

A Study on Effects of Pesticides on Fishes in Bhadbhada Dam Bhopal, Madhya Pradesh, India.

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ABSTRACT : The study of the effects of environmental pollutants like pesticides specially the insecticides on the health of the aquatic organisms known as Aquatic Toxicity. The substances which are used to check pests including aquatic weeds, plants diseases, insects and aquatic snails, that carry the cause of Schistosomiasis called Pesticides. They are highly toxic not only to the fishes but also to the other organisms which compose the food chain. In general pesticides are used very extensively in forestry, public health agriculture and in veterinary practices. Pesticides are classified according to their target used. They are three major pesticides - Herbicides used for weed control, Insecticides used for insect control and Fungicides used for Mycotic control, but the more acute toxicity caused by insecticides. Contamination by insecticides badly affects the growth, survival and reproduction of aquatic organisms. Waste water contains different concentrations of pesticides. Pesticides residues enter into non-targeted animals through the food chain, threatening the ecological balance and biodiversity of the nature. The long-term exposure of pesticides arouses physiological disturbances, behavioral dysfunction, histopathological damages, hematological alterations, biochemical changes, immune-suppression, hormone disruption, diminish intelligence, reproductive abnormality and cancer. Fishes are important bioindicators for aquatic contamination to assess the changes caused by human activities effectively.

KEYWORDS: Pesticide, toxicity, aquatic toxicity, food chain, biodiversity, contamination, fishes, pollutants, ecological balance, bio-indicator.

I. INTRODUCTION:

Bhopal "The City of Lakes" has many dams. The 'Bhadrabha Dam' is a set of 11 sluice gates located at the southeast corner of the Bhoj

Taal in Bhopal. The dam was constructed in 1965. The Bhadrabha Dam gates are used to control the outflow of water from the lake to Kaliyasot river. They are usually opened only when the Bhopal city receives heavy rainfall during the monsoon season. Dam has a full tank level of 1666.80 feet. Van Vihar National Park and Sair Sapata are located on the site of Bhadrabha Dam and enhance its beauty. The water of the dam is facing problem of eutrophication, sewage, industrial waste, agricultural runoff etc.

Industrial waste has been conceded as serious pollutant of the aquatic environment. Pesticides are the substances used for controlling pests in various fields. They are very toxic, non-biodegradable and they remain persistent for longer time in the environment by the process of bio-accumulation and biomagnification through food chain.

After Green Revolution during 60's, we are living in a technological era, technologies are making our life easier. In India pesticides emerged as knight amours for crops to enhance yield [1]. Pesticides are used very commonly in forestry, agriculture, public health and veterinary practices and are gaining massive importance due to their ability to control weeds, pests including plant diseases, insects, aquatic snails and aquatic weeds [2-6]. Pesticides are grouped according to target used and shied a wide wide range of compounds like herbicides, insecticides, fungicides, rodenticides, molluscicides, nematicides, plant growth regulators and others. Out of which three major groups of pesticides are Herbicides used in weed control, Insecticides in insect management and Fungicides in fungal or mycotic control. The main chemical groups of pesticides that are usually being used in crop fields are Organophosphates, Carbamates, Organochlorine, Parasitoids, Triazole and Nicotinoids [7,8]. Unfortunately, in the face of

this advantages, its composition has great disadvantages too. Pesticides has ascribed with economic potential to improve production of food and fiber and benefited in vector - borne diseases, over a period of time its use has caused effects on human health and the environment including aquatic ecosystem that developed new branch of Aquatic Toxicology [9-11].

Aquatic Toxicology is a branch of science which deals with a study of the effects of environmental pollutants on the aquatic organisms. Pesticides are highly toxic substances not only for the fish but also to the other organisms which comprise the food chain. The main cause of deposition of pesticides in aquatic ecosystem is agricultural runoff near water bodies. Bio-accumulation of pesticides harm the long-term survival of fishes by disrupting the ecological relationship between organisms and loss of biodiversity [12-14]. Long-lived exposure of pesticides creates behavioral changes, physiological disturbances, hematological alteration, histopathological damages, biochemical changes, hormone disruption, immune suppression, diminish intelligence, reproductive abnormalities and cancer [15-22]. Fishes are significant bio-indicators for the aquatic contamination. Recent research showed that fishes are quickly becoming scarce due to the increasing use of chemical pesticides in fields. After all, fishes are important sources of proteins and lipids, healthy fishes are very important for human beings [23]. In India for the regulation of pesticides 2 different boards is made - The Central Insecticide Board and Registration Committee (CIBRC) and Food Safety and Standards Authority of India (FSSAI).

II. MATERIALS AND METHODS:

Water samples were collected seasonally during June 2017 to July 2018 from polluted and non-polluted selected sites by using Rottener water sample and were evaluated by standard methods given by a APHA (1985). Fishes are collected, arrange, preserved, identified and classified grounded on the works of Jhingaran (1982), Day's fauna (1989) and Jayaram (1999).

III. RESULTS AND DISCUSSION:

Agents which destruct the pests called pesticides. Herbicides, insecticides and fungicides are the most common pesticide used. They are of 2 types- natural and Synthetic. Chlorinate organophosphate and carbonate are synthetic pesticides. Vertebrates are very sensitive towards the toxicity caused by organophosphate. Cholinesterase is an enzyme for transmission of nerve impulse across the synapse inhibited by organophosphates.

Dichlorodiphenyltrichloroethane (DDT) and other organic chlorine chemical may have an impact on endocrinial system. DDT is extremely stable chlorinate hydro cation and greatly low degradable. It is one of the most known pesticide formally used worldwide. DDT has high persistence and fat solubility because it stored in the body of almost all organism. Due to its dangerous consequences, DDT has declared banned almost in all countries. When fish get exposed to pesticide, shows behavioral abnormalities, cancer, hematological and biochemical changes. The study reported abnormal behavior of *Puntius punctatus* due to exposure of Rogar insecticide. Bio-accumulation of Dieldrin, Aldrin, BHC, DDT in the liver, gills, kidneys and muscles of *Cyprinus carpio* and *Puntius ticto* have been reported because pesticide alter the enzyme activity. The activity of acetylcholinesterase in the brain of *Cyprinus carpio* affects the fingerlings due to pesticides.

Gills histology is altered due to the effects of Endosulfan Carbarly. Fish exposed to pesticide shows hematological changes also. *Cyprinus carpio* exposed to Carbofuran pesticide showed decrease in erythrocyte and leucocyte count. Heteropneumenes fossilis exposed to Dimecron pesticide showed significant decrease in RBC count, Hb percent and oxygen carrying blood capacity. In *Labeo rohita*, *Nandus nandus* and *Catla catla* have been noticed significantly for their histological and biochemical alteration in the gills and fins due to effect of Diazinon, Endosulfan and Chlorpyrifos. *Clarius batrachus* exposed to Phorate and Carbaryl showed decrease cholesterol level in serum. *Mystus vittatus* exposed to Dimecron and Thiodon showed decrease rate of food intake, absorption, metabolism and control value. *Oreochromis mossambica* showed dysfunction in process of osmoregulation, resulting in alteration of ionic composition of blood.

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S.No	Test organism	Pesticides/ Pesticide Conc.	Exposure Time	Effect on Organism
1	Labeo rohita	Chlorpyrifos	15 days, 30 days	Changes in total protein and glycogen biochemistry.
2	Cyprinus carpio	Carbofuran 16 ppm	30 days, 19 days	Reduction in total R.B.C's, W.B.C's and Hb count.
3	Catla catla	Endosulfan Carbonyl	0.04 ppm 0.05 ppm	Histological changes in gills.
4	Puntius punctatus	Endosulfan Diazinon	7 days, 14 days	Action of Arginine and Tryptophan depleted because of interaction of pesticides with cellular protein.
5	Puntius punctatus	Endosulfan Diazinon	15 days, 30 days	After pesticide treatment changes in calcium content in stomach.
6	Puntius punctatus	Rogan (dimethoate)	7 days, 14 days	Changed behavioral pattern.
7	Cyprinus carpio & Punctius ticto	Aldrin BHC DDT Dieldrin	30 days	Bio-accumulation of pesticides in gills, liver, muscles and kidneys.
8	Mystus vittatus	Dimecron Thiodon	7 days, 14 days	Decrease in food intake, absorption, metabolism
9	Clarias batrachus	Carbaryl Phorate	24h, 72h, 120h, 168h	Decreased level of cholesterol in serum.
10	Clarius batrachus	Phorate 27 ppm	168 h	Histological and physiological changes in testis and ovary.
11	Gambusia offinisi	Dimecron .0068 ppm	30 days	Hepatic lesion with necrosis, pyknotic nuclei vesiculation, blood vessel of alimentary canal, kidneys, liver and gills damage.
12	Nandus nandus	Endosulfan Diazinon	30 days	Histological changes in fins and gills.

IV. CONCLUSION:

Pesticides have been acknowledged as serious pollutant of aquatic environment. Fishes are directly affected by accumulation of pesticides in their body. They cause serious deterioration in physiological, structural and metabolic system. It can affect a fish indirectly by transfer to next trophic level by food chain. Pesticidal accumulation in the tissues of fish can result in chronic disorder and cause possible damage of population. Fishes are prone to accumulate and retain pesticides and other pollutants from their environment. Pesticidal accumulation is depend upon exposure concentration as well as other factors such as temperature, salinity, hardness and metabolism in fish. Exposure to pesticide affects specific vital organs of fish such as liver, gills and kidneys. Liver is an organ of storage and site for

detoxification of toxic substances contain the highest pesticides concentration. Various tissues of fish contain different degree of pesticide accumulation because of its biochemical characteristics.

REFERENCES:

- [1]. Srivastava P and Singh A (2014) Fate of fungicides on fish, Clariasbatrachus- a complete study. LAP LAMBERT Academic Publishing, Germany. 134 p.
- [2]. Gagnaire B, Thomas-Guyon H and Renault T (2004) In vitro effectsof cadmium and chromium on pacific oyster, Crassostrea gigas(Thunberg) haemocytes. Fish Shellfish Immunol. **10**, 502-512.
- [3]. Jain P, Sharma J D, Sohu D and Sharma P (2005) Chemical analysis ofdrinking water

- of villages of Sanganer Tehsil, Jaipur district. *Int.J. Environ. Sci. Technol.* **2**, 373-379.
- [4]. **Mustapha M K (2008)** Assessment of the water quality of OyunReservoir, Offa, Nigeria, using selected physico-chemicalparameters. *Turk. J. Fish. Aquat. Sci.* **8**, 309-319
- [5]. **Naeem M, Salam A, Tahir S S and Rauf N (2010)** Assessment of theessential element and toxic heavy metals in hatchery rearedOncorhynchus mykiss. *Int. J. Agric. Biol.* **12**, 935-938.
- [6]. **Abu-Darwish M S, Al-Fraihat A H, Al-Dalain S Y A, Afifi F U and Al-Tabbal J A (2011)** Determination of essential oils and heavymetals accumulation in *Salvia officinalis* cultivated in three intrarawspacing in ash-shoubak, Jordan. *Int. J. Agric. Biol.* **13**, 981-985.
- [7]. **Srivastava P and Singh A (2014)** Fate of fungicides on fish, *Clariasbatrachus*- a complete study. LAP LAMBERT Academic Publishing, Germany. 134 p.
- [8]. **Sarba F S and Mehana S D (2015)**Pesticides toxicity in fish withparticular reference to insecticides. *Asian J. Agri. Food. Sci.* **3**,40-60
- [9]. **Igbedioh S O (1991)** Effects of agricultural pesticides on humans,animals and higher plants in developing countries. *Arch. Environ.Hlth.* **46**, 218-224.
- [10]. **Forget G (1993)** Balancing the need for pesticides with the risk tohuman health. In: Impact of Pesticide Use on Health inDeveloping Countries (eds. Forget G, Goodman T and De VilliersA.), 2-16. IDRC, Ottawa.
- [11]. **Aktar W, Sengupta D and Chowdhury A (2009)** Impact of pesticides use in agriculture: their benefits and hazards. *Interdiscip. Toxicol.* **2**, 1-12.
- [12]. **Xie P, Zhuge Y and Dai M (1996)** Impacts of eutrophication onbiodiversity of plankton community. *Acta Hydrobiol. Sinica* **20**(Suppl.), 30-37.
- [13]. **Morel F M M, Kraepiel A M L and Amyot M (1998)** The chemicalcycle and bioaccumulation of mercury. *Ann. Rev. Ecol. Systa.* **29**, 543-566.
- [14]. **Abedi Z, Hasantabar F, Khalesi M K and Babaei S (2013)** Enzymaticactivities in common carp, *Cyprinus carpio* influenced bysublethal concentrations of cadmium, lead and chromium. *WorldJ. Fish. Mar. Sci.* **5**, 144-151
- [15]. **Pandey A K, George K C and Mohamed M P (1995)** Effect of DDTon thyroid gland of the mullet, *Liza parsia*(Hamilton-Buchanan).*J. Mar. Biol. Assoc. India* **37**, 287-290.
- [16]. **Pandey A K, Mishra D K and Bohidar K (2014)** Histopathologicalchanges in gonadotrophs of *Channa punctatus* (Bloch) exposedto sublethal concentration of carbaryl and cartap. *J. Exp. Zool.India* **17**, 451-455.
- [17]. **Crisp T M, Clegg E D, Cooper R L and Wood W P (1998)**Environmental endocrine disruption: an effects assessment andanalysis. *Environ. Hlth. Perspect.* **106** (Suppl. 1), 11-56
- [18]. **Brouwer A, Longnecker M P, Birnbaum L S and Moore J (1999)** Characterization of potential endocrine related health effects atlow-dose levels of exposure to PBCs. *Environ. Heath. Perspect.* **107**, 639-649.
- [19]. **Mishra D K, Bohidar K and Pandey A K (2006)** Responses of interrenalcells of freshwater teleost, *Channa punctatus* (Bloch), exposedto sublethal concentrations of carbaryl and cartap. *J. Ecophysiol.Occup. Hlth.* **6**, 137-141.
- [20]. **Mishra D K, Bohidar K and Pandey A K (2008)** Effect of sublethal exposure of cartap on hypothalamo-neurosecretory system ofthe freshwater teleost, *Channa punctatus* (Bloch). *J. Environ.Biol.* **29**, 917-922.
- [21]. **Ullah R, Zuberi A, Ullah S, Ullah I and Dawar F U (2014)**Cypermethrin induced behavioural and biochemical changes inmahseer, *Tor putitora*. *J. Toxicol. Sci.* **39**, 829-836.
- [22]. **Ullah S and Zorriezahra M J (2015)** Ecotoxicology: a review ofpesticides induced toxicity in fish. *Adv. Anim. Vet. Sci.* **3**, 40-57.
- [23]. **Srivastava P and Singh A (2013a)**In vivo study of effects ofdithiocarbamates fungicide (Mancozeb) and its metaboliteethylenethiourea (ETU) on freshwater fish, *Clarius batrachus*.*J. Biol. Earth Sci.* **3**, 228-235.