THE TOXICITY EFFECT OF MONOCROTOPHOS 36 E.C% ON THE HISTOLOGICAL CHANGES IN GILL OF *LABEO ROHITA* (HAMILTON, 1882)

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Abstract: Pesticides are stable compounds and they enter the aquatic ecosystem through the agriculture run off. The evaluation of nature and degree of harmful effects produced by toxic substance in the aquatic organisms are evaluated by toxic tests. The 96 hour LC_{50} values have generally been found to be satisfactory for the measurement of acute toxicity. The differences in 96 hours LC_{50} of the same toxicant in different fishes may be attributed to individual traits including those of behavior and additional structure such as accessory respiratory organs. The individual characters such as size and weight, sex and biological behavior are important determination for variation in LC_{50} values. Therefore the present study is an attempt to study the toxicity of the pesticide with respect to Histology of fish *Labeo rohita* (Ham). The Monocrotophos affects not only fishes but also organisms in the food chain through the process of consumption of one by the other. The pesticide, which enters the body tissues of the fish, affects the physiological activities.

Key words: Monocrotophos, Labeo rohita, Pesticides, Pollution.

1. INTRODUCTION:

The industrial development and rapid urbanization has led to development of polluted zones discharging potentially toxic compounds in the environment. Especially, indiscriminate use of pesticides resulted in contamination of aquatic system has now become a global problem and is being extensively researched worldwide. Water pollution is recognized globally as a potential threat to both human and other animal populations which interact with the aquatic environments (Biney *et al.,* 1987[1]; Svensson *et al.,* 1995[2]). Long term and short term effect may result in the incidence of toxicity of fish and other aquatic life forms (Edwards, 1973[3]). The exposure to chemical contamination can induced a number of lesions and injuries to different fish organs suitable for Histopathological examination in searching damages to tissues and cells (Rabitto, I.S.,2005[4]) *et al.* The assessment of the ecotoxicological risks caused by pesticides to ecosystems is based on data on the toxicity and effects of pesticide preparations to non-target organisms. Fish are among the group of non-target aquatic organisms (Velisek *et al*., 2009[5]).The water contamination cause damages to aquatic life especially to fishes which are very sensitive to wide range of toxicant in the water (Herger *et al.*, 1995[6]). Gills are the first organs which come in contact with environmental pollutants. Paradoxically, they are highly vulnerable to toxic chemicals because firstly, their large surface area facilitates greater toxicant interaction and absorption and secondly, their detoxification system is not as robust as that of liver. Additionally, absorption of toxic chemicals through gills is rapid and therefore toxic response in gills is also rapid. This liver finding is in agreement with (Muthukumaravel *et al.,*2013[7] who studied histopathological impact of Monocrotophos on the liver of *Labeo rohita.* (Athikesavan, S *et al.,*[8] and Fernandes 2006[9]). Histopathological changes in fish organs have been increasingly studied as biomarkers for assessing aquatic contamination in environmental monitoring studies (Fricke *et al*., 2012[10]). Histological changes associated with pesticides in fish have been studied by many authors (King, 1962[11]; Cope, 1966[12]; Eller, 1971[13]; Razani et al., 1986[14]; Mukhopadhyay et al., 1987[15]; Bruno and Ellis, 1988[16]; Narayan and Singh, 1991[17]; Mercy et al., 1996[18]). Organophosphates are most preferred insecticides in agriculture due to their effectiveness, less persistent life and easy detoxification in animal tissues which directly inhibit AchE (acetylechelenesterase) activity observed by (Rao *et al*., 2005[19]) in fish and other aquatic organisms. Monocrotophos is a brownish yellow liquid with a sharp smell that irritates the eyes and skin. The IUPAC name is dimethyl (E)-1-methyl-2-(methyl-carbamoyl) vinylphosphate. Molecular formula is C7H14NO5P and molecular weight is 223.2. Hence an attempt has been made to evaluate the effect of Monocrotophos on the histopathological alterations in the gills of fresh water fish *Labeo rohita.*

2. MATERIALS:

Healthy freshwater fish, Labeo rohita of the weight (15 ±1g) and length (8.0 ± 0.5 cm) were selected for the experiment and were collected from the local commercially culture farm near Kumbakonam. Fish were screened for any pathogenic infections. Aquaria were washed with 1% KMnO4 to avoid fungal contamination and then dried in the sun light.. Healthy fishes were then transferred to glass aquaria (35´20´20 cm) containing dechlorinated tap water. Fish were acclimatized to laboratory conditions for 10 to 15 days prior to experimentation. The rate of mortality during acclimatization was less than 10%. They were regularly fed with commercial food. Tap water was changed daily to remove faces and food remnants.

3. TOXICITY TEST:

Toxicity tests were conducted in accordance with standard methods (APHA, 1992[20]). Stock solution of Monocrotophos 36% EC with a concentration of 0.1 ml per litre (equivalent to 1 ppm) was prepared in distilled water. Based on the progressive bisection of interval on a logarithmic scale, log concentrations were fixed after conducting the range finding test. The fish were starved for 24 hours prior to their use in the experiments as recommended by storage to avoid any interference in the toxicity of pesticides by excretory products. After the addition of the toxicant into the test tank with 10 litters of water having twenty fish, mortality was recorded after 24, 48, 72 and 96 hours. Five replicates were maintained simultaneously. Percent mortality was calculated and the values were transferred into probity scale.

4. METHOD:

After treatment, both the experimental and control fishes were sacrificed at the end of 4th day. gill were removed and dropped in aqueous Bouins fluid. After fixation, tissues were dehydrated through a graded series of ethanol, cleared in xylene, and infiltrated in the paraffin. Sections of 4–6 *l*m were prepared from paraffin blocks by using a rotary microtome. These sections were then stained with Hematoxylin-Eosin. Histopathological lesions were examined and photographed, using Leica photomicroscope.

Fig no: 1.The control Gill Section of *Labeo rohita*

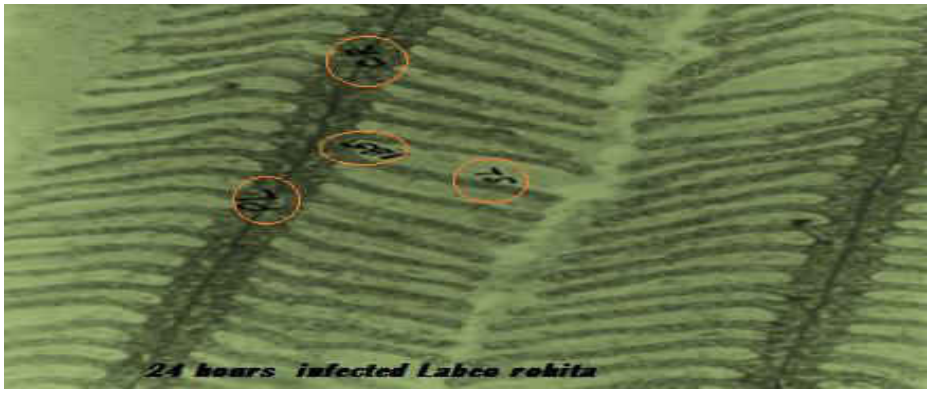

Fig no: 2.The 24 hours Treatment Gill of *Labeo rohita*

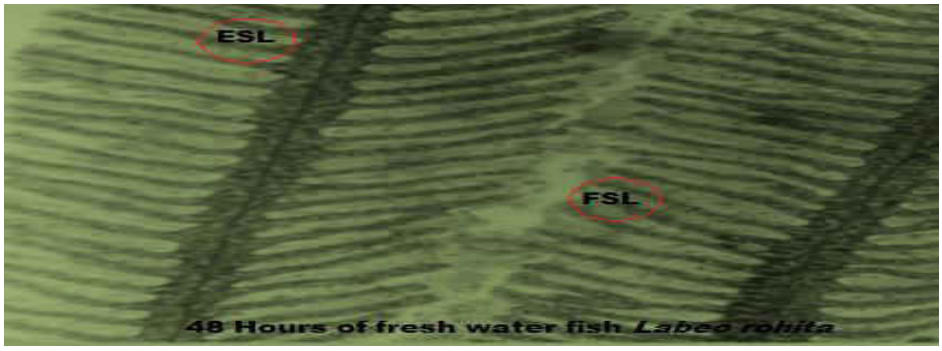

Fig no: 3.The 48 hours Treatment Gill of *Labeo rohita*

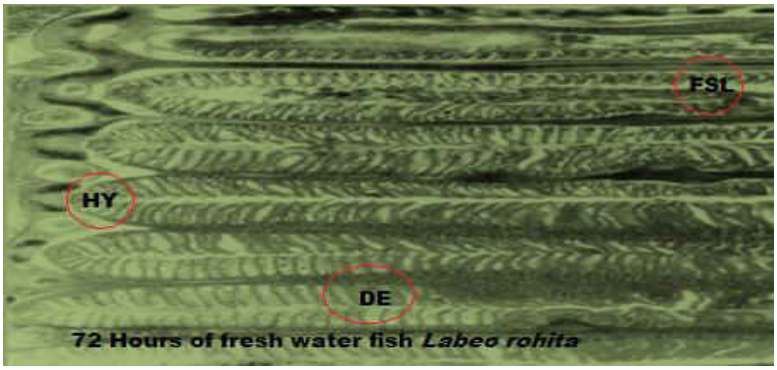

Fig no: 4.The 72 hours Treatment Gill of *Labeo rohita*

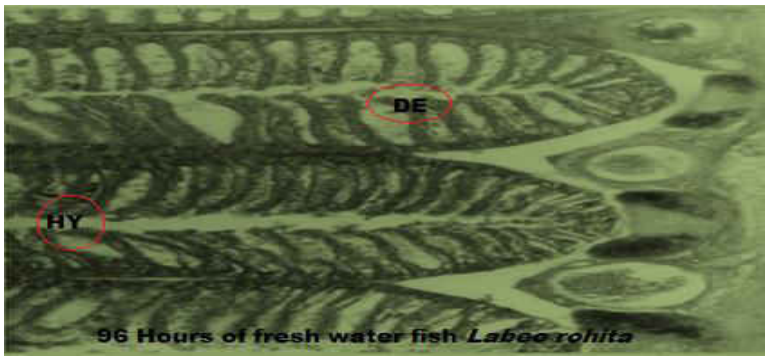

Fig no: 5.The 96 hours Treatment Gill of *Labeo rohita*

Legend of Histological pictures

PGL- Primary Gill Lamellae
SGL- Secondary Gill Lamellae
FSL – Fusion of Secondary Gill Lamellae
DE-Degeneration of Epithelium
Hy- Hypertrophy
EGL-Erosion Sec Gill Lamellae

5. RESULTS AND DISCUSSION:

In the present investigation has attempted the control fish secondary gill lamellae appeared as finger-like structures. The secondary gill lamella (SGL) was very thin, slender and attached on either side of the primary gill lamellae (PGL). Figure no: 2 Shows on The secondary gill lamellae are highly vasculared and surrounded by thin layer of epithelial cell.

The totally observed results in the present investigation shows on Histopathological changes have been found in gill and liver of *Labeo rohita* under sub lethal concentration of Monocrotophos chronic exposure fusion and shortening lamellae hypertrophy and degradation epithelium and necrosis were found in gill treated with

Monocrotophos of *Labeo rohita* Figure no:3 (Hemalatha and Banerjee 1977[21]) and Indirabai and Geetha (2010)[22] noted similar type of gill lesions in Zinc treated *Heteropneustes fossilis* and Monocrotophos treated *Labeo rohita* respectively,(Tamizhazhagan and Pugazhendy(2016) [23]) observed severe hyperplasia in secondary gill lamellae which lead to complete embedding in adjacent lamellae in copper, cadmium, lead and mercury treated *Oreochromis niloticus*. In the present study, hypertropy and degeneration of secondary lamellae were apparent in *L. rohita* exposed to monocrotophos (Figure 4). These observations are directly quite comparable to pathological lesions induced in gills by mercuric chloride in *Acipenser persicus* fry (Khoshnood *et al*., 2011[24]), by lead and cadmium treatment in *Cyprinus carpio* (Patnaik *et al*., 2011[25]), *Lates calcarifer* (Thophon *et al*.,2003[24]), *Brachydanio rerio* and *Salmo gairdneri* (Karlson-Norgren *et al*., 1985[26]). Patel and Bahadur 2010[27]) also noted severe gill lesions in copper treated *Catla catla*. In the present investigation the gill epithelium of Monocrotophos treated fish was completely desquamated, fusion and shapeless secondary lamellae and were broken at several places (Figure 5).(Daoust *et al*.1984[28]) also observed similar pathological lesions in the gill of copper treated rainbow trout, *Salmo gairdneri*. Further, (Hemalatha and Banerjee 1997[29]) and Al-Attar (2007)[30] also observed such gill damages in zinc chloride and nickel treated *Heteropneustes fossilis* and *Oreochromis niloticus*. (F.A.S. Mohamed, (2009[31]): The cellular damage observed in the gills in terms of epithelial proliferation, separation of the epithelial layer from supportive tissues and necrosis can adversely affect the gas exchange and ionic regulation.

6. RECOMMENDATIONS:

In modern Agricultural filed should be avoided Commercial manure and pesticide/Insecticide/Herbicide etc., recommended formers using only natural weed and predator control methods

7. CONCLUSION:

The results in the present study showed that the exposure of *Labeo rohita* of Monocrotophos caused pathology in their organs gill and they were associated with the exposure. Histological alterations in *Labeo rohita* under the toxicity of Monocrotophos can be used as a sensitive model to monitor the aquatic pollution and aquatic animals.

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