q can be written as

$$|Q - \gamma I| = \begin{bmatrix} -\gamma & 0 & 1 & 0 \\ 0 & -\gamma & 0 & 1 \\ A & 0 & -\gamma & B \\ 0 & C & D & -\gamma \end{bmatrix} = 0 \tag{21}$$

$$\text{i.e } \gamma^4 - \gamma^2(A + BD + C) + AC = 0 \tag{22}$$

The eigenvector χ corresponding to the eigenvalue γ can be calculated from $|Q - \gamma I|\chi = 0$

$$\text{i.e. } \begin{bmatrix} -\gamma & 0 & 1 & 0 \\ 0 & -\gamma & 0 & 1 \\ A & 0 & -\gamma & B \\ 0 & C & D & -\gamma \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} \tag{23}$$

$$\text{i.e.} \quad \left.\begin{aligned} -\gamma x_1 + 0x_2 + x_3 + 0x_4 &= 0 \\ 0x_1 - \gamma x_2 + 0x_3 + x_4 &= 0 \\ A x_1 + 0x_2 - \gamma x_3 + B x_4 &= 0 \\ 0x_1 + C x_2 + D x_3 - \gamma x_4 &= 0 \end{aligned}\right\} \qquad (24)$$

Solving Eq. (24) by Cramer's rule, one obtains

$$\chi = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} (C-\gamma^2)/\gamma \\ -D \\ C-\gamma^2 \\ -D\gamma \end{bmatrix} \qquad (25)$$

Eq. (22) is quadratic in γ whose roots are

$$\gamma = \pm\gamma_1 \, , \pm\gamma_2 \qquad (26)$$

$$\gamma_1 = \left[\frac{(A+BD+C)+\sqrt{(A+BD+C)^2-4CA}}{2}\right]^{1/2} \qquad (27)$$

$$\gamma_2 = \left[\frac{(A+BD+C)-\sqrt{(A+BD+C)^2-4CA}}{2}\right]^{1/2} \qquad (28)$$

Hence the matrix of eigen vectors $\chi(s)$ is

$$\chi = \begin{bmatrix} (C-\gamma_1^2)/\gamma_1 & (C-\gamma_2^2)/\gamma_2 & (C-\gamma_1^2)/-\gamma_1 & (C-\gamma_2^2)/-\gamma_2 \\ -D & -D & -D & -D \\ C-\gamma_1^2 & C-\gamma_2^2 & C-\gamma_1^2 & C-\gamma_2^2 \\ -D\gamma_1 & -D\gamma_2 & D\gamma_1 & -D\gamma_2 \end{bmatrix} \qquad (29)$$

and the solution of Eq. (18) is given by

$$\upsilon(x,s) = \chi(s)Y \qquad (30)$$

where

$$Y = \begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \end{bmatrix} = \begin{bmatrix} C_1 & \exp[\gamma_1 x] \\ C_2 & \exp[-\gamma_1 x] \\ C_3 & \exp[\gamma_2 x] \\ C_4 & \exp[-\gamma_2 x] \end{bmatrix} \qquad (31)$$

Substituting Eq. (29) and Eq. (31) into the Eq. (30), one obtains

$$\begin{bmatrix} \bar{u}(x,s) \\ \bar{\theta}(x,s) \\ \bar{u}'(x,s) \\ \bar{\theta}'(x,s) \end{bmatrix} = \begin{bmatrix} (C-\gamma_1^2)/\gamma_1 & (C-\gamma_2^2)/\gamma_2 & (C-\gamma_1^2)/-\gamma_1 & (C-\gamma_2^2)/-\gamma_2 \\ -D & -D & -D & -D \\ C-\gamma_1^2 & C-\gamma_2^2 & C-\gamma_1^2 & C-\gamma_2^2 \\ -D\gamma_1 & -D\gamma_2 & D\gamma_1 & -D\gamma_2 \end{bmatrix} \begin{bmatrix} C_1 & \exp[\gamma_1 x] \\ C_2 & \exp[-\gamma_1 x] \\ C_3 & \exp[\gamma_2 x] \\ C_4 & \exp[-\gamma_2 x] \end{bmatrix} \qquad (32)$$

Applying the physical condition of the problem as in Eq. (6) and Eq. (7), the solution of equation Eq. (18) can be written as

$$\bar{u}(x,s) = C_2[(C-\gamma_1^2)/\gamma_1]\exp[-\gamma_1 x] + C_4[(C-\gamma_2^2)/\gamma_2]\exp[-\gamma_2 x] \qquad (33)$$

$$\bar{\theta}(x,s) = -D\{C_2\exp[-\gamma_1 x] + C_4\exp[-\gamma_2 x]\} \qquad (34)$$

Applying Laplace Transform to Eq. (8) and Eq. (9), one obtains

$$\frac{\partial \bar{u}}{\partial x} = \frac{1}{s+\alpha} \tag{35}$$

$$\bar{\theta}(x,s) = 0 \tag{36}$$

Applying transformed boundary conditions Eq. (35) and Eq. (36) into the Eq. (33) and Eq. (34), one obtains

$$\bar{u}(x,s) = -\left\{ \frac{1}{(s+\alpha)\left(\gamma_1^2 - \gamma_2^2\right)} [(C-\gamma_1^2)/\gamma_1] \exp[-\gamma_1 x] + \frac{1}{(s+\alpha)\left(\gamma_2^2 - \gamma_1^2\right)} [(C-\gamma_2^2)/\gamma_2] \exp[-\gamma_2 x] \right\} \tag{37}$$

$$\bar{\theta}(x,s) = -D\left\{ \frac{1}{(s+\alpha)\left(\gamma_1^2 - \gamma_2^2\right)} \exp[-\gamma_1 x] + \frac{1}{(s+\alpha)\left(\gamma_2^2 - \gamma_1^2\right)} \exp[-\gamma_2 x] \right\} \tag{38}$$

Substituting the value of A, B, C, D, γ_1 and γ_2 from Eq. (17), Eq. (27) and Eq. (28) into the Eq. (37) and Eq. (38), and inverting by Laplace Transform for large value of s (i.e. small value of time t), one obtains

$$u(x,t) = \frac{1}{V_1 V_3}\left[\frac{(t-V_1 x)^2}{2} + (m-V_1)^2 (t-V_1 x) \right] - \frac{1}{V_2 V_3}\left[\frac{(t-V_2 x)^2}{2} + (m-V_2)^2 (t-V_2 x) \right] \tag{39}$$

$$\theta(x,t) = \frac{\beta}{V_3}\left[(t-V_1 x) + mu(t-V_1 x) - (t-V_2 x) \right] - mu\ (t-V_2 x) \tag{40}$$

where,

$$V_1 = \left\{ \frac{[1+(1+B\beta)m] + \sqrt{1+m^2(1+2B\beta)+2m(B\beta-1)}}{2} \right\}^{1/2} \tag{41}$$

$$V_2 = \left\{ \frac{[1+(1+B\beta)m] - \sqrt{1+m^2(1+2B\beta)+2m(B\beta-1)}}{2} \right\}^{1/2} \tag{42}$$

$$V_3 = \sqrt{1+m^2(1+2B\beta)+2m(B\beta-1)} \tag{43}$$

4. Numerical Results, Discussion and Remarks

For the interests of simplicity of calculation, we introduce the following dimensionless values

$$C_V = 383.1, \quad \tau = 10^{-14}, \quad K = 386, \lambda = 9.5\times 10^{10},$$

$$\mu = 4.5\times 10^{10}, \alpha = 17\times 10^{-6}, p = 8954$$

One obtains the expressions for the temperature, displacement respectively for our numerical discussion

corresponding graphs are plotted as follows

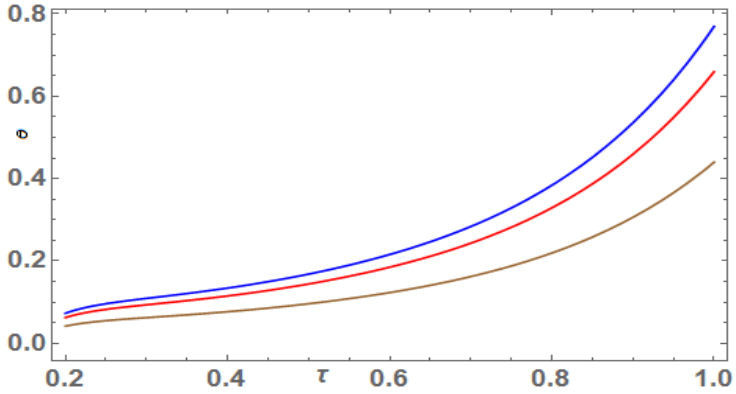

Fig. 2 (b): Temperature distribution along time form not equal to zero

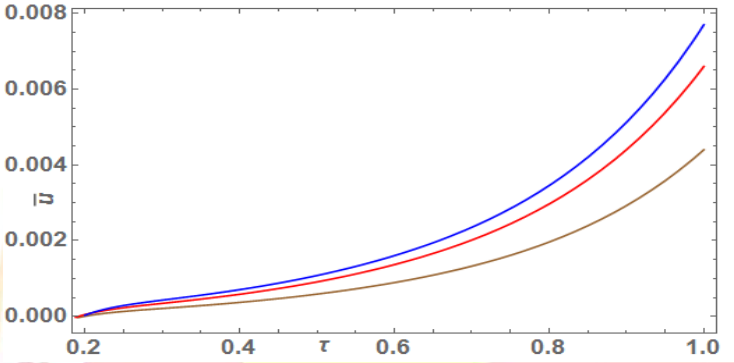

Fig. 2 (b): Temperature distribution along time for m=0

Conclusion

From this study of a transient problem of generalised thermoelasticity in an isotropic homogeneous elastic infinite rod, it is clear that the effect of thermoelastic parameter 'm' for the generalised coupled thermoelasticity of a single parameter as expected is not much pronounced in the displacement and temperature fields. The temperature field has a small oscillatory character about the time axis, while the displacement field decreases as time increases.

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An analysis for thermal stresses in a thin elliptic annulus plate with elastic supports on the curved surfaces

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Abstract

In this study, integral operational methods are used to investigate the thermally induced transverse vibration of a thin elliptic annulus plate with elastic supports at both radial boundaries. The axisymmetric temperature distribution is determined by the heat conduction differential equation and its corresponding boundary conditions by employing a unified integral transform technique by use of Mathieu functions and modified Mathieu functions. The solution of thermally induced vibration of the plate with both ends encased with elastic supports is obtained by employing an integral transform for double Laplace differential equation. The thermal moment is derivedon the basis of temperature distribution, and its stresses are derived based on resultant bending moments per unit width. The numerical calculations of the distributions of the transient temperature and its associated stress distributions are shown in the figures.

Keywords: Thermoelastic vibrations, elliptic annulus plate, elastic supports, heat conduction, thermal stresses, integral transform

1. Introduction

The thermoelastic vibration analysis is necessitated in many engineeringsscience applications such as design and computation of structures and mechanical devices, maintenance or predictions of breakdown. These reasons make the study of thermoelastic vibrations in structures and the control of their behaviour under dynamic loads an interesting study.

A short history of the research investigations associated with the thermoelastic vibrations insights using various operational and approximate methods like the Ritz energy method, Galerkin's method, finite element models and perturbation theory are reviewed that is used to solve the system.For example, Chen et al. [1] introduced three displacement functions to decompose three displacement components so that the three-dimensional equations of motion of a transversely isotropic body are uncoupled. Further expanding these functions in terms of orthogonal series, the equations of free vibration problem of a transversely isotropic cylindrical shell with ends simply supported are simplified to be readily dealtwith. Sato [2, 3] obtained solutions for composite elliptical membrane consisting of confocal elliptical parts under certain conditions during free as well as forced vibration analysis. Hutchinson and El-Azhari [4] use exact series solutions to the exact governing equations and present highly accurate resonance frequencies of stress-free cylinders on the basis of the linear three-dimensional theory of elasticity. Very recently, Bhad et al. [5, 6] and Dhakate [7]determined the thermally induced transverse vibration of a uniform thin elliptical object using few new integral transform methods. The aim of this work is to determine the thermal bending stresses using the exact formal solution of the partial differential equation prevailing the transverse vibration in terms of Mathieu functions and modified Mathieu functions. During problem formulation, we have initially solved heat conduction equation using the integral operation method. Secondly, we shall study the thermoelastic symmetrical vibration with elastic supported boundaries conditions using the theory of integral transform. Finally, the analytical solution for the thermal stress components is obtained based on resultant bending moments per unit width. The results presented here will be more useful in engineering problems particularly in vibrational analysis and in determining the state of strain in elliptical disk constituting foundations for reactors, pressure vessels, furnaces, etc.

2. Formulation of the problem

It is assumed that a thin elliptical annulus plate is occupying the space $D:\{(\xi,\eta,z)\in R^3 : a<\xi<b,\ 0<\eta<2\pi,\ 0<z<\lambda\}$ under transient temperature state having internal heat source within it, while supports at the boundaries as non-rigid. The geometry of the elliptical annulus plate indicates that an elliptic-cylindrical

coordinate system (ξ,η,z) is the most appropriate choices of the reference frame, which are related to the rectilinear coordinate system (x,y,z) by the relation $x=c\cosh\xi\cos\eta,\ y=c\sinh\xi\sin\eta,\ z=z$. The curves $\eta=$ constant represent a family of confocal hyperbolas while the curves $\xi=$ constant constitute a family of confocal ellipses. Both sets of curves intersect each other orthogonally at every point in space. The geometry parameters are given as $\xi\in[a,b],\ \eta\in[0,2\pi)$ and $z\in(0,\lambda)$.

2.1 Temperature distribution analysis

The heat conduction equation and boundary conditions are given as

$$\nabla^2\theta+\frac{\partial^2\theta}{\partial z^2}+\frac{Q(\xi,\eta,t)}{\lambda}=\frac{1}{\kappa}\frac{\partial\theta}{\partial t} \qquad (1)$$

in which $\theta(\xi,\eta,z,t)$ is temperature of the plate at point (ξ,η,z) at t time, ∇^2 denotes the two-dimensional Laplacian operator in elliptical coordinate, $Q(\xi,\eta,t)$ represents an energy generation term, $\kappa=\lambda/\rho C$ represents thermal diffusivity in which λ being the thermal conductivity of the material, ρ is the linear density, C is the specific heat of the material, assumed to be constant and the metric coefficient h is given as

$$h^{-2}=(c^2/2)(\cosh 2\xi-\cos 2\eta). \qquad (2)$$

The heat generation term is assumed in the form

$$Q(\xi,\eta,z,t)=Q_0\delta(\xi-a_0)\delta(\eta-2\pi)\delta(z-\lambda_0) \qquad (3)$$

in which Q_0 is typical value of the internal heat generation per unit time and per unit volume, $\delta(\ )$ is the Dirac delta function specifying the distribution of the internal het generation in which $\xi\neq a_0, a_0\in[a,b]$ and $z\neq\lambda_0$, $\lambda_0\in[0,\lambda]$.

The temperature distribution in the elliptical plate is obtained as a solution of the equation (1) with the following initial and boundary conditions

$$\left.\begin{aligned}&\theta(\xi,\eta,z,0)=0,\\&\theta(a,\eta,z,t)+k_1\frac{\partial\theta}{\partial\xi}(a,\eta,z,t)=0,\theta(b,\eta,z,t)+k_2\frac{\partial\theta}{\partial\xi}(b,\eta,z,t)=0,\\&\theta(\xi,\eta,0,t)=0,\theta(\xi,\eta,\lambda,t)=f(\xi,\eta,z,t)\end{aligned}\right\} \qquad (4)$$

with $f(\xi,\eta,z,t)$ as thesectional heat supply on the lower face, $k_i=k(T/\rho_i),\ i=1,2$ as the surface coefficients linearly related to the corresponding heat transfer coefficients which are supported by elastic supports [8, pp.1343] submerged in a non-viscous medium at the internal and external radial surfaces (i.e. $\xi=a$ and $\xi=b$),whereas T is the tension submitted to the upper face of plate, $\rho_i,\ i=1,2$ are the elastic constants of the supports given by the Hooke's law and they, in general, are different and k is the heat flux.

2.2 Thermal deflections formulation

During the formulation we assume few postulates that (i) the thickness of the elliptical annulus plate is small compared with the other dimensions of theplate, (ii) strain is nil at the middle surface of the plate, (iii) transverse shear and normal strains are neglected during investigation, (iv) shear stress is small compared to other stress, influence of shear and rotary inertia is neglected, and (v) finally the temperature distribution depends upon variable position and time. The differential equation for the transverse displacement in an elliptical annulus plate with small amplitude, in elliptic-cylindrical coordinate system and with the restriction that the transverse displacement on a point on the middle plane can be considered in two parts: the quasi-static solution $\omega_{st}(\xi,\eta,t)$, in which inertia effects and damping are disregarded, satisfying the equation

$$D\nabla^2\nabla^2\omega_{st}(\xi,\eta,t)=-\frac{M\theta(\xi,\eta,t)}{1-\upsilon} \qquad (5)$$

and the dynamic solution $\omega_d(\xi,\eta,t)$ satisfying the equation

$$D\nabla^2\nabla^2\omega_d(\xi,\eta,t)+\frac{1}{\alpha^2}\frac{\partial^2}{\partial t^2}\omega_d(\xi,\eta,t)+\frac{p(\xi,\eta,t)}{T}=-\frac{1}{\alpha^2}\frac{\partial^2}{\partial t^2}\omega_{st}(\xi,\eta,t) \qquad (6)$$

Now putting together both equations (5) and (6), yields the complete solution as

$$D\nabla^2\nabla^2\omega(\xi,\eta,t)+\frac{1}{\alpha^2}\frac{\partial^2}{\partial t^2}\omega(\xi,\eta,t)+\frac{p(\xi,\eta,t)}{T}=-\frac{M_\theta(\xi,\eta,t)}{1-\upsilon} \qquad (7)$$

in which $\omega(\xi,\eta,t)=\omega_d(\xi,\eta,t)+\omega_{st}(\xi,\eta,t)$ is the normal transverse deflection along the z-direction taking into account the effect of inertia, $\alpha^2=T/\rho\lambda$, $p(\xi,\eta,t)$ is the external pressure applied normally to the thin elliptical annulus plate, $D=E\lambda^2/[12(1-\upsilon^2)]$ is the modulus of rigidity of the annulus plate, E is the modulus of elasticity constant υ denotes the Poisson's ratio, and M_θ is the thermally induced resultant moment

$$M_\theta=\alpha E\int_0^\lambda z\,\theta(\xi,\eta,t)\,d\theta \qquad (8)$$

with α and E denoting coefficient of linear thermal expansion and Young's modulus of the material of the elliptical annulus plate, respectively. The Laplace operator in the elliptical coordinates has the form

$$\nabla^2=h^2(\partial/\partial\xi^2+\partial/\partial\eta^2) \qquad (9)$$

If we suppose that the boundaries of the thin annulus plate, $\xi=a$ and $\xi=b$, are supported by elastic supports [9, pp.1343] submerged in a non-viscous medium, then the boundary conditions, expressed in mathematical forms, as

$$\left.\begin{aligned}\omega(\xi,\eta,\lambda,t)+k_1\frac{\partial}{\partial\xi}\omega(\xi,\eta,\lambda,t)\Big|_{\xi=a}&=0,\\ \omega(\xi,\eta,\lambda,t)+k_2\frac{\partial}{\partial\xi}\omega(\xi,\eta,\lambda,t)\Big|_{\xi=b}&=0\end{aligned}\right\} \qquad (10)$$

and the initial conditions as

$$\omega(\xi,\eta,t)\big|_{t=0}=g_1(\xi,\eta),\ \ \omega(\xi,\eta,t)_{,t}\big|_{t=0}=g_2(\xi,\eta) \qquad (11)$$

2.3 Thermal bending stresses

The maximum normal stresses acting on those sections are parallel to ξz or ηz planes. Furthermore, the thermal stress components can be determined using small deflection and resultant moment as

$$\left.\begin{aligned}\sigma_{\xi\xi}&=\frac{6}{\lambda^2}\left\{Dh^2\left[\left(\frac{\partial^2\omega}{\partial\xi^2}+\upsilon\frac{\partial^2\omega}{\partial\eta^2}\right)-\frac{(1-\upsilon)\sinh 2\xi}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial\omega}{\partial\xi}+\frac{(1-\upsilon)\sin 2\eta}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial\omega}{\partial\eta}\right]+\frac{M_\theta}{1-\upsilon}\right\}\\ \sigma_{\eta\eta}&=\frac{6}{\lambda^2}\left\{Dh^2\left[\left(\upsilon\frac{\partial^2\omega}{\partial\xi^2}+\frac{\partial^2\omega}{\partial\eta^2}\right)+\frac{(1-\upsilon)\sinh 2\xi}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial\omega}{\partial\xi}-\frac{(1-\upsilon)\sin 2\eta}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial\omega}{\partial\eta}\right]+\frac{M_\theta}{1-\upsilon}\right\}\\ \sigma_{\xi\eta}&=\frac{6}{\lambda^2}\left\{Dh^2\left[\frac{\partial\omega}{\partial\xi}\sin 2\eta+\frac{\partial\omega}{\partial\eta}\sinh 2\xi-\frac{\partial^2\omega}{\partial\xi\partial\eta}(\cosh 2\xi-\cos 2\eta)\right]\right\}\end{aligned}\right. \qquad (12)$$

The equations (1)-(12) constitute the mathematical formulation of the problem under consideration.

3. Solution to the problem

3.1 Temperature distribution

In order to solve fundamental differential equation (1), firstly we introduce the here a finite transform (refer Appendix) over the variables (ξ,η) as

$$\bar{f}(\pm q_{2m}) = \int_a^b \int_0^{2\pi} S_{2m}(k_1,k_2,\xi,\pm q_{2m})\,(\cosh 2\xi - \cos 2\eta) \times ce_n(\eta,\pm q_{2m})\, f(\xi,\eta)\, d\xi\, d\eta \qquad (13)$$

In this way, we may define the inversion theorem of equation (13) in the form

$$f(\xi,\eta) = \sum_{m=0}^{\infty} \sum_{n=1}^{\infty} \bar{f}(\pm q_{2m}) S_{2m}(k_1,k_2,\xi,\pm q_{2m}) ce_n(\eta,\pm q_{2m}) / N_{2m,n} \qquad (14)$$

in which

$$N_{2m,n} = \pi \int_a^b S_{2m}^2(k_1,k_2,\xi,\pm q_{2m})(\cosh 2\xi - \Theta_n)\, d\xi$$

and

$$\Theta_n = \frac{1}{\pi}\int_0^{2\pi} \cos 2\eta\, ce_n^2(\eta, q_{2m})\, d\eta = A_0^{(n)} A_2^{(n)} + \sum_{r=0}^{\infty} A_{2r}^{(n)} A_{2r+2}^{(n)} \qquad [8, p.177]$$

The notations of the Mathieu functions used in this paper follow those adopted by McLachlan [8]. So, the symbols ce_n and Ce_{2m} denote the Mathieu and modified Mathieu functions of order n and m respectively. The prime $(')$ attached Ce_{2m} and ce_n represent the $\xi-$ and $\eta-$ derivatives respectively. The symbols $A^{(n)}$ is the Fourier coefficients of the Mathieu functions. On applying integral transform to the differential equation (13), and taking into account the boundary conditions (4), the differential equation (1) transformed into

$$\frac{\partial^2 \bar{\theta}}{\partial z^2} - \alpha_{2m}^2 \bar{\theta} + \frac{Q_0}{\lambda}\delta(z-\lambda_0)\exp[\alpha_{2m}^2(a_0 - 2\pi)] = \frac{1}{\kappa}\frac{\partial \bar{\theta}}{\partial t} \qquad (15)$$

with initial and boundary conditions

$$\left.\begin{aligned} &\bar{\theta}(q_{2m},\eta,z,0)\big|_{t=0} = 0 \\ &\bar{\theta}(q_{2m},\eta,0,t)\big|_{z=0} = 0, \bar{\theta}(q_{2m},\eta,\lambda,t)\big|_{z=\lambda} = \bar{f}(q_{2m},z,t) \end{aligned}\right\} \qquad (16)$$

in which $\alpha_{2m}^2 = 4q_{2m}/c^2$, $\bar{\theta}$ is the transformed function of θ respectively.

Applying Fourier sine transform to the eq. (16), using the boundary conditions (16), one yields,

$$\frac{\partial \bar{\bar{\theta}}}{\partial t} + \kappa\left(\alpha_{2m}^2 + \frac{\wp^2\pi^2}{\lambda^2}\right)\bar{\bar{\theta}} = \kappa\left(\frac{Q_0}{\lambda}\right)\sin\left(\frac{\wp\pi\lambda_0}{\lambda}\right)\exp[-\alpha_{2m}^2(a_0+2\pi)] + \kappa\left(\frac{\wp\pi}{\lambda}\right)[(-1)^{\wp+1}\,\bar{f}(q_{2m},\wp,t)] \qquad (17)$$

with initial condition as

$$\bar{\bar{\theta}}(q_{2m},\eta,z,0)\big|_{t=0} = 0 \qquad (18)$$

Applying Laplace transform to the equation (17) and taking into account the condition (18), the equation after mathematical simplification reduce to

$$\bar{\bar{\theta}}^*(q_{2m},\wp,s) = \left\{\frac{Q_0\kappa}{\lambda}\left[\sin\left(\frac{\wp\pi\lambda_0}{\lambda}\right)\exp[-\alpha_{2m}^2(a_0+2\pi)]\right] + \left(\frac{\kappa\wp\pi}{\lambda}\right)(-1)^{\wp+1} \times \bar{\bar{f}}(q_{2m},\wp,s)\right\} \Big/ \left[s + \kappa\left(\alpha_{2m}^2 + \frac{\wp^2\pi^2}{\lambda^2}\right)\right] \qquad (19)$$

Applying inverse Laplace transform on equation(19), one obtains

$$\bar{\bar{\theta}}(q_{2m},\wp,t)=\frac{Q_0\kappa}{\lambda}\exp[-\kappa(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})]\ \bar{g}(q_{2m},\wp)+(-1)^{\wp+1}\left(\frac{\kappa\wp\pi}{\lambda}\right)$$
$$\times\int_0^t \bar{f}(q_{2m},\wp,\tau)\exp[-\kappa(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})(t-\tau)]d\tau \quad (20)$$
$$\text{in which } \bar{g}(q_{2m},\wp)=\sin\left(\frac{\wp\pi\lambda_0}{\lambda}\right)\exp[-\alpha_{2m}^2(a_0+2\pi)].$$

Applying inversion theorem of the finite Fourier Sine transform on equation (20), one obtains,

$$\bar{\theta}(q_{2m},z,t)=\frac{2}{\lambda}\sum_{\wp=1}^{\infty}\left\{\frac{Q_0 k}{\lambda}\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})]\bar{g}(q_{2m},\wp)+(-1)^{\wp+1}\left(\frac{k\wp\pi}{\lambda}\right)\right.$$
$$\left.\times\int_0^t \bar{f}(q_{2m},\wp,\tau)\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})(t-\tau)]d\tau\right\}\sin\left(\frac{\wp\pi z}{\lambda}\right) \quad (21)$$

Applying inversion theorem of the transformed rules defined by equation(14) on equation(21), the temperature is obtained as,

$$\theta(\xi,\eta,z,t)=\frac{2}{\lambda}\sum_{m=0}^{\infty}\sum_{n=1}^{\infty}\sum_{\wp=1}^{\infty}\left\{\left(\frac{Q_0 k}{\lambda}\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})]\bar{g}(q_{2m},\wp)\right.\right.$$
$$\left.+(-1)^{\wp+1}\left(\frac{k\wp\pi}{\lambda}\right)\int_0^t \bar{f}(q_{2m},\wp,\tau)\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})(t-\tau)]d\tau\right) \quad (22)$$
$$\left.\times\sin\left(\frac{\wp\pi z}{\lambda}\right)S_{2m}(k_1,k_2,\xi,\pm q_{2m})ce_n(\eta,\pm q_{2m})/N_{2m,n}\right\}$$

The function is given in equation (22) represents the temperature at every instant and at all points of the elliptic annulus plate of finite height under conditions of radiation type on the surface.

3.2 Thermal deflections analysis

Substituting the equation (22) in equation (8), the thermally induced resultant moment is obtained as

$$M_\theta=\frac{2\lambda\alpha E}{\pi^2}\sum_{m=0}^{\infty}\sum_{n=1}^{\infty}\sum_{\wp=1}^{\infty}\left\{\left(\frac{Q_0 k}{\lambda}\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})]\bar{g}(q_{2m},\wp)\right.\right.$$
$$\left.+(-1)^{\wp+1}\left(\frac{k\wp\pi}{\lambda}\right)\int_0^t \bar{f}(q_{2m},\wp,\tau)\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})(t-\tau)]d\tau\right) \quad (23)$$
$$\left.\times\left(\frac{-\wp\pi\cos(\wp\pi)+\sin(\wp\pi)}{\wp^2}\right)S_{2m}(k_1,k_2,\xi,\pm q_{2m})ce_n(\eta,\pm q_{2m})/N_{2m,n}\right\}$$

In order to solve fourth order differential equation (7), using another integral transformation (refer Appendix) of order *m*and *n*over the variable ξ and η as

$$\bar{f}(q_{2m,n})=\int_a^b\int_0^{2\pi}(\cosh 2\xi-\cos 2\eta)\ Be_{2m}(k_1,k_2,\xi,q_{2m,n})$$
$$\times ce_{2m}(\eta,q_{2m,n})\,f(\xi,\eta)d\xi\,d\eta \quad (24)$$

The inversion theorem of (24) is

$$f(\xi,\eta)=\sum_{m=0}^{\infty}\sum_{n=1}^{\infty}\bar{f}(q_{2m,n})\zeta_{2m,n}(k_1,k_2,\xi,\eta,q_{2m,n})/C_{2m,n} \quad (25)$$

in which

$$\zeta_{2m,n}(k_1,k_2,\xi,\eta,q_{2m,n}) = \grave{B}e_{2m}(k_1,k_2,\xi,q_{2m,n})ce_{2m}(\eta,q_{2m,n})$$

and

$$C_{2m,n} = \pi\int_a^b(\cosh 2\xi - \Theta_{2m,n})\grave{B}e^2_{2m,n}(k_1,k_2,\xi,q_{2m,n})\,d\xi$$

On applying integral transform defined in equation (24) to the differential equation (7), and taking into account the boundary conditions (10), the differential equation transformed into

$$4Dq^2_{2m,n}\,\bar{\omega}(q_{2m,n},t) + \frac{1}{\alpha^2}\frac{\partial^2}{\partial t^2}\bar{\omega}(q_{2m,n},t) + \frac{\bar{p}(q_{2m,n},t)}{T} = \frac{\bar{F}(q_{2m,n},t)}{1-\upsilon} \qquad (26)$$

in which $F(\xi,\eta,t) = -\nabla^2 M_\theta$, $\bar{\omega}(q_{2m,n},t)$ and $\bar{F}(q_{2m,n},t)$ are the transformed function of $\omega(\xi,\eta,t)$ and $F(\xi,\eta,t)$ respectively.

Using Laplace transform on equation (26), the differential equation is reduces to

$$4Dq^2_{2m,n}\,\bar{\bar{\omega}}(q_{2m,n},s) + \frac{1}{\alpha^2}s^2\bar{\bar{\omega}}(q_{2m,n},s) + \frac{\bar{\bar{p}}(q_{2m,n},s)}{T} = \frac{\bar{\bar{F}}(q_{2m,n},s)}{1-\upsilon} \qquad (27)$$

in which $\bar{\bar{\omega}}(q_{2m,n},t)$ and $\bar{\bar{F}}(q_{2m,n},t)$ are the transformed function of $\bar{\omega}(q_{2m,n},t)$ and $\bar{F}(q_{2m,n},t)$ respectively.

Using the inverse Laplace theorem and the inverse theorem defined in equation (25), one obtains,

$$\begin{aligned}\omega(\xi,\eta,t) = \sum_{m=0}^{\infty}\sum_{n=1}^{\infty}\frac{\zeta_{2m,n}(k_1,k_2,\xi,\eta,q_{2m,n})}{C_{2m,n}}\Bigg\{\, & g_1(\xi,\eta)\\ & \times\cos(2q_{2m,n}\alpha\sqrt{D}) + \frac{g_2(\xi,\eta)}{2q_{2m,n}\alpha\sqrt{D}}\sin\left(2q_{2m,n}\alpha\sqrt{D}\right)t \qquad (28)\\ & + \frac{\alpha}{2q_{2m,n}\sqrt{D}}\int_0^t\left(\frac{\bar{F}(q_{2m,n},\tau)}{1-\upsilon} - \frac{\bar{p}(q_{2m,n},\tau)}{T}\right)\\ & \times\sin\left(2\alpha\sqrt{D}\,q_{2m,n}\right)(t-\tau)\,d\tau\Bigg\}\end{aligned}$$

The resulting equation of stresses can be obtained by substituting Eqs. (23) and (28).

4. Numerical Results, Discussion and Remarks

For the sake of simplicity of calculation, we introduce the following dimensionless values

$$\left.\begin{aligned}&\bar{\xi} = \xi/b,\ \bar{z} = [z-(-\lambda/2)]/b,\ e = c/b,\ \tau = \kappa t/b^2,\\ &\bar{\theta} = \theta/\theta_0,\ \bar{h}^2 = h^2b^2,\ \bar{\omega} = \omega/\alpha\theta_0 b,\\ &\bar{M}_\theta = M_\theta/Eb^3, \bar{\sigma}_{ij} = \sigma_{ij}/E\alpha\theta_0\ \ (i,j=\xi,\eta)\end{aligned}\right\} \qquad (29)$$

The mathematical computations have been carried out for Aluminum (pure) elliptic annulus plate with the thermo-mechanical properties are considered as modulus of elasticity E = 70 GPa, Poisson's ratio υ = 0.35, thermal expansion coefficient α = 23×10^{-6} /0C, thermal diffusivity κ = 84.18×10^{-6} m^2 /s^{-1}, density ϱ = 2712 kg/m^3 and thermal conductivity λ = 204.2 Wm^{-1} K^{-1}. The q_{2m} = 0.0989, 0.3987, 0.889, 1.5792, 2.4694, 3.5550, 4.8861, 6.3467, 7.9993, 9.8696, 11.9523, 14.2322, 16.6792, 19.0234, 21.2164, 23.6036, 25.0374, 27.7169, 29.2712, 31.0449are the positive and real roots of the $Ce_{2m}(\xi_o,q)Fey'_{2m}(\xi_i,q) - Fey_{2m}(\xi_o,q)Ce'_{2m}(\xi_i,q) = 0$. The physical parameter as $\bar{a}$ = 0.3 m, $\bar{b}$ = 1 m, $\bar{\lambda}$ = 0.05 m, and reference temperature θ_0 as 150^{0}C. For numerical thermoelastic analysis, we have considered various values of time as $\tau\,(<\tau_0 = 2,$ a fixed value). In order to examine the influence of heating on the plate, the numerical calculations

were performed for all the variables and numerical calculations are depicted in the following figures with the help of MATHEMATICA software.

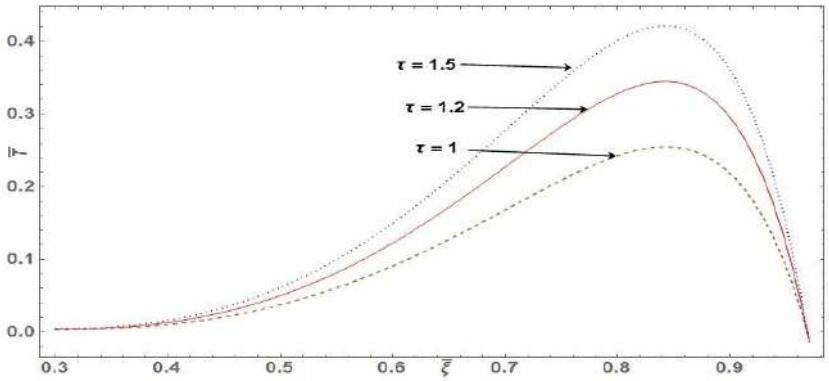

Fig. 1(a): Temperature distribution along radial direction for different values τ.

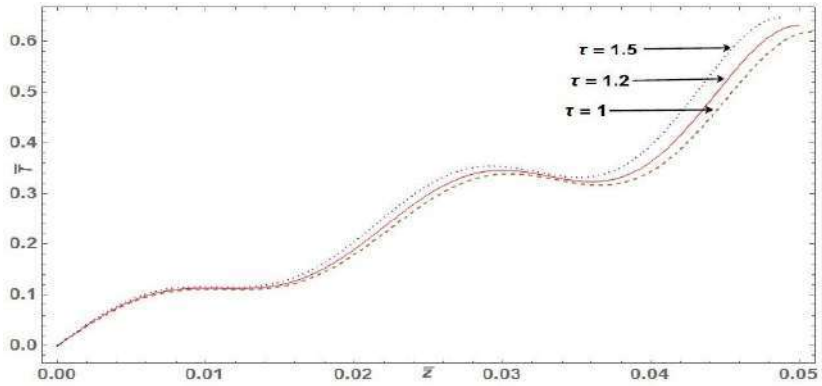

Fig. 1(b): Temperature distribution along $\bar{z}$ - direction for different values τ.

Figs. 1–3 illustrates the numerical results of temperature distribution, thermal deflection and stresses on elliptic annulus plate. As shown in Fig. 1(a), the temperature increases as the time proceeds along radial direction and is greatest at the other edge of the plate due to the combined energy of internal heat generation and known temperature. Fig. 1(b) shows that the temperature distribution along the $\bar{z}$ -direction for different values of time τ , which is maximum towards outer edge due to energized heat supply.

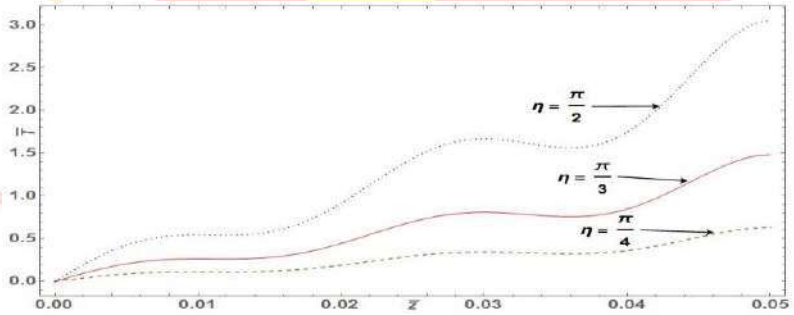

Fig. 1(c): Temperature distribution along $\bar{z}$ - direction for different values η.

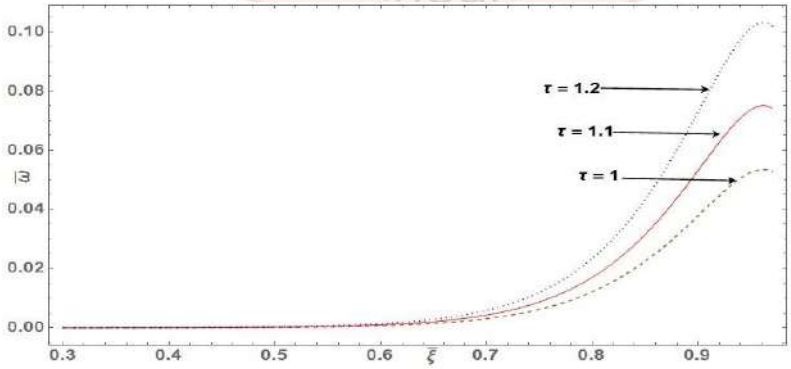

Fig. 2(a): Thermal deflection along radial direction for different τ.

Fig. 1(c) depicts that the temperature distribution along $\bar{z}$ -direction for different values of η attains maximum expansion at its outer core. There is an increment in the rate of heat propagation with thickness which leads to compressive force in the inner part and expands more on the outer surface whenever graph were plotted for temperature distributions, stress functions and deflection.Figs. 2(a) and 2(b) illustrates that the thermal deflection distribution over plate with elastic supported edges. Fig. 2(a) shows that the changes of thermal deflection along ξ-direction for different time parameter. The deflection is highest at the other edge of the plate due to the combined effect of internal and external supplied energy.

Fig. 3(a)-3(c) shows the variation of thermal radial stress $\sigma_{\xi\xi}$, tangential stress $\sigma_{\eta\eta}$ and shear stress $\sigma_{\xi\eta}$ along radial direction for different time parameter τ. From Fig. 3(a), the large compressive stress occurs at the inner edge while the tensile stress occurs at the outer edge which drops along the radial direction.

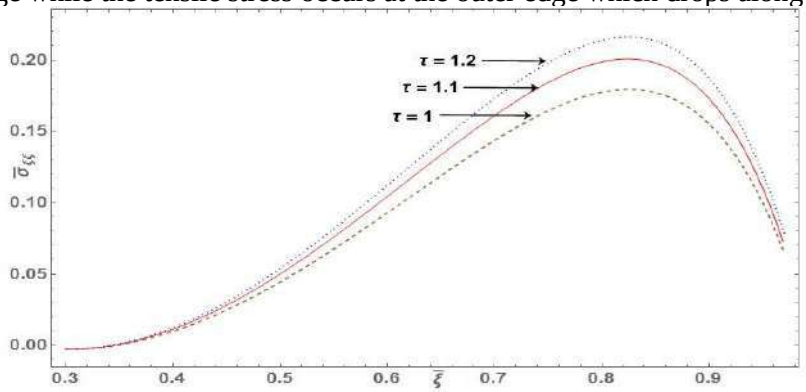

Fig. 3(a): Radial stress $\bar{\sigma}_{\xi\xi}$ along radial direction for different τ.

Fig. 3(b)-3(c) illustrates the thermal radial stress $\sigma_{\xi\xi}$, shear stress $\sigma_{\xi\eta}$ along angular direction for different values of $\bar{\xi}$. it is evident from the fig. 3(d) that at the early stage, radial stress increases gradually and maximum radial stress occurs at the mid-core and suddenly attains minimum value. The similar curve nature was observed for the angular stress along angular direction for different values of $\bar{\xi}$ and has been omitted here for the sake of brevity. It is observed from fig. 3(e) that shear stress has large influence of negative forces at the mid core for η- direction.

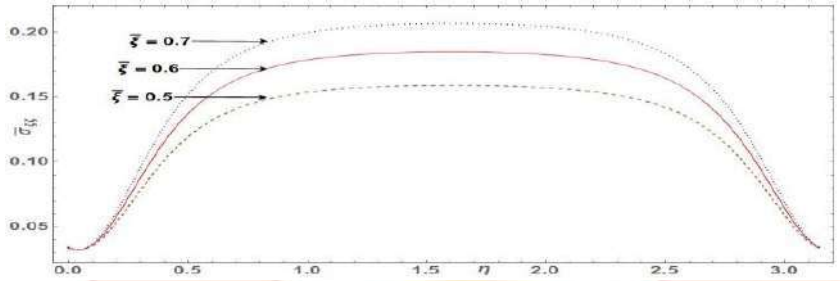

Fig. 3(b): Radial stress $\bar{\sigma}_{\xi\xi}$ along angular direction for different $\bar{\xi}$.

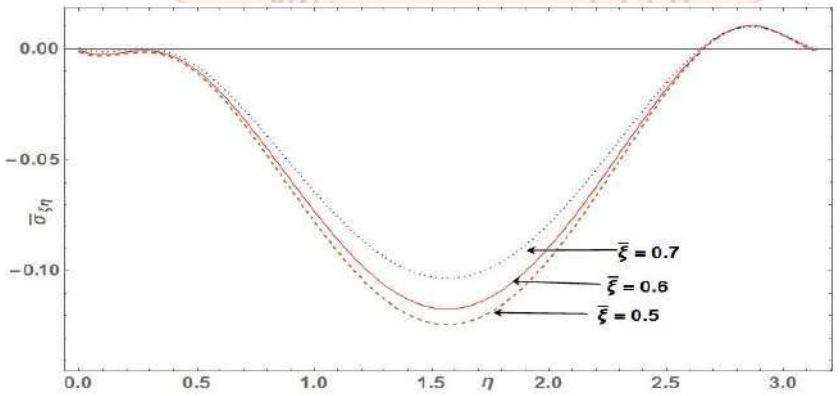

Fig. 3(c): Shear stress $\bar{\sigma}_{\xi\eta}$ along angular direction for different $\bar{\xi}$.

5. Conclusion

In this article, we have described the theoretical treatment of dynamic thermally induced vibration with its deflection and its associated stresses. The analytical technique proposed here is relatively simple and widely applicable compared to the methods proposed by other researchers. The results obtained while carrying research are described as follows

- The maximum tensile stress shifting from the outer surface due to maximum expansion of an outer part of the plate, its absolute value increases with the radius. This could be due to heat, stress, concentration or available internal heat sources under known temperature field.
- The value of radial stress $\bar{\sigma}_{\xi\xi}$ shows discontinuity at the boundaries whereas plateau type curve at the middle part along angular direction.

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Knowledge and Attitude of Health Care Professionals Regarding Placental Stem therapy

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Abstract

Background: The notion of stem cells is a developing concept. Stem cells are undifferentiated cells, capable of self-regeneration and differentiation into specific lineage cells. Self-regeneration can be maintained along many generations, increasing the number of cells.1 Aim: The present study aims to assess the knowledge and attitude of health care professionals regarding placental stem cell therapy. , Objectives: 1. To assess the knowledge of health care professionals regarding placental stem cell therapy. 2. To assess the attitude of health care professionals regarding placental stem cell therapy. 3. To co-relate the knowledge and attitude with various demographic variables. Methods: A descriptive survey approach with Purposive sampling was used to select 150 health care professionals working NMCH, Nellore, Andhra pradesh. Results: Maximum no. of health care professionals (55.3%) had inadequate knowledge and most of them (98%) had positive attitude. Conclusion: The study concluded that, 55.33% of health care professionals had inadequate knowledge and 98% of health care professionals had positive attitude.

Key words: Knowledge, Attitude, Health Care Professionals, Placental Stem Cell therapy.

Introduction

The notion of stem cells is a developing concept. Stem cells are undifferentiated cells, capable of self-regeneration and differentiation into specific lineage cells. Self-regeneration can be maintained along many generations, increasing the number of cells. Umbilical Cord blood (UCB), which is also called "placental blood," is the blood that remains in the umbilical cord and placenta following birth and after the cord is cut. Umbilical cord blood could be considered as a rich source of stem cells.2

The Cord blood is one of the richest and non controversial sources of stem cells. Cord blood is the blood left in the umbilical cord and placenta after the birth of the child and is collected within 10-15 minutes after the cord has been cut off by simple venipuncture, in the umbilical vein followed by gravity drainage in to a sterile anti- coagulant filled blood collection.3

The placenta is one of the most important sources of stem cells, and has been studied extensively over the past period. The placenta fulfills two main desiderata of cell therapy: obtaining of an as high as possible number of cells and use of non-invasive methods for their harvesting. Stem cells in cord blood have exceptional properties that make them desirable, such as high proliferative potential, increased ability for self-renewal, and decreased ability for antigen presentation.4

Need For The Study

During the 1970's researcher discovered that umbilical cord blood could supply the same kind of hematopoietic stem cells as bone marrow donor. And so, umbilical cord blood banking began by collecting and storing umbilical cord blood. Cord blood stem cells are currently used in the treatment of several life-threatening diseases, and play an important role in the treatment of blood and immune system related genetic diseases, cancer and blood disorders.5

The first clinically documented use of cord blood stem cells was in the successful treatment of a six-year-old boy affected by Fanconi anemia in 1988. Since then, cord blood has become increasingly recognized as a source of stem cells that can be used in stem cell therapy.6

Rajeshwari C (2015) conducted a study on knowledge and attitude of health professionals regarding placental stem cell, preservation and utilization. The study concluded that 84% of health professionals had inadequate knowledge and 25% had neutral attitude.7

Perlow JH. (2018) conducted a study to determine the Knowledge on umbilical blood banking among 425 patients. The data were collected by using questionnaire. This revealed that 37% patients had no knowledge regarding umbilical cord blood banking, 2.6% patients had knowledge and 74% patients were minimally informed about umbilical cord blood banking only 14% patients were educated about umbilical cord blood banking by their

nurses, although 90% patients expected their obstetrician to answer their questions on umbilical cord blood banking. This study concluded that patients are poorly informed about umbilical cord blood banking and they are expecting information from the health care professionals.8

Though there are many benefits of cord blood these fascinating stem cells are continued to be discarded as a medical waste even today due to the lack of Knowledge and negative attitude caused by the high cost involved. It is the responsibility of the health professionals to create awareness about Cord Blood Banking and to motivate its utilization by general public to move towards this bio health insurance. 9

Problem Statement

A study to assess the knowledge and attitude of health care professionals regarding placental stem cell therapy at NMCH, Nellore, A.P.

Objectives of The Study

1. To assess the knowledge of health care professionals regarding placental stem cell therapy.
2. To assess the attitude of health care professionals regarding placental stem cell therapy.
3. To co-relate the knowledge and attitude with various demographic variables such as age, sex, work experience, educational status and designation.

Delimitations

The study is delimited to:

1. Health care professionals who are working at NMCH, Nellore, A.P
2. Who are willing to participate in the study.

Materials & Methods:

Research approach: Non-experimental descriptive approach
Research design: Descriptive cross-sectional research design
Setting: The present study was conducted in NMCH, Nellore, A.P
Sample: Health care professionals in NMCH, Nellore, A.P and who fulfilled the inclusion criteria were selected for the study.
Sampling technique: Purposive sampling technique
Sample size: The sample size of the study was 150 health care professionals.
Criteria for sample selection
Inclusion criteria:

- Health care professionals working in NMCH, Nellore, A.P.
- Health care professionals who are present during study period and are willing to participate during the study period.

Exclusion criteria:

- Health care professionals not working in NMCH, Nellore, A.P.

Description of the tool
The tool is divided into three parts.
Part I: This part of tool included demographic information of study subjects such as age, sex, work experience, educational status and designation.
Part II: This part consisted of 20 structured multiple choice questions to assess the knowledge of health care professionals regarding placental stem cell therapy.
Part- III: This part consisted of 12 statements concerning the attitude of health care professionals regarding placental stem cell therapy. The statements were developed for the respondents to respond on five points Likert's scale i.e. strongly agree, agree, uncertain, disagree and strongly disagree.

Results& Discussion:

Table-1: Frequency, Percentage distribution of health care professional's knowledge regarding placental stem cell therapy. (N=150)

Level of knowledge	Frequency (n)	Percentage (%)
Adequate (≥50%)	67	44.66
Inadequate(<50%)	83	55.33

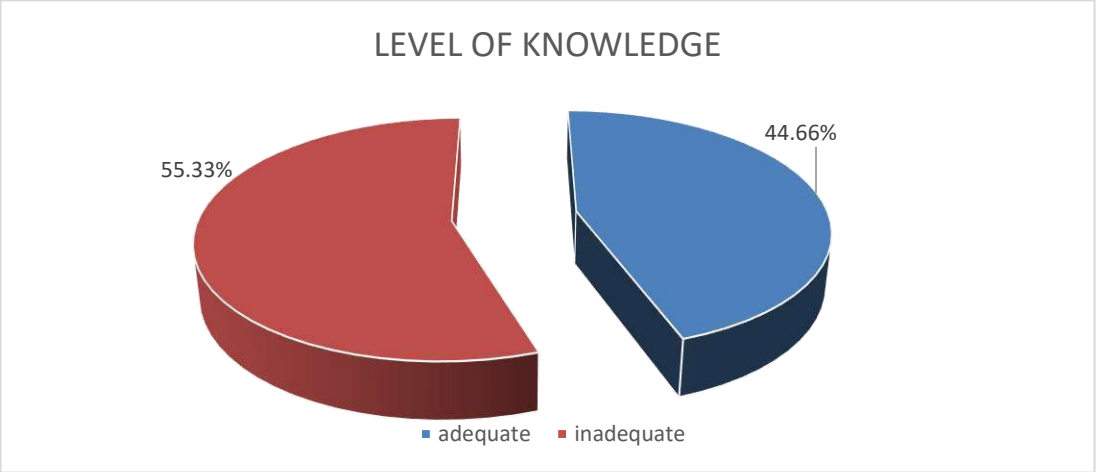

Fig-1: Frequency, Percentage distribution of health care professional's knowledge regarding placental stem cell therapy.

Table-2: Frequency, Percentage distribution of health care professional's attitude regarding placental stem cell therapy. (N=150)

Level of attitude	Attitude	
	Frequency (n)	**Percentage (%)**
Positive (≥50%)	147	**98**
Negative (<50%)	**3**	**2**

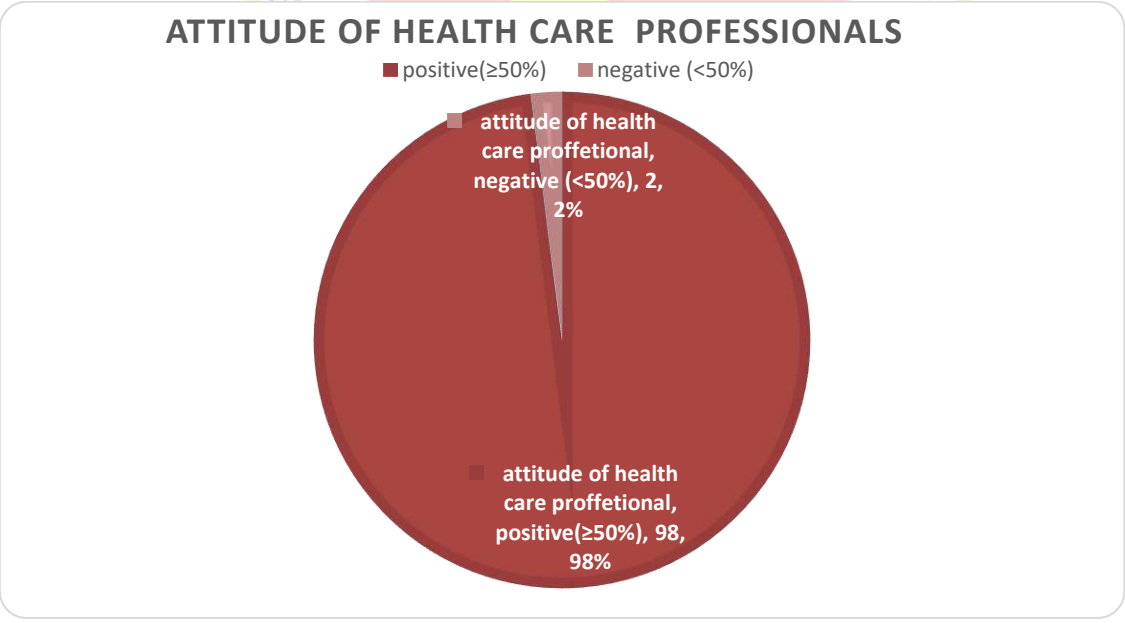

Fig-2: Frequency, Percentage distribution of health care professional's attitude regarding placental stem cell therapy.

Major Findings Of The Study

- The study shows that 44.66% of health care professionals were having adequate knowledge and 55.33% of health care professionals were having inadequate knowledge.
- Majority of health care professionals (98%) had positive attitude and only 2% of them had negative attitude regarding placental stem cell, cord blood banking and its utilization.
- The co-relation of attitude regarding placental stem cell, cord blood banking and its utilization according to age, sex, work experience, educational status and designation was found statistically non significant at ($p<0.05$) level.

Conclusion:

The study concluded that, 55% of health care professionals were having inadequate knowledge and 98% health care professionals had positive attitude regarding placental stem cell, cord blood banking and its utilization.

Recommendations

- On the basis of present findings it is recommended that a large sample should be studied in order to provide better picture of knowledge and attitude regarding stem cell, cord blood banking and its utilization.
- The study may be conducted at different community setting.
- The instrument used for assessing knowledge and attitude towards stem cell, cord blood banking and its utilization can further be developed and field tested for standardizing.
- There should be in- service workshop and seminar to enhance the health care professionals knowledge regarding stem cell, cord blood banking and its utilization.

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Review on Effect of EMS as a Chemical mutagen for improvement of Legume Cropsvarieties

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Abstract

Mutation is defined as any heritable changes in an individual's genome and phenotype. In the hands of plant breeders, mutation breeding is the most potent and effective weapon available. It has been used to improve morphological and physiological characters, disease resistance, draught resistance and quantitative characters including yielding ability.

It is a cheap and fast method of developing new improved varieties.Plant breeding aims to generate novel, high-yielding, and improved cultivars by examining genetic variability in important qualities. The chemical ethyl methane sulfonate (EMS) is routinely used to cause mutations at loci that control economically important features.

Keywords: *Mutation, Phenotype, breeding, cultivar, EMS.*

Introductions:

Hugo de Vries first time used the term "mutation" in 1901. Mutation is described as a change in the number or sequence of nucleotides that is permanent and relatively uncommon. The genetic improvement of crop plants for various economic characters through the use of induced mutations is referred to as mutation breeding.

Mutations have been induced using physical mutagens such as X-rays, Gamma rays, fast and thermal neutrons, heavy ion beams, and chemicals such as EMS, DES, and SA. As of now, 408 mutant varieties of food legume crops from 24 distinct crop species have been released for cultivation utilising mutation procedures around the world (Kharkwal et al., 2005).

There is immense scope to enhance mineral nutrient (biofortification) and essential amino acid contents of human food as well as animal feed along with altered protein and fatty acid profiles, physicochemical properties of starch, enhance phytonutrients in fruits and reduced antinutritional factors in staple food grains. Induced mutations could play a key role in inducing mutations in crop plants to improve nutritional quality. 776 mutant varieties have been recognised for their improved nutritional qualities among the globally developed 3,000 mutant types. (Jain et. al., 2011).

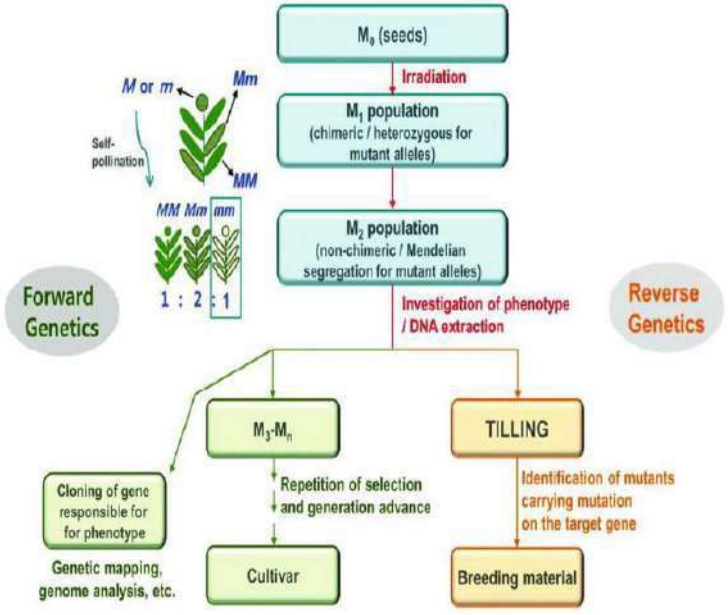

Fig.1. Mutation breeding integrated use with modern techniques.
Source: Directly taken from Jo and Kim, 2019.

Development of legume mutant varieties:

Physical or chemical mutagens can cause mutations. This is an excellent method for increasing genetic diversity for use in functional genomics and plant breeding. There have been 3,218 mutant varieties released around the world so far. Free exchange of mutant material and deployment in locations where farmers' needs are vital can maximise the use of mutant lines around the world.

Mutagenesis can be made more beneficial in the improvement of crop plants with the help of well-defined objectives in national research programmes, the availability of effective mutagenesis techniques, and efficient phenotype screening tools. Mutant identification/selection at the genotypic level, using new, high-throughput technologies, has changed the way mutations are now used in genetics and breeding.

Chemical mutagens are popular in in-vitro mutation induction, although irradiation can also be applied at low doses, EMS has become the mutagen of choice for developing mutant populations for high throughput screening such as in developing TILLING populations (Pathirana et. al. 2016)

As a result of sustained efforts through the use of physical and chemical mutagens, the IARI institute has made important contributions in understanding of induced mutagenesis(Kharkwal et al., 2004, 2005) and also achieved major success in developing eleven high yielding, disease resistant and agronomically suitable mutant varieties in several crops like chickpea,cow pea, field pea, pigeonpea and soybean(Kharkwal et al, 2004, Kharkwal et al., 2008).

Sagade (2008) used gamma rays, EMS, and MMS to achieve dramatic results in quantitative features in urdbean.

In Chickpea (Cicer arietinum L.) Var. Virat, the effect of Ethyl Methane Sulphonate (EMS) on seed germination and seeding injury was investigated. With rising EMS concentrations, the percentage of seeds germination reduced and seedling damage rose. Chickpea yield has not increased significantly in the last ten years. (Barshile et. al., 2006).

One of the reasons for chickpea's failure to achieve breakthrough productivity has been suggested to be a lack of genetic variety.Long pod mutants with greater diameter are a beneficial variant that can be used to boost seed yield by increasing the number of seeds per pod and seed size.

Long pod mutants with gamma rays, EMS, HZ, and SA in mungbean were identified by Sharma and Singh (1992) and Wani et al. (2011). while long pod mutants with EMS, gamma rays, and their combination in cluster bean were reported by Singh and Agarwal (1986) to have higher genetic variation and yield potential.

Four gigas mutant plant types were obtained from the M2 population of Chickpea cultivar Vijay; three from 300 Grey dosage and one from 0.2 percent EMS.All gigas exhibit a dominating phenotypic appearance, with 1.5 times the height of the control, an elongated, strong stem, and wider and broader leaflets than the control. The EMS gigas has fewer primary branches and larger, smooth leaves. One of the 300 Grey dose was sterile, while the other three contained flowers and pods. In comparison to the control, one gigas (EMS 0.2%) demonstrated 10 days of early flowering (Bogawar et. al. 2017).

Physical mutagen (gamma rays at 300 and 400 Gy doses) and chemical mutagen (ethyl-methane sulphonate 0.5 percent) treatments were used to mutagenize the seeds of three desi varieties of Chickpea released from Pantnagar. M1 generation showed gradual decrease in germination with increase in mutagen strength in addition to this, combination treatments caused more biological damage than individual mutagen treatment. Except for two agronomic traits, number of primary branches per plant and pod length, variation for variety demonstrated considerable differences in M2 generation..For eight traits, including yield per plant, all types of mutagenic treatments and variety treatment variance were significant (Dinkar et. al.,2020). Chickpea secondary branch number grew significantly in both the 300 Gy alone and the combination treatment with 0.5 EMS treatments. For several traits, the genotypic response was variable at different mutagenic levels.Although none of the genotypes outperformed the control for yield per plant at all of the treatment levels, one genotype, PG114, showed a substantial improvement in yield component trait pods per plant at 300 Gy + 0.5 percent EMS (Dinkar et. al.,2020).

M2 generation showed a complete positive trend of shift as a result of EMS treatment to mungbean, with lower and moderate doses of the mutagens increasing the mean number of seeds per pod and 100-seed weight, whereas M3 generation showed a complete positive trend of shift as a result of EMS treatment to mungbean. By increasing the quantity of seeds per pod and seed size, long pod and bold seeded mutants can be employed to increase yield potential The genotypic coefficient of variation, heritability, and genetic advancement in the treated population increased considerably for all of these variables, showing that mutagen-induced variability has a significant potential to improve the mungbean crop (Wani et. al. 2017).

When compared to gamma rays and combo therapies, EMS was found to be more successful at causing mutations. In this way, gamma rays were the least effective. The reaction to mutagenic efficacy was higher in the var. pusa-372 than in the var. Pusa-212 among the two Chickpea varieties (Wani 2009).

Conclusion:

From the above discussion regarding mutagens EMS (Ethyl Methane Sulphonate) is a effective chemical mutagen for the improvement of pulse crops like Chickpea, mungbean, urdbean etc. these improvement may be in the quantity or the quality of the crop.

The effect of EMS in the specified amount of dose is may be useful for the improvement of legume crops varieties and can be use as a best tool for mutational breeding to fulfil the food demand of country and having an economical value.

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Drinking Water Quality Analysis of Water Samples Collected From Manora Region, Dist. Washim

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ABSTRACT

For the drinking water quality analysis, the samples were collected from the different regions of Manora which includes Tap water, Tub well, and Well water for observation of Physico-chemical analysis. The in-vitro test of the collected water samples was performed for analysis of different parameters such as water temperature, pH, dissolved oxygen, total dissolved solids, Conductance, Chlorides, and Phosphates. The obtained data were compared with the standard unit given by BIS. The results of this study tell that physico-chemical parameters are within maximum permissible limit of WHO and BIS. Therefore, water is safe and suitable for domestic and drinking purposes after some treatment.

Keywords: Physico-chemical analysis, Manora region & Drinking water standards.

I. INTRODUCTION

The quality of Drinking water plays a very important role because it is directly related to human health [1, 2]. Today, the quality of water which we drinking is getting affected by the different activates of a human being. The availability of drinking water through surface and groundwater resources has become a very critical day-to-day life. Only 1% part is available on the land for drinking, domestic, agriculture, power generation, for industries and waste disposal [3].

Water sources are polluted by domestic wastage in rural areas whereas industrial wastage discharges into natural water sources in urban areas. Industrialization without provision of proper treatment of wastage and effluents as well as excessive applications of fertilizers and pesticides for agriculture purposes [4]. Due to the use of contaminated drinking water, the human population suffers from varied of water borne diseases. The increased use of metal based fertilizer in the agricultural revolution of the government could rise in the concentration of metal pollutants in the freshwater reservoirs due to water runoff [5].

The WHO suggests that 75% of all diseases in developing countries occur from polluted drinking water [6]. As a result, concerns about water quality are frequently the most critical factor in determining access to better water sources. Acceptable quality shows the safety of drinking water in terms of its physical, chemical, and bacteriological parameters [7]. International National and local agencies have established parameters to determine the biological and physicochemical quality of drinking water [8, 9].

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The present work was carried out in the Manora region to study the Drinking water quality. Manora is located in the Washim district of Maharashtra in the Amravati division. It is located between 20.2161°N & 77.5591oE coordinates.

II. METHODS AND MATERIAL

Water samples were collected in pre-cleaned polypropylene bottles with necessary precaution from different Loctions. Various physico-chemical parameters were analyses as given in standard manual of water and waste water analysis [10]. Selections of seven different stations were identified and water samples were collected at sites and assign as S1, S2, S3, S4, S5, S6, S7, S8, S9 and S10.

The main aim of the study was to investigate the physico-chemical characteristics of drinking water samples in Manora Region. Samples were collected from the sites in between 09:00 a.m. to 10:00 a.m. The sample for dissolved oxygen analysis was collected gently just below the water surface in a BOD bottle (250 ml) to avoid any air bubbles entering the bottle. The parameters like temperature, pH, dissolved oxygen, total solids, Conductance are analysed by using water analysis kit [11,12], Hardness is analysed as Calcium EDTA titration, Chloride by titration and Phosphate is analyzed by Calorimeter.

The reagents employed in this study were of the A.R./G.R. grade, and distilled water was utilised to make the various solutions. All reagents and calorimetric solution were produced and purified using a standard procedure for water analysis.

III. RESULTS AND DISCUSSION

The values of physico-chemicals parameters of Manora region are given in Table 1.

Temperature

Water temperature is one of the most important ecological factor which controls the physiological behavior of aquatic systems and hence the quality of water. In the present investigation, the water temperature ranged between 230C to 280C. The highest temperature of 280C was obtained at Site S6.

pH

It is nothing but the measure of the concentration of hydrogen ions, which provides the range of the acidity or alkalinity of a solution. In this study the pH ranges 7.2 to 8.2.

Table 1: Values of physico-chemicals parameters of Manora region.

Location	Temp.	PH.	DO	EC	TDS	TH	Chloride	Phosphate
S1	25.3	7.5	6.6	0.4	450	321.5	52.4	0.673
S2	26.3	7.64	6.3	0.4	479	423.8	47.8	0.993
S3	25.4	7.32	5.6	0.5	570	256.2	60.3	0.865
S4	25.5	7.23	5.7	0.3	367	254.3	29.5	0.785
S5	23.6	8.25	7.9	0.3	283	364.5	43.6	0.918
S6	28.7	7.63	6.2	0.2	423	470.4	62.4	0.341
S7	25.5	7.21	7.3	0.4	630	260.6	56.9	0.092
S8	25.6	7.57	8.2	0.5	439	180.6	32.6	0.862
S9	24.5	8.15	7.8	0.3	520	210.3	29.8	0.093
S10	24.7	7.35	6.9	0.3	630	287.2	39.5	0.742

Dissolved Oxygen (DO)

It is the amount of gaseous oxygen (O2) dissolved in the water. DO is very important parameter in concern with the water quality. It reflects the physical and biological present in the water. Oxygen enters the water by direct absorption from the atmosphere, by rapid movement, or as a waste product of plant photosynthesis. Water temperature and the volume of moving water can affect dissolved oxygen levels. Dissolved oxygen content indicates the health and ability of water body to purity itself through biochemical processes. During this study DO varies in the range of 5.6 to 8.2

Electrical Conductivity (EC)

EC is a measure of water's capability to pass electrical current. This ability is directly related to the concentration of ions in the water. The EC in present study for various samples is in the range of 0.3 to 0.5 M mhos.

Total dissolved soldis (TDS)

TDS refer to matter suspended and dissolved in water. Waters with high total solids generally are of poorer palatability and may induce an unfavorable physiological reaction in the transient consumer. In this study the TDS was found in the range of 367mg/L to 630 mg/L. The highest TDS was observed at site S7 & S10 which is 630 mg/L.

Total Hardness (TH)

The total Hardness of water is mainly due to the presence of Calcium and Magnesium ions which apart from Sulphate, Chloride and Nitrates are found in combination with carbonates and bicarbonates. In this study the total hardness were found to be 180.6 to 470.4 mg/L.

Chloride

The Chloride are found in partially in all natural waters. Chlorides are the most common inorganic ions present in the water. In this study the values for Chlorides are found in the range of 29.5 to 62.4 mg/L.

Phosphate

Phosphate leads to eutrophication which could also leads to unpleasant taste and odour of the water. The Phosphate content in the selected water sample were found in the range of 0.092 to 0.993 mg/L.

IV. CONCLUSION

By comparing the different values obtained in the present study with the permissible limits given by BIS and WHO, it can be conclude that most of the values are well within the permissible limits. The result of study reveals that the quality of drinking water is though fit for domestic as well as for drinking purpose after some treatment.

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Determination of Organochlorine Pesticides Residues From Water Samples Collected From Lower Pus Dam, Veni (M.S.)

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ABSTRACT

The contamination of organochlorine pesticides (OCPs) from the selected surface water of Lower Pus dam at Veni in Mahagaon Tahesil of Yavatmal District was investigated to estimate the current status of Organochlorine Pesticide residues in water. In this study water samples were collected from various locations of lower pus dam veni in two seasons during the year 2019. The Endosulfan, DDT & DDE were the most frequent detected compounds in the water. The concentration of the Endosulfan pesticides residue was found in the range of 0.03-0.04 µg/L, DDT in the range of 0.04-0.05 µg/L and DDE in the range of 0.01-0.02 µg/L. The Chlorodane and Heptachlore pesticide residues were found in very low concentration.

Key Words: Organochlorine , Pesticides, Lower pus dam.

I. INTRODUCTION

Pesticide is a general classification that includes insecticides, rodenticides, fungicides, herbicides and fumigants. Although pesticides may be selectively toxic to these forms of life, they may still be toxic to man if food contaminated by them is ingested[1]. Pesticides are known to be toxic to man[1]. People have contradictory ideas about the meaning of pesticides. The dictionary defines pesticide as a sub- stance for destroying harmful insects. The scientists are of the opinion that pesticides are chemical or biological substances that are designed to kill or retard the growth of pests interfering with the growth of crops, shrubs, trees, timber and other vegetation desired by humans. The term pesticide includes substances intended for use as plant growth regulators, defoliants, desiccants or agents for thinning fruit or preventing the premature fall of fruit[1]. The substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport also come under the category of pesticides [2]. Pesticides (herbicides, fungicides, insecticides) are widely used in the agriculture and industry around the world due to their high insecticidal activity. The presence of pesticide residues and metabolites in food, water and soil currently represents one of the major issues for environmental chemistry. Pesticides are, in fact, among the most important environmental pollutants because of their increasing use in agriculture[3].The toxicity of pesticides to target and non-target organisms generally depends on the amount present in the environment, the proportion available to the biota and

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ultimately in the amount actually encountered and absorbed by the organism[4]. Environmental distribution may lead to exposure of living organisms including man that are far removed from intended targets. Researchers have detected pesticides residues in heptachlor, endosulfane, Aldane, DDT and PCBs. Many of these pesticides have also been detected in sediment, aquatic plants and fish [5].

II. MATERIAL AND METHODS

Water samples were taken from 0.3 m below the surface with a pre-cleaned glass bottle. For sampling turbulent midstream position of water bodies were chosen to approximate mean concentration of river water. All foreign bodies were removed and the samples were stored in ice during transport and were kept at 4^0 C in the laboratory until the solid phase extraction.

III. SAMPLE EXTRACTION

The procedure applied for the extraction of pesticides was similar to those reported by Laabs *et al* [6] and Steinwandter [7]. Water samples were extracted using ultrasonic extraction. Sox let extraction was done with 20 ml of hexane: dichloromethane (3:1) for 30 min. The extract was concentrated with the aid of rotator evaporator. Pre-elution was carried out with the HPLC methanol. The concentration solvent extract was then analyzed for Pesticides. The solvent of the mobile phase of the HPLC is methanol and water (1:1). This was prepared by measuring 250ml of HPLC grade methanol into a 500ml flask and made up with 250ml of distilled water. The HPLC model CECIL 1010 was switched on. The wavelength of the system was determined by using UV visible equipment. Little quantity of stock solution was diluted with methanol and its wavelength determined nu scanning. A peak of 202nm was reached. The system wavelength was then set at 202nm and the sensitivity of the 0.05 nm of the UV detector component set. The flow rate was set at 1ml/min, afterwards, the purging of the system commenced by allowing the system to run for some time. The purging was carried out through a washing solution of 30% methanol, 70% water. Bubbling helium gas into the solution carried out degassing of the mobile phase was then set up and connected with HPLC system and allowed to run through the system of 20min. Each sample residues was dissolved in 1ml methanol. The extracted residues were the loaded and injected into the valve of the chromatography system. The resulting chromatograph for each sample was printed out. The various retentions time noted, concentration determined and recorded.

IV. RESULT AND DISCUSSION

Lower Pus dam is located at Veni in Mahagaon Tehasil, of Yavatmal district in Maharashtra state of India. This dam is totally surrounded by farm land. Farmer's of this region uses different fertilizers as well as pesticides to control the growth and population of pest for the well growth of crops which is very useful source of their economy and food. These pesticides can enter the reservoir through running waters and subterranean canals. These factors may lead to the contamination of this dam.

During the analysis of water we checked the some organochlorine pesticides.Table 1. shows result of organochlorine pesticides in water sapmples collected from three different sites of the dam. The Endosulfan, DDT & DDE were the most frequent detected compounds in the water. The concentration of DDT in the range of 0.04-0.05 µg/L and DDE in the range of 0.01-0.02 µg/L. The Chlorodane pesticide residues were found in

very low concentration. The pesticides heptachlor was not detected in the water samples in all site. It is showing that the farmers around the dam do not use them in large in their farming activities. Endosulfan, a broad spectrum contact insecticide and acaricide, is another pesticide used by many farmers. The associated figure for mean concentration of Endosulfan pesticides residue was found in the range of 0.03-0.04 µg/L.

Table 1: Levels of Organochlorine pesticides in water samples collected from Lower Pus dam.

	DDT			DDE			Endosulphone			Chlorodane			Heptachlore	
Pesticide station	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**
Summer season (2019)	0.01	0.03	0.04	0.01	0.02	0.01	0.03	0.02	0.01	0.01	ND	ND	ND	ND
Winter season (2019)	0.03	0.04	0.03	0.02	0.03	0.02	0.04	0.03	0.05	ND	0.01	ND	ND	ND
Average mean	0.02	0.035	0.035	0.015	0.025	0.015	0.03	0.02	0.01	ND	ND	ND	ND	ND
Standard deviation	0.014	0.0070	0.0070	0.0070	0.0070	0.0070	0.007	0.007	0.02	-	ND	-	-	-
Range	0.01-0.03	0.03-0.04	0.01-0.04	0.01-0.06	0.01-0.04	0.01-0.02	0.01-0.04	0.01-0.03	0.01-0.05	0.0-0.01	0.0-0.01	-	-	-

V. CONCLUSION

The analysis of water quality parameters of Lower pus dam reservoir showed that the values are well within the permissible limits. The result of study reveals that the quality of dam water is though fit for domestic, irrigation purpose and also for drinking purpose after some treatment and need continuous monitoring of physico -chemical parameters to improve the quality of water.

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Survey and characterization of habitat and habitat ecology of freshwater crab *Barytelphusa cunicularis*

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Abstract:

Freshwater crabs occupies most important position in various parts including pond, lake, paddy field, muddy region etc to maintain the stability of ecosystems. Crabs are one of the most important arthropods in the freshwater well as marine water habitat having unique role in nutrient cycling and small scale aquaculture; also it is dominant arthropods in terms of its biomass than others in the particular habitat. Burrows of crab *Barytelphusa cunicularis* were mostly found in areas with boulder and rock in Godavari river basin in two study areas and main river bed in another two tributaries. Frequency of occurrence of crab burrows occurrence in 1.0 M^2 area was varied in four river basins. Average 8, 17.2, 9.35 and 6.92 burrows per $1M^2$ were recorded during six month field visits in year 2015-2017 during late winter to summer season (December to May).

Keywords:

Barytelphusa cunicularis, Habitat, Burrow, Frequency, etc.

Introduction

Freshwater crabs are semi-terrestrial crustaceans. They actively construct the burrows along riverside in muddy and stony areas. Burrows are important to freshwater crabs for a number of functions such as allowing them to adapt to a semi-terrestrial existence, to avoid environmental stresses and protection from predators in water and land. Crab excavates burrows in the mud to avoid wave action of water in their habitat. Crabs excavate tunnel like burrows by dragging up of soil using trailing movement of walking legs and bulldozing it far from the mouth of the tunnel/burrows with the main cheliped (Green, 2004). The crab species excavate burrows of various size and shape (Y, S, J, L, U, V), with more complex architecture (Morrisey *et. al.* 2011). There is strong correlation between burrow size and carapace length of crabs. Each species shows different morphological characteristics (Strachan *et. al.,* 1999). It depends on species and its various purposes (Qureshi & Saher, 2012). The animals those create habitat, that directly or indirectly modulate the availability of resources are considered as "ecosystem engineers" (Lawton and Jones 1995). Present investigation was planned to estimate population density, size and shape of burrow of the crab species. It developed as an important database for suggesting crab-culture model for the fisher community under ex-situ conditions, for the backyard crab culture of this species.

2 Material and Methods

2.1 Study area

The present study was conducted at four study sites namely Godavari river at Dhanagar takli (19º.7′25.1148″ N, 77º3′50.7456″ E), Asna river (19˚14'0.5424"N, 77˚16'9.2496"E), Lendi river (18˚28'16.9716"N, 77˚16'50.2464"E) and Godavari river near Vishnupuri dam at Nanded (19º6′44.7084″ N, 77º17′20.2956″ E) during year 2015-2017. Asna and Lendi River are tributaries of Godavari River situated 5.0 km north east to the Nanded city of Maharashtra state in India.

2.2 Field Study

Field study was carried out during year 2015-2017. It was for crab burrow counting manually in 1 M^2 area from randomly spreaded burrows all across the study area. The selected four sites were characterized by main river bed, river bank with trees, agricultural field, and boulders & rocks (Table 1, 2, 3 & 4).

2.3 Abundance of crab burrows

During 2015-2016 at both study sites of Godavari River (at Dhanagar takli and Vishnupuri Dam) plots were marked each of 1.0 M^2 in rectangular pattern randomly as per availability of burrows in the area (Table.3.1 & 3.2). Similar study was carried out during 2016-2017 at Asna and Lendi River (Table 3.3 & 3.4). Burrows were recorded according to habitat condition used by this crab species. The burrow count was carried out in main river bed, in river bank with trees, in river bank near agricultural field and burrows in boulders and rocks with the help of labours the area was searched and marked for this study.

Observations:

Table 1. The number of burrows/M^2 of *B. cunicularis* recorded during year 2015-2016, in Godavari river (near Dhanagar Takli) Nanded, Maharashtra.

Habitat conditions used for burrow preparation	Burrows/ 1.0 M^2 Counted in 5 plots					Total
	1	2	3	4	5	
Burrows in main river bed	-	-	-	-	-	-
Burrows in river bank with trees	-	-	-	-	-	-
Burrows in river bank near agricultural field	4	6	3	2	1	16
Burrows in river bank with boulders & rocks	5	10	3	4	2	24
Total	09	16	06	06	03	40

Table 2. The number of burrows/M^2 of *B. cunicularis* recorded during year 2015 -2016, in Godavari river (Vishnupuri dam) Nanded, Maharashtra

Habitat conditions used for burrow preparation	Burrows/ 1.0 M^2 Counted in 5 plots					
	1	2	3	4	5	Total
Burrows in main river bed	**4**	**5**	**2**	**3**	**2**	**16**
Burrows in river bank with trees	**1**	**2**	**1**	**1**	**1**	**06**
Burrows in river bank near agricultural field	-	-	-	-	-	-
Burrows in river bank with boulders & rocks	**20**	**18**	**12**	**09**	**05**	**64**
Total	25	25	15	13	08	86

Table 3. - The number of burrows/M^2 of *B. cunicularis* recorded during year 2016 - 2017, in Asna River near Nanded, Maharashtra.

Habitat conditions used for burrow preparation	Burrows/ 1.0 M^2 Counted in 14 plots														Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Burrows in main river bed	06	05	03	04	06	01	01	-	06	-	08	08	07	02	57
Burrows in river bank with trees	-	-	01	-	-	-	01	-	-	-	-	04	-	01	07
Burrows in river bank near agricultural field	03	05	03	04	-	-	-	-	02	-	-	01	03	03	24
Burrows in river bank with boulders & rocks	03	-	03	02	06	01	01	01	06	-	06	04	07	03	43
Total	12	10	10	10	12	02	03	01	14	-	14	17	17	09	131

Table 4. -The number of burrows/ M^2 of *B. cunicularis* recorded during year 2016 - 2017, in Lendi River, Nanded, Maharashtra.

Habitat conditions used for burrow preparation	Burrows/ 1.0 M^2 Counted in 14 plots														Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Burrows in main river bed	12	03	02	01	01	-	02	02	04	01	02	04	01	05	40
Burrows in river bank with trees	02	-	01	01	-	-	01	02	01	01	01	-	01	01	12
Burrows in river bank near agricultural field	06	02	-	-	-	-	01	-	01	01	01	-	01	02	15
Burrows in river bank with boulders & rocks	06	02	04	01	-	04	01	02	01	01	01	02	04	01	30
Total	26	07	07	03	01	04	05	06	07	04	05	06	07	09	97

3 Results

Table 5. Burrow size category and frequency (in percentage) and Mean of total burrows counted ± Error of occurrence in Four Field Station during 2015 -2017.

Size class (Cm)	Godavari River	Vishnupuri Dam	Asna River	Lendi River
5.0-5.5	15	9.3	19	12.37
5.5-6.0	10	29	19.8	15.4
6.0-6.5.	37.5	31.3	39.6	18.5
6.5-7.0	30	25.5	12.9	22.6
7.0-7.5	7.5	4.6	8.39	30.9
Mean ±SE	8 ± 2.35	17.2 ± 4.69	9.35 ± 1.52	6.92 ± 1.56

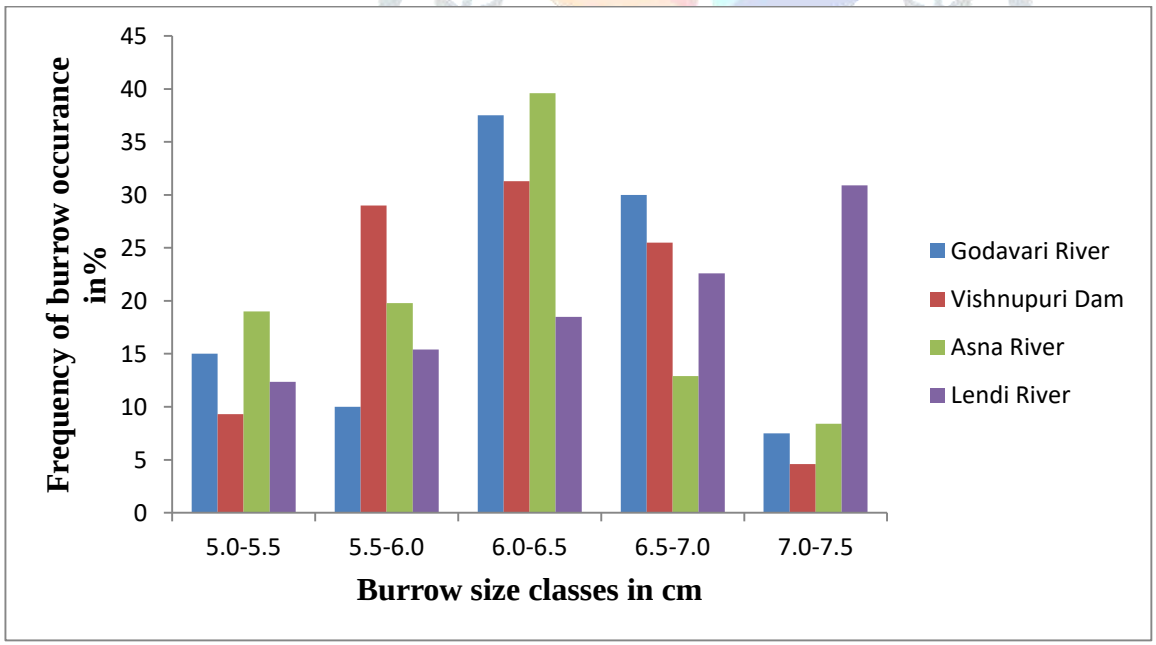

Fig. 1) Burrow size classes (cm) and frequency of burrow occurrence in (%).

Table 6. Descriptions of habitat and habitat ecology of five different Sampling sites.

Habitat Site type	Godavari river (Dhangar Takli)	Godavari river (Vishnupuri dam)	Asna River (Sanvgi road)	Asna River (Pasadgaon)	Lendi River
➢ Coastal vegetation	--	--	√	√	√
➢ Lime stone	--	--	--	--	--
➢ Agricultural land around swamp	√	√	√	√	√
Vegetations in the water					
➢ Plant/ bushes	*Acacea*	*Azadircta indica*	*Ipomea*	*Ipomea*	*Ipomea*
➢ Trees	*Azadircta indica*				
➢ flowers					
Habitat features					
➢ Stony margin	√	√	√	√	√
➢ Muddy margin	√	√	√	√	√
➢ Plant debris	√	√	√	√	√
➢ Animals/ birds					
Types of weeds					
➢ *Chara*	√	√	√	√	--
➢ *Hydrilla*	√	√	--	--	--

a) Under stone

b) Burrow in muddy area

c) Burrow under rock

d) Mud flat

e) Active burrow

f) Under stone

Fig. 2. (a-f). Type of micro-habitat conditions selected for construction of burrows by *Barytelphusa cunicularis* in Godavar River, Asna & Lendi Rivers, and the tributaries Godavari River.

4. Discussion

Crabs are ecologically important creatures in an aquatic ecosystem for nutrient mixing during burrow preparation in a habitat (Wang *et.al*. 2010). Devi, P. (2014) conducted survey in fifteen different field station in backwater area of Cochin, Kerala, India and observed that the crab species *Varuna litterata* construct burrows along the embankments or sides of pools, creeks and shallow banks. Whereas, *Barytelphusa cunicularis* in present investigation construct majority of burrows in river banks with boulder and rock in Godavari river (at Dhanagar takli and Vishnupuri dam, 24 & 64 respectively). Similarly, in the river bed (57 & 40 number of burrows respectively in Asna and Lendi River).

Distribution and abundance of freshwater crab *Potamonautes odhneri* from natural vegetation forest site in rivers of Kenya was examined (Dobson *et.al*., 2007). The adults of this species were found in the river bed, they observed 40% invertebrates reproduced in the open agricultural sites and reported that it is a part of recruitment of young crabs; whereas in the present study we found (16, 00, 24 &15 burrows, with respect to river habitat) in agricultural fields, along the four rivers at the study sites.

Sen *et. al*. (2017) found a correlation between burrow architecture and size class, sex of the fiddler crab *Uca rosea in* Sundarbans of west Bengal in India. Similar results we obtained to get an idea from burrow size about the size class of this crab species. Size class of burrow 6.0 - 6.5 cm were more frequencies of burrow

occurrence (37.5, 31.3, 39.6 in Godavari River and Asna River, while 30.9 was in Lendi River in size class 7.0 - 7.5 cm).

The crab carapace width showed significant correlation with the diameter of burrow opening. Burrow volume and total length of burrows Vachhrajan and Trivedi, (2016) in a study observed that crabs utilize deep burrows with large diameter located on the upper part of sandy shore. In the present study on crab burrow carried out in two rivers in 5 different plots and another two river in 14 different plots of $1M^2$ area, according to habitat condition used by crabs (Table 3.1, 3.2, 3. and 3.4).

Crab burrowing in salt marshes can mix surface and deeper soil over a period of years (Jin Qing Wang, 2010), accelerating litter decomposition and promoting the efficient reuse of nutrients by plants. Variation in the burrow architecture with crab age appears to be related to the crab's behaviour (Chan, *et. al.* 2006). Whereas in the present study the size of burrow tunnel (diameter in cm) directly represent the size group of the crab species in different microhabitat of study area.

Morrisey *et. al*. (1991), found that burrows of mud crab *Helice crassa* were more abundant at muddy site than at sandy sites. Similarly in the present investigation burrows were more in boulder and rocky regions in two areas and main river bed in the two the tributaries.

Micheli *et. al.* (1991) studied behaviour and ecology two crab species *Sesarma meinerti* and *Cardisoma carnifex* in mangrove were having same foraging activity but differ in burrowing activity, one was diurnal and another was nocturnal. *B. cunicularis* found in present study was having nocturnal habit to construct the burrows in different microhabitats (Fig. 2. a-f) and diurnal habit to hide in the burrow. It also prefers night time for foraging (6.00 p. m. to 6.00 a. m.).

Chua, *et al.* (2015), studied characteristics of habitat of freshwater crabs in Singapore's tropical rainforest, to conserve a range of habitat for the survival of four crab species. Lim *et. al.* (2003, 2006) compared nine crab burrow dimensions and differentiated the crab size class. The fiddler crab burrows were with steeper decent slope in sandy habitat than muddy habitat. In the present study also burrow size class and their abundance (Frequency) in a particular plot of $1M^2$ area was recorded (Table.3.5) in Four tributaries.

5. Conclusion

Burrows of crab *Barytelphusa cunicularis* were mostly found in areas with boulder and rock in Godavari river basin in two study areas and main river bed in another two tributaries. Frequency of occurrence of crab burrows occurrence in 1.0 M^2 area was varied in four river basins. Average 8, 17.2, 9.35 and 6.92 burrows per $1M^2$ were recorded during six month field visits in year 2015-2017 during late winter to summer season (December to May).

6. Conflict of interest

Authors declare no conflict of interest.

7. Authors contribution

First author was responsible for all experimental work, data acquisition and analysis and writing and preparation of manuscript. Corresponding Author was contributed to experiments and data analysis also responsible for study concept, designing and coordinating the research, supervising the work and revising the manuscript. Both authors read and approved the final manuscript.

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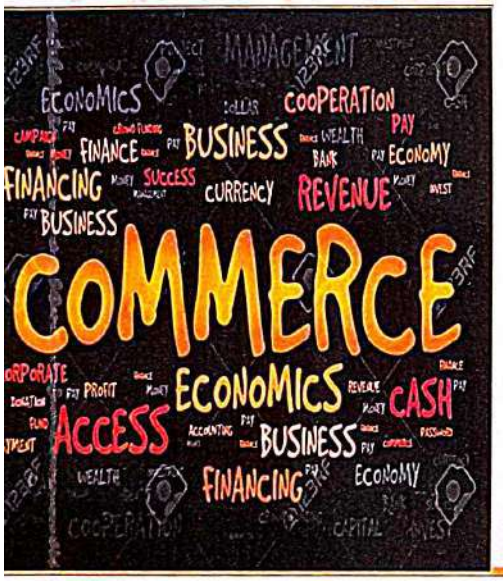

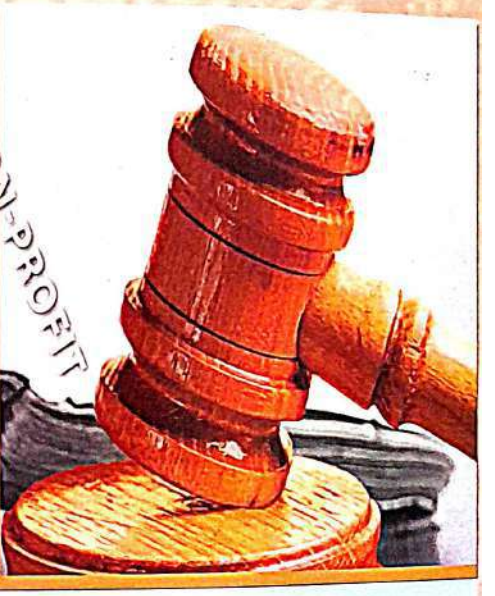

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Tiger Loss Cases in Human Dominated Landscapes, a State wise Analysis of Panthera tigris Mortality Cases in India.

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Abstract

Current situation of tiger census is good but increasing population of tigers in India itself a key concern for its conservation and management in human-dominated landscapes imparting a high frequency of conflict across the country .The best known highland of central India is a benevolent illustration of incidents at regular basis in terms of human loss and injured big cats or farmers etc. Population dynamics of tigers thus depends on the quality of good and poor habitats. The local reproductive success in the good habitats (Source area/core-critical tiger habitat) exceeds local mortality. The outer poor habitats with less productivity than local mortality are sink" areas (buffer/connecting corridors in a tiger landscape).For this study secondary data of tiger mortality from 2012-2019 cases were taken from official site of NTCA. The data depicts 52.4% of mortality cases were inside the park while 33.87% cases were recorded outside the boundary of tiger reserves.For present study questionnaire survey also conducted in some human dominated area around the reserve forest to know the movement pattern of tigers and threats too.

Keywords: Tiger mortality, seizures, population dynamics, habitat suitability etc.

Introduction:

Creation of NTCA (National Tiger Conservation Authority) making provision for raising, arming and deploying the special Tiger Protection Force, refinement of tiger assessment, active management involving local people, supporting buffer areas to address man-tiger interface issues, creating inviolate space for tigers, and the like (**Rajesh Gopal 2015**).Due to such concerted efforts, at present India alone has the maximum number of wild tiger (2967 as per Tiger Census 2020). Increasing numbers of tigers and carrying capacity of habitat suitability is a big challenge and an ecology-based method for defining priorities for large mammals' conservation is tough task (**Wikramanayake, Alan, Robison, 1998**). On the other hand genetic viability of source population must be maintained along with carrying capacity of the wild habitat for wild tiger in India (**Yumnam B, Jhala YB, Qureshi Q et.al 2014**). Impact of habitat fragmentation on the demography of population is also a key factor in conservation strategies (**Umapathy, G.,Hussain, Shaik et.al 2011**). **S.Kumar (2015),** had worked on habitat fragmentation lending to loss of gene flow from source of population of tiger, a study of Corbett reference to corridor, Ramnagar Uttarakhand, India. Present study imparts the tiger mortality cases recorded by the NTCA, Data analysis showed the location of tiger mortality i.e. inside the tiger reserve or outside the reserve and some cases of seizure were also included.

Materials & Methods:

Secondary Data of tiger mortality from 2012 to 2019 were taken from government official web site of NTCA (National Tiger Conservation Authority) and analyzed it to get the conclusion and questionnaire survey regarding movement pattern of tiger in communities have been conducted nearby the tiger reserves and reserve forest division which are having high frequencies of human-tiger conflicts like Maharashtra i.e. Tehsil Bramphuri, Gondipri, Kurkheda, Amori,Deori, Sindhi Wahi, Mul, Pandherkawada, Pusad,Akot etc.

Result & Discussion:

The data depicted that from 2012 to 2019 tiger mortality cases were officially recorded by the government and displayed on its official web link. Data showed that in out of total 750 cases, 393 cases were recorded from inside the reserve and 254 cases were belongs to outside of the reserve area. While 103 cases were seizure by other ways.

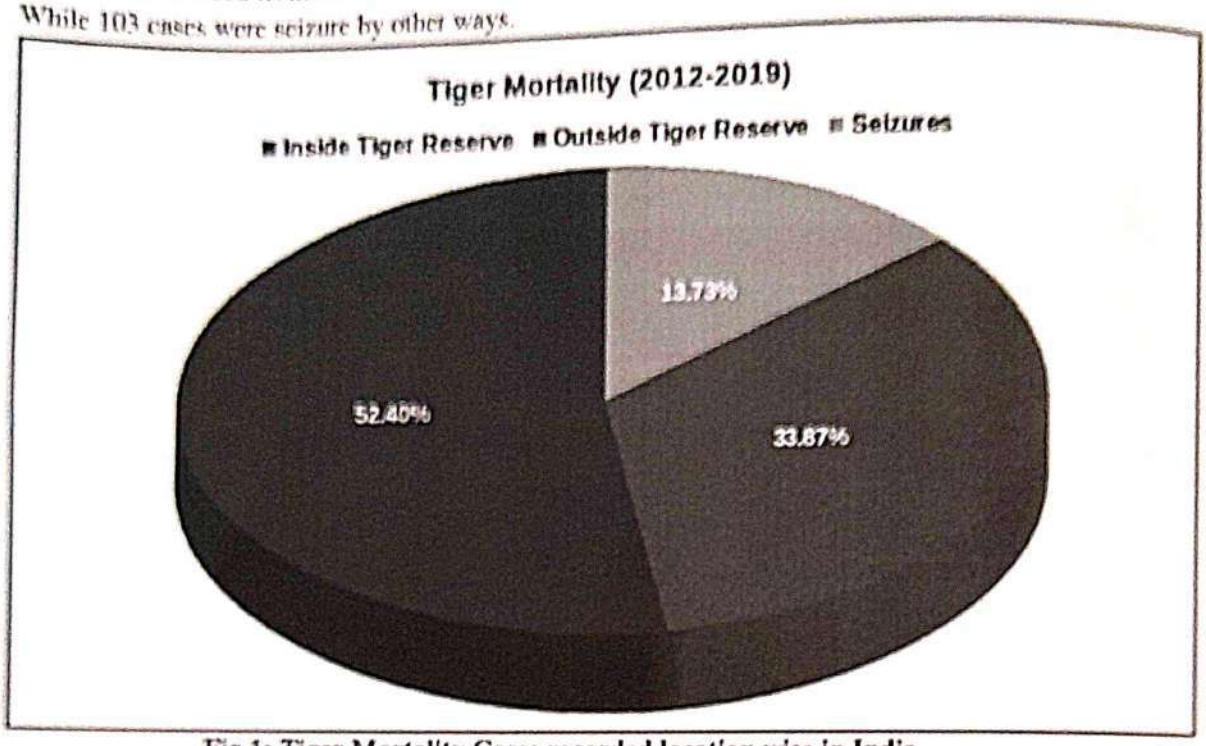

Fig 1: Tiger Mortality Cases recorded location wise in India

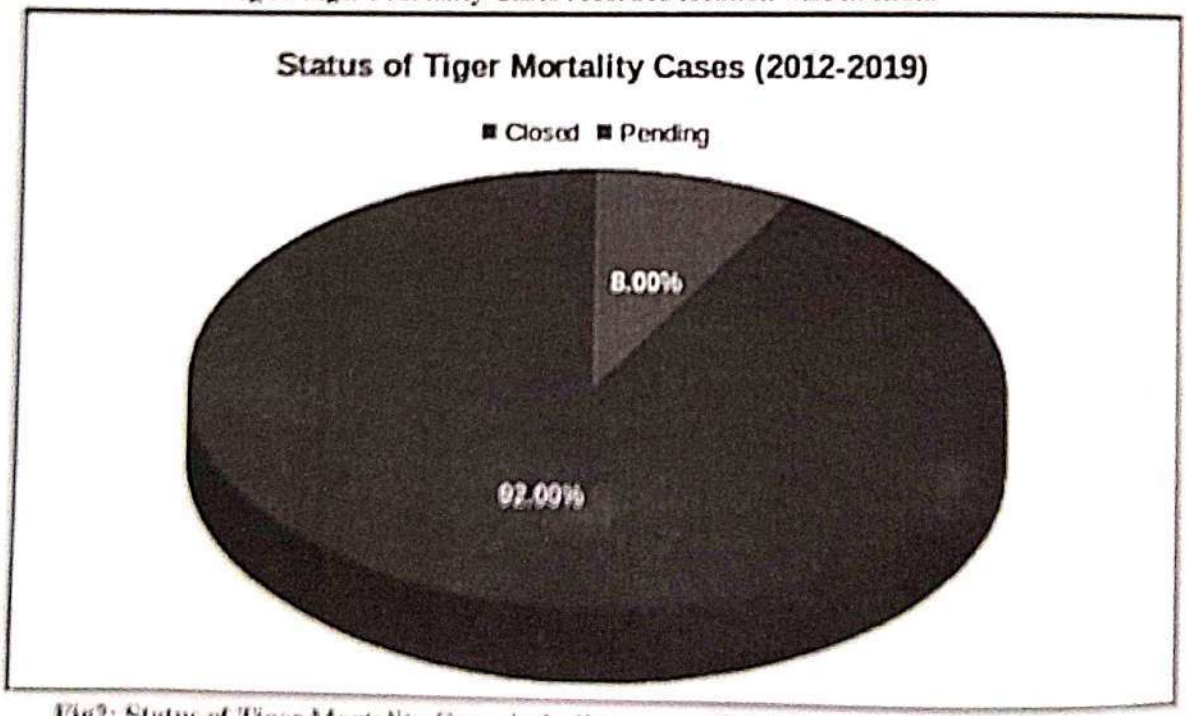

Fig2: Status of Tiger Mortality Cases in India as per official data, *Source- NTCA*

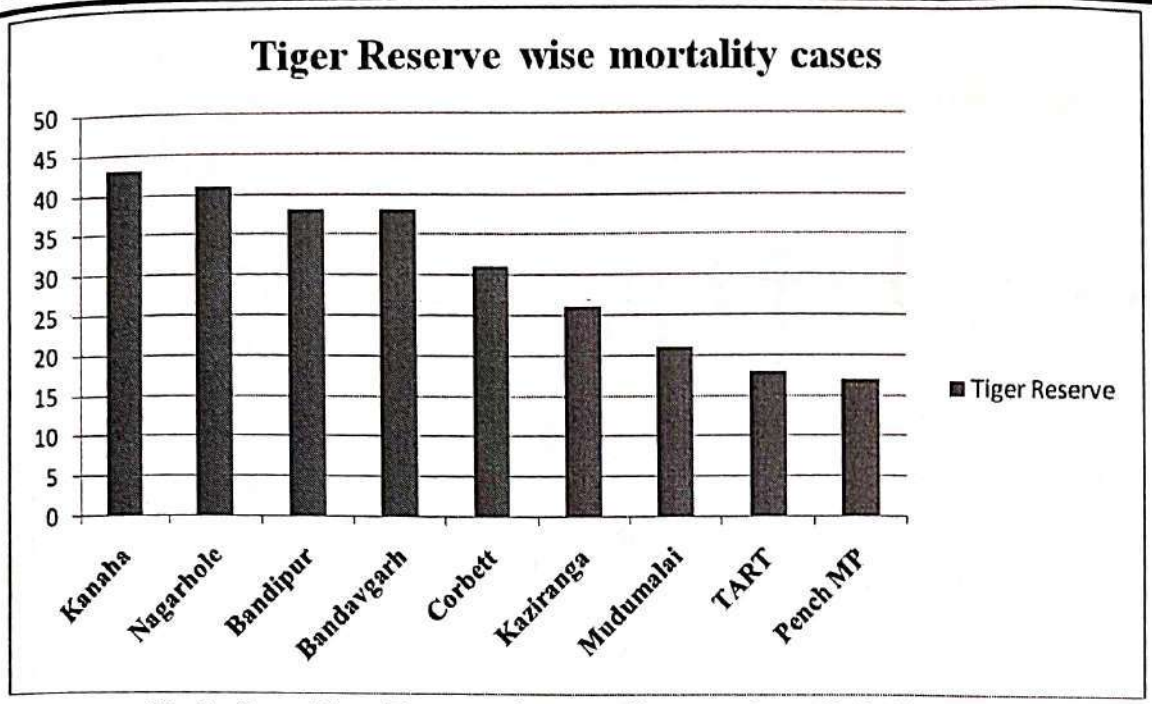

Fig 3: Some Tiger Reserve wise mortality cases from 2012-19

Figure 3 imparts the result and recorded mortality cases of some tiger reserve wise in India like Kanha (43), Nagahole (41) , Bandipur(38), Bandavgarh (38), Corbett (31), Kaziranga (26), Mudumalai(21),TART(18),Pench-MP(17) in 2012-19.

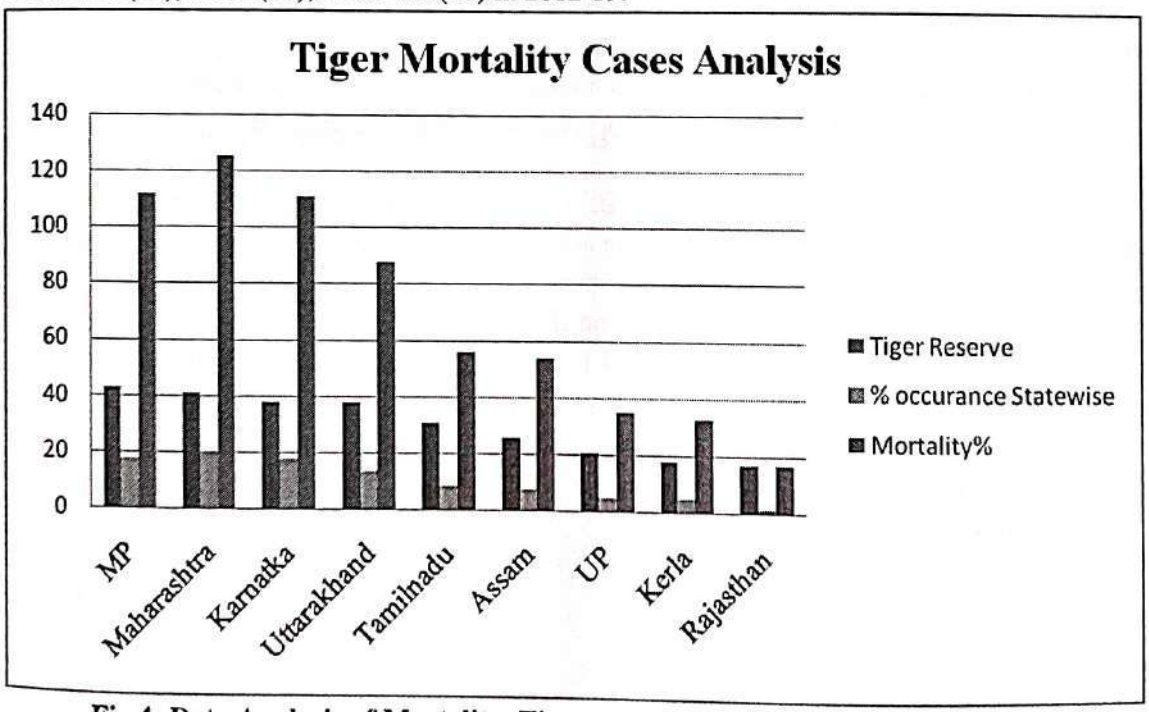

Fig.4: Data Analysis of Mortality, Tiger Reserve wise, % occurrence & State wise (2012-19)

Fig 4 depicted the **Maharashtra** is having the highest number of mortality (20&), MP (18%) ,Karnataka(18%),Uttarakhand(14%),Tamilnadu(9%),Assam(8%),UP(5%),Kerla(5%)followed by the Rajasthan(2%). While on the other hand wildlife protection society of India (wpsi) showed a current data on wpsi-india.org/new of tiger and leopard mortality cases in **2021** depicted high potentiality along with poaching and seizure too. Official data shows the seizures, natural death and poaching too.On the othe hand the movement pattern in communities by any means leads a situation of conflict

or thenegative interactions which is always trouble some and challenging issues for mitigation and conservations too.

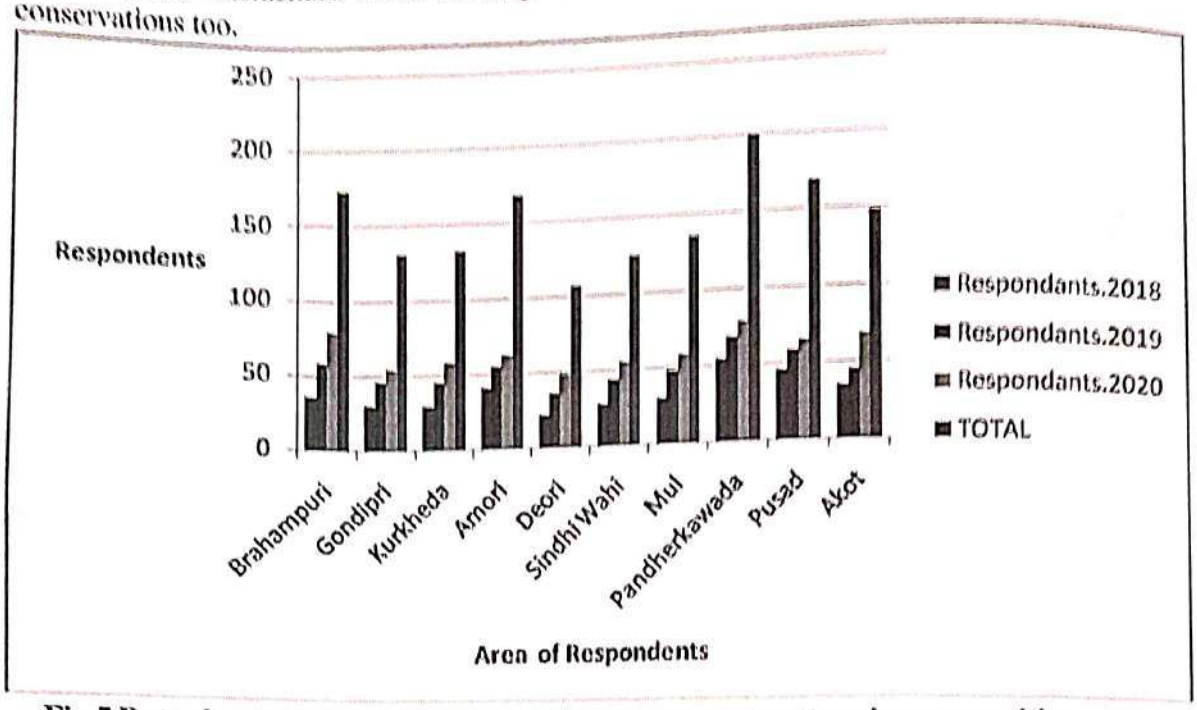

Fig.5 Data shows the Respondants regarding movement pattern in communities

Overall the questionire survey depicts a severe movement of big cats in the commmunities and livestock predation too. So the movement in the human dominated landscapes are not sound for both the big cats and human beings by all means. Retaliatory killing , poisoning ,electrocution in one hand while on the other hand incidents of death and human loss leads or develops the negative attitude towards big cats and provoke many type of retaliatory action against a the wild life

Conclusion:

Finally the study showed high frequencies of mortality cases and poaching too but the government efforts imparts the reduction of cases in across the country but in recent years the number of cases are in vogues, perhaps the current situation of pandemic catastrophic in India gives a opportunity to illegal activities or poaching while on the other hand sporadic news from across the country always alarming the carrying capacity and human-tiger conflict or negative interaction too regularly. Area like highland of central India is always in prime for conflict issues due to some socio-political cum geographical conditions and more important factors the movement pattern of tigers in the communities for livestock predation or accidental cases poachings etc. We have to rethink the all boundaries of mitigation and conservations skills to resolve the current scenario. Fragmentation of habitat, carrying capacity and corridores connectivity are some of importnt issues.

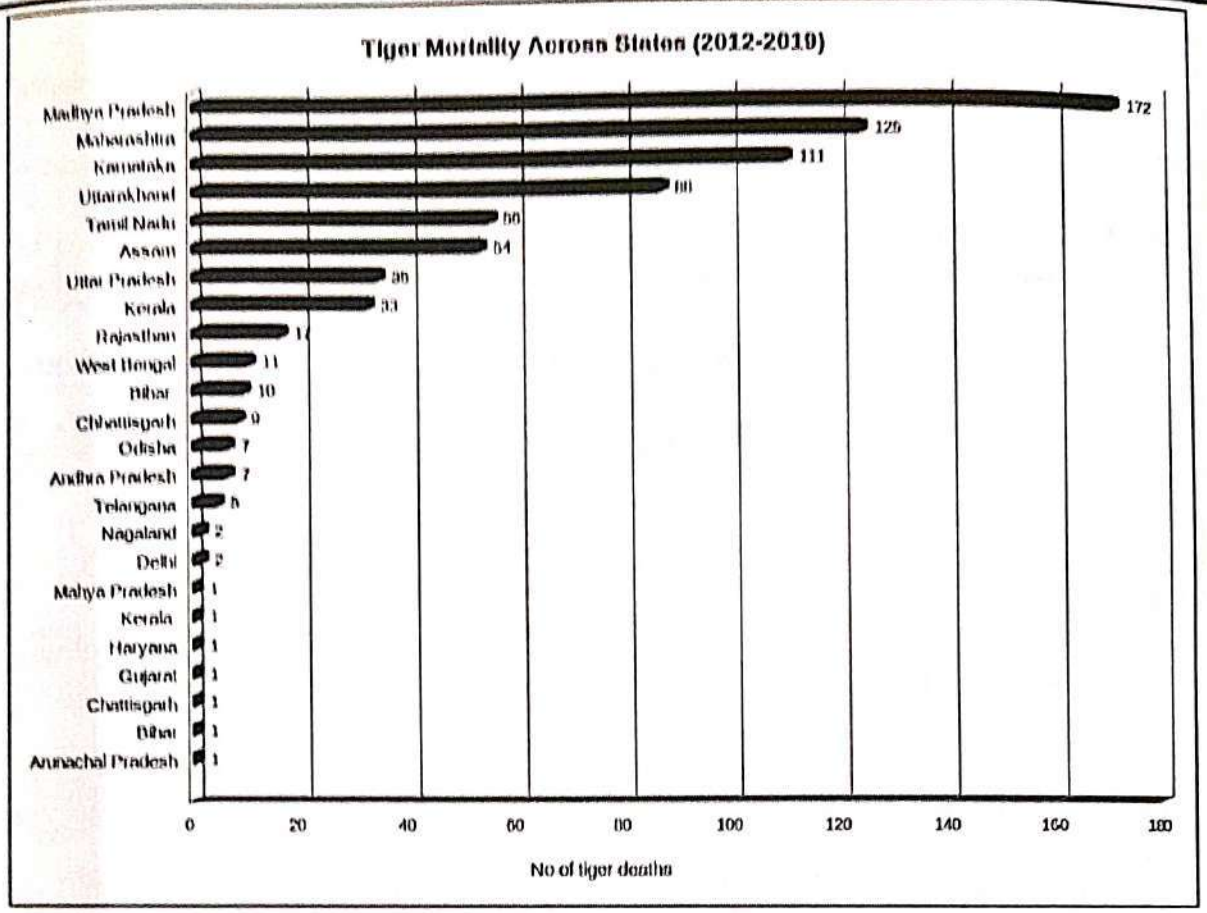

Fig.5: State wise figure of Tiger Mortality. ***Source: www.ntca.gov.in***

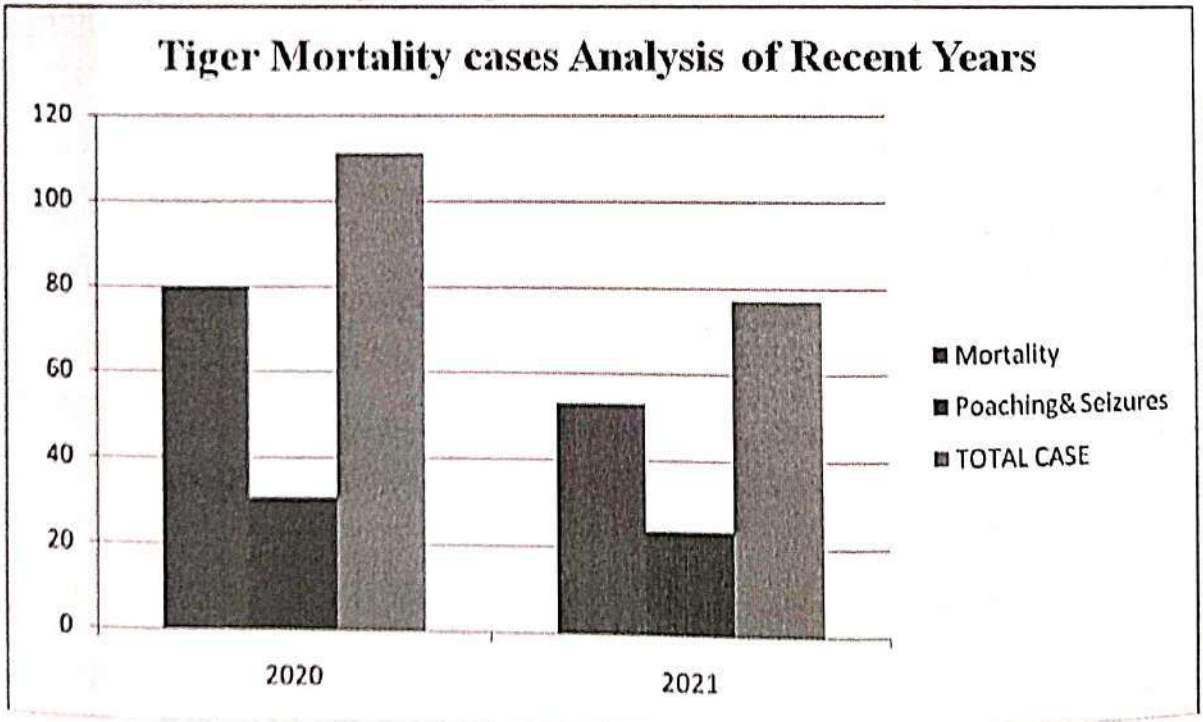

Fig.6: Tiger Mortality cases in 2020-2021. ***Source: wpsi-india.org***

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ग्रामीण भागातील महिला बचतगट व स्वावलंबन

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Research Paper - Commerce

प्रस्तावना -

ग्रामीण क्षेत्रातील आर्थिक विकासाचा अभ्यास करत असताना खऱ्या अर्थाने महिला चा आर्थिक विकासात सहभाग आहे हे अभ्यासावे लागते.महिलांनी आपल्या विकासासाठी बचतगट याच्या माध्यमातून स्वत:चे स्वावलंबन केले आहे हे निदर्शनात येते. महिलांमधील कर्मशक्ती सामर्थ्याचे बळखटीचे पंख देणारी संस्था म्हणजे बचत गट म्हणून ओळखले जाते.प्रत्येक घराच्या दृष्टीने आजच्या काळात आर्थिक नियोजन आवश्यक आहे. आर्थिक नियोजन हे बचतीपेक्षा कमालीचे असते, परंतु सर्वसामान्य वर्गाचा विचार करता लहान-लहान बचत ही बचतीची कल्याणकारी योजना म्हणून ओळखली जाते.

बचत गटातील सुरुवात बांग्लादेशातील चितगाव विद्यापीठातील अर्थशास्त्रज्ञ व ग्रामीण बँकेचे प्रणेते व नोबेल विजेते डॉ. महंमद युनुस यांनी स्वयंसहाय्यता गटाची प्रथम सुरुवात केली आहे. सन 1983 साली ग्रामीण बँक प्रकल्पाचे रुपांतर ग्रामीण बँकेत करून लहान लहान गटांना बँकेच्या मुख्य व्यवहारात आणले तेच गट आज बचतगट, स्वयंसाहाय्यगट, लघुवित्त रोजगार गट या नावाने वाटचाल करीत आहेत.भारत देशात सर्व प्रथम कर्नाटक राज्याने सन 1986-87 मध्ये बचत गटाची चळवळ उभी केली. सन 2001 पासून भारत देशात महिलांच्या आर्थिक क्रांतीसाठी सुरुवात झाली. देशातील ग्रामीण भागात मोठ्या प्रमाणात लोक वास्तव्य करतात, विविध समस्यांना तोंड देत स्वत:च्या गरजा पूर्ण करण्यासाठी विविध मार्गांचा अवलंब करतात त्यांने मुख्य बचत गट हा एक मार्ग दिसून येतो.

भारत देशात सहकारी चळवळ भारतीय पहिला कायदा 1904 पासून पतसंस्था निर्माण झाल्या नरंतु एक उद्देशीय संस्था असल्याने भारतीय सहकार दुसरा कायदा 1912 अस्तित्वात आला व बहुउद्देशीय धोरण राबवले जाऊ लागले यातच ग्रामीण क्षेत्राच्या विकासाला चालना मिळाली. ग्रामीण भागात राहत असलेल्या महिला वर्गाच्या मदतीला बचत गट हा कामी आला. महिला वर्गाने बचत गटाच्या माध्यमातून स्वत:चा विकास करण्यासाठी ग्रामीण भागातील महिला वर्गाने व त्याकाळच्या सरकारनेही पुढाकार घेऊन महिलांचा विकास केला आहे.

व्याख्या -

"समान गरजा असणाऱ्या स्वइच्छेने एकत्रीत येऊन सामाजिक व आर्थिक पार्श्वभूमी असलेल्या लोकांना सामुहिक एकत्रीकरणाला स्वयंसहाय्यता गट असे म्हणतात."

"बचत गट म्हणजे निश्चित स्वरुपाचे सामुहिक तयार केलेली लोकांची संघटना होय."

उद्दीष्टे :

1) महिला बचत गटाची वैशिष्ट्ये स्पष्ट करणे.
2) ग्रामीण भागातील महिलांच्या आर्थिक समृद्धीचा अभ्यास करणे.
3) महिला बचत गटाच्या माध्यमातून विविध उद्योगसमुह स्पष्ट करणे.
4) महिला बचत गटासमोरील समस्यांचा आढावा घेणे

संशोधनाची पद्धती -

प्रस्तु शोध निबंधासाठी द्वितीयक साम्रगीचा वापर केला आहे. यामध्ये संदर्भग्रंथ, संशोधन प्रबंध, मासिके, वर्तमानपत्रे व इंटरनेटचा वापर केला आहे.

गृहितके :

1) महिलांच्या आर्थिक विकासात बचत गट हा महत्त्वाची भूमिका बजावतात.
2) बचत गटामुळे ग्रामीण भागातील महिला स्वकृत्त्यावर स्वावलंबी बनल्या आहेत.
3) महिलामध्ये नेतृत्वगुण, निर्णयक्षमता, आर्थिक व्यवहारात सहभाग वाढला आहे.

महिला बचत गटाची वैशिष्ट्ये :

1) सन 1998 पासून भारत सरकारने आपल्या अर्थसंकल्पात बचत गटांना कर्ज वाटपाबाबत तरतूद केली आहे.
2) बचत गटांना अल्प व मध्यम काळासाठी अल्प व मध्यम स्वरूपाचा कर्जपुरवठा कमी व्याजदराने केला जातो.
3) केंद्र व राज्य सरकारने विविध योजना राबविल्या आहेत.
4) समता, समानता, बंधुभाव, एकात्मता, स्वावलंबन, समुहाने यातल्याचा वाढ झाली आहे.

ग्रामीण भागातील महिलांचा आर्थिक समृद्धीचा अभ्यास करणे -

1) व्यवसायात टसा - लघुउद्योग, कुटीरउद्योग, हस्तकला उद्योग, कौशल्य विकास, मसाल्याचे पदार्थ, पीठ गिरण्या, पापड निर्मिती इतर कामातून ग्रामीण भागात महिला व्यवसायात टसा उमटावत आहेत.
2) शेतीत महिलांची मोलाची साथ - शेती क्षेत्रात मोठ्या प्रमाणात महिला वर्ग कामगिरी बजावत असलेले दिसून येते. जवळपास शेतीतील सर्वच कामे महिला सक्षमपणे करित आहेत. पारंपारीक शेती व आधुनिक शेती देखील महिला करत आहेत
3) सामाजिक व राजकीय क्षेत्रात नावलौकिक - स्वयंसेविका माध्यमातून सामाजिक व राजकारणाच्या

माध्यमातून विविध पदापर्यंत महिलांनी कामगिरी करीत आहेत.

महिला बचत गटाच्या माध्यमातून विविध उद्योग समुह स्पष्ट करणे

1) दुग्ध व्यवसाय - पश्चिम महाराष्ट्रातील कोल्हापूर जिल्ह्यामध्ये छोट्याशा गावात कमी लोकसंख्या असलेल्या भागात मानकखाडी येथील सरस्वती महिला बचत गटाने दुग्ध व्यवसाय सुरु केला आहे.

2) रेशीम उद्योग - खामगाव तालुका शहराजवळ असलेल्या खुटाला खुर्द येथील कलांगण महिला बचतगट यांनी रेशीम उद्योग सुरु केला आहे. कच्चा माल खरेदी करून पक्का माल तयार करणे व विकणे यातुन त्यांची आर्थिक प्रगती केली आहे.

3) मोत्याची शेती - आष्टी तालुक्यातील लोणी गावामधील गट दुर्गामाता महिला बचत गटाने मोत्याची शेती केली आहे. या गटात 12 महिला आहेत. मानव विकास मिशन व महिला आर्थिक विकास महामंडळाकडून आर्थिक मदत घेतली आहे. शेतात मुबलक पाणी असल्याने 12 फूट खोल व 12 फूट लांब 2 खड्डे घेतले व एक दोरीची जाळ्या तयार करून शिंपले त्यात सोडले त्यात दोन्ही खड्ड्यात 2500 शिंपले आहेत यात हजार मोत्याचे उत्पादन घेतले आहे मोत्याला सरासरी 300 रु. ते 900 रु. भाव मिळेल.

4) नांदेड जिल्हा बचतगट - जिल्ह्यातील महिला स्वयंसहाय्यता गटांच्या माध्यमातून पुदिनाशेती, फुलशेती, भाजीपाला शेती, शेळीपालन, दुग्धव्यवसाय आदी पूरक व्यवसाय सुरु केले आहे.

महिला आर्थिक विकास महामंडळामार्फत नांदेड जिल्ह्यात तेजस्विनी महाराष्ट्र ग्रामीण महिला सबलीकरण योजना राष्ट्रीय नागरी योजना, उत्पादने विक्री अभियान, वॉटर शक्ती अभियान, राबविण्यात येतात.

आजवर जिल्ह्यात 3 हजार 605 महिला गट स्थापन केले आहे. महिला सदस्य संख्या 39 हजार 210 आहे. आजवर 19 कोटी 6 लाख रु. बँकेत बचत आहेत. 119 कोटी 15 लाख कर्ज देवाण घेवाण आहे. बँकेकडून 83 कोटी 40 लाख कर्ज उपलब्ध केले आहे. बँकेचे कर्जपरतफेड प्रमाण 99 टक्के आहे.

महिला बचत गटातील समस्या -

1) महिला बचत गटातील महिला सर्व शिक्षीत असतातच असे नाही.

2) ग्रामीण भागातील महिला बचत गटाला अपूरे भांडवल हि समस्या भेडसावते.

3) आधुनिक तंत्रज्ञानाचा अभाव.

4) शासकीय मदत व अनुदान प्राप्त होत नाही.

5) नविन कौशल्याचा अभाव.

6) शिक्षण व प्रशिक्षणाचा अभाव

7) एकाधिकार शाहितून तंटे-भांडणे-वादविवाद निर्माण होतात.

8) ग्रामीण भागात उत्पादन केलेल्या मालाचा योग्य बाजार पेठेचा अभाव.

9) भांडवला अभावी व्यवसाय बंद करतात

10) बाजार पेठेतील खुल्या स्पर्धेत टिकणे शक्य होत नाही.

निष्कर्ष -

ग्रामीण भागातील महिलांनी बचत गटाच्या माध्यमातून स्वावलंबी बनण्याचा मार्ग निवडला आहे व त्यात त्यांनी आपले यश मिळवले आहे. बचत गटाच्या माध्यतून सर्वसामान्य कुटुंबातील महिलांनी पुढाकार घेऊन आर्थिक समस्यावर बचत गट हा एक उपाय आहे ही हे सिद्ध केले आहे. ग्रामीण भागात बचत गट स्थापन करून ग्रामीण भागातच बचत गटाच्या माध्यमातून व्यवसाय उद्योग निर्माण करणे व चालवणे महत्त्वपूर्ण कार्य करत आहेत. महिला बचत गटामुळे महिलाचा विकास झाला आहे.

1) ग्रामीण भागातील महिलांची आर्थिक सुधारणा झाली आहे.
2) ग्रामीण भागात लघुउद्योग, कुटीर उद्योग, हस्तकला उद्योग, मसाल्याचे पदार्थ, शेतीपुरक व्यवसायइ. महिला बचत गटामुळे सुरु झाले आहेत
3) ग्रामीण भागातील महिलांना व्यक्तीमत्व विकासाला वाव मिळाला.
4) ग्रामीण भागातील महिलामध्ये सामाजिक एकात्मता निर्माण झाली.
5) ग्रामीण भागाच्या विकासाला चालना मिळाली.
6) दरिद्र्याचे प्रमाण कमी झाले.
7) बेकारीचे प्रमाण कमी होऊन नवीन रोजगाराच्या संधीत वाढ झली.
8) शेती क्षेत्राच्या विकासाला चालना मिळाली.
9) बँकांच्या बचतीत वाढ झाली.
10) राजकारणात नेतृत्व करण्याची संधी निर्माण झाली.

संदर्भ सूची :-

1) महिला बचतगटात झालेल्या परिवर्तनांचा एक आर्थिक अभ्यास प्रकल्प
2) यशस्वामीनी - यशोदा फाऊंडेशन
3) भारतीय प्रतिभूमी और विनिमय बोर्ड
4) योजना मासिक
5) इंटरनेट, वृत्तपत्रे, मासीके, साप्ताहिके इ.
6) मार्गदर्शिका - चौधरी पब्लिकेशन
7) बचत गट - डॉ. प्रमोद जोगदेव
8) बचत गटासाठी कार्यक्षम व्यवस्थापन प्रशिक्षण पुस्तिका - ज्ञान प्रबोधिनी पुणे.
9) महिला स्वयंसहाय्यता बचत गट - प्रा. ष. यू. मुलानी

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Changing Role of Libraries in Information Services

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Abstract :

The present paper deals that new era of librarian plays a key role in developing information policy for the organization ensuring that access to all information resources. from internal record to external database is provided in the most strategically effective and cost effective manner. the library and information professionals are required to acquire such knowledge and skill as the library is one of the highly information technology influenced service profession.

With the development of ICT libraries nature has changed from traditional libraries to automated library. hybrid library. electronic library and virtual library. As library environment change then automatically the librarian role for this libraries have also changed . presently librarian play many role like Knowledge Manager. Researcher Legal Advisor. Teacher and many more.

Introduction:

Information technology is defined as "a combination of computer and telecommunication technology which makes possible new systems to help people for doing the work in a better manner". Technological services save the time of user as well as library personnel also. Modern technology has brought dramatic changes in library management and library services. The face of library is changing due to implementation of information and communication technology . All libraries are using partly or fully the communication technology in their libraries. librarian also insisting to provide the electronic based services of libraries to the users, These electronic base services save the time of user as well as library staff and user also get information in less time and to the point information by single click on the computer at their place.

The location and provision of information services has dramatically changed over the last ten years. There is no need to leave the home or office to locate and access information now readily available on-line via digital gateways furnished by a wide variety of information providers. Information electronically accessible from a wide variety of globally distributed information repositories. Information is no longer simply text and picture . It is electronically in a wide variety of formats. many of which are large . complex and often integrated.

The various reasons to application of Information and communication technology in libraries.

- To increase the efficiency of library operations.
- Improve the effectiveness of existing services.
- Offer a wide range of new services.
- Perform task which cannot be done by the manual system.
- Improve accuracy and control over operations.
- Reduce duplication of efforts.
- Library consortium is possible other libraries.
- To provide readymade databases.
- Facilitate marketing or information services.
- Provide gateway access to global digital information resources
- Meet users rising expectations for complex information needs.

Following services should be provided by the library to it's users.

- Circulation services.
- Database search services .
- Reference services.
- Reference support for projects /presentation/ assignment.
- Assistance in how to search faster/ web search.
- User education and training programmers.
- OPAC
- Internet facility
- Current awareness services.
- SDI services.
- List of new arrival

Changing Role of Library :

- Traditional library emphasis on the storage and preservation of physical items. where as digital library require less space to store and preservation of library material.
- Traditional library bound to provide service within the time limit . but the digital virtual and electronic library provide the services to their user 24 x7 means 365 days.
- To acquire the information user can visit the library physically where as in digital library user can use the library from their home or from any part of the geographical area with the help of computer.
- Some traditional libraries are providing the hybrid method in their library. Some material is in hard from and some material in soft form .

Changing Role of Library Services.

- Library at your door step.
- Online services to all user.
- Information communication technology application in the library.
- Tailoring services in this services librarian provide the only to the point information
- Consolidation and repackages.
- Time management
- Total quality management
- E-book and e-journals services
- Database services etc.

New Challenges for Library and information Service Professionals :

We live in a dynamic turbulent world and the turbulence is set to increase its pace in the future. In a fast changing . expanding diverse global digital information environment. libraries are facing a variety of complex challenges from multiple sectors of the knowledge society in the 21th Century. The major challenges are.:

- Information Explosion
- Information and Communication Technology revolution .
- Explosive growth and usage of web resources
- Dwindling Library budgets
- Escalating cost of printed documents
- Intensive use of digital resources
- Heightened level of users expectations
- Interactive virtual learning environment
- Changing nature of number of information resources
- New patterns of scholarly publishing and communication

- Development of digital. Virtual and Hybrid Libraries
- Online Bookshops and Information services.

Changing Role of Library and Information services professionals :

In the modern World the role of the LIS professionals is adapting to changing technologies. information environment and customers expectations. Library professionals are increasingly responsible not only to provide traditional library information services but also to deliver online information services according to the actual user needs. Librarians need to keep up with their user's expectation to survive and service them . Librarians need to become information knowledge navigators who data into information.

In the 21st century everyone is going through many occupational changes to face the future challenges. Information and Communication Technology has transformed the role of not only libraries but also library professional in the changing environment in which they now work. Library professional are functioning under great pressure to become more efficient to deliver more effective services to the users. As the role of LIS professionals is changing to face the new challenges posed by ICT . They must be keen to stay at the forefront of innovation in the library world. LIS professionals need to be confident and competent that they can prepare for new challenges. Deal with emerging technologies manage change effectively and claim new professional role. A well-informed competent and creative LIS professional shall play multiple evolving role in the 21st century. As the information industry has changed the expectations of information users have soared and librarians have come to fear for their position and profession. As we race into the future. Librarians should begin to think about the position of the library in the new environment. LIS professional are functioning under great pressure to keep pace with the constantly changing technological environment.

Conclusion :

LIS professionals face complex challenges posed by rapid revolutionary advances in ICT. Libraries have to redesign their position to meet evolving needs. Librarians need to implement new practices and new technologies manage change and improve performance and competencies to face future challenges of knowledge society. They need to develop professional competencies to adapt changing technologies. In order to deliver timely value added quality content and world-class services to the users from their desktop.

Library information professionals have to recognize the expanding nature of the technological changes and professional challenges that they face in the modern world and realize to improve the range of professional competencies required to adapt and manage the changing technology successfully. The challenges represented by these competencies must be seized and acted upon today in order to ensure that librarians have better future in the twenty first century. LIS professionals must strive struggle and improve new skills and knowledge about new technologies that will be needed to provide responsive Library Information Services to the user in the twenty first century.

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Terrorism And Human Rights

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Abstract :-

I think terrorism is the cancer of mankind if is cureless sore to humanity it always shows its barbaric face to world by its horrifying and diabolic acts with passing time this monster up grading itself with lethal venom. Mostly terrorist activities are performed on the pretext of religion but I confirm neither religion nor its books provokes for such inhuman acts. Anywhere in the world terror only can give bloodshed and destruction. Terrorists don't think about anything they just want to terrify mankind 26/11, 9/11, parliament attack, horrified daily routine of J & K condition of northeast, naxalism in Maharashtra, bleeding of Iraq and Syria, massacre of innocence in Peshawar and recently episode of Charlie. Hebdo tell the destructive saga of terrorism. The Purpose of this essay is to consider the impact on human rights of the recent rise in the importance attached to, and the perceiveddanger arising from, violent acts of terrorism. By 'human rights' is meant the law, practice and scholarship that has grown up around a subject that has enjoyed huge attention over the past 60 years, beginning with the new international order that was put in place at the end of the Second World war and exploded into public view even dramatically with the end of Cold War in 1989. If the half-century that followed the signing of the Universal Declaration of Human Right by the vast majority of the nations of the world in 1948 can without exaggeration be described be described as an 'age of human rights' then it may well be the case that next 50 year (and beyond) will in due course with equal validity be capable of being described as an 'age of terrorism' or- if one is skeptical of the empirical foundations of the claim- at very least an 'age of counter-terrorism'.

Introduction :-

Terrorism and human rights are inter-related to each other because when one starts other violates. Terrorism is global concern today and in true sense it has relation with the almighty. I have taken this topic only because I have been working of on this topic since when I lost near ones in the terror attacks from 1993 Bombay, 2002 Gujrat, 2004 and 2006 in Mumbai and the latest one in November 26 in different areas of Mumbai. Truly, this topic does not need a proper introduction but what it needs is a proper and right full stop. Terrorism itself is an attack on human rights. The direct linkage between terrorism and human rights was first recognized by world Conference on human Rights in Vienna, 1993, of the Vienna declaration and its program of Action stipulates that "acts, methods and practices of terrorism in all its form and manifestation as well as linking in some countries to drug trafficking are activities aimed at the destruction of human rights. Some Vital question of ethics, human rights, and value by means of dialogue between law and literature. Terror or terrorism has never been far from the consciousness of poetic culture since French Revolution and philosophers such as Burke and Kant were grappling contemporaneously with the curious compulsion to words terror of the modern age. Terrorism is a deliberate and systematic murder, maiming and menacing of innocent to inspire fear for political ends. Terrorism according to me is a product of fanatical violence perpetrated generally in order to realize some political ends to which all humanitarian and ethical beliefs are sacrificed. It is a use of force, threat, and a violence method to combat to achieve certain goals that is aim to induce a state of fear in the victim, that it is ruthless and against humanitarian norms and that publicity is an essential in the terrorist strategy.

Defining terrorism :-

Terror and terrorism can be viewed either from the perspective of the person of the person who applies it or from the perspective of the person subjected to it. As Hegel observed that about the master slave relationship, the possibility exchange of roles always exists. Applied terror and terrorism as function of domination alters the human relation between the parties. Hegel sees this as a dialectical exchange with social as well psychological complications.

The relation between the forces of terror as instrument of state. Terror here is in the service of the state. There is evidence that no human being can terrorize another human being without an exaltation which is the Jacobean's thought of "virtue". Terrorism by unofficial group against the

targets another state or within the state, if promoted or condoned by a government, may raise issues which are unlawful use of force by the state. Terrorism is a means to to those fanatics who uses this as one of the most valuable weapon against all the combined forces against it.

Factors of Terrorism :-

This is a question which everyone has an answer and each answer varies from one another. This shows that how people are concerned about this threat, its effect in all spheres of life. In my project I will be dealing with various promote terrorism at large. These are

- Economic aspect
- Political aspect
- Social aspect
- Religious aspect
- Ideological aspect

Politics of Terrorism in India :-

The political systems are facing a major paradox at present. It related to the stability of the nation-state which, with its unprecedented military strength and large panoply of other security arrangement, has grater chances of fending off internal opponents and external aggressors. Thus the governments, in their eagerness to secure and maintain a desired degree of obedience and loyalty, have frequently directed institutionalized violence their own citizenry as well as against other communities under their control.

Role of Police And National Human Rights Commission :-

In this chapter I will be dealing with the way police is been acting on these crucial and sentimental issues. The human rights violation in the custody and steps taken by human rights commission and media both print and electronic. India has had its share of terrorist attacks and is learning to live with it. Today, not only Mumbai and Delhi are high on list of terrorist but hi-tech hubs like Bangalore and Hyderabad have already begun to been on the terrorist radar. If Mumbai was shaken by the serial blasts in the local trains which left hundreds dead and injured and Delhi was in stock at the bombing that took place in crowded shopping area, the attacks in India's emerging high tech hubs like Bangalore and Hyderabad in previous years came as an eye opener. Today what is new is the act that the terrorist has become more sophisticated and knows how to attack in places where it would hurt the most. Take for instance, the Mumbai blast orchestrating the seven blasts in a public transportation system is not the job of the amateur. The terrorist knows that India is globally emerging as an economic superpower in IT, BPO and even conventional businesses. Over the last couple of year, intelligence agencies have continually sent warning signals of militant groups planning attacks in Bangalore and the going on high alert. Bangalore, where all the global giants like Intel, IBM, Motorola, HP, have development offices, has more than 1,500 It and BPO firms. Several Indian defense, space and scientific research institution institutions are also based in Bangalore.

Three Reasons For Terror Activities :-

1) Terrorist feel they are sending signals to international investors that India may be the safest place to be.
2) A significant number of US, firms have operations here and when the militant tendency is to get back at the Us, this is the one way of getting back.
3) Security is not as tights as it could be.

The terrorist is looking at the other means of attack i.e. through technology. There are many companies here that are working on mission critical applications for US firms. To hit back at the US government, all you need is to cripple the operations through technology and data theft.

We have in the last 15 odd years, seen 5 different kinds of terrorisms emerging in India. Of course the most significant one is the one we seen on account of cross border insurgency in Jammu and Kashmir. The second is the Punjab which we saw in the 1980's and was fortunate to have been able to overcome. The third we saw a severe problem in the south from the LTTE. Problems in the north east is continuing and the latest to join these categories is the kind of terrorism spread along the various parts of central India the Maoist insurgency from Andhra Pradesh.

Conclusion :-

Terrorism is generally understood to refer to the deliberate killing of civilians in order to spread fear through populations and force the hand of political leaders. Militant groups seeking to

overthrow authority have frequently used exemplary violence to intimidate political opponents via public opinion. States too have employed terror to intimidate and repress their opponents. In this new context, human rights organizations – and particularly non-governmental organizations (NGOs), to which this report primarily refers – were challenged to be relevant. Critics claimed they had misread the profound threat that modern terrorism poses and spent too much time defending the rights of people accused of terrorist offences and too little advocating the rights of victims. Such criticisms have been particularly directed at international human rights organizations.

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Cyber Material

लोक साहित्य : लोकवाङ्मय उखाणे

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प्रस्तावना :

लोक साहित्यामध्ये लोक समूहाच्या पारंपारिक जीवनाचा अविष्कार झालेला असतो. लोक साहित्य हे आदिमानव निर्मित असून त्याची मालकी समूहाची असते. लोक साहित्याचे प्रचलन एका पिढीपासून दुसऱ्या पिढीपर्यंत होत असते. लोक साहित्य हा लोक संस्कृतीचा एक पैलू असतो. लोक साहित्य म्हणजे लोकजीवनाचा इतिहास असेही म्हणता येते. लोक साहित्य हे कला आणि वाङमय यांचे स्त्रोत असते लोक साहित्य ही समाजाची अभिव्यक्ती असते. समाजमनाचे विविध पैलू त्यामध्ये पहावयास मिळतात.

लोक वाङमयात उखाणा हे एक मौल्यवान लेणे आहेत. लोक वाङमयातील उखाण्यांचे हे दालन वेगळे पण आगळे आहे. उखाण्याचा प्रकार फार प्राचीन काळापासून परंपरेने चालत आला असून त्यात नेहमीच नविन अशी भर पडत आलेली आहे. रामायण, महाभारतात उखाणे घालण्याच्या पध्दतीचा धागा आपणास सापडतो. उखाणा कधी भव्य दिव्य विचार बोलून दाखवितो तर कधी थट्टामस्करी, मिस्कील विनोद करुन गालावर खळी पाडतो, तर कधी ऐकणाऱ्या व्यक्तीला कोड्यात टाकतो. अशा या उखाण्याचा उद्देश असतो, मनोरंजनातून ज्ञान.

उखाण्याला पर्यायी शब्द :

उखाणा या शब्दाला भारतात अनेक पर्यायी शब्द उपलब्ध आहेत. कुट, प्रहेलिका, कोडे, प्रश्न, ब्रम्होस्त्र मायना असेही प्रचलीत शब्द उखाणा या प्रकारांसाठी उपयोगात आणले जातात. हिंदीत उखाण्याला पहेली म्हणतात, तर सिंध्दी भाषेत उखाणी हा शब्द प्रचलीत आहे.

उखाण्याचे प्रकार :

उखाणे प्रामुख्याने दोन स्वरुपात लोकजीवनात प्रचलित असलेले आढळतात. १) कोडी किंवा कूट २) साधा उखाणा.

१) कोडी किंवा कूट :

कोडी किंवा कूट याचा अर्थ गूढ अर्थाने वचन उखाण्याच्या या स्वरुपात प्रश्न आणि उत्तर यांचा समावेश असतो. अशा प्रकारच्या उखाण्यातून प्रश्न विचारणा व त्या प्रश्नांचे उत्तर देणारा असे दोन घटक असतात. प्रश्न रुपकाची असतात. उत्तरात गोपनाचा स्फोट अपेक्षित असतो. अशा प्रकारच्या उखाण्याचा प्राण म्हणजे त्यातील 'गोपन' कूट प्रश्नांच्या अशा उखाण्यास मराठवाडयात 'तोरका' हा शब्दही काही परिसरात प्रचलित आहे. अशा स्वरुपाच्या उखाण्याचा महत्वाचा उद्देश म्हणजे मनोरंजनातून ज्ञान हा असतो. या उखाण्याला सांस्कृतिक परंपरा असते. गूढतेमूळे उखाण्याला एक विशिष्ट सौदर्य प्राप्त होते. उखाण्याच्या या प्रकारात त्याच्या बाह्य स्वरुपावरुन अशा प्रकारच्या उखाण्यांचे दोन वर्ग पुढील प्रमाणे करता येतात.

१) प्रश्नार्थक रचनेची कोडी
२) प्रश्न विरहित रचनेची कोडी

पहिल्या वर्गातील रचना प्रश्नार्थक असते. उदा.

पाऊस नाही, पाणी नाही, रान कसे हिरवे?
कात नाही, चुना नाही, तोंड कसे रंगले?

अशा उखाण्यात उखाणा घालणारा सुटसुटीत व लयबध्द रचनेत प्रश्न विचारतो, आणि उत्तर देणारा एका शब्दात या प्रश्नाचे उत्तर देतो गोपनाचा स्फोट करतो. वरील उखाण्याचे उत्तर 'पोपट' असे आहे. प्रश्न विरहित उखाण्याचे उदा. खालील प्रमाणे

काळी गाय, ढवळी येणी,
तिघ लागतात तिच्या ध्यानी
एक हिंडे परदेशावानी।।

या उखाण्यातही गोपनची क्रिया आहेतच फक्त उखाण्याची रचना प्रश्न विरहित आहे अशा प्रकारचे उखाणे मराठीत विपुल प्रमाणात उपलब्ध आहेत.

१) प्रश्नोत्तर स्वरुपाचे उखाणे :

प्रश्नोत्तरी स्वरुपाच्या उखाण्यांना 'कूट' असेही म्हणतात. प्रश्नोत्तरी उखाण्याचा विकार प्रश्न व उत्तर यात असतो यात दोन घटक असतात. एक प्रश्न विचारणारा व या प्रश्नात उत्तर देणारा दुसरा घटक या उखाण्यातील प्रश्न रुपकाश्रयी असतात व उत्तरात गोपनाचा स्फोट करुन मूलार्थ व्यक्त केला जातो. अशा स्वरुपाच्या उखाण्याला प्राचीन परंपरा आहे. महाराष्ट्र 'कलगीतुऱ्या' प्रकारात आध्यामिक आशयावर आधारलेली अनेक कुटे उपलब्ध झालेला आहेत. वेदात कूटे आणि कुटकथानक स्वतंत्र प्रकारात आढळतात. काही कुटे कथानकावर आधारलेली आढळतात. त्यांना कुटकथानक म्हणतात. अध्यात्मावर आधारित कुटकथानकें नाथ संप्रदायात प्रचलित असल्याचे अढळते. कलगीतुऱ्याच्या लावणीत प्रश्नोत्तराच्या रुपाने एखादे कथानक महाभारत,रामायण, भागवत इत्यादी पौराणिक विषयावर आधारलेली आहेत. प्रश्नोत्तरी स्वरुपाच्या उखाण्याचा एक विषेश म्हणजे प्रश्नात आणि उत्तरात पद्यात्मक असते. एक चरण प्रश्नाचा असून दुसरा चरण पहिल्या चरणात विचारलेल्या प्रश्नांच्या उत्तरांचा असतो. प्रश्नोत्तरी स्वरुपाच्या या उखाण्याचे उदाहरण म्हणून दुर्गा भागवत यांनी पुढील उखाणा दिला आहे.

प्रश्न :—

कोठें सांगा ही कांचन नगरी
तिथे कोण तो तप करी
हयाचे पासून कोण नारी
गुरु पुत्रा याचा शोध करी
सृष्टीची रचना कशी झाली केव्हा
आकाश तारे निर्मिले कोणी तेव्हा
प्रश्न करीतो अडूरखाला
उत्तर देई रे गुरुच्या मुला।।

उत्तर :—

एकवीस स्वर्ग तो कांचन नगरी
तेथे गौतम ऋषी तप करी
तेथे हो जन्मली गो माता आई
खरे सांगतो शोध तू घेई
मायेपासून उत्पन्न सारे
तेहतीस कोटी देवांचे पसारे
अगस्तीपासून निमार्ण तारे
सृष्टी ही निर्मिली त्या मायाने रे
सीताराम राजापूर वाला
प्रश्नाचा जबाब देतो तुला।।

याप्रमाणे प्रश्नोत्तर करीत करीत कुटातील कथानक विकसित होत जाते प्रश्नोत्तररुपी उखाण्याचा विधीशी संबंध असल्याने काही ठिकाणी पहावयास मिळाते. बंजारा जमातीत लग्नविधीत प्रश्नोत्तर रुपी उखाणे घालण्याची प्रथा काही ठिकाणी पहावयास मिळते. गोंड जमातीत मार्तिकाच्या विधीशी अशा उखाण्यांचा उपयोग करतात.

उखाण्यातील प्रश्नोत्तरी स्वरुपाच्या उखाण्याचे स्वतंत्र वैशिष्ट असते उखाण्यातील पदतालित्य वैशिष्टयपूर्ण आणि कलात्मक असते रुपकांच्या आश्रयांनी केलेली गुंफन आश्चर्यचकित करणारी असते. कोडयात टाकणारी असते.

प्रश्न विरहीत उखाणा :–

प्रश्नविरहीत उखाण्याची रचना साधी, सोपी व सहजस्फूर्त असते. यात फक्त गोपनाक्रिया असते. या उखाण्यांची रचना गद्यात्मक असतो तरी पद्याकडे अधिक झूकलेली आढळते.

प्रश्नविरहीत उखाण्यांचे वर्गीकरण पुढील प्रमाणे करता येते.

१) नाव घेण्याचे उखाणे
२) व्याही विहीणीचे उखाणे
३) खेळातील उखाणे
४) मनोरंजनात्मक उखाणे

अशा स्वरुपाचे उखाण्यांना साधे उखाणेही म्हणतात. महाराष्ट्रात उखाण्यातून नाव घेण्याची प्रथा आहे. नाव घेण्याच्या उखाण्याच्या निर्मिती मागील प्रेरणा अभ्यासनीय आहे. स्त्रीने व पुरुषाने नेहमीच व्यवहारात एकमेकाने नाव उच्चारावयाचे नाही व प्रसंगी विषेश उखाण्यातून ते उच्चारावास हरकत नाही या समजुतीतून उखाण्यांची निर्मिती झाली असावी. नैमित्तीक कारणासाठीच नवऱ्याचे नाव उखाण्यातून घेणे याचा स्पष्ट उल्लेख एक नाथांचया 'रुख्मिणी स्वयंवरांत १५ ते १८ या अध्यायात आलेला आहे ते असा –

न कळे भीमकाचे लाघव, सकळही म्हणती धन्यभाव
आता घेऊनिया नांव, पायमागे कुणाचे ।।५४।।

रुख्मिनीला नाव घेण्याबद्दल केलेला हा उल्लेख स्पष्ट आहे. चमत्कृतीजन्य, लयबध्द आणि संयमक अशी काव्यरंचना अशा प्रकारच्या उखाण्यातून आढळते. कल्पकतेला अशा उखाण्यात महत्वाचे स्थान असते. अशा प्रकारच्या उखाण्यातून विविधता नाविन्य आणि बदलत्या समाजस्थितीचे दर्शन आपणास घडते. उदा.

सोन्याची बुगडी, मोत्याचा घोस
..... रावांची नाव घ्यायची मला हौस

चमत्कृतीजन्य रचनेचे उदाहरण म्हणून पुढील उखाणा देता येईल.

ताड फाड
रामफळाचं झाड
सोन्याच चौकट
रुप्याचा पाट
खोलीत खोली
खोलीत अंजीर भात
टंजीर भातावर साजूक तूप
..... रावांच रामासारख रुप

अशा या उखाण्यात कल्पकता आहे.

२) व्याही–विहीणीचे उखाणे :–

लग्नप्रसंगी विषेशत: रुखवताच्या प्रसंगी थट्टामस्करी करुन हास्याचे तुषार उडविण्यापलीकडे अशा स्वरुपांच्या उखाण्याची झेप जात नाही व्याही–विहिणीच्या या उखाण्यात अश्लिलता अधिक प्रमाणात आढळते.

"आला आला रुखवत त्यात होती नोट
विहिणबाई मागती पँट आणि कोट"

आणि हाच उखाना पुढे अश्लिलता धारण करतो. तो असा

"आरकरांची नय, तिला परकराचा दाणा
इव्हाही म्हणतो इहिनबाई
पलंगावरती का याना
येते दादा ये, पन फजितीला भेते"

भारतात निरनिराळ्या प्रदेशात व जमातीत लग्नप्रसंगी गायिल्या जाणाऱ्या गीतांचा अभ्यास करतांना या गीतातील सांकेतीक अश्लिलता आपल्या लक्षात येते.

३) खेळातील उखाणे :–

साध्या उखाण्याचा किंवा प्रश्नविरहीत उखाण्याचा तिसरा प्रकार म्हणजे खेळातील उखाणा हा होय त्या उखाण्याची सांगड एखाद्या खेळाशी घातली जाते. महाराष्ट्रात झिम्मा किंवा फुगडी हे खेळ खेळतांना अशा उखाण्यांचा वापर होतो. उदा.

"समोर होता कोनाडा, त्यात होता पेडा
मैनीला नाही कळला, तीचा नवरा होता येडा
नवरा होता येडा बाई नवरा होता येडा
त्याला आवडे लांडया शेपटीचा गोंडा"

या उखाण्याला दुसरी मैत्रीला उत्तर देते त्याचे त्याचे स्वरुपही एकमेकांचे वर्म काढण्यासारखेच आहे.

समोर होता कोनाडा, त्यात होता आणा
ठकीला नवरा भेटला काणा, बाई काणा
असा नवरा लई शाहाणा बाई शाहाणा
का ग ठके त्याच्याकडे जाईना

असे स्पर्धात्मक स्वरुप अशा प्रकारच्या उखाण्याचे असते.

मनोरंजनात्मक उखाणे :–

केवळ मनोरंजनाच्या हेतूने अस्तित्वात आलेला उखाण्यांचा हा प्रकार आहे. मनोरंजनाचे हे उखाणे पुरुष वर्गात अधिक प्रमाणात प्रचलित आहेत या उखाण्याचे स्वरुप कोडयासारखे आहे. पण अत्यंत सुटसुटीत असा हा उखाणा असतो. संध्याकाळी मंडळी गप्पा गोष्टी करावयास बसले की, या उखाण्याचा रंग चढतो आणि मग उखाणे सांगव्याची स्पर्धा सुरु होते अशा उखाण्यांची उदा. पुढील प्रमाणे

१) पाच दार — (पवा)
२) वळचणीला खवा — (केस)
३) दुधावरचा फेस — (लोणी)
४) जेवनात जी — (करंजी)
५) वैरणात बा — (कडबा)

मोजके व समर्पक शब्द हे या उखाण्यांचे एक वैशिष्ट्ये होय.

सारांश :

उखाण्याचे स्वरुप असे विविधतेने नटलेले आहे. उखाण्याच्या विविध घडणी आकर्षक असून अर्थपूर्ण आहेत. पुरुष वर्गात कोडी तर स्त्रियांत उखाणे प्रचलित आहेत. उखाण्याची परंपरा भारतातील सर्वच प्रांतात प्रचलित असल्याचे दिसते. उखाण्याची कलात्मक अर्थपूर्ण रचना त्यातील कल्पना, विचारांची मांडणी आणि त्यातील नाद ताल त्याचे वेगळेपण दर्शवितो. मंनोरजनातून ज्ञानाची देवाण–घेवाण करण्याचे उखाणा–कूट हे एक माध्यम आहे. साधारणत: वेद काळापासून ब्रम्होधाच्या रुपातून प्रवास करीत करीत उखाणा आजही लोक जीवनात प्रचलित राहिला आहे. याचे एक कारण उखाण्याची कलात्मक रचना होय.

संदर्भ ग्रंथ सूची :

१) दुर्गा भागवत, लोक साहित्याची रुपरेखा
२) डॉ. प्रभाकर मांडे, लोकसाहित्याचे स्वरुप
३) कमलाबाई देशपांडे, अपौरुषपेय वाङ्मय
४) तत्रैव
५) कुंदनलाल उप्रेती लोकसाहित्य के प्रतिजात
६) लोकसाहित्य (संकल्पना व स्वरुप) डॉ.व्यवहारे

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लोकवाङमयातील स्त्री-गीते

प्रा.रेखा व्ही.इंगोले
मराठी विभाग प्रमुख
मा.सु.पा.कला, विज्ञान व कै.पां.ठा.वाणिज्य महाविद्यालय, मानोरा जि.वाशिम

प्रस्तावना :-

भारतीय लोक वाङमयाचे दालन समृध्द आणि संपन्न आहे. वेदपूर्वकालापासून लोक जीवनात प्रचलीत असलेल्या लोक वाङमयात वेगवेगळ्या कालखंडात भर पडत गेल्याने त्यात संपन्नता आली आहे. विशेषत: पुराण काळातील पुराण वाङमयाच्या परंपरेने लोक वाङमयाला अधिक समृध्दता लाभली मराठीतील लोक वाङमयाचे दालनही संपन्नतेने आणि विविधतेने नटलेले आहे. लोकवाङमयातील आशय, रचना, अभिव्यक्ती यांच्या स्वरूप विशेषांच्या आधारे लोक वाङमयाच्या वर्गीकरणाचे प्रयत्न अभ्यासकांनी केले आहेत. त्यामध्ये मराठी लोक वाङमयाचा बराचसा भाग लोकगीतांनी व्यापलेला आहे.

मौखिक परंपरेने लोक जीवनात विविधतेने नटलेली आहेत. कित्येक शतकांपासून ही लोकगीते मौखिक परंपरेने लोकजीवनात प्रचलीत राहिली.

लोकगीते म्हणजे काय - लोकगीतांचा अभ्यास करून त्यांच्या स्वरूप विशेषांवर प्रकाश टाकण्याचे प्रयत्न आपल्या देशात आणि पाश्चिमात्य देशातील अनेक अभ्यासकांनी केले आहेत. लोक साहित्याचा पाश्चात अभ्यासक अलेक्झांडर क्रॉप लोकगीतांचे स्वरूप स्पष्ट करतांना म्हणतो की, 'लोकगीत हे भावगीत असून लोकगीतांचा उगम निरक्षरात होऊन त्यांच्या कर्ता अनामिक असतो. लोकगीतांची निर्मिती भूतकाळातील असून कित्येक शतकांची परंपरा या गीतांना लाभलेली आहे.' डॉ.सरोजिनी बाबर यांच्या मते 'मौखिक परंपरेने चालत आलेले भावगीत म्हणज लोकगीत होय.' लोकगीतांची निर्मिती लोकसमूात स्वाभाविकपणेच होत असते आणि ते बोलण्यापेक्षा गाऊन प्रदर्शित केले जाते. लोकगीतांच्या या विषयासंबंधी ग्रीम म्हणतो - 'लोकगीते अकृत्रिम असतात, तो सहजतेने स्वयंनिमार्ण होतात.' तर लोकगीतांच्या नित्य नूतनते बद्दल लोक साहित्य विशारद व्ही विलियम म्हणतो - लोकगीत नवेही नसते आणि जुनेही नसते वनातील वृक्षाप्रमाणे त्यांची मुळे भूतकाळात खोलवर रूजलेली असतात परंतू तिला नित्यनूतन शाखा पुष्प फळे येत असतात. व्ही विलियमच्या विचारावरून लोकगीतांचे सातत्य लक्षात येते या सातत्यामुळेच लोकगीतांना नित्यनूतनता प्राप्त होत असते.

लोकगीतांचे वेगवेगळ्या प्रकारे वर्गीकरण केले जाते त्यामध्ये स्त्रि-गीते हाही प्रकार प्रामुख्याने असतो.

लोकवाङमयातील स्त्रि-गीते :-

यामध्ये जात्यावरची गीते, विधीगीते, संस्काराशी संबंधीत गीते, फेरावरची गाणी इत्यादी गीतांचा समावेश होतो. स्त्रियांनी मौखिक रूपात निमार्ण केलेली स्त्रियांत प्रचलीत असलेली, परंपरेने प्राप्त झालेली गाणी म्हणजे स्त्री-गीते असे म्हणता येईल. मराठी लोकगीतात स्त्रीगीते विपुल आहेत. लोकगीते म्हणजे स्त्री गीते म्हणण्या इतपत संख्या या गीतांची आहे. स्त्री ही मुळातच भावनाशील, हळवी आणि कोमल अंत:करणाची असल्यामुळे सुख दु:खाचे कितीतरी अनुभव तिला येतात. मानवाविष्कार अनेक प्रकारचे सण, कुलाचार विधी, व्रत वैकल्ये, नवस सायास इत्यादीतून लोकगीतांची निर्मिती होत असल्यामुळे आणि हे क्षेत्र प्रामुख्याने स्त्री सांभाळत असल्यामुळे स्त्री गीतांची विपुलता असावी असे वाटते. स्त्री ही जात्याच भावना प्रधान संवदेनक्षम मताची असल्यामुळे पुरूषापेक्षा ती अधिक भावसकल असते आतंरीचा हा भाव व्यक्त करण्यासाठी ती विविध प्रसंगी गीतांचा आश्रय घेते. त्यातूनच स्त्री गीतात विविधता आलेली आहे. स्त्री जीवनातील विविध भावचित्रे आणि जीवनानुभवांचा अविष्कार स्त्री गीतात पाहवयास मिळतो.

मराठी लोकगीतातील स्त्री गीतात पुढील प्रकारची गीते आढळतात. १) ओवी गीते, २) विधिगीते, ३) फेरावरची गीते, ४) खेळगीते, ५) ऋतुगीते, ६) कृषीकर्म करतांनाची गीते ७) सण उत्सव प्रसंगाची गीते

ओवी गीते :-

ओवीगीतात जात्यावरच्या ओव्या कितीतरी आढळतात. मराठी लोकगीतांत स्त्री गीते विपुल आहेत. त्यातल्या त्यात ओवीगीतांची संख्या कितीतरी आहे. जात्याला ईश्वर मानून त्याच्या साक्षीने गायिलेल्या ओव्या आशय आणि अभिव्यक्तीच्या दृष्टीने वैशिष्ट्यपूर्ण आहेत. स्त्री जीवनातील अनेक घटना, प्रसंग आणि भावनुभवांची एक चित्र मालिकाच त्यातून प्रत्ययास येते. त्यामुळ या गीतांना एक वेगळेपण आलेले आहे. आंतरीच्या उमाळ्यातून जिवीच्या जिव्हाळ्यातून या ओव्यांची निर्मिती झालेली असल्यामुळे त्या भावस्पर्शी झालेल्या आहेत.

१) देवदेवता विषयक ओवीगीते :-

मौखिक परंपरेने स्त्री जीवनात प्रचलीत असलेल्या ओवीगीतात त्या निर्मिती मागील संस्कारीत मनाचे व त्या मताने जोपासलेल्या देव - देवता विषयींच्या श्रध्दाचे प्रतिबिंब पडलेले पहावयास मिळते. अशा ओव्यातून शंकर पार्वती, श्रीविष्णु-लक्ष्मी, तुळजापुरची अंबाबाई, माहुरची रेणुका, पंढरपुरचा विठोबा, सूर्यनारायण, खंडोबा इत्यादी देव देवता विषयक श्रध्दा व्यक्त होताना दिसतात.

प्रात:काळीच उगवत्या सूर्याला हात जोडून त्याविषयी श्रध्दा व्यक्त करणारी स्त्री पुढील ओवी गीतात पहावयास मिळते.

'उगवला नारायण माझ्या अंगणी प्रकाशला
हळदी-कुंकवाचा वटा, शालूचा माखला ||'

देवी देवातांना लौकीक पातळीवर आणण्याची किमया आमच्या अशिक्षीत समजल्या जाणाऱ्या स्त्री मनाने या ओवी गीतातून केलेली आहे.

२) पौराणिक संदर्भाची ओवीगीते :-

मराठी लोकगीतांवर पुराण वाङमयाचा प्रभाव पडलेला आहे. पुराणातील, महाकाव्यातील आदर्श व्यक्ती जीवनाविषयी तिला आत्यंतीक स्वरूपाचा आदर आहे. राम, लक्ष्मण, मारोती, श्रीकृष्ण यांच्या विषयी तिच्या मनात श्रध्देची भावना आहे. सीता, द्रौपदी, मंदोदरी, तारा, रूख्मिनी, सावित्री, चांगुना, तारामती, अहिल्या इत्यादी स्त्री जीवनाकडे पाहण्याची तिची दृष्टी श्रध्देची असून या व्यक्तीरेखांना ती आपल्या मनात अत्यंत पूजनीय असे स्थान देते आंतरीच्या या श्रध्देतूनच ती आपल्या ओवीगीतांतून चित्रण करतांना दितसे. अशीच एक ओवी पुढील प्रमाणे आहे.

'रामराया आला घाम, सीताबाई घाला वारा |
पती संगतीत प्रेमे वनवास कंठी सारा ||'

असे सहजस्फूर्ती आणि स्वाभाविक चित्रण हा ओवीगीतांचा एक महत्वाचा विशेष आहे. आपल्या जीवनातील सुख दु:खे, आपल्या श्रध्दा पुराणातील अशा व्यक्तीच्या माध्यमातून व्यक्त केल्या जातात. पुराणातील ज्या व्यक्ती ज्या घटना जी जीवनमूल्ये स्त्री मनावर ठसली, भावली त्यांचीच अभिव्यक्ती ओवी गीतांतून झालेली आहे. पुराणातील अशा अलौकीक व्यक्तीचे चित्रण करतांना लौकीत जीवनातील सुख दु:खाचा भाव त्यांच्या माध्यमातून व्यक्त करण्याची एक आगळी किमया या स्वरूपाच्या ओवीगीतातून केलेली आहे.

३) कौटुंबिक जीवनविषयक ओवीगीते :-

स्त्री ज्या कुटूंबात राहते, नांदते जेथे लहानाची मोठी होते त्या कुटूंबातील अनेक नातेसंबंध तिच्याशी जोडले जातात. कौटुंबिक नात्यातील ज्या संबंधीचे अत्यंत हळूवारपणे केलेले चित्रण ओवीगीताचा एक महत्वाचा विशेष आहे या स्वरूपाची प्रत्येक ओवी अंतरीच्या भावनेने ओथंबलेली आहे. या प्रकारच्या ओवीगीतांतून आई-वडील, मावशी-आत्या, पती-पत्नी इत्यादी कौटुंबिक नात्यातील रेशीमगाठी उकलण्याचा भावपूर्ण प्रयत्न केलेला असतो. संसारातील सुख दु:खाचा उत्कट अविष्कारही या ओवीगीता विशेष सांगताना साने गुरूजी म्हणतात. 'ज्या वाङमयात स्त्रियांना आपला आत्मा संपूर्णपणे झालेला आहे असे वाङमय म्हणजे ओवी वाङमय जात्यावर दळतांना, पाळणा हलवितांना, मुलांना थोपटतांना, झोपाळ्यावर झोके घेतांना या ओव्या सहजस्फुर्त रचल्या गेल्या आहेत. या ओव्यातील अकृत्रिम सहृदयता अपूर्ण आहे या ओव्यात वत्सलतेचा सिंधू आहे.'

स्त्री जीवनातील कौटूंबिक नात्याचा भाव व्यक्त करणारी पुढील ओवी उदाहरणादाखल देता येईल.

लुगड घेतलं रेशीम जरीकाठी |
हावशा बंधुराया, मनी डोरल चिंचपेटी ||

ओवी गीतांतील अशा ओव्या म्हणजे एक भाव चित्रचं होय. जिव्हाळ्याचे म्हणून जे जे असेल ते ते आंतरीच्या भावनेतून स्त्रियांनी कधी जात्यावर दळतांना, निवडण-टिपणं करतांना आपल्या ओव्यातून व्यक्त केले आहे. ओवीगीतांचा आणि जात्याचा अत्यंत जवळचा संबंध आहे. जात्याच्या गतीबरोबरच स्त्री मनातील ओवी अनेक भाव घेऊन व्यक्त होते. मराठी लोकगीतात ओवी गीतांची संख्या विपुल आहे. स्त्री मनातील भाव समर्थपणे व्यक्त करण्याचे सामर्थ्य ओवीच्या भाषेत आहे.

फेरीवरची लोकगीते :-

सण, उत्सव, विधी प्रसंगी गाणी म्हणण्याची प्रथा स्त्री जीवनात आजही रूढ आहे. विशेषत: नागपंचमी, वटसावित्री पोर्णिमा, संक्रांत, मंगळगौरी या सारख्या सण उत्सवाच्या प्रसंगी मराठी स्त्रीया या गाणी गातात.

निष्कर्ष :-

मराठी लोकगीतातील स्त्री गीते म्हणजे स्त्रियांनी जतन करून ठेवलेला अमूल्य खजिना आहे. स्त्री गीतांतून स्त्री जीवनाचे विविध पैलू सामाजिक जीवनाच्या पार्श्वभूमीने व्यक्त होतात. स्त्रीयांची ही गाणी वाङमयाच्या आस्वादाच्या दृष्टीने उत्कट भावानुभव देणारी आहेत. स्त्री गीतांचा सामाजिकदृष्ट्या अभ्यास होणे गरजेचे आहे. स्त्री गीते म्हणजे काव्यगंगा ही भावगंगा आपल्या दोन्ही तीरावर नांदत असलेल्या लोकजीवनाला आनंद देत देत अनेक वाटा वळणे घेत घेत नव्या जुन्यांचा स्विकार करीत प्राचीन काळापासून अखंडपणे वाहत आलेली आहे. मराठी मनाचे, मराठी जीवनाचे आणि मराठी लोक संस्कृतीचे विविधरंगी सुंदर चित्र आपल्याला मराठी लोक गीतांत पाहावयास मिळते. एक प्रकारचा जीवंतपणा, एक प्रकारचे चैतन्य या लोकगीतांतून प्रत्ययास येते.

ग्रंथसुची :-

१) डॉ.दुर्गा भागवत लोकसाहित्याची रूपरेषा
२) अनुसया लिमये, घाटावरील श्रमीकांची लोकगीते
३) तत्रैव
४) कमलाबाई देशपांडे अपौरूषेय वाङमय
५) डॉ.प्रभाक मांडे लोकसाहित्याचे स्वरूप
६) अनुसया लिमये, घाटावरील श्रमीकांची लोकगीते
७) लोकसाहित्य (संकल्पना स्वरूप) डॉ.व्यवहारे

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Tiger Loss Cases in Human Dominated Landscapes, a State wise Analysis of Panthera tigris Mortality Cases in India.

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Abstract

Current situation of tiger census is good but increasing population of tigers in India itself a key concern for its conservation and management in human-dominated landscapes imparting a high frequency of conflict across the country .The best known highland of central India is a benevolent illustration of incidents at regular basis in terms of human loss and injured big cats or farmers etc. Population dynamics of tigers thus depends on the quality of good and poor habitats. The local reproductive success in the good habitats (Source area/core-critical tiger habitat) exceeds local mortality. The outer poor habitats with less productivity than local mortality are sink" areas (buffer/connecting corridors in a tiger landscape).For this study secondary data of tiger mortality from 2012-2019 cases were taken from official site of NTCA. The data depicts 52.4% of mortality cases were inside the park while 33.87% cases were recorded outside the boundary of tiger reserves.For present study questionnaire survey also conducted in some human dominated area around the reserve forest to know the movement pattern of tigers and threats too.

Keywords: Tiger mortality, seizures, population dynamics, habitat suitability etc.

Introduction:

Creation of NTCA (National Tiger Conservation Authority) making provision for raising, arming and deploying the special Tiger Protection Force, refinement of tiger assessment, active management involving local people, supporting buffer areas to address man-tiger interface issues, creating inviolate space for tigers, and the like (**Rajesh Gopal 2015**).Due to such concerted efforts, at present India alone has the maximum number of wild tiger (2967 as per Tiger Census 2020). Increasing numbers of tigers and carrying capacity of habitat suitability is a big challenge and an ecology-based method for defining priorities for large mammals' conservation is tough task (**Wikramanayake, Alan, Robison, 1998**). On the other hand genetic viability of source population must be maintained along with carrying capacity of the wild habitat for wild tiger in India (**Yumnam B, Jhala YB, Qureshi Q et.al 2014**). Impact of habitat fragmentation on the demography of population is also a key factor in conservation strategies (**Umapathy, G.,Hussain, Shaik et.al 2011**). S.Kumar (2015), had worked on habitat fragmentation lending to loss of gene flow from source of population of tiger, a study of Corbett reference to corridor, Ramnagar Uttarakhand, India. Present study imparts the tiger mortality cases recorded by the NTCA, Data analysis showed the location of tiger mortality i.e. inside the tiger reserve or outside the reserve and some cases of seizure were also included.

Materials & Methods:

Secondary Data of tiger mortality from 2012 to 2019 were taken from government official web site of NTCA (National Tiger Conservation Authority) and analyzed it to get the conclusion and questionnaire survey regarding movement pattern of tiger in communities have been conducted nearby the tiger reserves and reserve forest division which are having high frequencies of human-tiger conflicts like Maharashtra i.e. Tehsil Bramphuri, Gondipri, Kurkheda, Amori,Deori, Sindhi Wahi, Mul, Pandherkawada, Pusad,Akot etc.

Result & Discussion:

The data depicted that from 2012 to 2019 tiger mortality cases were officially recorded by the government and displayed on its official web link. Data showed that in out of total 750 cases, 393 cases were recorded from inside the reserve and 254 cases were belongs to outside of the reserve area. While 103 cases were seizure by other ways.

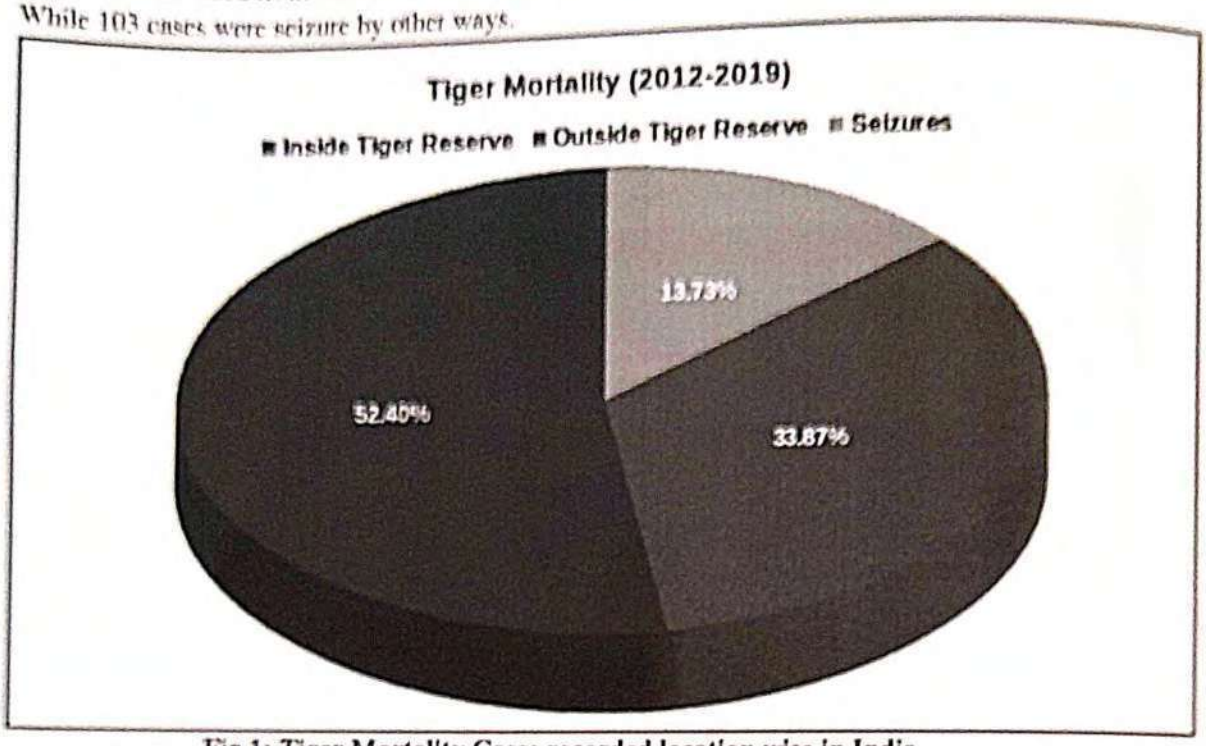

Fig 1: Tiger Mortality Cases recorded location wise in India

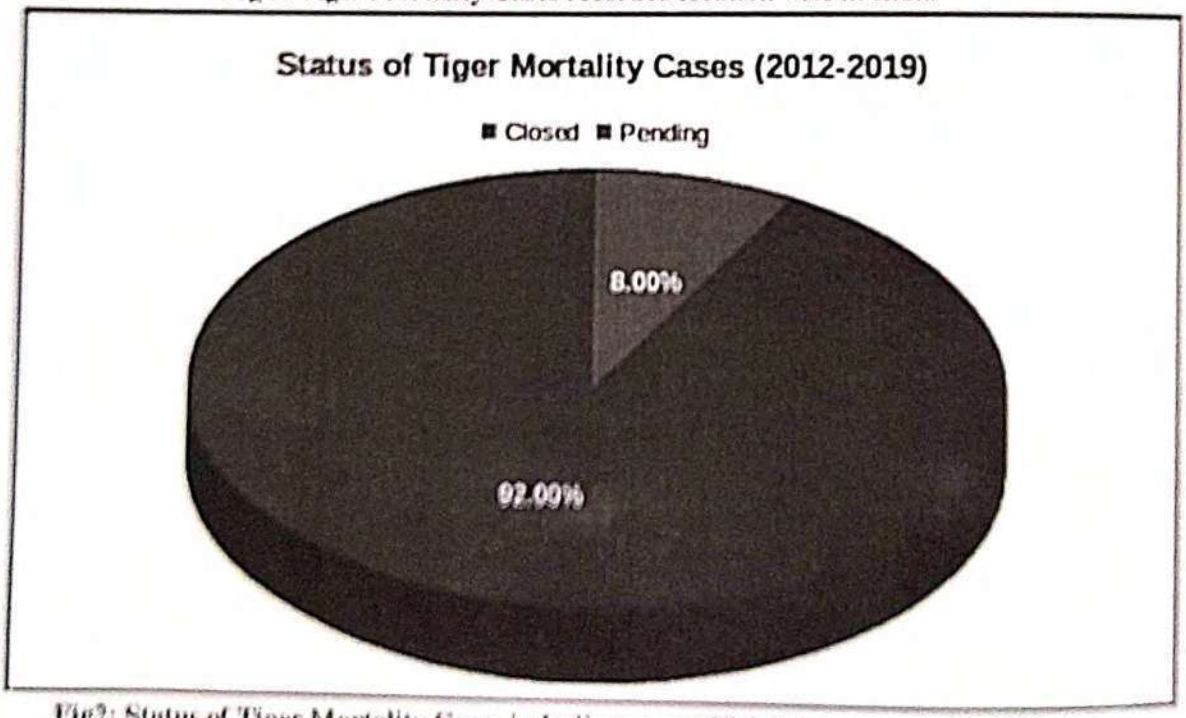

Fig2: Status of Tiger Mortality Cases in India as per official data, *Source- NTCA*

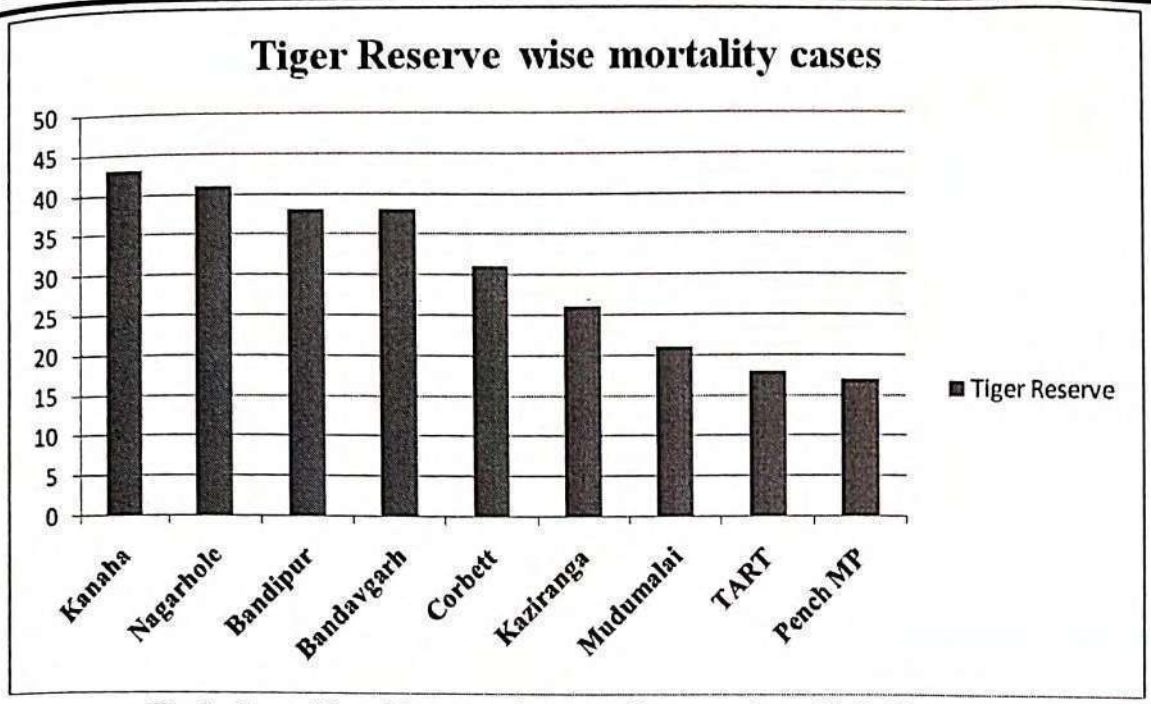

Fig 3: Some Tiger Reserve wise mortality cases from 2012-19

Figure 3 imparts the result and recorded mortality cases of some tiger reserve wise in India like Kanha (43), Nagahole (41) , Bandipur(38), Bandavgarh (38), Corbett (31), Kaziranga (26), Mudumalai(21),TART(18),Pench-MP(17) in 2012-19.

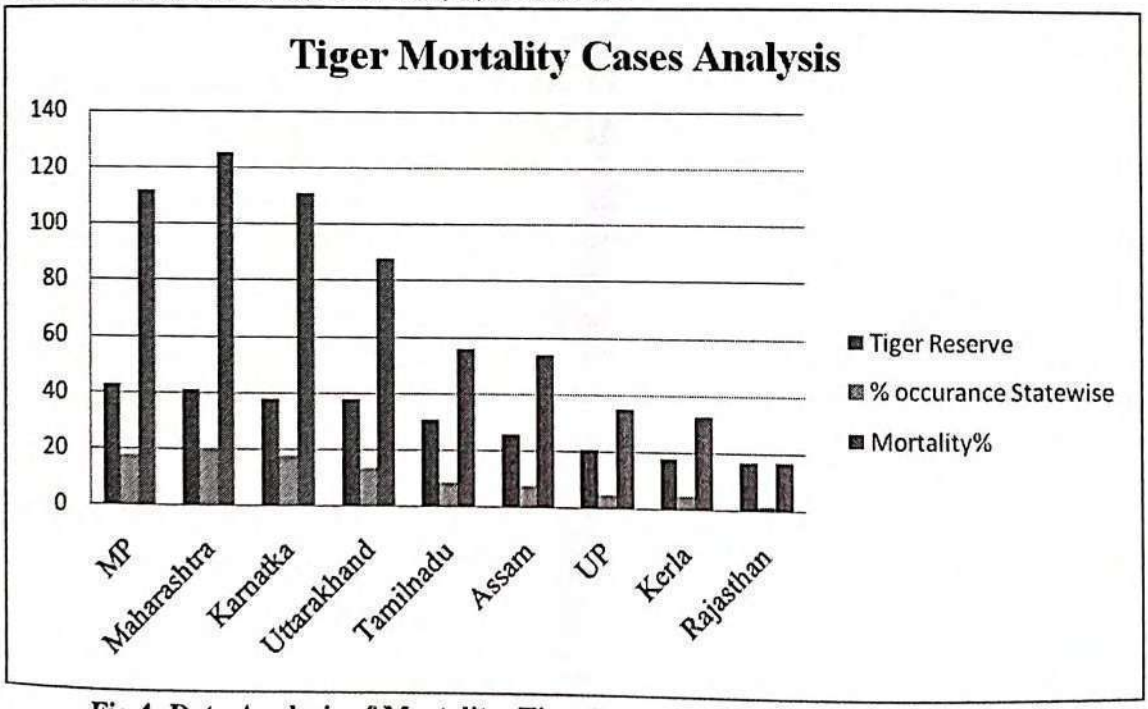

Fig.4: Data Analysis of Mortality, Tiger Reserve wise, % occurrence & State wise (2012-19)

Fig 4 depicted the **Maharashtra** is having the highest number of mortality (20&), MP (18%) ,Karnataka(18%),Uttarakhand(14%),Tamilnadu(9%),Assam(8%),UP(5%),Kerla(5%)followed by the Rajasthan(2%). While on the other hand wildlife protection society of India (wpsi) showed a current data on wpsi-india.org/new of tiger and leopard mortality cases in **2021** depicted high potentiality along with poaching and seizure too. Official data shows the seizures, natural death and poaching too.On the othe hand the movement pattern in communities by any means leads a situation of conflict

or thenegative interactions which is always trouble some and challenging issues for mitigation and conservations too.

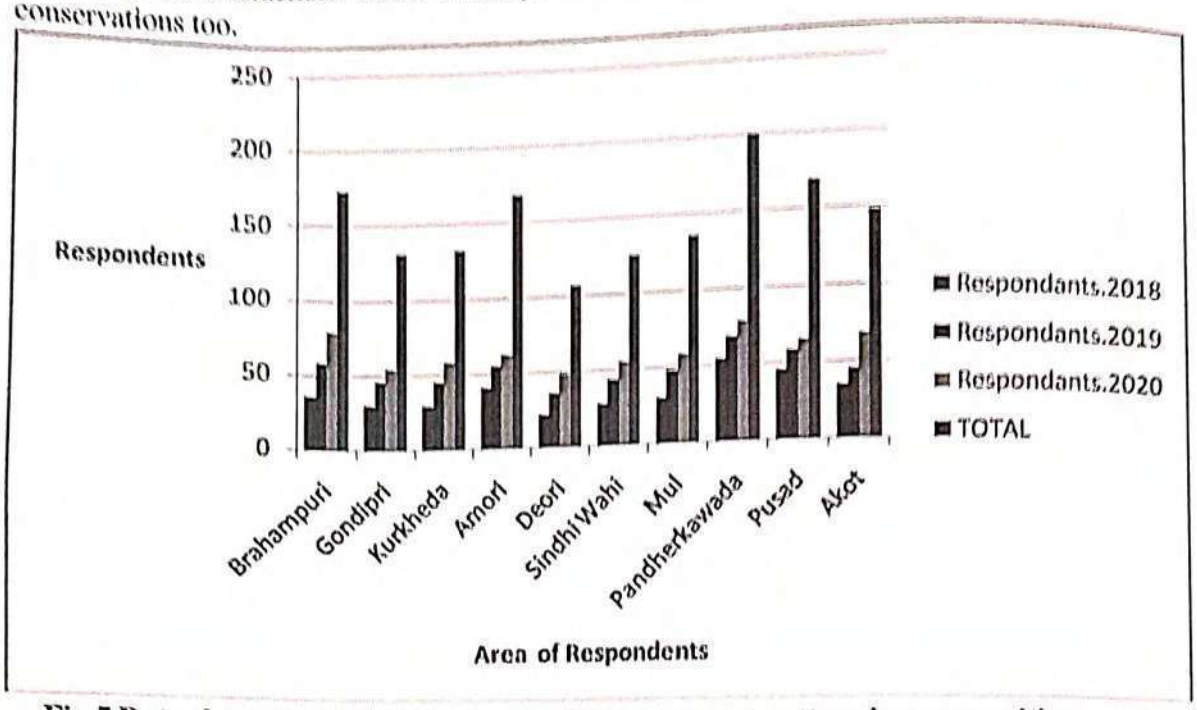

Fig.5 Data shows the Respondants regarding movement pattern in communities

Overall the questionire survey depicts a severe movement of big cats in the commmunities and livestock predation too. So the movement in the human dominated landscapes are not sound for both the big cats and human beings by all means. Retaliatory killing , poisoning ,electrocution in one hand while on the other hand incidents of death and human loss leads or develops the negative attitude towards big cats and provoke many type of retaliatory action against a the wild life

Conclusion:

Finally the study showed high frequencies of mortality cases and poaching too but the government efforts imparts the reduction of cases in across the country but in recent years the number of cases are in vogues, perhaps the current situation of pandemic catastrophic in India gives a opportunity to illegal activities or poaching while on the other hand sporadic news from across the country always alarming the carrying capacity and human-tiger conflict or negative interaction too regularly. Area like highland of central India is always in prime for conflict issues due to some socio-political cum geographical conditions and more important factors the movement pattern of tigers in the communities for livestock predation or accidental cases poachings etc. We have to rethink the all boundaries of mitigation and conservations skills to resolve the current scenario. Fragmentation of habitat, carrying capacity and corridores connectivity are some of importnt issues.

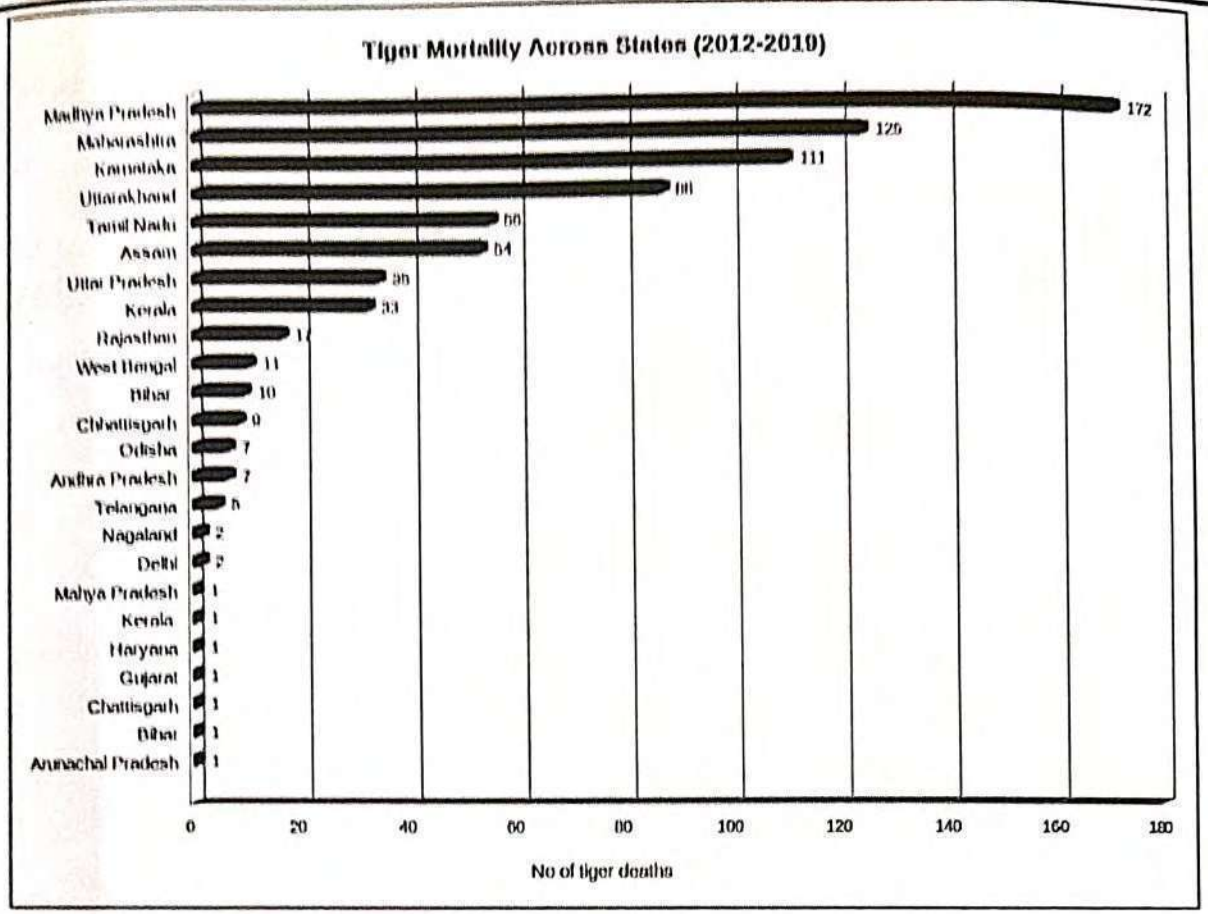

Fig.5: State wise figure of Tiger Mortality. ***Source: www.ntca.gov.in***

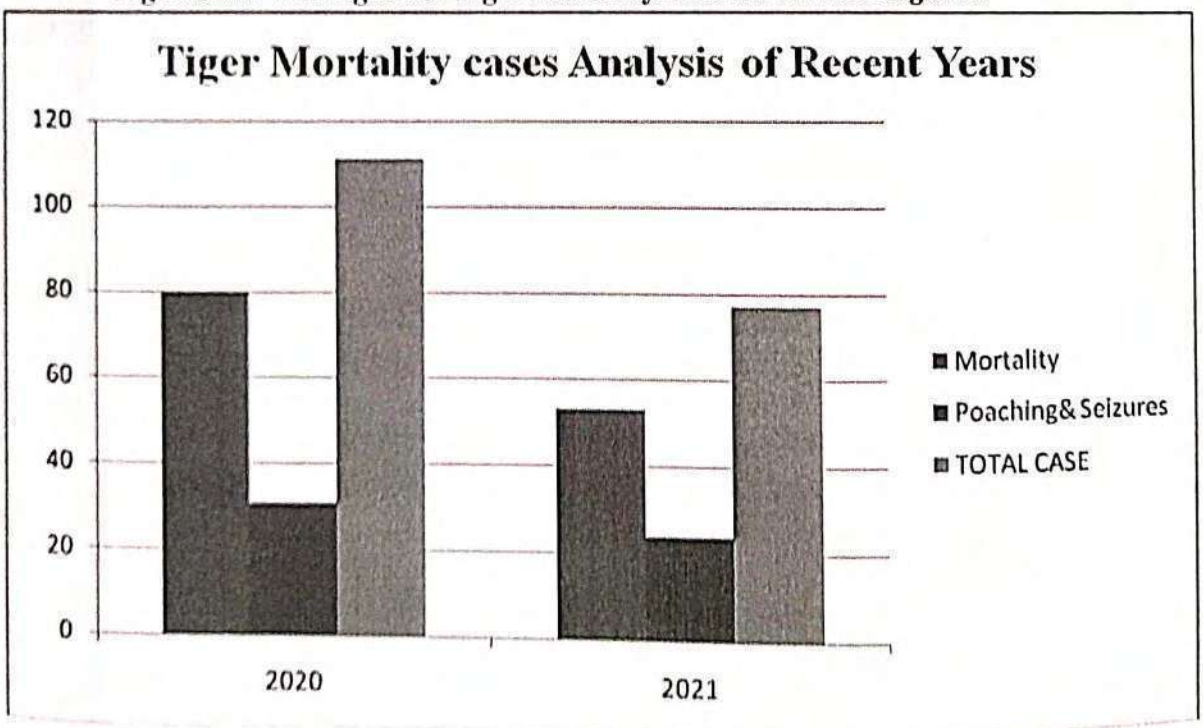

Fig.6: Tiger Mortality cases in 2020-2021. ***Source: wpsi-india.org***

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समाज सुधारकांचे शिक्षणविषयक विचार

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प्रस्तावना :

प्रत्येक शतकामध्ये समाजाला सुयोग्य वळण लावण्यासाठी समाज जीवनात महत्वपूर्ण बदल घडविण्यासाठी एखादा क्रांतीसूर्य जन्माला येतो, या विधानाची प्रचिती देणारा क्रांतीसूर्य म्हणजे ज्योतीराव फुले. एकोणविसाव्या शतकात महाराष्ट्रातील अग्रस्थानी असणारे समाज सुधारक देह म्हणजे महात्मा ज्योतीराव फुले.

पददलितांच्या उध्दारासाठी, स्त्री शिक्षणासाठी समानता व सत्यासाठी झिजविणाऱ्या महात्मा ज्योतीराव फुले यांचा जन्म सातारा जिल्हयातील कटगुण गावी 20 फेब्रुवारी 1827 रोजी झाला. वडील गोविंदराव गो-हे, फुलमाळयाच्या धंद्यावरुन त्यांचे आडनाव फुले झाले. 1848 साली पुण्यातील भिडे वाडयात मुलींसाठी पहिली शाळा ज्योतीबांनी सुरु केली. आपली पत्नी सावित्रीबाई यांना शिकवुन शिक्षीकेचे काम करण्यास प्रोत्साहन दिले.

ज्योतीबा शाळेतील गरिब मुलांना पाटया, पेन्सीली, पुस्तके, प्रसंगी कपडे पुरवित असत. स्त्री शिक्षणानंतर ज्योतीबांनी अस्पृश्योद्वाराचे. कार्य हाती घेऊन गुलामगिरी ग्रंथ लिहून दलीतांच्या अन्यायास वाचा फोडली. सार्वत्रिक शिक्षणावर भर देऊन ज्योतीबांनी दिनबंधु वृत्तपत्र सुरु केले. 1873 साली त्यांनी सत्यशोधक समाजाची स्थापना केली. आपल्या लिखानामधून, पोवाडयामधुन, व्याख्यानामधून स्त्रीयांच्या, दलीतांच्या, शेतकऱ्याच्या कामगारांच्या अन्यायाला वाचा फोडली. मनुष्य जातीने श्रेष्ठ ठरत नसुन गुणांनी ठरतो, इश्वर सर्वव्यापी असुन सर्व त्याचीच लेकरे आहेत असे त्यांनी सांगीतले. इंग्लंडचा राजपुत्र एकदा पुण्यास आला होता. तेव्हा त्याच्या सभेस ज्योतीबा शेतकऱ्यांच्याच पोशाखात गेले. देशातील गरिबांचे वर्णन करुन आम्हाला चांगले शिक्षण देऊन गरीबी दुर करा असे आपल्या तडफदार भाषणातुन त्यांना सांगीतले. अशा या थोर समाज सेवकाचा महात्मा पदवी देऊन लोकांना गौरव केला.

ज्योतीराव फुले यांचे शिक्षण विषयक कार्य :

समाजातील अनिष्ट प्रवृत्ती नष्ट करायच्या असतील तर सर्वप्रथम समाजाच्या प्रत्येक स्तरापर्यंत शिक्षण पोहोचले पाहिजे, ही ज्योतीरावांची विचारधारा होती. शेतकऱ्यांचा आसूड या पुस्तकाच्या उपोद्घातात ते म्हणतात,

विद्येविना मति गेली, मतिविना निती गेली,
नितीविना गती गेली, गती विना वित्त गेले,
वित्तविना शुद्र खचले, इतके अनर्थ एका अविद्येने केले.

स्त्रीया व शुद्रांना शिक्षण मिळाले पाहिजे, तेव्हाच त्यांचे दैन्य नाहीसे होईल असा त्यांना ठाम विश्वास होता. म्हणुनच सदाशिवराव गोवंडे, सदाशिवराव हाटे, परांजपे, मोरोपंत वाळवेकर यासारख्या मित्रमंडळीशी त्यांनी विचारविनीमय केला आणि सन 1848 साली बुधवार पेठेतील भिडेवाडा येथे मुलींची पहिली शाळा सुरु झाली. स्त्रियांना विशेषतः कनिष्ठ वर्गातील स्त्रियांना शिक्षणाचा अधिकार नाही, या हजारो वर्षाच्या रुढीवर ज्योतीरावांनी घणाघाती घाव घातले. स्त्रिने शिक्षण घेणे म्हणजे भ्रष्टाचार ! स्त्रि

शिक्षणामुळे सुखाचे वाटोळे होऊन स्त्रीला अकाली वैधव्य प्राप्त होते. अशा प्रकारच्या अंधश्रध्दांनी बरबटलेल्या समाजाकडून ज्योतीरावांना कडाडून विरोध झाला. पण ज्योतीराव कळवळून सांगत होते,

आता तरी तुम्ही मागे घेऊ नका । धिक्कारुन टाका मनुस्मृता ।।
विद्या शिकताच पावाल ते सुख । घ्यावा माझा लेख ज्योती म्हणे।।

मुलींच्या या शाळेत शिकविण्याकरिता अध्यापिका पाहिजे, याराठी त्यांनी आपल्या पत्नीला सावित्रीबाईंना शिकविले. अत्यंत साध्या, प्रेमळ, सहनशिल व पतिपारायण अशा सावित्रीबाईंनी ज्योतीरावांच्या स्त्रि शिक्षण विषयक कार्यात मनापासुन भाग घेतला. शिक्षीकेला शाळेत जातांना शेणाचे गोळे, दगड मारले गेले. त्यामुळे होणाऱ्या वेदनापेक्षा स्त्री शिक्षणाचे मोल अधिक होते. सावित्रीबाईच्या प्रेरक आधारामुळे आणि मित्रमंडळींच्या खंबीर सहकार्यामुळे 3 जुलै 1851 मध्ये चिपळुनकर वाड्यात त्यांनी शाळा सुरु केली 17 सप्टेंबर 1851 मध्ये रास्ते वाडयात शाळेची स्थापना केली, तर 15 मार्च 1852 मध्ये वेताळ पेठेत शाळा सुरु झाली. विचारांना कृतीत उतरविण्यासाठी लागणारे उदंड धाडस ज्योतीरावामध्ये होते. त्यामुळेच मुलींच्या शाळेबरोबरच पुण्यामध्ये त्यांनी अस्पृश्यासाठी शाळा काढली. समाजाच्या शिक्षण पोहचविण्यासाठी सन 1955 मध्ये रात्र शाळेची स्थापना सर्व स्तरात केली. ज्योतीरावांचे हे क्रांतिकारी कर्मठ समाजाला पैलवणारे नव्हते. त्यांना खिळ घालण्यासाठी काही दृष्ट प्रवृत्तीच्या लोकांनी अघोरी मार्ग निवडला, ज्योतीरावांच्या घरी मारेकरी धाडले, पण सामाजीकता, बंधुतेचा वसा घेतलेल्या ज्योतीबांच्या तेजाने मारेकऱ्यांनी शस्त्रे टाकुन दिली. आणि निर्भयी ज्योतीरांवाना शरण गेले. परंपरेच्या जोखडात अडकलेल्या अंधश्रध्दाळु समाज ज्योतीरावांना विरोध करीत असला तरी इंग्रज सरकारने समाजाला गती देणाऱ्या नवि दिशा देणाऱ्या ज्योतीरावांच्या कार्याचा गौरव केला. 16 नोव्हेंबर 1852 मध्ये मेजर कॅन्डी यांच्या अध्यक्षतेखाली शिक्षण कार्याबद्दल सरकारी विद्या खात्याकडून त्यांचा सत्कार करण्यात आला.

समाजधुरंधर ज्योतीराव फुले :

समाजाच्या प्रगतीसाठी स्त्रिया व शूद्रांना शिक्षण देण्याबरोबरच इतर अनिष्ट सामाजिक प्रथांचे निर्मुलन आवश्यक आहे हे जाणून त्यादृष्टीने ज्योतीरावांचे कार्य सुरु झाले.

विधवा विवाह :

राजा राममोहन रॉय यांच्या प्रयत्नांनी सन 1821 मध्ये सतीची चाल कायद्याने बंद झाली. स्त्रीचे जीवंतपणी चितेवर जाणे यामुळे थांबले, तरी विधवेच्या जीवनात नेहमीच अत्याचाराची विटंबनेची चिंता रचली जायची. त्यात बिचारी होरपळून जायची, विधवेची विटंबना थांबावी म्हणून त्यांनी विधवा विवाहाला चालना दिली. 8 मार्च 1860 रोजी त्यांनी पहिला विधवा विवाह पुण्यात घडवून आणला. शेणवी समाजातील एका विधवा स्त्रिचा विवाह या समाजातील विधुराशी लावून दिला. स्त्री जीवनात क्रांती घडविणाऱ्या या घटनेमुळे त्यांच्यावर टिकेची झोड उठली, पण ते अविचलत राहिले, विधवांना अत्याचारांच्या मालिकेतून मुक्त करुन सुरक्षित जीवनाचा मार्ग त्यांनी प्राप्त करुन दिला.

केशवपन निषेध :

विधवा स्त्रिच्या डोक्यावरील सर्व केस कादून तिला विद्रुप करणाऱ्या निर्घुण रूढी विरुद्ध त्यांनी प्रचार केला न्हावी समाजामध्ये जागृती केली. याची परिणिती म्हणजे एप्रिल 1890 मध्ये मुंबईत न्हावी समाजाची सभा झाली. त्यात सुमारे पाचशे न्हावी समाजाची सभा झाली. त्यात सुमारे पाचशे न्हावी व्यावसायिकांनी केशवपनांचे काम करणार नाही, असे ठणकावून सांगीतले. ज्योतीरावांनी सांगीतलेल्या समाज परिवर्तनाचाच हा एक भाग आहे.

शिक्षणामुळे सुखाचे वाटोळे होऊन स्त्रीला अकाली वैधव्य प्राप्त होते. अशा प्रकारच्या अंधश्रध्दांनी बरबटलेल्या समाजाकडून ज्योतीरावांना कडाडून विरोध झाला. पण ज्योतीराव कळवळून सांगत होते,

आता तरी तुम्ही मागे घेऊ नका । शिक्काकरुन टाका मनुमता ।।
विद्या शिकताच पावाल ते सुख । घ्यावा माझा लेख ज्योती म्हणे।।

मुलींच्या या शाळेत शिकविण्याकरिता अध्यापिका पाहिजे, यासाठी त्यांनी आपल्या पत्नीला सावित्रीबाईंना शिकविले. अत्यंत साध्या, -प्रेमळ, सहनशिल व पतिपारायण अशा सावित्रीबाईंनी ज्योतीरावांच्या स्त्रि शिक्षण विषयक कार्यात मनापासुन भाग घेतला. शिक्षीकेला शाळेत जातांना शेणाचे गोळे, दगड मारले गेले. त्यामुळे होणाऱ्या वेदनापेक्षा स्त्री शिक्षणाचे मोल अधिक होते. सावित्रीबाईच्या प्रेरक आधारामुळे आणि मित्रमंडळींच्या खंबीर सहकार्यामुळे 3 जुलै 1851 मध्ये चिपळुनकर वाड्यात त्यांनी शाळा सुरु केली 17 सप्टेंबर 1851 मध्ये रास्ते वाडयात शाळेची स्थापना केली, तर 15 मार्च 1852 मध्ये वेताळ पेठेत शाळा सुरु झाली. विचारांना कृतीत उतरविण्यासाठी लागणारे उदंड धाडस ज्योतीरावामध्ये होते. त्यामुळेच मुलींच्या शाळेबरोबरच पुण्यामध्ये त्यांनी अस्पृश्यासाठी शाळा काढली. समाजाच्या शिक्षण पोहचविण्यासाठी सन 1955 मध्ये रात्र शाळेची स्थापना सर्व स्तरात केली. ज्योतीरावांचे हे क्रांतिकारी कर्मठ समाजाला पैलवणारे नव्हते. त्यांना खिळ घालण्यासाठी काही दृष्ट प्रवृत्तीच्या लोकांनी अघोरी मार्ग निवडला, ज्योतीरावांच्या घरी मारेकरी धाडले, पण सामाजीकता, बंधुतेचा वसा घेतलेल्या ज्योतीबांच्या तेजाने मारेकऱ्यांनी शस्त्रे टाकुन दिली. आणि निर्भयी ज्योतीरांवाना शरण गेले. परंपरेच्या जोखडात अडकलेल्या अंधश्रध्दाळु समाज ज्योतीरावांना विरोध करीत असला तरी इंग्रज सरकारने समाजाला गती देणाऱ्या नवि दिशा देणाऱ्या ज्योतीरावांच्या कार्याचा गौरव केला. 16 नोव्हेंबर 1852 मध्ये मेजर कॅन्डी यांच्या अध्यक्षतेखाली शिक्षण कार्याबद्दल सरकारी विद्या खात्याकडून त्यांचा सत्कार करण्यात आला.

समाजधुरंधर ज्योतीराव फुले :

समाजाच्या प्रगतीसाठी स्त्रिया व शूद्रांना शिक्षण देण्याबरोबरच इतर अनिष्ट सामाजिक प्रथांचे निर्मुलन आवश्यक आहे हे जाणून त्याद्दष्टीने ज्योतीरावांचे कार्य सुरु झाले.

विधवा विवाह :

राजा राममोहन रॉय यांच्या प्रयत्नांनी सन 1821 मध्ये सतीची चाल कायद्याने बंद झाली. स्त्रीचे जीवंतपणी चितेवर जाणे यामुळे थांबले, तरी विधवेच्या जीवनात नेहमीच अत्याचाराची विटंबनेची चिता रचली जायची. त्यात बिचारी होरपळून जायची, विधवेची विटंबना थांबावी म्हणून त्यांनी विधवा विवाहाला चालना दिली. ८ मार्च 1860 रोजी त्यांनी पहिला विधवा विवाह पुण्यात घडवून आणला. शेणवी समाजातील एका विधवा स्त्रिचा विवाह या समाजातील विधुराशी लावून दिला. स्त्री जीवनात क्रांती घडविणाऱ्या या घटनेमुळे त्यांच्यावर टिकेची झोड उठली. पण ते अविचलत राहिले. विधवांना अत्याचारांच्या मालिकेतून मुक्त करुन सुरक्षित जीवनाचा मार्ग त्यांनी प्राप्त करून दिला.

केशवपन निषेध :

विधवा स्त्रिच्या डोक्यावरील सर्व केस काढून तिला विद्रुप करणाऱ्या निर्घुण रुढी विरुद्ध त्यांनी प्रचार केला न्हावी समाजामध्ये जागृती केली. याची परिणिती म्हणजे एप्रिल 1890 मध्ये मुंबईत न्हावी समाजाची सभा झाली. त्यात सुमारे पाचशे न्हावी समाजाची सभा झाली. त्यात सुमारे पाचशे न्हावी व्यावसायिकांनी केशवपनांचे काम करणार नाही, असे ठणकावून सांगीतले. ज्योतीरावांनी सांगीतलेल्या समाज परिवर्तनाचाच हा एक भाग आहे.

बालहत्या प्रतिबंध :

काही वेळा विधवांना अत्याचार सोशीत मातृत्वाला सामोरे जावे लागे. कलंकिता हा बोल लागू नये म्हणून भ्रूणहत्येचे प्रकार घडत असतात. मूल जन्माला आले तर अनौरस संतती म्हणून हिणवले जात असते. हि दुरावस्था टाळण्यासाठी ज्योतीरावांनी सावित्रीबाईंच्या मदतीने आपल्या घरातच बालहत्या प्रतीबंधक गृह स्थापन केले. विधवांची प्रसूती आणि निराधार बालकांसाठी अनाथाश्रम असे त्यांचे स्वरूप होते.

अनौरस संततीला मान्यता :

विधवेच्या मुलाला अनौरस संतती म्हणून त्यांची समाजात अवहेलना केली जात असते. अशा संततीला निर्भय, निकोप वातावरण मिळावे म्हणून त्यांनी प्रयत्न केले. या प्रयत्नांना कृतीची जोड दिली. त्यांनी व सावित्रीबाईंनी अनाथ बालकाश्रमातील यशवंत ला दत्तक घेतले. याला माया ममत्व, सुसंस्कार आणि शिक्षणाचा लाभ झाला. हाच त्यांचा पुत्र पुढे डॉक्टर झाला.

द्विभार्याप्रतिबंध :

पुरुषाने एकापेक्षा अनेक लग्न केल्याने स्त्रीला दुःसह स्थितीला सामारे जावे लागे. अशा परिस्थितीत त्यांनी द्विभार्याप्रतिबंधक चळवळ सुरु केली.

अस्पृश्यांसाठी पाणवठा खुला :

आधी केले. मग सांगितले ही वृत्ती असल्याने ज्योतीरावांनी सन 1868 मध्ये आपल्या घरचा हौदा अस्पृश्यांना पाणी पिण्यासाठी खुला केला. त्याकाळी पाणी या मुलभूत गरजेसाठीही भेदभावामुळे समाजातल्या कनिष्ठ वर्गाला विलक्षण त्रासाला सामोरे जावे लागत होते.

कर्मकांडाऐवजी समाजोपयोगी उपक्रम :

मृत्युनंतर वडीलांच्या बाराव्याच्या वेळी कुठल्याही कर्मकांडात न अडकता ज्योतीराव व त्यांचा भाऊ राजाराम यांनी वडीलांच्या स्मरणार्थ आंधळयापांगळ्यांना जेवण घातले. गरीब मुलांना पाटी-पेन्सीली दिल्या. वडीलांच्या स्मृतीसाठी हा पायंडा त्यांनी सुमारे दिडशे वर्षापूर्वी घातला. समाजापुढे आदर्श ठेवला.

शेतकरी, कामकरी यांचे ज्योतीराव :

शेतकरी आणि कामकरी यांच्या दुःखाचे आणि दारिद्र्याचे निवारण करण्यासाठी चळवळ उभारणारे पहिले पुढारी अशा शब्दात धनंजय किर यांनी ज्योतीरांवाचा गौरव केला आहे. शेतकऱ्यांचा आसुड या पुस्तकात त्यांनी शेतकऱ्यांच्या अवनत स्थितीचे चित्र रेखाटून त्यावर उपाय योजनाही सुचविली आहे. दुष्काळ विषयक विनंती पत्रक काढून त्यांनी मदतीचे आवाहन केले. त्यातुन दुष्काळग्रस्त शेतकऱ्यांविषयी असणारी आस्था अंतःकरणाला भिडते.

सत्यशोधक समाजाची स्थापना :

उच्चनीच भाव, स्त्रीदास्य, मूर्तीपुजा, कर्मकांड इ. गोष्टींचे उच्चाटन करून समताप्रधान समाज निर्माण करण्यासाठी व अंधश्रद्धेचे निर्मुलन करुन वैचारिक कांती करण्यासाठी त्यांनी सन 1873 मध्ये 'सत्यशोधक समाजाची स्थापना केली.

महात्मा ज्योतीरांवाचे वाङ्मय :

आपल्या शैक्षणिक, सामाजिक विचारांच्या प्रसारासाठी तसेच आपल्या कार्याला बळकटी यावी, विचार सर्वदूर पसरावेत या हेतूने ज्योतीरावानी गुलामगिरी, शेतकऱ्यांचा आसुड इ. पुस्तके तृतीय रत्न हे नाटक, पोवाडे, अखंडादी काव्यरचना केली.

अखंडादी काव्यरचना व त्यातील मूल्यविचार :

ज्योतीराव आपल्या अभंगाना अखंड असे संबोधतात. त्यांची बरीचशी स्फुट रचना अभंग वृत्तात आहे. मात्र मानवता, सद्विवेक, सदाचार, समता यातून सार्वजनिक सत्य सांगणारा आपला वेगळा आशय स्पष्ट व्हावा, म्हणून वेगळीक सुचविणारे अखंड असे अभिधान त्यांनी योजिलेले दिसते. अखंडमधून काही मुल्ये व्यक्त होतात. उदा.

*मानवाचा धर्म एकच, धर्मराज्य भेद मानवा नसावे।। सत्याने वर्तावे ।। ईशासाठी ।।

*स्त्री पुरुष समानता :- स्त्री पुरुषांसाठी शाळा त्या घालाव्या । विद्या शिकवाव्या ।। भेद नाही ।।

*श्रमप्रतिष्ठा जगाच्या कल्याणा देह कष्टवावा । कारणी लावावा । सत्यासाठी ।।

*सौजन्यशीलता - परा । लाभ होता संतोष मानीतो । साहय देतो घेतो । सदगुणांचे।।

*सद्विवेक - दृढ मनी धरी सद्विवेकास ।। तेच संतानास ।। सुख देई ।।

एकंदरीत, महाराष्ट्रातील समाज सुधारकांचे अग्रणी असणाऱ्या महात्मा ज्योतीराव फुले यांचे विचार, त्यांचे आजही दिशादर्शक असे आहे.

सत्य धर्माचीया वाट । जोती दाविली धोपट ।।
अवघे विष्व आपुले घर । सत्य हाची परमेश्वर ।।
सत्याची धरा कास । ज्योतीबाची आण तुम्हास ।।
सोडा तुम्ही वर्ण धर्म । जातीभेद हे पापकर्म ।।
शिकवा विद्या लहानथोर । नाश पावेल घोर अंधार ।।

सारांश :

महाराष्ट्र ही केवळ मर्दाची व संताचीच भूमी नसुन ती विचारवंत व समाज सुधारकांचीही भूमी आहे. अशा या महाराष्ट्रात पेशवाईच्या अस्तानंतर जे थोर विचारवंत होऊन गेलेत त्यांच्यात महात्मा ज्योतीराव फुले यांचे स्थान निःसंशय श्रेष्ठ आहे. महाराष्ट्रात इंग्रजी राजवट स्थिरावल्यानंतरही आधुनिक शिक्षणाची दारे केवळ वरीष्ठ समाजाच्या वस्तीतच उघडत होती. बहुजन समाजाच्या वस्तीत मात्र अजुनही अज्ञानाच्या काळोखाचा राबता होता. परिणामी भारतीय स्त्रि आणि अस्पृश्यादी बहुजन समाज अज्ञान व अंधश्रध्दांच्या डोहात अजुनही गटांगळया खात होता. शतकानुशतकापासून चालत आलेली बहुजन समाजाची ही दैन्यावस्था वरवरच्या मलमपट्टीने संपणार नव्हती. हजारो वर्षांचा हा रोग थातुरमातुर उपायांनी बरा होणे शक्य नव्हते. त्यासाठी आवश्यकता होती तो रोग समुळ नष्ट करणाऱ्या प्रभावी उपचारांची. महात्मा ज्योतीबा फुलेंच्या रुपाने महाराष्ट्रात एक असा निष्णात धन्वंतरी निपजला की त्याने या रोगाच्या मुळावरचा घाव घातला.

महात्मा ज्योतीबा फुले यांनी 24 सप्टेंबर 1873 रोजी पुणे येथे सत्यशोधक समाजाची स्थापना केली. सत्यशोधक समाजाच्या कार्यकत्यांनी बहुजन समाजात शिक्षणाचा प्रसार केला. शिक्षण घेऊ इच्छिणाऱ्या गरीब विद्यार्थ्यांसाठी शिष्यवृत्ती उपलब्ध करुन दिली. अशा प्रकारे समाजामध्ये शिक्षण विषयक विचार रुजविण्याचे कार्य महात्मा ज्योतीबा फुले यांनी केले.

संदर्भ सूची :

अनसुया कुंभार, त्रिवार वंदन तुम्हा, लातुर : विद्याभारती प्रकाशन.
डॉ. अशोक नाईकवाडे, युगप्रवर्तक महात्मा फुले, गौरव ग्रंथ.
मदन माडींकर, इतिहास, मुंबई : हिमालया पब्लिशिंग हाऊस.
उत्तमराव पाटील, ज्योतीपर्व, पृ. 19.

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मानवाच्या जीवनात समतोल आहाराचे महत्त्व

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प्रस्तावना :—

मानवी शरीराचा व्यापार हा प्रामुख्याने अन्नावर अवलंबून असतो. अन्न ही मानवी जीवनाचे अस्तित्व टिकविण्यास आवश्यक अशी प्राथमिक गरज आहे. शरीराची वाढ होणे, झिज भरुन काढणे, उष्णता निर्मिती, कार्यशक्ती हे सर्व अन्नामुळे घडून येते. त्यामुळे आहारात घेतलेले अन्न पोषणदृष्टया समतोल असायला पाहिजे.

समतोल आहार म्हणजे शरीराला आवश्यक असणारे पोषकतत्वे त्या व्यक्तीच्या वयानुसार शरीर स्थितीनुसार, कार्यानुसार तसेचं प्राप्त भौगोलिक परिस्थितीत गरजेनुसार पाहिजे त्या—त्या आहारात कमी कालावधीकरिता शरीर पोषणाच्या भविष्याकरिता तरतूद असणे अशा आहाराला समतोल आहार म्हणता येईल.

मानवाला बऱ्याच जबाबदाऱ्या पार पाडाव्या लागतात. ती मग स्त्री असो किंवा पुरुष.

स्त्रियांच्या बाबतीत पाहिले असता आपण म्हणतो की, स्त्री म्हणजे खरे तर गृहकृतदक्ष महिला, स्त्री ही घरातच असणारी, घरकामे करणारी, करवून घेणारी, मुलांच्या शाळा, कॉलेजच्या वेळा सांभाळणारी, सगळयांचे जेवण, खाणे बनविणारी, पतीराज कामावरुन घरी आले की, त्याच हातात गरमागरम चहा, नास्ता देणारी फक्त घर, घर आणि घरातच असणारी परिस्थितीशी तडजोड करुन निमुटपणे जगणारी, जो काय संघर्ष असेल तो स्वत:शी करणारी तोही मनातच/प्रत्येकाच्या गरजा पुरवताना तिच्या नाकी नऊ येते आणि हे सर्व करीत असताना तिला प्रत्येकाची गर्जी सांभाळावी लागते. येते आणि हे सर्व करीत असताना तिला प्रत्येकाची मर्जी सांभाळावी लागते. त्यामध्ये तिची परिस्थिती अशी होऊन जाते की सोडल तर धावते आणि पकडलं तर चावते. सगळयांचे मन सांभाळताना ती नेहमीच स्वत:कडे दुर्लक्ष करीत असते. स्त्री हीच आरोग्याचा केंद्रबिंदु माणून तिची लहाणपणापासून अखेरपर्यंत जोपासना केली तरी समाजाचा काय तर देशाच्या आरोग्याची पातळी निश्चित उंचावेल. स्त्री ही कुटुंबाचा आहार ठरते. तयार करणे, सर्वांना देते. अखेरपर्यंत संसाराचा गाढा ओढते. स्त्री हा समाजाचा आवश्यक घटक आहे. आजकाल त्यात नोकरी करणाऱ्या स्त्रियांचा आकडा वाढत चाललाय त्याचप्रमाणे पुरुषाची सुध्दा घर, नोकरी आणि इतरही बाबतीत फार ओढताण होते. आणि धावपळीमुळे त्यांनासुध्दा त्याच्या आहाराकडे लक्ष द्यायला वेळ नसतो. म्हणून त्यांच्या गरजा व आरोग्याच्या पातळीवर प्रकाश टाकणे आणि त्यात सुधारणा आणणे आवश्यकच आहे.

उद्दिष्टे :—

१) मानवाचा आहार विषयक गैरसमज.
२) मानवाला आहार विषयक सवयी लावणे.
३) आरोग्य चांगले ठेवण्यासाठी आहार विषयक सल्ला.
४) समतोल आहाराच्या कमतरतेचे परिणाम
५) पोषक घटकविषयी विस्तृत माहिती

मानवाचा आहार विषयक गैरसमज :—

मानवाला आपले जीवन सक्षमक करण्यासाठी आहाराच्या माध्यमातून आवश्यक घटक मिळत असताना चुकीच्या पध्दतीने आहार घेतल्यामुळे आजारही निर्माण होतात. आहार कशा पध्दतीने असावा किती प्रमाणात असावा, नेमके काय किती आणि केव्हा घ्यायला पाहिजे आणि आपल्या कामानुसार, शक्तीनुसार कसा आहार घ्यायला पाहिजे, हे त्यांना माहित असायला पाहिजे. शरीर अवयवच्या क्रिया सुरळीत राहण्यासाठी आहार अत्यंत महत्त्वाचा आहे.

या बाबतीत मानवच स्वत:चा शत्रू आहे, असे म्हटले तर वावगे ठरणार नाही. बहुसंख्य लोकांचे खाणेपिणे अवेळी असते. आवडते ते खूप खायचे आणि जे आवश्यक आहे त्याकडे दुर्लक्ष करायचे. प्रत्येक वयात विशेषत:

तारुण्यात प्रवेश करताना, प्रौढावस्थेत आणि वृध्दावस्थेत आहाराबाबत मानवाने अतिशय जागरुक असले पाहिजे. त्यांचा आहार हा त्यांच्या वय, लिंग, कामाचे स्वरुप यावर अवलंबून असायला पाहिजे. परंतु सर्वसाधारण घरांमध्ये यावर विचारसुध्दा होत नाही. त्यामुळे मानवामध्ये विकार वाढत जातात. चुकीच्या आहारामुळे त्याच्या वजनावर परिणाम होत आहे. वनज वाढल्यामुळें तें डायटिंगकडे वळतात आणि त्यामुळे त्याचें वनज कमी होत नाही. उलट आहारातून मिळणाऱ्या पोषक मूल्यांना तें मुकतात आणि त्याचा परिणाम म्हणजें नवीन समस्या निर्माण होतात.

मानवाला आहार विषयक सवयी लावणे :—

- रोज सकाळी एक ग्लास गाईचे कोमट दूध प्यावे.
- नाचणीचे सत्व, खजूर, गव्हाची गुळ घालून पातळ खीर यापैकी पदार्थाचा नाश्ता करावा.
- स्त्रीयांनी पाळीच्या आधी एक आठवडा जड अन्न, रात्री उशिरा जेवण हे कटाक्षाने टाळावे त्यापेक्षा भरपूर तूप घालून मुगाची खिचडी, आमटी, भात, पातळ सूप असा आहार घ्यावा त्यामुळे पाळीचा त्रास होत नाही.
- तुपामध्ये तळून लसणाच्या दोन पाकळया खावयात.
- बहुबीज, अधिक असणारी फळे जसें पेरु, डाळींब इत्यादी खावीत.
- कडधान्ये, तूप, ताक, पालेभाज्या व फळे आवर्जुन खावी.

आरोग्य चांगले ठेवण्यासाठी आहार विषयक सल्ला :—

आपल्या शरीराचे ऐका —

रात्रीच्या जागरणामुळे प्रवासामुळे एखाद्या वेळेस शरीर व्यायामाला विरोध कसा असेल तर त्याचे ऐका त्या दिवशी तुम्ही योगा व प्राणायाम करु शकता.

भुकेच्या वेळेस नक्की खा :—

जेवण पुढे मागें ढकलून नको त्या वेळेस नको ते पदार्थ खाण्यापेक्षा जेवणाच्या वेळा पाळा. काहीच शक्य नसेल तर किमान डाळ, फुटाणे, शेंगदाणे यापैकी काहीही खावे, त्याबरोबरीने नोकरी करणाऱ्यांनी एखादी काकडी, गाजर बरोबर न्यावे.

पोट भरल्यावर खाणं थांबवावं :—

कितीही आवडीचा पदार्थ असला तरी एका वाढव्यानंतर थांबावो. त्यामुळे जास्तीचे उष्मांक पोटात जाणार नाहीत. कॉफी, चहा, थंड पेय यातून मिळणाऱ्या पोषक उष्मांकापेक्षा ताक, पन्हे, कोकम, सरबत, मिल्कशेक इत्यादी पेये घ्यावीत.

स्नायूंवर भर द्यावा :—

स्नायू वाढविण्यासाठी प्रथीनेयुक्त आहार व व्यायाम करावा. तरुणाईत वाढलेलें स्नायू वृध्दपणा लांबविण्यासाठी उपयोगी पडतात.

जास्त चरबीयुक्त पदार्थ टाळा :—

तळलेले पदार्थ, प्रक्रिया केलेले मटन इत्यादी पदार्थांवर निर्बंध घालावे. वाफवलेले, कमी तेलावर शिजवलेले ताजे पदार्थ आहारात जास्त असावे. व्यायाम शाळेत जाणे व त्याचप्रमाणे सायकल चालविणे, गड चढणे, पोहणे इत्यादी व्यायाम प्रकारांमध्ये तरुणाईने भाग घ्यावा.

- किमान दोन वेळा नास्ता व २ वेळा जेवण घ्या.
- जेवण गरम घ्यावे.
- वनज ससत तपासावे नवीन अन्न पदार्थाचा रोजच्या जेवणात वापर करावा.
- भाजीचे प्रमाण जास्त असावें. लाल, हिरव्या, पिवळया भाज्या आवर्जून खाव्यात.

समतोल आहाराच्या कमतरतेचे परिणाम :—

- डोळे, नखे, त्वचा, मूत्र, मल इत्यादींचा स्वाभाविक रंग बदलून त्यांना पिवळा, लाल किंवा किंचित हिरवा रंग येतो.
- शरीराचे तापमान वाढते किंवा आतून गरम वाटणे तोंडाची चव आंबट वा कडू होणे.
- चक्कर येणे, झोप कमी घेणे, डोळयासमोर अंधारी येणे, निस्तेजपणा येणे, त्वचा, डोळे, केस यांच्यावरची चकाकी कमी होणे, पचन मंदावणे योग्य पोषण न झाल्यामुळे मासिक पाळीचे विकार, डोळयाखालील वर्तुळे उमटणे.
- सौंदर्यविषयक समस्या
- सतत चहा घेतल्या गेल्यामुळे आम्लपित्ताची तक्रार, अल्सर, बध्दकोष्ठता, ॲनिनियासारखे विकार, पाठदुखी, सांधेदुखी

निष्कर्ष :—

आपल्या राजेच्या कामात सुधारणा करायला हवी. त्यांनी सकाळी भरपूर नास्ता घ्यावा. त्यात अंकुरीत कडधान्य गव्हाची सोजी, अंडी, थालीपीठ, इडली, दोसा घ्यावा जोडीला एक ग्लास दुध किंवा ताक व फळ घ्यावी. पोळी करताना सोयाबीनयुक्त पोळया किंवा नाचणीच पीठ घालून पोळी करावी. कणिक दुधात भिजवावी तसेच टमाटर, काकडी, मेथी, मुळा, गाजर घ्यावे तसेच फळेसुध्दा घ्यावे.

जास्तीत जास्त मिश्र पध्दतीचा वापर करून स्वयंपाक करावा. दाण्याचा कुट, तिळ कुट, खसखस हे पदार्थ वापरावे. तेल घाणीवरचे ताजे वापरने आवश्यक रिफाईन्ड तेल टाळावित. डाळ शिजवताना त्यात एक चमचा मेथी दाणे आवश्य घालावे. याप्रमाणे थोडेफार बदल केल्यास संतुलीत आहाराचे नियम पुष्कळ अंशी पाळले जातील. जास्तीत जास्त आहार घटक एका वेळी भोजनात असावे. कारण हे सर्व एका टिम प्रमाणे काम करतात. अशाप्रकारे मानवो आपल्या खाण्यापिण्याकडे लक्ष दिल्यास आरोग्य विषयक बऱ्याच समस्या कमी होतील आणि जीवन सुखकर होईल.

संदर्भ ग्रंथ :—

मानव विकास — लिना कांडलकर
पोषण आणि आहारशास्त्र — त्रिवेणी फरकाडे
सकाळ वृत्तपत्र गुरुवार, १६ जुलै २००९
सकाळ फॅमिली डॉक्टर १३ ऑगस्ट, २००४

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Review Article on Present and Future of Crypto Currencies

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Abstract:
Crypto currencies are the digital money. It has gain wide spread popularity among the new generations and techno-lovers. Crypto currency is encoded from the word encrypt, which is a technique famous for its security and safe handling of data. Crypto currency implied cryptography because of this element it is hard to duplicate it. It is entirely different from physical money. In the banking system, all records are stored in computers or papers. But in the crypto currencies are stored on the internet with the help of block chain technology. Bit coin, Ethereum, Dogecoin and many cryptos. Crypto currencies at present have a huge market capitalization, every nation on the planet deals with crypto currencies.

Keywords: Currencies, Banking System, Block chain Technology

1. Introduction:

Many business tycoons like Alon Musk, Jack Dressy openly supported crypto currencies. Many economists called it are a bubble that can burst at any time. It is one of the fastest modes of transferring currencies in the world; it uses peer-to-peer technology for the transition. It is not only the quickest route to transfer many but also a very low cost and convenient method for the money transfer. China has developed a firewall to stop the circulation of crypto currencies. India also in 2018 stopped all banks to do any transactions with the crypto-exchanges. Many nations have some prohibitions yet the horse-run of the crypto currencies has not stopped. In India, more than 8 million people have invested in crypto currencies and the number is continually rising. The Supreme Court of India has given some relief to the Indian crypto currency lovers, 2018 banned is nulled by the Supreme Court. Crypto currencies are a new entrant in the currency format. Its non-existing currency and digital currency. It works on block chain technology, which makes the world's safest currency, which can't be counterfeited. Crypto currency implied cryptography because of this element it is hard to duplicate it. All crypto currencies are decentralized and not controlled by any central government or any central authorities. This feature makes such currencies more immune and to any centralized interferences. Crypto currency is encoded from the word encrypt, which is a technique famous for its security and safe handling of data. Encryptions are used to do secure personal data and transactions on the internet [1]. These currencies are handled on the computer and non-physical feature makes these currencies unique and decentralized. We can also call these currencies of the internet. It is a form of digital property that can only be handled on computers with the help of block chain technology. Crypto currencies created a fear among the conventional banking system, the current banking system is based on the transaction based in ledger but in crypto currencies, there is no physical record of the transactions, it is recorded on the public ledger which can only be accessed through the internet. It does not work on the conventional verification of the banks. It works on block chain technology which requires peer to peer truncations; in this anyone who has a crypto-address can send and receive digital assets without bank interferences. Because of this, it becomes a threat to the existing banking system. It is only recorded digitally, not require any agent to save verify it. In short in the future present banking system will collapse. It is entirely different from physical money. In the banking system, all records are stored in computers or papers. But in the crypto currencies are stored on the internet with the help of block chain technology.

In the present scenario, it is mostly used in the various crypto currencies' exchanges, they provide block chain-enabled flat form to buy and sell crypto currencies. Bit coin, Ethereum, Dogecoin and many cryptos. Crypto currencies at present have a huge market capitalization, every nation on the planet deals with crypto currencies. Many business tycoons like Alon Musk, Jack Dressy openly supported crypto currencies. Some countries have already listed crypto currencies as the alternative to the present physical currencies. But it is also facing many hurdles to become the finest alternative to the physical currencies, no international institution is ready to regulate crypto currencies, reason behind this is its uncertainty and no presence of its controller. At present these currencies and their exchanges are highly volatile, any positive comment or any positive tweet by any famous personals can skyrocket these currencies in the same manner opposite can happen with any negative comment. In this way, these are the most uncertain and volatile currencies. Many economists called it are a bubble that can burst at any time [2]. It is one of the fastest modes of transferring currencies in the world; it uses peer-to-peer technology for the transition. It is not only the quickest route to transfer many but also a very low cost and convenient method for the money transfer. On the other hand, any conventional bank charges more transfers than crypto currencies. With less time and fewer transfer fees, we can transfer crypto currencies to the rest of the world. In the present era, crypto currencies are deregulated and decentralized, which

means no one has a cent per cent control over these currencies. Crypto currencies are traded globally without any censorship. It's a hurdle free and censorship-resistant method to create and store wealth. Anybody in the world can have access to your crypto-wallet without your password. No one has the right to freeze your crypto-wallet. Our bank accounts can be freeze or given limited access to withdraw money by the order of the higher authorities. But crypto currencies are free from all these censorships. We can store any amount of wealth in the form of crypto currencies without any fear of the authorities; nobody has access to our wallets so no one can freeze our account, unlike our bank accounts.

2. Role of Internet:

The Internet has played a very significant role in the familiarizing of crypto currencies. Crypto currencies have a healthy and prospering future ahead. No doubt in the upcoming days' masses will not carry paper money they will store money in the mobile and laptop. Rupee and Dollar or paper money will not exist in the upcoming decades this internet money will take over them. In the future we will witness that this money will become history and crypto currencies will be used all over the world. People will use it in many multiple ways. It will be the part and parcel of human life shortly. At present crypto currencies are facing many problems, there are two sects are present in this area, one has deep faith in the trustworthiness of the crypto currencies, this group think it is the money of the future. But on the other side, another sect thinks it is a bubble that can be burst at any time. For them, it's a scam or hoax to wipe out the hard-earned money of the masses. Besides all this their upward rise in the popularity of crypto currencies [3]. In a very less time, it gains widespread fame and gains a huge market cape.

3. Development of Crypto currency:

There is no easy-going for the crypto currencies since their inception it facing many problems, many countries of the world have already banned dealing in crypto currencies. China has developed a firewall to stop the circulation of crypto currencies. India also in 2018 stopped all banks to do any transactions with the crypto-exchanges. Many nations have some prohibitions yet the horse-run of the crypto currencies has not stopped. In India, more than 8 million people have invested in crypto currencies and the number is continually rising. The Supreme court of India has given some relief to the Indian crypto currency lovers, 2018 banned is nulled by the supreme court. Now Indian government is planning to bring a bill to regulate cryptocurrencies, because they know it's the future of money and has a long-lasting presence in the world. The RBI is also planning to bring digital currencies soon. Cryptocurrencies have an outstanding future ahead because of their paramount benefits. Cryptocurrencies have paramount remarkable aspects, but it is also loaded with the bundle of problems. It is also a fact it can't entirely replace paper money. Its fact that it's the easiest and fastest mode of transaction. But all these are irregulated and decentralized. If anything goes wrong then no one will be held responsible. It's because no authority is governing it. Crypto-market is so volatile with a piece of negative news any famous man can crash the market. So, investment in this is highly risky and dangerous. We have heard many stories about the loss of money due to the volatility of the market. Another major issue with these currencies is that they consume power, which is an environmental hazard [4]. Consumption of more power creates an environmental crisis. According to some media reports, it consumes more energy than an American household and this power consumption is going higher and higher. Digital money is the result of the revolution of the internet, these virtual currencies have a great future ahead but they have to be stable, centralized and environmentally friendly. Security is an essential part of this confident building process. If crypto-techno clears all these hurdles then we can predict that cryptocurrencies are the money of the future. And it will change the whole banking system. It will reduce dependency on the man-power, it will be low cost and easily accessible to its users. In recent many businesses, platforms have started to accept payments in the form of cryptocurrencies. Tesla of Alon Musk is one of them. Such encouragement will boost the circulation and acceptance of digital assets.

4. Conclusion:

To conclude, digital currencies are the future of money, present fiat currencies will be of no use and no one carries money in their pant pockets. On the other hand, everyone will keep digital money in the wallet of their phones. It will be used multiply. In future of cryptocurrency depends on the advancement of internet technology. If crypto-engineers address the present issues then we can say fiat currencies will be no more in the upcoming ages. At present, it's familiar with new generations but with time, it will increase its user base and be accepted by everyone, because of its feasibility and accessibility.

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Abstract:
Crypto currencies are the digital money. It has gain wide spread popularity among the new generations and techno-lovers. Crypto currency is encoded from the word encrypt, which is a technique famous for its security and safe handling of data. Crypto currency implied cryptography because of this element it is hard to duplicate it. It is entirely different from physical money. In the banking system, all records are stored in computers or papers. But in the crypto currencies are stored on the internet with the help of block chain technology. Bit coin, Ethereum, Dogecoin and many cryptos. Crypto currencies at present have a huge market capitalization, every nation on the planet deals with crypto currencies.

Keywords: Currencies, Banking System, Block chain Technology

1. Introduction:

Many business tycoons like Alon Musk, Jack Dressy openly supported crypto currencies. Many economists called it are a bubble that can burst at any time. It is one of the fastest modes of transferring currencies in the world; it uses peer-to-peer technology for the transition. It is not only the quickest route to transfer many but also a very low cost and convenient method for the money transfer. China has developed a firewall to stop the circulation of crypto currencies. India also in 2018 stopped all banks to do any transactions with the crypto-exchanges. Many nations have some prohibitions yet the horse-run of the crypto currencies has not stopped. In India, more than 8 million people have invested in crypto currencies and the number is continually rising. The Supreme Court of India has given some relief to the Indian crypto currency lovers, 2018 banned is nulled by the Supreme Court. Crypto currencies are a new entrant in the currency format. Its non-existing currency and digital currency. It works on block chain technology, which makes the world's safest currency, which can't be counterfeited. Crypto currency implied cryptography because of this element it is hard to duplicate it. All crypto currencies are decentralized and not controlled by any central government or any central authorities. This feature makes such currencies more immune and to any centralized interferences. Crypto currency is encoded from the word encrypt, which is a technique famous for its security and safe handling of data. Encryptions are used to do secure personal data and transactions on the internet [1]. These currencies are handled on the computer and non-physical feature makes these currencies unique and decentralized. We can also call these currencies of the internet. It is a form of digital property that can only be handled on computers with the help of block chain technology. Crypto currencies created a fear among the conventional banking system, the current banking system is based on the transaction based in ledger but in crypto currencies, there is no physical record of the transactions, it is recorded on the public ledger which can only be accessed through the internet. It does not work on the conventional verification of the banks. It works on block chain technology which requires peer to peer truncations; in this anyone who has a crypto-address can send and receive digital assets without bank interferences. Because of this, it becomes a threat to the existing banking system. It is only recorded digitally, not require any agent to save verify it. In short in the future present banking system will collapse. It is entirely different from physical money. In the banking system, all records are stored in computers or papers. But in the crypto currencies are stored on the internet with the help of block chain technology.

In the present scenario, it is mostly used in the various crypto currencies' exchanges, they provide block chain-enabled flat form to buy and sell crypto currencies. Bit coin, Ethereum, Dogecoin and many cryptos. Crypto currencies at present have a huge market capitalization, every nation on the planet deals with crypto currencies. Many business tycoons like Alon Musk, Jack Dressy openly supported crypto currencies. Some countries have already listed crypto currencies as the alternative to the present physical currencies. But it is also facing many hurdles to become the finest alternative to the physical currencies, no international institution is ready to regulate crypto currencies, reason behind this is its uncertainty and no presence of its controller. At present these currencies and their exchanges are highly volatile, any positive comment or any positive tweet by any famous personals can skyrocket these currencies in the same manner opposite can happen with any negative comment. In this way, these are the most uncertain and volatile currencies. Many economists called it are a bubble that can burst at any time [2]. It is one of the fastest modes of transferring currencies in the world; it uses peer-to-peer technology for the transition. It is not only the quickest route to transfer many but also a very low cost and convenient method for the money transfer. On the other hand, any conventional bank charges more transfers than crypto currencies. With less time and fewer transfer fees, we can transfer crypto currencies to the rest of the world. In the present era, crypto currencies are deregulated and decentralized, which

means no one has a cent per cent control over these currencies. Crypto currencies are traded globally without any censorship. It's a hurdle free and censorship-resistant method to create and store wealth. Anybody in the world can have access to your crypto-wallet without your password. No one has the right to freeze your crypto-wallet. Our bank accounts can be freeze or given limited access to withdraw money by the order of the higher authorities. But crypto currencies are free from all these censorships. We can store any amount of wealth in the form of crypto currencies without any fear of the authorities; nobody has access to our wallets so no one can freeze our account, unlike our bank accounts.

2. Role of Internet:

The Internet has played a very significant role in the familiarizing of crypto currencies. Crypto currencies have a healthy and prospering future ahead. No doubt in the upcoming days' masses will not carry paper money they will store money in the mobile and laptop. Rupee and Dollar or paper money will not exist in the upcoming decades this internet money will take over them. In the future we will witness that this money will become history and crypto currencies will be used all over the world. People will use it in many multiple ways. It will be the part and parcel of human life shortly. At present crypto currencies are facing many problems, there are two sects are present in this area, one has deep faith in the trustworthiness of the crypto currencies, this group think it is the money of the future. But on the other side, another sect thinks it is a bubble that can be burst at any time. For them, it's a scam or hoax to wipe out the hard-earned money of the masses. Besides all this their upward rise in the popularity of crypto currencies [3]. In a very less time, it gains widespread fame and gains a huge market cape.

3. Development of Crypto currency:

There is no easy-going for the crypto currencies since their inception it facing many problems, many countries of the world have already banned dealing in crypto currencies. China has developed a firewall to stop the circulation of crypto currencies. India also in 2018 stopped all banks to do any transactions with the crypto-exchanges. Many nations have some prohibitions yet the horse-run of the crypto currencies has not stopped. In India, more than 8 million people have invested in crypto currencies and the number is continually rising. The Supreme court of India has given some relief to the Indian crypto currency lovers, 2018 banned is nulled by the supreme court. Now Indian government is planning to bring a bill to regulate cryptocurrencies, because they know it's the future of money and has a long-lasting presence in the world. The RBI is also planning to bring digital currencies soon. Cryptocurrencies have an outstanding future ahead because of their paramount benefits. Cryptocurrencies have paramount remarkable aspects, but it is also loaded with the bundle of problems. It is also a fact it can't entirely replace paper money. Its fact that it's the easiest and fastest mode of transaction. But all these are irregulated and decentralized. If anything goes wrong then no one will be held responsible. It's because no authority is governing it. Crypto-market is so volatile with a piece of negative news any famous man can crash the market. So, investment in this is highly risky and dangerous. We have heard many stories about the loss of money due to the volatility of the market. Another major issue with these currencies is that they consume power, which is an environmental hazard [4]. Consumption of more power creates an environmental crisis. According to some media reports, it consumes more energy than an American household and this power consumption is going higher and higher. Digital money is the result of the revolution of the internet, these virtual currencies have a great future ahead but they have to be stable, centralized and environmentally friendly. Security is an essential part of this confident building process. If crypto-techno clears all these hurdles then we can predict that cryptocurrencies are the money of the future. And it will change the whole banking system. It will reduce dependency on the man-power, it will be low cost and easily accessible to its users. In recent many businesses, platforms have started to accept payments in the form of cryptocurrencies. Tesla of Alon Musk is one of them. Such encouragement will boost the circulation and acceptance of digital assets.

4. Conclusion:

To conclude, digital currencies are the future of money, present fiat currencies will be of no use and no one carries money in their pant pockets. On the other hand, everyone will keep digital money in the wallet of their phones. It will be used multiply. In future of cryptocurrency depends on the advancement of internet technology. If crypto-engineers address the present issues then we can say fiat currencies will be no more in the upcoming ages. At present, it's familiar with new generations but with time, it will increase its user base and be accepted by everyone, because of its feasibility and accessibility.

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स्थापना : ९ जानेवारी १९२७

इतिहासाचार्य वि. का.राजवाडे संशोधन मंडळ, धुळे

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या संस्थेचे त्रैमासिक

।। संशोधक।।

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दूरध्वनी (०२५६२) २३३८४८, ९४०४५७७०२०

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अक्षरजुळणी : सौ. सीमा शिंत्रे, वारजे-माळवाडी, पुणे ५८.

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प्रा. डॉ. जयवंत कांबळे
इतिहास विभाग प्रमुख
मा.सु.पा. महाविद्यालय, मानोरा

प्रस्तावना :

डॉ. बाबासाहेब आंबेडकरांचा मूळ अभ्यास विषय अर्थशास्त्र होता. त्यांनी अर्थविषयक अनेक विचार मांडले आहेत. डॉ. बाबासाहेब आंबेडकर हे भारतातीलच नव्हे तर जागतिक दर्जाचे एक सर्वश्रेष्ठ अर्थतज्ज्ञ होते. अर्थशास्त्रामध्ये नोबेल पारितोषिक मिळविणारे डॉ. अमर्त्य सेन डॉ. बाबासाहेब आंबेडकरांना अर्थशास्त्रातील आपला गुरू मानतात एक अर्थशास्त्रज्ञ म्हणून डॉ. आंबेडकरांनी फार मोठे व व्यापक योगदान दिले आहे. स्वातंत्र्यानंतर डॉ. आंबेडकर भारताचे पहिले कायदामंत्री बनले इ.स. १९४७-४९ दरम्यान मसुदा समितीचे अध्यक्ष म्हणून भारतीय संविधानाला आकार देताना त्यांच्यातील एक महान अर्थतज्ज्ञ आपल्याला दिसून येतो. मानवी अधिकाराचे मुलतत्त्व म्हणून त्यांनी लोकशाही राज्यव्यवस्थेचा अतिशय जोरकसपणे पुरस्कार व पाठपुरावा केला. समता, स्वातंत्र्य व बंधुता या तीन लोकशाही तत्त्वांचा राजकिय हक्क असा संकुचित अर्थ लावला जाऊ नये, असे त्यांचे म्हणणे होते. डॉ. आंबेडकर हे सामाजीक व आर्थीक लोकशाहीचे दे पुरस्कर्ते होते. सामाजिक व आर्थिक लोकशाहीकडे दुर्लक्षून राजकिय लोकशाही टिकू शकणार नाही आशा प्रकारचा त्यांनी ईशारा सुध्दा दिलेला आहे. भारतीय संविधानात डायरेक्टीव्ह प्रिन्सीपल्स ऑफ दि स्टेट पॉलीसी हे अभिनव प्रकरण समाविष्ठ करुन त्यांनी आपला आर्थिक लोकशाही विषयक दृष्टीकोण विशद केला आहे.

आपला अर्थविषयक दृष्टीकोण अधिक स्पष्ट करतांना डॉ. आंबेडकर फ्रेंच क्रांती व रशियन राज्यक्रांतीची मिमांशा करतांना म्हणतात की, ''आर्थिक समतेशिवाय सामाजिक समता व सामाजिक स्वातंत्र्य या कल्पना फोल ठरतात. फ्रेंच राज्यकांतीच्या इतिहासाचे परिशिलन केल्यास हे आपल्याला चांगले लक्षात येईल. ज्याकडे धन नाही, त्याच्याकडे स्वातंत्र्य नाही कारण त्याला पोटासाठी दुसऱ्यावर अवलंबून राहण्याशिवाय पर्याय नाही. जो परावलंबी आहे तो मनुष्य केंव्हाही स्वतंत्र असू शकत नाही.'' अशा प्रकारे आर्थिक स्वातंत्र्य सर्व प्रकारच्या स्वातंत्र्याची जननी असते हा विचार डॉ. आंबेडकरांनी मांडला आहे. प्रस्तुत शोध निबंधामध्ये डॉ. आंबेडकरांच्या आर्थिक लोकशाही संदर्भातील दृष्टीकोणाची मांडणी पुढील प्रमाणे करता येईल.

शोषितांना आर्थिक न्याय :

भारतातील विषमतावादी व्यवस्थेने उच्चवर्णीयांना मालकी व वारसा हक्काने संपत्ती व प्रतिष्ठेची सर्व साधने दिली आहेत. परंतु अवर्णाला पिढ्याण-पिढ्या अस्पृश्यताच प्राप्त झालेली दिसते. डॉ. आंबेडकर या यंत्रणेला 'आर्थिक शोषणाची अनियंत्रीत यंत्रणा' असे म्हणतात. अस्पृश्यता ही केवळ सामाजिक संस्था नसून व्यक्ती समूहाचे गुलामगिरीकरण करणारी आर्थिक संस्था सुध्दा आहे असे बाबासाहेबांचे मत होते. गुलामाच्या मालकावर गुलामाच्या पोषणाची जबाबदारी असते परंतु या संस्थेनी हि जबाबदारी न घेता केवळ शोषणाची प्रथा रुढ केली. अस्पृश्यतेच्या प्रश्नाला बेकारी, द्रारिद्र्यशोषण व विषमतेचा संदर्भ असल्यामुळे त्यांच्या आर्थिक अंगावर भर देणे आवश्यक ठरते. भारताच्या दक्षिण व पश्चिम भागातील जमिनदारांनी अस्पृश्यवर्गाला वेठबिगारीच्या रूपाने शतकानुशतके सवर्णाच्या दावणीला बांधल्याचे भीषण चित्र दिसून येते. अतिशय अल्प आणि कित्येकदा खोटया कर्जापायी त्यांचे कायमस्वरुपी गुलामीकरण घडून आलेले दिसून येते. सवर्णानी उगारलेले आर्थिक हत्यार या वर्गाला परावलंबित्वामुळे झुगारुन देता येत नाही. सवर्ण-अवर्ण लढ्यामध्ये जो मूलतः लढा असतो तो आर्थिक सत्तेच्या मक्तेदारीमुळे नेहमीच सवर्णाची सरशी होत आली आहे. असे बाबासाहेबांचे मत होते. गुलामगीरीतून मुक्त करण्यासाठी डॉ. आबेडकरांनी अस्पृश्यांच्या स्वायत व स्वतंत्र्य वसाहतीची योजना मांडली होती. कारण ईतर मार्गानी या वर्गाचे आर्थिक परावलंबन दूर करण्याचा प्रयत्न केला तर सवर्णाचे सामाजिक बहिष्कार व असहकार्याचे अमोघशस्त्र तयार असतेच असे त्यांचे मत होते.

समाजातील शोषीत दुर्बल घटकांची अशा प्रकारची पार्श्वभुमी असतांना डॉ. आंबेडकरांनी या घटकाला संविधानाच्या माध्यमातून आर्थिक न्याय देण्याचा जोरकसपणे प्रयत्न केल्याचे आल्याला दिसून येईल.

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कृषी व औद्योगीकरणाच्या संदर्भातील विचार :

भारतासारख्या शेतीप्रधान अर्थव्यवस्थेत जमीन हे केवळ उत्पादनाचे साधन नसून, मालकी हक्कामुळे त्याला सामाजिक दुर्जासुध्दा प्राप्त होत असतो. म्हणून आंबेडकरांनी प्रथमतः अस्पृश्यांना जमीन मालकी हक्काने देण्यात याव्यात अशी सूचना केली. त्यापेक्षाही पुढे जाऊन शेती हा व्यवसाय एका वर्गाच्या मालकीच्या न ठेवता त्याबाबत सामुदायिक मालकी निर्माण व्हावी व त्यांचे नियंत्रण राज्याच्या हातात असावे अशी सामुदायिक शेतीची कल्पनाही त्यांनी मांडली. या व्यवस्थेमध्ये कोणीच जमीनदार व मालक असणार नाही त्याप्रमाणे कोणी खंडकरी किंवा शेतजमूर असणार नाही. त्यामुळे आर्थिक दास्यत्वाचा व सामाजिक अन्यायाचा प्रश्न सुटेल असे बाबासाहेबांचे मत होते. परंतु हा केवळ आशावादच राहिलेला दिसतो त्याच प्रमाणे डॉ. आंबेडकरांना शेतीला उद्योगाचा दर्जा द्यायचा होता पण तो देता आला नाही यांची खंत बाबासाहेबांनी बोलून दाखविली होती.

भारतामध्ये जलद गतीने औद्योगिकरण घडून आल्यास अवर्णाची पारंपारिक ग्राम व्यवस्थेतून सुटका होऊन त्यांना शहराकडे वळता येईल अशीही कल्पना त्यांनी मांडली होती. परंतु त्यात सुध्दा दुहेरी कोंडी निर्माण होण्याची शक्यता दिसुन आली. कारण पारंपारिक व्यवस्थेत राहायचे म्हटले तर अस्पृश्यतेचा जाच सोसून किमान जगण्याची हमी होती. नागरी औद्योगिक परिसरामध्ये बेकारीची सतत टांगती तलवार डोक्यावर ठेवण्यापेक्षा ते बरे होते. काहीही झाले तरी अस्पृश्यता किंवा बेकारी यापैकी एकाचा धाक या वर्गावर राहत असल्यामुळे त्यांला कोडीच म्हणावे लागते.

समाजवाद व आर्थीक लोकशाही

डॉ. आंबेडकरानी समाजवादासारख्या पर्यायाचा सखोल विचार केल्याचे दिसते. भारताच्या संदर्भात सांसदीय घटनात्मक राज्य समाजवादाची कल्पना मांडली आहे. अर्थात त्याला सांसदीय लोकशाहीची जोड दिल्याशिवाय ते व्यावहारिकदृष्ट्या पूर्णत्वाला जाऊ शकत नाही. आर्थिक लोकशाही स्थापण करणे हि समाजवादी समाजरचनेची पुर्वअट होय. डॉ. आंबेडकरांची समाजवादाची संकल्पना लोकशाही समाजवादापेक्षा वेगळी आहे. भारतीय घटना समितीच्या भाषणात मार्गदर्शक तत्त्वासंबंधी बोलतांना डॉ. आंबेडकर म्हणाले होते की, घटना निर्मीतीची उदिष्टये दुहेरी आहेत. एक म्हणजे राजकिय लोकशाहीची संरचना तयार करणे व दुसरे म्हणजे आपले आदर्शभुतपरिमणआर्थिक लोकशाहीचे असून जी कोणती सत्ता सरकारात असेल तीने हा आदर्श प्रत्यक्षात आणण्यासाठी झटले पाहिजे असे डॉ. आंबेडकराचे समाजवाद व आर्थिक लोकशाही बाबत विचार होते...

निष्कर्ष :

भारतामध्ये वर्तमान स्थितीत जी आर्थिक विषमता आहे म्हणजेच आहेरे वर्गाकडे अधिकाधिक संपत्तीचा साठा जमत आहे आणि नाहीरे वर्गाकडे उदर निर्वाह कसाबसा करावा लागत आहे ही स्थिती दूर करण्यासाठी डॉ. आंबेडकरांचे आर्थिक विचार पूर्णपणे अंमलात आणणे आवश्यक आहे. शेती व औद्योगिकरणाच्या बाबतीत डॉ. आंबेडकरांचे विचार अंमलात आणल्यास भारतातील नाहिरे वर्गाची आर्थिक स्थिती सुधारु शकते. आणि त्या माध्यमातून राजकिय सामाजिक व आर्थिक विषमता नष्ट होऊ शकते.

राजकिय लोकशाही प्रमाणेच आर्थिक लोकशाही स्विकारल्यास भारतातील आर्थिक विषमता दुर करण्यासाठी डॉ. आंबेडकरांचे आर्थिक विचार अतिशय महत्त्वपूर्ण ठरतात.

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Nanotechnology and its Utilization in Different Fields-A Review

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Abstract
Nanotechnology, also referred to as molecular nanotechnology, is a sort of manufacturing technology that enables the creation of objects from the atom up and the precise rearrangement of matter. In other words, nanotechnology is the molecular level three-dimensional structural control of materials and electronics. Tools are available for preparing, describing, manipulating, and even displaying nanoscale structures. These emerging technologies are also referred to as molecular manufacturing and molecular engineering. This technology isn't accessible right now. However, recent advancements in science have made it possible to observe and control atoms directly. This is only a small portion of the growing number of Nano scale science and technology techniques, though.
Keywords: Nanotechnology, Scanning tunneling microscope, Nano composites

1. Introduction

The fundamental idea behind nanotechnology is that almost any chemically stable structure that isn't clearly prohibited by physical laws can be created. Theoretical and computational simulations demonstrate the viability and conformity of molecular manufacturing systems. Our understanding of a molecular manufacturing system is likewise enhanced by these simulations. Today, scientists are creating a number of instruments and strategies that will be necessary to make nanotechnology a reality [1]. The density of an object is determined by its molecular structure, which is composed of tiny atoms that are closely bound to one another. Nano systems must be developed in a way that is cost-effective and overcomes these limitations in order to help in the development of machines that can withstand the whims of the environment because several parameters, such as molecule density, malleability, ductility, and surface tension are involved. Take metals as an example. Atoms in metals, especially solid metals, are held together by powerful structural forces, enabling them to withstand high temperatures [2]. By intelligently manipulating the properties of matter, nanotechnology aims to build incredibly efficient systems. For instance, researchers have shown that changing the size of the particles can modify their electrical and, consequently, optical properties [3].

2. History of Nanotechnology

The self-replicating Nano machines described in the book have the potential to generate almost any material good, reverse global warming, treat sickness, and vastly increase lifespans. Scientists with tenured university posts and NSF grants mocked these predictions, pointing out that they were ludicrous predictions of the future due to their intrinsic improbability [4].

3. Scanning Tunneling Microscope (STM)

The STM is a device that can move and position a tip near a surface with atomic precision. The scanning tunneling microscope is a relatively straightforward concept. It scans a surface with a sharp, electrically conductive needle. The position of the needle's tip is controlled by a voltage-controlled piezoelectric drive to within 0.1 angstrom (less than the radius of a hydrogen atom). A tunneling current travels from the tip to the surface when the needle is within a few angstroms of the surface and a modest voltage is given to the needle [5]. This tunneling current is then detected and amplified, and it can be used to map the contour of the surface, such as when a blind guy taps in front of a mirror. To detect its presence, a variety of physical interactions with the surface are utilized. Some scanning tunneling microscopes actually push on the surface, observing how strongly it pushes back. Others attach the probe to the surface and connect it to a voltage source, then monitor the current flow as the probe approaches the surface [6].

4. Nanotechnology will we be able to make?

4.1 Improved Transportation

Diamond is pricey, and we can't create it in the forms we desire. It also shatters. We'll be able to produce shatterproof diamond (with a structure that resembles diamond fibers) in whatever shape we wish thanks to nanotechnology. This would allow us to build a Boeing 747 that was 50 times lighter unloaded yet just as sturdy. Space ships and space flying will be significantly cheaper and more capable thanks to nanotechnology. The strength-to-weight ratio and component cost are essential characteristics for space ship performance and economy; nanotechnology will increase both of these parameters. Nanotechnology will provide incredibly sophisticated

computers to guide both those spacecraft and a wide range of other activities in space, in addition to producing remarkably light and robust materials for space ships at a low cost [7].

4.2 Intelligent Cars

In a few years, your car will be aware of the freeway conditions along your preferred home-travel route. The GPS would choose the shortest route, and the computer system would instantly calculate the speed and location history of every vehicle in your path. You might put the car in automatic mode and read your preferred book while driving. When in automatic mode, the vehicle would be intelligent enough to prevent any collisions with other cars and take safety precautions if you were to fall asleep.

4.3 Nano-composites

In the GM Safari and Astro Vans, "step aids" are made of a plastic Nano composite. It produces improvements in strength and weight reductions, which result in less fuel consumption and enhanced performance. It is also lightweight, rustproof, and scratch-resistant.

4.4 Atom Computers

Today, lithography, or "stone writing," is used to create computer chips. If the computer hardware revolution is to proceed at its current rate, we will need to switch from lithography to some new post-lithographic manufacturing method in about ten years. Each logic component will ultimately be constructed from a small number of atoms. There have already been designs for computer gates with less than 1,000 atoms, but each atom in such a little device needs to be at the ideal location. We will require a manufacturing method well beyond today's lithography: we will need nanotechnology.

4.5 High Memory Storage Capacity

An extremely high-density memory immediately springs to mind as a possible use. The new work shows a minimal spot-size of 10 angstroms, while in practice a slightly greater size might be needed. A one square centimeter surface can store 1014 bits if we assume that one bit can be read or written into a 10 angstrom square. That translates to 100 terabytes. It seems safe to assume that this technology will be used to create a low-cost, very large capacity secondary storage device (disc replacement) in the not-too-distant future. However, the more significant conclusion of this work is that it might get us closer to being able to manipulate molecules under control [9]. The best thing about this method is that we don't even need to conceive it; Bell Laboratory and IBM Almaden are both actively researching it.

4.6 Molecular Electronics

In order to achieve maximum downsizing, the properties of electrons may be used for implementing ones and zeros, respectively, instead of the "on" and "off" states of transistors. One and zero can be implemented using positive and negative spins, respectively. The ultimate goal in the search for downsizing is a biological or chemical computer, a new radical information processing system that may easily implement functionalities using organic cells or bacteria as basic components. The biological level scale may allow for the centering of large density circuits. Through the synthesis of simple and complicated compounds that release charge upon photo excitation, analogous devices have been successfully created.

4.7 Military Applications

The "smart bomb" but not the "smart bullet" is the two most common "smart" weapons in use today. In the future, even small weapons like a single bullet could contain more computing power than the biggest supercomputer currently in use. This would enable them to communicate with weapons tracking systems and perform real-time image analysis of their surroundings in order to acquire and navigate to targets with more control and precision. Additionally, we will be able to make weapons more quickly and more cheaply while utilizing all of diamond's unique material qualities. The way we fight wars will change as a result of the quick and low-cost production of large numbers of stronger, more precise weapons that are directed by dramatically improved processing capacity. This kind of change has the potential to irreparably damage the old power structures. The military's use of nanotechnology raises a number of issues that, in the interest of caution, we should look into now rather than later as we develop this new technology.

4.8 Smart Furniture

Doctors advised a little exercise and cautioned against the practice of having many individuals remain still for long periods of time. But what if the furniture transforms into something more comfortable for us while yet maintaining its attractive appearance and general feel? Future smart furniture might be embedded with microchips that would enable it to respond to a person's posture and adjust its behavior accordingly. Nanotechnology would make it possible to build adaptable buildings that are ungainly and unfinished. A chair adjusts because it is made of a series of hinges that reluctantly bend and stretch in a few locations to accommodate the desired position.

4.9 Solar Energy

Solar power will become affordable because to advances in nanotechnology, which will also reduce the cost of the equipment required to deploy solar cells. In this application we need not build new or technically superior solar cells: manufacturing affordably what we already know how to make expensively will propel solar power into the mainstream.

4.10 Medical Uses

The cells themselves perform the healing; contemporary medicine merely acts as an observer. We could create a medical technology that for the first time would allow us to directly heal the injuries at the molecular and cellular level that are the main causes of disease and ill health if we had surgical tools that were molecular in both their size and precision [10]. We can anticipate a tremendous jump in our medical capabilities when the accuracy of medications is joined with the intelligent direction of the surgeon's knife.

5. Nanotechnology Indian Scenario

An international event for entrepreneurs, early-stage businesses, investors, IP, joint ventures, service providers, start-up enterprises, and strategic partnerships is the IndiaNano Summit. The initiative will support long-term Nano scale research and development that could result in breakthroughs in industries like materials and manufacturing, Nano electronics, healthcare, medicine, and national security, as well as fields like the environment, energy, chemicals, biotechnology, agriculture, and information technology. Nanotechnology may have an impact on people's health, wealth, and quality of life that is at least equal to the combined effects of microelectronics, medical imaging, computer-aided engineering, and synthetic polymers produced in this century. The IndiaNano Nanotechnology Initiative identifies Grand Challenges, which are likely scientific breakthroughs that, if they were to be achieved, would have a significant positive economic impact on India and significantly raise the standard of living for its people [11]. Examples of these innovations include manufacturing things and products from the bottom up that is, by constructing them out of atoms and molecules and fitting the whole Parliamentary Library inside a device no larger than a sugar cube. The mission's vision and goals are as follows:

- ✓ To give the public and business sectors the tools they need to develop a nanotechnology effort for India.
- ✓ To offer a special and useful platform for establishing and investigating connections between businesspeople, start-ups, and investors for nanotechnology
- ✓ To encourage long-term development and research in the Nano scale.
- ✓ To support nanotechnology startups and projects
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Of course, any significant advancement has related issues. Before we can fully benefit from nanotechnology, we must consider how we could address these problems.

- ✓ Nanotechnology won't help us with our issues!
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- ✓ Amorphous Nano scale computing
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Nuclear technology and nanotechnology are interrelated. Nuclei cannot be transformed, despite what alchemists and nuclear scientists have claimed. Only chemists can rearrange molecules, which is all that nanotechnology does. The notion of exponentiation can, however, is applied to this technology because nuclear explosions result from the exponential growth of neutrons in a critical mass of fissile material. Here, we are discussing a potential exponential growth in the creation of complex artifacts rather than an exponential development in the destruction of things and the release of energy.

8. Conclusion

The development of instruments that will enable us to employ these substances to make goods is also being done in the field of nanotechnology, in addition to work on the materials of the future. Logic devices, molecular tweezers, and scanning tunneling microscopes have already been created as a result of experimental work. Additionally, theoretical work on the creation of Nano-computers is progressing. All things considered, it is obvious that the technology is practical. The development of smarter, faster, stronger, smaller, and less expensive systems is predicted to have a significant impact on our economy and society in the twenty-first century. A much more potent capacity is offered by nanotechnology. We cannot provide effective defense, environment, and medical care without also raising everyone's level of living. The physics behind nanotechnology is sound, the engineering is practical, there are many different ways to approach it, the results will be revolutionary times revolutionary, and it will happen within our lifetimes.

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Abstract
Nanotechnology, also referred to as molecular nanotechnology, is a sort of manufacturing technology that enables the creation of objects from the atom up and the precise rearrangement of matter. In other words, nanotechnology is the molecular level three-dimensional structural control of materials and electronics. Tools are available for preparing, describing, manipulating, and even displaying nanoscale structures. These emerging technologies are also referred to as molecular manufacturing and molecular engineering. This technology isn't accessible right now. However, recent advancements in science have made it possible to observe and control atoms directly. This is only a small portion of the growing number of Nano scale science and technology techniques, though.
Keywords: Nanotechnology, Scanning tunneling microscope, Nano composites

1. Introduction

The fundamental idea behind nanotechnology is that almost any chemically stable structure that isn't clearly prohibited by physical laws can be created. Theoretical and computational simulations demonstrate the viability and conformity of molecular manufacturing systems. Our understanding of a molecular manufacturing system is likewise enhanced by these simulations. Today, scientists are creating a number of instruments and strategies that will be necessary to make nanotechnology a reality [1]. The density of an object is determined by its molecular structure, which is composed of tiny atoms that are closely bound to one another. Nano systems must be developed in a way that is cost-effective and overcomes these limitations in order to help in the development of machines that can withstand the whims of the environment because several parameters, such as molecule density, malleability, ductility, and surface tension are involved. Take metals as an example. Atoms in metals, especially solid metals, are held together by powerful structural forces, enabling them to withstand high temperatures [2]. By intelligently manipulating the properties of matter, nanotechnology aims to build incredibly efficient systems. For instance, researchers have shown that changing the size of the particles can modify their electrical and, consequently, optical properties [3].

2. History of Nanotechnology

The self-replicating Nano machines described in the book have the potential to generate almost any material good, reverse global warming, treat sickness, and vastly increase lifespans. Scientists with tenured university posts and NSF grants mocked these predictions, pointing out that they were ludicrous predictions of the future due to their intrinsic improbability [4].

3. Scanning Tunneling Microscope (STM)

The STM is a device that can move and position a tip near a surface with atomic precision. The scanning tunneling microscope is a relatively straightforward concept. It scans a surface with a sharp, electrically conductive needle. The position of the needle's tip is controlled by a voltage-controlled piezoelectric drive to within 0.1 angstrom (less than the radius of a hydrogen atom). A tunneling current travels from the tip to the surface when the needle is within a few angstroms of the surface and a modest voltage is given to the needle [5]. This tunneling current is then detected and amplified, and it can be used to map the contour of the surface, such as when a blind guy taps in front of a mirror. To detect its presence, a variety of physical interactions with the surface are utilized. Some scanning tunneling microscopes actually push on the surface, observing how strongly it pushes back. Others attach the probe to the surface and connect it to a voltage source, then monitor the current flow as the probe approaches the surface [6].

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4.1 Improved Transportation

Diamond is pricey, and we can't create it in the forms we desire. It also shatters. We'll be able to produce shatterproof diamond (with a structure that resembles diamond fibers) in whatever shape we wish thanks to nanotechnology. This would allow us to build a Boeing 747 that was 50 times lighter unloaded yet just as sturdy. Space ships and space flying will be significantly cheaper and more capable thanks to nanotechnology. The strength-to-weight ratio and component cost are essential characteristics for space ship performance and economy; nanotechnology will increase both of these parameters. Nanotechnology will provide incredibly sophisticated

computers to guide both those spacecraft and a wide range of other activities in space, in addition to producing remarkably light and robust materials for space ships at a low cost [7].

4.2 Intelligent Cars

In a few years, your car will be aware of the freeway conditions along your preferred home-travel route. The GPS would choose the shortest route, and the computer system would instantly calculate the speed and location history of every vehicle in your path. You might put the car in automatic mode and read your preferred book while driving. When in automatic mode, the vehicle would be intelligent enough to prevent any collisions with other cars and take safety precautions if you were to fall asleep.

4.3 Nano-composites

In the GM Safari and Astro Vans, "step aids" are made of a plastic Nano composite. It produces improvements in strength and weight reductions, which result in less fuel consumption and enhanced performance. It is also lightweight, rustproof, and scratch-resistant.

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In order to achieve maximum downsizing, the properties of electrons may be used for implementing ones and zeros, respectively, instead of the "on" and "off" states of transistors. One and zero can be implemented using positive and negative spins, respectively. The ultimate goal in the search for downsizing is a biological or chemical computer, a new radical information processing system that may easily implement functionalities using organic cells or bacteria as basic components. The biological level scale may allow for the centering of large density circuits. Through the synthesis of simple and complicated compounds that release charge upon photo excitation, analogous devices have been successfully created.

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Doctors advised a little exercise and cautioned against the practice of having many individuals remain still for long periods of time. But what if the furniture transforms into something more comfortable for us while yet maintaining its attractive appearance and general feel? Future smart furniture might be embedded with microchips that would enable it to respond to a person's posture and adjust its behavior accordingly. Nanotechnology would make it possible to build adaptable buildings that are ungainly and unfinished. A chair adjusts because it is made of a series of hinges that reluctantly bend and stretch in a few locations to accommodate the desired position.

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An international event for entrepreneurs, early-stage businesses, investors, IP, joint ventures, service providers, start-up enterprises, and strategic partnerships is the IndiaNano Summit. The initiative will support long-term Nano scale research and development that could result in breakthroughs in industries like materials and manufacturing, Nano electronics, healthcare, medicine, and national security, as well as fields like the environment, energy, chemicals, biotechnology, agriculture, and information technology. Nanotechnology may have an impact on people's health, wealth, and quality of life that is at least equal to the combined effects of microelectronics, medical imaging, computer-aided engineering, and synthetic polymers produced in this century. The IndiaNano Nanotechnology Initiative identifies Grand Challenges, which are likely scientific breakthroughs that, if they were to be achieved, would have a significant positive economic impact on India and significantly raise the standard of living for its people [11]. Examples of these innovations include manufacturing things and products from the bottom up that is, by constructing them out of atoms and molecules and fitting the whole Parliamentary Library inside a device no larger than a sugar cube. The mission's vision and goals are as follows:

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9. References

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DIVERSITY, POPULATION AND HABITAT USED BY SPIDERS IN COTTON AGRO-ECOSYSTEM

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ABSTRACT

In all 8891 spiders were collected from 14 families, 39 genera and 46 species per acre from Cotton agro-ecosystem by using visual search and pitfall trap method. In the Collection 63.55% specimens were adults and 36.45% spiders collected were immature. Lycosids dominated the collection with 1957 (22.01%) specimens followed by Araneids 1588 (17.86%), Oxyopids 1288 (14.48%), Tetragnathids 989 (11.12%) and then Salticids 929 (10.44%). The species abundance was in the order Araneidae > Salticidae > Theridiidae > Lycosidae. The population of hunters and web builders was 66.67% and 33.32%, showing clear dominance of hunters. Sparrasids were not reported and thomisid spiders were just 0.95% of the total population. 15 new species were recorded (Table-1) which includes Cyclosa gossypiata sp. nov., Cyclosa moonduensis(male), Lipocrea epeiroides, Clubiona foliata sp. nov., Schizocosa sp. nov., Oxyopes tiengianensis , Myrmarachne sp., Scytodes sp., Scytodes sp., Phoneyusa sp.nov., Nesticodes rufipes, Theridion sp. nov. , Theridion sp. nov. , Thomisus okinawensis, Uloborus walckenaerius. A new genus Phoneyusa (for India) from Theraphosidae was recorded from cotton agro-ecosystem.

Keywords: *Spider, Cotton fields, agro-ecosystems*

Introduction

Cotton is one of the most important commercial crops playing key role in economic and social affairs of the world. Although, it is cultivated in more than 80 countries of the world, ten countries viz – USA, China, India, Brazil, Pakistan, Turkey, Mexico, Egypt and Sudan account for nearly 85% of the total production. There are four cultivated species of cotton, viz. *Gossypium hirsutum*, *G. arboreum*, *G. herbaceum* and *G. barbadense*. India is the only country where all the 4 cultivated species are grown. However, the crop output is affected due to insect pests on them. In India over 160 species of insects and non insects pests have been reported to damage the cotton crop (Agrawal, 1978). Important insect-pests of cotton are American bollworm, pink bollworm, spotted bollworm and spiny bollworm), cutworm (*Agrotis* sp), aphids (*Aphis gossypii*), white fly, red cotton bug, spider mites, cotton jassids and thrips.

Dippenaar-Schoeman *et al.* (1999) studied spiders in South African cotton fields with respect to diversity and abundance (Arachnida: Araneae). Van den Berg *et al.* (1990) investigatedthe effect of pesticides on spiders in South African cotton fields. Spiders are generalist predators that can function as biological control agents within agroecosystems (Moulder and Reichle, 1972; Nyffeler and Benz, 1987; Riechert and Bishop, 1990; Young and Edwards, 1990; Kajak *et al.*, 1991; Kajak, 1997).Mellet, *et al.* (2006) investigated the effect of Bt-cotton cultivation on spider populations in Marble Hall, South Africa.According to them neither Bt-cotton nor the application of endosulfan had apparent negative effects on ground or plant dwelling spiders in the field. Spiders should therefore be able to continue playing a role in biological control in Bt-cotton fields. Ghavami *et al.* (2007) investigated the spider fauna of cotton fields in Iran during 2003-2004. The mean populations of spiders in cotton fields from three different places like Thayilpatti, Madathuppatti and Vembakkottai, Virudhunagar district, Tamil Nadu, India were studied by Jeyaparvathy *et al.* (2012). Jeyaparvathi *et al.* (2013) also investigated the biological control potential of spiders on the selected cotton pests and found that the three species of spiders like (*Peucetia viridana, Oxyopes birmanicus* and *Peucetia latikae* were predominant in the cotton fields of

Achamthavirthan, Virudhunagar district, Tamil Nadu, India.

Spiders are one of the major predatory groups within the agro-ecosystem, and are intrinsic in maintaining the ecological balance of pest species (Wise, 1993). Their diversity within this system is therefore important in providing a stable and natural method of pest control. Considering their role in the agro-ecosystem, the present study was undertaken to know the diversity, population structure and habitat use by the spiders in cotton agro-ecosystem from Purna river basin.

Absolutely no work has been done on spider diversity in cotton agro-ecosystem from Vidarbha and Maharashtra. The present study was an effort to make an inventory of spiders along with the details about the microhabitats used by the spiders

METHODOLOGY

Study area

The present work was carried out in agricultural fields from Purna river basin which originates in Pokharni Village 21° 30'N 77° 46'E which is 2 km away from Bhainsdehi (Betul district Madhya Pradesh adjoining Amravati district of Maharashtra).

Rain fall

The basin receives most of the rainfall from the South-West monsoon during June to September. The weighted mean maximum, minimum and average annual rainfall of the basin during last 10 year were 2599 mm, 654 mm and 1431 mm respectively.

Temperature

The mean monthly temperature varies from 12.7 ^{o}C during December to 42 ^{o}C in April.

Humidity

The humidity during winter season is as low as 42% in the month of February and as high as 89% in the month of August.

Wind speed

The mean daily wind speed is maximum (12.33 km/hr) in the months of June and minimum (4.3 km/hr) in the month of December.

Cropping pattern: The crops are dominated by cotton and orange in the three districts of Vidarbha and banana plantations in Jalgaon district. Hence spider diversity is studied from various cotton fields. This includes both irrigated and non irrigated fields; throughout the basin.

Spider collection:

Todocument a comprehensive inventory of spiders from cotton agro-ecosystemwell established sampling protocols for spider collection were adopted in different selected sampling plots, which included pitfall trap and hand collection.

Pitfall Trapping - Wet pitfall trap method was used to study the ground dwelling spiders. The pitfall traps consisted of a 9 cm wide by 16 cm deep plastic jar, one-third filled with 30% ethyl acetate and a few drops of liquid soap/detergent. The pitfall traps were left open for a period of four days. The distance between two adjacent jars was 1 meter.

Collecting by Hand -A soft paintbrush was used to gently knock the specimen into a collecting vial. Many a times after observing the spider it was gently pick off by hand. Remains of webs and the curling leaves of plants were examined for any spiders in them and were collected in plastic vials. Many a time's stones were unturned for spiders hiding there. This method of sampling was used to collect the spiders, which were found on the ground, under the litter, mulch etc. Web-building and free-living spiders on the foliage and stems of living or dead shrubs etc. were also collected by hand picking.

Post collection work

After coming to the laboratory, the spiders were sorted according to the family and thenphotographs were taken by using the camera, then the legs and palps of the spiders were manipulated and made straight by dipping them in warm water and after making their legs straight they were immediately transferred to 70% ethyl alcohol in a petridish. Legs and palps were again made straight and properly oriented. Plastic U- pins were kept on spider legs and palps as weight, so that they are not folded back. All the mature specimens were

identified by dissecting their genitalia upto the species level. A help of relevant literature from India and abroad was taken for proper identification. While survey and collection of spiders from cotton fields microhabitat used by them were noted.

Analysis

Spiders captured by pitfall traps and hand picking methods were pooled for each site for quantitative analysis. Species richness was estimated for each cropping type. Similarity of spider species among different crop zones was examined using the diversity indices including Shannon – weiner index, Simpson index and Margalef richness index. The diversity, richness, and evenness indices for spiders were calculated using the Biodiversity calculator (www.
Alyoung.com/labs/biodiversity_calculator.
html) .
Voucher specimens are deposited at Arachnology Museum, Forest Training Institute, Chikhaldara.

Observations and Results

In all 8891 spiders were collected from 14 families, 39 genera and 46 species per acre from Cotton agro-ecosystem by using visual search and pitfall trap method (Table No.1). In the Collection 63.55% specimens were adults and 36.45% spiders collected were immature. Lycosids dominated the collection with 1957 (22.01%) specimens followed by Araneids 1588 (17.86%), Oxyopids 1288 (14.48%), Tetragnathids 989 (11.12%) and then Salticids 929 (10.44%). The species abundance was in the order Araneidae > Salticidae > Theridiidae > Lycosidae (Fig.No.1). The population of hunters and web builders was 66.67% and 33.32%, showing clear dominance of hunters. Sparrasids were not reported and thomisid spiders were just 0.95% of the total population.

15 new species were recorded (Table-1) which includes *Cyclosa gossypiata* sp. nov., *Cyclosa moonduensis*(male), *Lipocrea epeiroides, Clubiona foliata* sp. nov., *Schizocosa* sp. nov., *Oxyopes tiengianensis* , *Myrmarachne* sp., *Scytodes* sp., *Scytodes* sp., *Phoneyusa* sp.nov., *Nesticodes rufipes, Theridion* sp. nov. , *Theridion* sp. nov. , *Thomisus okinawensis, Uloborus walckenaerius*. A new genus *Phoneyusa* (for India) from Theraphosidae was recorded from cotton agro-ecosystem.

The orb weavers like *Eriovixia excelsa, Neoscona theisi,Neoscona vigilans,Guizygiella indica,Leucauge decorata* and*Tetragnatha mandibulata* were seen constructing web of small size depending on the space available and were successful to capture enough prey. The ability of these spiders to construct webs of small sizes with suitable inclination in Cotton agro-ecosystem. Thus the distribution of spiders in Cotton agroecosystem is very typical, vertically stratified so that the crop is protected from all types of pests. The present observation thus supports the earlier observations made by Nyffeler *et al.* (1989); Hayes and Lockley (1990); Van Den Berg *et al.* (1990), Ghafoor (2002) and Bundy (2005). In one study, Dippenaar-Schoeman *et al.* (1999) observed Thomisids as dominant predators in Cotton fields, but in the present study Lycosids were the dominant predators in Cotton- agroecosystem. Thomisids represented only 0.95% population.

While survey and collection of spiders from cotton fields microhabitat used by them were noted and accordingly the detail observation are given in (Table.2).

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Table: 1 Spider species collected (Per acre) from Cotton agro-ecosystem.

Spider Species	Female	Male	Immature	Total
Family : Araneidae Clerck, 1757			671	1588
Cyclosa confraga (Thorell,1892)	1	0		
Cyclosa gossypiata sp. nov. Keswani, 2013	61	0		
Cyclosa moonduensis Tikader,1963	59	34		
Cyclosa spirifera Simon,1889	30	14		
Cyrtophora citricola (Forsskål,1775) *	55	16		
Eriovixia excelsa (Simon,1889)	101	65		
Larinia chloris (Audouin,1826)	79	0		
Lipocrea epeiroides (O. P.-Cambridge,1872)	49	32		
Neoscona theisi (Walckenaer,1841)	189	51		
Neoscona vigilans (Blackwall,1865)	55	26		
Family : Clubionidae Wagner,1887			220	560
Clubiona foliata sp. nov.	263	77		
Family : Gnaphosidae Pocock,1898			288	617
Drassodes luridus (O. P.-Cambridge,1874)	99	21		
Sergiolus singhi Tikader & Gajbe,1976	9	0		
Zelotes shantae Tikader,1982	139	61		
Family : Lycosidae Sundevall,1833			779	1957
***Hippasa*greenalliae** (Blackwall,1867)	102	70		
Lycosa poonaensis Tikader & Malhotra,1980	436	0		
Pardosa pseudoannulata (Bösenberg & Strand,1906)	429	124		
Schizocosa sp. nov.	17	0		
Family : Miturgidae Simon, 1886			180	320
***Cheiracanthium* inornatum** O. P.-Cambridge,1874	72	68		
Family : Oecobiidae Blackwall,1862			7	20
Oecobius putus O. P.-Cambridge,1876	8	5		
Family : Oxyopidae Thorell,1870			366	1288
Oxyopes pankaji Gajbe & Gajbe, 2000	437	173		
Oxyopes tiengianensis Barrion & Litsinger,1995	235	75		
Peucetia latikae Tikader,1970	0	2		
Family : Salticidae Blackwall,1841			266	929
Hasarius adansoni (Audouin,1826) *	54	45		
Hyllus semicupreus (Simon,1885)	0	95		
Myrmarachne sp.	9	6		

Phintella vittata (C. L. Koch,1846)	117	26		
Plexippus paykulli (Audouin,1826) *	34	88		
Rheneflavigera (C. L. Koch,1846) *	0	44		
Telamonia dimidiata (Simon,1899)	89	31		
Thyene imperialis (Rossi,1846) *	13	12		
Family : Scytodidae Blackwall,1864			45	150
Scytodes sp.	51	0		
Scytodes sp.	54	0		
Family : Tetragnathidae Menge,1866			285	989
Guizygiella indica (Tikader & Bal,1980)	215	86		
Leucauge decorata (Blackwall,1864)	200	61		
Tetragnathamandibulata Walckenaer,1841	71	71		
Family : Theraphosidae Thorell,1869			0	2
Phoneyusa sp.nov.	1	1		
Family : Theridiidae Sundevall,1833			83	336
ArgyrodesargentatusO. P.-Cambridge,1880	30	24		
Parasteatoda mundula (L. Koch,1872)	60	0		
Theridula gonygaster (Simon,1873)	34	0		
Nesticodes rufipes (Lucas,1846) *	19	6		
Theridion sp. nov.	9	0		
Theridion sp. nov.	71	0		
Family : Thomisidae Sundevall,1833			41	85
Indoxysticus minutus (Tikader, 1960) *	21	15		
Thomisus okinawensis Strand,1907	8	0		
Family : Uloboridae Thorell,1869			10	50
Uloborus walckenaerius Latreille,1806 *	22	18		
14 FAMILIES, 39 GENERA, 46 SPECIES	**4107**	**1543**	**3241**	**8891**

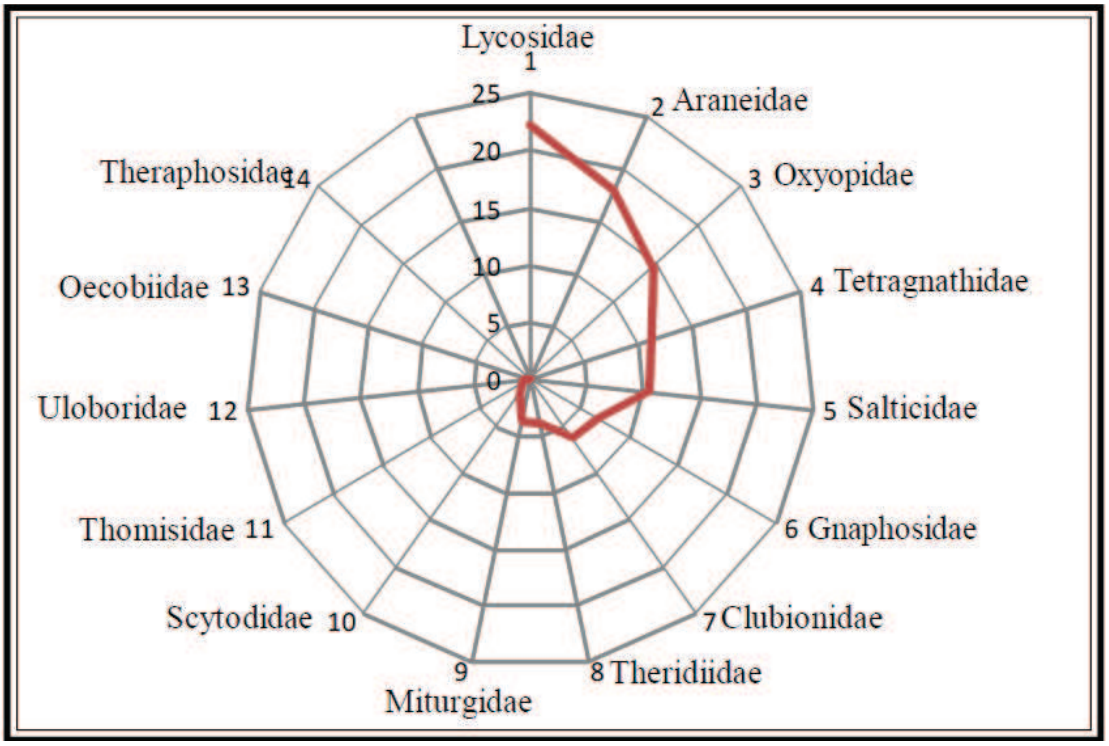

Fig.1, Familywise percent occurrence of spider population per acre of Cotton agro-ecosysten

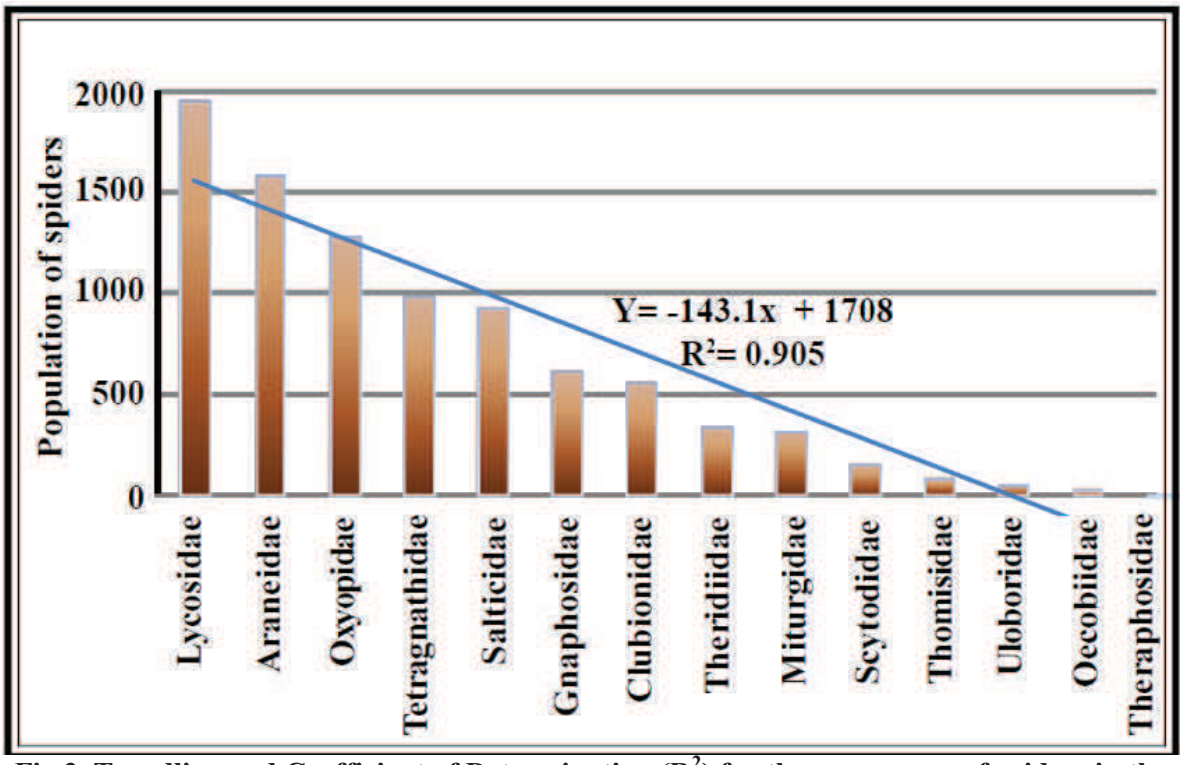

Fig.2, Trendline and Coefficient of Determination (R^2) for the occurrence of spiders in the cotton agro-ecosystem from Purna river basin

Table: 2. Microhabitat used by spiders in Cotton agro-ecosystem.

Species	Microhabitat used by spiders in Cotton agro-ecosystem
Cyclosa confraga (Thorell,1892)	Scattered throughout the plant structure
Cyclosa gossypiata sp. nov. Keswani,2013	Scattered throughout the plant structure
Cyclosa moonduensis Tikader,1963	Scattered throughout the plant structure
Cyclosa spirifera Simon,1889	Scattered throughout the plant structure
Cyrtophora citricola (Forsskål,1775) *	In webs towards the periphery
Eriovixia excelsa (Simon,1889)	On the web between adjacent plants and branches
Larinia chloris (Audouin,1826)	Scattered throughout the plant structure
Lipocrea epeiroides (O. P.-Cambridge,1872)	Scattered throughout the plant structure
Neoscona theisi (Walckenaer,1841)	On foliage, on the web build between adjacent plants and branches
Neoscona vigilans (Blackwall,1865)	On foliage, on the web between plants and branches
Clubiona foliatasp. nov.	Inside curled leaves, on foliage, at the base of cotton fruit, inside open cotton boll
Drassodes luridus (O. P.-Cambridge,1874)	On ground surface, in leaf litter
Sergiolus singhi Tikader & Gajbe,1976	On ground surface, in leaf litter
Zelotes shantae Tikader,1982	On ground surface, in leaf litter
***Hippasa*greenalliae** (Blackwall,1867)	At the base of plant inside sheet web provided with tunnel
Lycosa poonaensisTikader & Malhotra,1980	On ground, soil crevices
Pardosa pseudoannulata(Bösenberg & Strand,1906)	On ground, soil crevices
Schizocosa Sp.nov.	On ground
***Cheiracanthium* inornatum** O. P.-Cambridge,1874	On foliage, under leaf litter
Oecobius putus O. P.-Cambridge,1876	On the surface of stones towards the boundry of field
Oxyopes pankaji Gajbe & Gajbe,2000	On foliage, on ground
Oxyopes tiengianensis Barrion & Litsinger,1995	On foliage, on ground
Peucetia latikae Tikader,1970	On foliage, in grass
Hasarius adansoni (Audouin,1826) *	Among leaf litter, foliage, on ground
Hyllus semicupreus (Simon,1885)	Among leaf litter, foliage, on ground
MyrmarachneSp.	On foliage, ground
Phintella vittata (C. L. Koch,1846)	On foliage, on ground, in leaf litter
Plexippus paykulli (Audouin,1826) *	On foliage, on ground, among leaf litter
Rheneflavigera (C. L. Koch,1846) *	On foliage, on ground, among leaf litter
Telamonia dimidiata (Simon,1899)	On foliage
Thyene imperialis (Rossi,1846) *	On foliage, ground, among leaf litter
***Scytodes* Sp.**	Inside dried leaves, on ground
***Scytodes* Sp.**	Inside dried leaves, on ground
Guizygiella indica (Tikader & Bal,1980)	Inside rolled up leaves, on web between plants and branches
Leucauge decorata (Blackwall,1864)	Between plants and branches close to the ground
Tetragnathamandibulata Walckenaer,1841	On web between plants and branches near the ground, on the open cotton boll, on the basal branches
Phoneyusa sp.nov.	Ground
ArgyrodesargentatusO. P.-Cambridge,1880	Inhabiting webs of *Cyrtophora*
Nesticodes rufipes (Lucas,1846) *	In the webs towards the periphery of field
Parasteatoda mundula (L. Koch,1872)	Inside the dried leaf entangled in the web

Theridion sp. nov.	Throughout the cotton plant structure
Theridion sp. nov.	Throughout the cotton plant structure
Theridula gonygaster (Simon,1873)	On foliage
Indoxysticus minutes (Tikader, 1960) *	On foliage
Thomisus okinawensis Strand,1907	On foliage, on flowers
Uloborus walckenaerius Latreille,1806 *	Underside of the leaf in the middle of the plant

DISCUSSION

The present study dealts with the spider diversity in a specific locality like agro-ecosystem, that too in a specific region of Vidarbha that is Purna River Basin. In cotton agro-ecosystem Lycosid population was the highest (22.01%) followed by Araneids (17.86%) and then Oxyopids (14. 48%) and Salticids (10.44%) indicating major population of hunting spiders.

The Shannon index calculated for cotton agro-ecosystem was 4.777. This is confirmed further by calculating Margalef richness index. The Margalef richness index is 5.209 for spider diversity in cotton agro-ecosystem. The R-Squared value calculated for cotton agro-ecosystem is 0.905. In Cotton agro-ecosystem Lycosid rearing can be taken up at priority for pest control.

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Spiders of Agro-ecosystems: A Review

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Abstract: The large number of studies about the diversity, systematic and ecology of spiders carried out in last three decades in different types of ecosystems all over the world but the importance of spiders in agro-ecosystems as bio-control agents is still largely unknown. In this paper the literature about the study carried out in different agro-ecosystems is reviewed. Total 230 scientific papers published between year from 1804-2012, which are cited here. Several National and International studies have done in different agro-ecosystems like cotton, rice, wheat, maize, soybean, sugarcane, cereal fields, peanut, pea, apple orchards, lime orchards, citrus and banana fields. Significant reports of spider diversity reported from Cotton, Citrus and Banana agro-ecosystems from various parts of world given in Table.No.1.

Keywords: Biological Control, Spider, Agro-ecosystems

Introduction

International Studies:

Spiders play an important role in regulating insect pests in agriculture ecosystems (Nyffeler and Benz, 1987; Nyffeler *et al.*, 1994b; Sunderland, 1999a). Studies of Hamamura (1969); Sasaba *et al.* (1973); Gavarra and Raros (1973); Samal and Misra (1975); Kobayashi (1977); Chiu (1979); Holt *et al.* (1987) and Tanaka (1989) clearly described the role of spiders as predators in reducing insect pests in rice fields. They are ubiquitous in terrestrial ecosystems and abundant in both natural and agricultural habitats (Turnbull, 1973; Nyfeller and Benz, 1987). The distribution and diversity of spiders has drawn attention of naturalists in different parts of the world since the eighteenth century. Latreille (1804); Leach (1815); Koch (1836); Cambridge (1885, 1892 and 1897) and Simon (1887) prepared the early taxonomic records on spiders. According to the World Spider Catalog, Version 14.5 by Platnick (2014), the updated list documented 44540 species of spiders worldwide belonging to 3924 genera and 112 families.

Spiders can colonize fields early, feed on alternative prey until pest populations arrive, and target pests before they reach peak densities (Settle *et al.*, 1996; Landis and Van der Werf, 1997; Chang and Kareiva, 1999; Symondson *et al.*, 2002). They have a low metabolic rate that enables them to survive periods of starvation (Greenstone and Bennett, 1980). Understanding how spiders (Araneae) colonize agro-ecosystems is important since sustaining viable populations of generalist predators is a key attribute of effective integrated pest management (e.g. Snyder and Wise, 1999; Schmidt *et al.*, 2004). Dippenaar-Schoeman *et al.* (1999) studied spiders in South African cotton fields with respect to diversity and abundance (Arachnida: Araneae). Van den Berg *et al.* (1990) investigated the effect of pesticides on spiders in South African cotton fields.

Lycosid spiders are most effectively collected with pitfall traps and it has been shown that the number of linyphiid species caught is about the same in pitfall traps as in D-vac trapping (Dinter, 1995; Standen, 2000). Pitfall traps are also good to know the pattern of predators, and they have been shown to be suitable for monitoring activity (Bishop and Riechert, 1990). Population densities of spiders are low in the vegetation zone of meadows and cereals and high on the ground (Nyffeler and Benz, 1987). Spiders are generalist predators that can function as biological control agents within agroecosystems (Moulder and Reichle, 1972; Nyffeler and Benz, 1987; Riechert and Bishop, 1990; Young and Edwards, 1990; Kajak *et al.*, 1991; Kajak, 1997).

Spiders help in pest management. The spider families Linyphiidae, Dictynidae, Theridiidae, and Agelenidae consistently keep their webs standing which contribute to pest mortality (Nentwig, 1987; Sunderland *et al.*, 1986a,b). Grasshoppers exhibited reduced feeding on grass in the presence of the spider *Pisurina mira* (Walckenaer) (Araneae: Pisauridae). Similarly, the presence of spiders deterred Japanese beetles, *Popilliae japonica* (Newman) (Coleoptera: Scarabaeidae), from feeding on soybean leaves. Spiders have effectively reduced pest populations in agroecosystems (Riechert, 1999; Johnson *et al.*, 2000; Whitehouse and Lawrence, 2001). Predation is most effective when spiders are present early in the growing season when the predator to prey ratio is high (Edwards *et al*., 1979; Ekbom and Wiktelius, 1985; Chiverton, 1986; Birkhofer *et al.*, 2008). Halaj and Wise (2001) performed a meta-analysis of terrestrial food webs in agricultural systems and discovered that spiders exhibited strong top-down effects on plants. Presence of spider populations resulted into reduced larval populations of the moth *Spodoptera littoralis* (Boisduval) (Lepidoptera: Noctuidae) and decreased populations of Cicadellidae (Hemiptera), Thripidae (Thysanoptera), as well as decreased populations of Aphididae (Hemiptera) in southern Bavaria (Lang *et al*., 1999). Riechert and Bishop (1990) found prey densities and plant damage to be lower in garden test systems with augmented spider densities. *Araneus quadratus* Clerck (Araneae: Araneidae) indirectly reduced plant damage by preying on grasshoppers (Andrzejewska *et al.*, 1967). Sea grape leaf damage was significantly reduced when spiders preyed upon gall midges (Spiller and Schoener, 1990). Spiders fed on herbivores, increasing the dry biomass of the plant species *Solidago rugosa* (Schmitz, 2003). The spider *Anyphaena celer* (Hentz) (Araneae: Anyphaenidae) increased mortality of the hemipteran herbivore *Stephanitis pyrioides* (Scott) (Shrewsbury and Raupp, 2006). In soybean, plant damage was reduced when spiders were added (Rypstra and Carter, 1995). Additionally, composted plots had less soybean leaf and pod damage when more spiders were present and non-crop plants had reduced damage as *Argiope trifasciata* (Forskål) (Araneae: Araneidae) had eaten more leaf-chewing insects (Rypstra and Marshall, 2005). Spider predation on pests has been further demonstrated in several other agroecosystems by Riechert and Lockley (1984).

Spiders are especially useful for reducing aphid densities (Sunderland *et al.*, 1986a, *Collins et al.*, 2002). Aphids (Hemiptera: Aphididae) represented approximately 14% of the prey captured by spiders (Nyffeler *et al.*, 1994b). Linyphiid spiders (Araneae: Linyphiidae) killed 31 *Sitobion avenae* (F.) (Hemiptera: Aphididae)/m2/day in winter wheat (Sunderland *et al*., 1986b). In Europe, experimentally manipulated increases in ground predator densities resulted in aphid reduction in maize (Lang *et al.*, 1999), barley (Chiverton, 1986; Ekbom *et al.*, 1992; Ostman *et al.*, 2003), and wheat (Edwards *et al.*, 1979; Chiverton, 1986; Mansour and Heimbach, 1993; Collins *et al.*, 2002; Lang, 2003; Schmidt *et al.*, 2004, von Berg *et al.*, 2009). In addition, presence of spider populations exhibited decreased damage by the greenbug, *Schizaphis graminum* (Rondani) (Hemiptera: Aphididae) (Muniappan and Chada, 1970; Mansour *et al.*, 1981).

It has been suggested that spiders in agro-ecosystems take refuge in surrounding natural landscapes during periods of cultivation and disturbance (e.g., Halley *et al.*, 1996; Wissinger, 1997). Spiders common to agro-ecosystems have been found to move from weed strips to cereal fields in the spring (Lemke and Poehling, 2002) and the proportion of spider webs in cereal fields correlates with the proportion of surrounding non-crop habitat (Schmidt and Tscharntke, 2005a). Differences in spider assemblage patterns in natural landscapes such as woodland and old-fields adjacent to cultivated land was observed (Riechert and Bishop, 1990; Samu and Szinetar, 2002) showing the importance of such landscapes as spider reservoirs. Assemblage differences, however, can fluctuate depending on the time of year. For instance, dominant arable species have been found to be more abundant in permanent grassland in early spring indicating a dependence on natural habitat (Schmidt and Tscharntke, 2005b). Spider colonization of agro-ecosystems occur more commonly *via* long distance colonization events (i.e., ballooning) rather than short distance methods (cursorial) (Riechert and Bishop, 1990; Schmidt and Tscharntke, 2005b). Conservation biological control has also been promoted as a method for increasing populations of spiders in agro-ecosystems (Halaj *et al.*, 2000).

Mellet, *et al.* (2006) investigated the effect of Bt-cotton cultivation on spider populations in Marble Hall, South Africa. According to them neither Bt-cotton nor the application of endosulfan had apparent negative effects on ground or plant dwelling spiders in the field. Spiders should therefore be able to continue playing a role in pest control in Bt-cotton fields. Danisman, *et al.* (2007) Investigated spider fauna of Cereal Fields in Antalya (Araneae). A total of 629 spiders were recorded from wheat, oats and maize fields belonging to 41 species from to 34 genera and 16 families.

Hibbert and Buddle (2008) assessed the dispersal of spiders within agricultural fields and an adjacent mature forest in Canada. They carried out manipulative experiment in corn fields and their adjacent forests using enclosures that restricted access to ground-dwelling spiders. Enclosures were either closed from the adjacent habitat but open to ballooning and ground-dwelling spiders or were open plots. This allowed them to test the role of ballooning compared to cursorial dispersal of ground-dwelling spiders within these habitats. Ninety species were collected using visual surveys and with pitfall traps. More species were collected in cornfields, and more individuals were collected in litter-addition plots. Tahir (2009) investigated diversity and predatory efficacy of spiders inhabiting the rice fields of Central Punjab, Pakistan.

Ghavami *et al.* (2007) investigated the spider fauna of cotton fields in Iran. Spider samples were collected by them from different cotton field localities by pitfall trap and insect net. They classified a total of 632 specimens in 45 species and 59 genera belonging to 19 families. *Cheiracanthium pennyi*, *Neoscona adianta*, *Aulonia albimana* and *Thanatus formicinus* were the most abundant species in cotton fields. Most species belonged to Thomisidae and Araneidae families and the fewest species were from Gnaphosidae, Linyphiidae and Pisauridae families.

Species composition, population densities, and vertical distribution of spiders in Soyabean agro-ecosystem are documented by several arachnologists from different countries (Barry, 1973; LeSar and Unzicker, 1978; Culin and Rust, 1980; Culin and Yeargan, 1982; House and Stinner, 1983; Ferguson *et al.*, 1984; Gregory *et al.*,1989; Carter and Rypstra, 1995; Balfour and Rypstra, 1998; Marshall *et al.*, 2002; Vichitbandha and Wise, 2002; Hlivko and Rypstra, 2003; Pearce *et al.*, 2005; Beltramo *et al.*, 2006; Gonzalez *et al.*, 2009).

Throughout the world, diversity, habitat use and prey preferences by spiders in the rice agro-ecosystem has been extensively investigated by number of authors indicating role of spiders in Integrated Pest Management to control insect pests (Woods and Harrel, 1976; Barrion and Litsinger, 1984; Heiss and Meisch, 1985; Shepard *et al.*, 1987; Xu, *et al.*, 1987; Ye and Wang, 1987; Oraze *et. al.*, 1988; Oraze *et al.*, 1989; Bastidas *et al.*, 1993; Im and Kim, 1996; Kumar and Velusamy, 1997; Barrion, 1999; Im and Kim, 1999; Bamdaradeniya and Edirisinghe, 2001; Bambaradeniya and Edirisinghe, 2008; Tahir and Butt, 2008; Everton, 2009; Tahir and Butt, 2009; Tahir, *et al.*, 2009; Tahir, 2009).

The species composition and frequency of spiders occurring in wheat crop is studied by (Doane and Dondale, 1979; Sunderland *et al.*, 1980; Nyffeler and Benz, 1988c; Nyffeler and Benz, 1988b; Basedow, 1998; Feber *et al.*, 1998; Toth and Kiss, 1999; Basedow *et al.*, 2000; Greenstone, 2001; Harwood, 2001; Pluess *et al.*, 2008). Predatory role of spiders in Maize crop is documented by several authors (Everly, 1938; Sharma and Sarup, 1980; Plagens, 1986; Alderweireldt and Desender, 1990; Peterson *et al.*, 2010). Costall and Death (2009) studied population structure and habitat use by the spider *Latrodectus katipo* along the Manawatu-Wanganui coastline.

Agnew *et al.* (1985) and Agnew and Smith (1989) studied spider diversity in peanut agro-ecosystem with respect to Ecology and habitat use in Texas. Distribution and importance of spiders as predator in sugarcane crop is well studied by Ali and Reagan (1985) and Rinaldi *et al.* (2002). Diversity, population density and effect of pesticides on the occurance of spiders in apple orchards was studied earlier in different countries by (Dondale, 1956; Dondale, 1958; Dondale, *et al.*, 1979; Bostanian, *et al.*, 1984; Wyss, *et al.*, 1995; Wisniewska and Prokopy, 1997; Bogya and Marko, 1999; Miliczky *et al.*, 2000; Pekar and Kocoukek, 2004;). Mansour and Whitcomb (1986); Amalin *et al.* (2001a;b); Ghavami and Ghanadamooz (2008) investigated diversity and habitat use by spiders in citrus ecosystem in Israel, Florida and Iran respectively.

Ntonifor *et al.* (2012) conducted a study to elucidate the frequent occurrences of the tropical vagrant huntsman spider, *Heteropoda venatoria* in bananas, for which, the spider habitats, temporal abundance, distribution and dynamics were studied in banana agro-ecosystems in Cameroon. They concluded that the tropical huntsman spider prefers close fitting sites and crevices as habitats due to its flattened body and long flexible legs. The banana-agroecosystem and plant architecture provides many of such suitable hideouts including litter spots/mulches, loose pseudostem leaf sheaths, leaf petioles, spaces between flower bracts and clusters and between fingers of bunches. During the rains, most of the spiders could migrate into these more sheltered habitats.

Many farmers use chemical pesticides to help control pests. An ideal biological control agent, therefore, would be one that is tolerant to synthetic insecticides. Although spiders are more sensitive to insecticides than insects, some spiders show tolerance, perhaps even resistance, to some pesticides. Spiders are less affected by fungicides and herbicides than by insecticides (Yardim and Edwards, 1998). Spiders such as the wolf spiders *P. pseudoannulata* are highly tolerant to botanical insecticides such as Neem-based chemicals (Theiling and Croft, 1998; Markandeya and Divakar, 1999). They are also generally more tolerant to organophosphates and carbamates than of pyrethroids, organochlorines, and various acaricides. This tolerance may be due to genetic resistance bred over a period of continuous exposure (Theiling and Croft, 1998; Wisniewska and Prokopy, 1997; Yardim and Edwards, 1998; Marc *et al.*, 1999; Tanaka *et al.*, 2000). *P. pseudoannulata* (Lycosidae), *Tetragnatha maxillosa* (Tetragnathidae), *Ummeliata insecticeps* and *Gnathonarium exsiccatum* (Linyphiidae) were highly sensitive to the pyrethroid deltamethrin, but very tolerant of the organophosphate diazinon and the carbamate carbaryl (Tanaka *et al.*, 2000).

Studies on Spiders of Agro-ecosystems from India:

In India, studies on the population and abundance of the spider assemblages in agricultural crops are few. Some basic studies were carried out by Pathak and Saha (1999) and Bhattacharya (2000). Banerji, *et al.* (1993) and Anbalagan and Narayanaswamy (1999) analyzed the population fluctuation of spiders in paddy fields. However, these studies were mostly limited to the identification of spiders and investigation of the dominant spider species.

Trivedi (2009) carried out an ecological study to determine the quantitative and qualitative community structure and population of spiders in Groundnut crop fields. Spiders were collected at random following a quadrant method (each quadrant of 1 sq. m taken per visit, total count 25 quadrants), 25 visits every week, during the crop season from july to November, 2002, at Munjka village of Rajkot, Gujarat state. A total of 809 spiders, belonging to 37 species under 22 genera and 10 families were collected. They were classified into three guilds based on their predatory behavior ashunting, ambushing and web building; the per cent of spiders within active groups were 68.48, 14.83, and 16.69 respectively. The largest numbers of individuals collected belonged to the families Salticidae (27.69%), Oxyopidae (11.25%), and Philodromidae (11.13%). The most abundant genera were *Marpissa, Pardosa, Oxyopes and Theridion*. The most abundant Salticid and Lycosid identified to species were *Plexippus paykulli* (4.94%) and *Pardosa pseudoannulata* (4.94%) respectively. Maximum density of spiders was observed during the flowering stage of the crop in September, thereafter it decreased, and evenness index (e) was almost higher (3.0) in Groundnut crop-ecosystem. These results indicated that an increased diversity index (H') was correlated with crop growth and it ranked as October- 3.94 > September – 3.89> August- 2.73>Nov-0.99> July-0.0.

Siliwal Manju and Dolly Kumar (2002, 2003a,b) reported *Harmochirus brachiatus (Thorell), Dinopis goalparaensis, Triaeris manii* and *Triaeris poonaensis* spiders from banana agroecosystems of Baroda, Gujarat. Similarly they have also sighted *Latrodectus hasseltii indicus* Simon (Araneae: Theridiidae) in a cotton field in Baroda district, Gujarat during 2001.Dollykumar and Shiva Kumar (2004, 2006) investigated the seasonal abundance of spiders in rice and pigeon pea agroecosystems of Vadodara Gujarat, with special emphasis on Bio-control aspect.

Sebastian, *et al.* (2005) studied spider fauna of the irrigated rice ecosystem in central Kerala. A survey of spiders associated with the irrigated rice ecosystem in central Kerala, India was conducted by them across different elevation ranges. Spiders were collected from rice fields of high ranges, midland and

low land areas in two cropping seasons viz., June–September 2002 (Kanni Krishy) and October 2002–February 2003 (Makara Krishy) with a total of 144 hours of sampling time distributed across the two seasons. The sampling areas constituted Adimali and Marayoor of Idukki district (high range), Vannappuram of Idukki district and Kothamangalam of Ernakulam district (midland) and Parakkadavu and Piravom of Ernakulam district (lowland). Visual searching methods were used to sample the spider fauna from quadrats. A total of 1130 individuals belonging to 92 species, 47 genera and 16 families were recorded during the study period. Araneidae and Tetragnathidae were the dominant families and *Tetragnatha mandibulata* (Family Tetragnathidae) the most abundant species. Various diversity indices, as well as richness and Chao I estimator were used to analyze the possible effect of elevation on species occurrence; the results showed that species richness and diversity were the highest in Parakkadavu, which is a lowland area. In a cluster analysis the localities belonging to the same elevation were found to form separate groups. Orb weavers were dominant at all study sites. Most of the spider diversity in agro-ecosystem is studied by several researchers in rice fields from different states of India (Sellammal and Chelliah, 1982; Krishnaswami *et al.*, 1984; Gupta *et al.*, 1986; Rajendran, 1987; Nirmala, 1990; Ansari and Pawar, 1992; Banerji *et al.* (1993); Mishra and Shrivastava, 1993; Kumar, 1994; Thakur *et al.*, 1995; Ganeshkumar and Velusamy, 1996; Sahu, *et al.*, 1996; Samiyyan and Chandrasekaran, 1998; Venkateshalu *et al*., 1998; Anbalagan and Narayanaswamy, 1999; Pathak and Saha, 1999; Bhattacharya, 2000; Vanitha, 2000; Mathirajan, 2001; Shenhmar *et al.*, 2001; Zhimomi *et al*., 2001; Jose, *et al.*, 2002; Satpathi, 2004; Patel *et al.*, 2004 and 2005; Sebastian *et al.*, 2005; Sudhikumar, *et al.*, 2005; Devarassou and Adiroubane, 2006; Diraviam *et al*., 2006; Kumar and Shivakumar, 2006; Manisegaran *et al*., 2006; Manu and Bai, 2006; Venturino, *et al.*, 2008; Chatterjee, *et al.*, 2009 and Jayakumar and Sankari, 2010).

The mean populations of spiders in cotton fields from three different places like Thayilpatti, Madathuppatti and Vembakkottai, Virudhunagar district, Tamil Nadu, India were studied by Jeyaparvathy *et al.* (2012). In these areas, twenty common species of spiders belonging to six families from these three selected areas were collected and identified. The collected spiders were belonging to the families, Salticidae, Oxyopidae, Araneidae, Lycosidae, Gnaphosidae and Sparassidae. In this study, two types of spiders were observed, one is web weaver and another one is non-web weaver. The web weaving spiders were belonging to the family Araneidae and Lycosidae. The non-web weaving spiders were belonging to the family Salticidae, Oxyopidae, Gnaphosidae, Lycosidae and Sparassidae. *P. viridana, O. birmanicus, O. hindostanicus, P. latikae and A. anasuja* were dominant predator recorded in these three selected areas. The population dynamics of the individual spider species in different months showed that the population of spider species mainly *P. vridana, O. birmanicus, O. hindostanicus, A. anasuja, N. lugubris, P. latikae, C. cicatrosa* and *L. pseudoannulata* were very high throughout the study period. The increase in the spider density suggested that the spider density is influenced by the increase in prey density.

Jeyaparvathi *et al.* (2013) also investigated the biological control potential of spiders on the selected cotton pests and found that the four species of spiders like (*Peucetia viridana Oxyopes birmanicus* (Thorell) and *Peucetia latikae* were predominant in the cotton fields of Achamthavirthan, Virudhunagar district, Tamil Nadu, India.

Table 1: Significant Reports of Spider Diversity Reported from Cotton, Citrus and Banana Agro-Ecosystems from Various Parts of World

Agro-ecosystem	Country	Reference	Major observations
Cotton	Texas	Dean *et al*., 1982	1. Reported 97 species from 71 genera and 18 families. 2. Orb weavers as dominant species mostly inhabiting middle of the plant and ambushing spiders occupied top of the plant.
Cotton		Dean *et al*., 1987	1. Hunting spiders *Phidippus audax*, *Metaphidippus galathea* and *Misunenops celer* were observed predating on the cotton fleahopper, *Pseudatomoscelis seriatus*.
Cotton	Israel	Mansour, 1987	1. Spiders from 18 and 13 families were recorded from pesticide unsprayed and sprayed fields respectively. 2. Spiders suppress pest populations and delay pest outbreaks.
Cotton	Texas	Nyffeler *et al*., 1987b	1. Cotton fields were dominated by generalist predator, *Oxyopes salticus.* 2. 0.12 million prey might have been killed by them per ha cotton land per week.
Cotton	Texas	Nyffeler *et al*., 1987a	1. Green lynx spider, *P. viridans* feeds both diurnally and nocturnally. 2. *P. viridans* was observed feeding on insects of orders Diptera, Hymenoptera, Heteroptera, Homoptera, Coleoptera, Lepidoptera, Neuroptera, and Odonata.
Cotton	Texas	Nyffeler *et al*., 1987c	1. *A. aurantia* was found to be a predator of the cotton fleahopper (about 1 % of the spiders'diet).
Cotton	Texas	Nyffeler *et al*., 1988a	1. Web-building spiders *Dictyna segregata*, *Theridion australe*, *Tidarren haemorrhoidale* and *Frontinella pyramitela* found to prey on Aphids and cotton fleahoppers.
Cotton	Texas	Nyffeler *et al*., 1988b	1. Black widow spider, *Latrodectus mactans* preyed on red fire ant, *Solenopsis invicta*, which constituted 75 % of the prey.
Cotton	Texas	Nyffeler *et al*., 1989	1. Orb weavers as dominant groups in cotton field. 2. Prey selection by spiders is determined by web location, web inclination, and web strength.
Cotton	Texas	Breene, 1989	1. Recorded 18 species of spiders from 11 families Preying on cotton fleahopper.
Cotton	Mississippi	Hayes and Lockley, 1990	1. Coleoptera and Diptera are important preys of wolf spiders during night.
Cotton	South Africa	Van Den Berg *et al*., 1990	1. 76 species from 61 genera and 18 familes were identified. Lycosidae (41.9 %) as dominant family.

		Breene *et al*., 1990	1. *O. salticus, P. audax,* and *M. celer* controlled cotton fleahoppers almost 42 %, 66 % and 32 % respectively.
Cotton	Texas	Nyffeler *et al*., 1992	1.Cotton fleahoppers composed almost 25% of the total prey of *O. salticus* during June and July.
Cotton	Texas	Nyffeler *et al*., 1992	1.Lynx spiders were the dominant predators feeding predominantly on Heteropteran, Hymenopteran, and Dipteran pests.
Cotton	Texas	Breene *et al*., 1993	1. Spiders were observed feeding upon every major and most minor, secondary, or occasional insect pests of Texas cotton. They act as ecological indicators.
Cotton	China	Zhao, J. Z., 1993	1. 204 species of spiders inhabited cotton fields in China, belonging to 21 families and 88 genera. These species accounted for >50% of the total population of predators of cotton insect pests.
Cotton	South Africa	Dippenaar-Schoeman *et al*.,1999	1. 127 species from 92 genera and 31 families were reported. Their occurance was in the order Thomisidae > Araneidae >Theridiidae.
Cotton	Pakistan	Ghafoor, 2002	1. 64 species belonging to 8 families were recorded from cotton fields and the dominance was in the order of Lycosidae > Gnaphosidae > Salticidae > Araneidae.
Cotton	India	Sebastian *et al*., 2004	1. *Oxyopes chittrae* was observed as actively hunting spider in cotton.
Cotton	Central Kenya	Warui *et al*., 2004	1. 132 species belonging to 30 families were recorded from cotton fields from central Kenya and they were in the order of Salticidae > Gnaphosidae > Araneidae > Lycosidae >Theridiidae >Thomisidae >Zodariidae.
Cotton	New Mexico	Bundy, 2005	1. 42 genera from 19 families were identified which were in the order of Lycosidae > Linyphiidae > Thomisidae as abundant families.
Cotton	Iran	Ghavami, 2008	1. Spiders act as biological control agents of insect pests in agro-ecosystems.
Cotton	Iran	Ghavami, 2008a	1. 76 species from 59 genera and 19 families were reported from cotton fields from Iran. 2. *Thanatus formicinus, Cheiracanthium pennyi, Aulonia albimana, neoscona adianta* were dominant species.
Citrus	Florida	Muma, 1975	1. Cribellate spiders were abundant in the citrus grove.
Citrus	California	Carroll, 1980	1. Reported spider as a major predator in citrus canopy as well as in the litter.
Citrus	Israel	Mansour and Whitcomb, 1986	1. Spiders act as a biocontrol agent for *Ceroplastes floridensis* (Homoptera: Coccidae).
Citrus	South Africa	Van Den Berg *et al*.,	1. 3054 spiders from 21 families were sampled in an unsprayed citrus orchards.

		1992	2. Order of dominance was family Salticidae > Theridiidae > Thomisidae > Araneidae > Clubionidae > Tetragnathidae.
Citrus	Texas	Breene *et al*., 1993	1. 33 species from 13 families of spiders were reported their occurance was in the order Araneidae > Theridiidae > Thomisidae > Salticidae > Lycosidae > Tetragnathidae > Gnaphosidae > Uloboridae > clubionidae > Anyphaenidae.
Banana	Panama	Harrison, 1968	1. Vertical distribution of spiders was studied in the banana field. 2. Member of family Argiopidae represented by largest number.
Banana	Cameroon	Ntonifor *et al*., 2012	1. *H. venatoria* inhabited the soil litter /mulches, loose leaf sheats (barks) of pseudostems and stumps, leaf petioles, spaces between banana flower bracts and clusters.

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Studies on diversity of natural enemies in brinjal crops

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Abstract
Natural pest of cotton diversity is found in standing commercial crops growing by farmer and due this pest huge loss in their production as well as productivity of crops. This research article help for diversion of natural pest by intercropping and border crop plantation during or before inter plantation of commercial crops help in diversion of pest for their survive. In paper total number of pest identified with their family found in brinjal vegetable field in washim district. Also mentioned alternate crop growing for source of food for pest and this crop protect from microclimate, provide shelter and breeding platform to pest.

Keywords: brinjal, pest, biodiversity, intercrop and recommendation etc.

Introduction
Living beings are broadly classified into three forms: the producers, the consumers and decomposers. Each of the three forms encompasses numerous varieties of organisms which differ from each other in colour, size, shape, weight, structure, chemical composition, habits, habitats, feeding styles, etc. Above all, the genetic characters of one organism cannot match with another organism. In this way the earth is supporting a diversity of life forms. Biodiversity considered for insect pest and microorganism interaction within ecosystem (Vandermeer and Perfecto, 1995). Some researchers have suggested the mixed cropping or intercropping method to encourage the natural enemies. The presence of weeds in an agricultural field could influence the abundance and distribution of natural enemies (Tooker and Hanks, 2000). Intercrops or border crops provide breeding grounds, pollen and nectar to adult natural enemies. They also give suitable microclimate to the natural enemies. This chapter deals with the diversity of natural enemies in brinjal and okra fields and the impact of intercrops on the diversity indices is analyzed by comparing with the monocrop ecosystem.

Biodiversity
Biodiversity or biological diversity refers to the variety within the living world. The term biodiversity is defined as 'the variety of genetically distinct populations and species of plants, animals, and micro-organisms with which *Homosapiens* shares the Earth, and the variety of ecosystems of which they are a part' (Ehrlich and Ehrlich, 1992). In addition, biodiversity can also be defined in terms of assemblage of species in space, such as in beta-diversity (species composition along an environmental gradient) and in gamma diversity (Species composition within similar habitats at different sites) (Whittaker, 1965). Species richness provides an extremely useful measure of diversity when a complete catalogue of species in the community is obtained (Magurran, 1988). Biodiversity is important in the view point of environmental stability, sustainability, economy and aesthetic values. It is also recognized that loss of biodiversity is mainly due to man-made activities and is taking place at an alarming rate in most parts of the world (Anura Wijesekara and Wijesinghe, 2003).
Sustainable use for conservation of biodiversity important. Less than 2 million flora and fauna have been described and named. These include 3 lakh species of green plants and fungi, 8 lakh species of insects, The comparable figures of described species in India are 15,000 species of flowering plants, 67,000 insects, 4000 species of molluscs, 6,500 species of invertebrates, 2000 fishes, 140 amphibians, 420 reptiles, 1200 birds and 340 mammals. From the above figures it is quite obvious that up to 75% of the species do not even have a name. Over the years, various catastrophes like drastic changes in climate brought about by continental drift, massive volcanic eruptions or asteroid impacts have caused mass extinction of life on various parts of the globe.

Importance of biodiversity
Biodiversity is importance because to maintain the balance of environment. Interaction pest and insect between human from ancient for their livelihood. Another ways biodiversity importance because of some pest and insect are beneficial for breeding of plants carried out by insect and pest. Also, some product produced by insect and pest like gums, honey for human need his diet.

Diversity in Agro ecosystems
Conservation and sustainable use of biodiversity has been given prime importance throughout the world mainly due to the fear that the rapid alteration of the earth`s environment may lead to a loss of stability of the ecosystems. This will be detrimental to the survival of mankind in this universe (IGBP, 1990).

Factors affecting insect diversity
Dempster (1968) demonstrated the effect of pesticides on natural predators of *Pieris rapae* (Lepidoptera: Pieridae) resulting in a long term net increase in the pest population. Because of the fragile nature, insects are easily affected by even minor perturbations in the environment, so much so, they have been considered as indicators of disturbance (Majer, 1983; Disney, 1986; Rosenberg *et al*., 1986) Claasen (1933) documented the changes that happened to the insect fauna as a result of industrial activities in the United States.

Insect diversity in India

The insect diversity in India as compared to the world fauna is as follows: Of the 29 insect orders, 27 orders are known from India. The *Coleoptera* has been so far recorded by 103 families, followed by *Diptera* 87 families, *Lepidoptera* 84 families, *Hemiptera* 77 families and *Hymenoptera* 57 families (ZSI, 1991). Ghosh (1994) reported in the Island ecosystem of Andaman and Nicobar, as many 1747 species of insects belonging to 22 orders showing a fairly well spread entomofauna. The Lepidoptera represents nearly 50 percent of species that occur on mainland India. On the other hand, in Lakshadweep island group, only 113 species belonging to 7 insect orders have been recorded.

Species composition of brinjal field

Brinjal, called in scientific name is *Solanum melongena* L., is one of the three most important vegetables in South Asia (India, Bangaladesh, Nepal and Sri Lanka), which accounts for almost 50% of the world`s area under cultivation (Alam *et al.*, 2003) [2]. In the brinjal field, various arthropod species, both pests and natural enemies, prevail during seedling to harvesting stage. E1-Shafie (2001) observed 28 species of insect pests under seven different insect orders from the brinjal ecosystem while Nayar *et al*. (1995) reported 53 species of insect pests of brinjal. Latif *et al*. (2009) [8] observed 20 species of harmful arthropods under 17 families belonging to 6 different orders. *Leucinodes orbonalis* (Guenee) is a serious brinjal shoot and fruit borer pest.

In Chhattisgarh, the most common pests recorded were *Atractomorpha crenulata*, *Oxya velox*, *Mocis* sp. and *Taeniothrips* sp. (Bhardwaj, 1986).

Materials and methods

Collection of pest in morning and evening time from brinjal crop field at Washim district area Maharashtra, India during July- in. Insect sampling was done in villages of Washim district, the details related collection of insects of study sites and total area covered for sampling are given in sampling method. where castor, roselle, cowpea and agathi were grown as intercrops or border crops.

Sampling methods

Several methods of sampling such as visual observation, net sweeping, baiting and Pit-fall trapping are available for assessment of the arthropod population in vegetable ecosystems (Latif *et al*., 2009) [8]. The method of sampling will vary according to the insect group to be collected. All the collected pest and insect identified by babar hussain chang *et al*, 2018 and sort out their order, family and species.

Result and conclusion

Some phytophagous and entomophagous insects recorded in brinjal crops

Epilachna vigintioctopunctata

Leucinodes orbonali

Cyrtacanthacris tatarica

Oxya nitidula

Eyeprepocnemus alacris alacris

Poekilocerus pictus

Trigonodes hyppasia

Margaronia indica

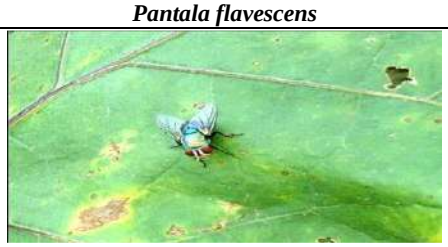
Homoptera

Orthetrum testaceum

Pantala flavescens

Platycnemis dealbata

Ictinogomphus rapax



Syrphus ribesii

Vespula germanica

Photograph of brinjal crops field in the study areas

Fig 1: Brinjal field

Table 1: List of some phytophagous insects recorded in brinjal in washim districts.

Order	Family	Name of the insect
Orthoptera	*Acrididae*	*Oxya nitidula* (Walker)
		*Eyeprepocnemus alacris alacris (*Serville*)*
	Pyrgomorphidae	*Poekilocerus pictus*
		Orthacris sp
Lepidoptera	*Noctuidae*	*Trigonodes hyppasia* (Cramer.)
		Margaronia Indica
	Crambidae	*Leucinodes orbonalis*
Odonata	*Libellulidae*	*Orthetrum testaceum* (Burmeister
		Pantala falvescens (Fabricius)
		Diplocodes trivialis
		Trithemis festiva
	Platycnemididae	*Platycnemis dealbata*
		Rhyothemi svariegata (Linn)
	Gomphidae	*Ictinogomphus rapax* (Rambur)
		Heliogomphus selysi
Coleoptera	*Coccinellidae*	*Epilachna vigintioctopunctata* (Fab)
	Chrysomelidae	*Diapromopha* sp.
		Galeruca indica (Baly.)
Hymenoptera	*Vespidae*	*Vespula germanica*
		Vespa analis (Fab.)
Diptera	*Syrphidae*	*Dideopsis aegrota* (Fabricius)
		Ischiodons cutellaris (Fabricius)
		Citrogramma flavigenum Wyatt
		*Eupeodes corollae (*Fab.)
		Syrphus ribesii

Table 2: List of neutral insects recorded from brinjal field

Order	Family	Name of the Insect
Hymenoptera	Megachilidae	*Megachile lanata* (Fab.)
Diptera	Drosophilidae	*Drosophila melanogaster* (Meigen)
	Tabanidae	*Chrysops* sp
		Tabanus tenebrosus (Walker)
	Muscidae	*Hydrotaea dentipes*(Fab.)
		Heliographa insignis (Stein.)
		Limnopho rafallax (Stein)
		Neomyia flavidi pennis (Macquart)
Coleoptera	Scarabaeidae	*Onitis* sp.
Phasmida	Heteronemiidae	*Oreophoetes paruana*
Mecoptera	Panorpidae	*Panorpa appendiculata*

In the present studies of pest and insect on brinjal crops field and border crops were collected and identified in two season mentioned photo graph and table no. 1 and 2.

Conclusion

Natural pest of cotton diversity is found in standing commercial crops growing by farmer and due this pest huge loss in their production as well as productivity of crops. Diversion of natural pest by intercropping and border crop plantation during or before inter plantation of commercial crops help in diversion of pest for their survive. In paper total number of pest identified with their family found in brinjal vegetable field. Alternate crop growing for source of food for pest and this crop protect from microclimate, provide shelter and breeding platform to pest. Also, pest and insect can survive on border crop all necessary food required to pest and insect produced by it. So, pest and insect diversity studies in commercial crops and available alternate source of food to pest and insect always better for farmer to avoid huge loss of crops.

Recommendation

1. Planting border crop for alternate source to pest and insect.
2. Adaptation of crop rotation
3. Use of insect and pest resistance variety.
4. Install insect and pest trap in field.
5. Conserve bio control agent like spider survive on feeding of pest and insect.

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Barotropic Bulk Viscous FRW Cosmological Model in *f (Q)* Gravity

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Abstract: -

In the present work our aim is to construct Barotropic Bulk Viscous fluid FRW Cosmological models in the framework of $f(Q)$ modified theory of gravity. We explore the accelerating universe behavior for a few popular f(Q) models using a hybrid expansion law solution, which combines the properties of the exponential functions and power law $a(t) = a_0\left(\frac{t}{t_0}\right)^k e^{b\left(\frac{t}{t_0}-1\right)}$. We have produced a class of coefficient of bulk viscosity, distinct barotropic models of the cosmos, for an alternative choice of barotropic fluid. There is also discussion of the geometric and physical characteristics of cosmological theories.

Keywords:-Barotropic Bulk Viscous Fluid, FRW Space-Time, $f(Q)$ modified Gravity.

I. INTRODUCTION

The Einstein's General Relativity (GR) is considered as a central hypothesis to comprehend a few secret parts of gravitational elements that give fundamental comprehension of astrophysical marvels just as the universe. As of late, a few observational confirmations have closed the main certainty that the universe encounters an early swelling just as late-time sped up extension [1-3]. It has been said that this is brought about by the presence of some baffling power containing terrible gravitational impacts which is referred to as dark energy (DE). There are chiefly two ways to deal with manage this strange nature of DE and astronomical speeding up issues. One methodology prompts adjustment of activity standard in GR known as altered hypotheses of gravity which are considered as elective ways to deal with fuse DE. In the other methodology, to comprehend the idea of DE, a few dynamical DE applicants are presented [4, 5]. The most un-complex comprehension for this DE is the introduction of a cosmological consistent identifying with state of state limit $\omega = -1$. Furthermore, in the assembled works dissipated from the cosmological reliable there are various candidates of DE which is identified with the energy thickness of a dynamical scalar field, for instance, substance $(\omega > -1)$ [6, 7]. Spirit field $(\omega < -1)$ [8, 9] and Quinton (that can inverse apparition locale to center district) [10, 11] Chaplygin gas [12], k-essence [13-16], Tachyon field, Holographic and Age realistic DE. Fundamentally, there appear to be two ways for the universe to be expanding faster than usual. First, the accelerated expansion of the universe can also be explained by updated theories of gravity. The Ricci scalar, the Gauss-Bonnet invariant, the trace of the energy-momentum tensor, and the torsion scalar of the universe are each denoted by the letters R, G and T, respectively, in the modified theories of gravitation known as $f(R), f(R,T), f(G)$ and $f(R,G)$gravity. In the context of these modified theories of gravity, numerous works have been developed, and intriguing findings have been made in. Vernov and Ivanov[17] have considered $f(R)$cosmological model in scalar field. Bhoyar et al. [18] described Bianchi type-I with quadratic equation of state in the metric version of $f(R)$ gravity and obtained exact solutions of the field equations by applying volumetric power law and exponential law of expansion. Bhoyar et al. [19] investigated the dynamics of locally rotationally symmetric and spatially homogeneous Bianchi type-I (LRS) SR with the linear equation of state filled with a perfect fluid in the framework of $f(T)$gravity. They applied the gravitational field equations for the linear and quadratic form of $f(T)$gravity. Bhoyar et al. [20] studied the interaction and non-interaction between Holographic dark energy and dark matter within the frame work of $f(G)$gravity using a spatially homogeneous and anisotropic. Borgade et al. [21] dedicated to the self-propelling investigation of dynamics of bulk viscous string in LRS Bianchi type-I cosmological model within the circumstance of $f(R,G)$gravity. Agrawal et al. [22] explained bouncing cosmological models in an

isotropic and homogeneous space time with the F(R) theory of gravity.A model that is based on the so called $f(Q)$ gravity theory, also known as symmetric teleparallel gravity, or non-metricity scalar, Q, acts as the gravitational interaction among all of the determinations. Jimenez et al. [23] were the first to establish the concept of $f(Q)$ gravity. By incorporating the polynomial functions of the red shift in Lagrangian and successfully deriving from data on the expansion rate, type Ia Supernovae, Quasars, Gamma-Ray Bursts, BAO data, and CMBR distance, Lazkozet al. [24] studied an intriguing restriction on $f(Q)$ gravity theory. In contrast to the formulation of traditional GR, an analysis of $f(Q)$ theory of gravity has advanced quickly, along with astrophysical data observational limitations to provoke it. Mandal et al. [25] found successfully tested the energy requirements for $f(Q)$ gravity models. They specified free parameters and limit the families of $f(Q)$ models that are compatible with the accelerated expansion of our universe was made possible by the energy requirements. Bajardi et al.[26] took into account $f(Q)$ extended symmetric tele parallel cosmologies, where Q is the non-metricity scalar, and used the order reduction method to constrain its functional form. Non-linear extension of non-metricity scalar for MOND found by Fabio et al.[27]. Constraint on the equation of state parameter (ω) in non-minimally coupled $f(Q)$ gravity discussed by Mandal and Sahoo [28]. With the modification of the evolution of linear perturbations, Atayde and Frusciante [29] provided observational restrictions on the non-metricity of the $f(Q)$ gravity, which reproduces an exact history of CDM background expansion. Impact of $f(Q)$ gravity, a particular family of modified gravity models in which gravity is defined by the non-metricity scalar, Q [30], on cosmic observables. Shekh [31] described the holographic dark energy concept in terms of f gravity.The candidate [32–34] detailed the most recent cosmological models of $f(Q)$ gravity theory and explained the causes of the universe's accelerating expansion.The most recent formulation of $f(Q)$ gravity is provided by [35], and it was further demonstrated that the energy conservation criteria is identical to the field equation of $f(Q)$ theory's affine connection.

In the early stages of the universe's evolution, the bulk viscosity is crucial. The fact that matter in the early cosmos behaved like a viscous fluid when neutrino decoupling took place is evidence for this. The faster expansion can also be produced by mixing cosmic fluid with bulk misleading pressure [36]. The role of bulk viscosity in the universe's current accelerated phase has been investigated by Fabris et al. [37].Bali and Tinker [38] study the Bianchi type-III bulk viscous barotropic fluid cosmological model with variables G and Λ.Yadav [39] studied bulk viscous and barotropic perfect fluid cosmological models of the Bianchi type III within the framework of Lyra's geometry, and Bali and Saraf [40] investigated a C-field cosmological model for barotropic fluid distribution with bulk viscosity and decaying vacuum energy (Λ) in FRW Space-Time(SR).In the context of the $f(T)$ theory of gravity, where, T stands for the torsion scalar, Chirde and Shekh [41] presented the spatially homogenous and isotropic Friedman Robertson-Walker (FRW) cosmological model with barotropic viscous fluid. Using a newly created mathematical formalism, Mishra et al. [42] built the cosmological model of the universe in a two-fluid environment Recently, Gusu [43] provided a cosmological model with a bulk viscous and DE fluid nature that included a Bianchi type-I universe. By assuming the hybrid expansion law, they were able to get the answers to the field equations.We explore the Baratropic Bulk Viscous FRW Cosmological Model in $f(Q)$ Gravity in this paper, which is motivated by the discussions and analyses discussed above. This is how the work in this paper is laid out: We have explored a FRW cosmological model within the context of $f(Q)$ Gravity with Baratropic Bulk Viscosity and derived the field equations in the section under "Model and The Field Equations. The hybrid expansion law, which generates a time-dependent deceleration parameter as indicated by the observation data, was taken into consideration in the section on "Cosmographic Solutions". Additionally, it is well-known from the literature that this law is a generalization of both the exponential law and the power law cosmologies. We have covered "Physical Parameters and Kinematical Parameters" in the most recent sections. The final section concludes with a summary of the results.

II. MODEL AND THE FIELD EQUATIONS

Let us consider the homogenous and isotropic Robertson – Walker space time,

$$ds^2 = -dt^2 + A^2(t)\left[\frac{dr^2}{1-kr^2} + r^2\left(d\theta^2 + Sin^2\theta d\phi^2\right)\right], \tag{2.1}$$

where $A(t)$ is function of cosmic time t called as the scale factor and the determinant of metric (2.1) can be written as:

$$g = \det g_{mn} = \frac{-A^6(t)r^4 Sin^2\theta}{1-kr^2} \tag{2.2}$$

.

The homogeneous and isotropic Robertson-Walker SR forms the canvas upon which the grand narrative of our expanding universe unfolds. Like a symphony of cosmic proportions, it describes a cosmos where every point looks the same in all directions and the fabric of space stretches or shrinks uniformly as time progresses. This elegant framework, woven by the hands of Einstein's equations and the astute insights of cosmological pioneers, allows us to contemplate the vast tapestry of galaxies, stars, and planets as they journey through the epochs of time, painting a

portrait of the universe's evolution that is as mesmerizing as it is profound.Due to the importance of R-W model many authors have considered and developed the new models of Universe [44-47].

2.1 $f(Q)$ Gravity and the Energy Momentum Tensor (EMT):

The $f(Q)$ Gravity theory is a fascinating and innovative approach to understanding the fundamental forces of the universe. Unlike traditional GR, which relies on the curvature of SR to describe gravity, $f(Q)$ gravity theory introduces a new variable Q , which represents a non-metric field. This departure from conventional physics allows for a more versatile framework to explore the mysteries of dark energy and dark matter, potentially offering insights into the nature of these enigmatic cosmic constituents. By extending the mathematical toolbox of gravitational theories, $f(Q)$ gravity theory opens up exciting avenues for exploring the fundamental underpinnings of our universe and challenging our understanding of gravity in a way that may ultimately lead to profound breakthroughs in our comprehension of the cosmos. Here,we have considered that the action for symmetric teleparallel gravity which is given by

$$S = \int \frac{1}{2} f(Q)\sqrt{-g}\, d^4x + \int L_m \sqrt{-g}\, d^4x \tag{2.3}$$

Where $f(Q)$ represents the function forms of Q, g is the determinant (2.2) of metric (2.1), and L_m is the matter Lagrangian.

The non-metricity tensor and its traces can be written as:

$$Q_{\lambda\mu\nu} = \nabla\lambda g_{\mu\nu} \tag{2.4}$$

The non-metricity tensor, a fundamental concept in the realm of GR and differential geometry, plays a pivotal role in our understanding of SR curvature beyond the familiar confines of the metric tensor. While the metric tensor characterizes the intrinsic geometry of SR, the non-metricity tensor encapsulates the effects of torsion and non-gravitational forces on the curvature. This tensor unveils the subtle interplay between geometry and matter, offering a deeper insight into the fabric of the universe. Its presence highlights the profound complexities of SR, ultimately enriching our comprehension of the cosmos by accounting for the intricate interrelationships among various physical phenomena, from gravitational waves to the behavior of particles in curved space.

$$Q_\alpha = Q_\alpha{}^\mu{}_\mu,\ \tilde{Q}_\alpha = Q^\mu{}_{\alpha\mu}. \tag{2.5}$$

Also, the non-metricity tensor helps us to write the super potential as

$$P^\alpha{}_{\mu\nu} = \frac{1}{4}\left[-Q^\alpha{}_{\mu\nu} + 2Q_{(\mu}{}^\alpha{}_{\nu)} + Q^\alpha g_{\mu\nu} - \tilde{Q}^\alpha g_{\mu\nu} - \delta^\alpha{}_{(\mu}Q_{\nu)}\right] \tag{2.6}$$

where the trace of non-metricity tensor has the form

$$Q = -\,Q_{\alpha\mu\nu}P^{\alpha\mu\nu} \tag{2.7}$$

The EMT T^i_j for bulk viscous distribution is taken as

$$T^i_j = (\bar{p} + \rho)u^i u_j + \bar{p} g^i_j\ , \tag{2.8}$$

The energy-momentum tensor, a fundamental concept in theoretical physics, encapsulates the distribution and flow of energy and momentum within a given SR. It serves as a cornerstone of GR relativity, encoding the gravitational effects of matter and energy. This tensor not only informs the curvature of SR but also influences the dynamics of particles and fields within it. In essence, it is the mathematical embodiment of the interplay between mass, energy, and the geometry of the universe, offering profound insights into the behavior of the cosmos on both cosmic and quantum scales. Its intricate components and symmetries reveal the intricate dance between forces and matter, providing a crucial tool for understanding the fabric of our universe.

Together with commoving co-ordinate $u^i = (0,0,0,1)$ the four velocity vector for (2.1) can be expressed as:

$$u^i u_i = -1, \bar{p} = p - \xi\, u^i_{;i}, \tag{2.9}$$

Where u^i is the four velocity vector of the cosmic fluid and $\bar{p}, p$ *and* ρ are the effective pressure,isotropic pressure and energy density of the matter respectively, ξ is coefficient of the bulk viscosity which is a function of time t. The effective pressure of the viscous fluid turns out to be $\bar{p} = (p - \xi\theta)$ and the universe filled with Baratropic perfect fluid lead to EoS $p = \gamma\rho$ .Here γ is constant with the field equations corresponding to matric (2.1) with $f(Q)$ gravity are as follows:

$$H^2 + 2H^2 f_Q - \frac{1}{6}f = \frac{k^2}{3}\rho \tag{2.10}$$

$$\left[12\,H^2 f_{QQ} + f_Q + 1\right]\dot{H} = -\frac{k^2}{3}\bar{p} \tag{2.11}$$

Where $\bar{p} = (p - \xi\theta)$ is the effective pressure, p is the isotropic pressure, ξ is the coefficient of bulk viscosity which is the function of t and $\theta = 3H$ is the Expansion Scalar of Baratropic Bulk Viscosity fluid.

Here there are two field equations which are corresponding to the metric (2.1) and having the theory of $f(Q)$ gravity contains four unknowns so we have to utilize another to conditions so that we can get an exact solution of these field equations. So in the upcoming section we have discussed the cosmographic solution of above $f(Q)$ gravity model non-linear differential equations.

III. COSMOGRAPHIC SOLUTION AND SOME PARAMETERS

The Cosmographic Solution unveils the universe's secrets through a mathematical lens, transcending the ordinary and illuminating the extraordinary. It is a mesmerizing dance of equations and constants that choreographs the cosmic ballet, revealing the intricate choreography of distances, velocities, and accelerations on the stage of SR. Much like a skilled artist's brushstroke, this solution allows us to capture the universe's rhythm from the stately waltz of galaxies in their cosmic clusters to the rapid pirouettes of stars in their galaxies. As we decode the intricate patterns woven into the fabric of this solution, we unveil the hidden dimensions of the universe, each equation and coefficient adding a stroke of insight to the masterpiece of our existence. In order to obtain a cosmological model where the universe shifts from the declaration phase to the current accelerated phase, we will assume that the scale factors are as follows.

3.1 Hybrid Expansion Law (HEL)

The Hybrid Expansion Law, a daring departure from traditional cosmological paradigms, propels us into a realm of cosmic evolution that defies simplistic categorization. Like a harmonious blend of musical genres, it marries the rhythmic crescendo of exponential expansion with the nuanced tempo changes of power-law dynamics. This cosmic symphony, composed in the language of equations, narrates the tale of a universe that first gallops through an accelerated growth phase before settling into a measured stride of expansion. In this uncharted territory of the cosmos, the Hybrid Expansion Law beckons us to reconsider the narrative of our universe's journey, inviting us to explore the intricacies of its melody and decipher the enigmatic harmony that weaves through the fabric of space and time.

$$a(t) = a_0\left(\frac{t}{t_0}\right)^k e^{b\left(\frac{t}{t_0}-1\right)}, \tag{2.12}$$

where $k \geq 0$, $b \geq 0$ are constant model parameters, a_0, t_0 represent the present value of the scale factor and the age of the universe respectively. The main motivation for choosing the scale factor in the above form is that it produces a time dependent deceleration parameter, as indicated by the observation data.Also it is known the literature that this law is a generalization of the power law cosmology and the exponential law cosmology. The Hubble parameter, Expansion Scalar, and deceleration parameter can be obtained from (2.12), respectively.

3.2 Hubble Parameter

$$H = \frac{\dot{a}}{a} = \left[\frac{k}{t} + \frac{b}{t_0}\right] \tag{2.13}$$

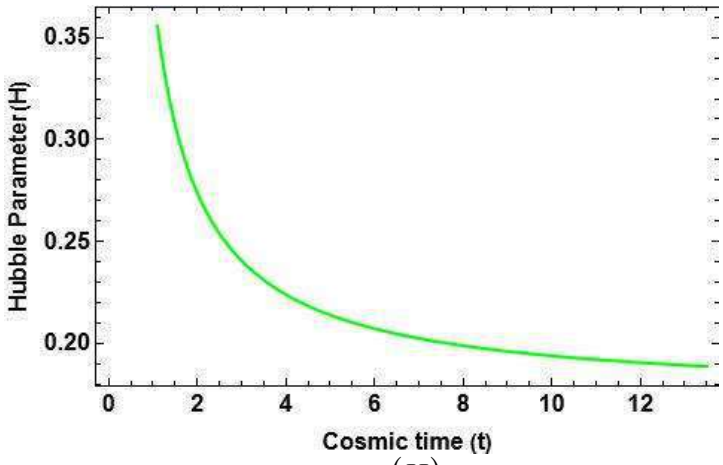

Figure 1.Hubble Parameter (H) Vs Cosmic time t

3.3 Expansion Scalar

The fractional rate at which the volume of a tiny ball of matter changes over time as determined by a central commoving observer is quantified by the expansion scalar. Here we obtained an expansion scalar in terms of special form of hybrid expansion law.

$$\theta = 3H = 3\left[\frac{k}{t} + \frac{b}{t_0}\right] \tag{2.14}$$

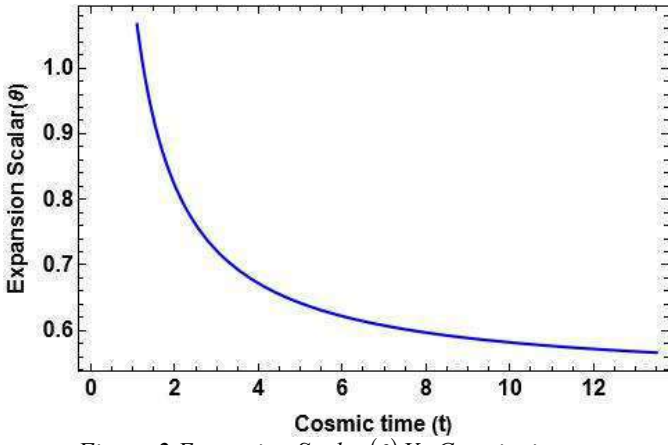

Figure 2.Expansion Scalar (θ) Vs Cosmic time t

3.4 Deceleration Parameter:

Imagine the cosmos as a vast cosmic dance, with galaxies swirling and pirouetting through the expansive ballroom of space. The deceleration parameter in cosmology is like the conductor of this celestial ballet, telling us whether the dance is gradually slowing down or picking up the pace.In technical terms, the deceleration parameter (often denoted as "q ") is a measure of how the expansion of the universe changes over time. It encapsulates the delicate interplay between the universe's gravitational pull, trying to reign in the cosmic choreography, and any cosmic forces or energies that might be pushing the dancers galaxies apart.If the deceleration parameter is positive, it means the universe's expansion is being resisted by its gravitational attraction, causing the dance to decelerate. It's like watching a dancer twirl and gracefully slow down, succumbing to gravity's embrace.Conversely, if the deceleration parameter is negative, it signifies that the cosmic dance is accelerating. Understanding the deceleration parameter allows cosmologists to uncover the cosmic storyline. It reveals whether the universe's evolution is dominated by familiar matter and energy or if some mysterious force like dark energy holds sway. This parameter, in its unique role, invites us to witness the cosmic performance and decipher the choreography of forces that have shaped the universe's grand narrative.

$$q(t) = \frac{-a\,\ddot{a}}{\dot{a}^2} = -1 + \frac{k\,t_0^2}{(b\,t + k\,t_0)^2} \tag{2.15}$$

It is clear that there is a transition phase from deceleration to acceleration at $t = \frac{t_0}{t}\left(-k \pm \sqrt{k}\right)$ with $0 < k < 1$ .Because the negativity of the second term leads to n concept of negative time which appears to be unphysical in the context of Big Bang cosmology. Weclosethat the cosmic transition may have occurred at $t = \frac{t_0}{t}(\sqrt{k} - k)$ .Also we notice that $q = -1$ for $k = 0$ (exponential law) and $q = \left(1/k\right) - 1$ for $b = 0$ (power law).If we take $k = 0$, HEL reduce to exponential law of the form $a(t) = a_0 e^{b\left(\frac{t}{t_0} - 1\right)}$ and if taken $b = 0$ then reduce to power law $a(t) = a_0\left(\frac{t}{t_0}\right)^k$. As several observational data have shown that $a > 0$ which describe a decelerating universe and $a < 0$ describe the accelerating universe expansion of the universe other observational data from type I_a Supernovae (SNI_a) has shown that the current universe is in the acceleration phase by confirming the range of deceleration parameter $-1 \le q < 0$.

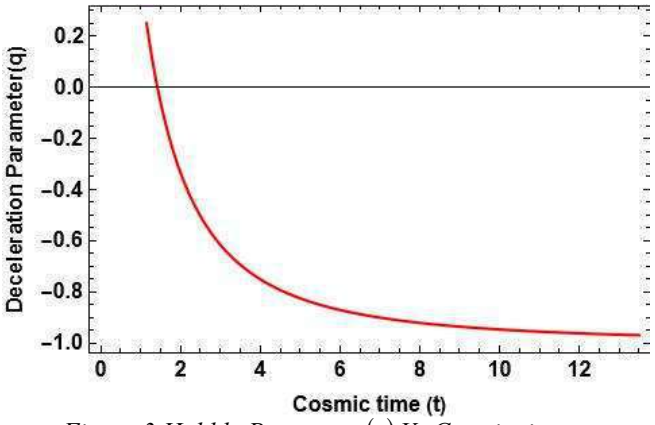

Figure 3.Hubble Parameter (q) Vs Cosmic time t

For the line element (2.1) the trace of non-metricity tensor takes following form:

$$Q = 6H^2 \tag{2.16}$$

The trace of the non-metricity tensor, an esoteric entity in the realm of differential geometry, unfurls a tale of the curvature-less facets of SR's fabric. In the intricate dance of curved geometry and warped paths, the non-metricity tensor unveils its enigma – it encapsulates the curvature effects that emerge not from gravity's embrace, but from the very notion of parallel transport itself. Unlike the gravitational curvature described by the metric tensor, this trace points towards deviations from Euclidean geometry due to the peculiar manner in which vectors are transported along curved trajectories. Thus, the trace of the non-metricity tensor opens a portal to explore a realm where the absence of gravity's hand gives rise to geometric distortions that challenge our fundamental perceptions of space itself.

$$f(Q) = \alpha\, Q^n + \beta \tag{2.17}$$

Now we choose $\alpha = 1$ & $\beta = 0$ in (2.14) and hence we get,

$$f(Q) = Q^n \text{ for } n \neq 0 \tag{2.18}$$

And by utilizing (2.16) we get trace of non-matricity tensor as,

$$Q = 6\left[\frac{k}{t} + \frac{b}{t_0}\right]^2 \tag{2.19}$$

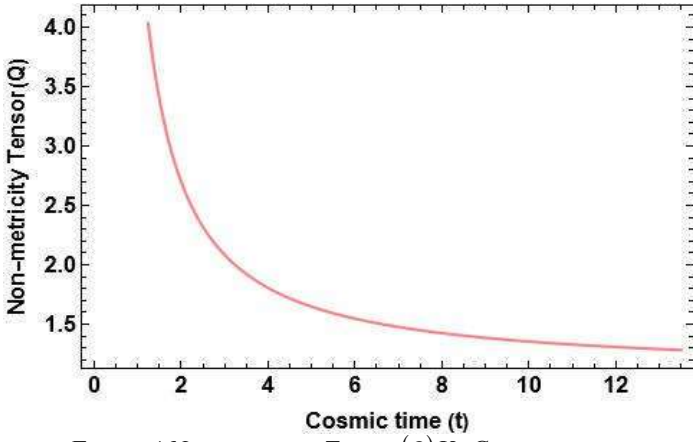

Figure 4.Non-metricity Tensor (Q) Vs Cosmic time t

IV. DYNAMICAL AND PHYSICAL PROPRETIES OF THE MODEL

By utilizing (2.12, 2.18 & 2.19)in the field equations (2.10-2.11), those equationscan be written in the form as:

$$\frac{3}{k^2}\left[\frac{(k\,t_0 + b\,t)^2}{t^2 t_0^2} + \frac{2n\,(k\,t_0 + b\,t)}{t^2 t_0^2}\left\{\frac{6\,(k\,t_0 + b\,t)^2}{t^2 t_0^2}\right\}^{n-1} - \frac{1}{6}\left\{\frac{6\,(k\,t_0 + b\,t)^2}{t^2 t_0^2}\right\}^{n}\right] = \rho \tag{2.20}$$

The behavior of the Bara-tropic bulk viscous fluid energy density versus cosmic time t is shown the Figure 5 and it is consistent for the model as, bulk viscosity of the model behaves like the same. The energy density with a cosmic time decreasing slightly and then it is constant with respect to time.

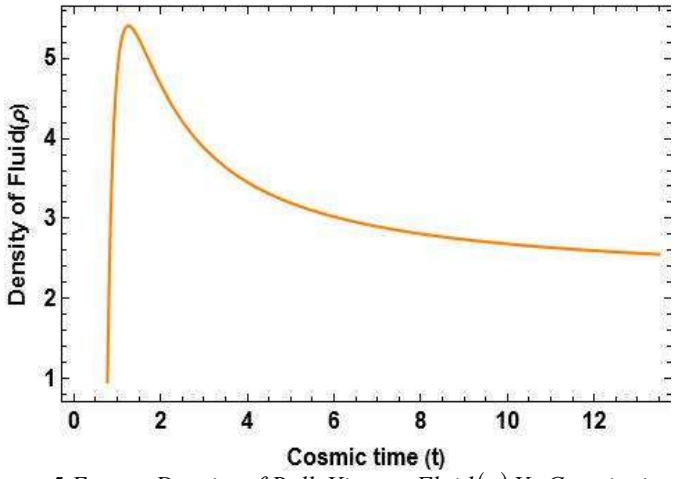

Figure 5.Energy Density of Bulk Viscous Fluid (ρ) *Vs Cosmic time* t

$$\frac{3}{k\,t^2}\left[\left\{\frac{12\,n\,(n-1)(k\,t_0+b\,t)^2}{t^2t_0^2}\right\}\left\{\frac{6\,(k\,t_0+b\,t)^2}{t^2t_0^2}\right\}^{n-2}+n\left\{\frac{6\,(k\,t_0+b\,t)^2}{t^2t_0^2}\right\}^{n-1}+1\right]=\bar{p} \tag{2.21}$$

where, $\bar{p}$ is the effective pressure. The behavior of the Barotropic bulk viscous fluid pressure versus cosmic time t is shown the Figure 6. The effective pressure of the model decreases rapidly then it is constant with respect to time.

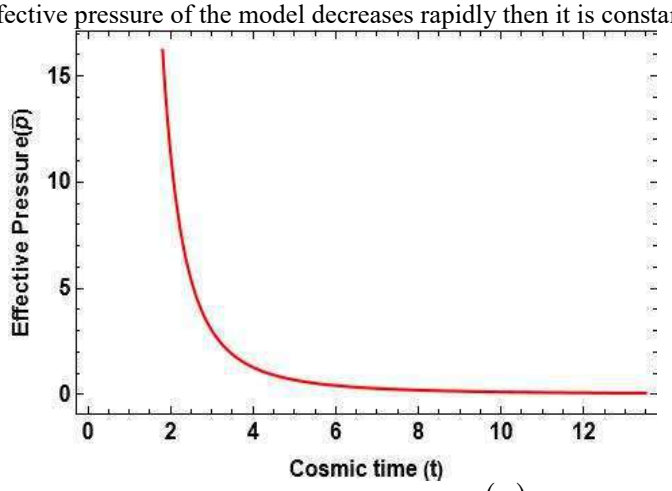

Figure 6. Effective Pressure of Bulk Viscous Fluid $(\bar{p})$ *Vs Cosmic time* t

The EoS for the bulk viscos fluid can be expressed as $p=\gamma\rho$,where $\rho\in[0,1]$. The barotropic bulk viscous fluid pressure of theuniverse negatively increases with cosmic time t depicted by Figure 2. It is clearly seen that barotropic pressure of the universe is rapidly increases in the negative form and hence it is consistent.

4.1 Models of Barotropic Bulk Viscous Fluid

For the present model to discuss the nature and the behavior of baratropic bulk viscous fluid source let us choose some of the cases and obtained different models of the Universe in the following way.

Case-i) Dust Universe $(\gamma=0)$

For the dust universe we choose $\gamma=0$ (2.20) and hence with this the isotropic pressure becomes zero $(p=0)$. Hence the Coefficient of Bulk Viscosity in terms of cosmic time t for the dust like Universe found out as:

Coefficient of Bulk Viscous: -

The bulk viscosity coefficient approaches a constant value that is close to zero and decreases positively with time. This is consistent with ξ 's physical behavior, as the behavior depicted in Figure 3 is consistent with $\gamma=0$.

$$\left[\frac{-2\,n\,\langle\{(2n-1)t_0+2\,b\}t+2k\,t_0\rangle}{3k^2(k\,t_0+b\,t)^2}\left\{\frac{6\,(k\,t_0+b\,t)^2}{t^2t_0^2}\right\}^{n-1}\right]=\xi \tag{2.22}$$

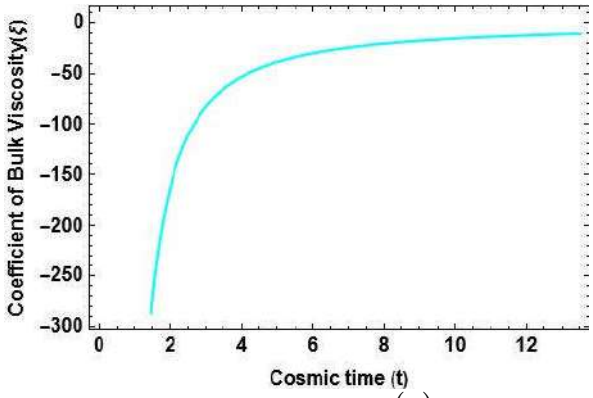

Figure 7.Coefficient Bulk Viscous Fluid (ξ) *Vs Cosmic time* t

Case-ii) Radiation Dominated Universe $\left(\gamma = \frac{1}{3}\right)$. For $\left(\gamma = \frac{1}{3}\right)$ the disordered radiation corresponds with equations of equation of state and eq. (2.20).

Isotropic Pressure:- $p = \frac{1}{3}\rho$

The isotropic pressure of Bara-tropic bulk viscous fluid shows positive nature and then decreases to negative one and again increases to positive way.The behavior are depicted in Figure 8 and is consistent with $\gamma = 1/3$.

$$\frac{1}{k^2}\left[\frac{(k\,t_0 + b\,t)^2}{t_0^2 t^2}\left\langle 1 + 2n\left\{\frac{6\,(k\,t_0 + b\,t)^2}{t^2 t_0^2}\right\}^{n-1}\right\rangle - 6^{n-1}\left\{\frac{(k\,t_0 + b\,t)^2}{t^2 t_0^2}\right\}^{n-1}\right] = p \tag{2.23}$$

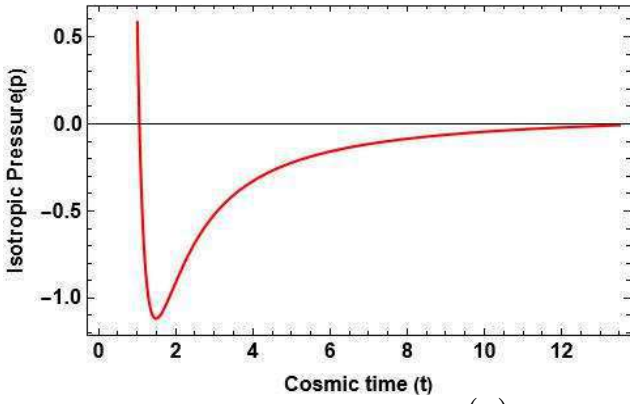

Figure 8.Isotropic Pressure of Bulk Viscous Fluid (p) *Vs Cosmic time* t

Coefficient of Bulk Viscosity:

The bulk viscosity coefficient decreases exponentially and then the nature is constant. This is consistent with ξ 's physical behavior, as the behavior depicted in Figure 9 is consistent with $\gamma = 1/3$.

$$\left(\frac{t\,t_0}{3k^2(k\,t_0 + b\,t)}\right)\left[\frac{(k\,t_0 + b\,t)^2}{t_0^2 t^2}\left\langle 1 + 12n\left\{\frac{6\,(k\,t_0 + b\,t)^2}{t^2 t_0^2}\right\}^{n-1}\right\rangle - 6^{n-1}\left\{\frac{(k\,t_0 + b\,t)^2}{t^2 t_0^2}\right\}^{n-1}\right] = \xi \tag{2.24}$$

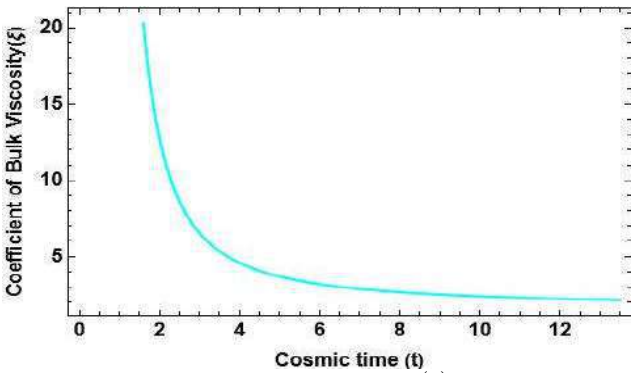

Figure 9.Coefficient Bulk Viscous Fluid (ξ) *Vs Cosmic time* t

Case-iii) Stiff Fluid Universe $(\gamma = 1)$. For Stiff Fluid Universe from (2.20) with EOS we obtained the isotopic pressure as

Isotropic Pressure:- $p = \rho$

For the present case bulk viscosity coefficient decreases positivelywith cosmic time and then it may be constant. Its behavior depicted in Figure 10 is consistent with $\gamma = 1$.

$$\left(\frac{t\,t_0}{k^2(k\,t_0+b\,t)}\right)\left[\frac{(k\,t_0+b\,t)^2}{t^2t_0^2}+\frac{2n\,(k\,t_0+b\,t)}{t^2t_0^2}\left\{\frac{6\,(k\,t_0+b\,t)^2}{t^2t_0^2}\right\}^{n-1}-\frac{1}{6}\left\{\frac{6\,(k\,t_0+b\,t)^2}{t^2t_0^2}\right\}^{n}\right]=\xi \tag{2.25}$$

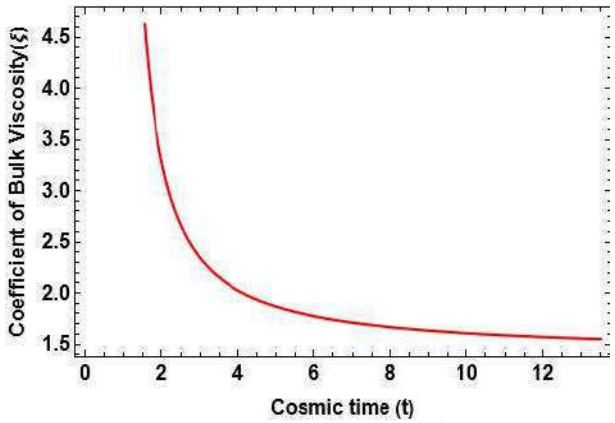

Figure 10.Coefficient Bulk Viscous Fluid (ξ) *Vs Cosmic time* t

4.2 Jerk Parameter

In the cosmic ballet of expansion, the Jerk Parameter emerges as a performer of the highest intrigue. Just as a conductor guides an orchestra through delicate transitions, the Jerk Parameter unveils the universe's next movement a shift beyond mere expansion. This parameter, a celestial choreographer, encapsulates the rate at which cosmic acceleration itself accelerates. In simpler terms, it captures the universe's willingness to embrace change on a deeper level.Much like a sudden crescendo in a musical piece, the Jerk Parameter signals a transformative phase in cosmology. If it reveals a positive value, it suggests that the universe's pace of acceleration is gaining momentum, hinting at new and exotic energies that defy conventional physics. In contrast, a negative value implies a subtle deceleration in the acceleration, a cosmic twist that compels us to ponder the gravitational interplay and unseen forces shaping our existence.As we contemplate the Jerk Parameter's enigmatic dance, we find ourselves on the precipice of understanding the very fabric of SR and the intricate choreography that shapes the universe's evolution. With each observation and calculation, we inch closer to unraveling the cosmic secrets that lie hidden within this cosmic parameter, inviting us to glimpse the breathtaking complexities that drive the grand narrative of the cosmos.

$$j(t)=\frac{\frac{b^3}{t_0^3}+3\frac{b^2}{t_0^2}k\left(\frac{t_0}{t}\right)+3\frac{b}{t_0}k(k-1)\left(\frac{t_0}{t}\right)^2+k(k-1)(k-2)\left(\frac{t_0}{t}\right)^3}{\left[\frac{b}{t_0}+k\left(\frac{t_0}{t}\right)\right]^3} \tag{2.26}$$

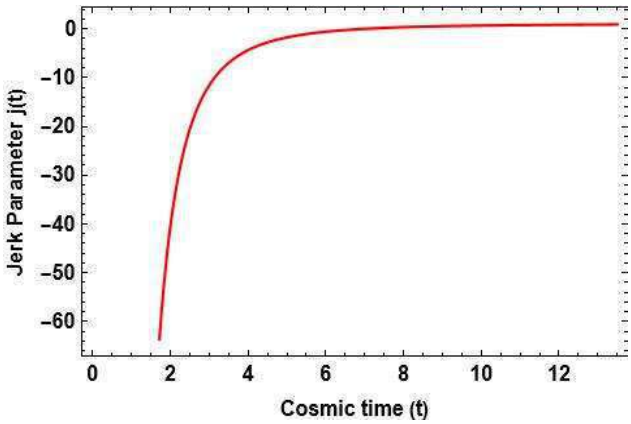

Figure 11.Jerk ParameterVs Cosmic time t

4.3 Snap Parameter

In the vast tapestry of cosmological dynamics, the Snap Parameter emerges as a captivating and enigmatic character. Unlike its more familiar counterparts, it delves into the realm of acceleration in a distinct and compelling manner. This parameter unveils the cosmic secret of how the rate of acceleration itself changes with time, adding an extra layer of complexity to the narrative of expansion. Like an elusive choreographer, it not only describes the current state of acceleration but also paints a vivid picture of whether this acceleration is escalating or abating. Imagine the universe as a grand performance on a cosmic stage, where galaxies play their roles and SR sets the backdrop. The Snap Parameter, in this cosmic theater, acts as a spotlight that shifts its focus, revealing the universe's dramatic dynamics. Its value provides insight into the balance between gravitational forces pulling things together and mysterious energy pushing them apart. When the Snap Parameter takes center stage, it offers a unique glimpse into the intricate choreography of cosmic evolution, giving us a chance to witness the universe's ever-changing dance of expansion and acceleration in a way that no other parameter can quite capture.

$$s(t)=\frac{\left[\left(\frac{b}{t_0}\right)^4+4\left(\frac{b}{t_0}\right)^3 k\left(\frac{t_0}{t}\right)+6\left(\frac{b}{t_0}\right)^2 k(k-1)\left(\frac{t_0}{t}\right)^2+4\frac{b}{t_0}k(k-1)(k-2)\left(\frac{t_0}{t}\right)^3+k(k-1)(k-2)(k-3)\left(\frac{t_0}{t}\right)^4\right]}{\left(\frac{b}{t_0}+k\left(\frac{t_0}{t}\right)\right)^3} \quad (2.27)$$

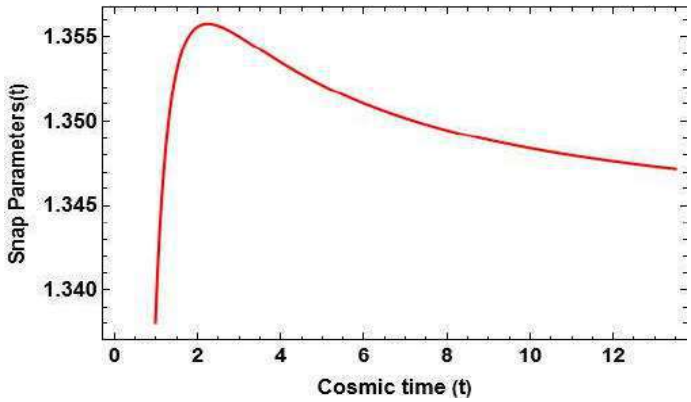

Figure 12.Snap ParameterVs Cosmic time t

4.4 Lerk Parameter

In the realm of cosmology, the Lerk Parameter emerges as a captivating enigma that deepens our understanding of the universe's intricate dance. Unlike the familiar cosmic constants, the Lerk Parameter is a dynamic entity that encapsulates the interplay between cosmic forces, casting a veil of uncertainty over the fate of our cosmos. Much like the elusive notes in a musical composition, the Lerk Parameter harmonizes the cosmic melodies of expansion and contraction, its value shaping the cosmic symphony's tempo.This parameter is a measure of the universe's curvature, akin to the way a compass points to North. However, it doesn't lead us through physical space, but through the curvature woven into the very fabric of SR. A positive value hints at a closed universe, where expansion eventually gives way to contraction, while a negative value suggests an open expanse of eternal expansion. With its finger on the pulse of the universe's geometry, the Lerk Parameter beckons cosmologists to decipher its cryptic message, revealing the curvature of reality itself and inviting us to ponder the cosmic destiny that lies hidden within its numerical value.

$$l(t)=\frac{\left[\left(\frac{b}{t_0}\right)^5+5\left(\frac{b}{t_0}\right)^4 k\left(\frac{t_0}{t}\right)+10\left(\frac{b}{t_0}\right)^3 k(k-1)\left(\frac{t_0}{t}\right)^2+10\left(\frac{b}{t_0}\right)^2 k(k-1)(k-2)\left(\frac{t_0}{t}\right)^3+5\frac{b}{t_0}k(k-1)(k-2)(k-3)\left(\frac{t_0}{t}\right)^4+k(k-1)(k-2)(k-3)(k-4)\left(\frac{t_0}{t}\right)^5\right]}{\left[\left(\frac{b}{t_0}\right)+k\left(\frac{t_0}{t}\right)\right]^5} \quad (2.28)$$

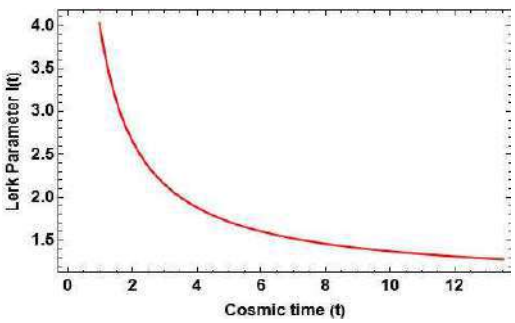

Figure 13. Lerk ParameterVs Cosmic time t

V.CONCLUSIONS

Within the framework of the $f(Q)$ theory of gravity, we have discussed a spatially homogenous and isotropic Friedman-Robertson-Walker cosmological model featuring a barotropic bulk viscous fluid in this research. The physical parameters of the model have been determined. The models that are derived show an expanding model that gets close to isotropy. Additionally, it has been noted that the bulk viscous coefficient is more significant in the universe's isotropization process. As a result, the isotropy seen in the current cosmos might be explained. It is a result of the fluid's viscous effects, which have existed since the universe's inception. One of the most interesting aspects of this evolution is the recently established late-time transition from a decelerating to an accelerating regime of expansion of the universe. In this case it is observed that the case of the De Sitter universe; and the early stage of the universe were decelerating, whereas the universe is accelerating at the present epoch, which is corroborated from the recent Supernovae Ia observations. The expansion scalar, the generalized Hubble parameter, both is constant throughout the evolution of the universe as t. This shows that the universe is expanding with increase in cosmic time, but the rate of expansion decreases to a constant value, which shows that the universe starts evolving with constant volume at an infinite rate of expansion. The exact solution given in this study could help explain perfect fluid distribution in the $f(Q)$ theory of gravitation as well as the evolution of the cosmos in FRW space-time with viscous effects. Overall our derived model represents the accelerating as well as the decelerating phase of the present universe.

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"कृषी-पर्यटन": शेतकऱ्यांच्या शाश्वत विकासाचे नवे दालन

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सारांश:

पर्यटन सध्यस्थितीमध्ये सगळ्याच देशामध्ये किंवा अर्थव्यवस्थांमध्ये आर्थिक वाढीस चालना देणारे माध्यम किंवा क्षेत्र म्हणून ओळखले जाते. जगामध्ये अनेक देशांनी त्यांची पर्यटन क्षमता विकसित करून त्यांच्या अंतर्गत अर्थव्यवस्थेमध्ये आमुलाग्र बदल घडवून आणले आहेत. पर्यटनामध्ये कुशल आणि अकुशल अशा दोन्हीही लोकांसाठी अतिरिक्त उत्पन्नाचे स्रोत आणि मोठ्या प्रमाणावर रोजगार निर्मिती करण्याची क्षमता आहे.

आज पारंपरिक पर्यटनाची संकल्पनाच बदलली आहे. कृषी-पर्यटनासारखी पर्यटनाची काही नवीन क्षेत्रे उदयास आली आहेत. पर्यटनाला चालना दिल्याने लोकांना अनेक प्रत्यक्ष व अप्रत्यक्ष फायदे हे निश्चितच मिळतील. पर्यटन हा शाश्वत विकासाचा आणि ग्रामीण भागाच्या आर्थिक विकासाचा मार्ग आहे. ज्यादवारे अभ्यागतांना कृषी क्षेत्र, कृषी व्यवसाय, स्थानिक उत्पादने, पारंपारिक अन्न आणि ग्रामीण लोकांचे दैनंदिन जीवनतसेच सांस्कृतिक घटक, परंपरा इत्यादी समवेत परिचित होण्याची संधी आहे. याशिवाय हा उपक्रम अभ्यागतांना निसर्गाच्या आणि ग्रामीण क्रियाकलापांच्या जवळ आणतो ज्यात ते सहभागी होऊ शकतात आणि त्यांचे मनोरंजन करू शकतात.

"कृषि-पर्यटन" शेतकरी आणि शहरी लोकांसाठी उपयुक्त आहे याने शेतकऱ्यांना, अनेक कुटुंबांना आणि ग्रामीण युवकांना अतिरिक्त उत्पन्नाचे स्रोत व रोजगाराच्या संधी प्रदान केल्या आहेत परंतु, अशा ठिकाणांच्या विकास प्रक्रियेत काही अडचणीसुद्धा आहेत. ग्रामीण विकास आणि उत्पन्नाचा स्तर वाढण्याच्या दृष्टीने शासनस्तरावरून व अन्य संबंधित अधिकाऱ्यांनी पाठबळ देण्याचा प्रयत्न करणे गरजेचे आहे.

प्रस्तावना :

पर्यटन सध्यस्थितीमध्ये सगळ्याच देशामध्ये किंवा अर्थव्यवस्थांमध्ये आर्थिक वाढीस चालना देणारे माध्यम किंवा क्षेत्र म्हणून ओळखले जाते. जगामध्येअनेक देशांनी त्यांची पर्यटन क्षमता विकसित करून त्यांच्या अंतर्गत अर्थव्यवस्थेमध्ये आमुलाग्र बदल घडवून आणले आहेत. पर्यटनामध्ये कुशल आणि अकुशल अशा दोन्हीही लोकांसाठी अतिरिक्त उत्पन्नाचे स्रोत आणि मोठ्या प्रमाणावर रोजगार निर्मिती करण्याची क्षमता आहे.

आज पारंपरिक पर्यटनाची संकल्पनाच बदलली आहे. कृषी-पर्यटनासारखी पर्यटनाची काही नवीन क्षेत्रे उदयास आली आहेत. पर्यटनाला चालना दिल्याने लोकांना अनेक प्रत्यक्ष व अप्रत्यक्ष फायदे हे निश्चितच मिळतील. कृषि पर्यटन हा शाश्वत विकासाचा आणि ग्रामीण भागाच्या आर्थिक विकासाचा मार्ग आहे. ज्यादवारे अभ्यागतांना कृषी क्षेत्र, कृषी व्यवसाय, स्थानिक उत्पादने, पारंपारिक अन्न आणि ग्रामीण लोकांचे दैनंदिन जीवनतसेच सांस्कृतिक घटक, परंपरा इत्यादी समवेत परिचित होण्याची संधी

आहे. याशिवायहा उपक्रम अभ्यागतांना निसर्गाच्या आणि ग्रामीण क्रियाकलापांच्या जवळ आणतो ज्यात ते सहभागी होऊ शकतात आणि त्यांचे मनोरंजन करू शकतात.

"कृषीपर्यटन" "कृषी-पर्यटन" शेतकरी आणि शहरी लोकांसाठी उपयुक्त आहे याने शेतकऱ्यांना, अनेक कुटुंबांना आणि ग्रामीण युवकांना अतिरिक्त उत्पन्नाचे स्रोत व रोजगाराच्या संधी प्रदान केल्या आहेत परंतु, अशा ठिकाणांच्या विकास प्रक्रियेत काही अडचणीसुद्धा आहेत. ग्रामीण विकास आणि उत्पन्नाचा स्तर वाढण्याच्या दृष्टीने शासनस्तरावरून व अन्य संबंधित अधिकाऱ्यांनी पाठबळ देण्याचा प्रयत्न करणे गरजेचे आहे.

आज पारंपारिक पर्यटनाची संकल्पना बदलली आहे. कृषी पर्यटनासारखी पर्यटनाची काही नवनवीन क्षेत्रे उदयास येत आहेत. अशा प्रकारच्या पर्यटनाला चालना दिल्यास लोकांना अनेक प्रत्यक्ष आणि अप्रत्यक्ष फायदे होतील. कृषी-पर्यटन हा शेती आणि पर्यटनाशी अशा दोन्हीही संबंधित एक नाविन्यपूर्ण कृषी क्रियाकलाप आहे. त्यात उत्पन्नाचे अतिरिक्त स्रोत आणि शेतकऱ्यांना रोजगाराच्या संधी निर्माण करण्याची मोठी क्षमता आहे. महाराष्ट्र तसेच भारत हे जगातील प्रमुख पर्यटन केंद्रांपैकी एक आहे. त्यातही भारत हा प्रमुख कृषिप्रधान देश आहे. भारतात आणि महाराष्ट्रातही कृषी-पर्यटन विकसित करण्यासाठी खूप मोठा वाव मोठी क्षमता आहे.

संशोधनाची उद्दिष्टे

प्रस्तुत संशोधन लेखाची उद्दिष्टे खालीलप्रमाणे आहेत.

कृषी-पर्यटन : एक व्यवसाय म्हणून प्रस्थापित होण्याच्या दृष्टीने शक्यता तपासणे.

कृषी-पर्यटन : शेतकऱ्यांच्या दृष्टीने आर्थिक विकासातील महत्त्व तपासणे.

शेतकऱ्यांच्या दृष्टीने कृषी-पर्यटन केंद्रांसाठी समस्यांचा शोध घेणे आणि उपाययोजना सुचविणे.

संशोधन विषयाचे महत्त्व :

महाराष्ट्रासह भारतात शेती हा सर्वात महत्त्वाचा व्यवसाय आहे. परंतु, आज अनियमित मान्सून, कृषी-उत्पादनांच्या किमतीतील चढ-उतार आणि कृषी क्षेत्राच्या काही अंतर्गत उणिवा किंवा कमकुवतपणामुळे ते फायदेशीर ठरत नाही. त्यामुळे शेतीमध्ये काही नाविन्यपूर्ण उपक्रम करण्याची गरज आहे, ज्यामुळे शेतकरी, ग्रामीण लोकांना मदत होईल.

महाराष्ट्रात आज शहरी लोकसंख्या दिवसेंदिवस वाढत आहे. सतत बंद असलेली फ्लॅट्स संस्कृती, सतत व्यस्त असलेली ऑफिसेस, क्लब, खेळ, मसालेदार फास्ट फूड, संगणक, इंटरनेट इत्यादि मध्येच लोकांचे जग मर्यादित आहे. ते फक्त व्हिडीओ, दूरदर्शन किंवा संगणकाच्या स्क्रीनमध्येच निसर्ग पाहू शकतात. शहरांमध्ये राहणाऱ्या बऱ्याच लोकांचे खेडेगावात नातेवाईकसुद्धा नसतात किंवा त्यांचा कामानिमित्त गावाशी असलेला संपर्कच तुटलेला असतो., दुसरे म्हणजे ते कधीही गावात गेले नाहीत किंवा राहिले नाहीत अशा लोकांना ग्रामीण जीवनाचा आनंद तर अनुभवायचा आहे, परंतु तशा प्रकारच्या सोयी-सुविधांच्या अनुपलब्धतेची समस्या आहे. म्हणूनच ग्रामीण क्षेत्रातील शेतकऱ्यांना ही एक मोठी संधी आहे. शेतक-यांना कृषी-पर्यटन केंद्रांच्या विकासासाठी आणि त्यातून त्यांची सेवा आणि उत्पन्नाचे अतिरिक्त स्त्रोत निर्माण होतील.

संशोधन पद्धती व तंत्रे :

महाराष्ट्रातील कृषी पर्यटन व्यवसायाचे फायदे आणि उपयुक्तता तपासण्यापुरतीच अभ्यासाची

व्याप्ती मर्यादित आहे. अभ्यासात त्यांचे फायदे आणि समस्यासुद्धा समाविष्ट आहेत. प्रस्तुत अभ्यास हा कृषी-पर्यटन या विषयावर केला गेला असून त्यामध्ये केंद्र आणि राज्य सरकारच्या संबंधित लेख, शोधनिबंध, अहवाल, 11 व्या योजना दस्तऐवजातून माहिती सादर केली गेली आहे. भारत आणि महाराष्ट्र सरकार, तसेच कृषी मंत्रालयाच्या वेबसाइटवरूनसुद्धा काही माहिती सादर करण्यात आली आहे. महाराष्ट्राच्या पर्यटन विकास महामंडळाकडूनसुद्धा काही कल्पना केवळ शैक्षणिक अभ्यासार्थ घेण्यात आल्या आहेत.

कृषी-पर्यटन संकल्पना :

'कृषी-पर्यटन' ही संज्ञा पर्यटनाचा नवा चेहरा आहे. कृषी पर्यटन हा शेतीवर आधारित व्यवसाय आहे जो लोकांसाठी खुला आहे. ही विशेष कृषीपर्यटन स्थळे सामान्यतः पाहण्यासाठी गोष्टी, काही करण्यासारख्या गोष्टी आणि उत्पादन किंवा खरेदी करण्यासाठी भेटवस्तू देतात आणि लोकांसाठी खुल्या असतात. कृषी पर्यटनाची व्याख्या पुढीलप्रमाणे केली जाते- "कृषी उत्पादने पाहण्यासाठी आणि अनुभवण्यासाठी कृषी विपणन मिश्राचा केलेला महत्तम वापर म्हणजे कृषी विपणन होय."

श्रीमान पांडुरंग तावरे, एटीडीसी, पुणे यांच्या मते- "कृषि-पर्यटन म्हणजे कृषि व्यवसाय क्रियाकलाप, जेव्हा एखादा स्थानिक शेतकरी किंवा परिसरातील व्यक्ती एखाद्या व्यक्तीला किंवा पर्यटकाला त्यांच्या शहरात किंवा देशामध्ये आढळणार नाही असे कोणतेही कृषी उत्पादन जसे संत्री, मोसंबी, नारळ, अननस, ऊस यांसारख्या स्थानिक पातळीवर पिकवलेल्या अन्नपदार्थांची वाढ, कापणी आणि प्रक्रिया पाहण्यासाठी परवानगी देण्यासाठी त्यांच्या कृषी फार्मला भेट देतात."

अनेकदा शेतकरी भेट देणाऱ्या पाहुण्यांना शेतातील घरी राहण्याची संधी देत असतात आणि त्यासोबतच शिक्षण घेण्याची सुद्धा संधी प्रदान करतात. कृषी-पर्यटन आणि ईको-टुरिझम यांचा एकमेकांशी जवळचा संबंध आहे. इको-टुरिझम टूर हे व्यावसायिक कंपन्यांद्वारे प्रदान केले जाते परंतु, कृषी-पर्यटनामध्ये शेतकरी स्वतः त्यांच्या कृषी फार्मवर शहरी लोकांसाठी सहलीचा आनंद, मनोरंजन, शिक्षण आणि मजेदार अनुभव देतात.

कृषी-पर्यटन हा शाश्वत पर्यटन विकासाचा आणि ग्रामीण भागातील बहूकृषीक्रियाकलापांचा एक मार्ग आहे ज्याद्वारे अभ्यागतांना कृषी क्षेत्र, कृषी व्यवसाय, स्थानिक उत्पादने, पारंपारिक अन्न आणि ग्रामीण लोकांच्या दैनंदिन जीवनाविषयी आणि सोबतच सांस्कृतिक घटक आणि परंपरा म्हणून माहिती मिळवण्याची संधी मिळते. शिवाय, हा उपक्रम पर्यटकांना निसर्गाच्या आणि ग्रामीण क्रियाकलापांच्या जवळ आणतो ज्यामध्ये ते सहभागी होऊ शकतात, मनोरंजन करू शकतात आणि पर्यटनाचा आनंदही अनुभवू शकतात.

कृषी पर्यटन केंद्र तयार करण्यासाठी किमान आवश्यकता :

कमीत कमी दोन हेक्टर जमीन, फार्म हाऊस, जलस्रोत आणि पर्यटकांचे मनोरंजन करण्यास इच्छुक असणारा शेतकरी कृषी पर्यटन सुरू करू शकतो. वैयक्तिक शेतकरी किंवा शेतकऱ्यांचा गट, कृषी सहकारी संस्था, अशासकीय संस्था, कृषी विद्यापीठे आणि कृषी महाविद्यालये त्यांची केंद्रे सुरू करू शकतात. ग्रामपंचायतीसुद्धा त्यांच्या कार्यक्षेत्रात ग्रामस्थ आणि शेतकऱ्यांच्या मदतीने अशी केंद्रे सुरू करू शकतात.

पायाभूत सुविधा:

- ग्रामीण स्वरूपाचे फार्महाऊस किंवा शेतातीलच ठिकाणी राहण्याची सुविधा.

• शेतीतील संसाधने जसे, पाणी, शेळी/कुक्कुट फार्म, रेशीम शेती फार्म, ग्रीन हाउस इ.
• पर्यटकांना इच्छा असल्यास, अन्न शिजवण्यासाठी स्वयंपाक करण्याची सुविधा.
• पोहण्यासाठी विहीर किंवा तलाव किंवा स्विमिंग टॅंक , बैलगाडी, गुरांचा गोठा, दूरध्वनी सुविधा इ
• अत्यावशयक वाहन सुविधा व प्रथमोपचार आणि आपत्कालीन वैद्यकीय सेवा.

आनुषंगिक सुविधांची उपलब्धता:

• नाश्ता, दुपारचे जेवण आणि रात्रीच्या जेवणासाठी स्थानिक ग्रामीण जेवण.
• शेतकऱ्यांना कृषी उपक्रम पाहण्याची आणि त्यात सहभागी होण्याचा प्रस्ताव.
• पर्यटकांना ग्रामीण खेळांमध्ये सहभागी होण्याची संधी.
• संस्कृती, पेहराव, कला, हस्तकला, सण, ग्रामीण परंपरा याविषयी माहिती प्रदान करणे.
• बैलगाडीची सफर, शक्य असल्यास घोडेस्वारी, मासेमारीसाठी जवळच्या तलावामध्ये सुविधा.
• पर्यटकांना फळे, मका, शेंगदाणे, ऊस आणि इतर कृषी उत्पादने देणे.

इतर विविध सुविधा :

• भविष्यातील पर्यटन व्यवसायासाठी गावातील संस्कृतीबद्दल आवड निर्माण करण्याचा प्रयत्न.
• पर्यटकांना स्थानिक पेहरावातील जवळच्या व्यक्तींशी ओळख करून देणे.
• उत्तम संवादकौशल्य असलेले प्रशिक्षित कर्मचारी किंवा विनोदी शैलीच्या व्यक्तींची नियुक्ती.
• पर्यटकांच्या मदतीसाठी रेल्वे आणि बसच्या वेळापत्रकाशी संबंधित अचूक माहिती.
• पर्यटकांच्या चांगल्या समाधानासाठी शेतकरी त्यांच्या गरजेनुसार इतर अतिरिक्त सुविधा देखील देऊ शकतात.

कृषी-पर्यटन केंद्रांचे फायदे :

कृषी-पर्यटन विकासाचे अनेक फायदे आहेत. यामुळे शेतकरी आणि ग्रामीण जनतेला अनेक प्रत्यक्ष आणि अप्रत्यक्ष फायदे मिळू शकतात. ते पुढीलप्रमाणे विशद करता येतील-

· शेतकरी कुटुंबातील सदस्य आणि तरुणांना रोजगाराच्या संधी
· उत्पन्नातील चढउतारावर निर्बंध आणण्यासाठी शेतकऱ्यांसाठी अतिरिक्त उत्पन्नाचा स्रोत.
· सामाजिक व नैतिक मूल्यांसह शहरी आणि ग्रामीण लोकांमधील सांस्कृतिक परिवर्तन.
· शहरी संपर्कामुळे संसाधनात वाढ होऊन शेतकरी त्यांचे जीवनमान उंचावू शकतात.
· शहरी लोक सुद्धा ग्रामीण जीवनाबद्दल जाणून घेऊ शकतात.
· कृषी पर्यटनामुळे इतर पारंपारिक पर्यटन केंद्रांवरील भार कमी होण्यास मदत होऊ शकते.

कृषि पर्यटनाची आवश्यकता :

अनियमित पर्जन्यमान, कर्जबाजारीपणा, उत्पादनांच्या अस्थिर किमतींमुळे शेती व्यवसाय अधिक असुरक्षित होत चालला आहे. शेतीच्या विविध समस्यांमुळे महाराष्ट्रातील काही शेतकरी आत्महत्यासुद्धा करत आहेत. महाराष्ट्रात 1995 ते 2005 या कालावधीत 30000 हून अधिक शेतकऱ्यांनी आत्महत्या केल्या आहेत. म्हणून, शेतीला पाठिंबा देण्यासाठी आणि शेतीपासून संबंधित उत्पन्नाचे स्रोत निर्माण करण्यासाठी कृषी- संबंधित व्यवसाय सुरू करण्याची गरज आहे.

शेतक-यांना लहान आणि व्यवहार्य कृषी-व्यवसाय करण्यास चालना आणि प्रोत्साहित करण्यासाठी कृषी-पर्यटन उपयुक्त ठरू शकेल. हे शेतकऱ्यांना अनेक संभाव्य फायदे प्रदान करू शकते. शेतकरी कुटुंबियांना पूर्णत: रोजगारासाठी संधी प्रदान करताना कमीत कमी संसाधने वापरुन उत्पन्न

निर्मिती क्रियाकलापांना पूरक ठरू शकते. सुंदर नैसर्गिक शेती आणि मूलभूत पायाभूत सुविधांमुळे कृषी-पर्यटन नक्कीच एक व्यवसाय म्हणून प्रस्थापित होऊ शकते यात शंकाच नाही.

शासनाचे धोरण :

कृषी-पर्यटनाच्या जाहिरातीमध्ये राज्य आणि केंद्र कृषी-मंत्रालय, ग्रामीण विकास मंत्रालय अशा काही महत्त्वाच्या भागधारकांचा समावेश होतो. देशांतर्गत पर्यटनाला चालना देण्यासाठी, सरकारने ओळखलेल्या महत्त्वाच्या क्षेत्रांना पायाभूत सुविधांच्या विकासासाठी, उत्पादनांचा विकास आणि वैविध्यीकरणासाठी, इको-एडव्हेंचर स्पोर्ट्सचा विकास, सांस्कृतिक सादरीकरण, स्वस्त निवास प्रदान करणे इ. बाबत सरकारलाही कृषी पर्यटनाचे महत्त्व पटले आहे.

भारताच्या नियोजन आयोगाने पर्यटनावरील दहावी पंचवार्षिक योजना तयार करण्यासाठी कार्यगटाची स्थापना केली होती. ग्रामीण आणि मागासलेल्या भागात रोजगार निर्मिती आणि दारिद्र्य निर्मूलनाचे साधन म्हणून पर्यटनाला उच्च प्राधान्य दिले आहे आणि गावाच्या विकासाला चालना देण्यासाठी कृषी पर्यटन आणि शेतीच्या उत्पन्नाला पूरक पर्यटनाची क्षमता विकसित करता येऊ शकते असे विदित केले आहे.

कृषी पर्यटनाच्या प्रमुख आव्हाने :

· कृषी पर्यटनाबाबत परिपूर्ण ज्ञानाचा अभाव.
· कमकुवत संभाषण कौशल्य आणि लहान शेतकऱ्यांच्या व्यावसायिक दृष्टिकोनाचा अभाव.
· कृषी-पर्यटनासाठी मूलभूत पायाभूत सुविधा विकसित करण्यासाठी भांडवलाची कमतरता.
· अशा प्रकारच्या उपक्रमांबाबत शेतकऱ्यांचे अज्ञान.
· कृषी-पर्यटन उद्योगात असंघटित क्षेत्राचे आधिक्य.
· लाखो शेतकऱ्यांकडे लहान आकाराची जमीन व सततच्या दुष्काळाशी वाटाघाटी.

कृषी पर्यटनाच्या समस्यांवरील संभाव्य-उपाययोजना :

· लहान शेतकरी सहकारी तत्त्वावर त्यांची कृषी-पर्यटन केंद्रे विकसित करू शकतात.
· शाळा, महाविद्यालये, स्वयंसेवी संस्था, क्लब, युनियन, यांच्याशी संपर्क विकसित करता येईल.
· इंटरनेट, टेलिव्हिजन इ. द्वारे पर्यटन केंद्राची विस्तृत प्रसिद्धी, व्यापक जाहिरात करता येईल.
· परदेशी पर्यटकांना आकर्षित करण्यासाठी वेबसाइट विकसित करून वेळोवेळी अपडेट करणे.
· स्वागत आणि आदरातिथ्य यासाठी कर्मचारी किंवा कुटुंबातील सदस्यांना प्रशिक्षण.
· ग्राहकांच्या गरजा, इच्छा आणि त्यांच्या अपेक्षा समजून सेवा प्रदान.
· व्यावसायिक सुविधा / सेवांसाठी योग्य भाडे आणि शुल्क आकारणी.
· पर्यटकांच्या मनोरंजनासाठी / सेवा देण्यासाठी स्थानिक संसाधनांचा परिणामकारक वापर.
· अभिप्राय (फीडबॅक) आणि सेवेबद्दलच्या टिप्पण्या आणि सूचना अधिक जाणून घेणे.
· पर्यटकांशी प्रामाणिकपणे वागणे आणि त्यांच्यासोबत सहभागी होणे गरजेचे.
· भविष्यातील व्यवसाय आणि साखळीसाठी पर्यटकांशी चांगले संबंध विकसित करणे.
· विविध प्रकारच्या पर्यटकांसाठी आणि त्यांच्या कुटुंबियांसाठी विविध कृषी-भ्रमण पॅकेजेस.

निष्कर्ष व सूचना :

आपल्या देशात कृषी-पर्यटन विकासाची मोठी क्षमता आहे, कारण नैसर्गिक परिस्थिती आणि विविध प्रकारचे कृषी उत्पादन तसेच ग्रामीण भागातील विविधता, परंपरा, सण इत्यादि सर्वच बाबतीत

असलेले वैविध्य पर्यटकांना आकर्षित करते. त्याचप्रमाणे 55 टक्क्यांहून अधिक लोकसंख्या ही शहरी भागात राहते आणि त्यांना सहल म्हणून आणि ग्रामीण जीवनाचा आनंद घ्यायचा आहे, ग्रामीण जीवनाबद्दल जाणून घ्यायचे आहे यासाठी खर्च करण्यास तयार आहेत. यामुळेच शेतकऱ्यांना आर्थिक विकासाची एक चांगली संधी आहे. परंतु शेतकऱ्यांमध्ये या व्यवसायाबाबत कमी जागरूकता आणि आर्थिक व योग्य दृष्टिकोनाची समस्या आहे.

त्यामुळे स्थानिक जिल्ह्यांतील कृषी विभाग, कृषी विद्यापीठे यांनी कृषी पर्यटनासंदर्भात सकारात्मक दिशा आणि काही नाविन्यपूर्ण कल्पना देण्याचा प्रयत्न करणे अभिप्रेत आहे. सरकारने महाराष्ट्रातील कृषी पर्यटन उपक्रमांना अनुदान आणि सार्वजनिक बँकांद्वारे वित्तपुरवठा करून बचत गटांच्या धर्तीवर आर्थिक सहकार्य देण्याचा प्रयत्न केला पाहिजे.

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LONG TERM ECONOMIC CHALLENGES ARISING DUE TO COVID-19: A ROADMAP OF STRATEGIES TO OVER COME THE PANDEMIC

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ABSTRACT
The outbreak of Covid-19 pandemic has disrupted not to India only but to the whole world in terms of financial activity, lives of human being or economic activity too. To curb the spread of Corona Virus government has planned various measures and executed as and when it desires. The Virus is at a peak in the month of April and May in the year 2020 and 2021 also and slowly it tends to decline. But this threat is going to set a tougher challenge in front India in achieving its growth prospects target. The more and more it takes times to control the spread of Covid-19, there is chance of having an adverse effect on India economy including the lives of human being. This research paper is emphasized on economic challenges and strategies to overcome the covid-19 pandemic. The objectives of the researcher to study the economic challenges and strategies adopted and faced by the government to break the chain of corona virus and to minimize the economic losses. The researcher collects the information from the secondary data by searching from internet, news paper, and government reports.
Key Words: Covid-19, government, Economic challenges, strategies.

INTRODUCTION
As we know that Corona Virus is a global pandemic, which not only affected the public health but also have left its severe impact on financial market and global economy. To curb the spread of virus the central as well as state government has imposed several stringent measures. These measures resulted in significant disruption in the economy in both long and short term period. The pandemic reduce the productivity and increase loss of life of common individual, reduction in income, rise in unemployment, disruptions in transportation system, shutting down of manufacturing industries are some of the major consequence of the disease. Looking into the matter seriously, the government has taken various emergency measures to preserve the incomes of individuals working in a company and also the companies whose operations are paused due to lockdown, improving and expanding the health care system in the country so that population at a large can avail the benefits of medical treatment during pandemic, advancing loans to the companies including MSMEs at lower interest rate with flexible terms and conditions to keep alive after pandemic. The regulations of the financial market were eased for financial institution to support the credit facility.

OBJECTIVES OF THE STUDY
- To study the economic challenges during Covid-19
- To study the several strategies to curb the spread of Corona Virus.

METHODOLOGY
In order to accomplish the objectives of the research study, the researcher prefer the secondary sources for collecting the adequate information by searching on the newspapers, government reports, and internet.

COVID-19 AND ITS IMPACT ON THE ECONOMY
The impacts of global pandemic have been felt by small, large and big industries also besides human being. The Indian government and the RBI are taking several measures to protect the economy from its downfall because lockdown in the country has slowdown the pace of the economy. The economy is melting across the world because the exporters record less ordered for their products. It is believed

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with some statistics and measurement that the fifth largest economy in the world by 2024 is India with USD 3.7 trillion GDP, leading by United States with USD 25.3 trillion, China by USD 20.6 trillion, Japan by USD 5.6 trillion and Germany by USD 4.9 trillion GDP. In 2021 IMF and RBI have placed their growth prospects assessment for India and reported that India's GDP growth will be at 10.5% as per RBI while IMF forecast towards India's growth is 2% more than RBI i.e. 12.5%. These forecasts will be a challenge before the government to achieve by controlling the situation of covid-19 as soon as possible and these is possible by vaccinating the population of India at a large.

ECONOMIC CHALLENGES AMIDST COVID-19

- **Increase in unemployment** – Due to shutdown of enterprises, the issue of unemployment is one of the economic challenges before the government.
- **Survival of MSMEs** – The pain of demonetization and GST is not still fully recovered from the MSMEs, the Covid-19 take rise. These MSMEs are not in a position to face some smaller or bigger problems and continue their operations due to lack of capital and resources as raw materials. The government should take enough measures to protect their survival in the economy as theses MSMEs are the backbone of the growing economy.
- **Inflation** - Amidst Covid-19 raise in inflation rate is the major issues before the government which need to be curb otherwise the burden of inflation will directly reflects on the ordinary people as during the pandemic the people are already suffering from the less income. It is noted that in the year 2019 the consumer price index in July was 3.5% while in the same month when the Covid-19 is at peak in 2020 the inflation rate is 6.93%.
- **Rise in the Cases of Covid-19** – It is one of the biggest challenge before the government both central as well as state government to break the chain of covid-19. Otherwise, it will leave back a disgusting picture in the country by digesting the lives of common people at a huge rate per day. Beside this, vaccinating to the population at large to control the spread of Corona virus and making the situation normal.
- **Safety and security of frontline workers** – Besides the above challenges, the safety and security of the frontline workers are the utmost important. Because they are at the edge of life risk by getting infected with the Covid-19 virus depending on the types of service and the place of discharging their service based on their health.
- **Flexible arrangements of plans and duties of the employees** – Amidst Covid-19 making contingent plans for executing the responsibilities based on position and skills its desire to perform is also much needed to provide the service to the citizens of the country without any disruptions and to curb the spread of global pandemic with various strategies which ensure minimal contacts among suppliers, buyers, sellers and other stakeholders.

STRATEGIES OF THE GOVERNMENT AMIDST COVID-19

- **To availed proper medical facilities** – Though the virus have born in end of year 2019 but the second wave which takes place in 202 is much serious than the first wave because the daily rate of Covid-19 patients was reached to 4 lacs plus. The states government has declared lockdown to most part of their states with certain exemptions on necessary and emergency services. The government trying to manage the necessary ingredients which are essentials for the Covid-19 patients from the various parts of the country and during this period it is good to see that the countries are also forwarding their helping hands towards India.
- **Vaccination** – The Indian government has make its target to vaccinate the complete population by July 2022 because besides maintaining social distancing, covering the face with masks and using sanitizers and avoiding mass gatherings vaccination is the panacea of Covid-19. And for these besides using the domestic's vaccines the government also permitted the emergency use of foreign vaccine such as Sputnik V, Russia.
- **Non- Health Sector** – The responsibility of the government is not only towards the health sector but also the non-health sectors. Because disruption in proper supply of goods and services will have a great impact on the society at large and also in the businesses which are also important to

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survive amidst Covid-19. The government is planning to make optimum utilization of the resource to protect the manufacturing units, employees and customers and various such decision and policies are also executed which will mitigate the negative impact.

DISCUSSION & CONCLUSION

The outbreak of Corona virus is a significant shock for India and around the world which have its impact on the economies of the country, the country like USA also comes under the purview of the pandemic which resulted into rise in unemployment and cut in economic growth. The pandemic has drawn the attention of the government towards the undeserved and marginalized populations to prevent them from the adverse health effect. Besides, manufacturing, distribution, consumptions, flow of capital, etc. on which the Indian economy is based upon have been impacted adversely. There is not a magic stick in the hands of the government through which the economy could be reviving next to vaccinating the whole populations of India. Almost all the sectors such as hospitality, education, travel and tourism, MSMEs, etc. are facing these pandemic. Though the problem may be different, this depends upon the nature and size of the business and it will take a longer time to revive which will directly have an impact on the economy. After the lockdown when unlock process start, a fresh challenge appear before the government to make a strategy to minimal the losses and reactivate the economy so that it could get the pace to run in the track as normal. The pandemic teaches the lesson to analysis to what extent does the human being are ready to face the challenges and also provides an opportunities to accept and carry out reforms to deal to such circumstances.

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Traditionally Used Wild Edible Plants from Dist. Washim (M.S.) India.

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ABSTRACT

From ancient era human being depends on the different Sources of foods mainly either from plant source or animal source. Gradually the plants which are most suitable to grow and cultivates were continuously grown for the food purpose. Apart from cultivation and animal foods another option of food is available from wild plants of Forests. Even today's technologies period many tribal or local peoples are also depends on the forest food.

The present study was designed to document the wild edible fruits and vegetables of Washim district of Maharashtra state. Interviews, conversations, and personal observations were used to gather the data. The study revealed, total of 80 species were identified belonging to 72 genera from 39 families. Most of the fruits are eaten raw or when ripened and vegetables are consumed as seasonal vegetable and cooked as Bhaji. Some of them also have a good market potential thus are also connected with the economy of people therefore, there is urgent need to popularize and conserve these plants.

In the Washim district of Maharashtra rural peoples traditionally uses many wild plants as a food material. Wild edible plants consist of many nutritional values and bears a source of multiple vitamins. The present attempt shows the list of 80wild edible plants from Washim district. All wild edible plants have different edible parts and also different methods for preparing as a vegetable. Some plant parts can be directly eaten as a crude some of needs a specific process to make it edible.

KEYWORDS:*Wild, edible,nutritional, traditionally, Forests,Washim*.

I. INTRODUCTION

Native species that thrive and reproduce naturally in their natural habitat without being cultivated are referred to as wild edible plants (WEPs). Since the beginning of time, people have been gathering WEPs, and they are now a staple of traditional food systems and the human diet.

Historically, humans may have utilized more than 7000 WEPs so far (Grivetti and Ogle, 2000), but many such food resources and valuable plants are still to be explored (Mohan, 2000). Plants have taken on significant relevance in human cultures since the earliest hunter-gatherers and during various stages of adaption. Many people around the world have relied on several wild species, primarily for food and medicines. WEPs have historically played a significant role in the cultural, religious, and health spheres of Indians' rural and ethnic lives. The presence of many climatic zones and ecological diversity in India serves as a foundation for a high phytodiversity, and numerous studies on WEPs conducted by various researchers across India. (Sebastian and Bhandari, 1990, Bora and Pandey, 1996, Girach and Aminuddin Ahmed, 1988, Patole and Jain, 2002, Kulkarni et al., 2003, Kumer, 2003, Devi, 2003and Prasad et al., 2003).

The highest number of edible plants are reported from family Fabaceae previously known as Leguminosae i.e.,11 no. of plants. As wild edible plants contain numerous phytochemicals as an antioxidant, they have diverse medicinal properties too. This paper may be useful for all peoples which derived from Washim district to collect the edible plants and it also gives an opportunity clue to conserve such wild edible plants so that the next generations can also take the advantage of such a wild edible plant.

Day by day the forest area is going to decline due to human activities and habitat destruction is almost common for wildlife. Entry of wild monkeys, Tigers and other wild animal in to the villages and urban area is more common due to scarcity of forest food.The conservation of wild edible plant species is most common issue for wild animals as well as to fulfil the demand of food of local tribal communities and next generation.

The number of wild edible plants are continuously decreasing due to deforestation and the land utilization for agriculture or making of road. For conservation purpose the list of the plants and their uses from this paper may provide a good data and the plants may also cultivated and conserved.

II. MATERIALS AND METHODS

The information regarding the uses of different plants was collected through extensive field surveys and group discussions. Local residents of particular locations were engaged in conversation in their own tongue. Plant specimens were photographed in their natural habitats and samples of the plants were collected for the identification purpose.The data were gathered using the technique recommended by Jain (1995).The necessary data (local name, mode of preparation) were collected through questionnaire, interviews and discussions among the local peoples.The information was procured after discussions with several local persons, village elder peoples during year of 2021 to 2023.

Experimental Site:

The present study on wild edible plants was carried out to document the diversity of wild edible plants of different localities belonging to 5 tehsils i.e., Washim, Karanja, Malegaon, Risod and Manora of Washim district, Maharashtra, India.The focus of the study is on the areas surrounding the forests, various communities, and markets. The specimens were identified using fresh as well as herbarium materials with taxonomic keys in the Floras like, Flora of Maharashtra state vol.I [Singh and Karthikeyan 2000], vol. II [Singh et al 2000].

Figure 1. Map: Study area covered in different Tahsils of Washim district. (M.S.)

III. RESULTS AND DISCUSSION

The present investigation comprises 80 species of plants belonging to 39 families. Out of 39 families 5 families were belongs to monocotyledon and remaining 34 families were dicotyledons. In dicot, the dominant families were Fabaceae (11 sp.), Amaranthaceae(4 species), Asteraceae (4 sp.), Cucurbitaceae (4 sp.), Malvaceae (4 sp.), Moraceae (4 sp.), and remaining taxa belongs to two or one member of each family. For each species botanical name, family, Common name, parts used, method of use and habit is discussed (Table 1).

Among 80 wild edible plant species, 18 species of wild fruits are eaten raw directly when ripened, they are commonly consumed by the village children, women and old people of the Washim District. There are 16 wild edible fruit species viz., *Emblica officinalis* Gaertn., *Syzygiumcumini* (L.), *Aegle marmelos* L.,*Limoniaacidissma*L., *Syzygiumcumini* (L.) Skeels., *Diospyros melanoxylon*Roxb., *Phoenix sylvestris* (L.) Roxb., *Grewia tilifolia* Vahl., *Meynalaxiflora*Robyns., *Semecarpus anacardium* L., *Opuntia littoralis* (Engelm.) Cockerell, *Cordia dichotoma* G. Forst., *Lantana camara* var. aculeata (L.) Moldenke., *Madhuca longifolia* var. *latifolia* (Roxb) Chev., *Zizyphusmauritiana* Mill., *Ziziphus oenopolia* (L.) Mill.

Leaves of 34 wild edible plants are cooked & eaten as vegetables (*Portulacca oleracea* L. *Portulaca quadrofida* L., *Senna tora*L,*Commelinabenghalensis* L., *Impatiens balsamina* L., *Launaea procumbens* L., *Lactucaintybacea* (Jacq.)., *Oxalis corniculata* L., *Glossocordiabosvallia* (L. f.) DC., *Ipomoea nil* (L.) Roth., *Ipomoea aquatica*., *Amaranthus spinosus* L., *Amaranthus viridis* L., *Blepharis repens* L.)

Wild edibles are traditionally used as in the Chataney or Sauce preparations (*Tamarindus indicum*, *Hibiscus sabdariffa* L. The other plant parts of wild edible consumed are root (*Asparagus racemosus* Willd.),seed (*Cannabis sativa* L.), tuber (*Dioscoreabulbifera*L.), flowers or bud (*Bauhinia racemosa* L., *Bombax ceiba* L., *Bauhinia purpurea* L., *Sesbania grandiflora* (L.) Pers., *Telosma pallida* (Roxb.) Craib., *Cassia fistula* L. These not only have nutritive or edible qualities, but also therapeutic ones.

Table 1. Index of wild edible plant species from Washim District (M.S.)

Plant name	Common Name	Family	Eaten Part and methods of use	Habit
Abrus precatorius L.	Gunj	Fabaceae	Crude Leaves are eaten, dried Stem eaten.	V
Acmella paniculata (WalLex DC.) R. K. Jansen.	Akkalkara	Asteraceae	Leaves are used to make vegetables.	H
Aegle marmelos (L.) Corr.	Bel	Rutaceae	Ripen fruits pulp is eaten.	T
Amaranthus spinosus L.	Kate Math	Amaranthaceae	Leaves used as vegetables.	H
Amaranthus viridis L.	Math	Amaranthaceae	Leaves used as vegetables.	H
Amorphophallus paeoniifolius (Dennst)Nicolson.	Suran Kand	Araceae	Corms are used to make vegetables.	H
Asparagus racemosus Willd.	Shatavari	Asparagaceae	Raw Roots are eaten.	V
Basella alba L.	Wavding	Basellaceae	Leaves used as vegetables.	V
Bauhinia purpurea L.	Kanchan	Fabaceae	Flowers & young leaves to make vegetables.	S
Bauhinia racemosa Lam.	Aapta	Fabaceae	Inflorescence used as vegetable in season.	T
Blepharis repens (Vahl) Roth.	Hadsan	Acanthaceae	Leaves used as vegetables and dried leaves use with dry fruits to cure bone fracture.	H
Bombax ceiba L.	Katesavar	Malvaceae	Flowers & young fruits to make vegetables.	T
Boswellia serrata Roxb. ex Coleber	Salai	Burseraceae	Fruits are used to make vegetables.	T
Buchanania cochinchinesis (Lour.) M. R. Almeida	Charoli	Anacardiaceae	Ripen fruit pulp eaten & seeds are used in sweet basundi.	T
Capparis decidua (Forssk.) Edgew.	Kair	Capparaceae	Fruits are eaten raw and also to make pickles.	S
Capparis zeylanica L.	Waghati	Capparaceae	Fruits are used to make vegetable.	V
Careya arborea Roxb.	Kumbhi	Lecythidaceae	Fruits are used to make vegetable.	T
Cassia fistula L.	Bahava	Fabaceae	Flowers are used to make vegetable.	T
Celastrus paniculatus Willd.	Malkangni	Celastraceae	Ripened Fruits are eaten raw.	S
Celosia argentea L.	Kardu	Amaranthaceae	Leaves used as vegetables.	H
Centella asiatica (L.) Urban	Brhami	Apiaceae	Leaves used as vegetables.	H
Cissus quadrangularis L.	Hadjodi	Vitaceae	Leaves & Stem used to make vegetable.	V
Clerodendrum serratum (L.) Moon	Bharangi	Verbenaceae	Flowers are used to make vegetables.	S
Coccinia grandis (L.) Voigt.	Padwal	Cucurbitaceae	Fruits are used to make vegetables.	V
Cocculus hirsutus (L.) Theob.	Wasan wel	Menispermaceae	Leaves used as vegetables.	V
Colocassia esculenta (L.) Schott.	Chamkura	Araceae	Leaves are used in fried wada and bhaje a local food.	H
Commelina benghalensis L.	Kena	Commelinaceae	Leaves used as vegetables.	H
Corchorus olitorius L.	Chichura	Malvaceae	Leaves used as vegetables.	H
Cordia dichotoma G. Forst.	Gondhan	Boraginaceae	Ripened Fruits pulp is eaten.	T
Cucumis melo subsp. *Agrestis Var. agrestis*	Ran Kakadi	Cucurbitaceae	Ripened fruits are eaten and dried cuts of fruits are used to make vegetables (Usari).	V
Dendrocalamus strictus (Roxb.) Nees	Bamboo	Poaceae	Young soft stem used for making vegetable.	T
Digera muricata (L.) Mart.	Tanduljira	Amaranthaceae	Leaves & stem used to make vegetables.	H
Dioscorea bulbifera L.	Air Potatoe	Dioscoreaceae	Stem tubers boils & used to make vegetable.	V
Diospyros melanoxylon Roxb.	Tembhurni	Ebenaceae	Ripened fruits are very delicious to eat.	T
Diplocyclos palmatus (L.) C. Jeffrey.	Shivlingi	Cucurbitaceae	Leaves used as vegetables.	V
Emblica officinalis Gaertn.	Aawala	Euphorbiaceae	Fruits are eaten raw also makes pickles, juice and dried aawla supari.	T
Erythrina stricta Roxb.	Pangara	Fabaceae	Flowers are used to make vegetable.	T
Ficus benghalensis L.	Wad	Moraceae	Ripened Fruits are eaten raw.	T
Ficus hispida L.	Bhuiumbar	Moraceae	Ripened Fruits are eaten raw.	S
Ficus racemosa L.	Umbar	Moraceae	Ripened Fruits are eaten raw.	T
Ficus religiosa L.	Pimpal	Moraceae	Ripened Fruits are eaten raw.	T
Glossocordia bosvallia (L.f.) DC.	Ran Shepu	Asteraceae	Leaves used to make vegetables.	H
Grewia tilifolia Vahl.	Dhaman	Malvaceae	Ripened Fruits are eaten raw.	S

Hemidesmus indicus (L.) Schult.	Anantmul	Asclepiadaceae	Leaves used as vegetables, Roots used to prepare Kadha or making tea.	H
Hibiscus sabdariffa L.	Ambadi	Malvaceae	Leaves & Fruits are used to make vegetables.	H
Impatiens balsamina L.	Gulchhadi	Balsaminaceae	Leaves used to make vegetables..	H
Ipomoea aquatica Forssk.	Nalichi Bhaji	Convolvulaceae	Leaves, Shoots used to make vegetables.	V
Ipomoea nil (L.) Roth.	Pingali	Convolvulaceae	Leaves used to make vegetables..	V
Lactuca intybacea (Jacq.) Beauvera	Pathri	Asteraceae	Leaves used to make vegetables..	H
Lantana camara var. aculeata (L.) Moldenke.	Tantani/Ghaneri	Verbenaceae	Ripened Fruits are eaten raw.	S
Launaea procumbens L.	Pathari	Asteraceae	Leaves used to make vegetables..	H
Limonia acidissma L.	Kawath	Rutaceae	Fruits are used to make pickles.	T
Madhuca longifolia var. latifolia (Roxb) Chev.	Moh	Sapotaceae	Dried Flowers are fermented & makes alcoholic beverage (Daru), Fruits are eaten raw, seeds used to extract edible oil.	T
Meyna laxiflora Robyns.	Karbet	Rubiaceae	Ripened Fruits are eaten.	S
Mimusops elengi L.	Khirani, Bakul	Sapotaceae	Fruits are eaten raw.	S
Momordica dioica Roxb. ex Willd	Kartule	Cucurbitaceae	Fruits are used to make vegetable.	V
Moringa oleifera Gaertn.	Shevga	Moringaceae	Flowers and pods are used to make vegetable.	T
Mucuna pruriens (L.) DC.	Kuyari	Fabaceae	Leaves are used to make bhaji.	V
Nelumbo nucifera Gaertn.	Kamal	Nelumbonaceae	Petiole, Rhizome used to make vegetable.	H
Nymphaea nouchali Burm. f	Kamal	Nymphaeaceae	Petiole, flowers are used to make vegetable.	H
Ocimum tenuiflorum L.	Tulasi	Lamiaceae	Leaves are eaten raw; Seeds are used to make Faluda.	H
Opuntia littoralis (Engelm.) Cockerell	Nagfana	Cactaceae	Ripened Fruits are eaten raw.	S
Oxalis corniculata L.	Ambushi	Oxalidaceae	Leaves are used to make vegetables.	H
Phoenix sylvestris (L.) Roxb.	Shindi	Arecaceae	Fruits, Stem sap	T
Pithecellobium dulce (Roxb.) Benth.	Angreji Chinch	Fabaceae	Mature fruits placenta eaten raw.	T
Portulaca oleracea L.	Mothi Chivali	Portulaceae	Leaves & stem are used to make vegetables.	H
Portulaca quadrifida L.	Chhoti Chivali	Portulaceae	Leaves & stem are used to make vegetables.	H
Securinega virosa (Roxb.ex Willd.) Baill.	Pithori	Euphorbiaceae	Fruits are used to make vegetable.	S
Semecarpus anacardium L.	Biba	Anacardiaceae	Fresh or dried receptacles of the fruit are eaten raw. Kernel found inside the hard shell is eaten.	T
Senna occidentalis (L.) Link	Ran-Takala	Fabaceae	Leaves for vegetables & seeds as replacement to coffee.	S
Senna tora (L.) Roxb	Tarota	Fabaceae	Leaves are used to make vegetables.	H
Sesbania grandiflora (L.) Pers.	Hadaga	Fabaceae	Flowers are used to make vegetable.	T
Syzygium cumini (L.) Skeels.	Jambhul	Myrtaceae	Ripened Fruits are eaten raw.	T
Tamarindus indica L.	Chinch	Fabaceae	Flowers to make vegetable, Fruits used to make chutney, soup etc.	T
Telosma pallida (Roxb.) Craib	Jeevti	Apocynaceae	Flowers are used to make vegetable.	V
Terminalia bellirica (Gaertn.) Roxb.	Behada	Combretaceae	Seeds are eaten raw.	T
Tribulus terrestris L.	Sarata	Zygophyllaceae	Leaves are used to make vegetables.	H
Wrightia tinctoria R.Br.	Kala Kuda	Apocynaceae	Leaves are used to make vegetables.	T
Ziziphus jujuba Mill.	Bor	Rhamnaceae	Ripened Fruits are eaten raw.	T
Ziziphus oenopolia (L.) Mill.	Katbor	Rhamnaceae	Ripened Fruits are eaten raw.	S

Abbreviations used: H: Herb; S: Shrub; T: Tree; V: Vine

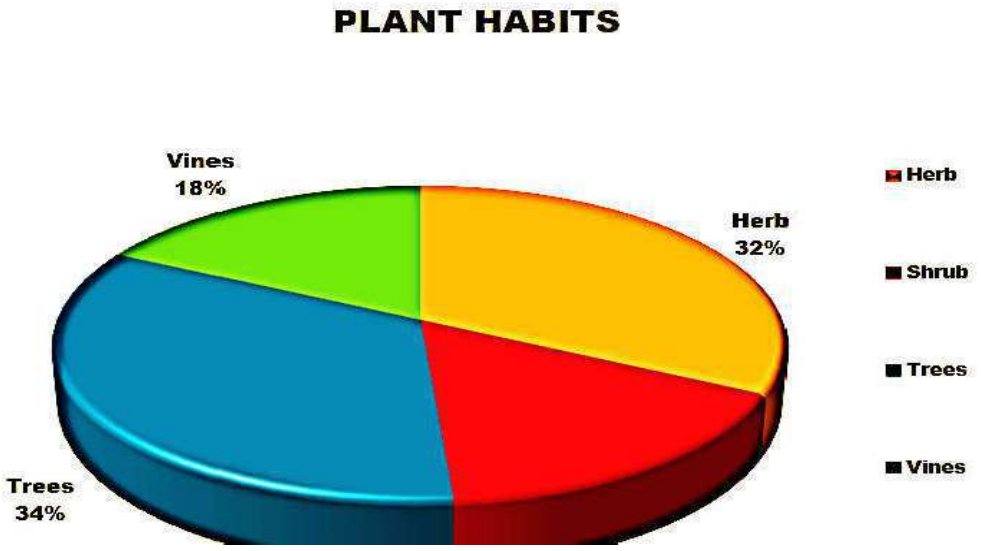

Fig. 2. Percentage of plants as per their diversified habit.

Table 2. Number of plants in different habits.

Plant Habit:	Herb	Shrub	Trees	Vines
Number of Plants:	26	13	27	14

IV. CONCLUSION

Among all studied 80 wild edible plant species the contribution of Trees (27) are more than herbs (26), followed by vines (14) and shrubs (13) in the wild edible fruits and vegetables of Washim District of Maharashtra (Table1 & 2). *Portulaca oleracea* L. is a very good source of alpha-linolenic acid&contain five times higher omega-3 fatty acids than spinach. Omega3 fatty acids essential for human growth, development, prevention of numerous cardiovascular diseases, and maintenance of a healthy immune system (Gill and Valivety, 1997).

The present study revealed that use of wild fruits and vegetables is very less and restricted to the few species only. As a result, traditional knowledge about the use of these wild Edible Fruits and Vegetables is disappearing very fast, hence it is the need of time to document and preserve this knowledge before it is lost. The use of wild fruits and vegetables need to be popularized as these are very good source of nutrients. Poor people can increase their income by producing wild vegetable species in addition to receiving nutritional benefits.The plant species need conservation strategies in order to maintain their availability for the future generations. Both, in situ as well as ex situ conservation strategies have to be implemented to conserve the plant resources.

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THE THEME OF EMERGENCE OF RACIAL CONSCIOUSNESS IN ALICE WALKER'S MERIDIAN

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Abstract

The paper titled, The Theme of Emergence of Racial Consciousness in Alice Walker's Meridian discusses Meridian's active participation in Civil Rights Movement after the renunciation of her child. The paper also justifies Alice Walker's celebration of blackness, black roots and the aspirations of black womanhood. It presents a balanced picture of black womanhood. It also describes the task of Alice Walker as a writer to give back to black woman their own black woman self, their beauty, physical and sexual strength.

Key word:: Racial discrimination in USA, Racial Consciousness in Walker's Meridian, Walker and Civil Rights Movement.

Alice Walker's second novel *Meridian* (1976) is a study of personal development and sacrifice set during the Civil Rights Movement that is regarded by many critics as one of the best novels depicting that era. In this novel, Walker explorers conflicts between traditional black values handed down through slavery and the revolutionary polemic advocated by the black power movement.

Truman and Lynne give birth to a child named Carama. They move to Mississippi to continue the voter registration work they had begun as college students. Mississippi locals both black and white target Truman and Lynne for violence, humiliation and terror. Under these pressures their relationships flounder. Lynne eventually files for divorce and returns to her family in New England. Carama suffers from severe fainting spells. She dies in the convulsive grip of the find fainting spell. Now, Truman seeks relationship with Meridian in order to cure his loneliness.

Truman and Meridian enjoy a few months together. But Meridian does not want to make compromise with her activist work and she announces to Truman that she plans to move further South, where violence against newly registered voters escalated.

Through the total range of her experiences, Meridian creates a new self an androgynous self, she is transformed, as symbolized by the wasting illness from which she recovers and returns ' to the world Cleansed of sickness'. Meridian's androgynous quality, expressed in physically androgynous features is communicated through a passage near the end of the novel when she visits a prison and the inmates ask, 'who was that person?' That man and woman person with a shaved part in close cut hair? A man's blunt face and things, a woman's breast?' Here, Meridian appears as a symbol of one who has creatively united the masculine and feminine opposites and achieved a state of unconscious wholeness.

Meridian can be read as an attempt to mend the ruptures and reconstruct and alternate black tradition from its contemporary American artefacts. The novel, in other words, conducts an historical search in that it tries to recontextualize the past.

In *Meridian* Walker creates the first of a series of women characters who take the mythical hero's journey and redefine the hero archetype, so that modern women will understand that the pattern itself need not be based on gender stereotypes. She refuses to offer strategies for coping with the unfairness of patriarchal double standards, instead, Walker argues against beliefs stating that women must be wives and mothers to be fulfilled. In fact, she illustrates in Meridian how the restrictive nature of marriage and motherhood as it is defined in patriarchal society, imprisons women and prohibits them from developing into complete selves.

That feeling of responsibility didn't go away when the Civil Rights movement ended. Violence seemed to many young people at the time, including Walker, the only way to bring about change.

The resolution that Walker offers to outdo this dissonance is to envisage a new system. Unless women in any enslaved nation are completely liberated, the change cannot be called a revolution. Catching a glimpse of freedom and tasting a bit of self-determination, Meridian is unable to revert to the old routines that were established under a racist and capitalist regime.

He remains in conflict between his love for black women- whom he romanticizes as fertile mothers and the white women whom he finds sexually attractive. Truman marries Lynne, a white fellow activist only to enjoy the special privileges in White America. Lynne is exploited by black men and insulted by their wives who do not credit her sincere concern and love for the blacks. This episode depicts the blacks as perpetrators of base and criminal tendencies that animate any sort of relationship.

At the end of the novel, Truman undergoes a transformation from "fragmentation to wholeness". He reads the poems Meridian has left on the walls which state that forgiveness is the key to wholeness. Her personal possessions, a cap and dungarees, and a sleeping bag are symbolic of freedom, self-discovery and restoration that are left behind for Truman as a call to "his inner voice to communicate the spirit of change." A victim of psychological and political aggression, Meridian's journey is both external, as she travels about the south, and internal as she comes to terms with the discords about death, life, sex, love, motherhood, violence and change. Her internal exploration is an expression of the search for the African American women's spirit, a spirit that leads the way for others to follow.

Because of Meridian's emphasis on the 1960s Civil Rights Movement and black life afterwards, Michel Cooke labels the novel as prime example of the "intimacy" stage of African American literature:

At age seventeen, Meridian is left on her own to consider what to do with her life and her child's. when she says no to motherhood, she offends and loses her own mother, her family and her community. She feels guilty for leaving her baby, and cannot adequately explain why she must. She stops living by other's standards, learns to bloom for herself. Meridian cannot forgive herself for giving her son away.

Barbara Christian in her book *Black Feminist Criticism* observes :

....that tradition that is based on the monumental myth
of black motherhood, a myth based on the true
stories of sacrifice black mothers performed
for their children.....is.... restrictive, for it imposes a
stereotype of Black women, a stereotype of
strength that denies them choice and hardly admits
of the many who were destroyed. (BFC1985).

Meridian does not object to children, or mothers bearing children, but to the role a woman is expected to play once she becomes a mother. According to this role a mother, should sacrifice her individual personality and concerns in order to live for her children.

Meridian's cumulative guilt becomes so great that it prevents her from seeing or moving freely. Miss Winter is the only member of the audience who truly understands Meridian's struggle against the hegemonic discourse of the speech.

The quality of presenting 'self' with bold attitude can be seen in the works of Walker. As already stated, the book posses the autobiographical elements of her life, she stands keen to promote and proclaim her experiences as woman with racial approach of the mainstream society. In fact, the discrimination of gender, culture and race are dominant in her life which can be easily observed in the present work. It is the intellectual, political and cultural conflict of traditional black that makes her completely restless as an individual human being. These all conflict contributes to make her realized about her racial self. Through the protagonist, she has effectively uncovered the revolutionary polemic advocacy. It means that she has penned her racial agony in her literary works, making her more intensified about racial discrimination. It becomes also clear that the existence of

conflict in her life is resultant of being victimized from the power management of the society on the basis of race.

As a woman and more specifically an individual human being with different race, she does not accept the dominancy of male dominated society. She is taught in her childhood about the secondary position of the woman to the man. Her mother's primary intention about Walker was just to do the primary duties of a woman. She is taught to accept a woman's inferior status in society. But on the contrary, it is Walker who does not have the same point of view of her mother. Even she forcefully holds an air of independence and free thought.

Throughout her journey as a woman, she has experienced several incidences that make her to realize her "self" as a woman and especially as a human being with racial consciousness. Her feelings about love and sex show the helplessness of a woman. It is her though and personal experience that love and sex is just a sanctuary from social pressure which unfortunately results in pregnancy.

On the ground of political self and liberation, she presents the amalgamation of her generation with older generations. It is her generation who stands for the liberation from the societal pressure from the other. And older generation stands for the oppressed blacks. The intensity of slavery, racial discrimination and other anti-societal elements in relations with human being was higher in older generation. Thus her aggressive reply to her mother makes it more crystal clear that she does not want to follow that traditionalistic approach of woman in the society.

It would be perfectly right to point out that Walker, through her protagonist, presented her personal identity. This personal identity has become a collective identity. Throughout her work, she has experienced several questions concerning her "self" to define her in belief as to who she really is. These incidences caused her the question of identity in relation with race. This crisis of self-establishment into the society stands one of the most prominent conflicts she deals in her development as a woman.

Walker has been discriminated on the ground of race and colour. Her experiences of immigration and social disdain are some of the important elements for her to search her "self" that ultimately results into her emergence into racial consciousness. It is her painful experience about the notion of being treated by race. As a woman of colour, checked by a remote stress, she is confronted with racial slur.

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भारतीय संविधानातील राज्यनितीच्या मार्गदर्शक तत्वाचे महत्व व कामगिरी

प्रा.डॉ.जयवंत निवृत्ती कांबळे इतिहास विभाग प्रमुख मा.सु.पा.महाविद्यालय मानोरा

प्रस्तावना :-

भारतीय संविधानाच्या चौथ्या भागामध्ये राज्यनितीच्या मार्गदर्शक तत्वांचे विवेचन करण्यात आले आहे. स्पेनच्या राज्यघटनेमध्ये अशा प्रकारची तत्वे सर्वप्रथम समाविष्ट करण्यात आली होती. त्यानंतर आयर्लंडच्या राज्यघटनेमध्ये अशा प्रकारचे प्रकरण समाविष्ट करण्यात आले. आधुनिक काळातील श्रीलंकेच्या राज्य घटनेत सुध्दा मार्गदर्शक तत्वे आढळून येतात. भारतीय संविधानातील अनेक प्रकरणापैकी राज्यनितीच्या मार्गदर्शक तत्वाचे अतिशय महत्वाचे एक प्रकरण आहे. किंबहूना ते एक प्रमुख प्रकरण आहे. राज्यनितीची मार्गदर्शक तत्वे भारताच्या राज्यघटनेचे एक प्रमुख वैशिष्ट्ये होय. लोकशाही राज्यव्यवस्था परिणामकारक व यशस्वी रितीने कार्यान्वित करायची असेल तर त्यासाठी सरकारांनी कसे वागावे या विषयीचे मार्गदर्शन या तत्वातून करण्यात आले आहे. प्रस्तुत लघुशोध निबंधामध्ये भारताच्या राज्यघटेतील राज्यनितीच्या मार्गदर्शक तत्वांनी कोणती जबाबदारी पार पाडली याची मांडणी करण्यात आली आहे.

मार्गदर्शक तत्वाचे स्वरुप :-

केंद्र व राज्य सरकारांनी निरनिराळ्या बाबतीत कायदे करतांना कोणते धोरण स्विकारले पाहिजे याबाबतीत अतिशय सुंदर सुचना या प्रकरणामध्ये देण्यात आल्या आहेत. भारतीय राज्यघटनेच्या चौथ्या भागातील कलम 36 ते 51 पर्यंतच्या कलमापर्यंत या प्रकरणाचे सविस्तर विवेचन करण्यात आले आहे. 37 व्या कलमामध्ये या तत्वांच्या स्वरुपाचे विवेचन करण्यात आले आहे. या कलमात असे नमुद करण्यात आले आहे की, कोणत्याही न्यायालयामार्फत राज्यनितीच्या मार्गदर्शक तत्वांची अंमलबजावणी होणार नाही. तथापी देशाचा कारभार चालवत असतांना हि तत्वे मुलभूत समजली जातील व विधीनियम तयार करतांना या तत्वांना प्राधान्य देणे हे सरकारचे कर्तव्य राहिल.

भारतीय जनतेच्या विकासाठी अनेक आदर्शभूत तत्वे मान्य करणे आवश्यक आहे, याची घटनाकार डॉ. बाबासाहेब आंबेडकर यांना जाणीव होती. परंतु या सर्व तत्वांचा मुलभूत हक्कामध्ये समावेश करणे शक्य नव्हते. त्यामुळे हि राज्यनितीची मार्गदर्शक तत्वे एका स्वतंत्र प्रकरणामध्ये सांगण्यात आली आहेत. थोडक्यात सांगायचे झाल्यास ज्या तरतुदी करणे आवश्यक होते परंतु आर्थीक व सामाजिक परिस्थितीमध्ये शक्य नव्हते. त्या तरतुदीचा समावेश या प्रकरणामध्ये करण्यात आला आहे. या तत्वाची सरकारने अंमलबजावणी केली नाही तर सरकारला न्यायालयात खेचले जाउ शकत नाही.

संविधान सभेमध्ये भाषण करतांना मार्गदर्शक तत्वांच्या स्वरुपाविषयी डॉ. बाबासाहेब आंबेडकरांनी पुढीलप्रमाणे उद्गार काढले, मार्गदर्शक तत्वे हे दुसरे तिसरे काही नसून 1935 च्या कायद्याने गव्हर्नर जनरल व प्रांतांचे गव्हर्नर यांना जे सुचनापत्रक पाठविले जात असे त्यांचेच दुसरे नाव होय. दोघात फरक इतकाच आहे की, सुचनापत्रक फक्त कार्यकारी सत्तेला उद्देशून पाठविले जाई आणि मार्गदर्शक तत्वांचा उद्देश राज्याला मार्गदर्शन करणे हा आहे. म्हणजेच कार्यकारी मंडळ व विधीमंडळ या दोघांसाठी हि तत्वे सांगण्यात आली आहेत.

मार्गदर्शक तत्वाचे वर्गीकरण :-

राज्यनितीच्या मार्गदर्शक तत्वाच्या प्रकरणामध्ये आर्थीक, सामाजिक, शैक्षणीक, वैधानिक व परराष्ट्र संबंधाविषयी अनेक प्रश्नांचा उहापोह करण्यात आला आहे. परंतु खुद्द घटनेमध्ये या तत्वांचे तर्कशुध्द वर्गीकरण देण्यात आले नाही. वेगवेगळ्या लेखकांनी आपआपल्या परिने या तत्वांचे वर्गीकरण करण्याचा प्रयत्न केला आहे. विवेचन करतांना या तत्वांचे चार गट पाडता येतील.

1) आर्थीक तत्वे 2) सामाजिक तत्वे 3) राजकीय तत्वे 4) आंतरराष्ट्रीय संबंध विषयक तत्वे.

मार्गदर्शक तत्वांच्या अनुषंगाने पार पाडलेली कामगिरी :-

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संविधान सभेमध्ये ज्या पक्षाचे वर्चस्व होते त्याच पक्षाकडे प्रदिर्घकाळ सत्ता राहिल्यामुळे मार्गदर्शक तत्वांचे वेगवेगळ्या क्षेत्रात पालन करण्याचा सरकारने प्रयत्न केल्याचे दिसून येते. या मार्गदर्शक तत्वामुळे प्रभावीत होऊन सरकारने जे काही सुधारणा विषयक कायदे केले आहेत. त्याचा आढावा खालीलप्रमाणे घेता येईल.

1) न्याय विभागाला कार्यकारी विभागाकडून वेगळे ठेवण्याचे तत्व ○:-

हे तत्व देशातील बहुतेक राज्यांनी मान्य केलेले आहे. आसाम, महाराष्ट्र, गुजरात, पंजाब, मद्रास, केरळ इत्यादी राज्यांमध्ये अशा प्रकारचे सत्ता विभाजन मोठ्या प्रमाणावर करण्यात आले आहे.

2) ग्रामपंचायतीचा स्विकार ○:-

शासन व्यवस्थेतील सर्वात लहान घटक म्हणून ग्रामपंचायतीचा स्विकार देशातील सर्वच राज्यांनी केलेला आहे. भारतातील कोणतेही खेडे ग्रामपंचायतीशिवाय राहु नये याची सर्वच राज्यांनी दखल घेतली आहे. आज महाराष्ट्रामध्ये सर्वच खेड्यात ग्रामपंचायती असून त्यांना चांगला विकास निधी सुध्दा मिळत आहे.

3) उत्पादनाची साधने खाजगी क्षेत्राच्या हातात राहु नयेत ○:-

यासाठी निरनिराळ्या आणि मोठ मोठे प्रकल्प सरकार स्वतःकडे घेत आहे. भाक्रानांगल, हिराकुंड व दामोदर खोरे ही धरणे, भिलाई दुर्गापूर व राऊरकेला येथील लोखंड व पोलादाचे कारखाणे विशाखापटणम येथील जहाजबांधणी कारखाना, सिन्द्री येथील खताचा कारखाना यासारखे मोठमोठे उद्योगधंदे सरकारी मालकीचे असून त्यामुळे खाजगी व्यक्तीच्या खिशात संपत्ती केंद्रीत होण्याच्या प्रकाराला आळा बसला होता. परंतु आता सरकारने खाजगीकरणाच्या धोरणाला पसंती दिल्यामुळे हळूहळू अनेक सरकारी उद्योग धंद्याचे खाजगीकरण होत आहे आणि त्यामुळे अदाणी, अंबानी सारख्या खाजगी व्यक्तींच्या खिशात देशातील संपत्तीचे केंद्रीकरण होण्याचा धोका निर्माण झाला आहे.

4) बँकांचे राष्ट्रीयकरण ○:-

जनतेच्या हिताच्यादृष्टीने जास्तीत जास्त भांडवल सरकारच्या हाती असावे. यादृष्टीने श्रीमती इंदिरा गांधी यांनी प्रधानमंत्री असतांना चौदा बड्या बँकाचे राष्ट्रीयकरण करण्यात आले असून देशातील रिक्षा चालकापासून तर लहान शेतकऱ्यापर्यंत सामान्य माणसाला स्वस्त दरात कर्ज उपलब्ध करुन देण्यात येत आहे. तसेच बँकाच्या भांडवलाचा उपयोग जनतेच्या हिताच्यादृष्टीने करणे सरकारसाठी शक्य झाले आहे. आतापर्यंत शेतकऱ्यांना अनेकवेळा कर्ज माफि देणे सुध्दा यामुळे शक्य झाले आहे.

5) मागासवर्गीय जनतेचे कल्याण ○:-

आजपर्यंत मागासवर्गीय जाती जमातीच्या कल्याणासाठी त्यांना सवलती देण्यासाठीच्या मार्गातील अडचणी पाहिली घटना दुरुस्ती कायद्याने दुर करण्यात आल्या आहेत. लोकसभा विधानसभेमध्ये अनुसूचित जाती व जमातीसाठी 26 जानेवारी 1960 पर्यंत जागा राखीव ठेवण्याची तरतुद मुळ राज्यघटनेमध्ये होती. परंतु त्यामध्ये आणखी मुदतवाढ देऊन आजपर्यंत ह्या जागा राखीव ठेवण्यात आल्या आहेत. एवढेच नव्हे तर स्थानिय स्वराज्य संस्था, सरकारी नौकऱ्या व शिक्षण संस्था मधून मागास जाती जमाती साठी जागा राखीव ठेवण्यात आल्या आहेत आणि अजुनही अनेक मागास जातींना आरक्षण देण्याचा सरकार प्रयत्न करतांना दिसत आहे.

6) जमिनदारी नष्ट करणे ○:-

देशातील जमिनदारी पध्दत नष्ट करण्यासाठी जवळ जवळ सर्वच राज्य सरकारानी कसोसीने प्रयत्न केले आहेत. त्यासाठी चारवेळा घटना दुरुस्ती करावी लागली. त्यामुळे आज देशातील पुर्वीची जमिनदारी पध्दत नष्ट झाली आहे.

7) प्राथमिक शिक्षण सक्तीचे व मोफत ○:-

14 वर्ष वयोगटापर्यंत सर्वांना प्राथमिक शिक्षण सक्तीचे व मोफत करण्यात आल्यामुळे देशामध्ये शिक्षणाचा मोठ्या प्रमाणावर प्रसार होत आहे.

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8) दारुबंदीचे धोरण ○:-

देशातील काही राज्यांनी आपआपल्या राज्यात पुर्णपणे दारुबंदी केली आहे आणि उर्वरीत राज्यात सुध्दा दारुबंदीची मागणी होत आहे.

9) श्रमीकांच्या शोषणाविरुध्द कायदे ○:-

मीनिमम वेजेस ॲक्ट, गुमास्ता ॲक्ट, फॅक्टरी ॲक्ट यासारखे कायदे करुन कामाचे तास, रजेचे दिवस, विश्रांतीची वेळ, जास्त कामाचा मोबदला, किमान वेतन, मजुरांना द्यायच्या सोयी इत्यादी तरतुदी करण्यात आल्या आहेत. स्त्रि कामगारांना प्रसुतीच्यावेळी पगारी रजा स्त्रि व पुरुष कामगारांना समान वेतन दिले जाते. बालकामगारावर प्रतिबंध करण्यात आला आहे.

निष्कर्ष ○:-

1) स्वतंत्र भारतात आजपर्यंत मानवतेच्या दृष्टीकोणातून सरकारकडून जि कामे झालेली आहेत. त्याचे श्रेय भारतीय राज्यघटनेतील राज्यनितीच्या मार्गदर्शक तत्वांना द्यावे लागेल.

2) मागासजाती व जमातीच्या उत्कर्षासाठी सरकारने आजपर्यंत जी धोरणे आखुण, त्याची अंमलबजावणी केल्यामुळे पुर्वी पेक्षा या जातींना सामाजिक न्याय देण्याची प्रक्रिया सुरु आहे. हि बाब सुध्दा राज्यनितीच्या मार्गदर्शक तत्वामुळे सरकारांना करता येणे शक्य होऊ शकेल.

3) सरकारने मार्गदर्शक तत्वांच्या अंमलबजावणीकडे पाहिजे त्या प्रमाणात लक्ष देण्यात आले नाही. अशी अनेकदा टिका केली जात असते. आजही सामान्य लोकांच्या जिवनात फारसा फरक पडला नाही. त्यांचे जिवन जास्त कठीण व अवघडत बनत आहे. शिक्षण, अन्न व आरोग्यासारखे प्रश्न अजुन पुर्णपणे सुटलेले नाहीत. सरकार हे प्रश्न सोडविण्याचे प्रयत्न करतात. परंतु भ्रष्टाचारामुळे हे प्रश्न पुर्णपणे सुटत नाहित.

संदर्भग्रंथ ○:-

1) "भारताचे संविधान" लेखक :- प्रा. बि.टि. देशमुख
2) 1978 च्या 44व्या घटनादुरुस्ती कायद्याचे कलम 38 (1) नंतर 38 (2)
3) "डेमॉक्रॉटीक गव्हमेंट इन इंडिया" लेखक ○:- अलेन ग्लेडहिल
4) "दि रिपब्लिकन ऑफ इंडिया" लेखक ○: अलेन ग्लेडहिल
5) राज्यघटनेतील कलम 14 व कलम 19

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Structural Coloration in Animals: Insights from Physics and Biology

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Abstract: Structural coloration in animals refers to the phenomenon where colors are produced not by pigments, but by the physical interaction of light with specialized nanostructures in their tissues. This review article provides a comprehensive overview of structural coloration in animals, focusing on the optical properties of biological materials and the underlying physics behind these phenomena. We discuss examples of structural coloration in various taxa, including butterflies, birds, fish, and insects, highlighting the diversity of nanostructures and optical effects observed in nature. Furthermore, we explore the mechanisms of light interaction with nanostructures, such as interference, diffraction, and scattering, and how these principles contribute to the vibrant colors and iridescence seen in structural coloration. Additionally, we examine the ecological and evolutionary implications of structural coloration, including its role in communication, camouflage, mate choice, and predator-prey interactions. By integrating insights from physics and biology, this review provides a deeper understanding of the fascinating interplay between light, nanostructures, and living organisms in the natural world.

Keywords: **structural coloration, animal coloration, nanostructures, optical properties, physics, biology, iridescence, evolutionary ecology.**

I. INTRODUCTION

Coloration in the animal kingdom has long captivated scientists and enthusiasts alike, with its vibrant hues and intricate patterns serving myriad functions from camouflage to mate attraction. While the conventional understanding attributes animal coloration primarily to pigments, a remarkable alternative exists in the form of structural coloration [1]. Unlike pigments, which absorb certain wavelengths of light and reflect others based on their chemical composition, structural coloration arises from the physical interaction of light with specialized nanostructures within an organism's tissues. This review embarks on an illuminating journey into the realm of structural coloration, where we delve deep into the optical marvels that adorn the natural world. Our exploration will encompass the diverse array of taxa where structural coloration is observed, from the delicate wings of butterflies to the iridescent scales of fish and the shimmering feathers of birds. By examining these examples, we aim to showcase the remarkable adaptability and evolutionary significance of structural coloration across different species and ecological niches. At the heart of structural coloration lies the intricate interplay between light and nanostructures. By manipulating the physical properties of these nanostructures, organisms can produce an astonishing array of colors and optical effects, ranging from iridescence to metallic sheens. Through the lens of physics, we will unravel the underlying mechanisms that govern light interaction with nanostructures, including interference, diffraction, and scattering. By

understanding these principles, we can appreciate the exquisite precision with which living organisms harness light to create dazzling displays of color [2].

Furthermore, our exploration extends beyond the aesthetic allure of structural coloration to uncover its ecological and evolutionary implications. From the role of iridescence in mate selection to the use of camouflage for predator evasion, structural coloration plays a multifaceted role in shaping the interactions between organisms and their environment. By examining these ecological dynamics, we gain insights into the selective pressures driving the evolution of structural coloration and its adaptive significance in diverse ecological contexts. In synthesizing insights from the fields of physics and biology, this review seeks to provide a holistic understanding of the fascinating interplay between light, nanostructures, and living organisms in the natural world. By unraveling the mysteries of structural coloration, we hope to inspire further inquiry into this captivating phenomenon and its implications for our understanding of evolution, ecology, and the beauty of the natural world [3].

II. HISTORICAL BACKGROUND

The fascination with coloration in the natural world dates back centuries, with early observations rooted in artistic expression and philosophical inquiry. Ancient civilizations marveled at the vivid hues of flowers, birds, and insects, attributing their colors to divine craftsmanship or symbolic significance. However, it wasn't until the emergence of modern scientific inquiry that the mechanisms underlying animal coloration began to be systematically investigated. One of the earliest scientific inquiries into animal coloration can be traced back to the 17^{th} century, with the pioneering work of scientists such as Robert Hooke and Isaac Newton [4]. Hooke's seminal work "Micrographia" (1665) provided detailed illustrations of natural phenomena observed through microscopes, including the colorful scales of butterflies and the iridescence of peacock feathers. Newton's experiments with prisms laid the groundwork for understanding the behavior of light, leading to the discovery of the visible spectrum and the principles of color mixing. Throughout the 18^{th} and 19^{th} centuries, naturalists and biologists continued to document and classify the diverse array of colors and patterns exhibited by animals [5]. The advent of microscopy enabled closer examination of the structural features responsible for producing colors, revealing intricate nanostructures within the tissues of certain organisms. However, the precise mechanisms governing structural coloration remained elusive until the 20^{th} century, when advances in optics and materials science facilitated deeper insights into light-matter interactions at the nanoscale. One of the pivotal moments in the study of structural coloration came with the discovery of the iridescent scales of butterfly wings in the early 20^{th} century [6]. Scientists such as Sir Cyril Clarke and Hilda Bruce documented the complex nanostructures present in these scales, laying the foundation for understanding how structural coloration is produced. Subsequent research in the fields of optics, materials science, and developmental biology further elucidated the mechanisms by which organisms manipulate light to create an astonishing array of colors and optical effects.

In recent decades, interdisciplinary collaborations between physicists, biologists, and materials scientists have led to significant advances in our understanding of structural coloration. High-resolution imaging techniques and computational modeling have provided unprecedented insights into the nanostructural organization of biological tissues, allowing researchers to unravel the intricate mechanisms underlying color production in nature [7].

Today, the study of structural coloration continues to be a vibrant and interdisciplinary field, with researchers exploring its ecological, evolutionary, and technological implications. From uncovering the adaptive significance of coloration in natural habitats to developing bioinspired materials for photonics and camouflage, structural coloration remains a source of inspiration and wonder, bridging the gap between art and science in our quest to understand the beauty and complexity of the natural world [8].

III. TYPES OF STRUCTURAL COLORATION

Structural coloration in animals encompasses a diverse range of optical phenomena, each characterized by distinct nanostructural features and optical effects. While the underlying principles of light interaction remain consistent, the specific types of structural coloration observed in nature can be categorized based on their nanostructural organization and resulting optical properties [9]. Here, we explore some of the primary types of structural coloration found in animals:

1. Periodic Nanostructures:

Photonic Crystals: These are periodic arrangements of materials with alternating layers of different refractive indices, creating a photonic bandgap that selectively reflects certain wavelengths of light. Examples include the multilayered structures found in the wing scales of butterflies and the photonic crystals present in the iridescent feathers of birds.

Cholesteric Liquid Crystals: Cholesteric liquid crystals exhibit a helical structure that selectively reflects circularly polarized light. This results in iridescent colors that change with the viewing angle. Cholesteric liquid crystals are commonly found in the skin of certain fish, such as the opalescent or iridescent colors seen in some species of angelfish and damselfish.

2. Diffraction Gratings:

Diffraction gratings consist of regularly spaced grooves or ridges that scatter light in specific directions based on the wavelength and angle of incidence. These structures produce iridescent colors and often exhibit strong directional dependence. Examples include the diffraction gratings found in the wing scales of butterflies and the iridescent colors of certain beetle exoskeletons.

3. Thin Film Interference:

Thin film interference occurs when light is reflected and refracted at interfaces between thin layers of materials with different refractive indices. This interference leads to the selective amplification or attenuation of certain wavelengths of light, resulting in iridescent or metallic colors. Thin film interference is commonly observed in the nanostructured layers of cells, such as the guanine crystals in the skin of fish and the keratin layers in bird feathers.

4. Microstructures and Nanostructures:

Microstructural and nanoscale features, such as ridges, grooves, and sculpted surfaces, can also contribute to structural coloration by diffraction, scattering, or interference of light. These features may be present in various biological tissues, including insect wings, fish scales, and bird feathers, and can produce a wide range of colors and optical effects.

These categories represent broad classifications of structural coloration based on the underlying nanostructural organization and optical mechanisms involved. However, it's important to note that many organisms exhibit combinations of these types of structural coloration, resulting in the stunning diversity of colors and optical effects observed in the natural world.

IV. OPTICAL PROPERTIES AND PHYSICS PRINCIPLES OF STRUCTURAL COLORATION

Structural coloration in animals arises from the intricate interplay between light and nanostructures within biological tissues. By manipulating the physical properties of these nanostructures, organisms can produce a dazzling array of colors and optical effects. Understanding the optical properties and underlying physics principles involved is essential for unraveling the mysteries of structural coloration [10]. Here, we delve into some of the key optical properties and physics principles at play:

Interference: Interference is a fundamental principle underlying many forms of structural coloration. It occurs when two or more light waves interact, either constructively reinforcing or destructively canceling each other out. In the context of structural coloration, interference often occurs between light waves reflected from different interfaces within nanostructured materials, such as thin films or multilayered structures. Depending on the relative phase and path length of the reflected waves, interference can lead to the selective amplification or attenuation of certain wavelengths of light, resulting in vibrant colors.

Diffraction: Diffraction is the bending or spreading of light waves as they encounter obstacles or pass-through narrow openings. In the context of structural coloration, diffraction gratings composed of regularly spaced ridges or grooves can scatter incident light in specific directions based on the wavelength and angle of incidence. This scattering leads to the creation of iridescent colors and often results in strong directional dependence, with colors varying depending on the viewing angle.

Scattering: Scattering refers to the redirection of light waves as they encounter particles or irregularities within a medium. In structural coloration, scattering can occur when light interacts with nanoscale features such as microstructures or sculpted surfaces within biological tissues. Depending on the size and geometry of these features, scattering can selectively enhance or attenuate certain wavelengths of light, leading to the production of colors and optical effects.

Thin Film Interference: Thin film interference occurs when light waves reflect and interfere with each other at interfaces between thin layers of materials with different refractive indices. This interference leads to the selective amplification or attenuation of certain wavelengths of light, resulting in iridescent or metallic colors. Thin film interference is commonly observed in biological tissues containing layers of materials such as guanine crystals or keratin, where the thickness and refractive index of the layers determine the colors produced.

Polarization: Polarization refers to the orientation of light waves as they oscillate in a particular plane. In structural coloration, certain nanostructures can selectively polarize light, leading to the production of polarized colors. This polarization effect can be exploited by organisms for visual signaling or communication purposes, as polarized light may be perceived differently by potential mates or predators.

By harnessing these optical properties and physics principles, organisms can create a stunning array of colors and optical effects through structural coloration. From the iridescent wings of butterflies to the metallic sheen of beetle exoskeletons, the natural world abounds with examples of the captivating interplay between light and nanostructures in living organisms.

V. COMPARATIVE STUDIES AND PHYLOGENETIC ANALYSES OF STRUCTURAL COLORATION

Understanding the evolution and diversity of structural coloration in animals requires comparative studies and phylogenetic analyses across different taxa. By examining patterns of coloration and the underlying nanostructural features across evolutionary lineages, researchers can elucidate the origins, evolutionary trajectories, and adaptive significance of structural coloration [11]. Here, we delve into the importance of comparative studies and phylogenetic analyses in unraveling the mysteries of structural coloration:

Evolutionary Origins: Comparative studies of structural coloration can shed light on its evolutionary origins and ancestral traits. By examining the distribution of structural coloration across different clades and reconstructing ancestral states, researchers can infer when and how this phenomenon first emerged in the animal kingdom. Phylogenetic analyses can help identify common ancestors and trace the evolutionary transitions from non-structural to structural coloration, providing insights into the selective pressures and ecological contexts driving its evolution.

Convergent Evolution: Structural coloration has evolved independently in multiple lineages, often resulting in similar optical effects despite differences in nanostructural organization. Comparative studies of convergent evolution can reveal whether similar structural coloration traits arise through shared genetic pathways or through convergent evolution driven by similar environmental pressures. Phylogenetic analyses can help reconstruct the evolutionary relationships between species exhibiting convergent structural coloration, providing insights into the genetic basis and adaptive significance of these traits.

Functional Diversity: Structural coloration serves diverse functions across different taxa, including communication, camouflage, mate attraction, and predator deterrence. Comparative studies can elucidate how the functional roles of structural coloration vary across evolutionary lineages and ecological contexts. By examining the correlation between coloration patterns, nanostructural features, and ecological variables, researchers can uncover the selective pressures driving the evolution of specific coloration strategies within different habitats and lifestyles.

Coevolutionary Dynamics: Structural coloration often coevolves with other traits, such as visual perception mechanisms in predators or mate choice preferences in conspecifics. Comparative studies and phylogenetic analyses can reveal patterns of coevolution between structural coloration and associated traits, providing insights into the ecological interactions and evolutionary dynamics shaping coloration evolution. For example, comparative studies of mimicry complexes can elucidate how structural coloration evolves in response to predation pressure and mimicry strategies within a community.

Technological Applications: Comparative studies of structural coloration not only deepen our understanding of natural phenomena but also inspire technological innovations. By mimicking the nanostructural features and optical principles observed in biological systems, researchers can develop bioinspired materials for applications such as photonic devices, color displays, and optical coatings. Comparative analyses of nanostructures across different taxa can provide insights into design principles and optimization strategies for engineering biomimetic materials with desired optical properties.

VI. TECHNOLOGICAL APPLICATIONS AND BIOMIMICRY OF STRUCTURAL COLORATION

The remarkable optical properties and nanostructural features underlying structural coloration in animals have inspired a wide range of technological applications and biomimetic innovations. By mimicking the design principles observed in nature, researchers have developed novel materials and devices with enhanced optical properties and functionalities [12]. Here, we explore some of the key technological applications and biomimetic advancements inspired by structural coloration:

Photonic Devices: Structural coloration in animals often relies on photonic crystals and diffraction gratings to produce vibrant colors and iridescent effects. By replicating these nanostructural features in synthetic materials, researchers have developed photonic devices with tunable optical properties. These devices have applications in color displays, optical filters, sensors, and photonic circuits. For example, biomimetic photonic crystals have been used to create color-changing fabrics and coatings for textiles and consumer electronics.

Optical Coatings and Films: Thin film interference plays a key role in many forms of structural coloration, resulting in iridescent and metallic effects. Biomimetic coatings and films inspired by the nanostructures found in butterfly wings and beetle exoskeletons have been developed for applications in paints, cosmetics, and architectural surfaces. These coatings offer enhanced coloration, reflectivity, and durability compared to traditional pigmented materials, making them attractive for a variety of industrial and consumer applications.

Camouflage and Stealth Technologies: The adaptive coloration strategies observed in animals, such as camouflage and disruptive coloration, have inspired biomimetic approaches to concealment and stealth technologies. By mimicking the color-changing capabilities of cephalopods or the disruptive patterns of certain insects, researchers have developed adaptive camouflage materials and coatings for military and civilian applications. These materials can adapt their appearance to match their surroundings or disrupt visual detection by predators or surveillance systems.

Optical Fibers and Waveguides: The nanostructural organization of photonic crystals and diffraction gratings in biological tissues has inspired the development of biomimetic optical fibers and waveguides with enhanced light-guiding properties. By replicating the hierarchical structures found in butterfly wings or bird feathers, researchers have created waveguides capable of controlling the propagation and dispersion of light in telecommunications, sensing, and biomedical imaging applications. These biomimetic waveguides offer improved performance and efficiency compared to conventional optical materials.

Environmental Sensing and Monitoring: The optical properties of structural coloration in animals can be exploited for environmental sensing and monitoring applications. Biomimetic sensors and detectors inspired by the nanostructures found in butterfly wings or fish scales have been developed for detecting changes in humidity, temperature, pressure, and chemical composition. These sensors offer high sensitivity, rapid response times, and low power consumption, making them suitable for environmental monitoring, agriculture, and biomedical diagnostics.

VII. CHALLENGES AND FUTURE DIRECTIONS IN STRUCTURAL COLORATION RESEARCH

Despite the remarkable progress made in understanding the optical properties and evolutionary significance of structural coloration in animals, several challenges and opportunities lie ahead for researchers in this field. As we look to the future, addressing these challenges and exploring new avenues of inquiry will further deepen our understanding of structural coloration and unlock its full potential [13]. Here are some key challenges and future directions in structural coloration research:

Understanding Nanostructural Complexity: One of the primary challenges in structural coloration research is unraveling the nanostructural complexity of biological tissues. Many organisms exhibit intricate nanostructures composed of multiple layers, shapes, and materials, making it challenging to characterize and replicate these structures accurately. Future research efforts will focus on developing advanced imaging techniques and computational modeling approaches to elucidate the three-dimensional organization of nanostructures and their optical properties.

Biomolecular Control and Assembly: Achieving precise control over the biomolecular processes responsible for creating nanostructures in living organisms remains a significant challenge in biomimetic materials synthesis. Future research directions will explore bioengineering approaches to manipulate the expression, assembly, and self-organization of biomolecules involved in structural coloration. By harnessing genetic and biochemical tools, researchers can engineer synthetic materials with tailored nanostructures and optical properties [14].

Dynamic and Adaptive Materials: Many organisms exhibit dynamic and adaptive coloration capabilities, allowing them to change their appearance in response to environmental stimuli or behavioral cues. Mimicking these dynamic color-changing mechanisms in synthetic materials presents exciting opportunities for biomimetic applications. Future research efforts will focus on developing stimuli-responsive materials and devices capable of real-time color modulation and adaptive camouflage. These materials could find applications in wearable technology, smart textiles, and responsive coatings.

Ecological and Evolutionary Dynamics: Integrating ecological and evolutionary perspectives into structural coloration research is essential for understanding its adaptive significance and ecological roles in natural habitats. Future studies will explore the ecological interactions between organisms and their environment, including predator-prey dynamics, mate choice, and mimicry complexes. By combining field observations, experimental manipulations, and

phylogenetic analyses, researchers can unravel the ecological and evolutionary drivers shaping coloration evolution [15].

Technological Applications and Commercialization: Translating insights from structural coloration research into practical applications and commercial products represents a significant opportunity and challenge. Future research efforts will focus on scaling up biomimetic materials synthesis, optimizing manufacturing processes, and overcoming technological barriers to commercialization. Collaborations between academia, industry, and government agencies will be essential for advancing biomimetic technologies and bringing them to market.

VIII. CONCLUSION

The Structural coloration in animals represents a fascinating intersection of physics, biology, and materials science, offering a window into the intricate interplay between light and nanostructures in the natural world. Through interdisciplinary research efforts, we have gained valuable insights into the optical properties, evolutionary dynamics, and technological potential of structural coloration. As we continue to unravel its mysteries and overcome key challenges, the future holds promise for unlocking new applications, understanding ecological interactions, and further appreciating the beauty and complexity of nature's palette.

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Dynamics of the Indian Stock Market: A Comprehensive Review

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Abstract- **This review paper delves into the multifaceted dynamics of the Indian stock market, examining its historical evolution, regulatory framework, market structure, key indices, recent trends, challenges, and emerging opportunities. Through a detailed analysis, we aim to provide investors, analysts, and policymakers with a nuanced understanding of the Indian equity market, shedding light on its strengths, weaknesses, and potential trajectories.**

Keywords- **Nifty, Sensex, BSE, NSE, SEBI**

1. Introduction

1.1 Historical Perspective: The Indian stock market has a storied history, with roots tracing back to the establishment of the Bombay Stock Exchange (BSE) in 1875. Over the decades, the market has undergone transformative changes, culminating in the establishment of the National Stock Exchange (NSE) in 1992, a milestone that ushered in an era of electronic trading and increased market efficiency [1].

1.2 Regulatory Framework: The Securities and Exchange Board of India (SEBI) plays a pivotal role in regulating the Indian stock market [2]. This section explores the evolution of regulatory frameworks, emphasizing the role of SEBI in fostering transparency, investor protection, and the overall integrity of the market [3]. Recent regulatory developments, including the Insolvency and Bankruptcy Code (IBC), are discussed in the context of their impact on market dynamics.

2. Market Structure:

2.1 Exchanges and Trading Platforms: A comprehensive overview of the market structure highlights the dual-exchange system dominated by the BSE and NSE [4]. The paper explores the competitive landscape, trading volumes, and technological advancements that have shaped the efficiency and accessibility of the exchanges.

2.2 Investor Participation: Examining the diverse investor base, from retail investors to institutional players, provides insights into market sentiment and behavior. The impact of foreign institutional investors (FIIs) and domestic institutional investors (DIIs) on market movements is also analysed [5].

3. Key Market Indices:

3.1 BSE Sensex and NSE Nifty: In-depth analysis of these benchmark indices, their composition, and methodologies reveals their significance as barometers of market performance [6]. The paper investigates historical trends, volatility, and correlations with economic indicators, offering a comprehensive view of market movements.

4. Market Trends and Challenges:

4.1 Trends Shaping the Market: Identifying and dissecting recent trends in sectors such as technology, healthcare, and renewable energy provides a forward-looking perspective. The review explores factors driving these trends, including government policies, global economic dynamics, and societal shifts.

4.2 Challenges Facing the Market: Examining challenges such as market volatility, liquidity concerns, and corporate governance issues underscores the need for ongoing reforms. The paper discusses the impact of macroeconomic factors, global uncertainties, and regulatory compliance on market stability [7].

5. Emerging Sectors and Investment Opportunities:

5.1 Technology and Innovation: A detailed exploration of the technology sector and the role of innovation in driving market growth. Case studies and success stories within this sector highlight potential investment opportunities and risks.

5.2 Pharmaceutical and Healthcare: Analyzing the resilience and growth potential of the pharmaceutical and healthcare sectors, considering both domestic and international demand. Regulatory frameworks and research and development activities are key factors influencing investment decisions [8].

5.3 Renewable Energy and Sustainability: Evaluating the burgeoning opportunities in the renewable energy sector, considering India's commitment to sustainable development. Government initiatives, corporate strategies, and market dynamics within the clean energy space are discussed.

6. Impact of Technological Advancements:

6.1 Digital Transformation: Assessing the transformative impact of digital technologies on the stock market, including the rise of online trading platforms, algorithmic trading, and the integration of financial technology (FinTech) solutions [9].

6.2 Cybersecurity and Risks: Addressing the cybersecurity challenges inherent in the digitized stock market infrastructure. A focus on risk mitigation strategies and the role of regulatory bodies in safeguarding investor interests [10].

Table 1: Key performance indicators over a four-year period

Key Performance Indicators				
	2019	**2020**	**2021**	**2022**
Market Capitalization	$2.5 trillion	$1.8 trillion	$2.2 trillion	$2.6 trillion
Trading Volume (avg daily)	5 million shares	4.2 million shares	5.8 million shares	6.5 million shares
BSE Sensex (Year-end)	40,000 points	45,500 points	50,200 points	52,500 points
NSE Nifty (Year-end)	11,800 points	13,200 points	14,500 points	14,500 points

7. Conclusion:

7.1 Synthesis of Findings: Summarizing key findings, insights, and implications from the review, offering a synthesized perspective on the current state and potential future trajectories of the Indian stock market.

7.2 Recommendations: Providing informed recommendations for investors, policymakers, and market participants based on the analysis conducted. Emphasizing the importance of continued regulatory vigilance, technological adaptability, and strategic investment approaches in navigating the evolving landscape.

In conclusion, this detailed review provides a comprehensive understanding of the Indian stock market, equipping stakeholders with valuable insights to navigate the complexities and capitalize on emerging opportunities.

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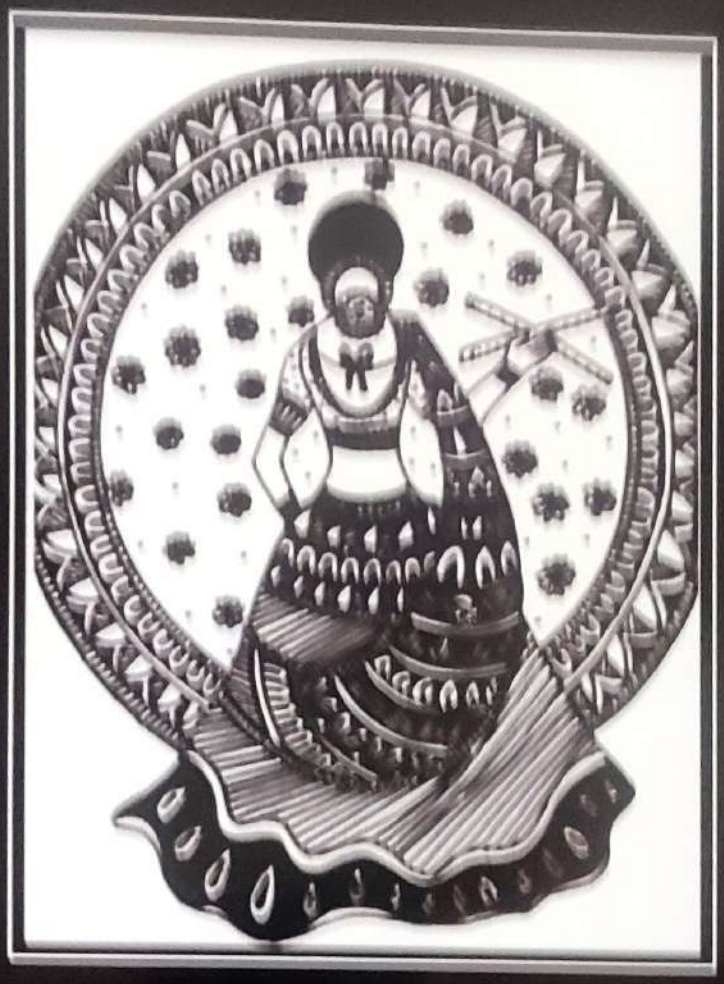

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बारोमास - एक ग्रामीण वास्तव

प्रा.रेखा व्ही. इंगोले मराठी विभाग प्रमुख मा.सु.पा.कला,विज्ञान व कै.पां.ठा.वाणिज्य महाविद्यालय,मानोरा जि.वाशिम मोबा.9404547271 ई-मेल : rekhaingole09@gmail.com

प्रस्तावना :-

भारतीय साहित्याच्या संदर्भात एकोनविसावे शतक महत्वाचे ठरते. याच शतकाने आधुनिक भारताला जन्म दिला. याच काळात विविध स्थित्यंतरा बरोबरच घडणाऱ्या सर्वांगिण परिवर्तनातूनच समाज जीवनात बदल घडून आले. या बदलातून ग्रामीण कांदबरी जन्माला आली. आणि ती बहरली सुध्दा विविध विषयांना आपल्या कवेत घेण्याची क्षमता या ग्रामीण कांदबरीत दिसू लागली. त्यामुळे या कादंबरीची व्याप्ती वाढली. म्हणून ग्रामीण साहित्याचा वेगळा प्रवाह निर्माण झाला. या प्रवाहातूनच अनेक श्रेष्ठ दर्जाच्या कादंबऱ्या निर्माण झाल्या आणि त्यातीलच अलिकडच्या काळातील कादंबरी म्हणजे 'बारोमास' ही कादंबरी आधुनिक काळातील मध्यमवर्गीय शेतकरी कुटूंबाच्या संसाराचे चित्र रेखाटणारी असून ग्रामीण तरूणांना जीवन जगत असतांना कसे संघर्ष करावे लागतात हे या कादंबरीचे मुख्य कथानक आहे. या कादंबरीत मुख्य कथानकास सहकार्य करणारी अनेक समाज चित्रणे आली आहेत. स्वातंत्र्योत्तर काळानंतर कोणत्याही मराठी साहित्यीकाने इतके परखड लेखन केलेले नव्हते. ते त्यांनी केलेले आहे. म्हणूनच 'बारोमास' ही कादंबरी थोडी विस्तृत आणि बहुआयामी झाली आहे. ह्या कादंबरीला 2004 च्या साहित्य अकादमी पुरस्कार मिळाला आहे.

कादंबरीच्या निर्मिती विषयी लेखक लिहीतो शेतकऱ्याच्या जीवनाला बारोमास वेदुन असणाऱ्या जन्मजात वेदनेच्या हुंकारातून ही कादंबरी आकाराला आली आहे. माझा सभोवतालचा ओला सुका ग्रामीण परीसर हेच तीचे प्ररेणास्थान आहे. लेखकाने आपल्या निष्ठा आणि अनुभव यांच्याशी प्रामाणिक राहून लेखन करावे, असे वाङ्मयीन संस्कार माझ्यावर झाले आहेत. त्या संस्काराचे फलीत म्हणजे 'बारोमास' ही कादंबरी आहे असे मी समजतो, अशी ही अतिशय संस्कारीत कलाकृती आहे. म्हणून ती वाचकांना जवळची वाटते. 'बारोमास' ही कादंबरी जगण्याचा नवा मूल्यविचार मांडतांना दिसते. ग्रामीण भागात जीवन जगणाऱ्या अनेक तरूणांना जगण्यासाठी संघर्ष करावा लागत आहे. देशाता स्वातंत्र्य मिळाल्यानंतर खूप काही बदल होतील अशी अपेक्षा होती ती ग्रामीण तरूणांच्या बाबतीत मृगजळ ठरली. ग्रामीण भागातील तरूण शिक्षण घेऊन पुढे आला. पण केवळ शिक्षण घेऊन त्याला चालणार नाही. तर त्याला व त्यांच्या कुटूंबाला जगण्यासाठी काहीतरी धडपड केली पाहिजे. ही जाणीव तरूणांच्या मनात निर्माण होवू लागली.

'बारोमास' ही एक महान शोकांतिका आहे. उत्कट होत जाणारा नाटकाचा शोकानुभव ही कादंबरी देते. मात्र पात्राच्या शोकात्मक जीवनाची ही कहाणी एखादया व्यक्तीच्या दोषातून निर्माण झालेली नाही. ती संपूर्ण समाज व्यवस्थेच्या आंतर्विरोधाची, राजकीय शक्तीच्या उपेक्षेतून भ्रष्टाचारी आत्मकेंद्रीततेतून सांस्कृतिक ऱ्हासाच्या प्रक्रियेतून उद्भवलेली करूण कथा आहे. म्हणून ती अधिक मूल्यवानही आहे असे डॉ.चंद्रकांत वांदीवडेकर म्हणतात. अशी ही कादंबरी सामाजिक परीस्थितीवर भाष्य करणारी आहे. एकंदरीतच सामाजिक जीवनाचा मानवी जीवनावर होणारा परिणाम चित्रित करणारी कादंबरी आहे.

बारोमास मधील मुख्य कथानक :-

बारोमास मधील मुख्य कथानक हे अलका व एकनाथ यांच्या अपयशी संसाराचे चित्र स्पष्ट करणारे आहे. एकनाथ शिक्षण पूर्ण करतो. तेव्हा त्याच्या आईला वाटत असते. की आपल्या मुलाने आपल्या भावाच्या मुलीशी विवाह करावा. पण एकनाथ ऐकत नाही. तो शहरी भागात राहिल्याने आणि तेथील

परिसर आवडल्याने तो तेथीलच एका इंजिनिअरच्या मुलीशी विवाह करतो. एकनाथ हा एम.बी.ए. झालेला असतो. म्हणून त्याला मुलगी तितकीशी असते. इंजिनिअरची मुलगी अलकाही शिकलेली असते पण तिला बि.एड करता आलेले नसते. म्हणून ती एकनाथशी विवाह करण्यास तयार होते. तिला वाटत असते आपला पती एम.बी.एड आहे. नोकरी कोठेतरी मिळेलच. इथून कांदबरीच्या मुख्य कथानकाला सुरुवात होते.

विवाह झाल्यानंतर अलका एकनाथ बरोबर संजोळात येते. संजोळात अलकाच्या सासरी अत्यावश्यक अशा बऱ्याच वस्तू नसतात. फक्त आपला पती एम.ए.बी.एड एवढेच तिचे समाधान. तिला वाटत असते की, आपणाला इथे जास्त दिवस रहात लागणार नाही. आपला पती एवढा शिकलेला आहे त्याला कोठेतरी नोकरी मिळेलच. या आशेवर ती एकनाथचा संसार करत असते. एकनाथच्या संसारात अनेक गोष्टींची कमतरता असते. घरात अनेक सुख-सुविधा नसतात. तरीही अलका चुलीवर काळ्या पांढऱ्या धुराच्या वेटोळ्यात स्वयंपाक करत असते.

मोहाडी आणि सांजोळ या दोन गावात फारच फरक असतो. अलका मोहाडीला वाढल्याने तिच्यावर तिथले संस्कार झालेले असतात, त्यामुळे अलका त्या पध्दतीने राहणीमान ठेवत असते. सामीण भागात राहणे, बोलणे, फिरणे या सर्व गोष्टी त्याला नवीन नसतात. अलकाला मात्र दिवसेंदिवस या सर्व गोष्टींना जमवून घेणे कठीण वाटू लागते. तशातच अलकाला एकनाथची आई शेवंतामाय त्रास देऊ लागते. कोणत्याही घरकामात सहकार्य करत नाही. कारण तिच्या मनाविरुध्द एकनाथने अलकाशी विवाह केलेला असतो. म्हणूनच त्याचा राग ती अलकावर काढत असते.

एकनाथचा लहान भाऊ मधु हा देखील बेकारच असतो. त्यालाही कोठेच नोकरी नसते. म्हणून तोही घरातच असतो. एकदा मधुला भुलगी देण्यासाठी पाहुणे येतात. तेव्हा अलका त्या पाहुण्यांना सांगते, "खूप दरिद्री आणि भिकारचोट घर आहे हे. शेतकऱ्यांचं घर आहे. कधीही हाय हायच राहते इथं. पाहुणे आले की पावभर साखर अन् चहाची पुडी आणायला दुकानावर पळावं लागते. मजुरापेक्षा वाईट परिस्थिती. आज पाहुणचार करायचा म्हटलं तर पावभर तेल, किलोभर रवा अन् किलोभर साखर वैलेवर विकत आणली होती. जेवण झाल्यावर द्यायला घरात सोप सुपारी नाही, म्हणून आता दुकानावर गेला माझा दीर..." असे ती पाहुण्यांना सांगत असताना मधु जिन्याजवळच्या दाराजवळ उभा राहून ते ऐकतो. तेव्हापासून तो अलकाशी बोलणे बंद करतो.

अलकावर पूर्वी बहिणीसारखी प्रेम करणारा मधु नंतर बदलतो अलका त्याच्या मनातून उतरते. तिच्याबद्दल मधुला तिरस्कार वाटू लागतो. तेव्हापासून अलका व मधु यांचे जमत नाही. अगोदरच नोकरी नाही म्हणून चिडलेल्या मधुला अलकाचे हे शब्द खूपच जिव्हारी लागतात. काळजात आग लागल्यासारखे होते. म्हणून पुढील काळात मधु अलकाच्या विरोधात जातो.

घरातील वातावरण हळूहळू अलकाच्या विरोधात जावू लागते आणि अलका अस्वस्थ होताना दिसू लागते. तशातच यावर्षी शेतात कोणकोणती पिके घ्यायची याविषयी चर्चा चालू होते. पण चर्चा होऊन शेवटी थांबते ती पैशाजवळ. तेव्हा शेवंतामाय सांगते की, सुनबाईच्या बांगड्या विकून पैसे आणा. असे ऐकता क्षणीच अलकाला चुलीतला जाळ आपल्या अंगावर आल्यासारखा वाटतो. ती धगधग नजरेने सासूकडे पाहते तेव्हा एकनाथला भीती वाटते आणि तो आईला म्हणतो, एकदा बांगड्याची मोडतोड झाल्यावर त्या घेता येत नाहीत. वर्षाच्या अगोदरच अलकाची सोन्याची पोत विकली ती अजून घेतली नाही. तरी अशा विविध कारणाने घरातील वातावरण वळणे घेऊ लागते. अलका चिडू लागते. एकनाथला नोकरी म्हणून ती ओरडू लागते. शेत विकून पैसे दिले असते तर एकनाथला नोकरी मिळाली असती असे अलका सांगते. तेव्हा शेवंतामाय त्याला विरोध करते आणि शेती कशी महत्वाची आहे ते सांगते. तेव्हा त्या दोघीत एक वेगळाच संघर्ष निर्माण होतो. शिकलेली आणि बिनशिकलेली आहेत असे एकनाथला वाटते.

अलका न जेवताच माडीवर जाऊन झोपते. थोड्या वेळाने एकनाथ तिच्याजवळ जातो व जेवण केलीस का? असे विचारत तिच्या अंगावर हात टाकतो. तेव्हा ती ताबडतोब त्याला झिडकारते व उठून बसते. तिला लग्नास भेट मिळालेले कपाट उघडून त्यातील साड्या काढते व पलंगाखालची सुटकेस काढून पलंगावर ठेवत आणि त्या साड्या त्यात भरते आणि माहेरी जाण्यासाठी तयारी करू लागते. अलका एकनाथला म्हणते, " इथ राहिले तर बांगड्यासाठी जीव घेतील तुमच्या घरातले हैवान..." अलकाला असे वाटते म्हणून ती माहेरी जाण्यासाठी एकनाथला पैसे मागते. पण एकनाथकडे पैसे नसतात. तेव्हा अलका ममता वरेकडूनच पन्नास रूपये उसने घेते आणि आपली सुटकेस घेऊन निघते. एकनाथ तिच्या मागेच असतो. अलका रस्त्याला लागते तेव्हा ती मागे फिरूनसुध्दा पाहत नाही. अलकाचे माहेरी जाणे हे काही पहिल्यांदाच नव्हते. पण हे असेच किती दिवस चालणार असे एकनाथला वाटते. तेवढ्यात समारेच्या भावकीतला शंकर तात्या येतो व चिरतो काय भांडण झाले की काय? तर एकनाथ सांगतो तिची परीक्षा आहे. अलकाला सोडून एकनाथ घरी येतो. तर शेवंतामाय व मधु यांचे संभाषण चालू असते. ते पण त्याला ऐकवत नाही. तेव्हा तो सरळ खाली येतो. आणि कल्याणीच्या मळ्याकडे चालू लागतो. अशा मनाच्या फाटक्या अवस्थेत मळा एकच आधार असतो.

अलका माहेरीच असते म्हणून एकनाथ तिला बोलवायला मोहाडीला जातो. तेव्हा अलका त्याच्यासोबत सांजोळात येते आणि पुन्हा एकनाथच्या संसाराला सुरूवात करते. सडा-सारवण, चहा-पाणी, भाकरी-भाजी, धुणं, भांडी घासणं ही सर्व कामे करू लागते. आधीच ती नाजूक असते आणि अशा या कामाने ती पूर्ण सुकून जाते. रात्री झोपते ती दिवसभराच्या कामानं थकून आणि सकाळी उठते ते दिवसभराच्या कामाच्या धास्तीने. अशा पध्दतीने अलका घरात काम करत असते, ते शेवंतामाय कोणत्याच प्रकारे घरकामात अलकाला मदत करत नाही.

घरातील अशा वातावरणामुळे एकनाथला त्रास होऊ लागतो. त्यात तो शिकलेला असूनही त्याला नोकरी मिळत नाही. म्हणून आपण विनाकारण शिकलो असे त्याला वाटायला लागते. आपण शहरातल्या मुलीशी लग्न केले. आपण कसे तरी सावरू पण तिला कसे सावरायचे हा प्रश्न एकनाथसमोर पडतो. एकनाथला नोकरी लागत नाही. तेव्हा तो शेतीतील कामे करत असतो. तेव्हा ते अलकाला आवडत नाही. याविषयी लेखक लिहितो, "कधी कधी आपण तुत्या अन् जुपणे खांद्यावर टाकून शेतात निघायचो. डवरे-वखरं हाणायला, तर अलका घट्ट आपल्याला धरून ठेवायची. डोळ्यांतून आसवं गाळत म्हणायची हे करू नका हो. अनपडाची कामं ही, तुम्ही सुशिक्षीत! आणि रडायची. आसवं गाळत म्हणायची, काही करा. किराणा दुकान टाका. वह्या, पुस्तकाचं दुकान टाका. पानपट्टी चालवा... पण हे भयानक काम नको. आणि रडायची."

अशा वेळेस एकनाथला वाटते. आपण मुक्ताशी विवाह केला असता तर बरे झाले असते. अलकाला तिच्या मनासारखा पती तरी मिळाला असता पण आता त्याला काहीच करता येत नाही. अशाही स्थितीत एकनाथ अलकाला बोलवायला मोहाडीला जातो. कारण अलका सारखी मोहाडीला जात असते. एकनाथ मोहाडीत गेल्यानंतर झाडाकडे पाहून सुखावतो पण त्याचवेळी अलका नेहमी माहेरीच जाते म्हणून दुखावतोही.

मोहाडीत अलकाच्या वडिलांच्या घरी संध्याकाळी सर्वांचे जेवण झाल्यानंतर एकनाथ सांगतो की अलकाला पाठवून द्या. त्यावर अनेकजण होय नाही म्हणत असतात. शेवटी अलकाचे वडील सांगतात, पंधरा दिवसासाठी घेऊन जा. पुढच्या महिन्यापासून ती कॉम्प्युटरचा कोर्स करणार आहे. मग पाठवून द्या. तेव्हा एकनाथ व अलका सांजोळला जातात. काही दिवस ठीक जातात, पण मधु व अलका यांचे काही पटत

नाही. किरकोळ कारणावरून त्यांच्यात भांडणे होत असतात.

मधुला एकदा साबण हवा असतो. तेव्हा अलका साबण देत नाही. यावरून त्यांच्यात वाद वाढत जातो. केवळ साबण हे मधु व अलका या दीर भावजयच्या भांडणाचे कारण नाही. याची मुळे मधुला पाहुणे पाहण्यासाठी येतात तेव्हा या घराण्याची अलका वस्तूस्थिती पाहुण्यांना सांगते खऱ्या अर्थाने इथेच दीर भावजयांच्या वादाची ठिणगी पडते आणि शेवटी मधु अलकाला मारतो. अलका खाली पडते आणि मोठमोठ्याने रडायला लागते. याविषयी लेखक लिहितात, "अगं आई ग.. मारेल..मला मारल..इकडा आयुष्यात मी कोणाचा मार नाही घेतला. या राक्षसाने मला मारलं... कसं करू मी... बाबाला आणा..आईला आणा... अग आई गं...." असा आक्रोश करत अलका जमिनीवर लोळू लागते. तेव्हाच बरीच धावपळ होते.

मधु शीळ वाजवत एकनाथच्या समोर येतो. एकनाथ त्याला विचारतो, तू माझ्या पत्नीला का मारलास? तेव्हा मधु उध्दट उत्तर देतो. त्यामुळे त्या दोघात बरीच झटापट होते. घरातील बऱ्याच वस्तू इकडे तिकडे फेकल्या जातात, काही वस्तू फुटतात आणि एकच गोंधळ होतो. तेव्हा अलका या घरात एक क्षणही थांबायला तयार नसते. ती ममता वारेला पन्नास रूपये उसने मागते आणि या घरातील सर्वच माणसे पशु आहेत. मी माहेरी जाते असे ती सांगते. तेव्हा ममता वारे अलकाला शांत करण्याचा प्रयत्न करते पण ती काही ऐकत नाही. तेव्हा शेवंतामायही तिला समजून सांगण्याचा प्रयत्न करते. पण अलका माहेरी निघून जाते. ती कायमचीच परत न येण्यासाठी. अलका आणि एकनाथ यांच्यातील एक संसारिक नाते इथे संपते आणि पुढे कादंबरीत अनेक समाजचित्रणे येताना दिसतात. अलका माहेरी गेल्यानंतर एकनाथ शेतकरी संघटनेत सामील होतो. शेतकऱ्यांसाठी कार्य करू लागतो. पण पुढे एकनाथला याच शेतकरी संघटनेच्या मोर्चाच्यावेळी अटक होते. आणि आपल्या दोन्हीही मुलांना नोकरी लागत नाही. संसारात सुख नाही म्हणून सुभानराव जांभुळखोऱ्यात जातात आणि कादंबरी पूर्ण होते. बारा महिने ग्रामीण भागातील शेतकऱ्यांच्या कुटूंबातील तरूणांना जो संघर्ष करावा लागतो. तो संघर्ष इथे चित्रीत होत असतानाच, 'अलका व एकनाथ यांच्या अपयशी संसाराची करूण कहाणी' तर ठरतेच परंतु 'बारोमास' ही कादंबरी केवळ एका व्यक्तीची शोकांतिका नसून ती ग्रामीण कुटूंबातील शोकांतिका आहे असे कादंबरीच्या अभ्यासावरून स्पष्ट होते आणि ही कादंबरी कृषी जीवनाशी निगडीत असणाऱ्या प्रत्येक शेतकरी जीवनाचे, ग्रामीण सुशिक्षीत बेकारांचे प्रतिनिधीक रूप ठरते.

बारोमास कादंबरीत कृषी जीवनातील समस्यांचे वर्णन केले आहे. शेती करीत असतांना निर्माण होणाऱ्या समस्या कमी अधिक सारख्या दिसून येतात. सुभानराव सारख्या कुटूंबाची होणारी दुर्दैशा ही जणू भारतीय शेतकऱ्यांच्या दु:खाचे प्रतिनिधीत्व करते. शेतीच्या समस्या या कधीच संपत नाहीत. कारण शेतीचा वाढणारा उत्पादन खर्च नापिकी वाढती महागाई, विजेचा प्रश्न, शेततविषयक सरकारचे आयात निर्यात धोरण, निसर्गाचा लहरीपणा, दुष्काळ, दारिद्रय, सावकारी कर्ज, भ्रष्ट शासन या सारख्या समस्यांनी आजचा शेतकरी देशोधडीला लागला आहे.

शेतावर देखील जागतिकीकरणाचा प्रभाव प्रत्यक्ष अप्रत्यक्षपणे पडत राहिला आहे. या कादंबरीत सुरवातीलाच होणारे विविध बदल नानु आजा बोलून दाखवतात. गावरान संकरीत बी-बियाणे, रासायनिक खते आणि त्याचा शेतीवरील परिणाम दाखविला आहे. नरूभाऊ व्यक्तीरेखेतून पारंपारिक आणि आधुनिक शेतीचे फायदे, सरकारची शेतिविषयक ध्येयधोरणे आयात-निर्यात धोरण, गॅट करार व त्याचे फायदे तोटे हमी भावाचे धोरण, बँकांचे कर्ज, सावकारी कर्ज अशा किती तरी विषयातून शेतीवरील जागतिकीकरणाचा प्रभाव दाखविण्यात आला आहे. जागतिकीकरणाचा प्रभाव निर्माण होवून औद्योगिकरण अधिकच वाढते. ग्रामीण कृषी जीवनात बदल झाला शेती मालाच्या भावाची तिव्रता वाढली. खताच्या वाढत्या किंमती निकृष्ट बियाण्यांच्या मधून होणारी फसवेगीरी, खेड्यातील भारनियमन यातील काही प्रश्न निश्चितच

जागतिकीकरणाशी संबंधीत आहेत. शेतकऱ्यांच्या वाट्याला बाजार भावामध्ये सुध्दा निराशा येत आहे. शासनाचे धोरण हया बाबत खुपच उदासीन आहे. त्यामुळे शेतकरी दिवसेंदिवस अडचणीत सापडत आहे. अनेक शेतकरी निसर्गाच्या आपत्तीला बळी पडत आहेत. अशा या निसर्गाच्या आणि मानवनिर्मीत्या शेतकरी हतबल झालेला दिसतो. या कादंबरीत शेतकरी संघटनेचे प्रभावीपणे चित्रण आलेले आहे. संघटनेचे नेते तेजराव खपके हे सुरवातीला शेतकऱ्यांसाठी अनेक प्रकारचे कार्य करताना दिसतात. मोर्चे भरविले जातात, मार्गदर्शन केले जाते. पण याचे काहीही फायदा शेतकऱ्यांना होत नाही. याचा बळी शिक्षक सुध्दा पडतो. राजकीय लोक सर्वसामान्य लोकांना कसे फसवितात याचे उत्तम या कादंबरीत चित्रण आलेले आहे. या कादंबरीतील आमदार मालपाणी व त्याचा पि.ए.उत्तम ठोकने हे दोघेही जरी राजकारणाचे प्रतिनिधीत्व करतात. हे पुढारी प्रशासकिय अधिकाऱ्यांच्या संगनमताने घोटाळे करतात व याचा त्रास मुले बळी पडतात.

समारोप :

बारोमास मध्ये सदानंद देशमुख यांनी शेतकऱ्यांच्या न संपणाऱ्या दुःखाचे दर्शन केले आहे. निसर्गावर अवलंबून असलेली शेती शेतकऱ्यांना कशी हैराण करुन सोडते. शेतकऱ्यांच्या जीवनातील छोट्या घटनांचे वास्तव प्रगट होते.

1) शेती व्यवसायाची होणारी अधोगती दिसून येते.
2) तरुण पिढीची शेती व्यवसाय संबंधीची उदासिनता दिसून येते.
3) अस्मानी आणि सुलतानी संकटात सापडलेला शेतकरी दिसतो.
4) वाचकाला अंतर्मुख करण्यास भाग पाडणारी वास्तव आहे.

संदर्भग्रंथ सुची :-

1) संदानंद देशमुख - बारोमास, प्रकाशन अनिरुध्द अनंत कुळकर्णी कॉन्टिनेंटल प्रकाशन पुणे पुनर्मुद्रण पुणे 2002
2) डॉ.चंद्रकांत बांदिवडेकर - मराठी कादंबरीचा इतिहास प्रकाशन मेहता पब्लिशिंग हाऊस पुणे.
3) सानप किशोर- प्रायोगीक कादंबरी आणि श्याम मनोहर बजाज पब्लीकेशन अमरावती.

Dynamics of the Indian Stock Market: A Comprehensive Review

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Abstract- **This review paper delves into the multifaceted dynamics of the Indian stock market, examining its historical evolution, regulatory framework, market structure, key indices, recent trends, challenges, and emerging opportunities. Through a detailed analysis, we aim to provide investors, analysts, and policymakers with a nuanced understanding of the Indian equity market, shedding light on its strengths, weaknesses, and potential trajectories.**

Keywords- **Nifty, Sensex, BSE, NSE, SEBI**

1. Introduction

1.1 Historical Perspective: The Indian stock market has a storied history, with roots tracing back to the establishment of the Bombay Stock Exchange (BSE) in 1875. Over the decades, the market has undergone transformative changes, culminating in the establishment of the National Stock Exchange (NSE) in 1992, a milestone that ushered in an era of electronic trading and increased market efficiency [1].

1.2 Regulatory Framework: The Securities and Exchange Board of India (SEBI) plays a pivotal role in regulating the Indian stock market [2]. This section explores the evolution of regulatory frameworks, emphasizing the role of SEBI in fostering transparency, investor protection, and the overall integrity of the market [3]. Recent regulatory developments, including the Insolvency and Bankruptcy Code (IBC), are discussed in the context of their impact on market dynamics.

2. Market Structure:

2.1 Exchanges and Trading Platforms: A comprehensive overview of the market structure highlights the dual-exchange system dominated by the BSE and NSE [4]. The paper explores the competitive landscape, trading volumes, and technological advancements that have shaped the efficiency and accessibility of the exchanges.

2.2 Investor Participation: Examining the diverse investor base, from retail investors to institutional players, provides insights into market sentiment and behavior. The impact of foreign institutional investors (FIIs) and domestic institutional investors (DIIs) on market movements is also analysed [5].

3. Key Market Indices:

3.1 BSE Sensex and NSE Nifty: In-depth analysis of these benchmark indices, their composition, and methodologies reveals their significance as barometers of market performance [6]. The paper investigates historical trends, volatility, and correlations with economic indicators, offering a comprehensive view of market movements.

4. Market Trends and Challenges:

4.1 Trends Shaping the Market: Identifying and dissecting recent trends in sectors such as technology, healthcare, and renewable energy provides a forward-looking perspective. The review explores factors driving these trends, including government policies, global economic dynamics, and societal shifts.

4.2 Challenges Facing the Market: Examining challenges such as market volatility, liquidity concerns, and corporate governance issues underscores the need for ongoing reforms. The paper discusses the impact of macroeconomic factors, global uncertainties, and regulatory compliance on market stability [7].

5. Emerging Sectors and Investment Opportunities:

5.1 Technology and Innovation: A detailed exploration of the technology sector and the role of innovation in driving market growth. Case studies and success stories within this sector highlight potential investment opportunities and risks.

5.2 Pharmaceutical and Healthcare: Analyzing the resilience and growth potential of the pharmaceutical and healthcare sectors, considering both domestic and international demand. Regulatory frameworks and research and development activities are key factors influencing investment decisions [8].

5.3 Renewable Energy and Sustainability: Evaluating the burgeoning opportunities in the renewable energy sector, considering India's commitment to sustainable development. Government initiatives, corporate strategies, and market dynamics within the clean energy space are discussed.

6. Impact of Technological Advancements:

6.1 Digital Transformation: Assessing the transformative impact of digital technologies on the stock market, including the rise of online trading platforms, algorithmic trading, and the integration of financial technology (FinTech) solutions [9].

6.2 Cybersecurity and Risks: Addressing the cybersecurity challenges inherent in the digitized stock market infrastructure. A focus on risk mitigation strategies and the role of regulatory bodies in safeguarding investor interests [10].

Table 1: Key performance indicators over a four-year period

Key Performance Indicators				
	2019	**2020**	**2021**	**2022**
Market Capitalization	$2.5 trillion	$1.8 trillion	$2.2 trillion	$2.6 trillion
Trading Volume (avg daily)	5 million shares	4.2 million shares	5.8 million shares	6.5 million shares
BSE Sensex (Year-end)	40,000 points	45,500 points	50,200 points	52,500 points
NSE Nifty (Year-end)	11,800 points	13,200 points	14,500 points	14,500 points

7. Conclusion:

7.1 Synthesis of Findings: Summarizing key findings, insights, and implications from the review, offering a synthesized perspective on the current state and potential future trajectories of the Indian stock market.

7.2 Recommendations: Providing informed recommendations for investors, policymakers, and market participants based on the analysis conducted. Emphasizing the importance of continued regulatory vigilance, technological adaptability, and strategic investment approaches in navigating the evolving landscape.

In conclusion, this detailed review provides a comprehensive understanding of the Indian stock market, equipping stakeholders with valuable insights to navigate the complexities and capitalize on emerging opportunities.

8. Acknowledgement

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EAGLE LEAP

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2 महिला सबलीकरण एक सक्रिय प्रक्रिया

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मो. ९४०३४७४९०२

तावना :–

लांच्या शारीरिक, मानसिक आणि भावनिक जीवनाची गुणवत्ता सुधारणे, आणि सांस्कृतिक मध्ये स्त्रियांना पुरुषांच्या बरोबरीने समान हक्क आणि अधिकार प्राप्त करुन देणे हा महिला लीकरण प्रक्रियेचा मुख्य उद्देश आहे.

राजकिय क्षेत्रातील दुर्गुणाचा नाश करण्याकरीता निकोप राजकीय क्षेत्रात प्रवेश करणे हा हला सबलीकरणाचा उद्देश आहे. स्वतःची सकारात्मक प्रतिमा तयार करणे व नकारात्मक ष्टीवर ताबा मिळवणे हे आहे.

ीतके :–

- महिला पुरुषांच्या बरोबरीने विकास आणि प्रगतीच्या समान संधी उपलब्ध करुन देणे महिला सबलीकरणाच्या प्रक्रियेत अपेक्षित आहे.
- महिलांना आर्थिक समता, हक्क, अधिकार, निर्णय, कर्तव्य, स्वअस्तित्व याची जाणीव व्हावी.
- महिला सबलीकरण हा पुरुषांच्या बरोबरीने समान राजकीय, सामाजिक अधिकार मिळविण्यासाठी आंतरराष्ट्रीय पातळीवर चालविलेला संघर्ष आहे.
- सर्व क्षेत्रातील महिलांना त्यांची ओळख व सामर्थ्य याची जाणीव करुन देणे.
- महिलांचे संघटन मजबूत होण्याकरिता आणि महिला वरील अन्याय, अत्याचार, गुन्हेगारी दूर होण्याकरिता महिलांचे सबलीकरण आवश्यक आहे.
- संपूर्ण समाज सुखी, समाधानी, आनंदाने व जबाबदार म्हणून कार्य करण्याकरिता सबलीकरण आवश्यक आहे.

शोधनाचे सिंहावलोकन :–

महिलांच्या अनेक समस्या आहेत. आजही समाजातील महिलांचे स्थान दुयम दर्जाचे आहे. ग्रामीण भागात आजही स्त्री ही दुसऱ्याच्या घरी जाणार आहे हे पक्का समज आहे. लहान

The Integral Role of Agri-Economy in the Indian Context: Sustaining Livelihoods and Fuelling Growth

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Abstract: -

The Agri-economy's integral role in the Indian context extends far beyond mere sustenance. It underpins livelihoods, sustains rural communities, and fuels economic growth. The interconnections between agriculture and various sectors emphasize its significance in achieving a balanced and inclusive development paradigm. However, to harness its full potential, concerted efforts are required to address challenges, embrace innovation, and create an enabling environment for sustainable agricultural growth. Preserving the rich heritage of Indian agriculture while embracing modernity is the key to ensuring a prosperous and equitable future for the nation.

Introduction:

In the vast tapestry of India's diverse economy, the agricultural sector has remained an essential thread, contributing significantly to the nation's growth, food security, and employment generation. The agri-economy, a comprehensive term encompassing agriculture, agribusiness, and related sectors, plays a vital role in the Indian context, shaping the lives of millions while serving as a cornerstone for economic development. In the diverse tapestry of India's economy, agriculture has long held a prominent position. With a history spanning thousands of years, agriculture has not only provided sustenance but has also been a vital contributor to the nation's economic growth and stability. The intricate interplay between the Agri-economy, livelihoods, and overall growth showcases how agriculture remains an essential cornerstone of the Indian context.

Historical Significance and Current Landscape:

Agriculture is the backbone of rural India, supporting the livelihoods of millions. The majority of India's population still resides in rural areas and depends directly or indirectly on agriculture for their sustenance. Farmers, agricultural laborers, and related industries make up a significant portion of the workforce. For them, agriculture isn't just a means of income, but a way of life deeply ingrained in cultural traditions. The Agri-economy provides diverse opportunities for employment, from sowing and nurturing crops to post-harvest processing and distribution. However, the sector's contribution goes beyond farming activities. It encompasses a broad spectrum of interconnected trades, including transportation, storage, agrochemicals, machinery, and retail. This intricate web of activities creates a multiplier effect, impacting various strata of society and sectors of the economy.

Agriculture has deep historical roots in India, forming the bedrock of civilization and cultural heritage. With over half of India's population dependent on agriculture, the sector continues to hold immense importance. Despite the expanding industrial and services sectors, agriculture remains the primary source of livelihood for rural communities, sustaining a way of life that's intricately woven into the nation's identity.

Contributions to Food Security:

One of the most critical roles of the Agri-economy is ensuring food security for the nation's vast population. India's agricultural production spans a wide range of crops, from grains to fruits and vegetables, addressing both domestic consumption and exports. The Green Revolution of the mid-20th century bolstered food production, averting famines and laying the foundation for self-sufficiency. Agriculture plays a pivotal role in bridging the urban-rural divide. Empowering rural areas is not only about providing economic opportunities but also about improving quality of life. As the agri-economy thrives, it enables investments in rural infrastructure, healthcare, education, and sanitation. This, in turn, curbs migration from rural to urban areas and alleviates pressure on urban centres.

Moreover, the empowerment of rural communities fosters a sense of belonging and preserves cultural heritage. It also helps in maintaining ecological balance by preventing over-centralization and promoting sustainable land use practices.

Employment Generation:

The Agri-economy stands as the largest employer in India, absorbing a substantial portion of the rural workforce. From farming and livestock rearing to fisheries and agro-processing, the sector provides livelihood opportunities across various segments. However, the sector also faces challenges due to seasonal nature, lack of mechanization, and limited value addition.

Contribution to GDP and Rural Development:

While its contribution to the GDP has decreased over time due to the growth of other sectors, the agri-economy remains a significant contributor. It accounts for around 15-20% of the GDP and continues to be a critical driver of rural development. By generating income, increasing purchasing power, and supporting rural infrastructure, the sector mitigates rural-urban divides. The agri-economy isn't just about subsistence; it's a catalyst for overall economic growth. Agriculture remains a significant contributor to India's Gross Domestic Product (GDP), even as the services and industrial sectors expand. The rural population's consumption patterns impact industries ranging from consumer goods to financial services. India's agricultural exports contribute substantially to its foreign exchange earnings. The country is a major global player in the export of commodities like rice, spices, fruits, and textiles. The agri-economy's success in global markets depends on the preservation of quality standards, adoption of modern techniques, and adherence to international regulations. By harnessing its agricultural potential, India can enhance its global trade position, generating more foreign exchange and reducing trade imbalances. This, in turn, can support domestic economic stability and infrastructure development.

Agricultural output provides raw materials to various agro-based industries such as textiles, food processing, and biofuels. It also generates demand for machinery and equipment, leading to growth in manufacturing sectors. The agri-economy's linkage with other sectors demonstrates its potential to fuel a comprehensive growth trajectory.

Agri-Business and Value Addition:

Beyond traditional farming, the agri-economy encompasses agribusiness and value addition. Processing, packaging, and marketing of agricultural products create a network of opportunities along the value chain. The emergence of agri-tech startups, e-commerce platforms for farm produce, and agri-tourism signifies the sector's evolving dynamics and potential for growth.

Challenges and Sustainable Practices:

The agri-economy faces multifaceted challenges, including land fragmentation, water scarcity, climate change impacts, and outdated farming techniques. The imperative for sustainable practices has never been greater. Initiatives promoting organic farming, efficient water management, and climate-resilient crops are pivotal to ensuring the sector's viability. Challenges and the Path Forward. While the agri-economy's importance is undeniable, it faces multifaceted challenges. Outdated farming practices, climate change, inadequate infrastructure, and limited access to credit hinder its growth potential. To maximize the sector's contribution, a holistic approach is needed. **Modernization:** Embracing modern farming techniques, such as precision agriculture and agroecology, can boost productivity while minimizing resource waste. **Infrastructure:** Investments in rural infrastructure like irrigation, roads, and storage facilities are crucial to reduce post-harvest losses and ensure a seamless supply chain. **Research and Innovation:** Government and private sector collaboration in research and innovation can yield crop varieties resilient to changing climatic conditions, ultimately increasing yields. **Market Access:** Strengthening market linkages can ensure fair prices for farmers' produce, reducing their vulnerability to intermediaries. **Education and Training:** Knowledge dissemination about sustainable practices, financial literacy, and new technologies can empower farmers to make informed decisions.

Government Initiatives and Policy Interventions:

Recognizing the agri-economy's significance, the Indian government has undertaken numerous initiatives to enhance productivity, livelihoods, and rural infrastructure. Schemes like Pradhan Mantri Kisan Samman Nidhi (PM-KISAN), soil health cards, and Rashtriya Krishi Vikas Yojana (RKVY) are designed to uplift farmers and modernize agricultural practices.

Future Prospects:

As India continues to progress, the agri-economy's role remains pivotal in achieving inclusive growth. Leveraging technological advancements, data-driven precision agriculture, and agri-entrepreneurship can unlock new dimensions of growth. Furthermore, integrating agri-value chains with global markets can bolster exports and bring international recognition to Indian produce.

Conclusion:

The agri-economy is not just a sector; it's a way of life, a cultural heritage, and an economic lifeline for millions. Its role in the Indian context extends beyond statistics; it embodies resilience, tradition, and progress. As India marches towards economic transformation, nurturing a sustainable, vibrant agri-economy becomes imperative. By addressing challenges, fostering innovation, and empowering rural communities, India can ensure that its agri-economy continues to be a driving force of growth, sustenance, and prosperity. The agri-economy's integral role in the Indian context extends far beyond mere sustenance. It underpins livelihoods, sustains rural communities, and fuels economic growth. The interconnections between agriculture and various sectors emphasize its significance in achieving a balanced and inclusive development paradigm. However, to harness its full potential, concerted efforts are required to address challenges, embrace innovation, and create an enabling environment for sustainable agricultural growth. Preserving the rich heritage of Indian agriculture while embracing modernity is the key to ensuring a prosperous and equitable future for the nation.

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Structural Coloration in Animals: Insights from Physics and Biology

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Abstract: Structural coloration in animals refers to the phenomenon where colors are produced not by pigments, but by the physical interaction of light with specialized nanostructures in their tissues. This review article provides a comprehensive overview of structural coloration in animals, focusing on the optical properties of biological materials and the underlying physics behind these phenomena. We discuss examples of structural coloration in various taxa, including butterflies, birds, fish, and insects, highlighting the diversity of nanostructures and optical effects observed in nature. Furthermore, we explore the mechanisms of light interaction with nanostructures, such as interference, diffraction, and scattering, and how these principles contribute to the vibrant colors and iridescence seen in structural coloration. Additionally, we examine the ecological and evolutionary implications of structural coloration, including its role in communication, camouflage, mate choice, and predator-prey interactions. By integrating insights from physics and biology, this review provides a deeper understanding of the fascinating interplay between light, nanostructures, and living organisms in the natural world.

Keywords: **structural coloration, animal coloration, nanostructures, optical properties, physics, biology, iridescence, evolutionary ecology.**

I. INTRODUCTION

Coloration in the animal kingdom has long captivated scientists and enthusiasts alike, with its vibrant hues and intricate patterns serving myriad functions from camouflage to mate attraction. While the conventional understanding attributes animal coloration primarily to pigments, a remarkable alternative exists in the form of structural coloration [1]. Unlike pigments, which absorb certain wavelengths of light and reflect others based on their chemical composition, structural coloration arises from the physical interaction of light with specialized nanostructures within an organism's tissues. This review embarks on an illuminating journey into the realm of structural coloration, where we delve deep into the optical marvels that adorn the natural world. Our exploration will encompass the diverse array of taxa where structural coloration is observed, from the delicate wings of butterflies to the iridescent scales of fish and the shimmering feathers of birds. By examining these examples, we aim to showcase the remarkable adaptability and evolutionary significance of structural coloration across different species and ecological niches. At the heart of structural coloration lies the intricate interplay between light and nanostructures. By manipulating the physical properties of these nanostructures, organisms can produce an astonishing array of colors and optical effects, ranging from iridescence to metallic sheens. Through the lens of physics, we will unravel the underlying mechanisms that govern light interaction with nanostructures, including interference, diffraction, and scattering. By

understanding these principles, we can appreciate the exquisite precision with which living organisms harness light to create dazzling displays of color [2].

Furthermore, our exploration extends beyond the aesthetic allure of structural coloration to uncover its ecological and evolutionary implications. From the role of iridescence in mate selection to the use of camouflage for predator evasion, structural coloration plays a multifaceted role in shaping the interactions between organisms and their environment. By examining these ecological dynamics, we gain insights into the selective pressures driving the evolution of structural coloration and its adaptive significance in diverse ecological contexts. In synthesizing insights from the fields of physics and biology, this review seeks to provide a holistic understanding of the fascinating interplay between light, nanostructures, and living organisms in the natural world. By unraveling the mysteries of structural coloration, we hope to inspire further inquiry into this captivating phenomenon and its implications for our understanding of evolution, ecology, and the beauty of the natural world [3].

II. HISTORICAL BACKGROUND

The fascination with coloration in the natural world dates back centuries, with early observations rooted in artistic expression and philosophical inquiry. Ancient civilizations marveled at the vivid hues of flowers, birds, and insects, attributing their colors to divine craftsmanship or symbolic significance. However, it wasn't until the emergence of modern scientific inquiry that the mechanisms underlying animal coloration began to be systematically investigated. One of the earliest scientific inquiries into animal coloration can be traced back to the 17^{th} century, with the pioneering work of scientists such as Robert Hooke and Isaac Newton [4]. Hooke's seminal work "Micrographia" (1665) provided detailed illustrations of natural phenomena observed through microscopes, including the colorful scales of butterflies and the iridescence of peacock feathers. Newton's experiments with prisms laid the groundwork for understanding the behavior of light, leading to the discovery of the visible spectrum and the principles of color mixing. Throughout the 18^{th} and 19^{th} centuries, naturalists and biologists continued to document and classify the diverse array of colors and patterns exhibited by animals [5]. The advent of microscopy enabled closer examination of the structural features responsible for producing colors, revealing intricate nanostructures within the tissues of certain organisms. However, the precise mechanisms governing structural coloration remained elusive until the 20^{th} century, when advances in optics and materials science facilitated deeper insights into light-matter interactions at the nanoscale. One of the pivotal moments in the study of structural coloration came with the discovery of the iridescent scales of butterfly wings in the early 20^{th} century [6]. Scientists such as Sir Cyril Clarke and Hilda Bruce documented the complex nanostructures present in these scales, laying the foundation for understanding how structural coloration is produced. Subsequent research in the fields of optics, materials science, and developmental biology further elucidated the mechanisms by which organisms manipulate light to create an astonishing array of colors and optical effects.

In recent decades, interdisciplinary collaborations between physicists, biologists, and materials scientists have led to significant advances in our understanding of structural coloration. High-resolution imaging techniques and computational modeling have provided unprecedented insights into the nanostructural organization of biological tissues, allowing researchers to unravel the intricate mechanisms underlying color production in nature [7].

Today, the study of structural coloration continues to be a vibrant and interdisciplinary field, with researchers exploring its ecological, evolutionary, and technological implications. From uncovering the adaptive significance of coloration in natural habitats to developing bioinspired materials for photonics and camouflage, structural coloration remains a source of inspiration and wonder, bridging the gap between art and science in our quest to understand the beauty and complexity of the natural world [8].

III. TYPES OF STRUCTURAL COLORATION

Structural coloration in animals encompasses a diverse range of optical phenomena, each characterized by distinct nanostructural features and optical effects. While the underlying principles of light interaction remain consistent, the specific types of structural coloration observed in nature can be categorized based on their nanostructural organization and resulting optical properties [9]. Here, we explore some of the primary types of structural coloration found in animals:

1. Periodic Nanostructures:

Photonic Crystals: These are periodic arrangements of materials with alternating layers of different refractive indices, creating a photonic bandgap that selectively reflects certain wavelengths of light. Examples include the multilayered structures found in the wing scales of butterflies and the photonic crystals present in the iridescent feathers of birds.

Cholesteric Liquid Crystals: Cholesteric liquid crystals exhibit a helical structure that selectively reflects circularly polarized light. This results in iridescent colors that change with the viewing angle. Cholesteric liquid crystals are commonly found in the skin of certain fish, such as the opalescent or iridescent colors seen in some species of angelfish and damselfish.

2. Diffraction Gratings:

Diffraction gratings consist of regularly spaced grooves or ridges that scatter light in specific directions based on the wavelength and angle of incidence. These structures produce iridescent colors and often exhibit strong directional dependence. Examples include the diffraction gratings found in the wing scales of butterflies and the iridescent colors of certain beetle exoskeletons.

3. Thin Film Interference:

Thin film interference occurs when light is reflected and refracted at interfaces between thin layers of materials with different refractive indices. This interference leads to the selective amplification or attenuation of certain wavelengths of light, resulting in iridescent or metallic colors. Thin film interference is commonly observed in the nanostructured layers of cells, such as the guanine crystals in the skin of fish and the keratin layers in bird feathers.

4. Microstructures and Nanostructures:

Microstructural and nanoscale features, such as ridges, grooves, and sculpted surfaces, can also contribute to structural coloration by diffraction, scattering, or interference of light. These features may be present in various biological tissues, including insect wings, fish scales, and bird feathers, and can produce a wide range of colors and optical effects.

These categories represent broad classifications of structural coloration based on the underlying nanostructural organization and optical mechanisms involved. However, it's important to note that many organisms exhibit combinations of these types of structural coloration, resulting in the stunning diversity of colors and optical effects observed in the natural world.

IV. OPTICAL PROPERTIES AND PHYSICS PRINCIPLES OF STRUCTURAL COLORATION

Structural coloration in animals arises from the intricate interplay between light and nanostructures within biological tissues. By manipulating the physical properties of these nanostructures, organisms can produce a dazzling array of colors and optical effects. Understanding the optical properties and underlying physics principles involved is essential for unraveling the mysteries of structural coloration [10]. Here, we delve into some of the key optical properties and physics principles at play:

Interference: Interference is a fundamental principle underlying many forms of structural coloration. It occurs when two or more light waves interact, either constructively reinforcing or destructively canceling each other out. In the context of structural coloration, interference often occurs between light waves reflected from different interfaces within nanostructured materials, such as thin films or multilayered structures. Depending on the relative phase and path length of the reflected waves, interference can lead to the selective amplification or attenuation of certain wavelengths of light, resulting in vibrant colors.

Diffraction: Diffraction is the bending or spreading of light waves as they encounter obstacles or pass-through narrow openings. In the context of structural coloration, diffraction gratings composed of regularly spaced ridges or grooves can scatter incident light in specific directions based on the wavelength and angle of incidence. This scattering leads to the creation of iridescent colors and often results in strong directional dependence, with colors varying depending on the viewing angle.

Scattering: Scattering refers to the redirection of light waves as they encounter particles or irregularities within a medium. In structural coloration, scattering can occur when light interacts with nanoscale features such as microstructures or sculpted surfaces within biological tissues. Depending on the size and geometry of these features, scattering can selectively enhance or attenuate certain wavelengths of light, leading to the production of colors and optical effects.

Thin Film Interference: Thin film interference occurs when light waves reflect and interfere with each other at interfaces between thin layers of materials with different refractive indices. This interference leads to the selective amplification or attenuation of certain wavelengths of light, resulting in iridescent or metallic colors. Thin film interference is commonly observed in biological tissues containing layers of materials such as guanine crystals or keratin, where the thickness and refractive index of the layers determine the colors produced.

Polarization: Polarization refers to the orientation of light waves as they oscillate in a particular plane. In structural coloration, certain nanostructures can selectively polarize light, leading to the production of polarized colors. This polarization effect can be exploited by organisms for visual signaling or communication purposes, as polarized light may be perceived differently by potential mates or predators.

By harnessing these optical properties and physics principles, organisms can create a stunning array of colors and optical effects through structural coloration. From the iridescent wings of butterflies to the metallic sheen of beetle exoskeletons, the natural world abounds with examples of the captivating interplay between light and nanostructures in living organisms.

V. COMPARATIVE STUDIES AND PHYLOGENETIC ANALYSES OF STRUCTURAL COLORATION

Understanding the evolution and diversity of structural coloration in animals requires comparative studies and phylogenetic analyses across different taxa. By examining patterns of coloration and the underlying nanostructural features across evolutionary lineages, researchers can elucidate the origins, evolutionary trajectories, and adaptive significance of structural coloration [11]. Here, we delve into the importance of comparative studies and phylogenetic analyses in unraveling the mysteries of structural coloration:

Evolutionary Origins: Comparative studies of structural coloration can shed light on its evolutionary origins and ancestral traits. By examining the distribution of structural coloration across different clades and reconstructing ancestral states, researchers can infer when and how this phenomenon first emerged in the animal kingdom. Phylogenetic analyses can help identify common ancestors and trace the evolutionary transitions from non-structural to structural coloration, providing insights into the selective pressures and ecological contexts driving its evolution.

Convergent Evolution: Structural coloration has evolved independently in multiple lineages, often resulting in similar optical effects despite differences in nanostructural organization. Comparative studies of convergent evolution can reveal whether similar structural coloration traits arise through shared genetic pathways or through convergent evolution driven by similar environmental pressures. Phylogenetic analyses can help reconstruct the evolutionary relationships between species exhibiting convergent structural coloration, providing insights into the genetic basis and adaptive significance of these traits.

Functional Diversity: Structural coloration serves diverse functions across different taxa, including communication, camouflage, mate attraction, and predator deterrence. Comparative studies can elucidate how the functional roles of structural coloration vary across evolutionary lineages and ecological contexts. By examining the correlation between coloration patterns, nanostructural features, and ecological variables, researchers can uncover the selective pressures driving the evolution of specific coloration strategies within different habitats and lifestyles.

Coevolutionary Dynamics: Structural coloration often coevolves with other traits, such as visual perception mechanisms in predators or mate choice preferences in conspecifics. Comparative studies and phylogenetic analyses can reveal patterns of coevolution between structural coloration and associated traits, providing insights into the ecological interactions and evolutionary dynamics shaping coloration evolution. For example, comparative studies of mimicry complexes can elucidate how structural coloration evolves in response to predation pressure and mimicry strategies within a community.

Technological Applications: Comparative studies of structural coloration not only deepen our understanding of natural phenomena but also inspire technological innovations. By mimicking the nanostructural features and optical principles observed in biological systems, researchers can develop bioinspired materials for applications such as photonic devices, color displays, and optical coatings. Comparative analyses of nanostructures across different taxa can provide insights into design principles and optimization strategies for engineering biomimetic materials with desired optical properties.

VI. TECHNOLOGICAL APPLICATIONS AND BIOMIMICRY OF STRUCTURAL COLORATION

The remarkable optical properties and nanostructural features underlying structural coloration in animals have inspired a wide range of technological applications and biomimetic innovations. By mimicking the design principles observed in nature, researchers have developed novel materials and devices with enhanced optical properties and functionalities [12]. Here, we explore some of the key technological applications and biomimetic advancements inspired by structural coloration:

Photonic Devices: Structural coloration in animals often relies on photonic crystals and diffraction gratings to produce vibrant colors and iridescent effects. By replicating these nanostructural features in synthetic materials, researchers have developed photonic devices with tunable optical properties. These devices have applications in color displays, optical filters, sensors, and photonic circuits. For example, biomimetic photonic crystals have been used to create color-changing fabrics and coatings for textiles and consumer electronics.

Optical Coatings and Films: Thin film interference plays a key role in many forms of structural coloration, resulting in iridescent and metallic effects. Biomimetic coatings and films inspired by the nanostructures found in butterfly wings and beetle exoskeletons have been developed for applications in paints, cosmetics, and architectural surfaces. These coatings offer enhanced coloration, reflectivity, and durability compared to traditional pigmented materials, making them attractive for a variety of industrial and consumer applications.

Camouflage and Stealth Technologies: The adaptive coloration strategies observed in animals, such as camouflage and disruptive coloration, have inspired biomimetic approaches to concealment and stealth technologies. By mimicking the color-changing capabilities of cephalopods or the disruptive patterns of certain insects, researchers have developed adaptive camouflage materials and coatings for military and civilian applications. These materials can adapt their appearance to match their surroundings or disrupt visual detection by predators or surveillance systems.

Optical Fibers and Waveguides: The nanostructural organization of photonic crystals and diffraction gratings in biological tissues has inspired the development of biomimetic optical fibers and waveguides with enhanced light-guiding properties. By replicating the hierarchical structures found in butterfly wings or bird feathers, researchers have created waveguides capable of controlling the propagation and dispersion of light in telecommunications, sensing, and biomedical imaging applications. These biomimetic waveguides offer improved performance and efficiency compared to conventional optical materials.

Environmental Sensing and Monitoring: The optical properties of structural coloration in animals can be exploited for environmental sensing and monitoring applications. Biomimetic sensors and detectors inspired by the nanostructures found in butterfly wings or fish scales have been developed for detecting changes in humidity, temperature, pressure, and chemical composition. These sensors offer high sensitivity, rapid response times, and low power consumption, making them suitable for environmental monitoring, agriculture, and biomedical diagnostics.

VII. CHALLENGES AND FUTURE DIRECTIONS IN STRUCTURAL COLORATION RESEARCH

Despite the remarkable progress made in understanding the optical properties and evolutionary significance of structural coloration in animals, several challenges and opportunities lie ahead for researchers in this field. As we look to the future, addressing these challenges and exploring new avenues of inquiry will further deepen our understanding of structural coloration and unlock its full potential [13]. Here are some key challenges and future directions in structural coloration research:

Understanding Nanostructural Complexity: One of the primary challenges in structural coloration research is unraveling the nanostructural complexity of biological tissues. Many organisms exhibit intricate nanostructures composed of multiple layers, shapes, and materials, making it challenging to characterize and replicate these structures accurately. Future research efforts will focus on developing advanced imaging techniques and computational modeling approaches to elucidate the three-dimensional organization of nanostructures and their optical properties.

Biomolecular Control and Assembly: Achieving precise control over the biomolecular processes responsible for creating nanostructures in living organisms remains a significant challenge in biomimetic materials synthesis. Future research directions will explore bioengineering approaches to manipulate the expression, assembly, and self-organization of biomolecules involved in structural coloration. By harnessing genetic and biochemical tools, researchers can engineer synthetic materials with tailored nanostructures and optical properties [14].

Dynamic and Adaptive Materials: Many organisms exhibit dynamic and adaptive coloration capabilities, allowing them to change their appearance in response to environmental stimuli or behavioral cues. Mimicking these dynamic color-changing mechanisms in synthetic materials presents exciting opportunities for biomimetic applications. Future research efforts will focus on developing stimuli-responsive materials and devices capable of real-time color modulation and adaptive camouflage. These materials could find applications in wearable technology, smart textiles, and responsive coatings.

Ecological and Evolutionary Dynamics: Integrating ecological and evolutionary perspectives into structural coloration research is essential for understanding its adaptive significance and ecological roles in natural habitats. Future studies will explore the ecological interactions between organisms and their environment, including predator-prey dynamics, mate choice, and mimicry complexes. By combining field observations, experimental manipulations, and

phylogenetic analyses, researchers can unravel the ecological and evolutionary drivers shaping coloration evolution [15].

Technological Applications and Commercialization: Translating insights from structural coloration research into practical applications and commercial products represents a significant opportunity and challenge. Future research efforts will focus on scaling up biomimetic materials synthesis, optimizing manufacturing processes, and overcoming technological barriers to commercialization. Collaborations between academia, industry, and government agencies will be essential for advancing biomimetic technologies and bringing them to market.

VIII. CONCLUSION

The Structural coloration in animals represents a fascinating intersection of physics, biology, and materials science, offering a window into the intricate interplay between light and nanostructures in the natural world. Through interdisciplinary research efforts, we have gained valuable insights into the optical properties, evolutionary dynamics, and technological potential of structural coloration. As we continue to unravel its mysteries and overcome key challenges, the future holds promise for unlocking new applications, understanding ecological interactions, and further appreciating the beauty and complexity of nature's palette.

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Internal morphological studies of crab burrows with special reference to *Barytelphusa cunicularis*

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Abstract
Burrows may be of different shape and size, simple or complex, having many branches or a single opening depending upon the animal. Various techniques have been used by biologists to determine the morphological patterns and other environmental effects on the burrow architecture. Burrows are simple tunnels, descending downwards either straight or slightly slanted, with or without branches. The burrow exhibits L, S, or Y like shapes. The relationship between Area of burrow opening (Sq. cm) and crab carapace width (mm) and burrow depth at Asna River were (r = 0.268 and r = 0.160) and at Lendi river it was (r = 0.046 and r = 0.160).

Keywords: Burrow, frequency, width, depth, cunicularis, river

Introduction
Organisms usually do not live in isolation. They interact with other organisms, inhabit a particular environment. Habitat is the place where organisms live and interact with their changing environments. The structure and architecture of burrows play a significant role and provide morphological support in the life of an organism [1, 8]. The activities of burrow construction promote the remobilization of sediment grain and nutrient cycling, thus changing the physical and chemical features of the local environments. It may be of different shape, size, simple or complex, may have single or multiple opening. By comparing the morphology, architecture and different patterns of burrows, it may be possible to suggest ecological differences between concern or associated species and their interaction with the surrounding environment. Burrow morphology depends on physical characteristics of the soil [2]. There is a difference between juvenile and adult crabs. Juveniles produce shallow J-shaped burrows, which incline vertically into the substratum. Larger crabs have Y-shaped and spiral burrows [3]. The study of crab burrows becomes important as the crab collectors use various methods to collect crabs [9]. To better understand the morphology and characteristics of burrows, we study the habitat of the crab *Barytelphusa cunicularis* with its burrow dimensions, found in Godavari River and its tributaries (Asna River and Lendi River) of Nanded, Maharashtra state.

Materials and Methods
1. Field study
Barytelphusa cunicularis excavates burrow at the shore of river when water level is high in rainy seasons. This study was conducted for measuring crab burrow openings with the help of measuring tape and calculated burrow dimensions. The empty, abandoned burrows were filled with thin slurry of Plaster of Paris. The mixture was poured through the mouth of the burrow openings and was allowed to harden for 2–3 h, depending upon environmental conditions. Burrow characterization was done using the following formula by [4].

$$\text{Area} = \Pi \times a \times b/4$$

Where, a = length of burrow opening.
b = width of burrow opening.
Π (Pie) = 3.14

2. Burrow casting
This study was conducted in February and March 2018. The burrows were selected randomly upstream and downstream side at Asna River, tributaries of Godavari River Nanded. To know the burrow structure of *Barytelphusa cunicularis*, a semisolid mixture (slurry)of Plaster of Paris (POP) was poured into burrows until the burrow was filled. Casting work was conducted only if there was a relatively high burrow density/frequency. The solidified burrow casts were (approximately after 2 h) dug out and brought to the laboratory for further measurement.

Fig a): Single opening of burrow

Fig b): Double opening of burrow

Fig c): Quadruplet burrow opening

Fig d): Burrow-opening measurement

Fig e): Burrow opening measurement

Fig f): Burrow-opening measurement

Fig 1 (a-f): A field study for characterization of burrows of *Barytelphusa cunicularis* In Godavari River and its tributaries in Nanded

Fig a): Poring of POP in burrows

Fig b): Active crab

Fig c): POP cast structure of burrow

Fig d): POP structure a burrow

Fig e): Measurement of burrow depth **Fig f):** POP cast structure of burrow

Fig 2 (a- f): Casting of burrow in *Barytelphusa cunicularis* on field at Asna and Lendi River (Godavari basin) using Plaster of Paris slurry (POP)

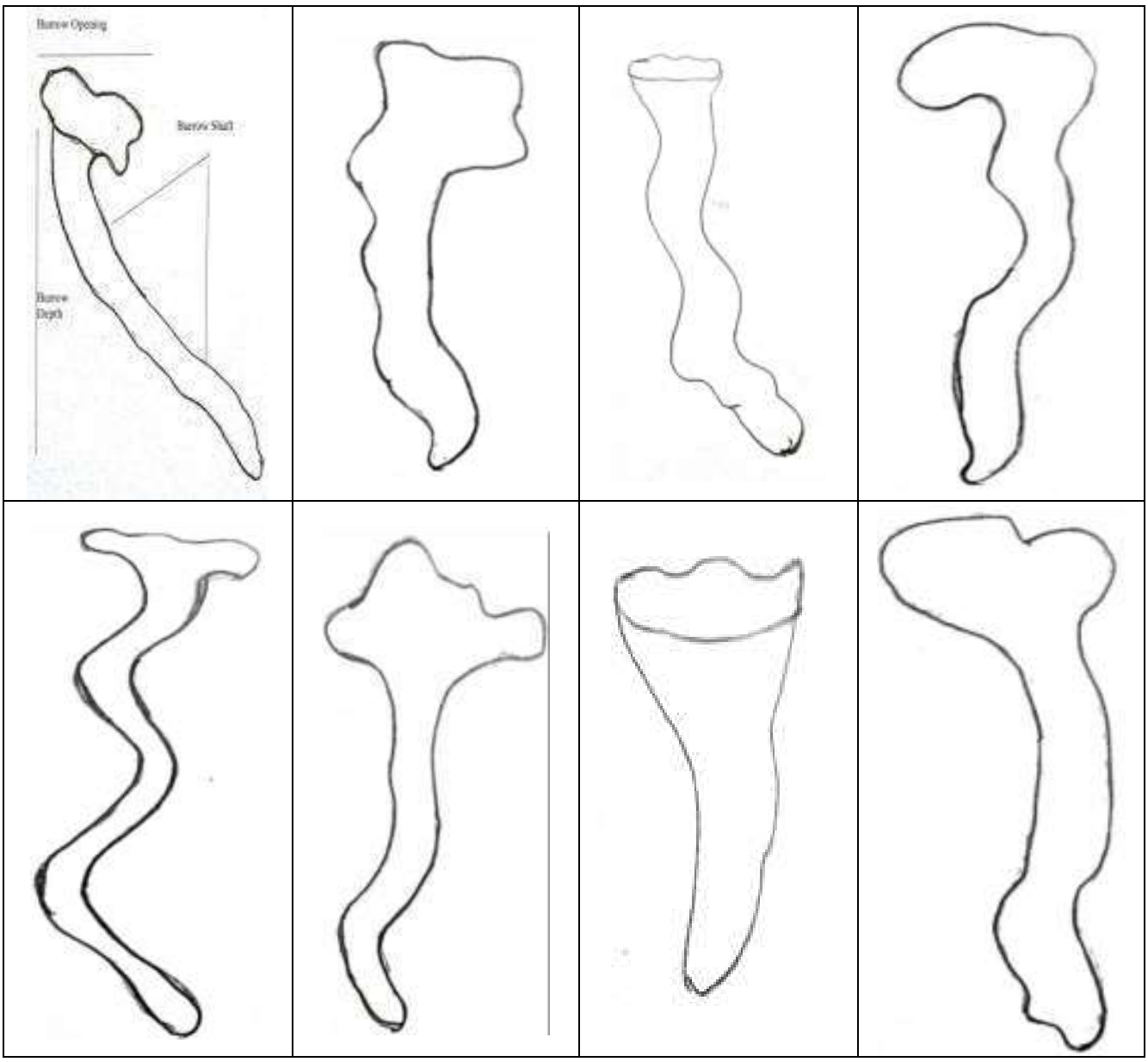

Fig 3: Schematic diagrams of dried excavated burrows after poring Plaster of Paris

Results

1. Burrow morphology and characteristics

Barytelphusa cunicularis excavate burrows of different shapes and size. Burrows pattern was simple tunnel and descending downward in any direction until reaches to the water level in wet area. It also excavates under big stone or rocks. Various shapes of burrows have been reported, such as unbranched, spiral, strait, gently curved, flask shape, etc.

2. Data analysis

The relationship between Area of burrow opening (Sq. cm) and crab carapace width (mm) and burrow depth at Asna River were (r = 0.268 and r = 0.160) and at Lendi river it was (r = 0.046 and r = 0.160).

One-way ANOVA showed that when comparing six burrow characteristics at three levels (Surface area opening, carapace with and burrow depth), there was a significant difference between them (P = 0.0032) at Asna river. It was not shown any significant difference at Lendi River (6.0288)

Table 1: Comparative account of burrow characteristics (BC) and carapace width of *B. cunicularis*at Asna River during 2017-2018

Cast Number	Burrow opening (Cm) Major	Minor	Surface area of opening (cm^2)	Carapace width of crabs (mm)	Burrow depth (Cm)
BC 1	5.1	4.5	18.01	60.18	27
BC 2	6.0	5.1	24.02	65.32	35
BC 3	4.5	3.7	13.07	61.16	30
BC 4	5.5	4.1	17.70	42.52	40
BC 5	5.2	4.9	20.00	58.48	76
BC 6	3.9	2.6	7.95	28.83	13.5

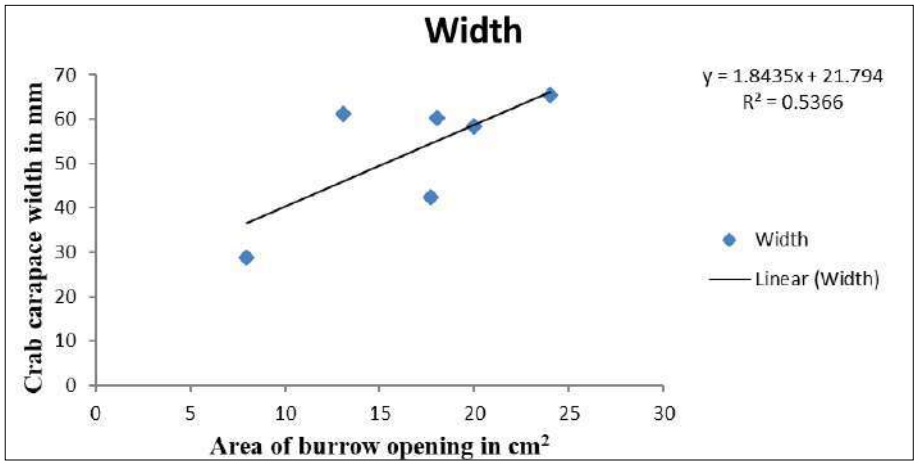

Fig 4: Relationship between Area of burrow opening (cm^2) and crab carapace width (Mm) at Asna River

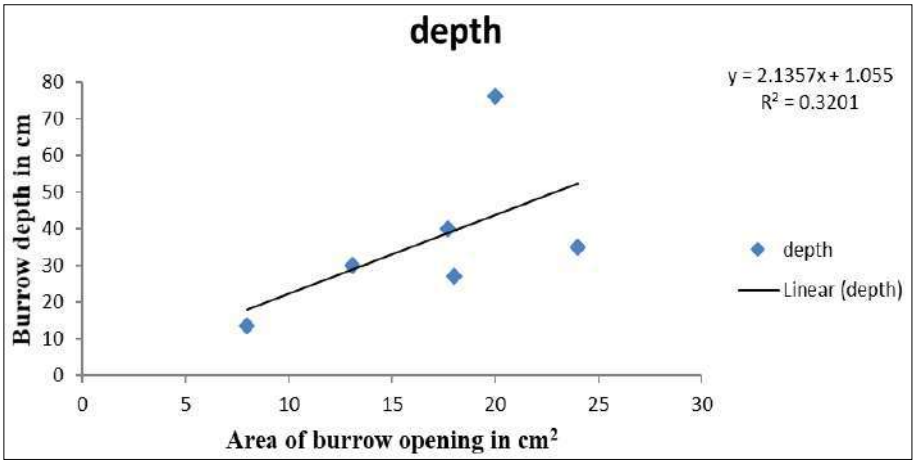

Fig 5: Relationship between Area of burrow opening (cm^2) and Burrow depth (cm) at Asna River

Table 2: One-way ANOVA for the mean of Burrow characteristics (Surface area, crab carapace width and burrow depth) of *Barytelphusa cunicularis*

ANOVA						
Source of Variation	**SS**	**df**	**MS**	**F**	**P-value**	**F crit**
Between Groups	3897.0783	2	1948.539	8.632866	0.0032	3.68232
Within Groups	3385.6759	15	225.7117			
Total	7282.7542	17				

P < 0.05

Table 3: Comparative account of burrow characteristics and carapace width of *B. cunicularis* at Lendi River during 2017-2018

Cast Number	Burrow opening (Cm) Major	Minor	Surface area of opening (cm^2)	Carapace width of crabs (mm)	Burrow depth (Cm)
BC 1	5.1	4.9	19.61	58.1	8.5
BC 2	4.6	3.8	13.72	48.4	6.3

BC 3	4.7	3.9	14.38	45.6	11.2
BC 4	3.7	3.6	10.45	53.3	21.3
BC 5	5.8	4.6	20.94	55.4	9.9
BC 6	5.2	4.8	19.59	46.5	11.2

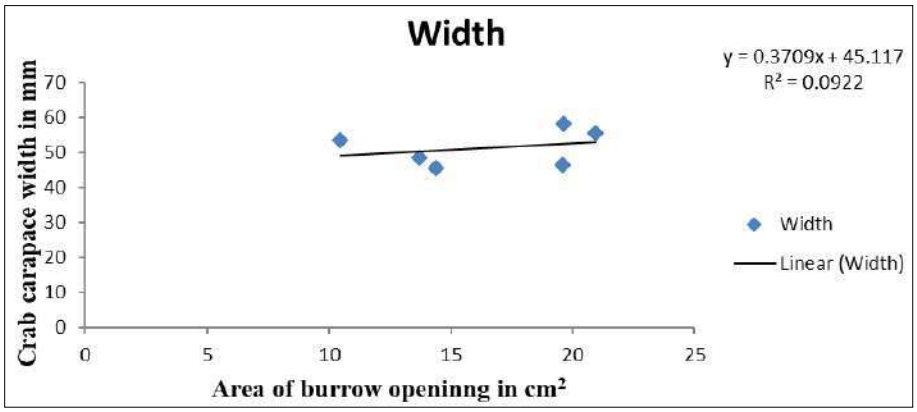

Fig 6: Relationship between Area of burrow opening (cm^2) and crab carapace width (mm) at Lendi River

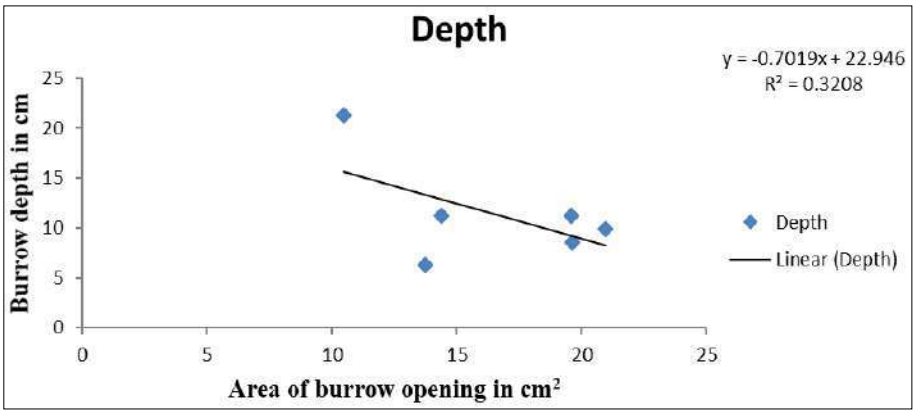

Fig 7: Relationship between Area of burrow opening (cm^2) and Burrow depth (cm) at Lendi River

Table 4: One-way ANOVA for the mean of Burrow characteristics (Surface area, crab carapace width and burrow depth) of *Barytelphusa cunicularis*

ANOVA						
Source of Variation	**SS**	**df**	**MS**	**F**	**P-value**	**F crit**
Between Groups	5639.379233	2	2819.69	119.6638	6.02883E-10	3.682320344
Within Groups	353.4514167	15	23.56343			
Total	5992.83065	17				

P > 0.05

Discussion

Burrow morphology of brachyuran crab *Ocypode ceratophthalmus*was studied at two sites located at the Saurashtra [5]. In the present investigations, total 55 burrow casts were obtained and 8 types of burrows shape were recorded. The crab carapace width showed significant correlation with burrow-opening diameter, burrow volume and burrow total length. Present Study also showed a significant relationship between areas, carapace width and burrow depth at Asna river (Tributaris of Godavari River) study site but not at Lendi River.

Burrow architecture of the ghost crab, *Ocypode ceratophthalmus* was studied [6], total 67 burrows were analyzed out of 131 burrows were excavated in their studies. compared with the young and juvenile crab burrows result of this study provides evidence that the J and U-shaped burrows could be precursors of Y-shaped burrows in the excavation process. [7], studied the engineering impact of burrowing crabs on distribution of organic matter. In their investigations, burrowing activities of these crabs and passive deposition of materials in their burrows have a significant impact on the organic matter and nutrient distributions in subtropical mangrove sediments.

Tunnels can be of various shapes and sizes, basic or complex, having numerous branches or a solitary opening depending upon the idea of the creatures [8]. In this examination the tunnels of *B. cunicularis* were found to have ellipsoidal openings at both rivers. Straightforward, at times spread either straight or somewhat inclined plummeting downwards many times burrows were spiral in shape.

Conclusion

This study provides one of the first descriptions of the morphology and ecology of burrows of freshwater crab *Barytelphusa cunicularis* in Nanded region of Maharashtra. The result shows significant variation in the burrow morphology. The complex morphology of these burrows

suggests that they are created, maintained the burrows. Crab burrow acts as an indicator crab population abundance and represent the interconnectivity of the burrow systems.

List of Abbreviations:
BC= Burrow Cast
Mm= Millimeter
Cm= centimeter
POP= Plaster of Paris

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इतिहास दर्पण

ITIHAS DARPAN

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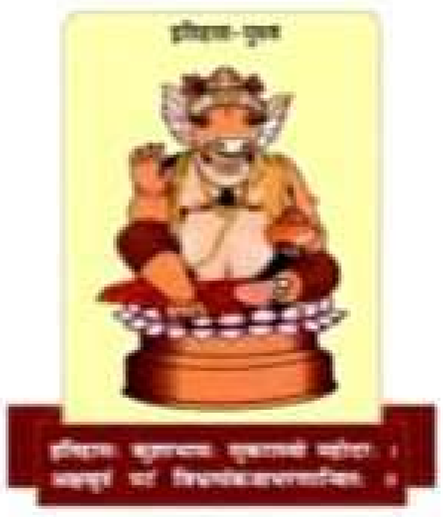

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6. The Evolution of Women's Rights: From Struggles to Successes

Prof. R. A. Nakshine
M. S. P College, Manora.

Abstract

This report presents an overview of the evolution of women's rights, emphasizing both global developments and the Indian context. It traces the history of women's struggles, from early social reform movements to modern-day campaigns for equality. Through examples from India's legal and political reforms—such as the abolition of Sati and the recent Women's Reservation Bill—it showcases the progress achieved. While significant strides have been made in areas like education, employment, and governance, the fight against gender discrimination is far from over. This report concludes by underscoring the need for sustained efforts to achieve full equality.

This report examines the evolution of women's rights with a focus on India, highlighting key historical struggles, milestones, and ongoing challenges. Throughout history, Indian women faced social restrictions such as Sati (widow immolation), child marriage, and exclusion from education and political participation. Reform movements during the 19th and 20th centuries, led by visionaries like Raja Ram Mohan Roy and Ishwar Chandra Vidyasagar, initiated changes by abolishing Sati and promoting widow remarriage and education for women.

The freedom struggle provided a platform for women leaders like Sarojini Naidu and Annie Besant to assert their rights. Post-independence, progressive legislation—such as the Hindu Succession Act (1956), Equal Remuneration Act (1976), and Dowry Prohibition Act (1961)—helped secure women's rights in areas like property ownership, equal pay, and protection from harassment.

India has achieved significant progress in recent decades. Campaigns like Beti Bachao, Beti Padhao aim to improve the status of girls by promoting education and preventing gender discrimination. The 73rd Amendment Act (1992) reserved 33% of seats for women in Panchayati Raj institutions, enabling greater political participation at the grassroots level. More recently, the passage of the Women's Reservation Bill (2023) aims to ensure 33% representation for women in Parliament and state legislatures, marking a historic step toward gender equality.

However, challenges such as gender-based violence, workplace harassment, and the wage gap persist. Campaigns like #MeToo India (2018) have brought workplace harassment to light, while grassroots initiatives empower rural women through Self-Help Groups (SHGs). This report concludes by acknowledging the progress made while emphasizing the need for continuous efforts to eliminate social and economic disparities.

The evolution of women's rights in India demonstrates that change is possible through persistent efforts by reformers, activists, and the government. With continued advocacy and collaborative efforts, India can ensure a more inclusive and equal society for future generations.

Introduction

The journey of women's rights is marked by struggles, sacrifices, and significant milestones. Across centuries, women have challenged oppressive practices to claim their rightful place in society. This seminar focuses on the evolution of women's rights, from being denied basic freedoms to achieving legal, political, and economic equality. In particular, we will explore India's journey toward gender equality and the global movements that inspired it. While many victories have been won, challenges remain, making it essential to continue working toward a more just and equitable society.

The fight for women's rights has been a long and transformative journey, spanning centuries and covering various aspects of life—social, political, economic, and cultural. In many societies, including India, women were traditionally confined to domestic roles and denied access to education, economic participation, and political power. Over time, movements emerged to challenge these norms, with women and allies advocating for equality, dignity, and justice. The evolution of women's rights reflects both the challenges of dismantling patriarchal systems and the successes achieved through legal reforms, protests, and social change.

Globally, the suffrage movement gave women voting rights, marking the first major victory. In India, the freedom struggle provided a platform for women to assert their rights and question social norms. Post-independence, the government introduced progressive laws promoting equality, education, and employment for women. Today, India's social campaigns, legal frameworks, and women's representation in politics reflect these efforts toward gender equality.

Despite progress, the fight for equality is ongoing. Modern issues such as gender-based violence, workplace harassment, and wage gaps highlight the need for further reforms and cultural shifts. This seminar explores the evolution of women's rights—from historical struggles to current

achievements—while focusing on the road ahead to ensure complete equality for women across the world.

This report emphasizes the importance of collective efforts, government support, and individual responsibility in shaping a future. Despite progress, the fight for equality is ongoing. Modern issues such as gender-based violence, workplace harassment, and wage gaps highlight the need for further reforms and cultural shifts. This seminar explores the evolution of women's rights—from historical struggles to current achievements—while focusing on the road ahead to ensure complete equality for women across the world.

Objectives

- To understand the historical context of women's struggles for equality across different eras and cultures.
- To examine the impact of global movements like the suffrage movement, second-wave feminism, and #MeToo on women's rights.
- To explore India's contribution to the women's rights movement, including social reforms, legal initiatives, and grassroots activism.
- To analyze key legal frameworks and policies in India, such as the Hindu Marriage Act, Equal Remuneration Act, and the Women's Reservation Bill.
- To assess the progress made in areas like education, employment, and political participation.
- To identify ongoing challenges, such as wage gaps, gender-based violence, and underrepresentation of women in leadership.
- To highlight the role of education and awareness in shaping societal attitudes toward gender equality.
- To inspire future actions and initiatives for promoting women's empowerment and achieving sustainable gender equality.
- To encourage a collaborative approach by involving government, civil society, and individuals in advancing women's rights.
- To provide recommendations for addressing existing challenges and ensuring an inclusive and equal society for future generations.
- To analyze how culture and traditions influence women's rights and gender roles in India.
- To explore the role of education in empowering women and reducing inequality.

- To examine the importance of women's health and access to healthcare in achieving equality.
- To investigate the role of men in supporting women's rights and promoting gender equality.

Summary

In my exploration of the evolution of women's rights in India, I have observed a significant transformation from social oppression to legal empowerment, driven by reform movements, legislation, and activism. Historically, women faced severe injustices, including child marriage, lack of education, and gender discrimination. However, pioneers like Raja Ram Mohan Roy and Ishwar Chandra Vidyasagar fought against these practices, laying the groundwork for change.

During the freedom struggle, women such as Sarojini Naidu, Kamala Nehru, and Aruna Asaf Ali actively participated in political protests, demanding equality and challenging gender stereotypes. After India gained independence, several progressive laws were enacted, including the Hindu Succession Act (1956), which granted women the right to inherit property, and the Equal Remuneration Act (1976), which ensured equal pay for equal work.

I found it inspiring that initiatives like the 73rd and 74th Constitutional Amendments (1992) reserved 33% of seats for women in local governance, significantly increasing their political participation. Women like Kiran Bedi, the first female IPS officer in India, and Mary Kom, a renowned boxer, have also broken barriers and become role models for many.

In more recent times, movements such as #MeToo India have shed light on workplace harassment, prompting discussions and policy changes. Campaigns like Beti Bachao, Beti Padhao aim to promote gender equality from a young age, while Self-Help Groups (SHGs) empower rural women by providing them with micro-financing and entrepreneurship opportunities.

Despite these achievements, I have also recognized that challenges persist, such as the wage gap, underrepresentation in leadership roles, and issues of safety and harassment. However, the passage of the Women's Reservation Bill (2023), reserving 33% of seats in Parliament and state legislatures for women, is a promising step toward greater representation.

Overall, the evolution of women's rights in India demonstrates that change is possible through collective effort and persistent advocacy. With ongoing reforms, education, and activism, I believe India is on the path to creating a more inclusive and equitable society for women.

In my analysis of the evolution of women's rights in India, I have witnessed a profound transformation that reflects the tenacity and strength of women across generations. Historically, Indian women faced numerous challenges, including practices like child marriage, lack of access to education, and systemic exclusion from political and economic spheres. These injustices sparked the early reform movements of the 19th century, where visionaries like Raja Ram Mohan Roy and Ishwar Chandra Vidyasagar advocated for social change, leading to the abolition of practices such as Sati and promoting the education of girls.

Conclusion

In conclusion, my exploration of the evolution of women's rights in India reveals a remarkable journey filled with resilience, transformation, and empowerment. This narrative is not just about struggles; it is also about the courage and determination of countless women and men who have fought against injustice and inequality. The story of women in India—transitioning from being marginalized and oppressed to becoming leaders and changemakers—serves as an inspiring example for the world.

I believe that we cannot overlook the profound impact of legal reforms, such as the Hindu Succession Act (1956), which empowered women with property rights, and the Protection of Women from Domestic Violence Act (2005), which provides essential safeguards against abuse. These laws are more than just words on paper; they represent a significant shift in societal attitudes toward gender equality.

Moreover, the ongoing efforts of grassroots movements, such as Self-Help Groups (SHGs), demonstrate the power of community in transforming lives. For instance, women like Vasanti Kshirsagar, who turned her life around through an SHG, exemplify what can happen when women are given the opportunity and support to thrive.

While I reflect on these achievements, I am also acutely aware of the challenges that remain. Issues like gender-based violence, wage disparities, and underrepresentation in leadership roles still need our attention and action. The recent passage of the Women's Reservation Bill (2023), reserving 33% of seats in Parliament and state legislatures for women, is a landmark achievement that signifies a commitment to greater representation and equality in governance. This change not only enhances women's voices in decision-making but also sets a positive precedent for future generations.

The evolution of women's rights in India is not just a narrative of struggles and victories; it is a call to action for all of us. As we move forward, I believe we must strive for a society where every woman can realize her potential, live free from violence and discrimination, and participate fully in all aspects of life. By working together—governments, civil society, and individuals—we can create an inclusive and equitable future, honoring the legacy of those who came before us while paving the way for the next generation of women leaders.

As I reflect on this remarkable journey, I remain committed to the ongoing fight for gender equality, ensuring that the ideals of justice, dignity, and equality are not just aspirations, but a lived reality for all women in India and beyond.

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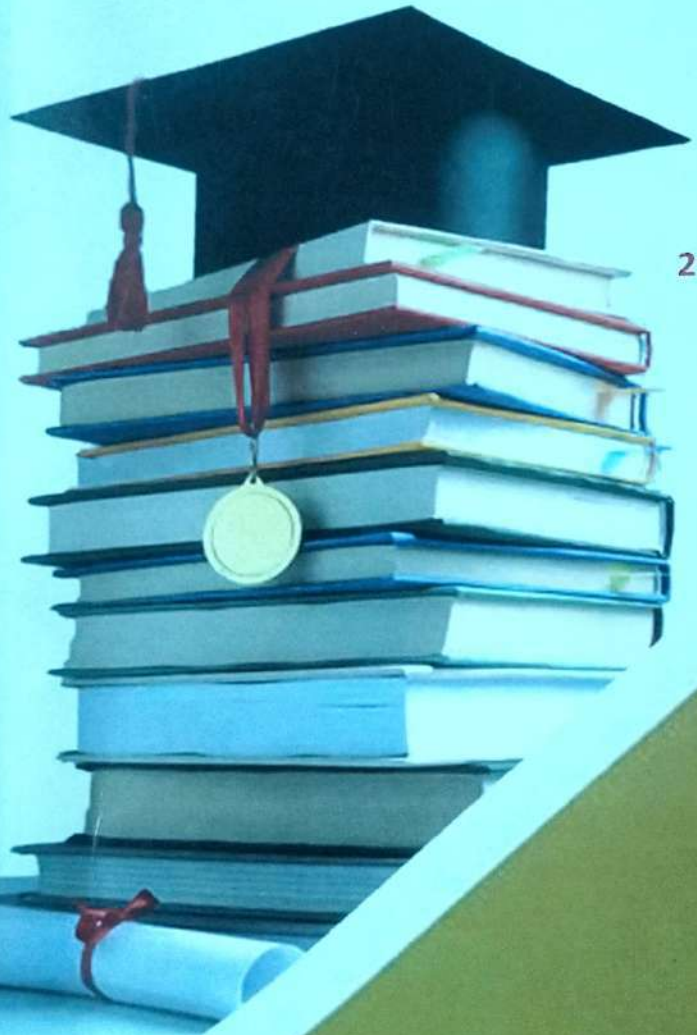

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AJANTA PRAKASHAN

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1. Identity Crisis, Power Dynamics and in A Song of Ice and Fire

Prashant N. Kamble
Assistant Professor, Department of English, M.S.P. Art and L.P.T. Commerce College, Manora.
Dr. U. S. Wadekar
Professor, Smt. Kesharbai Lahoti Mahavidyalaya, Amravati.

Introduction

The phenomenon of identity crisis in literature paves the way for character development. Characters in fiction undergoes transformation as the plot develops. The experience in the narrative shapes the identity of the characters. They could bring forth their hidden qualities or they could be affected by the changed circumstances and use their agency to manipulate the situation to their advantage. The discussion of various definitions of identity crisis makes the matter our investigation clearer.

During an identity crisis, a person "tries on" different identities and ways of being. They may question their family's values and cultural norms, and begin developing their own system of values and unique personality, separate from their family.

According to oxford dictionary identity crisis means a period of uncertainty and confusion in which a person's sense of identity becomes insecure, typically due to a change in their expected aims or role in society.

An identity crisis happens at a time when some change makes you re -evaluate who you are.

A Song of Ice and Fire is the series of fantasy novels written by American writer George R.R. martin. The main topics he has dealt with in his series are politics, power dynamics and political intrigue. The series portrays fictional continents of Westeros and Essos. He has also painted the wild picture of the wild world of forest where wild tribes live in proximity with nature.

Identity crisis and character development

Most of the characters in the series A Song of Ice and Fire face the dilemma of identity crisis. George R.R. Martin has introduced an aura of multi-dimensional characters. There are heroes who acts like villains and there are villains who show the tender feelings like sympathy and kindness. The utterly dishonest men show the streaks of honor. The world of the fantasy series A

Song of Ice and Fire is full of people with theirs unique strength and weakness, with their own features. The meek ladies as well as female knights. There are honest fools and utterly dishonest people like Jaime Lannister and Cersei Lannister. The world introduced is medieval in setting. There are seven kingdoms in the realm called Westeros and the seven families rule the different kingdoms. The North is ruled by the honest men Stark, the series portrays them as the descendants of the first men of the realm. Casterly Rock is ruled by the powerful and rich lord Tywin Lannister. The Lannisters are powerful but extremely ambitious and treacherous. The Lannisters are Tywin, Jaime, Cersei and Tyrion. There are Martells of Dorne, the Martells are poisonous in nature. They are brooding over the vengeance of the murder of Princess Elia who was wife to the prince Rheagar Targaryen. Rheagar Targaryen was murdered in the battle of Trident. The Greyjoys rule the Iron Island, these people wants to assert their own identity. They are not in alliance with any house of the realm. The Tullys rule the river lands. Catelyn Tully is married to Eddard of house Stark. The Baratheon rule from Dragonstone, they are three brothers Robert king of the realm Stannis and Renly. The Targaryen family presently include Viserys and Daenerys rest of the members of the Targaryen family are killed in the Baratheon Rebellion. The Targaryens are the descendants of dragon. They are from the old Valeria which is destroyed in the fire.

The characters in the story change their personalities according to the development of the story. Martin has emphasized to portray morally grey characters not entirely heroes nor villains. Martin's characters are real life figure. They suffer as men and women suffer in the real life. They respond to their emotions as normal human being. There is less fantasy and more reality in Martins novels.

The above picture shows that the realm is ruled by various families each aspiring for the power and want to rule the kingdom under one banner. The seat that represent the whole realm is iron throne at kings landing. The rivalry among the lords of the realm disrupt the realm and chaos follows.

The follies committed by mad king Aerys II are grievous. King Aerys II in his fit of madness banished Tywin Lannister from the position of kings Hand. In order to diminish his power in the realm he appointed Jaime Lannister as the member of the king's guard. This made Tywin Lannister heirless. The king Aerys II refused Rheagar's marriage with Tywin's daughter Cersei. Prince Rheagar on the other hand chose Lyanna Stark as the queen of love and beauty. The battle that followed destroyed the realm beyond count. Robert Baratheon who was betrothed to Lyanna

Cersei's character development. If the things had gone as expected we would have seen different aspects of Cersei's nature but the changed situation changed her disposition and we got one of the rare female protagonist who dominated the war narrative of the series A Song of Ice and fire. Cersei is the force that played the game of throne she manipulated things in such a way that everything in the power game revolves around her. Her relationship with her husband, with her brothers and even with the members of king's guard reveal her political prudence. She represents the Machiavellian principles in the series. Cersei's every move is toward accumulation of power. She altered her plan according to the situation. She used Jaime Lannister to her own end. She manipulated the appointments in king's court to serve her ends. She even played the game with the faith, she appointed the septons who serve her end and replaced people who were hurdle in her way. When her twin brother Jaime Lannister is captured by Robb Stark and her father is away from Kings Landing to fight the war she establishes relationship with Lancel Lannister then with Osmund and Osfryd Kettleback to her end. Throughout the series she plays various political game with the various character of the series. She offers Eddard Stark her own self until Jaime returns to kings Landing.

Her game reverts when her trusted people betray her and confess the crime she compelled them to commit. Her fortune turn against her when her well-orchestrated plan fail. She herself becomes victims of her own plan. Her brother Jaime Lannister is captive of the Starks, he loses his sword hand while returning to kings landing. Her son Joffrey is murdered on his wedding night. Her father died at the hand of his own child Tyrion. She suffers tremendously. She is made to walk the walk of atonement all naked before the common people of the kings landing. She is humiliated beyond limit. People curse her, they call her whore and pelt rotten vegetable at her. When Jaime learns about her relationship with other people of the court he abandons her to her faith. He did not return to save his twin sister.

Eddard Stark is honorable man who follows the simple life and straight traditions of the North. He is unaware of the courtly politics of the southern court. He is dear friend of the king Robert. He helped him win the iron throne and avenge the murder of his sister Lyanna Stark. Jon Arryn's death compels Eddard to walk south and accept the position of king's Hand the lord is so honorable that he does not make any changes in his behavior according to the customs of the southern courtly politics. He follows the simple rule of differentiating the truth from the false. He accuses Cersei of her incest, he questions Joffrey's legitimacy as Robert's heir. And extend his

support to Stannis Baratheon as the proper heir to the iron throne. He suffers a lot just for the sake of his honesty. Many people tell him to change his disposition and change his pursuit of the Joffrey's legitimacy. Eddard Stark continues his investigation and brings about his down fall. The death of Robert Baratheon changed the situation for him changed situation changed the result.

Arya Stark is daughter of Eddard Stark, she is small wilful child of nearly six to seven years old. George R. R. martin has portrayed her as tomboy from her early childhood she is indomitable. She rejects the gender role allotted to her, she enjoys being boy and doing the work of boy. She tends horses and learns sword fight. As a girl she never shows interest in girly things like sewing and dancing. He father's death changes her entire universe she hides her identity and disguises herself as boy, she frequently changes her name. In search of her lost home she hurtles from one place to another place. In the end of the series she joins the faith of R'hllor and chooses to become faceless assassin.

Sansa Stark is daughter to Eddard Stark and Catelyn Stark she is comely girl who is waiting her flowering to finalize he marriage with Joffrey Baratheon. Sansa is a dreamy girl who is much interested in the knightly tales and romantic love stories. She is betrothed to Joffrey Baratheon the heir to iron throne. She is completely naïve player in the game of thrones. She learns her harsh lesson after her father's execution. She had pleaded for the mercy for her father but Joffrey didn't listen her. She is ill-treated at kings landing after her father's death. She is used as catspaw to advance their agenda. In reality Sansa was hostage at kings landing. Peter Baelish tells her that life is not a song and she would learn it one day. Sansa Stark is married to the dwarf of Tywin Lannister Tyrion.

Daenerys Targaryen is another one more important character in the fantasy series A Song of Ice and Fire. She was borne in tumultuous time when the Targaryen dynasty came to end. She and her brother Viserys are the last surviving members of the dragon family. In the beginning she suffers hardship. She is sold to the war lord Khal Drogo at the age of thirteen, after enjoying her marital bliss she loses her husband and even her son her supporters. She undergoes hardship and carve out her own kingdom. Her subject call her mhysa or mother in the free cities of Meeren, Astopor Yi Ti she sets free the salves and becomes their mother. She also hatches three dragon eggs and gives them life to make them formidable force in the game of thrones and herself a formidable player.

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The Role of Digital Tools in Enhancing Academic Writing: A Case Study of Maharashtra Universities

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Abstract

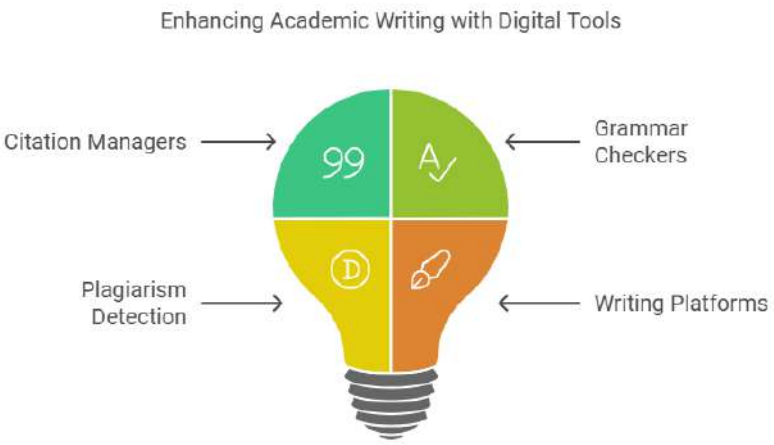
In the automated aeon, academic writing has been gone through a significant change, largely guided by the introduction of various digital assets. This paper high-lights the role of virtual tools in improving the academic writing, especially focusing on research scholars and faculty members in Maharashtrian universities. The study explores how this digital tool such as citation managers, grammar checkers, plagiarism detection software, and writing platforms help improve the quality, accuracy, and efficiency of academic writing. This paper tries to achieve its objective through interviews and surveys, this research study examines the extent to which digital tools have been utilized, the benefits using these tools, and the threats encountered by users.

Keywords

Digital tools, academic writing, Maharashtra universities, citation managers, grammar checkers, plagiarism detection, writing platforms.

Introduction

Academic writing is one the most desired skill in the field of the higher education. The research work is a very complex and cumbersome task requires amalgamation of various things, needs painstaking attention to structure, language, citation, and novelty for the research activities. But this process of academic writing has simplified due to the advance modern tools in the field of literature management software. These tools are playing a remarkable role in the enhancement of the productivity of research works. Nowadays with the help of this technologies many things can be done with one single click of the mouse.



Maharashtra is hub of world acclaimed universities and institutions, and also known as research factory on India. Here a large number of research scholars and faculty members are involved in producing academic research activities, these research studies are coupled with digital tools in facilitating the writing process. This virtual software helps its users to organize ideas, assure proper grammar, manage citations, and avoid duplication. I through this research paper tries to investigates the impact of these virtual tools on academic writing in Maharashtrian universities and institutions. The main focus is to understand how this advance technology help researchers to write better papers and what challenges they face in using them.

The Importance of Academic Writing

Academic writing is the heart and soul to the dissemination of knowledge. It needs crystal clear communication of ideas, proof-based arguments, and suitable reference system. According to Steve Graham academic writing ***is "a disciplined, structured approach to writing that adheres to specific rules regarding style, format, and accuracy."*** The credibility and originality of research work shows that effective academic writing improves the credibility of the author and the quality of research activities.

Digital Tools in Academic Writing

Twentieth century is the century of advancement in the technologies and this is visible in every hemisphere of the man-kind. In the last ten years, a large number of digital tools have been developed to help authors in the academic world. Evans et al. (2020) highlight many types of digital application that have proven as an essential part of academic writing:

Tools such as Mendeley, EndNote, Zotero, RefWorks and BibTex help researchers organize references and ensure accurate citations. This software become a boon for the research scholars and the faculty members in the Maharashtrian Universities. Now researchers not need to spend too much time in bygone research activities.

Software like ProWritingAid, Ginger, and Hemingway Editor, are widely used to improve the clarity and correctness of language. These tools now are playing a vital role in the research works around the world; therefore, we are witnessing huge influx of the research works.

Tools such Plagscan, Quetext, and Duplichecker help writers ensure the originality of their work. Less than one-minute researchers can scan their content and modify accordingly, due to this applications duplication can avoided easily. These tools are complying writers to create original works. All these literature management tools playing vital role in the field of research activities.

Tools such as Google Docs, Microsoft Word, and Evernote offer collaborative features and advanced writing functionalities. These platforms are performing a remarkable role in the academic writing.

Methodology

I this research study I applied a trio combination of the methods, first I did a survey of Maharashtrian scholars and faculty members. In this survey we engaged near about 200 scholars from the prominent universities across the state. In the survey we gave them a questionnaire set; these questions were related to their research works. Another approach we applied here we took one to one interviews of the faculty members and the research scholars from famous institutions of the Maharashtrian universities, all the selected scholars and faculty members are having pre knowledge about these tools. The data was compiled and analysed by using quantitative and qualitative approaches to present a comprehensive understanding of the impact of digital tools on academic writing.

Results and Discussion

The survey resulted that 70 % of scholars and 85 0% of faculty members regularly utilized digital tools for academic writing. Mendeley and Zotero, are the most commonly used tools were citation management software in the same manner as far as grammar checkers Grammarly and Ginger play a vital role for the rectification of the content, and for plagiarism detection tools such as Turnitin and Duplichecker are very handy.

According to the research scholars to improve the readability of the research works the depend on the grammar checkers and for the managing and organising referential data they use citation tools. Plagiarism also found a great place in the works of faculty members.

"Ensuring that my papers are original and free from plagiarism is a priority. I use Turnitin to check my work before submission to journals.

Benefits of Digital Tools

Improved Citation Accuracy: According to many research scholars and faculty members Citation managers were found to be particularly helpful in managing complex citation formats such as APA, MLA, and Chicago. According several research scholars while using these tools they noted that these applications are time-saver and they have reduced time at a great extent for citation errors. One scholar opined:

"Before using Mendeley, I used to struggle with citations. Now, it automatically formats them for me."

Enhanced Language and Grammar: Another most important contribution made by these to tools is identify and erasing common grammatical errors, enhance sentence structure, and improve the overall clarity of their academic works. Many of the faculty members mentioned that grammar checkers were especially useful in ensuring that their papers met the high standards of international journals.

Plagiarism Prevention: Plagiarism detection is the most needed in the arena of arena of academic writing, this tool helped both research scholars and faculty members avoid unintentional plagiarism. Plagiarism is dark mark in the educational field, many research scholars without doing any research activity tried to copy other scholars' work. But genuine participants appreciated the ability to check their work for similarities with other published papers before submission.

Omnipresent Writers: Writing applications such as Ginger Google Docs permitted multiple authors to work on the same research work in. This is the most incredible feature of these advanced tools was especially design for faculty members working on joint research projects.

Digital Tools and Academic Writing Quality

Overall, the study found that digital tools had a positive impact on the quality of academic writing. 90% of the respondents felt that their writing had improved after using these tools. In a nutshell we can say we can say these tools helped academic scholar and the faculty members to shine their skills. All advance tools are the heart and soul of the modern academic writings In particular, research scholars noted that the tools helped them produce more polished papers with fewer grammatical errors and better citation management. According to many Faculty members also found that using digital tools helped them meet the stringent requirements of academic journals more easily. However, the study also highlighted the need for balanced usage. While digital tools offer valuable support, they cannot replace the critical thinking and analytical skills that are essential for good academic writing.

Conclusion

The findings of this study indicate that digital tools play a significant role in enhancing academic writing among research scholars and faculty members in Maharashtra universities. Citation managers, grammar checkers, plagiarism detection software, and collaborative writing platforms help users improve the accuracy, clarity, and originality of their work. Universities should provide workshops and online tutorials to help students and faculty members learn how to use digital tools effectively.

Institutions should negotiate with software providers to offer free or discounted access to premium features, particularly plagiarism detection tools.By addressing these issues, In a nutshell, we can say that these remarkable tools are much needed for the productive and qualitative works. Maharashtra universities can ensure that research scholars and faculty members are better equipped to produce high-quality academic writing that meets international standards.

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(m,n) - Type Holographic Dark EnergyBianchi Type-V Cosmological Model in General Relativity

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ABSTRACT

Investigations currently underway aimed at the self-propelling study of $(m,n)-$type HDE cosmological model within the circumstance of theory of General Relativity (GR). The solutions of the field equations correspond to special form hybrid expansion law (HEL) which provides singular model. Also some physical and dynamical aspects and its behavior with the present day universe of the cosmological model have been discussed.

Keywords: $(m,n)-$ type HDE, General Relativity (GR), Bianchi type-V metric.

I. INTRODUCTION

The geometric theory of General Relativity (GR) explains gravitational phenomena. It is also helpful for building mathematical models in cosmology, which studies the universe's large-scale structure. The fast expansion of the universe has been proven by contemporary cosmological observations. Additionally, it has been confirmed that Dark Energy (DE), an unusual force with negative pressure, is the cause of this late time acceleration [1-6]. GR and modified theories of gravitation have been studied to explain this DE model. The most straightforward candidate to cause this cosmic acceleration was thought to be the cosmological constant, which stands for the energy density connected to the quantum vacuum. However, this straightforward DE model suffers from the coincidence and other grave issues in GR. Therefore, in an effort to explain this cosmic acceleration of the cosmos, various dynamical DE models have been studied.

DE is a unique kind of energy that fills the entire space and accelerates the universe's expansion overall. The DE is typically displayed in two ways: first, using a particular parameterization, and second, by changing gravity at incredibly large scopes. There are three main approaches to determine the DE condition of state from observational data: solving the scalar field conditions, building a helpful framework for the condition of state border, and implementing a boundary-free methodology. A dynamical scalar field and the vacuum energy thickness are two important alternatives for DE. As a result, in most core scenarios, the condition equation of state (EoS) associated with

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the vacuum energy thickness is consistent and a temporal component [7-9].

A number of investigators and writers examined Holographic Dark Energy (HDE), an alternative kind of DE.HDE models rely on a field-theoretical relationship between shorts in the infrared and brilliant energy domains. Different choices made at the infrared end resulted in different models, and it was also discovered that the universe's thickness is independent of its spatial shape [10–11]. [12] Established a link in the Bianchi Type-V universe between the HDE models and the quintessence scalar field DE models.For this anisotropic speeding up model of the cosmos, the quintessence scalar field and its core potential are rebuilt. [13–19] studied five-dimensional HDE models and minimally interacting models. A few writers [20–25] talked on the dynamics, cosmic evolution, and implications of HDE models of the universe in relation to various cosmological theories. Another class of HDE models in LRS Bianchi Type-I was obtained by signature flipping of isotropic homogeneous space-time with HDE in $f(G)$ gravity focused by [26] and [27]. Various HDE models, such as the Tsallis HDE and the Barrow HDE models, have also been studied [28–29].In light of the previous discussion of DE and HDE, we can now investigate (m,n)-type HDE cosmological models, which provide DE models that resemble age graphs in both kinematical and physical senses [30–31]. We have taken into consideration a General Relativity theory to describe the current universe's behaviour for these (m,n)-type HDE cosmological models.

Up to now, a number of GR cosmological models have been proposed to explain how our universe behaves.[32-33] explored the cosmogical models in GR. In GR, Bianchi type-V string cosmological models were studied by Yadav et al. [34]. [35–36] have obtained the Bianchi type-V DE cosmological model in GR and the FLRW non-singular. A cosmological model in which the viscous fluid in GR and the time-dependent Λ and G are investigated [37]. Our paper is structured as follows in relation to the cosmological discussion and extension mentioned above:

We discuss the metric and GR in **Section II**. In **Section III,** the metric solutions of a specific GR theory and the model are shown using the unique HDE form known as (m,n)-type HDE. In **Section IV**, the graphical representations of the model's physical and dynamical behavior using the (m,n)-type HDE are presented. **Section V** contains the conclusions.

II. METRIC AND GENERAL RELATIVITY

We consider a Bianchi type-V space-time of the form

$$ds^2 = dt^2 - A^2dx^2 - e^{-2\mu x}\left[B^2dy^2 + C^2dz^2\right], \tag{2.1}$$

where, A, B and C are the potential functions of cosmic time t only and μ is constant.

The energy momentum tensor for dark matter (DM) and HDE is taken as,

$$T_{ij} = \rho_{matt}u_iu_j + (\rho_{de} + p_{de})u_iu_j + p_{de}g_{ij} \tag{2.2}$$

Here, ρ_{matt} is the matter density of DM, ρ_{de} being the energy density and p_{de} is the pressure. The Holographic Dark Energy (HDE) model is one of the numerous approaches that have been put out to address this challenging problem.

For the energy momentum tensor (2.2) and for the space-time (2.1), the Einstein's field equation,

$$R_i^j - \frac{1}{2}Rg_{ij} = -8\pi T_{ij}, \tag{2.3}$$

yields the following five independent equations called as non-linear differential equations:

$$\frac{\ddot{A}}{A} + \frac{\ddot{B}}{B} + \frac{\dot{A}\dot{B}}{AB} - \frac{\mu^2}{A^2} = p_{de} \tag{2.4}$$

$$\frac{\ddot{A}}{A} + \frac{\ddot{C}}{C} + \frac{\dot{A}\dot{C}}{AC} - \frac{\mu^2}{A^2} = p_{de} \tag{2.5}$$

$$\frac{\ddot{B}}{B} + \frac{\ddot{C}}{C} + \frac{\dot{B}\dot{C}}{BC} - \frac{\mu^2}{A^2} = p_{de} \tag{2.6}$$

$$-\left[\frac{\dot{A}\dot{B}}{AB} + \frac{\dot{A}\dot{C}}{AC} + \frac{\dot{B}\dot{C}}{BC} - \frac{3\mu^2}{A^2}\right] = (\rho_{matt} + \rho_{de}) \tag{2.7}$$

$$\frac{2\dot{A}}{A}-\frac{\dot{B}}{B}-\frac{\dot{C}}{C}=0 \tag{2.8}$$

Here, in the all above equations the overhead dot denotes the differentiation with respect to t.

We shall now define cosmological parameters which would help solving the above filled equations. The volume V and the average scale factor $a(t)$ are given by;

$$V=a(t)^3=a^3=ABC. \tag{2.9}$$

The average Hubble parameter H, scalar expansion θ, shear scalar σ^2 and the anisotropy parameter Δ are defined as:

$$H=\frac{\dot{a}}{a} \tag{2.10}$$

$$\theta=3H \tag{2.11}$$

$$\Delta=\frac{1}{3}\sum_{i=1}^{3}\left[\frac{H_i-H}{H}\right]^2 \tag{2.12}$$

$$\sigma^2=\frac{3}{2}H^2\Delta \tag{2.13}$$

Also the deceleration parameter (q) is given by,

$$q=\frac{d}{dt}\left[\frac{1}{H}\right]-1 \tag{2.14}$$

.

III. SOLUTIONS OF THE FIELD EQUATIONS

In order to present a DE model in the presence of $(m,n)-$ type HDE here, we solve the field equations (2.4-2.8).

On integrating (2.8) and absorbing the constant of integration, we get

$$A^2=BC \tag{3.1}$$

Now by utilizing the set of five independentEqs. (2.4-2.8) having seven unknowns $A,B,C,\rho_{matt},\rho_{de},p_{de}$ and V. Hence to find determinate solution we use the following physically significant expressions:

The shear scalar of the line element is proportional to the expansion scalar, so that we have:

$$A=C^{\tau}, \tag{3.2}$$

where $\tau\neq1$ is a positive constant which preserves the anisotropy of the line element.

Also by using Eqs. (2.4-2.8) we get

$$B=\eta C=B=C;\eta=1 \tag{3.3}$$

Let us consider the special form of deceleration parameter in terms of average scale factor

$$a=\left(e^{k\beta t}-1\right)^{1/\beta}=\left(e^{\beta t}-1\right)^{1/\beta};k=1 \tag{3.4}$$

Now utilizing Eqs. (2.9) and (3.2-3.4) we get the values of the potential functions as:

$$B=\left(e^{\beta t}-1\right)^{\frac{3}{\beta(\tau+2)}}=C \tag{3.5}$$

$$A=\left(e^{\beta t}-1\right)^{\frac{3\tau}{\beta(\tau+2)}} \tag{3.6}$$

Also we've chosen to frame the cosmological model in this instance using an assumed scale factor. Additionally, we must ascertain the pressure, matter density and energy density with respect to cosmic time in order to frame a cosmological model of the universe. We adopt the power law form of the scaling factor.

With the help of Eqs.(3.5-3.6) in Eq. (2.1) the Bianchi type-V cosmological model with (m,n)-Type HDE source within the framework of GR becomes:

$$\begin{aligned}ds^2=dt^2-\left[\left(e^{\beta t}-1\right)^{\frac{3\tau}{\beta(\tau+2)}}\right]^2dx^2\\-e^{-2\mu x}\left[\left(e^{\beta t}-1\right)^{\frac{3}{\beta(\tau+2)}}\right]^2\left(dy^2+dz^2\right)\end{aligned} \tag{3.7}$$

IV. PHYSICAL AND DYNAMICAL PROPERTIES OF THE MODEL

Using Eqs.(3.4) and (3.5-3.6) in the Eqs. (2.10-2.14) we get the different kinematical and physical parameters of the model which help us to describe the characteristics of the universe:

- Hubble Parameter: $H=\left\{\frac{e^{\beta t}}{e^{\beta t}-1}\right\}$, (4.1)
- Expansion Scalar: $\theta=\left\{\frac{3e^{\beta t}}{e^{\beta t}-1}\right\}$, (4.2)

- Anisotropy Parameter: $\Delta = \left\{\frac{2(\tau-1)^2}{(\tau+1)^2}\right\}$, (4.3)
- Shear Scalar: $\Delta = \left\{\frac{3(\tau-1)^2}{(\tau+1)^2}\right\}\frac{e^{2\beta t}}{\left(e^{\beta t}-1\right)^2}$, (4.4)
- Deceleration Parameter: $q = \beta e^{\beta t} - 1.$ (4.5)

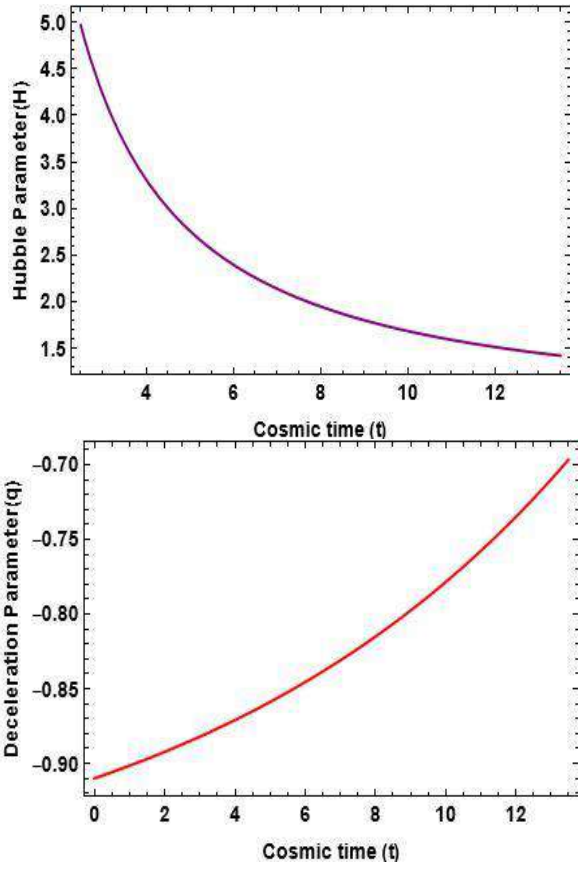


Figure 4.1: Shows the behavior H & q Vs cosmic time (t)

So, by using Eqs. (3.5-3.6) in the Eq. (2.6) we get the pressure of the universe as:

$$\left[\left(\frac{-3}{\tau+2}\right)\left\{\frac{e^{\beta t}}{e^{\beta t}-1}\right\}\left[\begin{array}{l}\left(\frac{9}{\tau+2}\right)\left\{\frac{e^{\beta t}}{e^{\beta t}-1}\right\} \\ +2\beta\left\{\frac{e^{\beta t}}{e^{\beta t}-1}-1\right\}\end{array}\right]+\left(e^{\beta t}-1\right)^{\frac{4(1-\tau)}{\beta(\tau+2)}}\right]=p_{de} \quad (4.6)$$

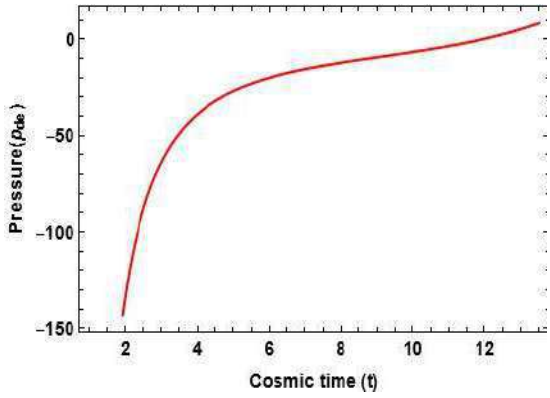


Figure 4.2: Shows the behavior p_{de} Vs cosmic time (t)

- **(m,n)-Type H.D.E**

Here, the idea of (m,n)-Type HDE is the extension of HDE with the parameters m and n with the chosen IR cut-off as,

$$L = \frac{1}{a^m(t)}\int_0^t a^n(t')dt' \quad (4.7)$$

Specifically, for a few explicit upsides of (m,n) the condition of state can normally develop cross ghost split even without presenting cooperation among DE and dark matter (DM). Additionally when (m,n) take some particular worth all the age graphic-like DE models can be recuperated. This development is likewise relevant to the models with summed up future occasion skyline as the holographic size in a similar soul. For age-like holographic models, when $m=n$ it appears to be that DE has a similar way of behaving as the prevailing fixing in the early epochs of the universe which infer that DE may be bound together with DM. In any case, we need to acquaint some component with make DE go amiss from DM state, and at last become predominant and be answerable for the speed increase of the universe.

Now for the construction of (m,n)-Type HDE models we define the energy density [38-40] as,

$$\rho_{de} = \frac{3b^2}{L^2} \quad (4.8)$$

here b is treating as a constant and L is given by (4.7).

As we have constructed our model on the basis of (m,n) -type HDE in the GR theory and hence by utilizing Eq. (3.4), (4.7) and (4.8) we get the energy density of (m,n)-Type HDE cosmological model as:

$$3b^2\left[\left(e^{\beta t}-1\right)^{\frac{-2(n+\beta)}{\beta}}\left\{\frac{e^{-2\beta t}}{(n+\beta)^2\left(e^{\beta t}-1\right)^{2m/\beta}}\right\}\right]=\rho_{de} \qquad (4.9)$$

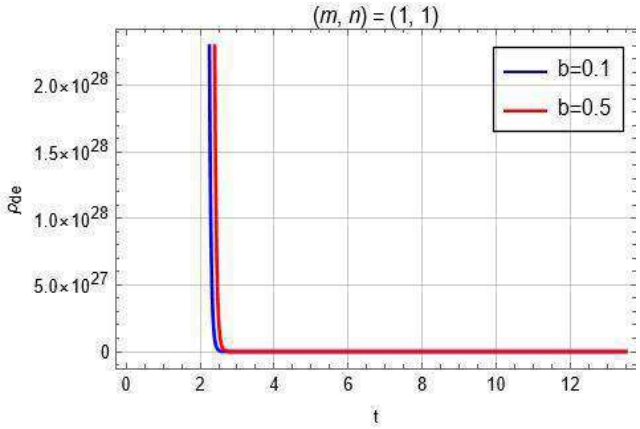
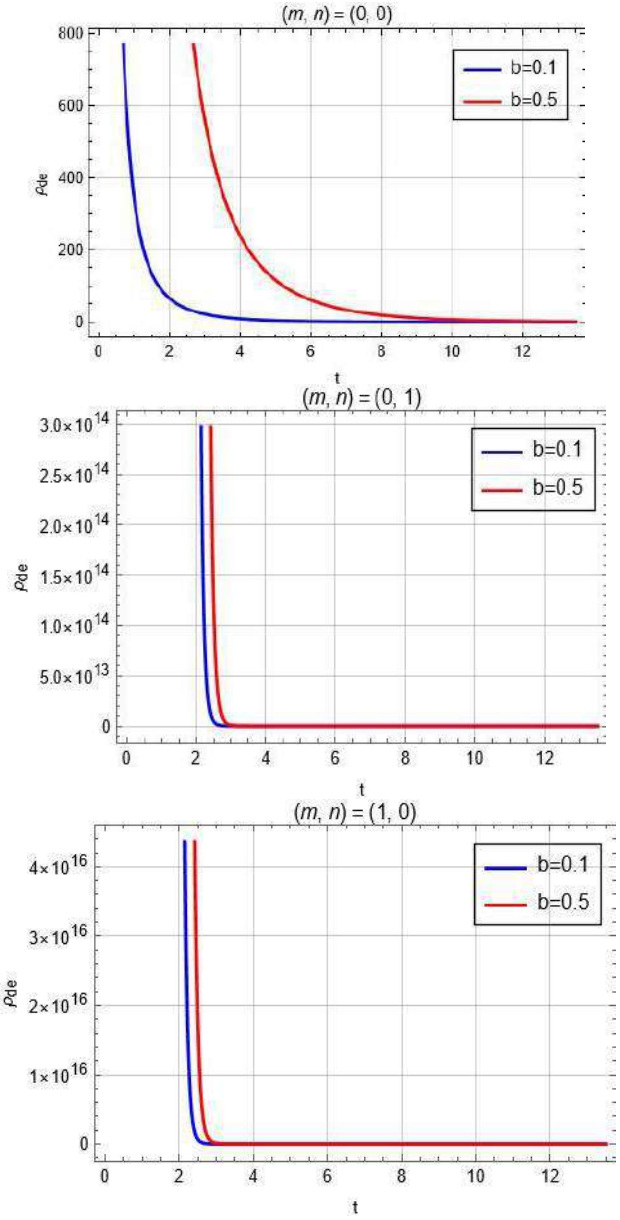
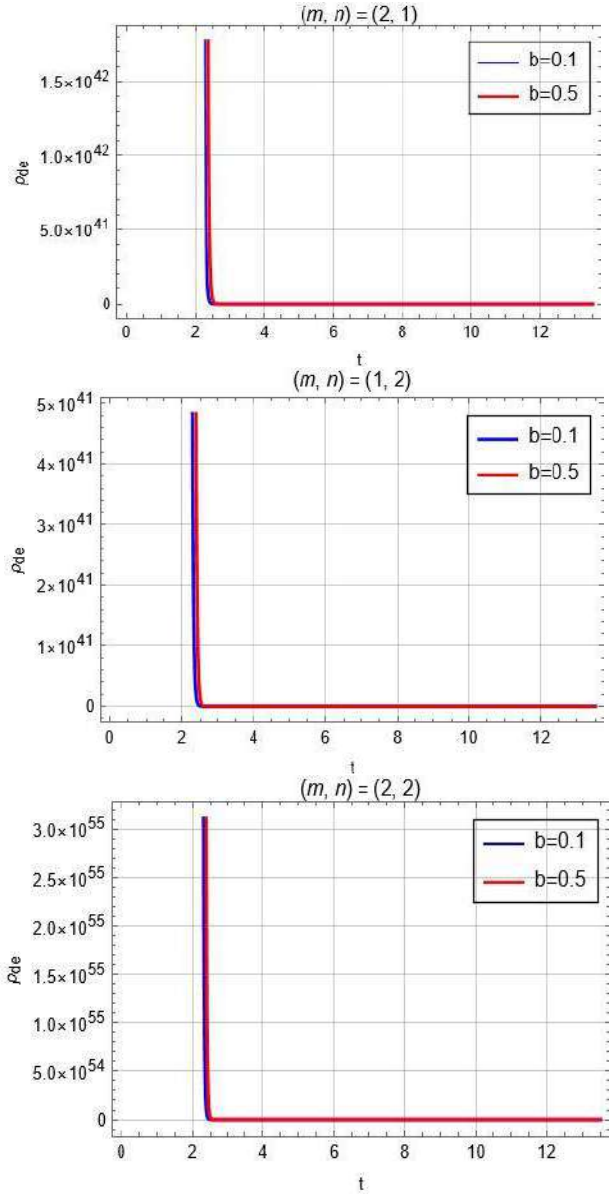


Figure 4.3: Shows the behaviour ρ_{de} Vs cosmic time (t)





In Figure 4.3 we have plotted the graph of energy density with cosmic time (t) for various positive values of $(m,n)=(0,0),(0,1),(1,0),(1,1),(1,2),(2,1)\&(2,2)$. Here for the value of constant $b=0.1\&b=0.5$ we got two (m,n) -type HDE cosmological models in the framework of GR as shown in Figure 4.3. Based on the analysis above, it is anticipated that this alteration will significantly alter the dark energy's asymptotic behaviour.

For $(m,n)=(0,0),(0,1),(1,0),(1,1),(1,2),(2,1)\&(2,2)$ the nature of energy density for both the models shows decreasing behaviour with varying cosmic time and for large values of t it became asymptotic. For $m=n=0$ both the models decreasing distinctly and for the large values of t it shows a constant asymptotic behaviour also here we can say that the model behaves like an ordinary HDE model. For $(m,n)=(1,2),(2,1)\&(2,2)$ etc., shows constant behaviour for all values of $t>0$ (Ref. Figure 4.3). When the parameters (m,n) are taken values in the authorized domain the model looks like a stable for HDE.

Also by utilizing Eqs.(3.5-3.6) together with Eqs.(4.8) and (2.7) we get the matter density of (m,n)-Type HDE cosmological model as:

$$\left[\frac{9(2m-1)}{(m+2)^2}-3\left(e^{\beta t}-1\right)^{\frac{4(1-m)}{\beta(m+2)}}\right] -3b^2\left[\left(e^{\beta t}-1\right)^{\frac{-2(n+\beta)}{\beta}}\left\{\frac{e^{-2\beta t}}{(n+\beta)^2\left(e^{\beta t}-1\right)^{2m/\beta}}\right\}\right]=\rho_{matt} \quad .(4.10)$$

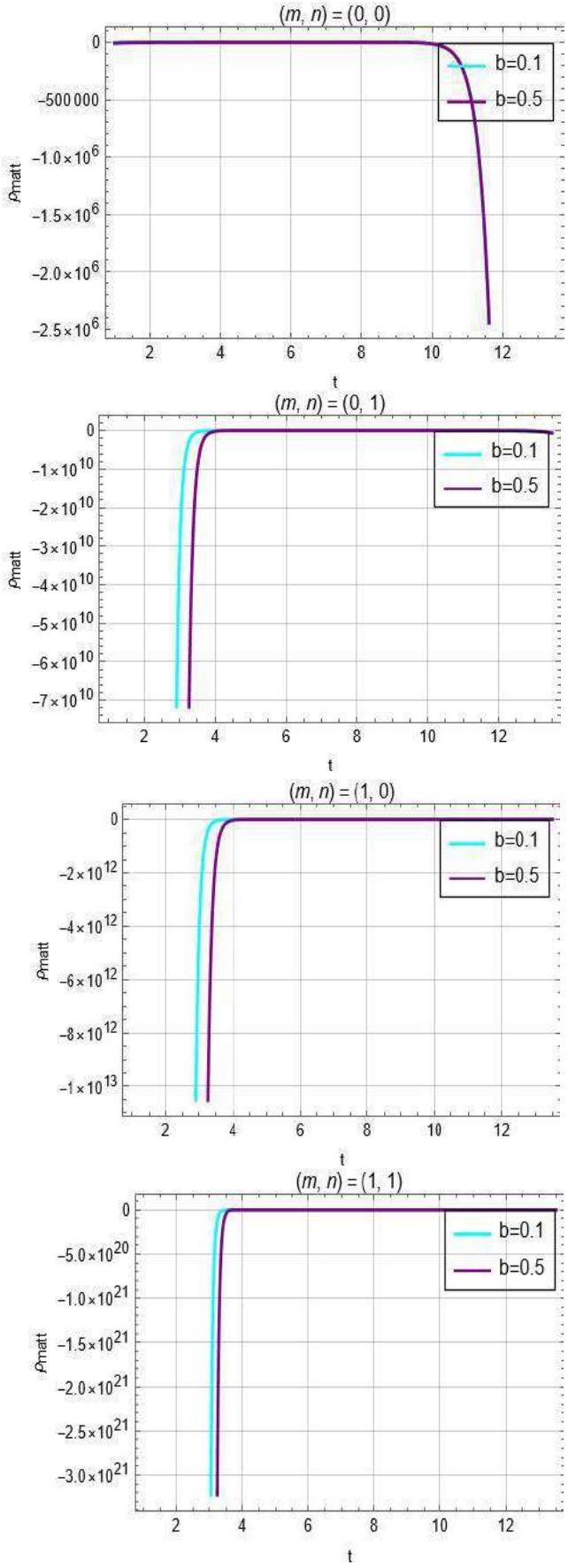


Figure 4.4: Shows the behavior ρ_{matt} Vs cosmic time (t)

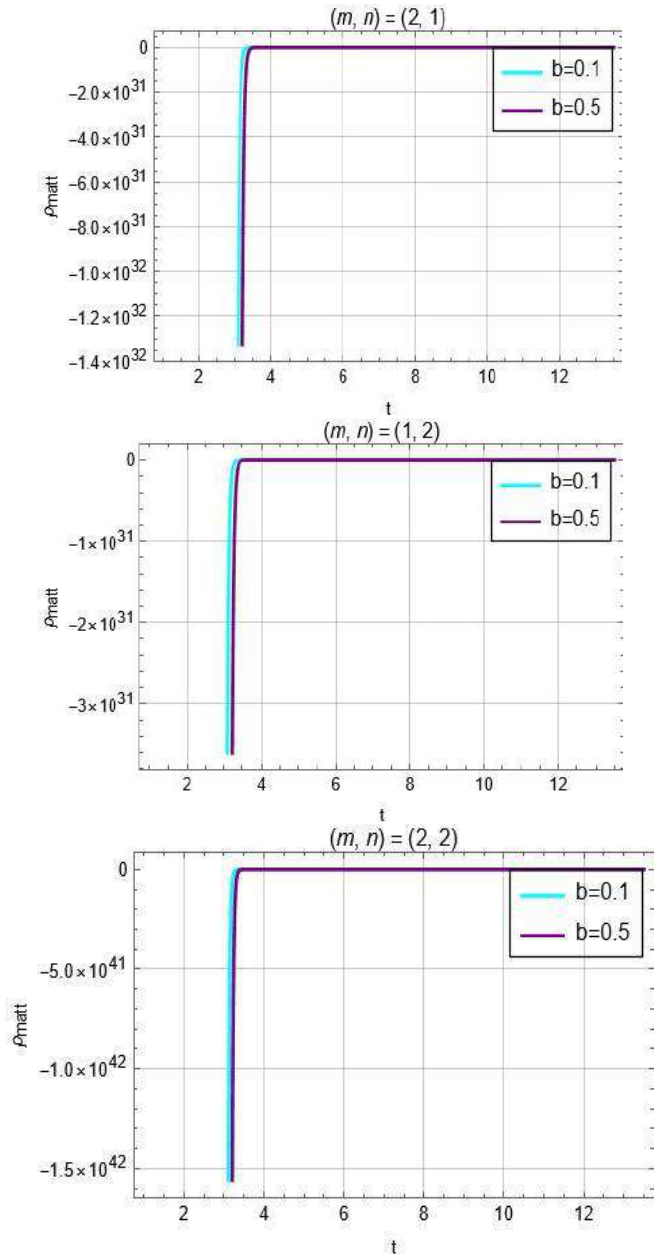


Figure 4.4: Shows the behaviour ρ_{matt} Vs cosmic time (t)

In Figure 4.4 we have plotted the graph of matter energy density with cosmic time (t) for various positive values of $(m,n)=(0,0),(0,1),(1,0),(1,1),(1,2),(2,1)\&(2,2)$. Here for the value of constant $b=0.1\&b=0.5$ we got two (m,n) -type HDE cosmological models in the framework of GR as shown in Figure 4.4. Based on the analysis above, it is anticipated that this alteration will significantly alter the dark matter shows asymptotic behaviour.

For $(m,n)=(0,0),(0,1),(1,0),(1,1),(1,2),(2,1)\&(2,2)$ the nature of matter energy density for both the models shows decreasing behaviour with varying cosmic time and for large values of t it became asymptotic. For $m=n=0$ both the models have merged and for the large values of, t it shows the constant asymptotic behaviour and here we can also say that, the model behaves like an ordinary HDE model. For $(m,n)=(1,2),(2,1)\&(2,2)$ etc., shows a constant behaviour for all values of $t>0$ (Ref. Figure (4.4). For the suitable choice of (m,n) in the authorized domain the model looks like a stable for DM.

The overall energy density parameter of the (m,n)-Type HDE cosmological model is found out as:

$$\Omega=\left[\Omega_{de}\left(\frac{\rho_{de}}{3H^2}\right)+\Omega_{matt}\left(\frac{\rho_{matt}}{3H^2}\right)\right]$$
$$=\left[\frac{\left\{3(2m-1)\left(e^{\beta t}-1\right)^2-(m+2)^2\left(e^{\beta t}-1\right)^{\frac{4(1-m)}{\beta(m+2)}-2}\right\}}{(m+2)^2e^{2\beta t}}\right] \quad (4.11)$$

V. CONCLUSION

As a generalization of the common holographic dark energy (HDE) models seen in the literature, we have developed a (m,n) type HDE model in this study. Such a generalization gives us greater theoretical room to accommodate the observable evidence at the phenomenological level. We have determined the fundamental limits on the values of (m,n) and examined the general characteristics of age-like HDE models in different epochs of the cosmos. In the situation of $m=n$, age-like holographic representations are unique. We have discovered that our model meets every prerequisite needed to be considered a dark energy (DE) candidate. According

to the initial numerical study, our model fits the observational data quite well.

The model's graphical behaviour led us to make the following discussions:

For the various values of $(m,n)=(0,0),(0,1),(1,0),(1,1),(1,2),(2,1)\,\&\,(2,2)$ we experienced the pressure of (m,n) -type HDE cosmological model which is negative (Figure 4.2), energy density of (m,n) -type HDE cosmological model is positive (Figure 4.3) and also the nature of matter density of (m,n) -type HDE cosmological model shown in (Figure 4.4). We therefore draw the conclusion that the above model is stable for the current universe or the most recent astronomical measurements based on these findings.

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इतिहासाचार्य वि. का. राजवाडे मंडळ, धुळे
या संस्थेचे त्रैमासिक

।। संशोधक।।

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- प्राचार्य डॉ. अनिल माणिक बैसाणे
- प्रा. डॉ. मृदुला वर्मा
- प्रा. श्रीपाद नांदेडकर

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दूरध्वनी (०२५६२) २३३८४८, ९४२२२८९४७१, ९४०४५७७०२०

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कार्यालयीन वेळ

सकाळी ९.३० ते १.००, सायंकाळी ४.३० ते ८.०० (रविवारी सुट्टी)

लेख सदस्यता वर्गणी : रु. २५००/–

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संविधानातील राज्यनितीच्या मार्गदर्शक तत्वांनी बजावलेली कामगिरी

प्रा.डॉ.जयवंत निवृत्ती कांबळे
मा.सु.पा.महाविद्यालय मानोरा

प्रस्तावना :

भारतीय संविधानाच्या चौथ्या भागामध्ये राज्यनितीच्या मार्गदर्शक तत्वांचे विवेचन करण्यात आले आहे. स्पेनच्या राज्यघटनेमध्ये अशा प्रकारची तत्वे सर्वप्रथम समाविष्ट करण्यात आली होती. त्यानंतर आयर्लंडच्या राज्यघटनेमध्ये अशा प्रकारचे प्रकरण समाविष्ट करण्यात आले. आधुनिक काळातील श्रीलंकेच्या राज्य घटनेत सुध्दा मार्गदर्शक तत्वे आढळून येतात. भारतीय संविधानातील अनेक प्रकरणापैकी राज्यनितीच्या मार्गदर्शक तत्वाचे अतिशय महत्वाचे एक प्रकरण आहे. किंबहूना ते एक प्रमुख प्रकरण आहे. राज्यनितीची मार्गदर्शक तत्वे भारताच्या राज्यघटनेचे एक प्रमुख वैशिष्ट्ये होय. लोकशाही राज्यव्यवस्था परिणामकारक व यशस्वी रितीने कार्यान्वित करायची असेल तर त्यासाठी सरकारांनी कसे वागावे या विषयीचे मार्गदर्शन या तत्वातून करण्यात आले आहे. प्रस्तुत लघुशोध निबंधामध्ये भारताच्या राज्यघटेतील राज्यनितीच्या मार्गदर्शक तत्वांनी कोणती जबाबदारी पार पाडली याची मांडणी करण्यात आली आहे.

मार्गदर्शक तत्वाचे स्वरुप :

केंद्र व राज्य सरकारांनी निरनिराळ्या बाबतीत कायदे करतांना कोणते धोरण स्विकारले पाहिजे याबाबतीत अतिशय सुंदर सुचना या प्रकरणामध्ये देण्यात आल्या आहेत. भारतीय राज्यघटनेच्या चौथ्या भागातील कलम ३६ ते ५१ पर्यंतच्या कलमापर्यंत या प्रकरणाचे सविस्तर विवेचन करण्यात आले आहे. ३७ व्या कलमामध्ये या तत्वांच्या स्वरुपाचे विवेचन करण्यात आले आहे. या कलमात असे नमुद करण्यात आले आहे की, कोणत्याही न्यायालयामार्फत राज्यनितीच्या मार्गदर्शक तत्वांची अंमलबजावणी होणार नाही. तथापी देशाचा कारभार चालवत असतांना हि तत्वे मुलभूत समजली जातील व विधीनियम तयार करतांना या तत्वांना प्राधान्य देणे हे सरकारचे कर्तव्य राहिल.

भारतीय जनतेच्या विकासाठी अनेक आदर्शभूत तत्वे मान्य करणे आवश्यक आहे, याची घटनाकार डॉ. बाबासाहेब आंबेडकर यांना जाणीव होती. परंतु या सर्व तत्वांचा मुलभूत हक्कामध्ये समावेश करणे शक्य नव्हते. त्यामुळे हि राज्यनितीची मार्गदर्शक तत्वे एका स्वतंत्र प्रकरणामध्ये सांगण्यात आली आहेत. थोडक्यात सांगायचे झाल्यास ज्या तरतुदी करणे आवश्यक होते परंतु आर्थीक व सामाजिक परिस्थितीमध्ये शक्य नव्हते. त्या तरतुदीचा समावेश या प्रकरणामध्ये करण्यात आला आहे. या तत्वाची सरकारने अंमलबजावणी केली नाही तर सरकारला न्यायालयात खेचले जाऊ शकत नाही.

संविधान सभेमध्ये भाषण करतांना मार्गदर्शक तत्वांच्या स्वरुपाविषयी डॉ. बाबासाहेब आंबेडकरांनी पुढीलप्रमाणे उद्गार काढले, मार्गदर्शक तत्वे हे दुसरे तिसरे काही नसून १९३५ च्या कायद्याने गव्हर्नर जनरल व प्रांतांचे गव्हर्नर यांना जे सुचनापत्रक पाठविले जात असे त्यांचेच दुसरे नाव होय. दोघात फरक इतकाच आहे की, सुचनापत्रक फक्त कार्यकारी सत्तेला उद्देशून पाठविले जाई आणि मार्गदर्शक तत्वांचा उद्देश राज्याला मार्गदर्शन करणे हा आहे. म्हणजेच कार्यकारी मंडळ व विधीमंडळ या दोघांसाठी हि तत्वे सांगण्यात आली आहेत.

मार्गदर्शक तत्वाचे वर्गीकरण :

राज्यनितीच्या मार्गदर्शक तत्वाच्या प्रकरणामध्ये आर्थीक, सामाजिक, शैक्षणीक, वैधानिक व परराष्ट्र संबंधाविषयी अनेक प्रश्नांचा उहापोह करण्यात आला आहे. परंतु खुद्द घटनेमध्ये या तत्वांचे तर्कशुध्द वर्गीकरण देण्यात आले नाही. वेगवेगळ्या लेखकांनी आपआपल्या परिने या तत्वांचे वर्गीकरण करण्याचा प्रयत्न केला आहे. विवेचन करतांना या तत्वांचे चार गट पाडता येतील.

१) आर्थीक तत्वे २) सामाजिक तत्वे ३) राजकीय तत्वे ४) आंतरराष्ट्रीय संबंध विषयक तत्वे.

मार्गदर्शक तत्वांच्या अनुषंगाने पार पाडलेली कामगिरी :

संविधान सभेमध्ये ज्या पक्षाचे वर्चस्व होते त्याच पक्षाकडे प्रदिर्घकाळ सत्ता राहिल्यामुळे मार्गदर्शक तत्वांचे वेगवेगळ्या क्षेत्रात पालन करण्याचा सरकारने प्रयत्न केल्याचे दिसून येते.

या मार्गदर्शक तत्वामुळे प्रभावीत होऊन सरकारने जे काही सुधारणा विषयक कायदे केले आहेत. त्याचा आढावा खालीलप्रमाणे घेता येईल.

१) न्याय विभागाला कार्यकारी विभागाकडून वेगळे ठेवण्याचे तत्व :

हे तत्व देशातील बहुतेक राज्यांनी मान्य केलेले आहे. आसाम, महाराष्ट्र, गुजरात, पंजाब, मद्रास, केरळ इत्यादी राज्यांमध्ये अशा प्रकारचे सत्ता विभाजन मोठ्या प्रमाणावर करण्यात आले आहे.

२) ग्रामपंचायतीचा स्विकार :

शासन व्यवस्थेतील सर्वात लहान घटक म्हणून ग्रामपंचायतीचा स्विकार देशातील सर्वच राज्यांनी केलेला आहे. भारतातील कोणतेही खेडे ग्रामपंचायतीशिवाय राहु नये याची सर्वच राज्यांनी दखल घेतली आहे. आज महाराष्ट्रामध्ये सर्वच खेड्यात ग्रामपंचायती असून त्यांना चांगला विकास निधी सुध्दा मिळत आहे.

३) उत्पादनाची साधने खाजगी क्षेत्राच्या हातात राहु नयेत :

यासाठी निरनिराळ्या आणि मोठ मोठे प्रकल्प सरकार स्वतःकडे घेत आहे. भाक्रानांगल, हिराकुंड व दामोदर खोरे ही धरणे, भिलाई दुर्गापूर व राऊरकेला येथील लोखंड व पोलादाचे कारखाणे विशाखापटणम येथील जहाजबांधणी कारखाना, सिन्द्री येथील खताचा कारखाना यासारखे मोठमोठे उद्योगधंदे सरकारी मालकीचे असून त्यामुळे खाजगी व्यक्तीच्या खिशात संपत्ती केंद्रीत होण्याच्या प्रकाराला आळा बसला होता. परंतु आता सरकारने खाजगीकरणाच्या धोरणाला पसंती दिल्यामुळे हळूहळू अनेक सरकारी उद्योग धंद्याचे खाजगीकरण होत आहे आणि त्यामुळे अदाणी, अंबानी सारख्या खाजगी व्यक्तींच्या खिशात देशातील संपत्तीचे केंद्रीकरण होण्याचा धोका निर्माण झाला आहे.

४) बँकांचे राष्ट्रीयकरण :

जनतेच्या हिताच्यादृष्टीने जास्तीत जास्त भांडवल सरकारच्या हाती असावे. यादृष्टीने श्रीमती इंदिरा गांधी यांनी प्रधानमंत्री असतांना चौदा बड्या बँकाचे राष्ट्रीयकरण करण्यात आले असून देशातील रिक्षा चालकापासून तर लहान शेतकर्यापर्यंत सामान्य माणसाला स्वस्त दरात कर्ज उपलब्ध करुन देण्यात येत आहे. तसेच बँकाच्या भांडवलाचा उपयोग जनतेच्या हिताच्यादृष्टीने करणे सरकारसाठी शक्य झाले आहे. आतापर्यंत शेतकऱ्यांना अनेकवेळा कर्ज माफि देणे सुध्दा यामुळे शक्य झाले आहे.

५) मागासवर्गीय जनतेचे कल्याण :

आजपर्यंत मागासवर्गीय जाती जमातीच्या कल्याणासाठी त्यांना सवलती देण्यासाठीच्या मार्गातील अडचणी पाहिली घटना दुरुस्ती कायद्याने दुर करण्यात आल्या आहेत. लोकसभा विधानसभेमध्ये अनुसूचित जाती व जमातीसाठी २६ जानेवारी १९६० पर्यंत जागा राखीव ठेवण्याची तरतुद मुळ राज्यघटनेमध्ये होती. परंतु त्यामध्ये आणखी मुदतवाढ देऊन आजपर्यंत ह्या जागा राखीव ठेवण्यात आल्या आहेत. एवढेच नव्हे तर स्थानिय स्वराज्य संस्था, सरकारी नौकर्या व शिक्षण संस्था मधून मागास जाती जमाती साठी जागा राखीव ठेवण्यात आल्या आहेत आणि अजुनही अनेक मागास जातींना आरक्षण देण्याचा सरकार प्रयत्न करतांना दिसत आहे.

६) जमिनदारी नष्ट करणे :

देशातील जमिनदारी पध्दत नष्ट करण्यासाठी जवळ जवळ सर्वच राज्य सरकारानी कसोसीने प्रयत्न केले आहेत. त्यासाठी चारवेळा घटना दुरुस्ती करावी लागली. त्यामुळे आज देशातील पुर्वीची जमिनदारी पध्दत नष्ट झाली आहे.

७) प्राथमिक शिक्षण सक्तीचे व मोफत :

१४ वर्ष वयोगटापर्यंत सर्वांना प्राथमिक शिक्षण सक्तीचे व मोफत करण्यात आल्यामुळे देशामध्ये शिक्षणाचा मोठ्या प्रमाणावर प्रसार होत आहे.

८) दारुबंदीचे धोरण :

देशातील काही राज्यांनी आपआपल्या राज्यात पुर्णपणे दारुबंदी केली आहे आणि उर्वरीत राज्यात सुध्दा दारुबंदीची मागणी होत आहे.

९) श्रमीकांच्या शोषणाविरुध्द कायदे :

मीनिमम वेजेस ॲक्ट, गुमास्ता ॲक्ट, फॅक्टरी ॲक्ट यासारखे कायदे करुन कामाचे तास, रजेचे दिवस, विश्रांतीची वेळ, जास्त कामाचा मोबदला, किमान वेतन, मजुरांना द्यायच्या सोयी इत्यादी तरतुदी करण्यात आल्या आहेत. स्त्रि कामगारांना प्रसुतीच्यावेळी पगारी रजा स्त्री व पुरुष कामगारांना समान वेतन दिले जाते. बालकामगारावर प्रतिबंध करण्यात आला आहे.

निष्कर्ष :

१) स्वतंत्र भारतात आजपर्यंत मानवतेच्या दृष्टीकोणातून सरकारकडून जि कामे झालेली आहेत. त्याचे श्रेय भारतीय राज्यघटनेतील राज्यनितीच्या मार्गदर्शक तत्वांना द्यावे लागेल.

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२) मागासजाती व जमातीच्या उत्कर्षासाठी सरकारने आजपर्यंत जी धोरणे आखुण, त्याची अंमलबजावणी केल्यामुळे पुर्वी पेक्षा या जातींना सामाजिक न्याय देण्याची प्रक्रिया सुरु आहे. हि बाब सुध्दा राज्यनितीच्या मार्गदर्शक तत्वामुळे सरकारांना करता येणे शक्य होऊ शकेल.

३) सरकारने मार्गदर्शक तत्वांच्या अंमलबजावणीकडे पाहिजे त्या प्रमाणात लक्ष देण्यात आले नाही. अशी अनेकदा टिका केली जात असते. आजही सामान्य लोकांच्या जिवनात फारसा फरक पडला नाही. त्यांचे जिवन जास्त कठीण व अवघडत बनत आहे. शिक्षण, अन्न व आरोग्यासारखे प्रश्न अजुन पुर्णपणे सुटलेले नाहीत. सरकार हे प्रश्न सोडविण्याचे प्रयत्न करतात. परंतु भ्रष्टाचारामुळे हे प्रश्न पुर्णपणे सुटत नाहित.

संदर्भ ग्रंथ :

१) ''भारताचे संविधान'' लेखक :- प्रा. बि.टि. देशमुख

२) १९७८ च्या ४४व्या घटनादुरुस्ती कायद्याचे कलम ३८ (१) नंतर ३८ (२)

३) ''डेमॉक्रॉटीक गव्हमेंट इन इंडिया'' लेखक :- अलेन ग्लेडहिल

४) ''दि रिपब्लिकन ऑफ इंडिया'' लेखक : अलेन ग्लेडहिल

५) राज्यघटनेतील कलम १४ व कलम १९

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IPO PERFORMANCE IN THE INDIAN STOCK MARKET: A COMPREHENSIVE ANALYSIS

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Abstract

Initial Public Offerings (IPOs) are one of the most significant ways for companies to raise capital and for investors to gain a stake in a company's growth potential. The Indian stock market, particularly in recent years, has seen a dramatic surge in IPO activity. This article presents a comprehensive analysis of IPO performance in India, focusing on the period from 2018 to 2024. Through this analysis, we aim to explore the key trends, factors influencing IPO performance, sector-specific patterns, and the impact of subscription levels and pricing strategies on the post-listing performance of IPOs.

Introduction

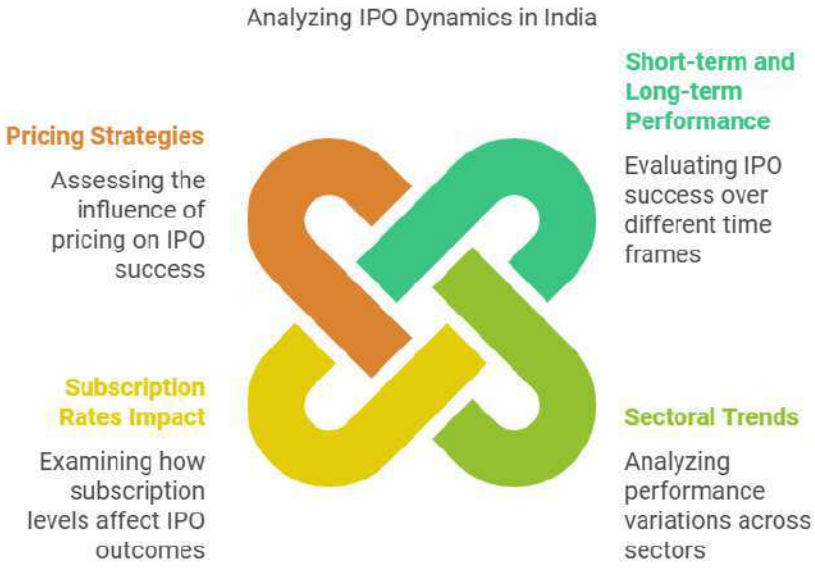
The Indian stock market has emerged as one of the fastest-growing equity markets in the world, fuelled by a burgeoning middle class, digitalization, and strong investor interest. One of the most popular methods for companies to raise capital in India is through the IPO process, where they offer shares to the public for the first time. IPOs provide an opportunity for investors to buy into emerging businesses with high growth potential. However, the performance of IPOs, particularly in emerging markets like India, can be volatile and influenced by various factors such as market sentiment, pricing strategies, and overall economic conditions.

In recent years, there has been a substantial increase in the number of IPOs in India, making it a rich area for research. This paper delves into IPO performance across different time periods, sectors, and market conditions, while exploring the factors contributing to the success or failure of these IPOs. The study also includes visual representations of key data trends, helping to illuminate patterns in the performance of Indian IPOs.

Key Objectives

The objective of this study is to:

1. **Evaluate the short-term and long-term performance of IPOS in India.**
2. **Analyse sectoral trends in the Indian IPO market.**
3. **Examine the impact of subscription rates on the post-listing performance of IPOS.**
4. **Assess the role of pricing strategies in IPO outcomes.**



Methodology

This research employs both qualitative and quantitative methods, using data from major Indian stock exchanges like the Bombay Stock Exchange (BSE) and the National Stock Exchange (NSE). A data set covering IPOs listed from 2018 to 2024 is analyzed, focusing on variables such as initial listing performance, post-listing returns, and the influence of factors like pricing methods and subscription rates. For graphical representation, data on the year-wise number of IPOs, sectoral performance, and the relationship between subscription rates and IPO returns are presented.

IPO Activity in India: An Overview

India has witnessed a substantial increase in IPO activity over the past few years. The year 2021 marked a record year for IPOs in India, with companies raising billions of dollars through public offerings. According to data from the National Stock Exchange, 2021 saw the listing of companies such as Zomato, Nykaa, and Paytm, each of which raised significant capital and generated substantial investor interest. However, the performance of these IPOs has varied significantly, with some enjoying strong post-listing growth, while others, such as Paytm, saw steep declines.

Sectoral Performance of IPOs

The Indian stock market is diverse, with IPOs spanning various sectors including technology, pharmaceuticals, real estate, and finance. Analysing sector-specific performance reveals which sectors are more likely to succeed in the IPO market.

1. **Technology and Fintech**

   Technology-driven IPOs, especially in sectors like fintech, digital services, and e-commerce, have seen tremendous success in India. The success of companies like Zomato, Nykaa, and Policybazaar demonstrates that investor appetite for digital-first companies is high. These companies not only raised significant capital but also saw positive returns post-listing.

2. **Healthcare and Pharmaceuticals**

   Healthcare IPOs in India have been moderately successful, with companies such as Medanta and KIMS Hospitals gaining investor interest. These companies have performed well due to the growing demand for healthcare services in India, particularly post-pandemic.

3. **Real Estate and Infrastructure**

   On the other hand, IPOs in the real estate and infrastructure sectors have been more volatile. While some have shown growth, many have faced challenges due to macroeconomic conditions like rising interest rates and inflation, which affect the affordability of real estate investments.

Subscription Levels and IPO Performance

One of the key factors influencing IPO performance is the level of subscription during the offer period. A higher subscription rate typically indicates strong investor interest, which often leads to a successful listing.

1. **Highly Subscribed IPOs**

   IPOs that are oversubscribed (10x or more) tend to perform well on listing day, as demand for shares exceeds supply, driving up the stock price. Companies like Zomato and Nykaa were highly subscribed and witnessed significant listing gains. These IPOs saw subscription levels in the range of 30x to 100x, reflecting robust investor confidence.

2. **Moderate Subscription IPOs**

   IPOs with moderate subscription (3x to 5x) tend to show more mixed results, where some IPOs perform well, while others stagnate or face corrections. Companies in traditional sectors, such as infrastructure, often fall into this category.

3. **Under-subscribed IPOs**

   Under-subscribed IPOs are often a cause for concern, indicating lackluster interest from investors. Companies that fail to attract sufficient subscription often face poor listing performance and struggle to gain momentum post-listing.

Pricing Strategies: Book Building vs. Fixed Pricing

The pricing of an IPO plays a crucial role in determining its performance post-listing. In India, two primary pricing strategies are used: fixed pricing and book-building.

1. **Book Building Method**

   Under the book-building method, the company sets a price band, and investors place bids within that range. This method generally leads to more accurate pricing, as it takes into account investor demand. Book-building IPOs have performed better in terms of post-listing gains.

2. **Fixed Pricing Method**

   Fixed pricing involves setting a fixed price for the shares, often based on the company's estimated valuation. IPOs using this method can sometimes be overvalued, leading to poor post-listing performance.

Long-Term Performance of IPOs

While initial returns are an important indicator, the long-term performance of IPOs is also a crucial factor for investors. Research shows that the performance of IPOs varies significantly in the long run, with some IPOs continuing to perform well, while others lose value after the lock-in period expires.

1. **Successful Long-Term IPOs**

   IPOs in sectors like technology and e-commerce often perform well over time, as they benefit from continued growth in their respective industries. For example, Zomato and Nykaa have continued to see growth, albeit with fluctuations.

2. **Underperforming IPOs**

   IPOs in traditional sectors, especially in infrastructure and real estate, often face a slowdown after their listing due to economic conditions such as rising interest rates or market corrections.

Conclusion

The Indian IPO market has experienced significant growth in recent years, with many IPOs offering substantial returns to investors. However, the success of these IPOs depends on several factors, including market sentiment, subscription levels, sectoral trends, and pricing strategies. While some sectors, particularly technology and fintech, have consistently outperformed others, IPOs in traditional sectors have faced more volatility. The correlation between high subscription levels and strong listing performance is evident, as is the influence of pricing methods on post-listing gains.

Investors need to carefully analyse various factors, including the company's sector, subscription levels, and market conditions, before investing in IPOs. Future research could explore the role of institutional investors in IPO success and examine the impact of global economic trends on the performance of Indian IPOs.

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Digital India and E-Commerce Growth: Transforming India's Economic Landscape

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Abstract

The Digital India initiative, launched in 2015, has been a driving force behind the rapid growth of e-commerce in India. This essay examines the interplay between the two, exploring how advancements in digital infrastructure, policy support, and changing consumer behaviors have contributed to the sector's expansion. It delves into statistical trends, the role of rural markets, and the impact on MSMEs, while also addressing the challenges and future prospects of e-commerce in India. Through case studies and analysis, the essay highlights the transformative potential of digital initiatives in creating a robust and inclusive e-commerce ecosystem.

Keywords: Digital India, e-commerce, rural markets, MSMEs, digital infrastructure, policy support, financial inclusion, technological innovation

Introduction

Digital India, launched in 2015, aims to transform India into a digitally empowered society and knowledge economy. The initiative has played a pivotal role in fostering technological innovation, financial inclusion, and socio-economic progress. Among its most significant beneficiaries has been the e-commerce sector, which has experienced exponential growth over the past decade. This essay explores the symbiotic relationship between Digital India and the expansion of e-commerce, delving into its enablers, statistical trends, challenges, and future opportunities while examining the impact of policy measures on creating a vibrant digital commerce ecosystem.

Growth of E-Commerce in India

India's e-commerce market has witnessed remarkable growth, driven by factors such as increased internet penetration, smartphone adoption, and supportive government initiatives. In 2022, the market was valued at $83 billion and is projected to reach $200 billion by 2027. With over 900 million internet users in 2023, approximately half of them are actively participating in online shopping. Mobile platforms have become a dominant channel for these transactions, with more than seventy percent of e-commerce purchases conducted through mobile devices. Furthermore, the rural e-commerce market has emerged as a significant growth area, expanding at an annual rate of thirty percent between 2018 and 2023.

Role of Digital Infrastructure

The Digital India program has laid the groundwork for this e-commerce boom in several ways. One of the key contributions has been the enhancement of digital infrastructure. The BharatNet project, which connects over 2.5 lakh gram panchayats with high-speed internet, has bridged the connectivity gap in rural areas. Additionally, the rollout of 4G and 5G networks has ensured seamless access to digital services across urban and rural regions alike. Another significant factor has been the proliferation of digital payment systems. Platforms like UPI, which recorded ten billion monthly transactions in 2023, have made online transactions quick, secure, and accessible. Initiatives such as the introduction of digital wallets and apps like Paytm and PhonePe have further simplified the payment process for users.

Policy Support for E-Commerce Growth

Policy support has also played a critical role in fostering the growth of e-commerce under the Digital India initiative. E-governance reforms, such as simplifying GST compliance for e-commerce entities, have eased the regulatory burden on businesses. Furthermore, government initiatives like Startup India and Make in India have created an enabling environment for entrepreneurship, encouraging innovation and investment in the digital commerce sector. The Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA), aimed at improving digital literacy among rural populations, has equipped millions with the skills necessary to participate in the digital economy.

Changing Consumer Behavior

The widespread adoption of digital technologies has also brought about significant changes in consumer behavior. Online shopping has become the preferred mode for a growing number of Indians, thanks to the convenience, variety, and competitive pricing it offers. Consumers increasingly value the ability to compare products, read reviews, and access personalized recommendations. The advent of omnichannel retailing—where businesses integrate their online and offline operations—has further enhanced the shopping experience by offering greater flexibility and choice. Companies like Reliance Retail and Tata Cliq have effectively implemented this model, blending physical stores with e-commerce platforms to meet the evolving preferences of their customers.

Rural India: A New Frontier for E-Commerce

Rural India, often perceived as a challenging market for e-commerce, has emerged as a promising area for growth. The availability of affordable smartphones and localized logistics solutions has facilitated the expansion of digital commerce in rural areas. Initiatives like Amazon Saheli, which empowers rural women entrepreneurs by providing them access to online markets, have been particularly impactful. For instance, Amazon Saheli reported a sixty percent increase in sales in 2023, underscoring the potential of e-commerce to drive socio-economic empowerment in underserved regions. Government programs like PMGDISHA and the establishment of Common Service Centres (CSCs) have further bridged the digital divide, enabling rural consumers and small businesses to benefit from digital platforms.

Contribution of MSMEs to E-Commerce Growth

Micro, Small, and Medium Enterprises (MSMEs) are another critical segment driving the growth of e-commerce in India. Over 1.5 million MSMEs have joined online marketplaces, leveraging digital platforms to reach a broader customer base. These businesses have benefited not only from increased visibility but also from access to global markets through initiatives like Amazon Global Selling. Government schemes such as MUDRA loans and the Digital MSME Scheme have provided financial and technical support, encouraging MSMEs to embrace digital tools and platforms.

Challenges Facing E-Commerce in India

Despite its impressive growth, the e-commerce sector faces several challenges that need to be addressed to sustain its momentum. Logistics and last-mile delivery remain significant hurdles, particularly in rural and remote areas where infrastructure is underdeveloped. Data privacy and cybersecurity concerns are another pressing issue, with incidents of data breaches and online fraud undermining consumer trust. Regulatory

complexities, including foreign direct investment (FDI) restrictions and evolving e-commerce policies, add to the challenges faced by businesses. Furthermore, a considerable portion of the population still lacks digital literacy, limiting their ability to engage with e-commerce platforms effectively.

Government Measures to Address Challenges

The Indian government has implemented a range of measures to overcome these challenges and foster e-commerce growth. The National E-Commerce Policy outlines guidelines for consumer protection, data privacy, and FDI in e-commerce, providing a clear regulatory framework for the sector. Production-Linked Incentive (PLI) schemes have been introduced to support domestic manufacturing and exports, further strengthening the supply chain. The Open Network for Digital Commerce (ONDC), a government-backed initiative, aims to democratize e-commerce by enabling small retailers to access digital platforms, thereby reducing dependency on major players like Amazon and Flipkart. Digital literacy campaigns continue to be a priority, with training programs designed to equip rural and semi-urban populations with the skills necessary to navigate the digital landscape.

Future Prospects for E-Commerce

Looking ahead, the e-commerce sector in India holds immense potential for further growth and innovation. Technological advancements such as artificial intelligence, blockchain, and the Internet of Things (IoT) are expected to enhance operational efficiency and customer experiences. Personalization and predictive analytics, powered by big data, will allow businesses to offer tailored shopping experiences, increasing customer satisfaction and loyalty. Cross-border trade represents another significant opportunity, with Indian businesses leveraging global marketplaces to expand their reach. Sustainability initiatives, such as eco-friendly packaging and carbon-neutral supply chains, are also gaining importance as consumers become more environmentally conscious.

Case Studies: Success Stories in Digital Commerce

Several case studies highlight the transformative impact of Digital India on e-commerce. Flipkart's Big Billion Days sale, for example, has become an annual phenomenon, with the 2022 event recording a thirty-five percent increase in sales compared to the previous year. This growth was driven largely by participation from rural and Tier-II cities, showcasing the widening reach of e-commerce. Similarly, the pilot phase of the ONDC project has demonstrated the potential of an open network to empower small retailers, enabling them to compete on a level playing field with established e-commerce giants.

Conclusion

In conclusion, the synergy between Digital India and the growth of e-commerce has reshaped India's economic landscape, fostering financial inclusion, entrepreneurship, and technological innovation. While challenges remain, the continued focus on policy reforms, technological advancements, and rural market penetration holds immense promise for the future. By addressing these challenges and leveraging emerging opportunities, India can establish itself as a global leader in the e-commerce domain, driving sustainable economic growth and digital empowerment for its citizens.

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