



## A Review: The Effect of Pesticides on Fish Fauna of Bhopal Upper Lake (MP)

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*(Received 23 June, 2012, Accepted 25 July, 2012)*

**ABSTRACT:** Studies on the toxicity of common pesticides and some industrial pollutants on fishes have been reviewed. Pollutants such as pesticides cause diseases, behavioral abnormalities, cancer and gene mutations in fishes. Physiological malformation, histological, haematological and biochemical changes have also been observed in fishes, Pesticides significantly affect the early life stages of fishes. Toxic effects of pesticides vary in different organs of the fish. Liver, gill, kidney are tissues that can accumulate high level of pollutants as well as other factors, such as salinity temperature, hardness etc.

**Keywords :** Bhopal Upper Lake, Fishes, Pesticides, Toxicity.

### INTRODUCTION

Industrial waste has long been recognized as serious pollutant of the aquatic environment. Pesticides have toxic effect in exposed organism. The presence of pesticides beyond permissible limits in water has been reported worldwide. Our study focuses on the toxic effect of pesticides on fish.

In lake, steps have been taken to monitoring of pesticides and other pollutants level in water sample. Monitoring of pollutants has been done in the lake. Several national drinking water mission and integrated environment programme on pesticides and other pollutants.

Water samples collected from various sources in different sites of lake were analyzed and pesticides were found within the permissible level. Pesticides concentration in submerged plants and fish at various sites of upper lake were observed only down stream sites and in fish collected at Bhadbhada weir, Kaliasot dam, Shaymala hills, Ahmadabad hills, Khanugaon and Ramsar, which was possible due to discharge of pesticides containing influent from various industries along sites of the lake.

Most of sites of lake are seriously polluted by industrial effluents. Effluents are waste products in liquid form resulting from industrial processing. They are released by different industries such as petrochemical complex, fertilizer factories, Oil refineries, Pulp paper, textile, Sugar, Steel mills and tanneries etc. All the chemicals of industrial waste are toxic to animal and many cases of death or sub-lethal pathology of liver, kidney, reproductive system, nervous system of fishes have been reported.

By discharge from the effluent inflows, amount of pesticides in water show an increase. They are present in water in dissolved condition form only at low levels, since pesticide compounds have low solubility. Mineral suspension and precipitation substances are able to store pesticides ions on their outer surface. Pesticides can also be found in water organisms. They can be taken up by higher organism through the food chain and sink to bottom as sediment.

Pesticides are pollutants which affect the aquatic fish. Presence of pesticides show alteration of behavior, bio-accumulation of pesticides in the body of fish histopathological and biochemical alterations in fish. Pesticides also effect early life stages of fish (Table 1).

### MATERIAL AND METHODS

Water samples were collected seasonally during june 2011 to july 2012 from polluted and non polluted selected sites using rottener water sampler and were estimated by standard methods as given by APHA (1985). Fishes are collected, arranged, preserved, identify and classify based on the work of Jhingran (1982), with slight modification as followed by Day's Fauna (1989) and Jayaram (1999).

### RESULTS AND DISCUSSION

All pest destruction agents are collectively known as pesticides. The most frequent used pesticides are insecticides, herbicides and fungicides. Pesticides are of two type naturally occurring and synthetic pesticide.

Table 1. Toxicity of pesticides on fishes.

S. No.	Test Organism	Pesticides/pesticide Conc.	Exposure Duration	Effect Organism
1.	<i>Carla catla</i>	Endosulfan carbonyl	0.04ppm 0.05ppm	Significant histological alteration in gill.
2.	<i>Labeo rohita</i>	Chlorophyrifos	15 days, 30 days	Biochemical changes of total protein and glycogen observed.
3.	<i>Puntius punctatus</i>	Endosulfan and Diazinon	7 days, 14 days	Depletion in the activity of arginine and tryptophane showing the interaction of pesticides with cellular proteins.
4.	<i>Puntius punctatus</i>	Endosulfan and Diazinon	15 days, 30 days	Alteration of calcium content in the stomach after pesticides treatment.
5.	<i>Puntius punctatus</i>	Rogon (dimithoate)	7 days, 14 days	Abnormal behavior pattern in fish
6.	<i>Cyprinus carpio</i>	Carbofuran 16ppm	30 days, 90 days	Decrease in total erythrocyte count, total leucocytes count and hemoglobin count.
7.	<i>Cyprinus carpio &amp; Puntius ticto</i>	Aldrin, Dieldrin BHC and DDT	30 days	Bioaccumulation of chlorinated pesticides in fish tissue gill, liver muscle and kidney observed.
8.	<i>Mystus vittatus</i>	Dimecron and Thiodon	7 days, 14 days	Rate of food in take, absorption and metabolism decrease from the control value.
9.	<i>Heteropneustes fossilis</i>	Endosulfan .00075 ppm .00050ppm .000375ppm	15d,30d 45d,60d	Increased concentration, of toxicant showed the decrease in liver glycogen. Hepatic cells are damaged due to depletion of glycogen.
10.	<i>Heteropneustes fossilis</i>	Dimecron	90 day	Significant decrease in Hb%, RBC number and O <sub>2</sub> carrying capacity of blood.
11.	<i>Clarias batrachus</i>	Carbaryl and Phorate	24h, 72h, 120h, 168h,	Cholesterol level in serum decreased during exposure period.
12.	<i>Clarias batrachus</i>	Phorate .27ppm	168h	Physiological and histological disorder in testis and ovary of insecticide exposed fish.
13.	<i>Gambusia affinis</i>	Dimecron .0068ppm	30 day	Histopathological changes such as hepatic lesion with necrosis pyconic nuclei vasculature damaged blood vessel in alimentary canal, liver, kidney and gill.
14.	<i>Oreochromis mossambica</i>	Endosulfan	30day	Endosulfan induced dysfunction of osmoregulation processes, resulting in alteration of ionic composition of blood.
15.	<i>Nandus nandus</i>	Endosulfan and Diazinon	30 day	Significant histological alteration in gill and finregion.

Synthetic pesticides like chlorinate organophosphate and carbonate. Organophosphate are most toxic to vertebrate. Organophosphates inhibit cholinesterase an enzyme essential for transmission of nerve impulse across the synapse. DDT and other organic chlorine chemical may have an influence on endocrinal system. DDT is highly stable chlorinated hydrocarbon or extremely low degradability. DDT is one of the most known pesticide previously used worldwide. The fat solubility and extreme persistence of DDT have led it to be stored in the body of almost all organism. The use of DDT has been declared illegal by almost all countries. Like pesticides also caused toxic effect

on fish. Behavioral abnormalities include cancer, hematological and biochemical change which have been observed in pesticides exposed fish. I have reported abnormal behavior of *Puntius punctatus* due to exposure of Rogor insecticide. Bioaccumulation of Aldrin, Dieldrin, BHC DDT in gill, liver, muscle and kidney of *Cyprinus carpio* and *Puntius ticto* have been observed pesticide alter the enzyme activity. The acetyl cholinesterase activity in brain of *Cyprinus carpio* (finger lings) pesticide.

Histology of gill altered due to effect of pesticide (endosulfan carbaryl). Pesticides exposed fish also shows hematological changes. Decrease of erythrocyte and

leucocytes count in pesticide (carbofuran) exposed *Cyprinus carpio*. Dimecron exposed *Heteropneustes fossilis* and showed significant decrease in Hb%, R.B.C. number and O<sub>2</sub> carrying capacity of blood.

In *Catla catla*, *Nandus nandus* and *Labeo rohita* have been observed significant histological and biochemical alteration in gill and fin region due to effect of endosulfan, diazinon and chlorophyrifos. Carbaryle and phorate, decreased cholesterol level in serum due to exposed in *Clarias batrachus*. Decrease Rate of food intake absorption, metabolism and control value in pesticide (Dimecron and Thiodon) exposed *Mystus vittatus*. Endosulfan exposed *Oreochromis mossambica* and showed dysfunction of osmoregulation processes, resulting in alteration of ionic composition of blood (Table 1).

## CONCLUSION

Pesticides have been recognized as serious pollutants of aquatic environment. Its affect fish directly by accumulation in their body. They cause serious impairment in metabolic, physiological and structural system (Table 1). It may affect a fish indirectly by transfer to the next trophic level of food chain. The accumulation of pesticides in the tissues of a fish can result in chronic illness and cause potential damage of population. Fish are able to accumulate and retain pesticides and other pollutants from their environment. Accumulation of pesticides in the tissue of fish is dependent upon exposure concentration as well as other factors such as salinity, temperature, hardness and metabolism of fish.

Pesticides effect on specific vital organs such as liver, gill and kidney. Liver contains the highest pesticides concentration because it is an organ of storage and detoxification of pesticides. Liver has also an important role in storage, redistribution, detoxification and also act as an active site of pathological effects, induced by contaminants. Different degree of pesticides accumulation in various tissues depends upon the biochemical characteristic of pesticides. Fish may accumulate pesticides by absorption through gills, has been observed the concentration of pesticides in gill reflect the concentration of pesticides in water in which fish species live.

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