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EFFECT OF DIOMETHOATE ON THE HISTOPATHOLOGICAL CHANGES IN GILL AND LIVER OF THE FRESHWATER FISH, *RASBORA DANICONIUS*

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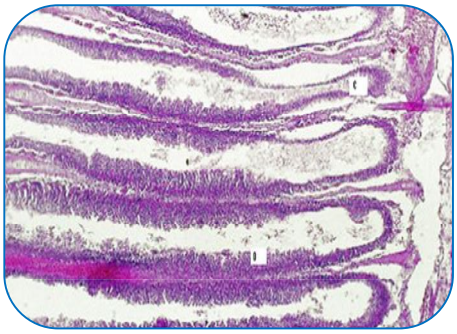
ABSTRACT:

Histopathology is sensitive tool to detect an effect of chemical compound within target organ of fish in laboratory experiment. Histopathological changes gives an early indication of pollution hazard. In the present investigation an attempt has been made to observe histopathological changes in the vital tissue like gill and liver of fish Rasbora daniconius exposed to lethal concentration of dimethoate at 96 hours LC_{50} (9.136 ppm). During experiment pathological changes indicate the destructive effect of dimethoate on different tissues like gill and liver.



KEYWORDS: *Dimethoate , Rasbora daniconius , gill and liver.*

INTRODUCTION :

Application of pesticide has contributed greatly in enhancing agricultural yield and for the control of insect borne diseases but the extensive use of pesticide contaminates soil surface. This pesticide enters in aquatic environment through agricultural runoff.

Industrial discharge, unwanted element like heavy metals, chemicals, pesticides, fertilizers, thermal constituents in the form of heat suspended solid are directly dispose into the aquatic environment. These pollutant decrease the level of dissolved oxygen in the water bodies and causes contamination of river, lakes and chronically affect the flora and fauna (Mathivanan, 2004) some pesticide accumulate in the different tissues of body and produce toxic effect.

The pesticide dimethoate is commonly used in latur district. These compound which frequently enter the aquatic environment through agricultural runoff and adversely affect aquatic animal such as fish. Ansan , *et. al* (1994) and Singh *et.al* (2003).

Histopathological investigation have proved to a sensitive tool to detect the direct effect of chemical compound within target organ of fish in laboratory experiment (schiwajer , et.al 1996). Histopathological changes not only give an early indication of population hazard, but also provide useful data on nature and degree of damage of cells and tissues (Sheikh *et.al* 2010)

MATERIALS AND METHODS

The live test fish *Rasbora daniconius* were collected from Manjara river, Latur and brought to laboratory. They were acclimated to laboratory condition for 15 days. Before conducting experiment the physico chemical analysis of water was done by Standard methods published in APHA. The fishes were separated into two groups control group and experimental. Each group contains 10 fishes. The group

which is exposed to 96 hours LC_{50} concentration of dimethoate (9.136 ppm) served at experimental group and control group free from pesticide. At the end of acute exposure (96 hours) the survived fishes were sacrifice immediately and remove the tissues gills and liver were removed from both group of fishes and fixed in aqueous bouins fluid for 24 hours. These tissue were dehydrated in different grade of alcohol, cleaned in xylene and block were prepare paraffin wax. The section were taken 4 to 5um in sized and stained with haematoxyline and eosin. After complete the dehydration process of slide was used for fixation and take a Photographs of the tissues.

RESULTS AND DISCUSSION

In the present investigation, the histopathological alteration induced due to the test fish *Rasbora daniconius* exposed to a concentration of dimethoate (9.136 ppm) showed following changes and abnormalities in the structure of tissues.

In the present investigation the light microscopic examination of vertical section of the gill of control fish (Fig. a) shows primary gill lamellae, secondary gill lamellae with gill arch. These lamellae look like leaf like structure. The lining of secondary gill lamellae on each side consist of thin layer of epithelium which rest on basement membrane covering pillar cells. Gill of experimental fish exposed to lethal concentration of dimetoate (Fig. b) showed that partial degeneration of epithelium of secondary gill lamellae, vacuolation, detachment of epithelial lining from surface of gill, hypertrophy, the nuclei of epithelial cell became pyknotic, fusion of primary and secondary gill lamellae resulting in reduction of respiratory surface. Several investigators reported the histopathology of gill. Brown, *et.al*. (1968) reported damage of gill by detergants skidmore *et.al*. (1972) reported the effect of zinc sulphate on the gill of Rainbow trout. The study of Jauch (1979) indicated that the effect of fenthion on gill of Cichlid fish and reported epithelial hyperplasia in secondary gill lamellae. Hadi and Alwan (2012) Studies on histopathological changes gill of fresh water fish, *Tilapia zillii*, exposed to aluminum and observed that the gills shows a typical structural organization of the lamellae in the untreated fish and treated fish with aluminum gill shows cellular hypertrophy or hyperplasia in the epithelial layer of primary filaments and fusion of secondary lamellae, epithelial lifting, interstitial edema and blood congestion in then vascular axis of primary filaments. In addition, a few telangiectasis were also observed at gill lamellae. The 100 µg aluminum/liter showed that caused cellular degeneration which result in necrosis of gill epithelial tissues. Shanta Satyanarayan, *et.al.* (2012) studied on histopathological changes in gills of *Cyprinus carpio* exposed to some chlorinated hydrocarbon pesticides and reported that the gills showed swelling and thickening in their filaments, in some case epithelial wall of the secondary lamellae completely destroyed and the pillar cells showed complete fusion and mucous cells were completely destroyed. In most cases, the epithelium of the secondary lamellae was separated from the supporting pillar cells. Complete necrosis and sloughing of secondary lamellae from the supporting pillar cells. The similar result were observed in the present investigation.

Wani, *et.al.* (2011) Studies on histopathological alterations induced copper Sulphate in gill of African catfish, *Clarias gariepinus*, and observed that the alterations after 30 days were lifting of lamellar epithelium and edema in the filamentary epithelium while as lamellar disorganization, swollen and fusion of secondary gill lamellae tipswere noticed after 60 days of exposure. Olaganathan and Patterson (2012) histological changes in the target organs of *Channa punctatus* after exposure to anthraquinone vat dyes and observed in the gill, the extensive lamellar hypertrophy with some proliferation at the base of secondary lamellae, intercellular epithelial cells exhibited hyperplasia, secondary lamella showing lamellar hypertrophy.

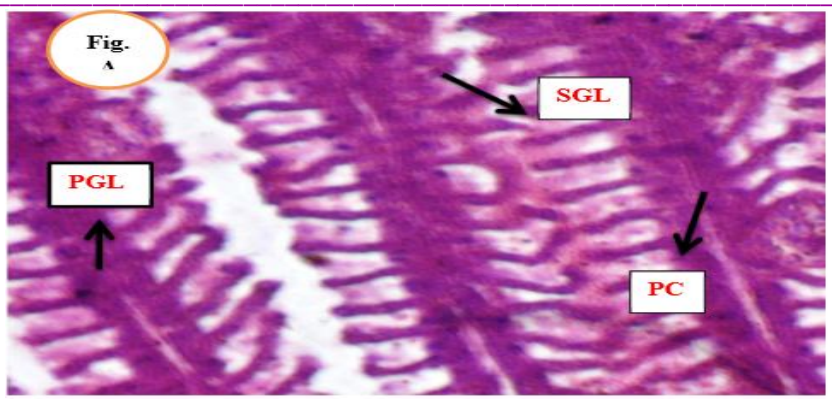


Fig. a. Photomicrograph of the gill section of control fish Rasbora daniconius showing the primary gill lamellae (PGL), secondary gill lamellae (SGL) and Pillar cells (PS).

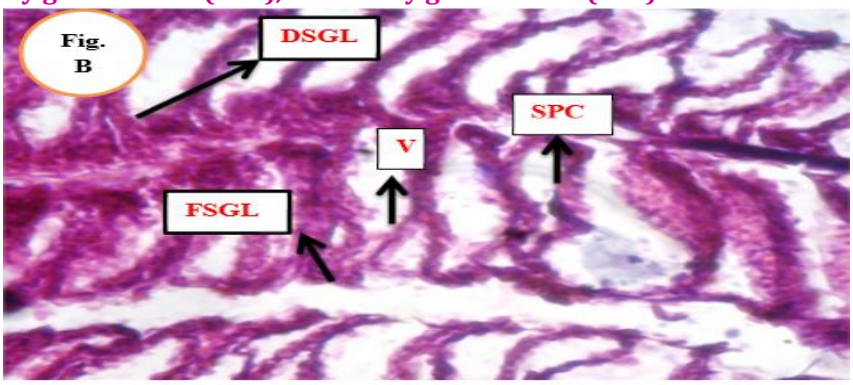


Fig. b Photomicrograoph of gill section exposed to dimethoate at 96 hours Lc 50 showing degeneration of secondary gill lamellae (DSGL), Voculation (V), Fusion of secondary gill lamellae (FSGL) and Seperation of pillar cells (SPC).

In the present investigation the histological structure of liver of fish in control group (Fig. a) shows number of hepatic lobule, each hepatic lobule is made up of hepatic cords separated by one another with blood sinusoid. The hepatic cord consist of chain of hepatic cells. Each hepatic cell shows distinct nucleus.

The histopathological alteration of liver of fish exposed to lethal concentration of dimethoate (fig.b) indicated mild vacuolation, pyknotic nuclei, degeneration of hepatocyte and thrombosis in central vein, vacuolation in cytoplasm of hepatic cell were observed. The same effect was observed by Mathut et.al. (1962) while studying the effect of DDT on liver, kidney and intestine of fish Ophiocephalus punctatus. Kumar et.al. (1981) worked on the effect of copper and zinc on gill, liver and kidney of Puntius conchonius and reported vacoulation within and outside the hepatocyte, He also observed severe necrotic changes in liver. Histological examination of liver of fish *Cirrhinus mrigala* treated with mercury showed loss of cellular architecture, blood vessels to be dilated, haemolysis due to destruction of erythrocytes, inflammation of hepatic cells, eccentric nuclei, vacuole appearance were common and congestion in blood sinusoids appeared in liver tissue reported by Chavan and Muley (2014). Senthamilselvan, *et.al.* (2010) Copper and lead induced histopathological alterations in liver of Indian major carp, *Catla catla* and reported that the mild vacuolation, pycnotic nucleus, and degeneration of hepatocytes and thrombosis in central vein. Where as, these effects were severe in the liver tissue of fish exposed to lead. The copper and lead exposed liver showing the hypertrophy, and hepatocytes and dilation of central vein In addition to these effects, hyperplasia of hepatocytes and dilation of central vein were observed in combined copper and lead exposed liver. In the present investigation the duration increased severe degradation of the liver cells or hepatocytes and

hypertrophy of hepatic nuclei and clumping was evident in many places due to the toxicity of dimethoate at LC_{50} at 96 hours. Shanta Satyanarayan, *et.al.* (2012) liver exposed to chlorinated hydrocarbon pesticides to freshwater fish *cyprinus carpio* and liver showed abnormal fatty degeneration, enlargement of liver, necrosis, congestion and fatty degeneration. Roberts, (1878) reported that the degenerative fatty change of the hepatocytes was the most common pathology in the liver. However, pathology is also common in farmed fishes with unsuitable dietary fats.

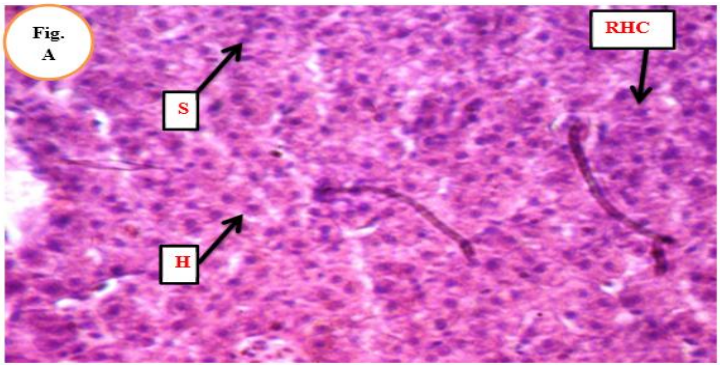


Fig A. **Photomicrograph of the Liver section of control fish *Rasbora daniconius* shows sinusoids (S), Hepatocyte (H) and row of hepatic cells (RHC).**

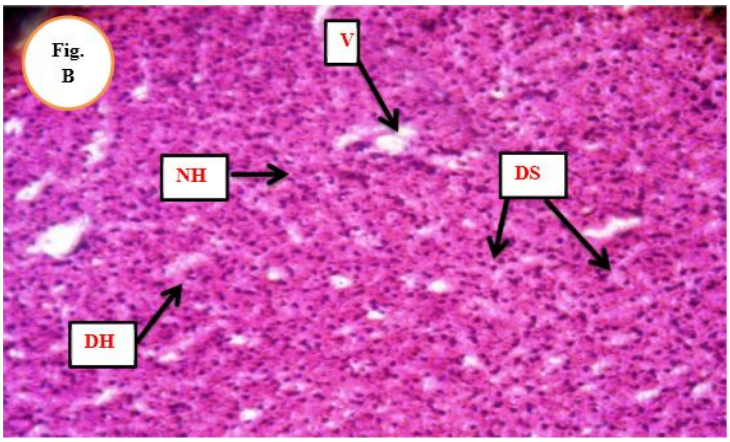


Fig. B. Photomicrograph o9f liver section of Rasbora danoconius exposed at 96 hours LC 50 showing vacuolation (V), degenerationof hepatocyte (DH), necorosis in hepatocyte (NH) and dilation of sinusoid (DS).

CONCLUSION

In the present investigation, histopathological changes were observed in gill and liver of *Rasbora daniconius* due to lethal concentration of dimethoate for 96 hours LC50. The tissues were severely damaged and disturb the physiological function of organ hence to avoid use of pesticide in large spectrum in agriculture.

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