

Major Research Project Report

**STUDIES ON INCIDENCE AND EXTENT OF PESTICIDE
RESIDUE IN NATURAL WATER RESERVIORS IN WASHIM
DISTRICT OF VIDARBHA REGION**

Submitted to

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Final Major Project Report

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Title: - “STUDIES ON INCIDENCE AND EXTENT OF PESTICIDE RESIDUES IN NATURAL WATER RESERVOIRS IN WASHIM DISTRICT ON VIDARBHA REGION.”

Amount Sanction: - 9, 33,000/-

Introduction: -

The term Pesticide is a composite term that includes all chemicals that are used to kill or control pest. Pesticide is a substance intended for preventing, destroying, repelling or migrating pests. A substance intended for use as plant growth regulator, defoliant or desiccant is also classified as pesticide. Pesticides are classified into insecticides, fungicides, herbicides or weedicides, acaricides, nematicides based on the target pest.

The fundamental contribution to the green revolution has been the development and application of pesticides for the control of wide variety of insectivores and herbivores pests that would otherwise diminishes the quantity and quality of food products. The use of pesticides coincides with chemical age which has transformed society since the 1950.

The agricultural use of pesticides is a subset of the larger spectrum of industrial chemical use in the modern society. The American Chemical Society database indicates in 1993 with some 500000 new compounds being added annually. In the Great lakes of North America for example the joint commission has estimated that there are more than 200 chemicals of concern in water and sediments of the Great lakes.

Pesticides are classified into five groups based on their structure viz, Organochlorine, organophosphate, carbamate, pyrethroids and others. Organochlorine pesticides are hydrocarbon that contains chlorine atoms and most of them are highly persistent, carcinogenic and mutagenic. DDT, DDE, Endosulfan, dicofol, Lindane, Heptachlore, methoxychlor, Chlorodane belong to

this group. Most of them are banned except endosulfan, dicofol and methoxychlor the last two being analogues of DDT but are comparatively safer. Most of them are insecticides and acaricides.

The organophosphate (OP) pesticides are ester of phosphoric, thiophosphoric or dithiophosphoric acid. They are much safer when compared to the organochlorine pesticides in that they degrade much faster in the environment and do not accumulate in animals. But they are cholinesterase inhibitors in animals and are toxic to pest-control operators who come directly in contact with them.

The carbamates are derivatives of carbamic, thiocarbamic or dithiocarbamic acid. All the three types of pesticides belong to this group. The pyrethroids are relatively newer pesticides. They are synthetic structural analogues of the naturally occurring pyrethrins in the pyrethrum extracted from the plants *Chrysanthemum cinerariaefolium* especially in the flowers. Commonly used as insecticides, they are much safer when compared organochlorine and organophosphate compounds. Being esters, they degrade in environment and are used in small quantities due to their high toxicity to the insects. Allethrin (used in mosquito repellent product) permethrin, Fenothrin, cypermethrin, deltamethrin, cyfluthrin and cyhalothrin belong to this group.

Pesticides that do not belong to these groups are triazine herbicides such as atrazine, simazine etc., plant growth regulators such as 2, 4-D, dicamba, gibberilic acid, indol-3-acetic acid etc urea herbicides, sex pheromones, and so on.

The trend of application of different pesticides in India radically differs from rest of the world. The data presented in **Figures 1(a)** and **(b)** reflects the estimates of global usage of pesticides (**Figure 1(a)**) in general and India (**Figure 1(b)**) in particular. The 76% of the total pesticides used in India is insecticide (**Figure 1(b)**). Correspondingly, the lesser use of herbicides and fungicides is reflected (**Figure 1(b)**). The main use of pesticides in India is for cotton crops (45%), followed by paddy and wheat.

The major part of the pesticides applied in any area for a specific reason (about 99%) remain unused and it gets mixed with air, soil, water and plants which by several means causes harmful effects on the people, pets, and the environment. Not only the farmers in rural areas but also the people in urban areas use more than half of pesticide in their homes and home gardeners, in and around the schools, business areas, and hospitals etc.

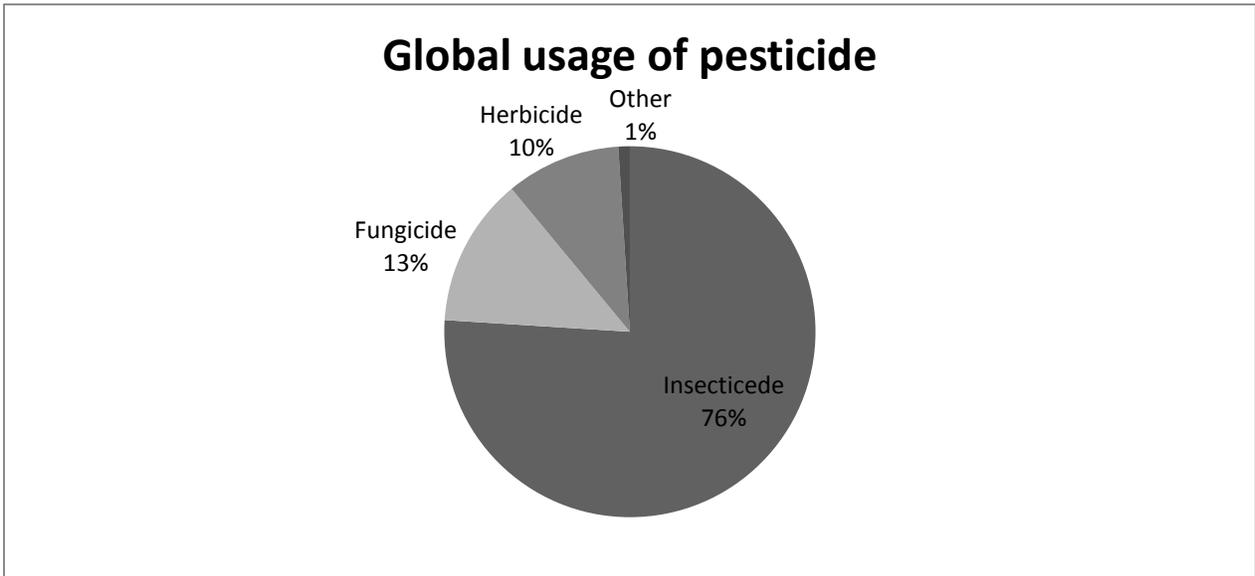


FIGURE 1 (a)

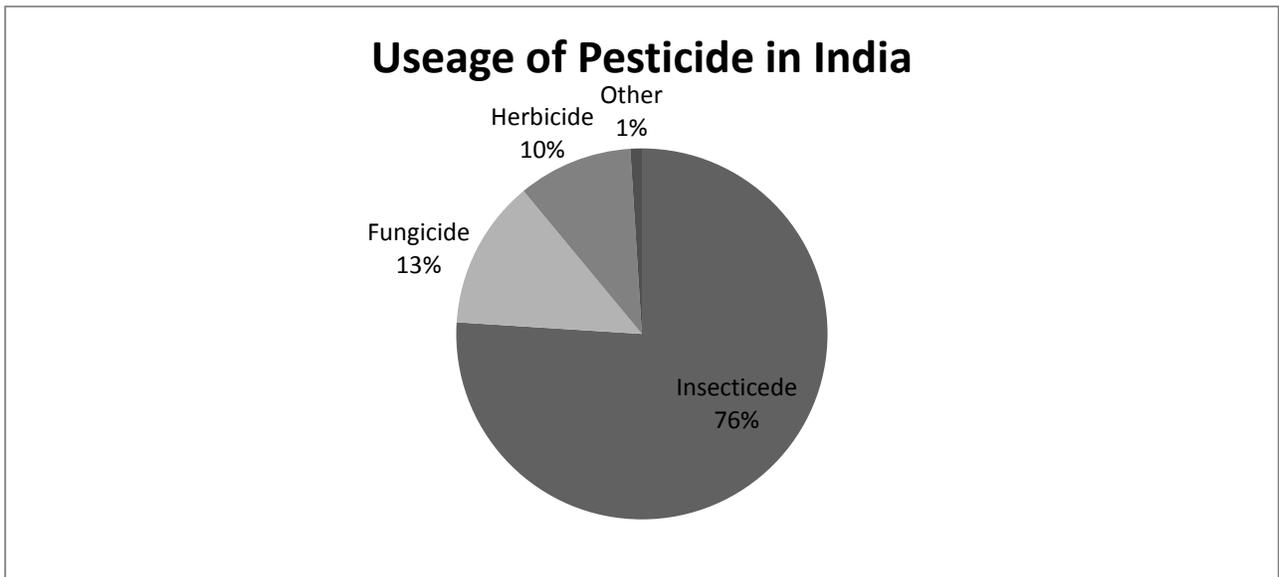


FIGURE 2 (b)

A pesticide is that compound which should be lethal to the targeted pests only and not to the non-target living organisms such as humans and animals. But the disproportionate application of these compounds has adversely affected the flora and fauna of the entire eco- system. After the death of about 100 people in India due to consumption of parathion contaminated wheat flour, Indian Council of Agricultural Research (ICAR) constituted a committee to suggest possible

remedies to combat the toxicity caused due to presence of pesticides and their residues in the edibles. After the first warning about the poisoning of organochlorines (OC) to living systems, the reports from US National Academy of Sciences endorsed the same by studying the toxicity of OC compounds and their metabolites in birds. The pesticides have been shown to display their effects by causing xenotoxicity, alterations in body's immunity, reproductive system and other physiological processes of different organisms thereby generating several diseases including cancer.

Hazardous effects of Pesticides:

The pesticides enter into surface and ground water primarily as runoff. Pesticides are the threat to health due to their inherent toxicity. There are many types of pesticides and exposure depends upon many factors. For an in depth discussion of factors surrounding pesticide exposure and human health.

Pesticides have an innate capacity to cause damage to biological systems which may involve human health, animal health or environment. The most dramatic of such effects on human and animals are the accidental acute poisoning. Several major outbreaks of poisoning with methyl and ethyl mercury compounds, hexachlorobenzene and parathion, have occurred in different causes of cause of acute poisoning have resulted from ingestion of large quantities of pesticides accidentally or with suicidal intent.

Pesticides Production can also be dangerous. One of the disasters at a pesticides manufacturing plant was in Bhopal, India. The plant accidently releases 40 tons of an intermediate chemical gas, methyl isocyanate, used to produced some pesticides. In that disaster nearly 3,000 people were killed immediately, over approximetly 15,000 deaths occurred and even today nearly 100,000 peoples are suffering from mild to severe permanent damage as a result of that disaster.

Pesticides can enter the human body through inhalation, ingestion, or by dermal penetration through the skin. Those who work with agricultural pesticides are the most at risk if they are not properly dressed or if there are broken and leaking equipment. The majority of average citizens who are affected by the pesticides intake the pesticide through consumption of a

food that was been contaminated with a pesticide."In 1958, all members of the family of a local chief who is a prominent cocoa farmer at Okebode in southwestern Nigeria were hospitalized after eating a leaf vegetable undergrowth of a cocoa farm that was earlier sprayed by lindane. In 2004, carbofuran pesticide residues found on several batches of noodles manufactured in Nigeria may have resulted in 23 reported cases of vomiting and one death". Pesticides cause headaches, blurred vision, vomiting, abdominal pain, suppress the immune system, lead to blood and liver diseases, depression, asthma, and nerve damage. The issue with these effects is that they may wait appear until a while after being ingested so tracing the symptoms back to the pesticide can prove to be quite difficult. Many of the symptoms can be mistaken for the flu and therefore not properly treated. The inactive ingredients such as chloroform can also cause serious risks to the liver and nervous system. These effects can also be experienced by the animals living around the streams where the pesticides accumulate. The pesticides bioaccumulate within the animals as they are not easily soluble, as that animal is eaten by another animal the pesticide then biomagnifies and obtains an even higher concentration as it moves further up the food chain.



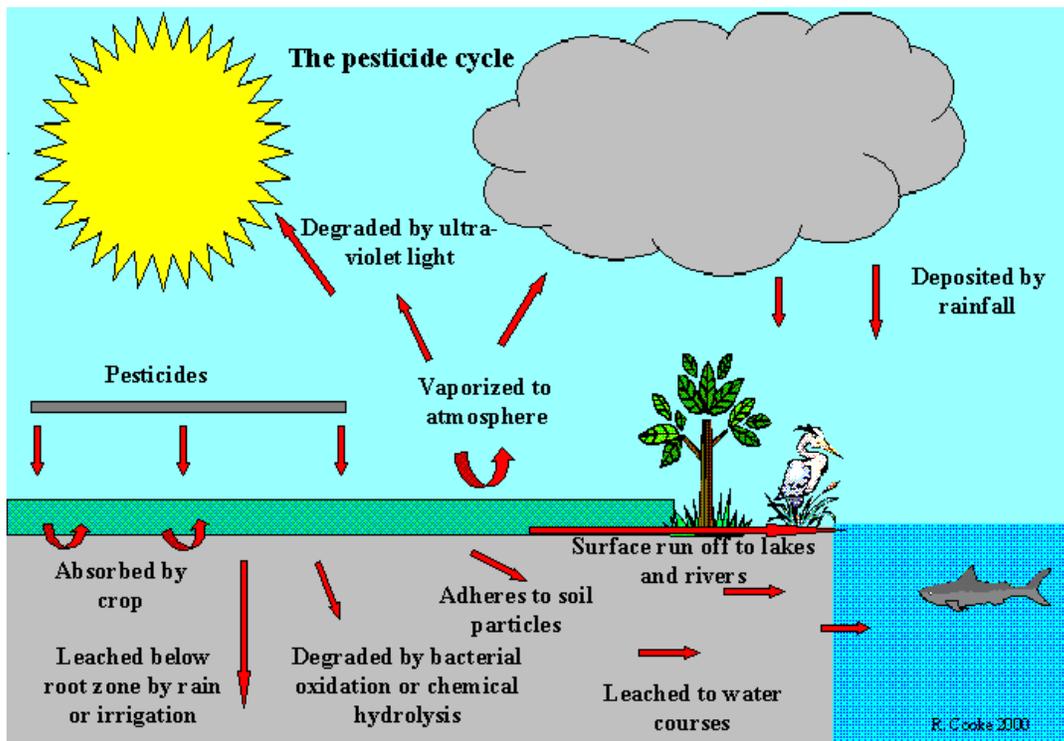
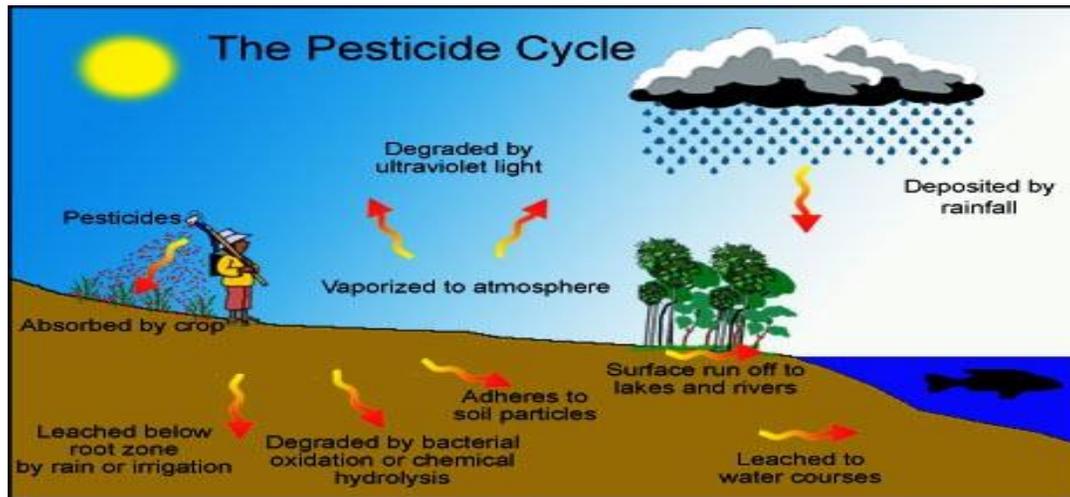


Fig. Pesticides Cycle in Environment

Pesticides have been linked from a short-term to a chronic impact of a wide range of health hazards. The chances of getting its health effects depend on the type of pesticides and the chemical it contains as well as how much and how long or how often you are exposed. It can cause different kinds of cancer and some of the most widespread type is breast cancer, leukemia,

brain, bone, ovarian, prostate, & liver cancers. Excessive exposure also increases neurological disorders, lymphoma, asthma, and Parkinson's disease. These chronic health effects may not be noticed for weeks, months or even years after exposure, which makes it difficult to connect its impact to pesticides. Some of the pesticides with high human toxicity are organochlorines, organophosphates & carbamates.

The major public health concern, however, is the ingestion of pesticides residues in drinking water, foods as these may involve large population over a long period of time. In addition to these human health hazards, pesticides may have serious impact on the environment. Apart from the large scale accidental release to the environment, only minimal levels are found in various environmental media. However, the levels are likely to be higher with pesticides that are persistent and or have a propensity for biomagnifications. In latter case the concentration of pesticide increase as it moves through the tropic chain.

Recent reports of increased incidence of abnormal development of testis and reproductive in capabilities related to exposure of environmental chemical have are used a great concern. The male reproductive system may be affected via different mechanism. The pesticides adversely affect spermatogenesis and cause testicular atrophy and fetotoxicity. In addition to reduced sperm count resulting from adverse effect on spermatogenesis, a toxicant may render spermatozoa defective, less mobile or even dead. A toxicant may also affect the reproductive functions via endocrine example DBCP (Dibromochloropane), a fungiant used in agriculture. It is one of the known supermatoxin pesticide, causes infertility in men. It has been observed among the occupational workers to induce azoospermia and ligospermea, along with an elevated serum concentration of leutinizing hormone (LH) and follicle stimulating hormone (FSH).

Persistent chemicals like DDT, dieldrin and polycyclic hydorocabons have been reported to alter the level of testosterone and to decrease the reproductive ability. Impotancy in farm workers on exposure to pesticides has also been reported.

Epidermilogical studies have confirmed that women married to men exposed to DCBP and chloropyrene have higher rate of abortions. Pesticides chemical like DDT, dieldrin and polycyclic hydrocarbon have been reported to alter the level of testosterone and to decrease the reproductive ability. Impotency in farm workers on exposure to pesticides has also been reported. Epidermiological studies have confirmed that women married to men exposed to DBCP and chloropyrene have higher rate of abortions. Pesticide like endosulfan is also found to

cause birth defect in newly born Childs. It was found that in Kasargod district in Kerala more than 50,000 villagers been exposed to endosulfan which is persistan organic pesticides sprayed on cashew plantation. More than 3000 people living near, downstream and downwind were affected by rare diseases like mental retardation, cerebral palsy, cancer etc. Due to these injurious effects , many of the highly toxic chlorinated hydrocarbon pesticides have been banned in the United States, Still these chemicals persists as environmental contaminants and are in wide spread use in developing countries.

In recent times, the extent of the use of pesticides, and their mode of application including their abuse especially in agriculture have been of much concern to environmental scientists. Alongside their uses are also the residual effect of these pesticides and particularly their replicating effect on human health. Pesticide residue as used in this research work is the residual amount of active components of a particular pesticide or group of pesticides found in a commodity (that is food or water) after the pesticide has accomplished the primary purpose of its application; or the residual amount of a pesticide found in a product which has been in the area of the pesticide application. Though pesticides are often misunderstood to refer only to insecticides, the term pesticide also applies to herbicides, fungicides, acaricides and other substances used to control pest.

The presence of pesticides in water (particularly bio-refactory organics that is aromatic chlorinated hydrocarbons) impacts objectionable and offensive taste, odours and colours to fish and aquatic plants even when they are present in low concentrations. The organochlorine (OC) pesticides are among the major types of pesticides, notorious for their high toxicity, their persistence in the physical environment and their ability to enter the food chain. Although the production and use of many types of OCs and organophosphorus (OPs) have been severely limited in many countries, they are, nevertheless, still being used unofficially in large quantities in many developing countries because of their effectiveness as pesticides and their relatively low cost.

Pesticides are widely used in the agriculture and industry around the world due to their high insecticidal activity. The presence of pesticide residues and metabolites in food, water and soil currently represents one of the major issues for environmental chemistry. Pesticides are, in fact, among the most important environmental pollutants because of their increasing use in agriculture.

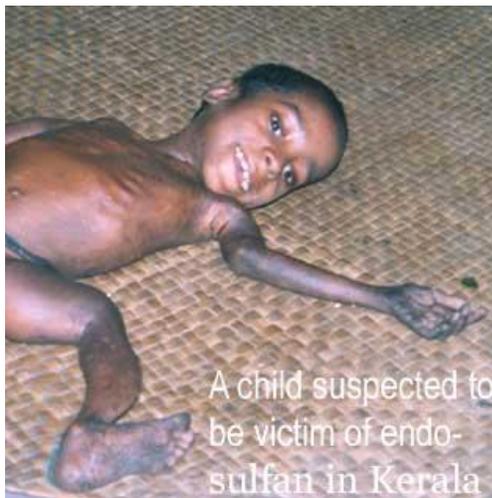
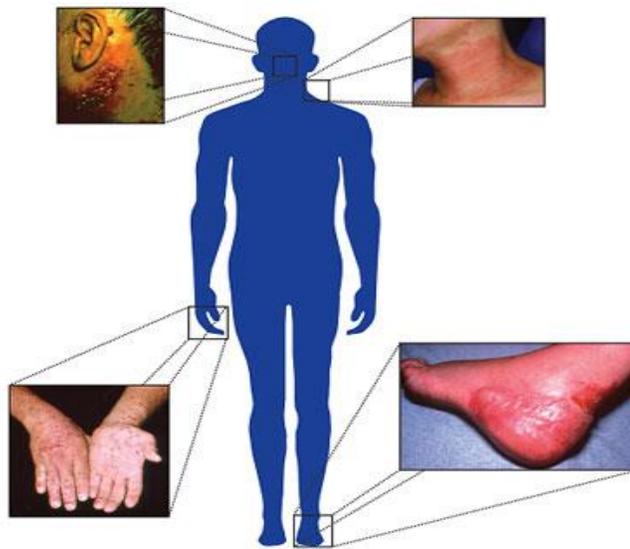


Fig. Effect of Pesticides residues on human health.

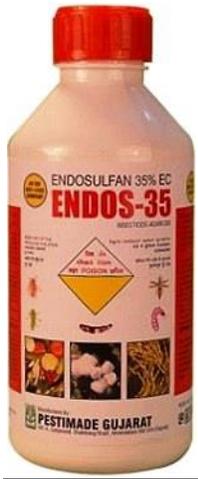


Fig. Effect of Pesticides residues on human health.

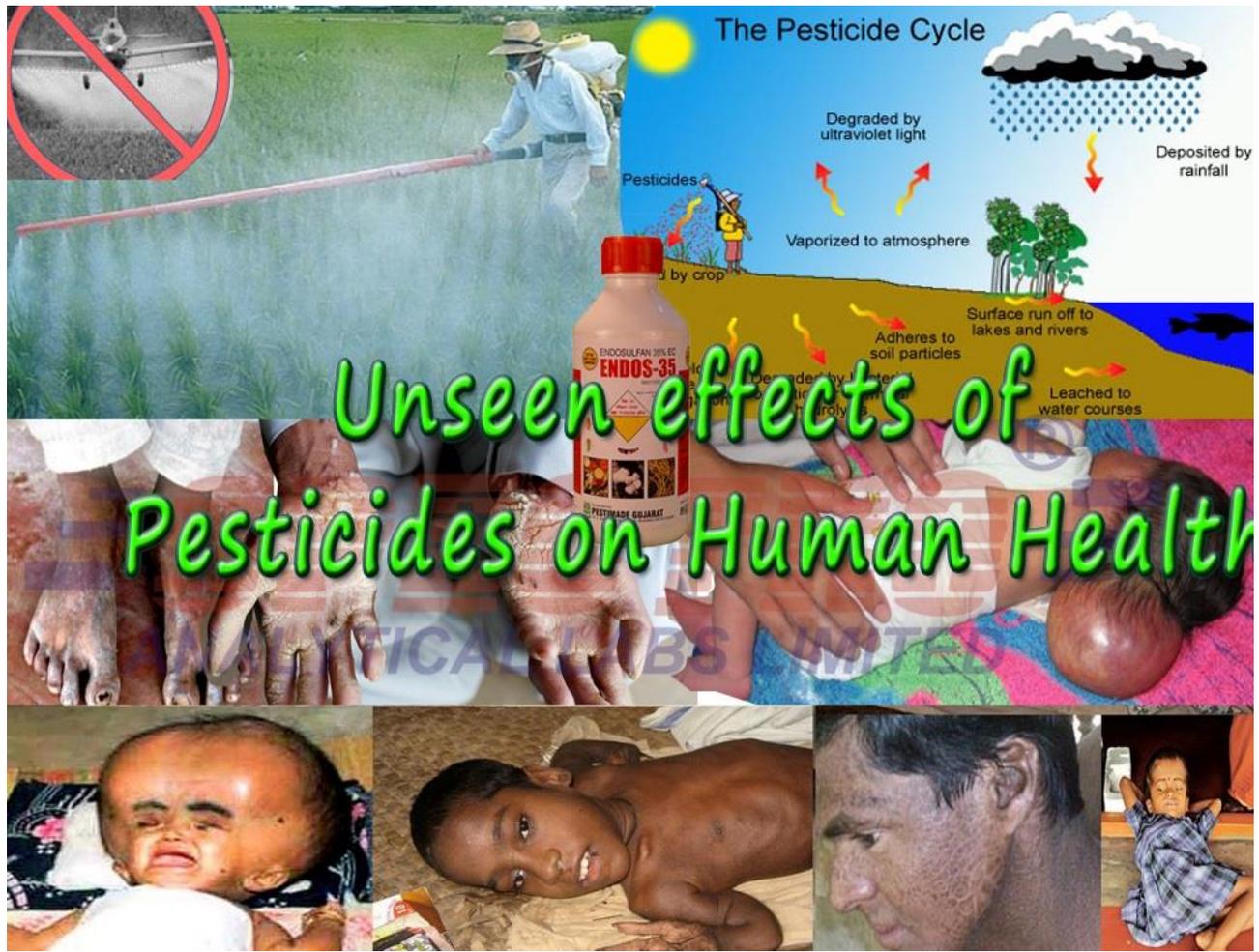


Fig. Unseen effect of Pesticides residues on human health.

Interdisciplinary relevance:-

As water is used in dairy and food industries in addition its use for drinking purpose, higher quantities of residual pesticides result into heavily contaminated dairy and food products. It may not permit the trade of natural water reservoirs in respect to its residual pesticide content. In addition, as the Washim is a rural district, these residues will pose serious health hazards to the most illiterate population. Hence in the context of aquatic fauna and flora, milk, food and health point of views this type of investigation is important.

International Status:-

It was reported that pesticides residues reduced sperm count resulting from adverse effect on spermatogenesis, a toxicant might render spermatozoa defective, less mobile or even dead. A toxicant may also affect the reproductive functions via endocrine e.g. DBCP (Dibromochloropropane), a fumigant used in agriculture. It is one of the known spermatotoxin pesticides, cause infertility in men. It has been observed among the occupational workers to induce azoospermia and oligospermea along with an elevated serum concentration of leutenizing hormone (LH) and follicle stimulating hormone (FSH).

Persistent chemical like DDT, dieldrin and polycyclic hydrocarbons have been reported to alter the level of testosterone and to decrease the reproductive ability. Impotency in farm workers on exposure to pesticides has also been reported. Pesticides contamination of water result of the United States Geological Surveys (USGS) found that more than 90% of water and fish sample from all streams sampled in U.S. contain at least one pesticide. It is also USGS found that around 50% of well sample contain one or more pesticides.

Epidemiological studies have confirmed that women married to men exposed to DBCP and chloropyrene have higher rate of abortion. Due to these injurious effects, many of the highly toxic chlorinated hydrocarbon pesticides have been banned in the United States, but still these chemicals persist as environmental contaminants and are in wide spread use in developing countries.

The organ chlorine pesticides have become ubiquitous contaminant and have been implicated in a broad range of deleterious health effects in man. The Toxic effects include reproductive failures immune system malfunction endocrine disruption.

National Status:-

Recent reports of increased incidence of abnormal development of testis and reproductive in capabilities related to exposure of environmental chemical have are used a great concern. The male reproductive system may be affected via different mechanism. The pesticides adversely affect spermatogenesis and cause testicular atrophy and fetotoxicity. It was observed that water and other food commodities have shown high levels of residual pesticides. The Ganga revier water contained 0.38 ppb at Patna. Whereas the HCH at a level of 0.36 ppb at Kanpur. It was recently observe that the Ganga River water at Bhagalpur in Bihar in monsoon DDT 489 mg/lit, Endosulfan 739 mg/lit. In winter DDT is 56.78 mg/lit, Endosulfan 108.02 mg/lit. and in summer season Endosulfan 130 mg/lit, Was found. It was also recently observed that the packaged drinking water sold in India contained very high levels of pesticides. In Human milk at Bomby DDT is found 0.224 ppb HCH 0.053 ppm in Lucknow 0.127 ppb DDT and 0.107 ppb HCH was found. It was recently observed that pesticides residue found in lakes of Bijapur Endosulfan 0.005 mg/lit 4-bromo-2-chlorophenol 0.009 mg/lit and oxyfluorfen was found to be 0.002 mg/lit.

Use of pesticides on large scale in the sector of Agriculture tends to increase the percentage of pesticides in water. The effect can be seen on human and animal life. The growing proportion of pesticides in drinking water gives rise to miscarriage in women. The recent study has shown that women reproductive system has been affected. The recent observations have been shown that sperm count is going lesser in male above all human immunity system is deteriorating. You will find cases of breast cancer in women where pesticides have been used in greater amount.

The Central pollution control Board Delhi had found α and β isomers of endosulfan recidues in Yamuna River. High concentration of HCH (0.259 $\mu\text{g/l}$) and malathion were detected in the surface water samples collected from river Ganga in Kanpur Uttar Pradesh. High concentration of methyl parathion, endosulfan and D.D.T. were observed in water samples collected from river at Bhagalpur Bihar. The ITRC Lucknow study also found 0.5671 ppb concentration of endosulfan in river at Allahabad. Similar resources were found in other water samples in India (Agrawal A and others, Pesticide residue in water- a challenging task in India, *Environ Monit Assess* 2015 Feb 1;187(2):54. Epub 2015 Feb 1.)

Between July and December 2002 pollution monitoring laboratory New Delhi analysed 17 different brands of Pdw and Pnmw. The samples were tested to see if they contain pesticides. The tests were for two kinds of pesticides Organochlorine and Organophosphorus pesticides. The PML tested the samples for 12 organochlorine and 8 organophosphorus pesticides. Chloropyrifos was detected in 28 out of 34 samples. This extremely toxic chemical was found in quantities exceeding the maximum permissible limits by huge margins. Bisleri (longterms), Kinley of Coca cola (longtimes) and Aquafina of Pepsi was 23 times high than the permissible limits for an individual Pesticides.

The resource of analysis of water samples from Vidarbha region affirmed the presence of HCH ($\alpha, \beta, \gamma, \delta$ Hexachlorocyclohexan), Endosulfan, DDT, Dichlorovos, Chloropyritos, Phorates etc. The highest concentration of 0.44 $\mu\text{g/l}$ was observed for Chloropyrifors in Bhandara and Yavatmal region and 0.42 $\mu\text{g/l}$ for Parathions methyl in Bhandare region. Pesticides in the surface water samples from Bhandara and Yavatmal region exceeded in the E.U. limits of 1.00 $\mu\text{g/l}$. A Highest of 0.39 $\mu\text{g/l}$ HCH has been reported in Amravati district. Isomers of endosulfan was found to be maximum in ground water sample with maximum value 0.72 to 0.6 $\mu\text{g/l}$ and 0.78 $\mu\text{g/l}$ in Bhandara, Amravati and Yavatmal region. Where as Organophosphate, Dichlorovos and Chloropyrifos as 0.25 $\mu\text{g/l}$ at Bhandara region. (Summajiya Z lari, Noor Khan and others, Comparison of Pesticides residues in surface water and ground water of Agriculture intensive area, Journal of Environmental Health Science and Engineering 2014, 12:11).

In India Organochlorine insecticide such as DDT and HCH constitute more of more than 70% of the pesticides used at present. Report from Delhi, Bhopal and other cities and some rural areas have indicates presence of significant level of pesticides in fresh water systems as well as bottled drinking mineral water samples. (Anju Agrawal, Ravi S. Pandey et al., Water Pollution with special Reference of pesticides contamination in India, Journal of water Recourses and Protection 2010, 2, 432-448).

Maharashtra is a state in western region of India. It has population of 114 million (2012). Maharashtra is divided into 36 districts, which are grouped into six divisions. The total agriculture are in the state is about 225.56 lakh hectror, out of which the net irrigated agricultural

is about 33,500 square kilometer. Vidarbha is the eastern region of Maharashtra, it has 11 districts.

Washim is one of the 11 districts of Vidarbha and was carved out of Akola district recently. Washim is a fairly small district towards the southern center of Maharashtra State. Surrounded by Akola and Amravati on its north, Yavatmal on its east and south, Hingoli on its south and Buldhana on its west, it is on the western end of the Vidharbha region. It is situated in the north eastern part of the State abutting Madhya Pradesh and lies between north latitudes 19°61' and 21°16' and east longitude 76°07' and 77°14' and falls in parts of Survey of India degree sheets 55 D, 55 H, 56 A and 56 E. The district has a geographical area of 5196 sq. km. The Climatic condition in the washim district is extreme and dry, with temperatures ranging from more than 45oC in the summer to less than 10oC in the winter. For Administrative convenience, the district is divided in 6 talukas viz, Washim, Karanja, Malegaon, Mangrulpir, Manora and Risod. It has a total population of 12, 97,160 as per 2011 census. The district forms part of Godavari and Tapi basin. River Penganga is the main river of the district. It flows through the Tehsil of Risod. Later it flows through the boundary of Washim and Hingoli districts. River Kas is the main tributary of Penganga. River Arunavati and its tributaries originates in the Tehsil of Washim and them flows through the tehsils of Mangrul Pir and Manora into the district of Yavatmal. River Katepurna originates in the hilly areas of the district and flows northwards through the tehsil of Malegaon and enters the Akola district. Adan is the anathor river in the washim district flowing through the Karanja Tehasil. Adan is main tributary of river Penganga. The Arunavati River meets the Adan River about 13 kilometres before it joins the Painganga River. There are total 53 major dams in Washim district.

Washim is tribal, rural district of Vidharbha region of Maharashtra. Major agriculture produce is Cotton, capsicum and Soybean. This district is a top grower of cotton and Soybean. Eventually, the illiterate tribal farmers use huge amounts of pesticides in their cotton and Soybean fields. It results into percolation of large quantities of these hazardous chemicals in natural water reservoirs as well as milk producing animals like cow, buffalo etc.

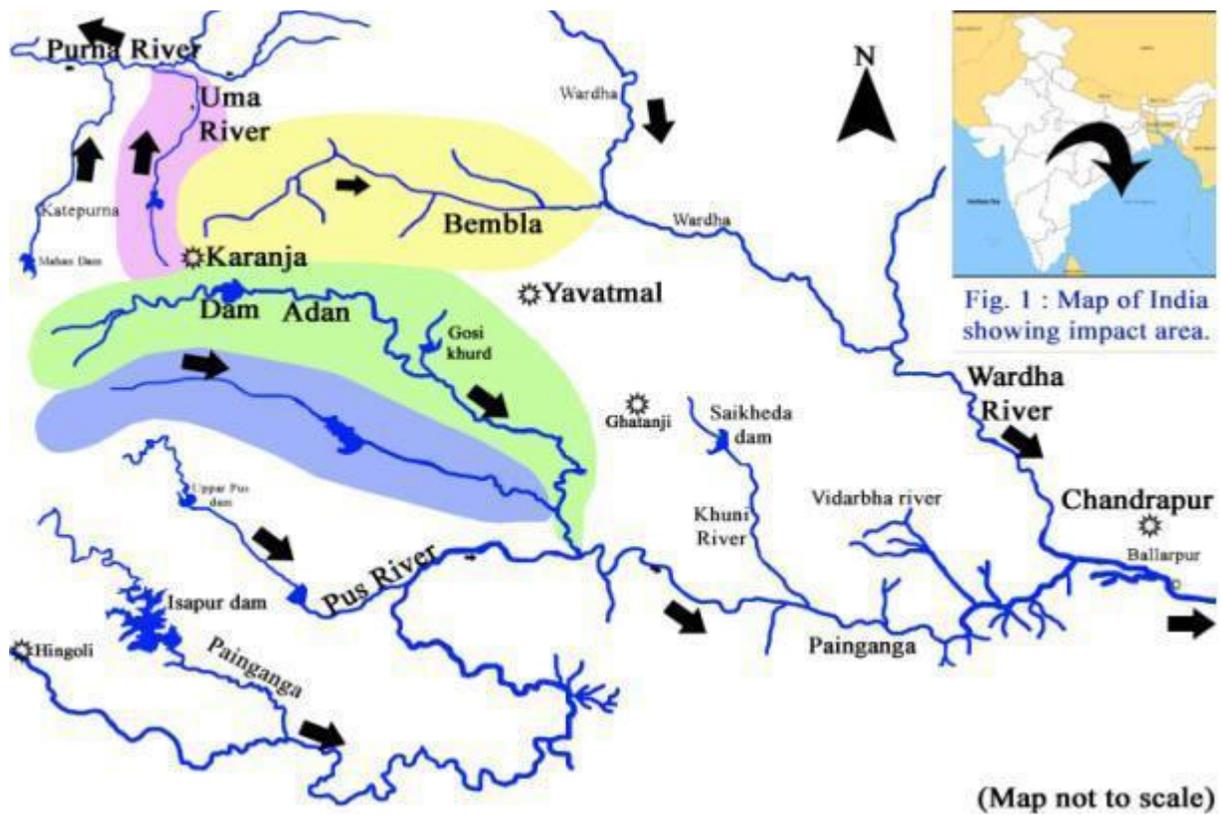


Fig. River Map of Washim District.



Fig. Map of Washim District. (M.S.)

BIS Permissible Limits for Pesticides Residues in water.

Sr.No.	Pesticide	BIS Permissible Limits (in µg/l)
1	Alachlor	20
2	Atrazine	2
3	Aldrin/ Dieldrin	0.03
4	Alpha HCH	0.01
5	Beta HCH	0.04
6	Butachlor	125
7	Chlorpyrifos	30
8	Delta HCH	0.04
9	2,4- Dichlorophenoxyacetic acid	30
10	DDT (<i>o, p</i> and <i>p, p</i> – Isomers of DDT,DDE and DDD)	1
11	Endosulfan (alpha, beta, and sulphate)	0.04
12	Ethion	3
13	Gamma — HCH (Lindane)	2
14	Isoproturon	9
15	Malathion	190
16	Methyl parathion	0.3
17	Monocrotophos	1
18	Phorate	2

The objective of research project:-

- a) To detect presence of pesticides residues in natural water reservoirs in Washim district of Vidarbha during seasons of two successive years.
- b) To determine the extent of these insecticides residues in natural water reservoirs.
- c) To investigate the probable sources of these residues.
- d) To aware the population of the district about the preventive and control measure of pesticides residues in environment.

Method & Material:-

Water samples were taken from 0.3 m below the surface with a pre-cleaned glass bottle. For sampling turbulent midstream position of water bodies were chosen to approximate mean concentration of river water. All foreign bodies were removed and the samples were stored in ice during transport and were kept at 4⁰ C in the laboratory until the solid phase extraction.

a) Extraction of pesticide residues from natural water reservoirs:

Pesticides residues can be extracted from natural water reservoirs using an organic solvent. One liter water will be taken from each of randomly selected natural water reservoirs from various Tahesils of the district during two seasons of the year. Each of the sample water flasks will be added with 10-15 gm of sodium chloride and the mixture will be stirred gently. The solution will be transfer in to a 2liter reparatory funnel followed by addition of 60ml methylene chloride. The funnel will be stoppard and shaken for three minutes, the lower dichloromethane layer will be separated from the upper water layer and the lower organic layer is drained through granular sodium sulphate (abiut 20g) into a 250ml conical flask. The extraction will be repeated twice more and the extracts will be combined. The dichloromethane will be evaporator under vacuum and the volume will be reduced to 1 ml. The mixture will transferred into a graduated tube using acetone (5ml) and the solvent will be evaporated just to dryness. The volume will be made up to 1 ml and will be stored into an auto sampler vial. Internal standard will be added and stored at 5⁰C in a freezer until analyzed.

b) For HPLC –Fluorescence detection.

The procedure applied for the extraction of pesticides was similar to those reported by Laabs *et al* [6] and Steinwandter [7]. Water samples were extracted using ultrasonic extraction. Sox let extraction was done with 20 ml of hexane: dichloromethane (3:1) for 30 min. The extract was concentrated with the aid of rotator evaporator. Pre-elution was carried out with the HPLC methanol. The concentration solvent extract was then analyzed for Pesticides.

The solvent of the mobile phase of the HPLC is methanol and water (1:1). This was prepared by measuring 250ml of HPLC grade methanol into a 500ml flask and made up with 250ml of distilled water. The HPLC model CECIL 1010 was switched on. The wavelength of the system was determined by using UV visible equipment. Little quantity of stock solution was diluted with methanol and its wavelength determined nu scanning. A peak of 202nm was reached. The

system wavelength was then set at 202nm and the sensitivity of the 0.05 nm of the UV detector component set. The flow rate was set at 1ml/min, afterwards, the purging of the system commenced by allowing the system to run for some time. The purging was carried out through a washing solution of 30% methanol, 70% water. Bubbling helium gas into the solution carried out degassing of the mobile phase was then set up and connected with HPLC system and allowed to run through the system of 20min.

Each sample residues was dissolved in 1ml methanol. The extracted residues were loaded and injected into the valve of the chromatography system. The resulting chromatograph for each sample was printed out. The various retentions time noted, concentration determined and recorded.

Result:-

In this study the water samples were collected from various tahesils of the district which are Karanja, Manora, Mangrulpir, Malegaon, Risod and Washim. Three sites were selected from each of the tahasil and were analysed for the Pesticides residues content. The Result form the study for various Tahesil was found as below.

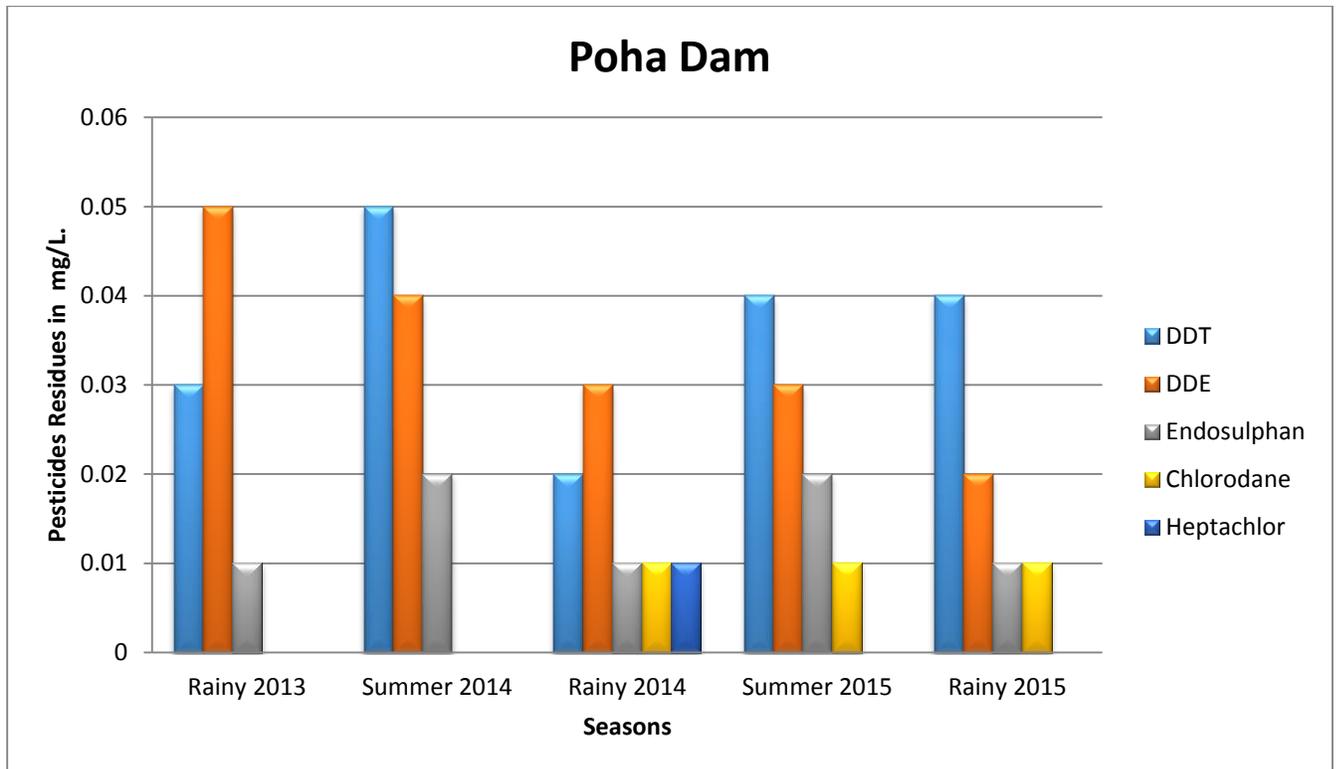
Karanja Tahasil

Karanja is one the important tahasil of washim district. Karanja Lad is famous for Papaya and Oranges. Karanja is main center for supply of papaya in Maharashtra. Papaya is supplied across north India (Haryana, Utter Pradesh, Jammu, Punjab, Uttarakhand, Bihar, Madhya Pradesh, Delhi, etc.) and Nepal from karanja tahasil. Adan is the district's largest irrigation project which is located at Pimpri-Barhata in Karanja taluka, other dams like Poha dam & Kajaleshwar dam are also major dams present in the tahasil. Karanja Tahasil has larger irrigation area so the farmers uses larger amount of pesticides in the fields.

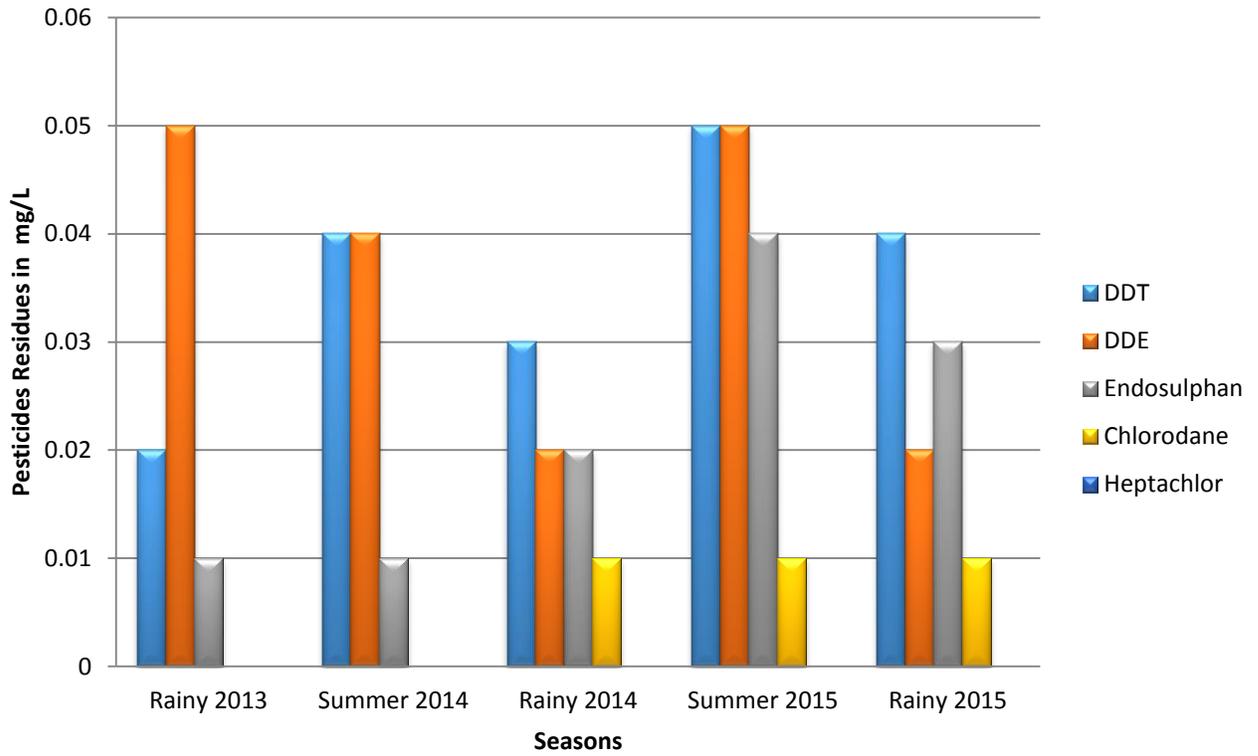
Results from the study for the Karanja Tahesil have been shown in table 1 which is related to the concentration of OC residues in water. The associated figure for mean concentration for pesticide DDT was in the range of 0.01-0.05 $\mu\text{g/L}$. The ratio of incidence as well as concentration of DDE, a metabolite of DDT, in these water samples were higher than those of recorded for DDT. This observed trend could be attributed to the decomposition and bioaccumulation of the DDT used in the past. DDE is more stable than DDT and decomposes more slowly by micro-organisms, heat and ultraviolet rays. The pesticide heptachlor was not detected in the water samples showing that the farmers around the reservoir do not use them in their farming activities. The pesticide chlorodane was found in very small quantity, Endosulfan, a broad spectrum contact insecticide and acaricide, is another pesticide used by many farmers. The associated figure for mean concentration of Endosulfan was in the range of 0.01-0.04 $\mu\text{g/L}$.

Table 1: Levels of organochlorine pesticides in water samples from Karanja Tahesil.

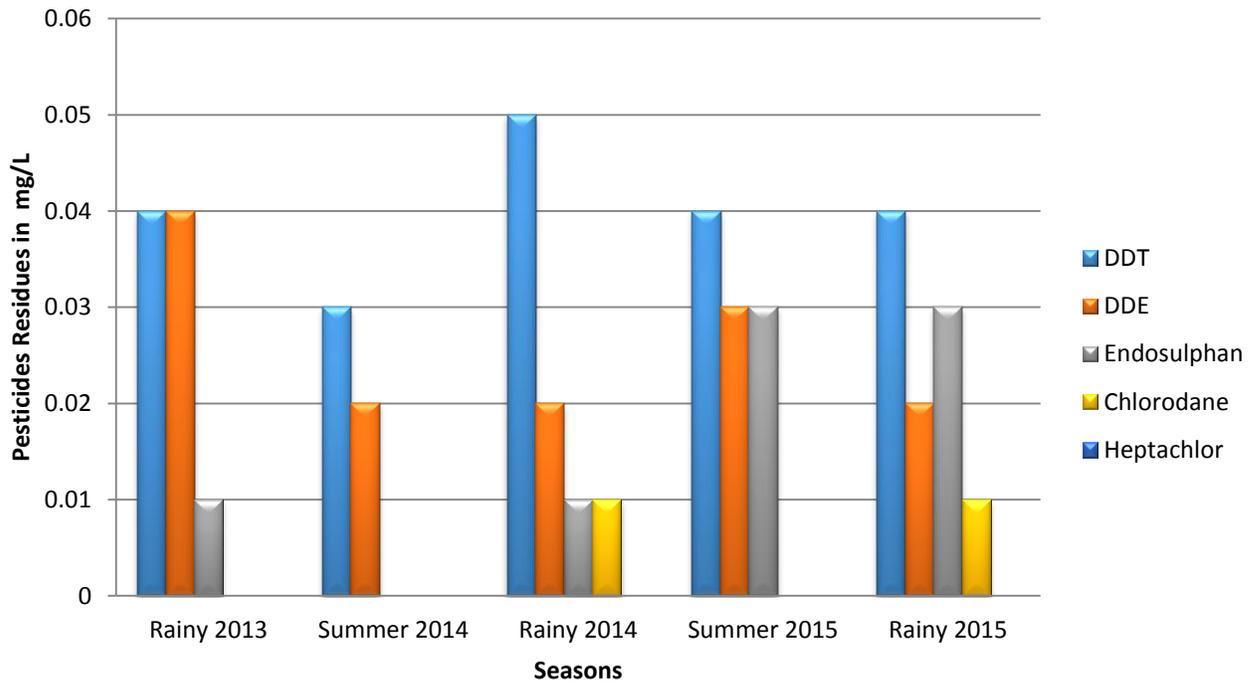
Karanja						
Dams/Rivers	Seasons	DDT	DDE	Endosulfan	Chlorodane	Heptachlor
Adan Dam	Rainy 2013	0.02	0.05	0.01	ND	ND
	Summer 2014	0.04	0.04	0.01	ND	ND
	Rainy 2014	0.03	0.02	0.02	0.01	ND
	Summer 2015	0.05	0.05	0.04	0.01	ND
	Rainy 2015	0.04	0.02	0.03	0.01	ND
Poha Dam	Rainy 2013	0.03	0.05	0.01	ND	ND
	Summer 2014	0.05	0.04	0.02	ND	ND
	Rainy 2014	0.02	0.03	0.01	0.01	0.01
	Summer 2015	0.04	0.03	0.02	0.01	ND
	Rainy 2015	0.04	0.02	0.01	0.01	ND
Kajaleshwar Dam	Rainy 2013	0.04	0.04	0.01	ND	ND
	Summer 2014	0.03	0.02	ND	ND	ND
	Rainy 2014	0.05	0.02	0.01	0.01	ND
	Summer 2015	0.04	0.03	0.03	ND	ND
	Rainy 2015	0.04	0.02	0.03	0.01	ND

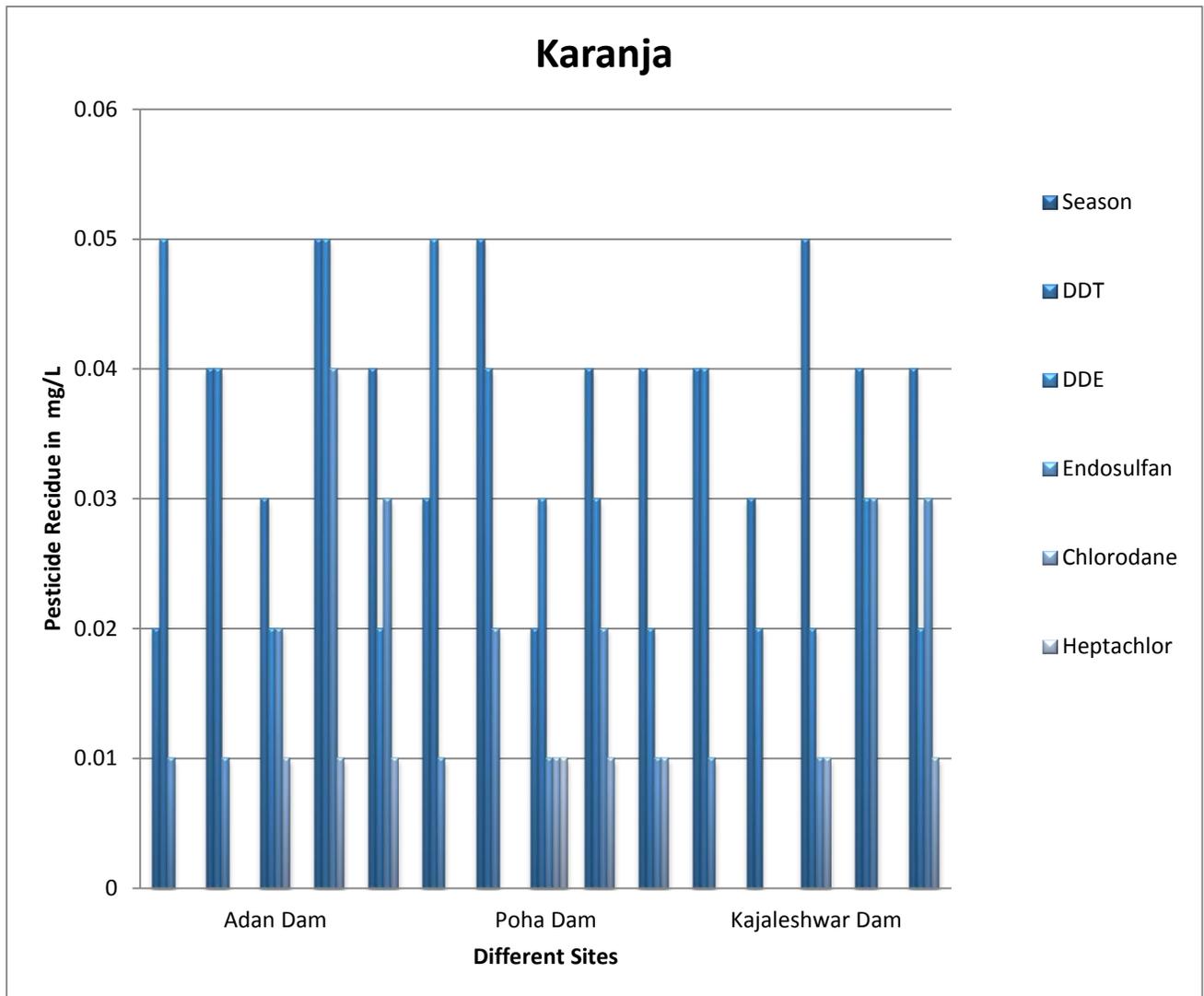


Adan Dam



Kajaleshwar Dam





Graph Showing Level of pesticide residues in Karanja Tehsil

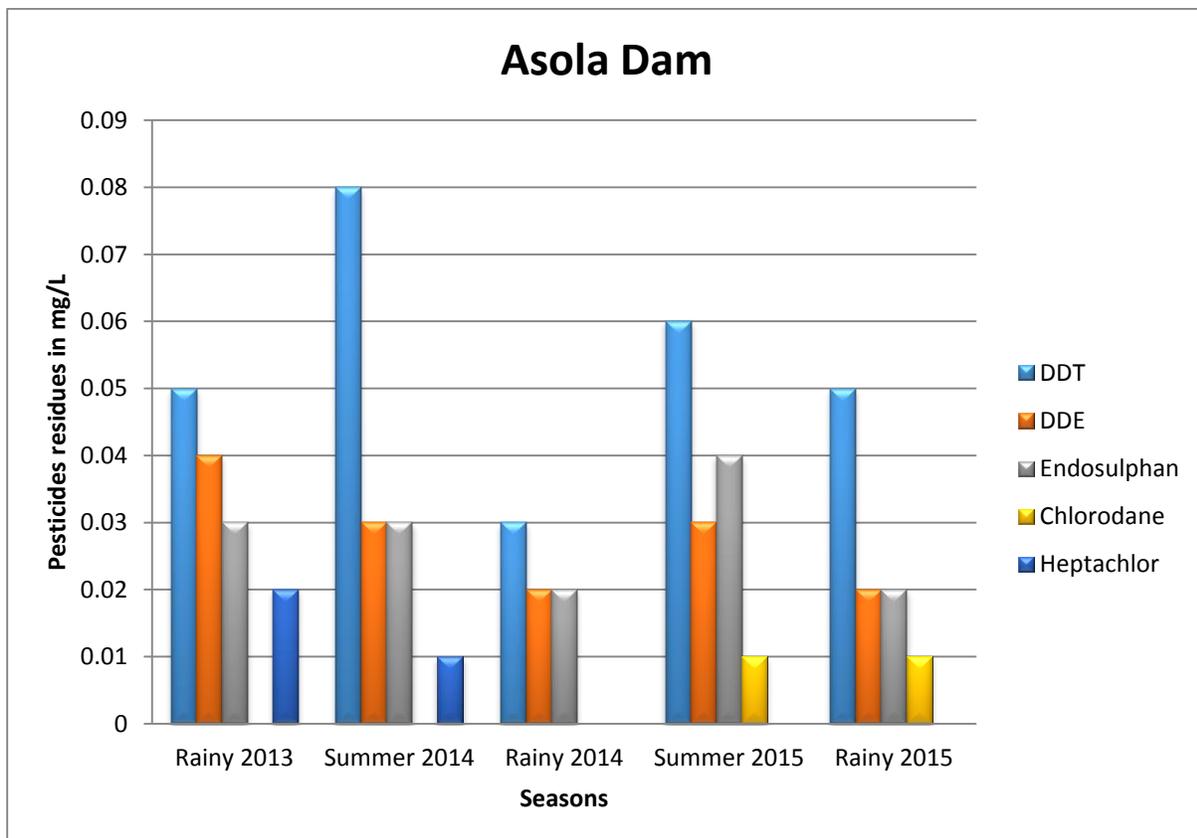
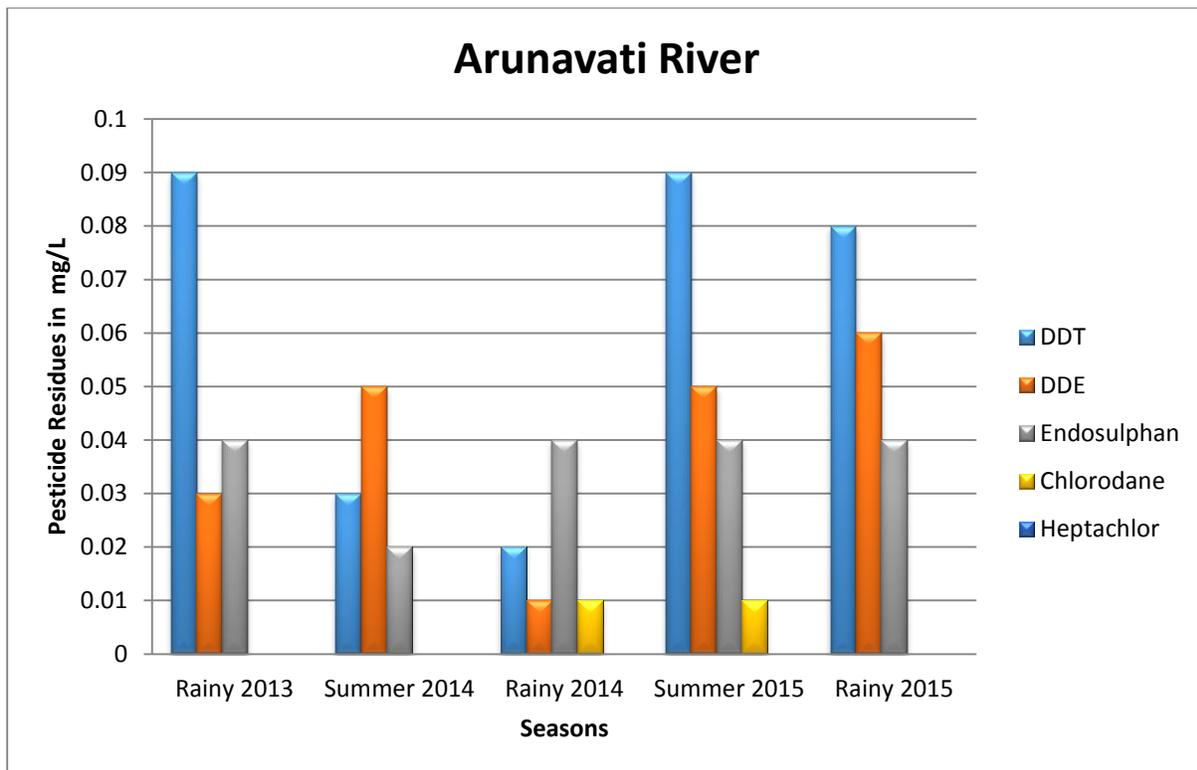
Manora

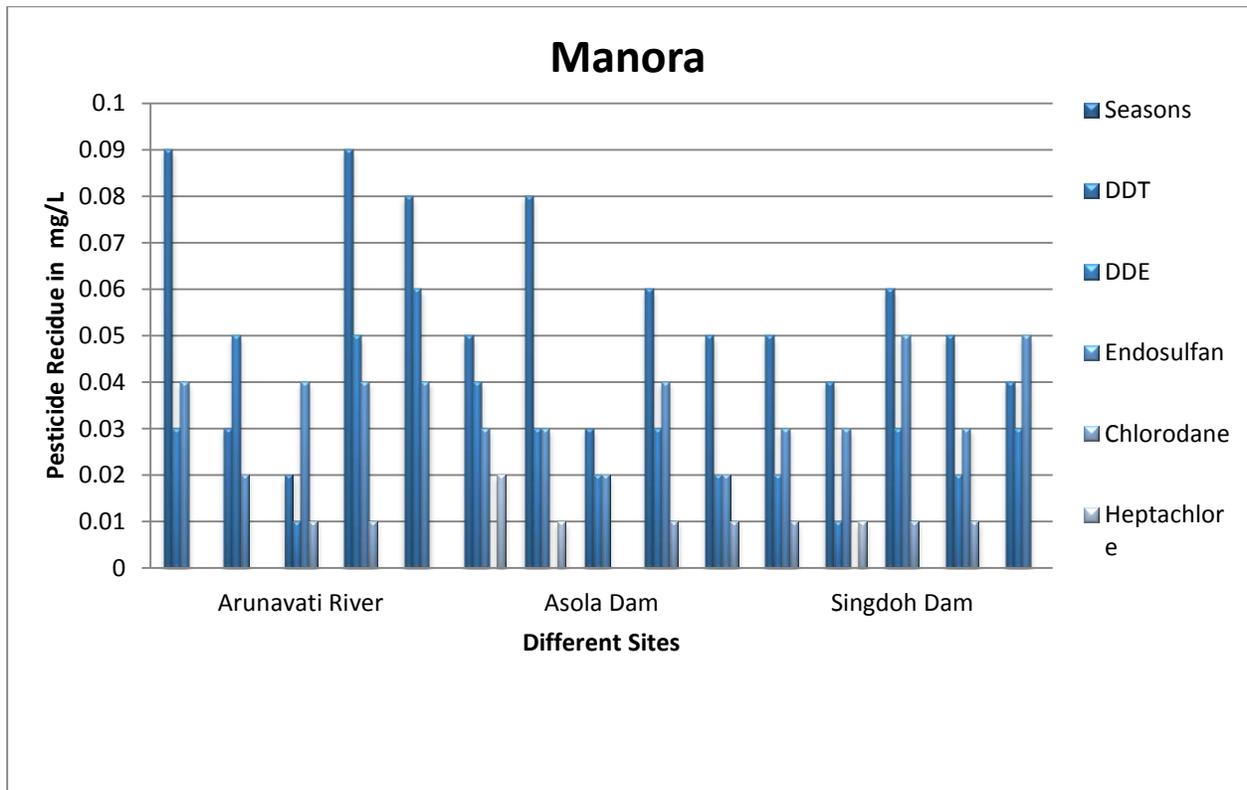
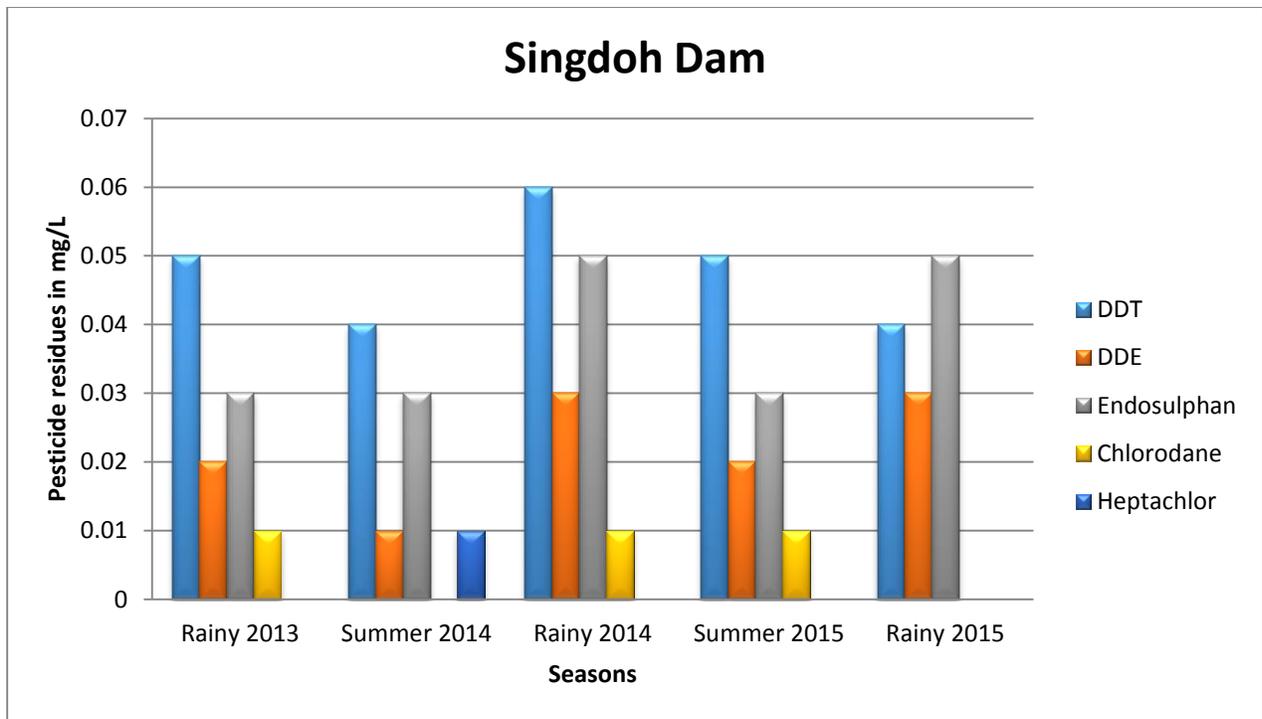
Manora is a taluka in Washim district. Nearby are other towns such as Waigaul, Poharadevi, and Asola. Many people from the area are members of the Banjara community and several are Muslim and Hindu and their main occupation is the farming. Arunavati River is the main river present in the tahasil, Asola dam & Singdoh dam are the major dams. Manora tahasil also have large area under irrigation.

Table no.2 shows concentration of OC pesticide residues in water for the Manora Tahesil. The associated figure for mean concentration for pesticide DDT was in the range of 0.01-0.09 µg/L and the associated figure for mean concentration for pesticide DDE was in the range of 0.01-0.06 µg/L. The pesticide chlorodane and Heptachlor were found in very small quantity, the associated figure these pesticides was found to be 0.0-0.01 µg/L. The associated figure for mean concentration of Endosulfan was in the range of 0.01-0.05 µg/L.

Table 2: Levels of organochlorine pesticides in water samples from Manora Tahesil.

Manora						
Dams/Rivers	Seasons	DDT	DDE	Endosulfan	Chlorodane	Heptachlor
Arunavati River	Rainy 2013	0.09	0.03	0.04	ND	ND
	Summer 2014	0.03	0.05	0.02	ND	ND
	Rainy 2014	0.02	0.01	0.04	0.01	ND
	Summer 2015	0.09	0.05	0.04	0.01	ND
	Rainy 2015	0.08	0.06	0.04	ND	ND
Asola Dam	Rainy 2013	0.05	0.04	0.03	ND	0.02
	Summer 2014	0.08	0.03	0.03	ND	0.01
	Rainy 2014	0.03	0.02	0.02	ND	ND
	Summer 2015	0.06	0.03	0.04	0.01	ND
	Rainy 2015	0.05	0.02	0.02	0.01	ND
Singdoh Dam	Rainy 2013	0.05	0.02	0.03	0.01	ND
	Summer 2014	0.04	0.01	0.03	ND	0.01
	Rainy 2014	0.06	0.03	0.05	0.01	ND
	Summer 2015	0.05	0.02	0.03	0.01	ND
	Rainy 2015	0.04	0.03	0.05	ND	ND





Graph Showing Level of pesticide residues in Manora Tahesil

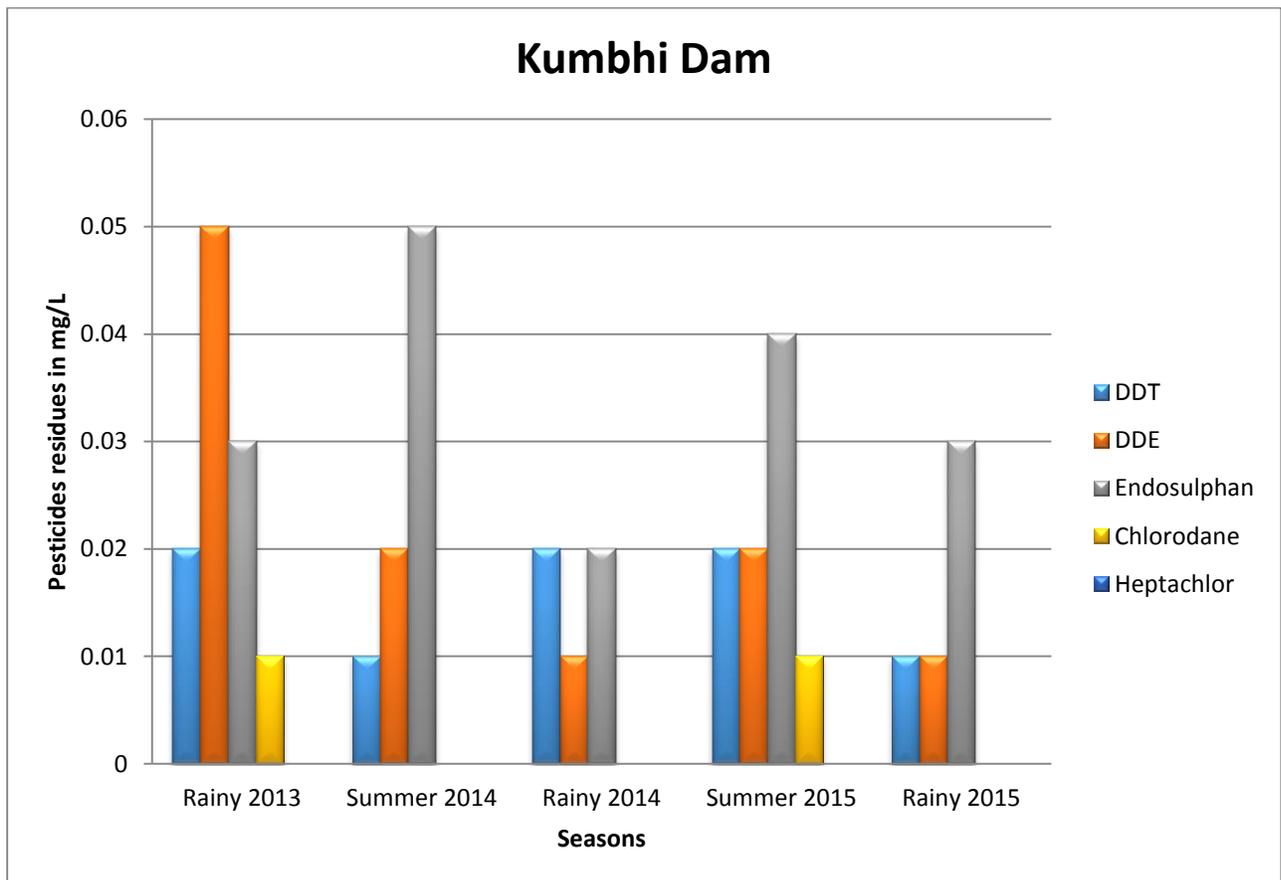
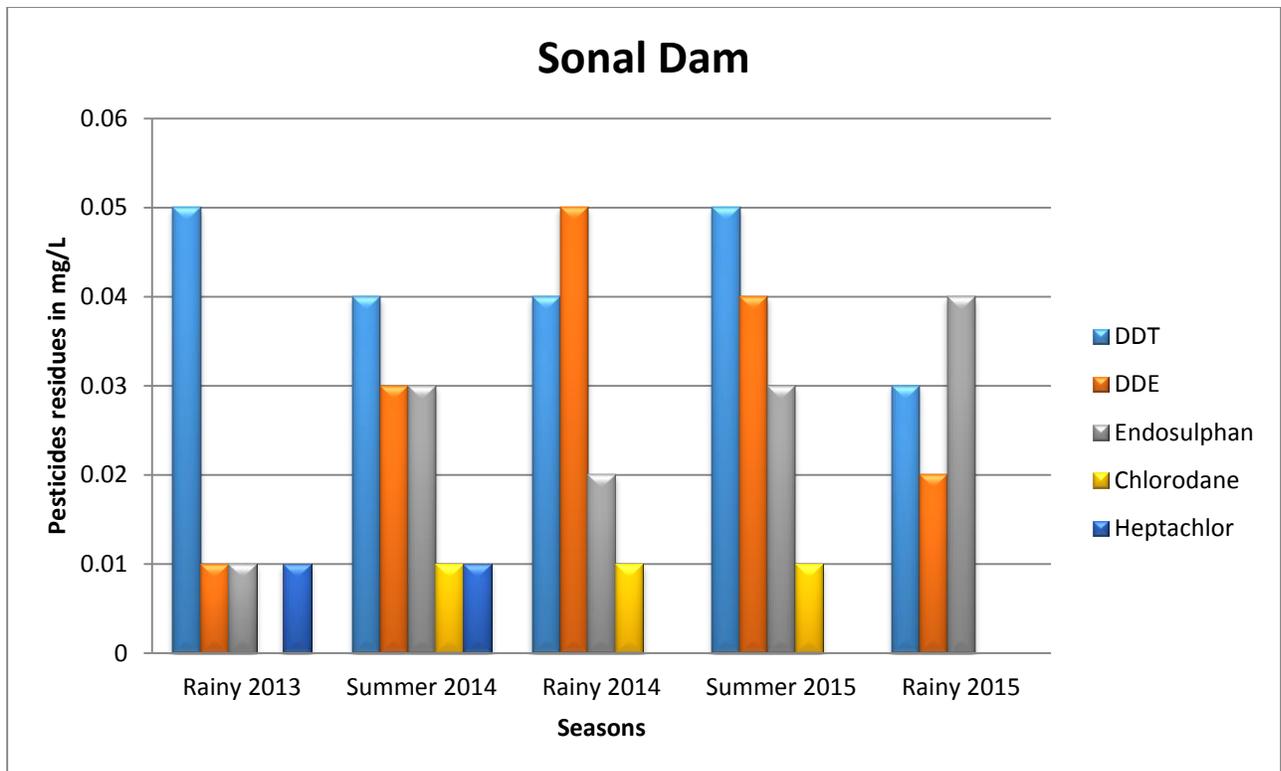
Mangulpir

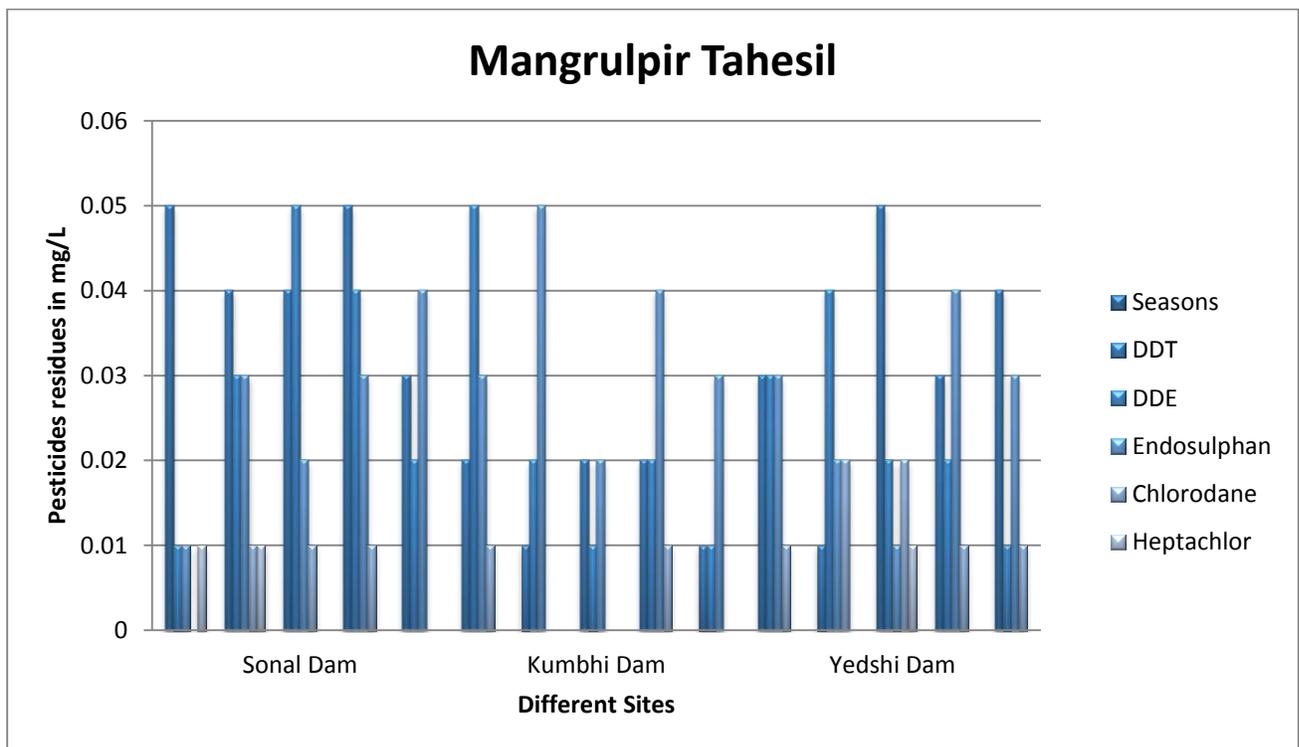
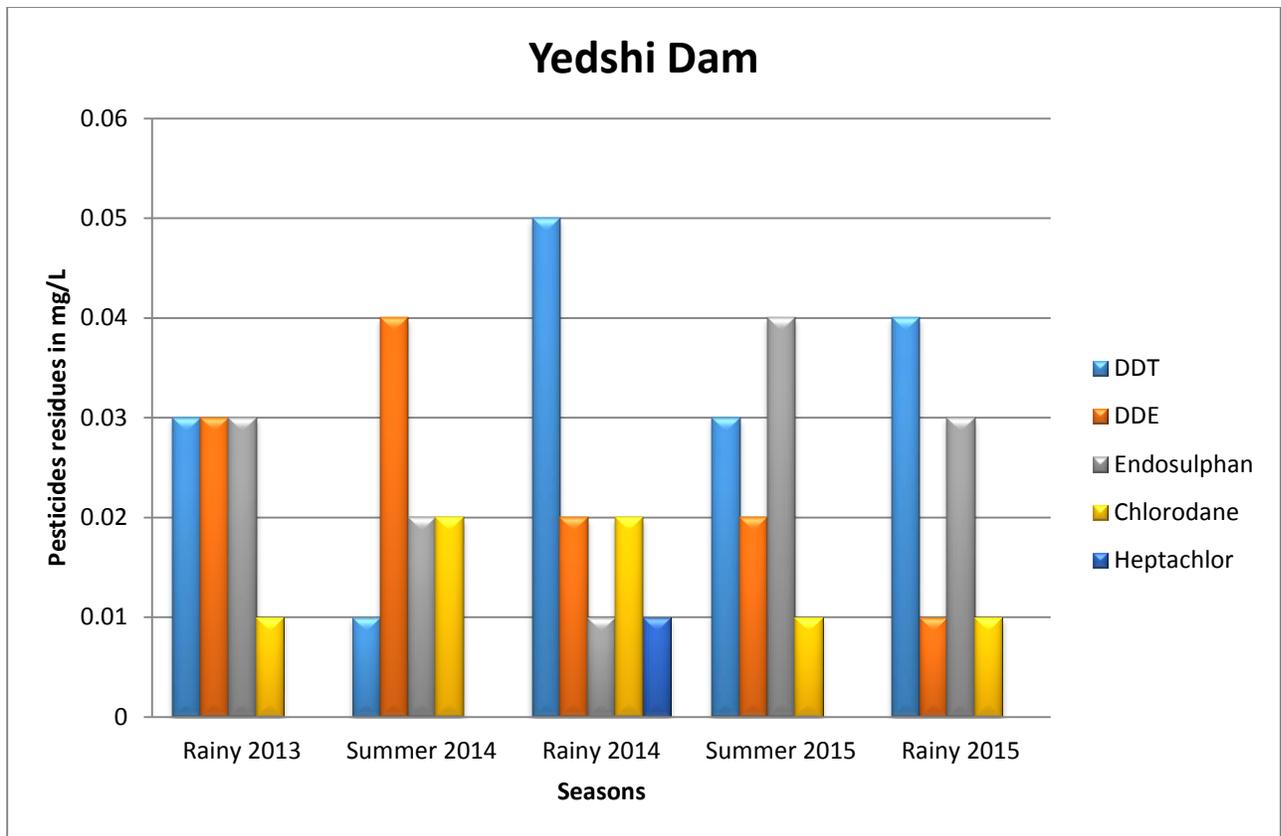
Mangrupir is the tahasil of washim district. Cotton, Sorgham and soyabean are the main crops cultivated in the Mangrupir tahasil. Green Chickpea is also cultivated on a large scale in Mangarulpir tahasil. Major population of the tahasil depends upon wells and rivers for the irrigation. Adan river is also main river flowing through the tahasil. Sonal dam, Kumbhi dam & Yedshi dam are among the major dams present in the magrulpir tahasil.

Table no.3 shows concentration of OC pesticide residues in water for the Maangrulpir Tahasil. The associated figure for mean concentration for pesticide DDT was in the range of 0.01-0.05 µg/L and the associated figure for mean concentration for pesticide DDE was in the range of 0.01-0.05 µg/L. The pesticide chlorodane and Heptachlor were found in very small quantity, the associated figure these pesticides was found to be 0.0-0.02 µg/L. The associated figure for mean concentration of Endosulfan was in the range of 0.01-0.05 µg/L.

Table 3: Levels of organochlorine pesticides in water samples from Mangrulpir Tahasil.

Mangrulpir						
Dams/Rivers	Seasons	DDT	DDE	Endosulfan	Chlorodane	Heptachlor
Sonal Dam	Rainy 2013	0.05	0.01	0.01	ND	0.01
	Summer 2014	0.04	0.03	0.03	0.01	0.01
	Rainy 2014	0.04	0.05	0.02	0.01	ND
	Summer 2015	0.05	0.04	0.03	0.01	ND
	Rainy 2015	0.03	0.02	0.04	ND	ND
Kumbhi Dam	Rainy 2013	0.02	0.05	0.03	0.01	ND
	Summer 2014	0.01	0.02	0.05	ND	ND
	Rainy 2014	0.02	0.01	0.02	ND	ND
	Summer 2015	0.02	0.02	0.04	0.01	ND
	Rainy 2015	0.01	0.01	0.03	ND	ND
Yedshi Dam	Rainy 2013	0.03	0.03	0.03	0.01	ND
	Summer 2014	0.01	0.04	0.02	0.02	ND
	Rainy 2014	0.05	0.02	0.01	0.02	0.01
	Summer 2015	0.03	0.02	0.04	0.01	ND
	Rainy 2015	0.04	0.01	0.03	0.01	ND





Graph Showing Level of pesticide residues in Mangrulpir Tahesil

Washim

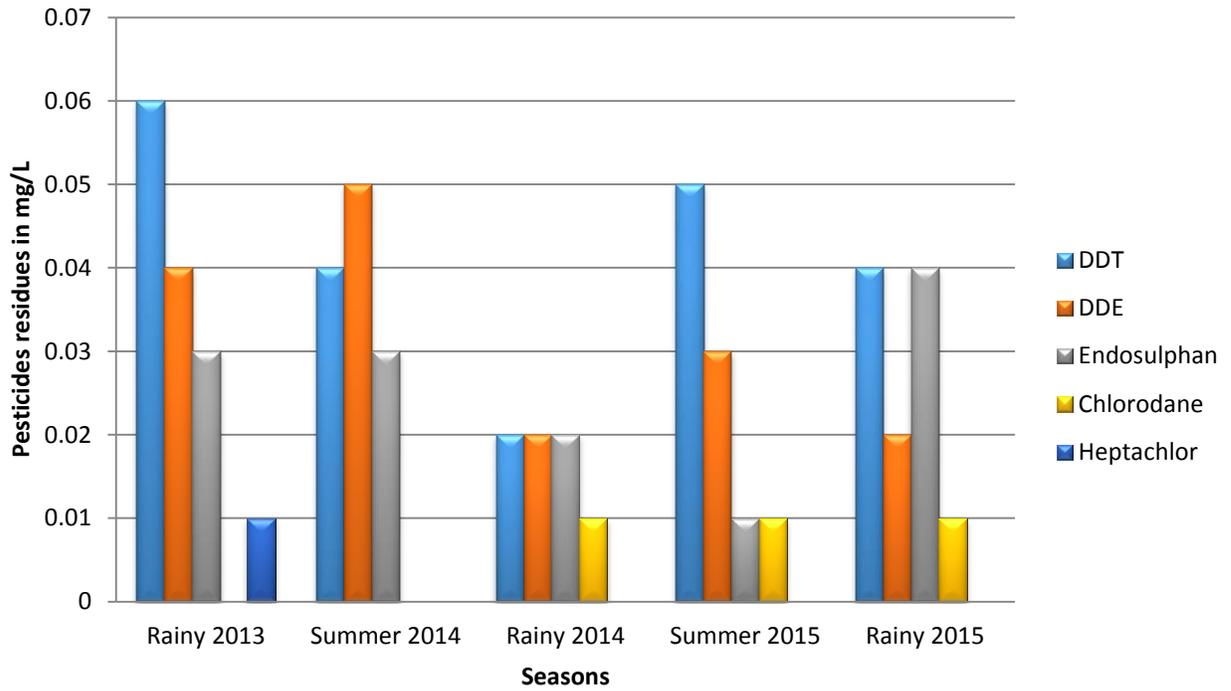
Cotton is the most important cash crop with the largest area under cultivation, followed by sorghum. Within the district, Washim taluka has the largest area under cotton cultivation. Washim is the largest producer of sorghum. Washim taluka is also wheat producers. Ekburji Dam, Umrashmshoddin Dam and Ukalipen Dam are the main dams in the tahesil and peoples living nearby area of these dams are depends upon these dams for the irrigation.

Table no.4 shows concentration of OC pesticide residues in water for the Washim Tahesil. The associated figure for mean concentration for pesticide DDT was in the range of 0.01-0.06 µg/L and the associated figure for mean concentration for pesticide DDE was in the range of 0.01-0.05 µg/L. The pesticide chlorodane and Heptachlor were found in very small quantity, the associated figure these pesticides was found to be 0.0-0.01 µg/L. The associated figure for mean concentration of Endosulfan was in the range of 0.01-0.05 µg/L.

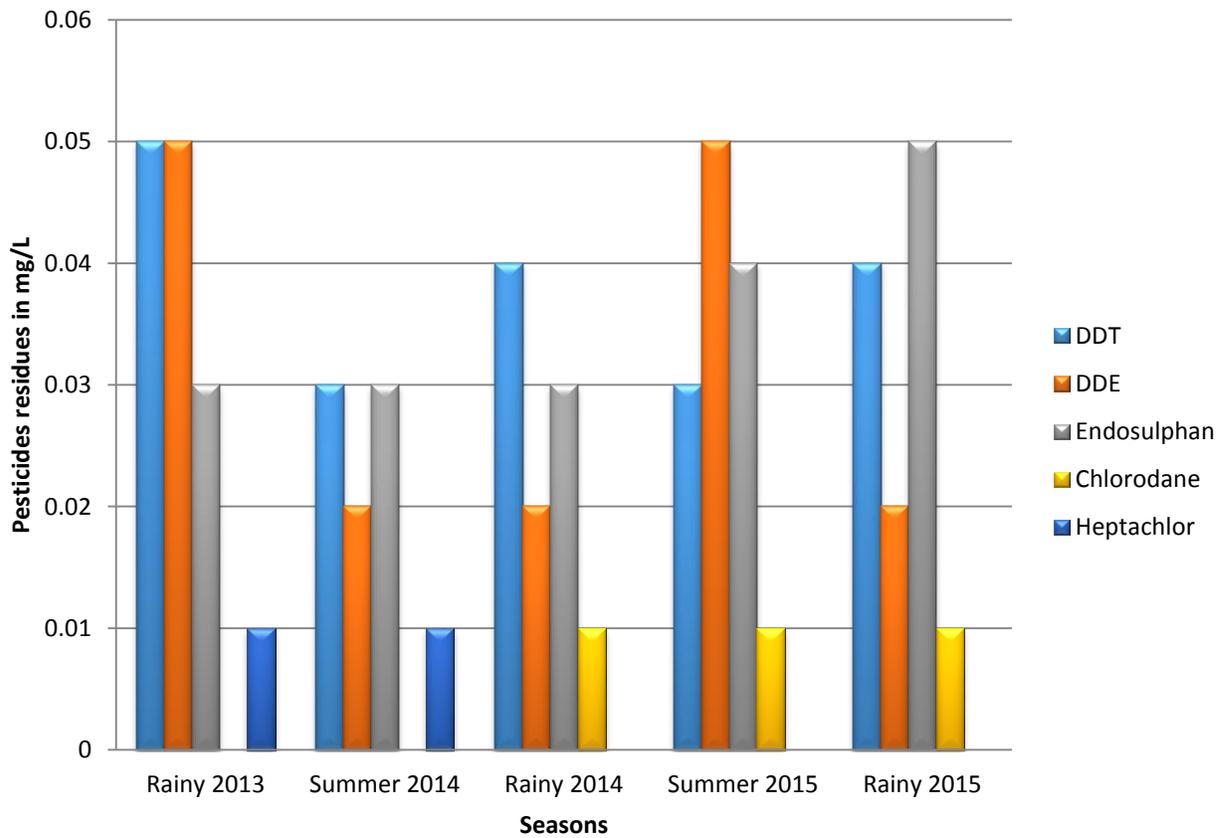
Table 4: Levels of organochlorine pesticides in water samples from Washim Tahesil.

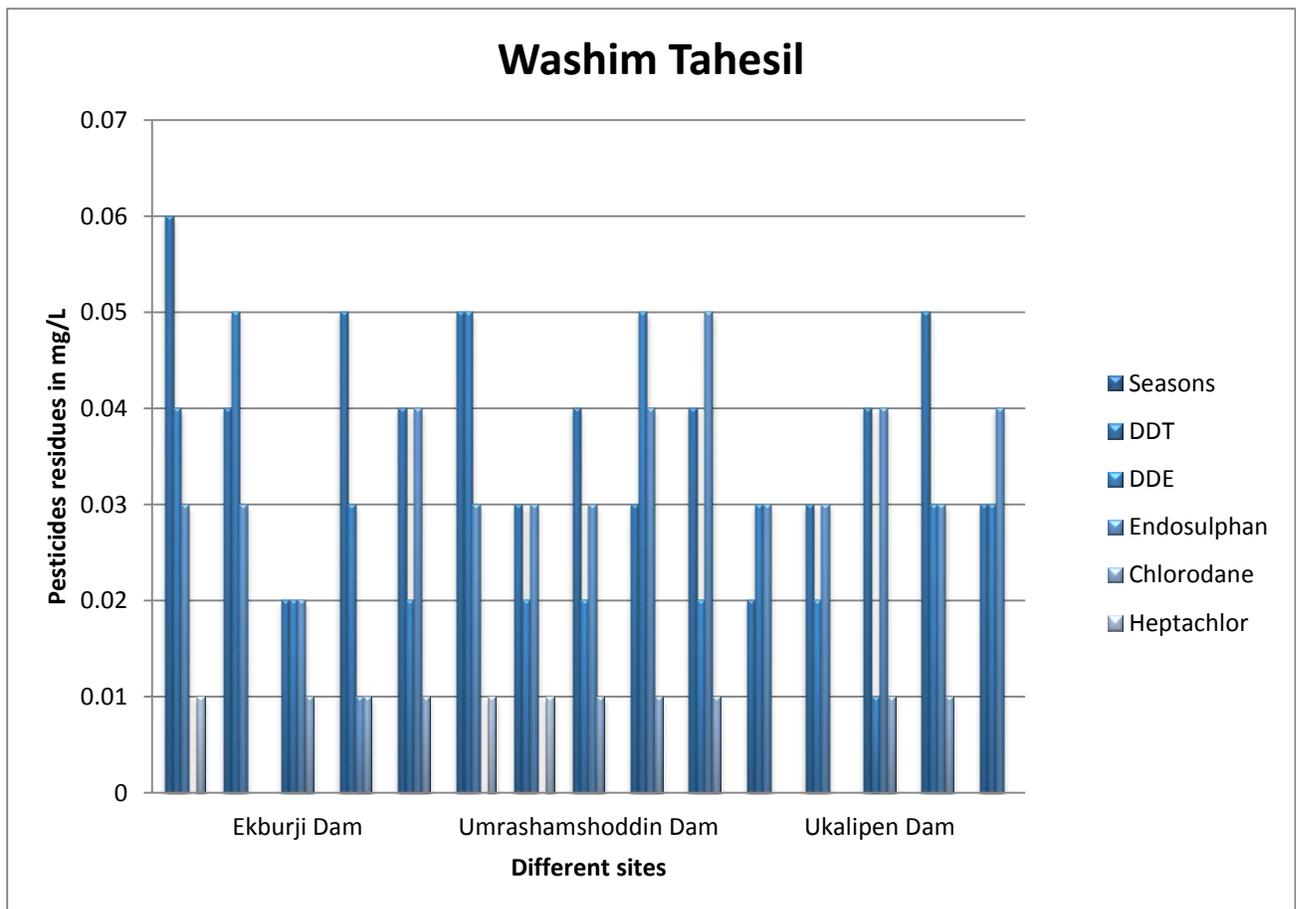
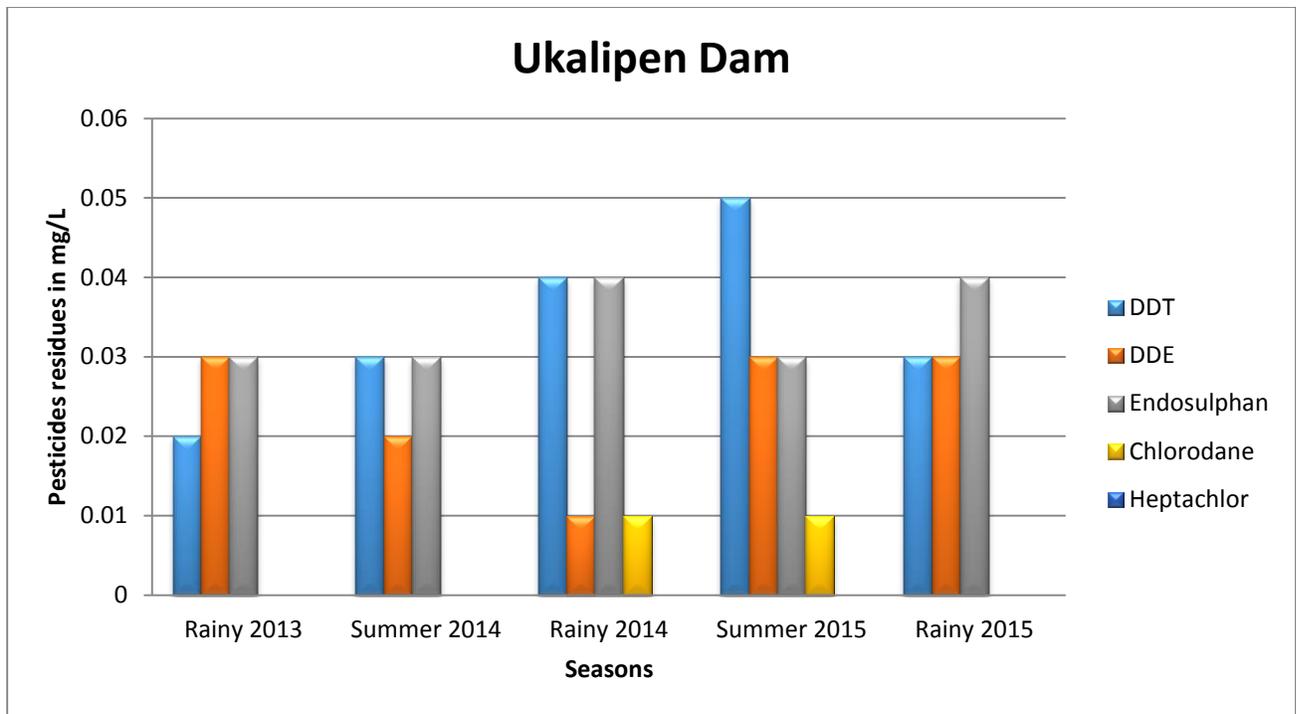
Washim						
Dams/Rivers	Seasons	DDT	DDE	Endosulfan	Chlorodane	Heptachlor
Ekburji Dam	Rainy 2013	0.06	0.04	0.03	ND	0.01
	Summer 2014	0.04	0.05	0.03	ND	ND
	Rainy 2014	0.02	0.02	0.02	0.01	ND
	Summer 2015	0.05	0.03	0.01	0.01	ND
	Rainy 2015	0.04	0.02	0.04	0.01	ND
Umrashamshoddin Dam	Rainy 2013	0.05	0.05	0.03	ND	0.01
	Summer 2014	0.03	0.02	0.03	ND	0.01
	Rainy 2014	0.04	0.02	0.03	0.01	ND
	Summer 2015	0.03	0.05	0.04	0.01	ND
	Rainy 2015	0.04	0.02	0.05	0.01	ND
Ukalipen Dam	Rainy 2013	0.02	0.03	0.03	ND	ND
	Summer 2014	0.03	0.02	0.03	ND	ND
	Rainy 2014	0.04	0.01	0.04	0.01	ND
	Summer 2015	0.05	0.03	0.03	0.01	ND
	Rainy 2015	0.03	0.03	0.04	ND	ND

Ekburji Dam



Umrashamshoddin Dam





Graph Showing Level of pesticide residues in Washim Tahesil

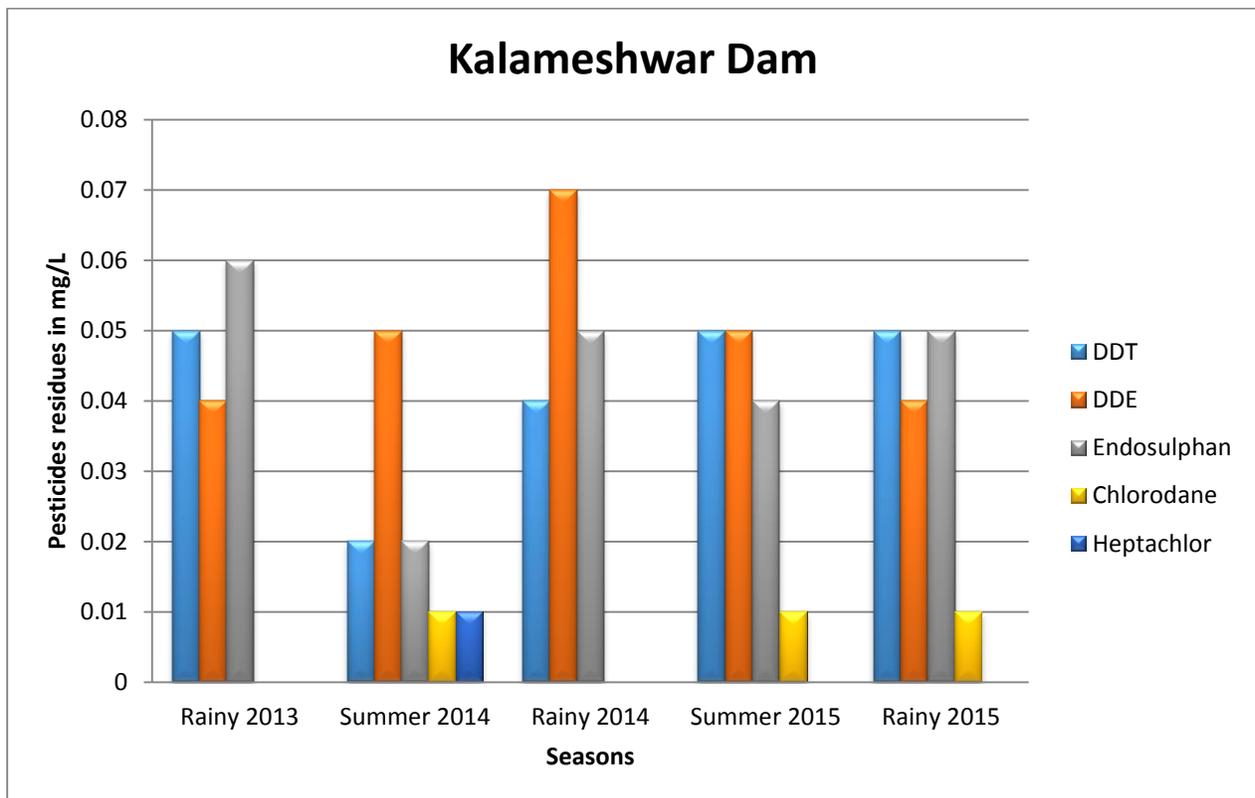
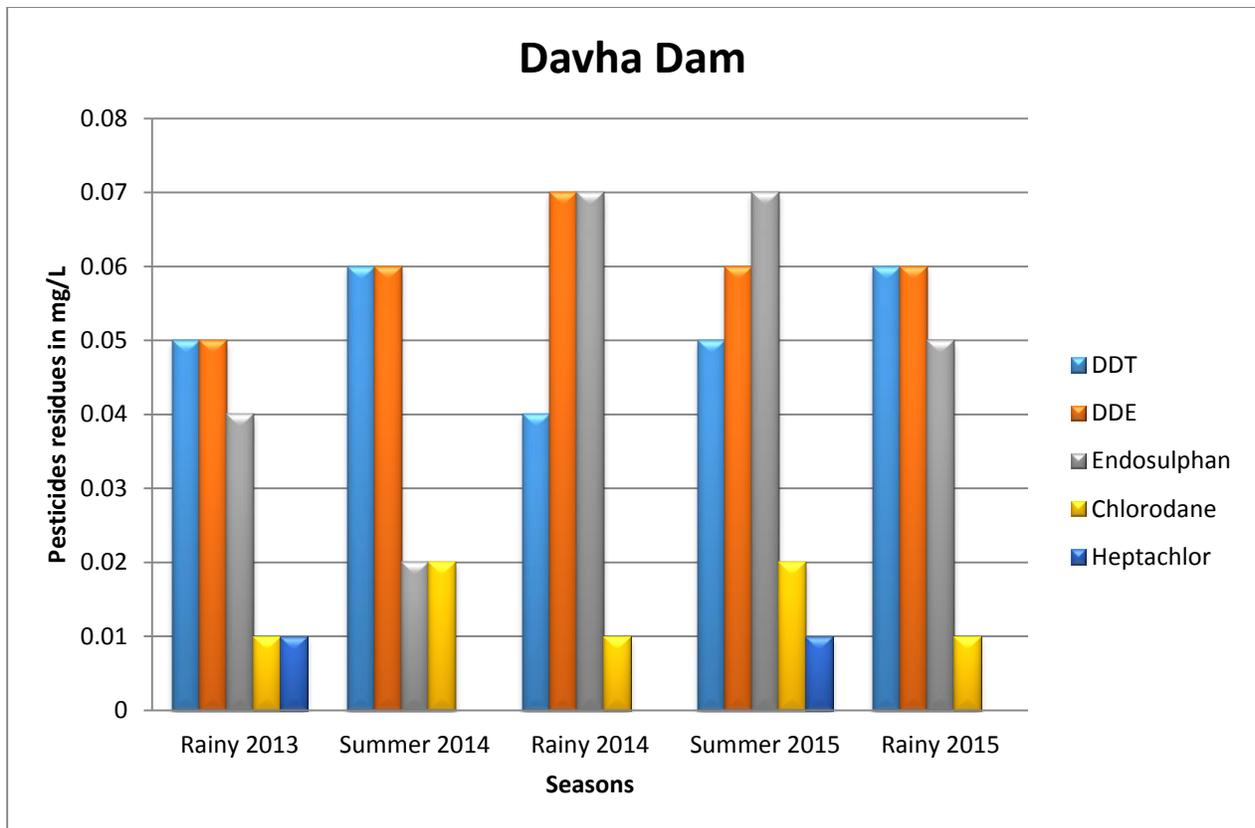
Malegaon

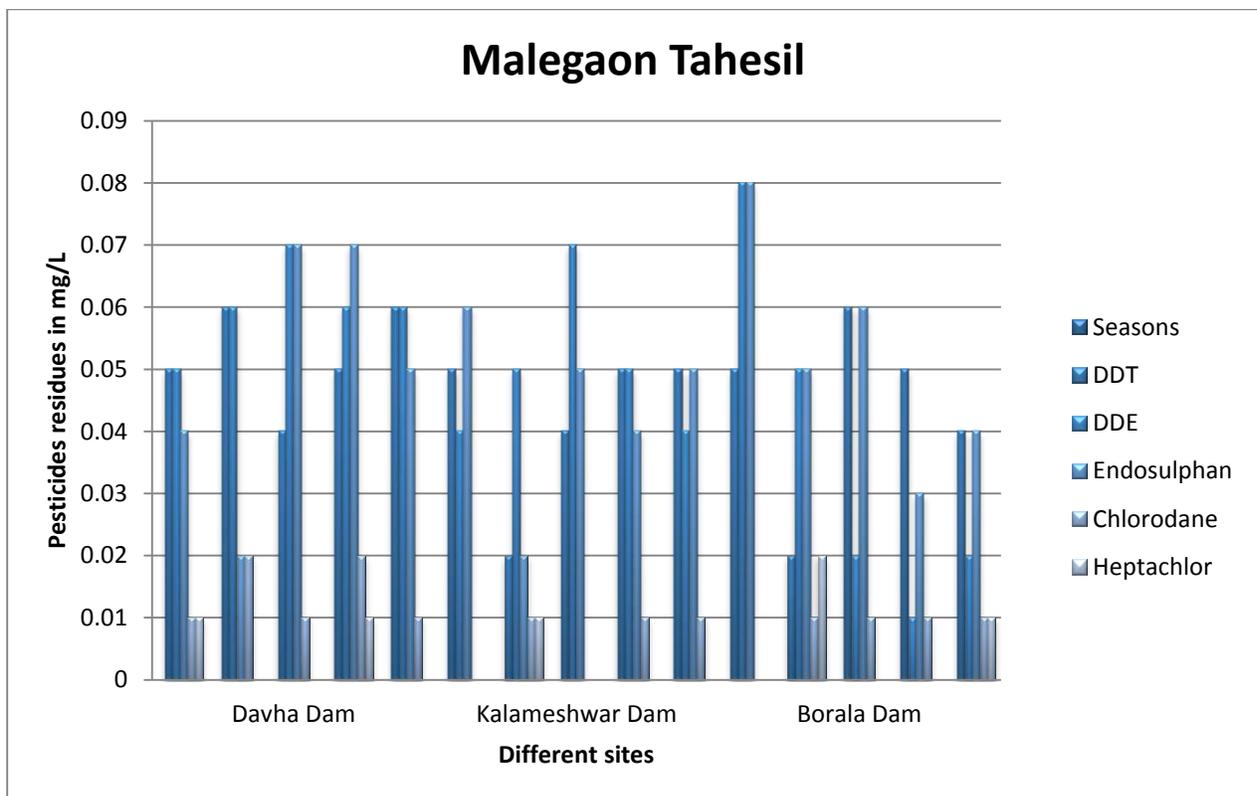
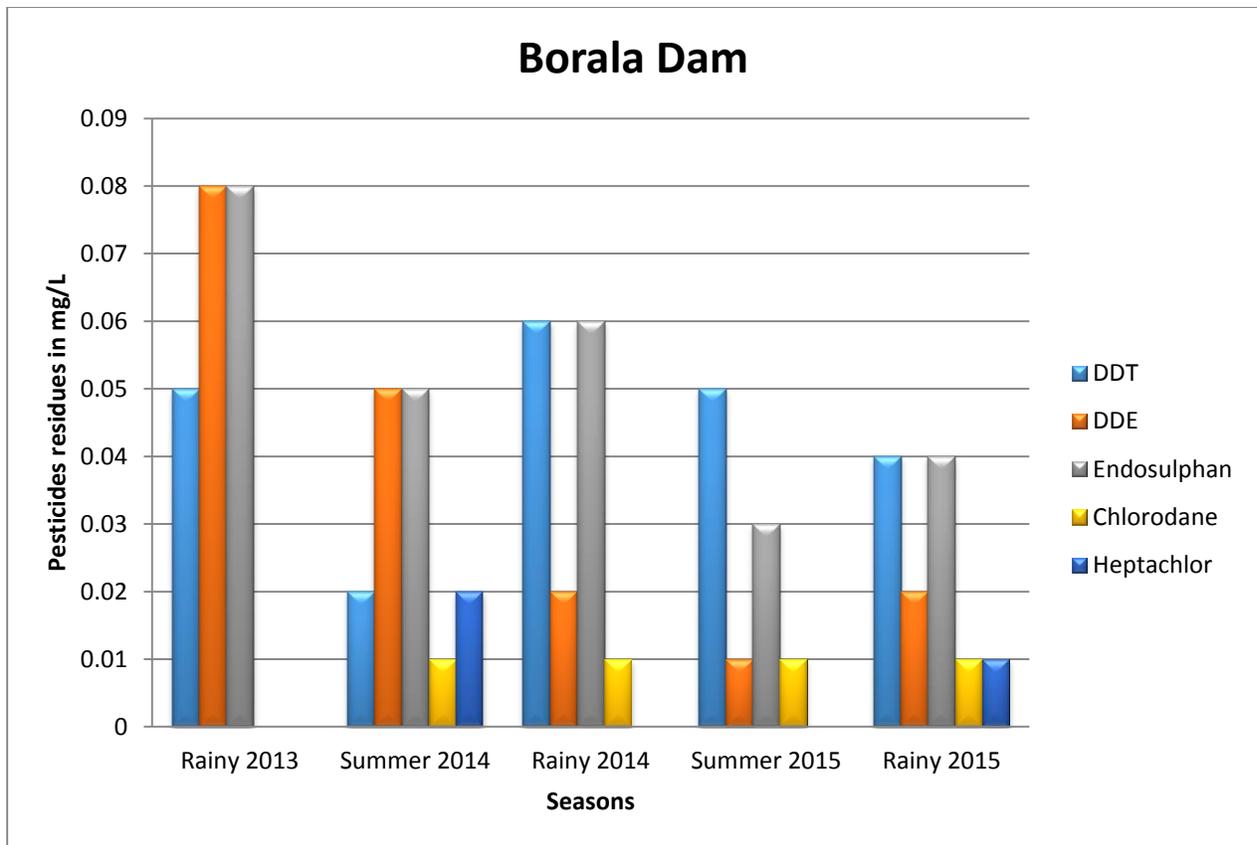
Malegaon tahesil is one of the tahesil of Washim district which is among the largest producer of sorghum in the district. The other crops like cotton, soyabean etc. The important Dams present in the tahesil are Davha Dam, Kalameshwar Dam and Borala Dam.

Table no.5 shows concentration of OC pesticide residues in water for the Malegaon Tahesil. The associated figure for mean concentration for pesticide DDT was in the range of 0.01-0.06 $\mu\text{g/L}$ and the associated figure for mean concentration for pesticide DDE was in the range of 0.01-0.08 $\mu\text{g/L}$. The pesticide chlorodane and Heptachlor were found in very small quantity, the associated figure these pesticides was found to be 0.0-0.02 $\mu\text{g/L}$. The associated figure for mean concentration of Endosulfan was in the range of 0.01-0.08 $\mu\text{g/L}$.

Table 5: Levels of organochlorine pesticides in water samples from Malegaon Tahesil.

Malegaon						
Dams/Rivers	Seasons	DDT	DDE	Endosulfan	Chlorodane	Heptachlor
Davha Dam	Rainy 2013	0.05	0.05	0.04	0.01	0.01
	Summer 2014	0.06	0.06	0.02	0.02	ND
	Rainy 2014	0.04	0.07	0.07	0.01	ND
	Summer 2015	0.05	0.06	0.07	0.02	0.01
	Rainy 2015	0.06	0.06	0.05	0.01	ND
Kalameshwar Dam	Rainy 2013	0.05	0.04	0.06	ND	ND
	Summer 2014	0.02	0.05	0.02	0.01	0.01
	Rainy 2014	0.04	0.07	0.05	ND	ND
	Summer 2015	0.05	0.05	0.04	0.01	ND
	Rainy 2015	0.05	0.04	0.05	0.01	ND
Borala Dam	Rainy 2013	0.05	0.08	0.08	ND	ND
	Summer 2014	0.02	0.05	0.05	0.01	0.02
	Rainy 2014	0.06	0.02	0.06	0.01	ND
	Summer 2015	0.05	0.01	0.03	0.01	ND
	Rainy 2015	0.04	0.02	0.04	0.01	0.01





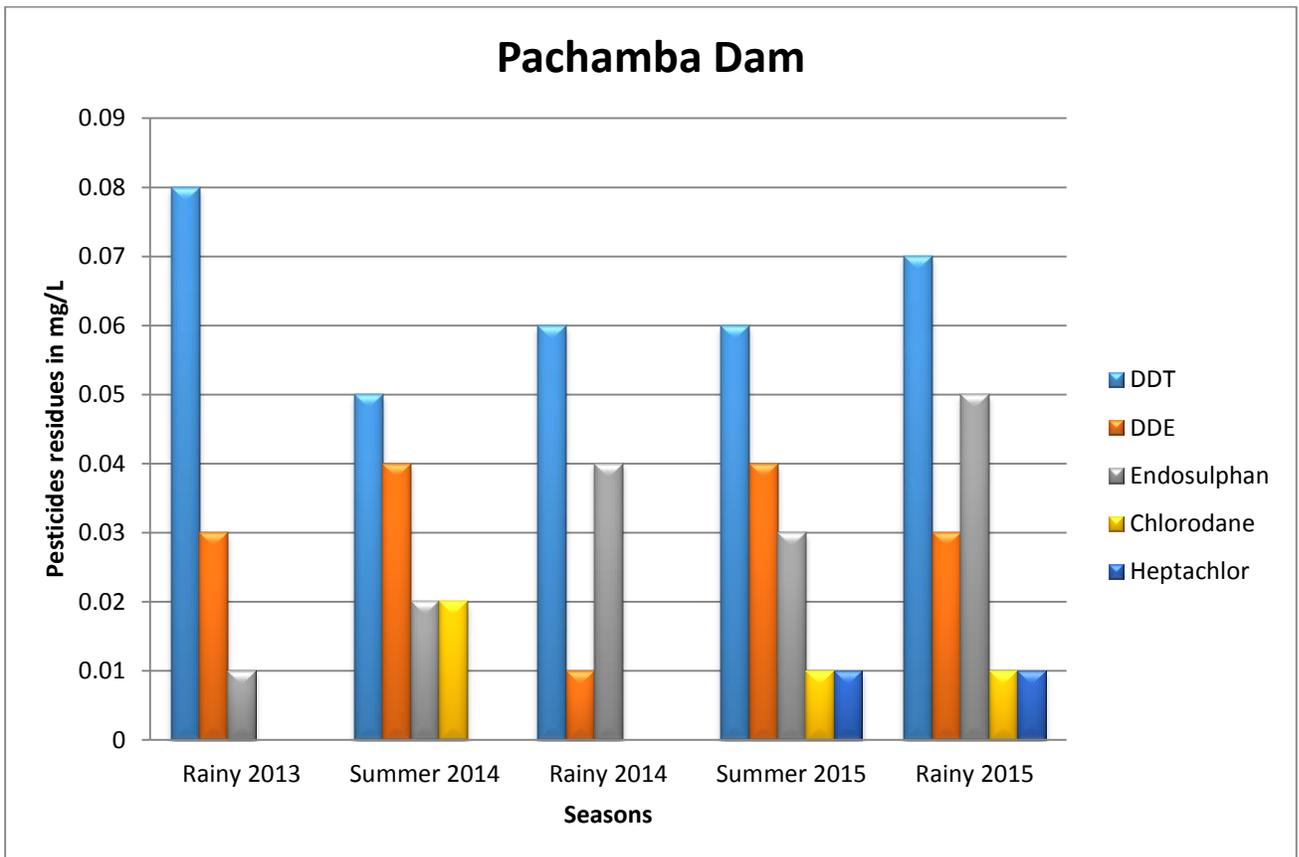
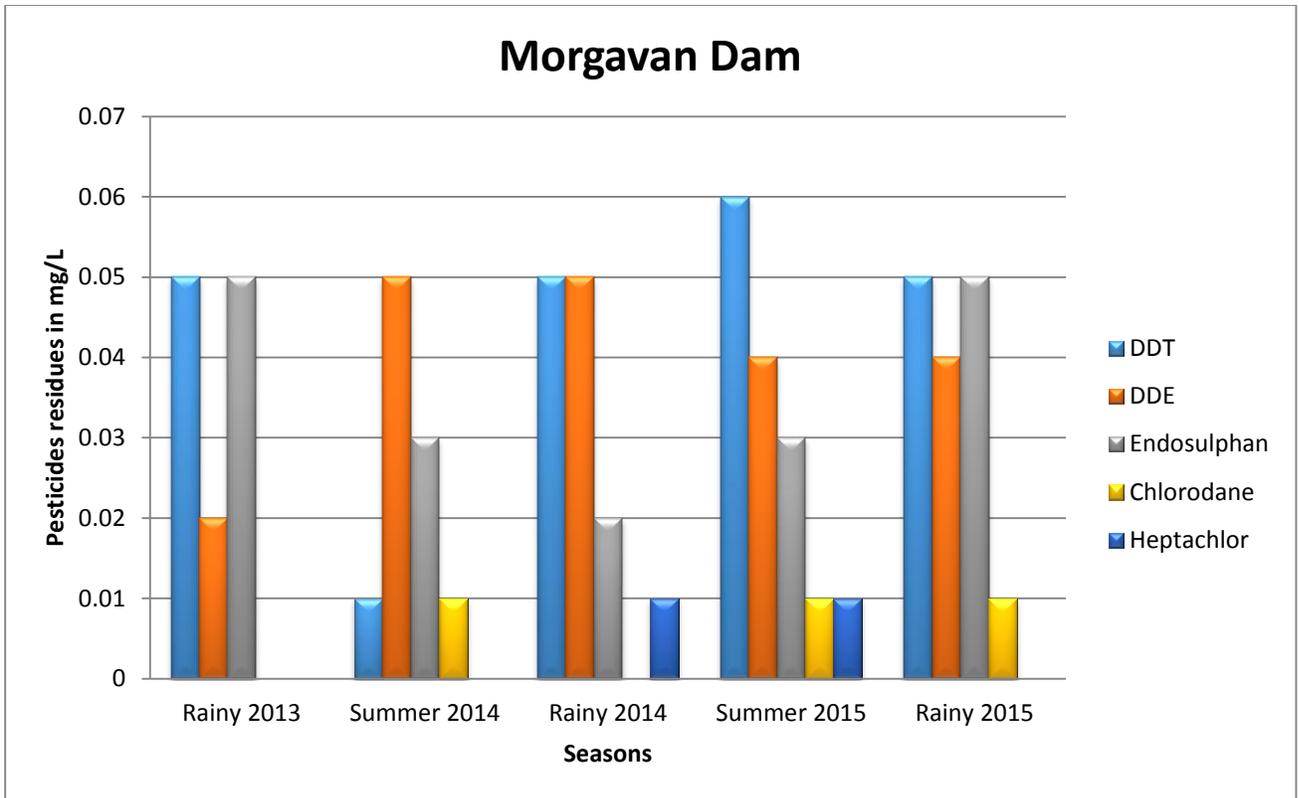
Graph Showing Level of pesticide residues in Malegaon Tahesil

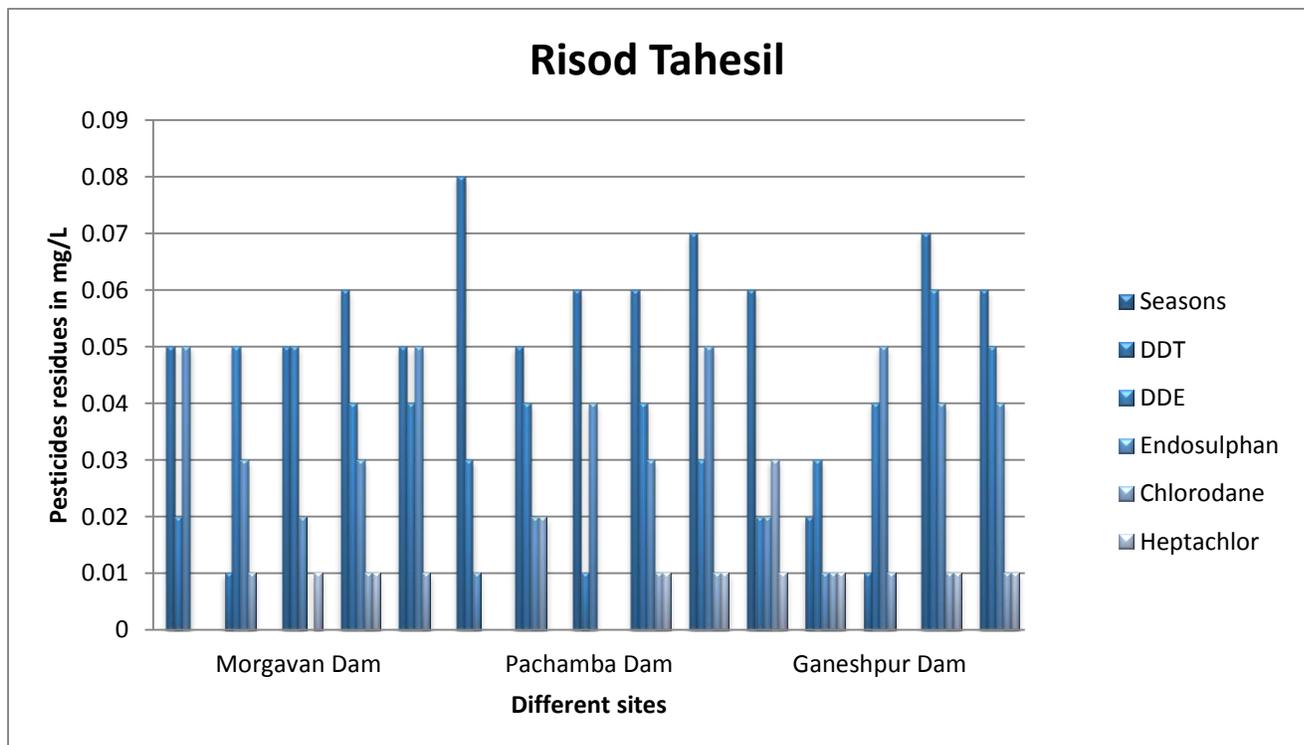
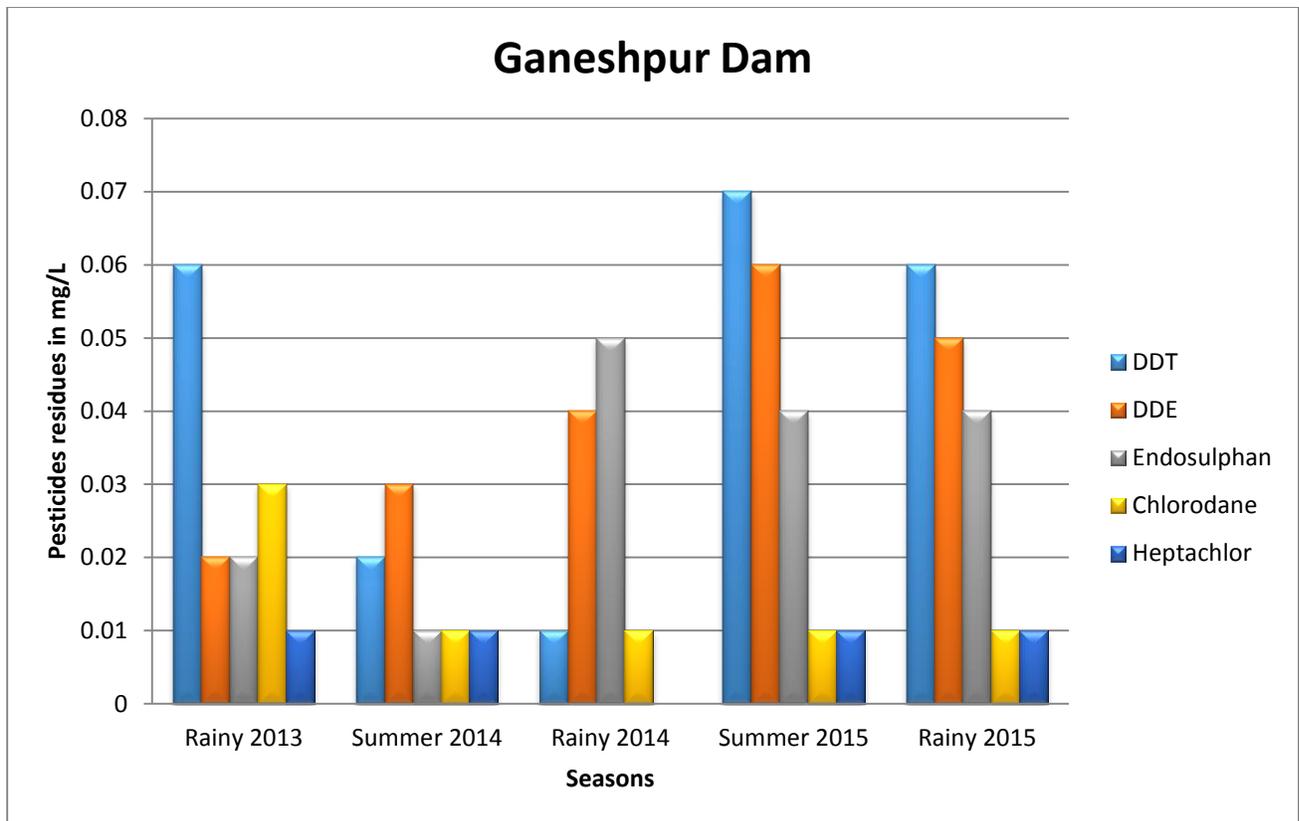
Risod

Table no.6 shows concentration of OC pesticide residues in water for the Risod Tahesil. The associated figure for mean concentration for pesticide DDT was in the range of 0.01-0.07 µg/L and the associated figure for mean concentration for pesticide DDE was in the range of 0.01-0.06 µg/L. The pesticide chlorodane and Heptachlor were found in very small quantity, the associated figure these pesticides was found to be 0.0-0.02 µg/L. The associated figure for mean concentration of Endosulfan was in the range of 0.01-0.05 µg/L.

Table 6: Levels of organochlorine pesticides in water samples from Risod Tahesil.

Risod						
Dams/Rivers	Seasons	DDT	DDE	Endosulfan	Chlorodane	Heptachlor
Morgavan Dam	Rainy 2013	0.05	0.02	0.05	ND	ND
	Summer 2014	0.01	0.05	0.03	0.01	ND
	Rainy 2014	0.05	0.05	0.02	ND	0.01
	Summer 2015	0.06	0.04	0.03	0.01	0.01
	Rainy 2015	0.05	0.04	0.05	0.01	ND
Pachamba Dam	Rainy 2013	0.08	0.03	0.01	ND	ND
	Summer 2014	0.05	0.04	0.02	0.02	ND
	Rainy 2014	0.06	0.01	0.04	ND	ND
	Summer 2015	0.06	0.04	0.03	0.01	0.01
	Rainy 2015	0.07	0.03	0.05	0.01	0.01
Ganeshpur Dam	Rainy 2013	0.06	0.02	0.02	0.03	0.01
	Summer 2014	0.02	0.03	0.01	0.01	0.01
	Rainy 2014	0.01	0.04	0.05	0.01	ND
	Summer 2015	0.07	0.06	0.04	0.01	0.01
	Rainy 2015	0.06	0.05	0.04	0.01	0.01





Graph Showing Level of pesticide residues in Risod Tahesil

Discussion:

Results from the study have been shown in differ tables for each Tahesils which is carried out in the seasons Rainy 2013, Summer, Rainy 2014, Summer 2015 & Rainy 2015 from the various dams and rivers of different tahasil of Washim district viz. Karanja, Manora, Mangrulpir, Washim, Malegaon & Risod. The results are related to the concentration of OC residues in water. The associated figure for mean concentration for pesticide DDT was in the range of 0.01-0.09 $\mu\text{g/L}$. The pesticides chlorodane, Lindane and heptachlor were not detected in the some water samples showing that the farmers around the reservoir do not use them in their farming activities but in some water samples found in the range of 0.0-0.02 $\mu\text{g/L}$. Endosulfan, a broad spectrum contact insecticide and acaricide, is another pesticide used by many farmers. The associated figure for mean concentration of Endosulfan was in the range of 0.01-0.07 $\mu\text{g/L}$.

Conclusion:

From the observed result we concluded that the water of all these areas of Washim district contains less amount of pesticide so water is suitable for domestic as well as agricultural purpose and also for drinking purpose after some treatment. Along with this pesticide analysis we also analyze some physico-chemical parameters and these parameter are in the limit of drinking water standards of BIS and WHO.

Dr. N. S. Thakare

Principal Investigator

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**AWARENESS OF THE PEOPLES ABOUT THE
PREVENTIVE AND CONTROL MEASURE OF
PESTICIDES RESIDUES IN ENVIRONMENT.**





**POSTER PRESENTATION ORGANIZED
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- ★ मुले वयात येण्याच्या प्रक्रियेवर विपरीत परिणाम होतो.
- ★ शारीरिक व मानसिक वाढ खुंटते.
- ★ आकडी येते.
- ★ कॅन्सरचा प्रादुर्भाव वाढतो.
- ★ व्यंग असलेली मुलं जन्माला येतात.
- ★ दृष्टी जाते.
- ★ किडनीवर परिणाम होतो .

रसायनशास्त्र विभाग

मा.सु.पा. कला, विज्ञान व
कै.पा.ठ.वाणिज्य महाविद्यालय, मानोरा