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Effect of Malathion on The Liver of Common Indian Catfish

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ABSTRACT

Despite the stringent laws made by the governments, for the welfare of ecosystem and environment, it is quite evident that humans have always ended up harming them through their irresponsible and selfish activities. Leave aside, the atmospheric pollution and its repercussions, the exponential increase in the use of chemicals and pesticides has been one the chief reasons for water pollution as well. However, the pesticides are widely used to keep the crops safe from pests and insects, when their residues get into the water bodies through the rainwater or because of the flood, they become curse for the aquatic animals, such as fish. Fishes are considered as the bio-indicator for they are relatively more sensitive to the changes in their environment than the other aquatic species. Hence, fishes are often put under observation to monitor water pollution. These pesticides not only hinder their proper growth but also put their survival in danger. Organophosphate pesticides are one the most extensively used pesticides because they more toxic than the other pesticides. Humans hardly realize that they are not only toxic for insects but for other animals including Homo Sapiens also. It is evident that Organophosphate pesticide disrupts the transmission of neurotransmitters, sent out by brain to various parts of body, by inhibiting Acetycholinesterase in the organisms. But the present study shall focus on the ill effects of Organophosphate Malathion on the Liver of Heteropneustes fossilis, commonly known as the Common Indian Catfish. Malathion is an Organophosphate insecticide whose application is not limited to just to farm and agriculture; it is also used to control mosquitoes, especially in coastal areas.

Keywords : Heteropneustes fossilis, Malathion, Biochemical Alterations, Toxicity.

I. INTRODUCTION

The chemical name of Malathion is O, O-dimethyl phosphorodithioate of diethyl mercaptosuccinate and the chemical formula of it is $C_{10}H_{19}O_6PS_2$. Once Malathion is deposited into the environment, either by spraying it on the crops or by using it to draw away the mosquitoes, its residue easily gets transported, through natural agents like rain, fog and wind, and harms non-target organisms both in terrestrial and aquatic environment. Malathion breaks down easily in moist environment. Thus, it quickly breaks down in water. Malathion when reacts with air it breaks down to form Malaoxon. However, Malaoxon is a breakdown product of Malathion only, it is way more toxic than Malathion itself. Once

Malathion is introduced into the environment, it may cause serious intimidation to the aquatic organisms and is notorious to cause severe metabolic disturbances in non-target species like fish and fresh-water mussels.(USEPA,2005) The acute toxicity of Malathion and its primary metabolic product Malaoxon results from impediment of acetylcholine degradation at the neuromuscular junction through irreversible inhibition of acetylcholinesterase.(Eto, M. 1974)Non-target species such as fishes have been monitored for pesticide contamination(Johnson, 1968; Kennedy et al. 1970); certain pesticides and their metabolites accumulate in liver.(Duke and Wilson, 1971) Results of controlled laboratory exposures of fishes to pesticides and related chemical reveal that the liver is often the organ with highest pesticide concentrations.(Hansen et al., 1971, Duke et al., 1971; Johnson, 1968; Dutta et al., Chetri,1984) Literatures reveal that the greatest damage or impairment is caused to liver due to various pesticide exposures.(Eisler and Edmunds, 1966; Eller, 1971) Liver is an organ, found in vertebrates which performs significant duties in the body such as detoxification of metabolites, synthesis of proteins, synthesis of several components of blood plasma, production of biochemicals necessary for digestion and growth, storage of glucose in the form of glycogen and release of glucose. The present investigation is aimed to evaluate the histopathological alteration, caused by the sublethal dose of Malathion, in the liver of Common Indian Catfish or Heteropneustes fossilis.

II. MATERIALS AND METHODS

Adult female Heteropneutes fossilis fishes were taken from different swamps of Darbhanga, India. Their average weight was 30g and the average length was 20cm. The fishes were acclimatized in the laboratory for 2 weeks in a glass aquaria having tubewell water. The temperature of water was 21 $\pm$ 2°C. Fish was fed daily with thoroughly cleaned pieces of goat intestine. Replicates of five fish were exposed to a sublethal concentration of Malathion for 96 hours, 168 hours or 7 days and 30 days in different aquaria containing 300 L of water.

The Malathion sample contained 50 p.c. active ingredient, 33 p.c. organic solvent and 17% inert ingredients (procured from [1]North Minerals Limited, Haryana, India) (1.2 mg per litre)°. The test water was renewed every 48 hour. The LC_{50} value of Malathion for 96 hours for Heteropneustes fossilis has been calculated to be 14.2 mg/l. Controls were made without pesticide for the same duration. The liver of exposed and control fishes were examined after 96 hrs, 168 hrs and 30 days.

Small pieces of liver were dissected and fixed in alcoholic Bouins fluid and then they were dehydrated by passing through a graded series of alcohol. They were embedded in Czechoslovakian paraffin wax and sections of 6μ thickness were cut and attained with haematoxylin and eosin. Studies of the sections were made with the help of Olympus compound microscope.

III. RESULT

The 96 hrs of exposure to Malathion produced shrinkage of the hepatic cells in the liver of H. fossilis. Some degeneration of the cell membrane was also observed. Vacuolation in the cytoplasm was also observed in some of the hepatocytes. Nuclei in many hepatocytes were seen to be shrunken and became very dark. After 168 hrs of exposure to Malathion, vacuolation was seen in cytoplasm. Vacuoles were evident and the nuclei were pyknotic and eccentric. Displacement of cytoplasm towards the inner cell membrane as well as disintegration of cell membrane was also observed at this stage.

But the most explicit histopathological alterations were noticed in the liver of the fish when it was exposed to Malathion for relatively longer period of time, i.e. 30 days. The colour of the liver turned

yellowish red, which, naturally, should have been reddish brown. Congestion was observed in Sinusoids. In some instances, haemostasis in central vein of the liver was also noticed. Hyperemia was seen in the liver parenchyma.

Due to the 30 days of exposure to the toxic Malathion, Necrotic changes were also observed. Cellular organization was damaged and the cell membrane, too, at many points, were ruptured. The hepatocytes lost their typical shape and nuclei were displaced to the periphery. The blood capillaries were often observed to be filled with the coagulated blood.

Hence, some of the significant, rather grave and worrying histopathological alterations in the liver of Heteropneustes fossilis because of their exposure to Malathion were destruction of cytoplasmic and nuclear materials, nuclear disarray, damage of protoplasmic material and consequent vacuolations and pyknosis of their nuclei.

IV. CONCLUSION

From the above results, it can be concluded that Malathion is dangerous and toxic to Common Indian Catfish, i.e. Heteropneustes fossilis. It induces many life threatening changes in the body of H. fossilis. In the present study the liver of control fish was functioning normally while grave and shocking alterations were observed in the liver of the fish which was exposed to toxicity. Apart from other biochemical alterations, which the organophosphate pesticide induces, it damages the liver badly. Hence, to protect the aquatic ecosystem, strict measures are required to mitigate the use of such potentially harmful pesticides which are not only dangerous for the aquatic species but also for terrestrial species such as human beings.

V. REFERENCES

[1]. USEPA, 2005. United States Environmental Protection Agency.

[2]. Eto, M., 1974. Organophosphorus pesticides: Organic and biological chemistry. CRC Press, Cleveland, OH.

[3]. Duke,T.W., and Wilson, A.J.Jr. (1971): Chlorinated hydrocarbons in livers of fishes from the north eastern Pacific Ocean. Pestic. Monit. J. 5: 228

[4]. Dutta, H.M., S. Adhikari, N.K. Singh, P.K. Roy, J.S.D. Munshi(1993): Histopathological changes induced by Malathion in the liver of a fresh water Catfish, Heteropneustes fossilis(Bloch) Bull. Environ. Ontam. Toxicol. 895-900.

[5]. Chetri, Lily (1984): Malathion induced histopathological changes in the liver of labeo rohita, Uttar Pradesh J. 2001, 4(1): 125 – 126

[6]. Eller, L.L.(1971): Histopathologic lesions in cut throat trout(Salmo Clarki) exposed chronically to the insecticide endrin. Amer. J. Pathol. 64-321.