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Research Article

EFFECT OF MALATHION TOXICITY ON DETOXIFYING ORGAN OF FRESH WATER FISH *CHANNA PUNCTATUS*

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ABSTRACT

The fresh water fish *Channa punctatus* when exposed to sublethal concentration of commercial grade malathion 50% EC for period of 7 days show histopathological alterations in detoxifying organ. The result showed the histopathological alteration in liver was damages like degeneration of cytoplasm, vacuolization of hepatocytes atrophy of liver. The changes in kidney included necrosis, swelling of reneal tubules, disintegrated cytoplasmic material.

Keywords: *Channa pucntatus,* Malathion.

INTRODUCTION

Pollution has now become at par with the conventional crimes. As water is scarce and its demand is likely to increase further, it needs more attention. Everybody knows that pollution refers to the contamination of the environment with harmful and undesirable wastes. One of the major agricultural chemical groups is pesticide which play important role in increasing agricultural productivity through controlling pest. But on the other hand, they cause much damage to the non-target organisms both in terrestrial and aquatic environment. Pesticides are the chemicals, which have posed potential health hazard not only to livestock and wild life but also to fish, birds, mammals and even human beings.

Aquatic organisms, including fish, accumulate pollutants directly from contaminated water and indirectly via food chain (Sasaki, *et al.,* 1997). The aquatic environment is continuously being contaminated with toxic chemicals from industrial, agricultural and domestic activities. In India pesticides are one of the major classes of toxic substances for management of pest in agricultural sectors and control of insect vectors of human disease. The runoff from treated areas enters the river and aquaculture ponds that are supplied by rivers. Water pollution due to pesticide is posing intricate problems that need our immediate attention. New chemical formulations are widely used to control pests of agricultural crops. Overspray and runoff of pesticides from agricultural fields may easily find their way into the natural water surfaces and adversely affect the quality of water surfaces and creates hazards for aquatic life resulting in serious damage to non-target species, including fishes (Bondarenko *et al.,* 2004).

Malathion (*O*-dimethyl-S1-2-di(ethoxycarbonyl)-ethylphosphorodithioate) is an organophosphorous insecticide widely used in agriculture and houses for the control of diseases vectors. It is a major source of environment poisoning in developing countries (WHO, 2003). Toxicological tests have shown that malathion affected central nervous system, immune system, adrenal gland, liver and blood. In present study effect of malathion on detoxifying organ like kidney and liver was studied.

MATERIAL AND METHODS

Healthy adult fishes *Channa punctatus* were collected from local river Godavari Dist. Nanded. Washed with 0.1% of potassium permagnate solution .Rinsed in water and acclimatized to the laboratory conditions for two weeks in glass

aquaria. During acclimatization fishes were fed with pieces of live earthworm on alternate days.
For studying histopathology of the various tissues, Ten fishes were exposed to sublethal concentration of malathion (0.8 ppm) for four days. Control group were also maintained separately. After 96 hours fishes were removed from both group and immediately stunned with a blow on the head, kidney and liver were dissected out and fixed for 24 hr in aqueous Bouin's fixative. The material was thoroughly washed in running tap water till yellow color of picric acid went off. The material was then dehydrated in different grades of alcohol, cleaned in xylene and paraffin blocks were prepared. Paraffin sections cut at 6 μm thicknesses with help of microtome. The sections were stained with hematoxyline and Eosin, mounted in DPX and observed under microscope.

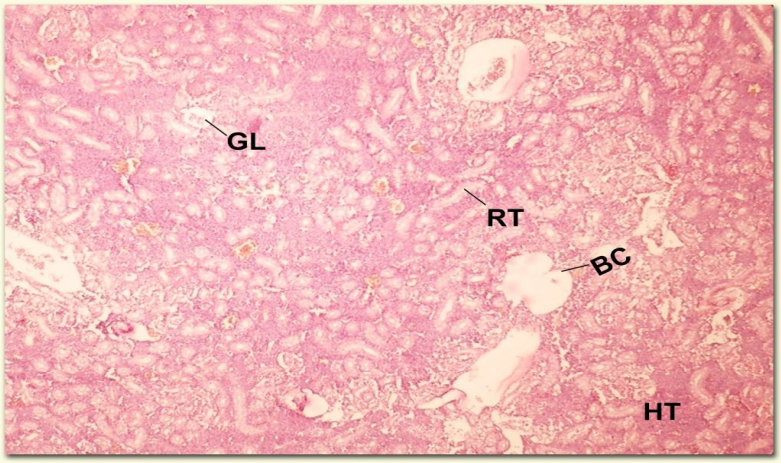

Plate - 1 Photomicrograph of T.S. of Kidney of Control fish *Channa punctatus*
(GL - Glomeruli ; HT - Haemopoetic tissue; RT - Renal Tubules BC - Bowman's Capsule)

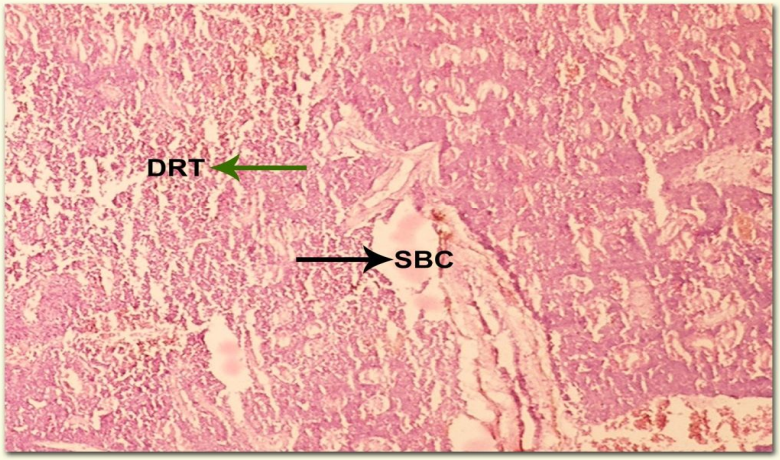

Plate - 2 Photomicrograph of T.S. of Kidney of *Channa punctatus* after 96 hours exposure to Malathion
(DRT - Degenerated Renal Tubules; SBC - Space in Bowmans capsule)

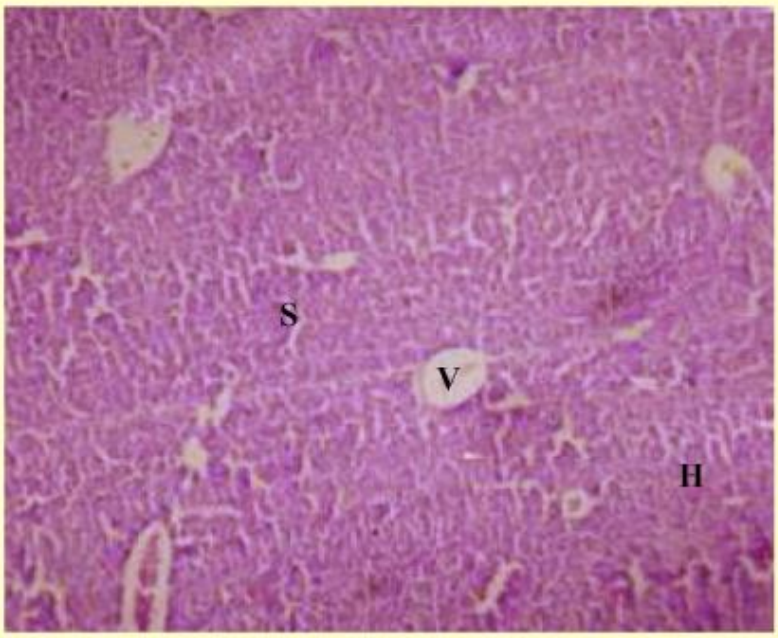

Plate - 3 Photomicrograph of T.S. of Liver of control fish *Channa punctatus* (S - Sinusydal Luman, V- Vein, H-Hepatocyte)

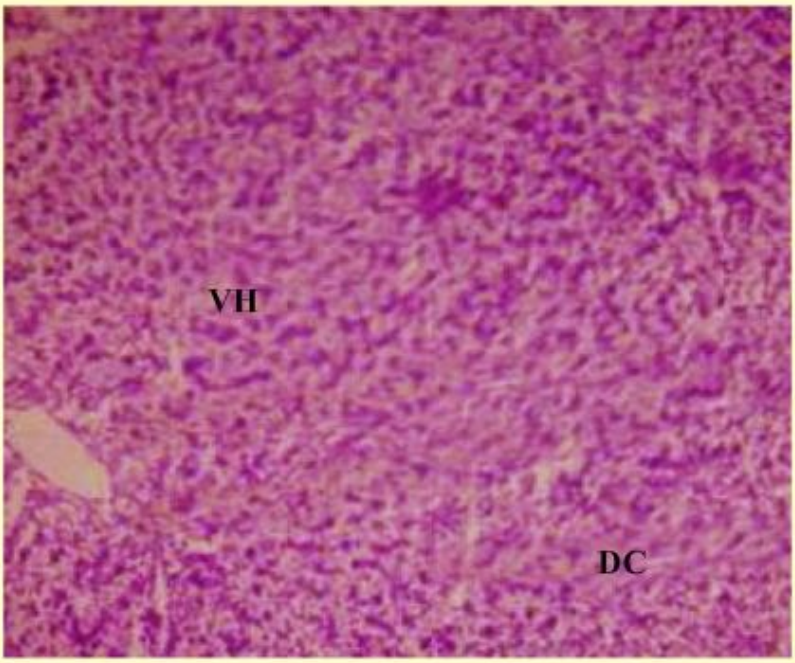

Plate - 4 Photomicrograph of T.S. of Liver of *Channa punctatus* after 96 hours exposure to Malathion (DC-degeneration of cytoplasm, VH-vacuolization of hepatocytes)

RESULT

Under sublethal concentration of malathion toxicity, renal tissue of the fish *Channa punctatus* showed marked pathological changes(Plate 1,2). Highly degenerative changes in renal tubules which include severe necrosis and spaces in bowman's capsule were observed.

Liver sections showed the hepatocytes with cord-like pattern. These cords were arranged around tributaries of the hepatic vein. Liver cells were large in size, polygonal in shape with homogenous eosinophilic cytoplasm and centrally located nuclei (Plate 3,4). A large number of blood sinusoids were observed which seperated hepatic cords one from another. Exposure of *Channa pnctatu* to malathion for 4 days induced degeneration of cytoplasm and vacuolization of hepatocytes.

DISCUSSION

In fish, as in higher vertebrates, the kidney performs an important function related to electrolyte and water balance and maintenance of stable internal environment. Following exposure to fish to toxic agent such as pesticide, histological alteration has been found at the level of the tubular epithelium and glmerolus. In present investigation kidney of *Channa punctatus* showed shrinkage of glomeruli and renal tubules. Degeneration of renal tubules and collecting tubules were observed. Due to shrinkage of glomeruli spaces in bowman's capsule increased.

Kidney is affected indirectly by the pesticides through the blood circular system. Konar (1970) reported the rapture of renal epithelium, collapse of renal tubules, swelling and nuclear changes in *Labeo rohita* treated with hepatochlor. According to Jayantha Rao (1982) severe pathological changes were noticed in kidney of exposed fresh water fish *Tilapia mosambica* which may be due to renal excretion of toxified fenvalerate. Dubale and Shah (1984) noted vacuolation and consequent necrosis of kidney of a fresh water teleost, *Channa punctatus* under toxic effect of malathion. Bhatnagar *et al.,* (1987) observed desquamation of epithedial cells, migration of nuclei towards lumen and complete dissolution of cellular wall of renal tubules in *Channa gachua* exposed to endosulfan. Basi *et al.,* (1990) observed extensive damage in the kidney of *Channa punctatus* exposed to DDT. Dhanapkiam and Premaltha (1994) worked on histopathological changes in the kidneys of *Cyprinus carpio* exposed to malathion and sevin and observed the loss of nuclei and appearance of vacuoles. Sastry and Gupta (1996) observed tubular necrosis, necrosis of haemopioetic tissue and inflammation in *Channa punctatus* exposed to dimethoate. In present investigation malathion exposure in *Channa punctatus* resulted in Shrinkage of glomeruli and renal tubule. Degeneration of renal tubules was observed. The results were similar to those by earlier studies. Das and Mukherjee (2000) showed disintegration of kidney, with necrosis of tubular cells in *Labeo rohita* exposed to hexachlorocyclohexane.

Different investigators and authors noticed toxical changes in the liver of catfish after Exposure to organophosphate and allied group of pesticides. Elezaby *et al*. (2001) studied the effect of Malathion on the fish *Oreochromis niloticus* and has observed that Malathion induced many histopathological changes in the liver and gills of the fishes. These changes were hemorrhage, necrosis and destruction of lamellae of the lungs, and necrosis and lipidosis in the liver. Shukla *et al.* (2005), noticed in his observation that when the catfish *Clarias batrachus* is exposed to the increased concentration (0.16/mL) of the organophosphate pesticide Nuvan, the hepatocytes exhibited reduction in their size and peripheral accumulation of cytoplasm. The nuclei of the hepatocytes lost their rounded appearance and the cell boundaries became obliterated at places after 20 days of pesticide exposure. The hemorrhage in liver was evident by increased volume of sinusoidal space.6 The hazardous effect of the pyrethroid insecticide, fenvalerate on the histology and histochemistry of the liver of the catfish (*Clarias gariepinus*) after exposure to 1/10LC for 5 and 10 days was investigated by S.A.Sakr *et al.* (2005). The results showed that the histopathological changes induced in the liver were mainly represented by cytoplasmic vacuolization of the hepatocytes, blood vessel congestion, inflammatory leucocytic infiltration, necrosis and fatty infiltrations.

The effect of insecticides on the liver of different fish species were studied by many investigators. Mandal and Kulshrestha studied the effects of sublethal concentration of sumithion on liver, kidney and intestine of *Clarias batachus*. They observed liver necrosis, vacuolization and breakdown of the cell boundaries. They also observed vacuolization of epithelial cell of uriniferous tubules and degeneration of the glomeruli in the kidney, while in the intestine, they noticed lesion formation in the villi and enlargement of mucous cells. Histological, changes in the liver of *Tilapia mossambica* after exposure to the organophosphate monocrotophos were

reported by Desai *et al.*. Sakr *et al.* studied the effect of the organophosphorous insecticide (Hostathion) on the liver of the carfish (*Clarias gariepinus*). Their results showed that this insecticide produced histopathological changes in the liver represented by liver cord disarray, cytoplasmic vacuolization of the hepatocytes, damage of blood sinusoids, blood vessel congestion and inflammatory leucocytic infiltrations.

Couch (1975) reported perivascular lesions in liver of fishes exposed to organic contaminants and pesticides. According to Gingerich (1982) the vacuolization of hepatocytes might indicate an imbalance between rate of synthesis and rate of release of substance in hepatocytes. In this study, all effects that were observed in the liver reduce the general state of health of H. fossilis at sublethal concentration. It may therefore, be said that a sublethal concentration may be safe however, it can not be used indiscriminately.

It is concluded that organophosphorous insecticide like malathion affected detoxifying organ like kidney and liver of *Channa punctatus* which could be used as a good response of aquatic pollution with effect of organophosphorous compound on fish.

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