

Histopathological Changes in Liver of Freshwater Fish, *Channa Marulius* (Ham Buch) Exposed to Sub Lethal Concentration of Cypermethrin

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Abstract: In the present study the toxic effects of Cypermethrin on the liver histology of fresh water fish, *Channa marulius* were investigated. The fishes were exposed to sub lethal concentrations i. e. 0.06 ppm and 0.18 ppm of Cypermethrin respectively for 96 h exposure period. Our result showed various histopathological changes like the liver hepatocyte degeneration, nuclear pyknosis, cellular swelling and congestion of blood vessels.

Index Terms: *Channa marulius*, Cypermethrin, histological changes and liver.

I. INTRODUCTION

Histopathological investigation on different tissues of fish is tools for toxicological studies and monitoring water pollutions. In histopathology we can provide information about the health and functional of organs. While injuries in organs can result in the reduced survival, growth, fitness, low reproductive success and increase of susceptibility to pathological agent. (Velmurugan et al. 2009) observed the histopathological lesion in the liver tissue of fresh water fish, *Cirrinus mrigala* exposed to sub lethal concentration of Dichlorfos. Frequently the intensity of tissue lesion depends on the concentration of insecticides caused specific or nonspecific histopathological damage (Devi and Mishra, 2013). Other researchers reported the same histopathological alteration in different tissue of fish treated with Fenitrothion (Benli and Ozkul, 2010), Aluminum (Hadi and Alwan, 2012), Diazon and temephos (Ba Omar, et al., 2013; Banaee et al., 2013).

The liver plays a key role in the metabolism and biochemical transformation of pollutant from environment and other histopathological alteration of the liver parenchyma or the bile duct (Anita et al., 2012). Fish liver regarded as major site of

storage, biotransformation and excretion of pesticides. Deltramethrin exhibited vacuolation and multifocal hemosiderosis in the liver of Zebra fish, *Danio rerio* (Dilip and Badre, 2013); Nile tilapia when exposed to heptachlor (Taddese et al., 2014); liver showed severe damage of *Chalcalburnus tarichi* (Kaptaner et al., 2014); greater damage of Zinc oxide on liver of *Cyprinus carpio* (Subashkumar and Selvanayagam, 2015) and neoplastic lesion in the liver (Aswin et al., 2016). Chloroxuron had their effect on liver, leaving altered lesion, vacuolation in liver of fish, *Mystus tengara* (Nahid and Ahsan 2018).

Therefore, an attempt has also been observe possible histopathological changes in liver of *Channa marulius* exposed to sub lethal concentration of Cypermethrin.

II. MATERIAL AND METHODS

The fresh water fish *Channa marulius* weighing (15 ± 5 g) and length (10 ± 3 cm) were collected from Kan and Panzara river of Sakri Taluka (Dhule). Live fishes were brought to the laboratory in wide mouthed plastic containers. After thoroughly washed under tap water and acclimated to laboratory conditions for 15 days. They were fed with standard fish diet (Tokyu). Water in the tank was changes after 2 days of interval. Technical grade Cypermethrin was purchased from local market of Sakri. The fishes were divided into five groups, each group with ten healthy fishes. They were transferred to plastic tough having capacity of 10 litres 4 groups were exposed to 1/4th and 3/4th sub lethal concentration (0.06 ppm and 0.18 ppm) of Cypermethrin. One group was kept as control.

At the end of exposure period, fish were randomly selected for histopathological examination. Tissue like liver was isolated

from control and experimental fish. Physiological saline solution (0.85% NaCl) was used to rinse and clean the tissues. They were fixed in aqueous Bouin's solution for 48 h, processed through graded series of alcohols, cleared in xylene and embedded in paraffin wax. Sections were cut at 5 μ thickness, stained with Haematoxyline and Eosin and mounted in DPX. The micro photographed was taken.

III. RESULTS AND OBSERVATIONS

Histology of Control Liver:

Histological architecture of control liver showed normal hepatic parenchyma with hepatocytes and nucleus was observed. Absence of any pathological changes was seen in control liver of *Channa marulius* (Fig.1).

Histopathology of liver on exposure to sub lethal concentration (0.06ppm and 0.18ppm) of Cypermethrin:

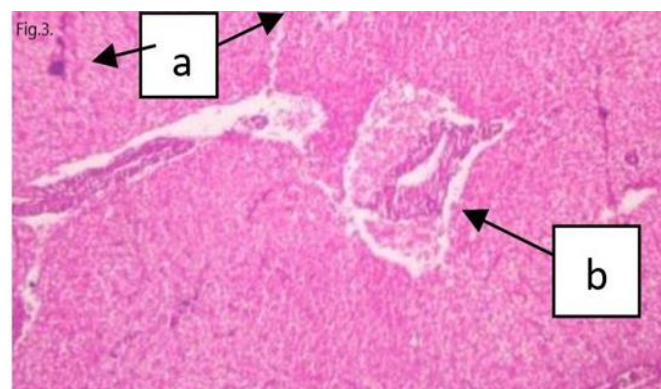
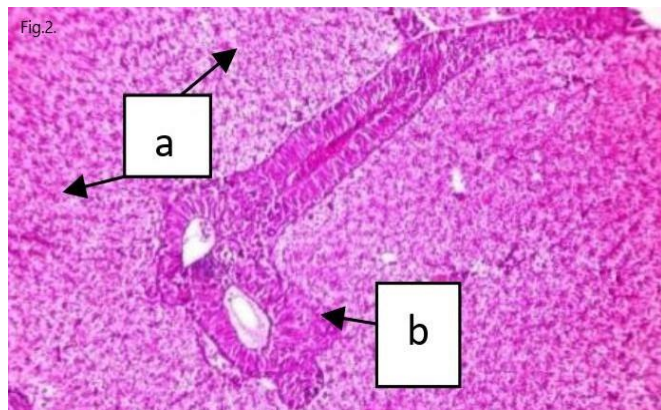
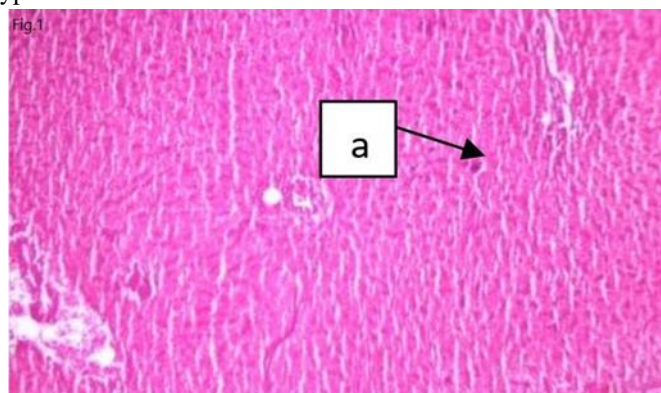
Fish exposed to 24 h sub lethal concentration of Cypermethrin, the liver exhibited the mild degree of degeneration, disarray of hepatic chords, pyknotic nuclei, very few vesiculations, increased sinusoidal space and parenchymatous nature was disrupted with congested blood vessels were seen (Fig. 2 and 6). At 48 h exposure fish liver the high vascularization of the tissue with cellular swelling of hepatic tissue, pyknotic nuclei, granular degeneration of hepatocytes and mild degree of cirrhosis were observed (Fig. 3 and 7). In 72 h treated fish the liver showed the disarray of hepatic chords, pyknotic nuclei, increased sinusoid and hemorrhagic condition was prominent with high degree of vacuolation (Fig.-4 and 8). Whereas 96 h intoxicated fish liver increased degeneration, vascularization, focal necrosis, exfoliation, aggregation, congregation, degeneration, karyolysis, pyknotic nuclei and few vacuolation of hepatocytic nuclei and focal necrosis were seen (Fig. 5 and 9).

IV. DISCUSSION

Individuals containing higher concentrations of pesticide Malathion showed the fibrosis, large necrosis area, leukocyte infiltration and the absence of melanomacrophages observed in the liver of *Heteropneust fossilis* (Sanjoy and Rita, 2012). Similarly, Pal et al (2012) described the impact of Chlorpyrifos on the liver, gill and kidney of *Cyprinus carpio* and expressed that extensive vacuolation, indistinct cell boundaries, loss of polygonal shape of the cell and degenerative necrosis are the respective histopathological changes. Fish liver histopathology is an indicator, of chemical toxicity and is useful way to study the effects of exposure on aquatic animals to toxins present in the aquatic environment (Manjula et al., 2014). Chavan and Muley (2014) studied some fish exposed to pesticides under laboratory conditions and acknowledged that the liver is the organ with the highest pesticide concentration, although literature on histopathological alterations is very scanty. Barbhuiya et al (2015) showed that Malathion induced marked degeneration of the liver in *Ophiocephalus punctatus*. Lakshmaiah (2016) worked on the histopathology of *Cyprinus carpio* and observed the

changes characterized by precipitation of cytoplasm, vacuolation of cells with corresponding increase in cell size, nuclear degeneration, hepatic cord disarray etc. Bhoi and Patole (2018) found variable and degenerative changes in length of gill lamellae with loss of epithelial tissue with focal congestion of blood vessels of *Channa marulius* after exposure to sub lethal concentration of Fenvalerate. As mentioned above, histopathology highly corroborates with present work on the effects of sub lethal concentrations of Cypermethrin on the liver of *Channa marulius* during the exposure period.

In the present study, histological changes were observed in liver of *Channa marulius* exposed sub lethal concentrations of Cypermethrin.



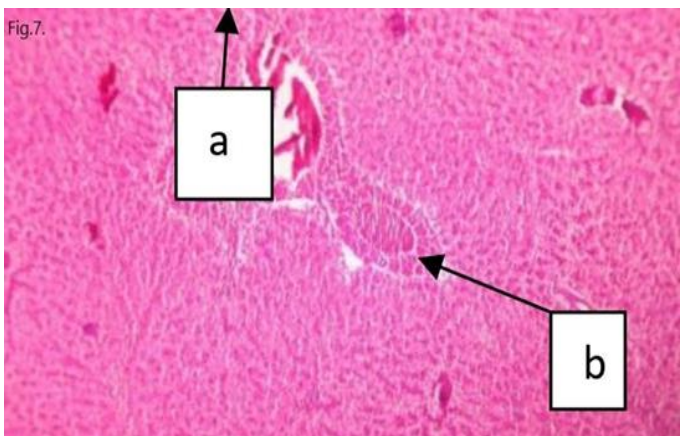
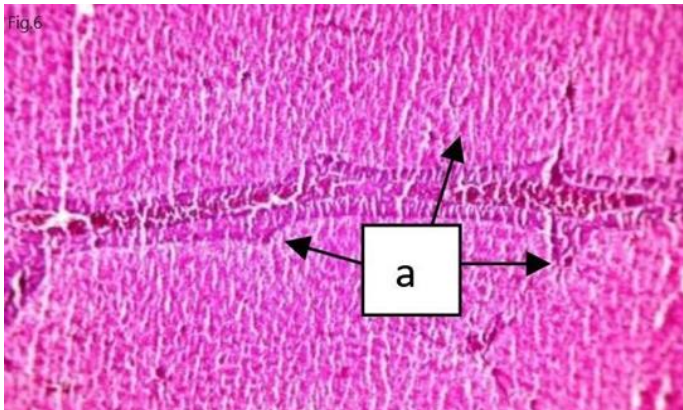
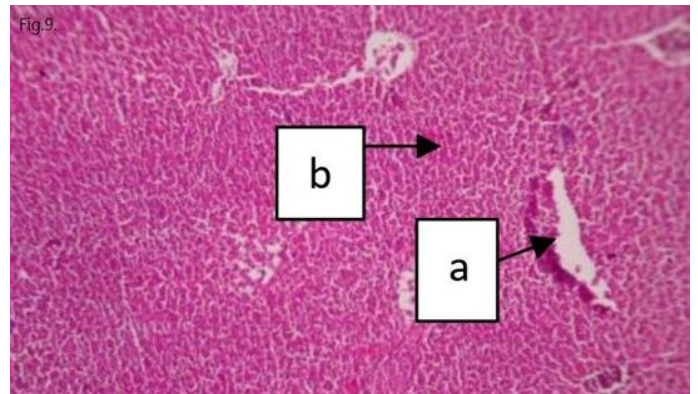
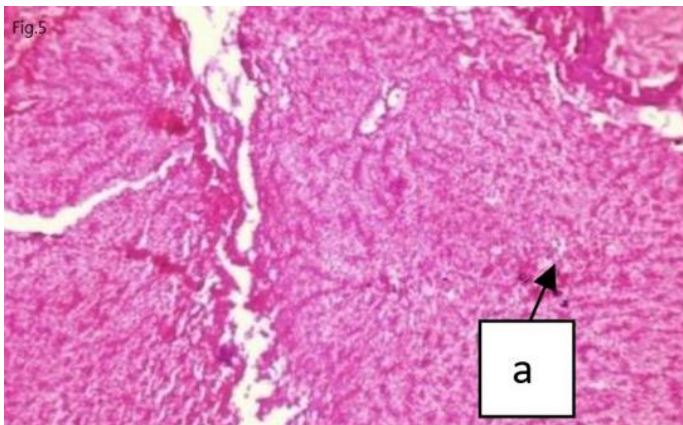
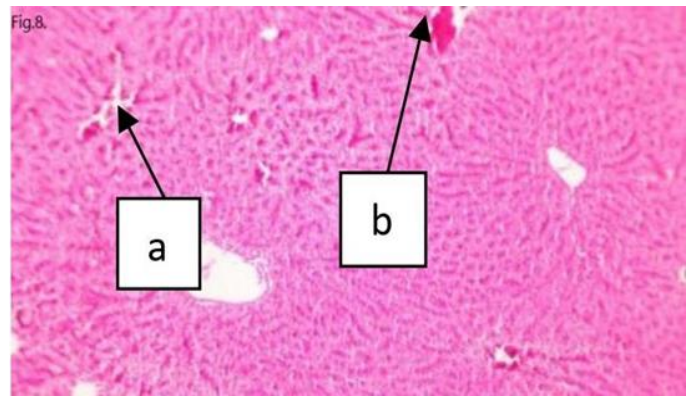
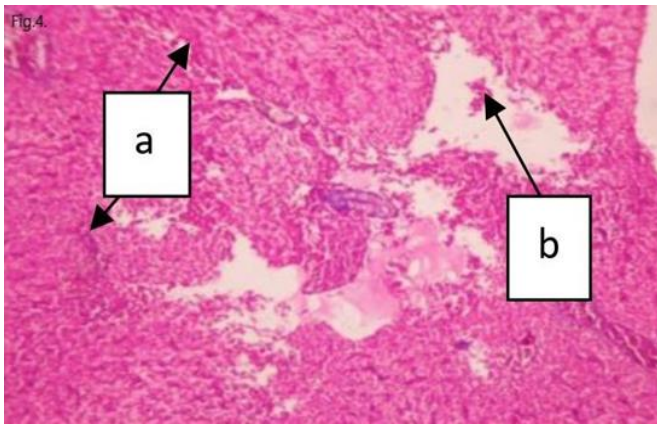


Fig 1. Section showing liver of Control fish, *Channa marulius* (100X) a) Normal hepatocytes.

Fig 2 and 6 *Channa marulius*, exposed to Cypermethrin (0.06 ppm and 0.18 ppm) at 24 liver showed, (100X) a) Degenerative changes of hepatocytes b) Mild degenerative features of liver.

Fig 3 and 7 *Channa marulius*, exposed to Cypermethrin (0.06 ppm and 0.18 ppm) (100X) 48 h, Liver appeared a) Mild vacuolar and degenerative changes in hepatic parenchyma. b) Degenerative cells with pyknotic nuclei.

Fig 4 and 8 *Channa marulius*, exposed to Cypermethrin (0.06 ppm and 0.18 ppm) 72 h, (100X) Liver observed a) Moderate nuclear degeneration in hepatocytes. b) Blood vessel.

Fig 5 and 9 *Channa marulius* exposed to Cypermethrin (0.06 ppm and 0.18 ppm) at 96 h (100X) liver has a) More pathological lesions in hepatic parenchyma b) Loss of cellular structure and coagulative changes of hepatocytes.

CONCLUSION

The Cypermethrin affect the *Channa marulius* at histopathological levels indicating their high toxicity. It is concluded that histopathological changes, could serve as valuable biomarkers for Cypermethrin. Thus, this study has revealed the toxicity of Cypermethrin on vital organs of *Channa marulius*. The study suggests that Cypermethrin is toxic to aquatic habitat.

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