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Toxicity of Malathon On the Common Indian Catfish

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ABSTRACT

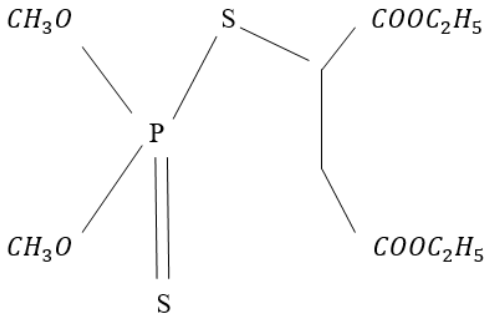
Environmental degradation and its related problems have affected and also attracted attention of every nation of the world. One of the most important environmental problems is excess use of chemicals and pesticides. Pesticides are one of the most potentially harmful toxic chemicals introduced into the environment. Though they have contributed considerably to human welfare, their adverse effects on non – target organisms are quite significant. A variety of toxic pesticides which pose a potential direct threat to fresh water organisms, particularly to sensitive animals, such as fish. Fishes are very sensitive to the changes in their aquatic environments that's why they are known as the bio – indicator species to monitor the water pollution. Organophophates pesticides are widely used amidst various group of pesticide in intensive agricultural practices to protect the crops from various pest and diseases owing to their high insecticidal property. Investigation of effects of toxic organophosphates pesticides such as malathion ($C_{10}\ H_{19}\ O_6\ PS_2$) on common Indian catfish "Heteropneustes fossilis" has diagnostic significance in evaluation of negative effects of pesticides to human health. Malathion, one of the most extensively studied pesticides, may induce many significant changes in catfish. Present study is aimed to review the toxicological effects on catfish exposed to the organophosphate pesticide malathion resulting different alterations at different parameters.

Keywords : Malathion, Toxicity, Biochemical Alterations, Catfish.

I. INTRODUCTION

Organophosphorus compounds have replaced organo – chlorines to a greater extent and are frequently sprayed on agricultural crops. Malathion ($C_{10}\ H_{19}\ O_6\ PS_2$) one of the earliest organophosphate insecticides developed in 1950, is used for the control of pest on green houses, home and garden vegetables, field crops and domestic animals.

Chemical name is 0, O – dimethyl dithiophosphate of diethyl marcaptosucinate. Structural formula of malathion is –



I Like other organophosphorus compounds, malathion find their way into aquatic habitats either by spray drift, aerial spray or washing from the atmosphere. (Tabrizi, 2001, Bagheri, 2007) Malathion has rapid biodegradability yet it leaves residues in the soil and water for several days after their application and pose a constant threat to non – target organisms, especially fish. (Magare and Patil, 2000).This review is an attempt to document the toxic impacts of Malathion on the common Indian catfish Heteropneustes fossilis," which will provide a base line data for the further research investigations. This fish possess Accessory respiratory organs in the form of a pair of sac like structure and dwells in marshy ponds, ditches and derelict water (Munshi, 1962). Bio – accumulation and bio – magnification of malathion in the common Indian cat fish leads to chronic toxicity and behavioural changes in extreme cases. There are various biochemical alterations caused by the toxicity of malathion compounds in catfish also.

II. MATERIALS AND METHODS

In the present study, fresh water fish H. fossilis was exposed to different concentrations of an organophosphate pesticide malathion and the variations in biochemical constituents of the fish were studied. The technical grade pesticide malathion 50% EC was taken for this present study. Malathion technical grade containing 95% by mass active ingredient was procured from M/s chemical Industries, Samastipur, from a Haryan firm and also from Darbhanga (Courtesy Ranjan Scientific Traders).

The fresh water fish H. fossilis (ranging in weight of 45.85 $\pm$ 3.62 kg and in length of 20.8 $\pm$ 0.67 cm) were brought from local fresh water tanks located within the radius of 15 km by fish traders of Donor, Darbhanga. During the period of acclimatization they were fed twice daily with thoroughly cleaned pieces of goat intestine. The fishes were exposed to the sub lethal concentration of malathion for 24, 48,72 and 96 hour respectively.

TABLE – 1

ACUTE TOXICITY (96 HR) AND ESTIMATED SAFE CONCENTRATION OF MALATHION TO (Heteropneustes fossilis).

PARENTHESES	VALUES
No. of Animals	20
Water temperature	27 $\pm$ 1.5°C
Lethal Concentration [PPM]	Confidence limit as 95% level 9.85 – 14.25

LC_0	8.20 PPm
LC_{50}	14.20 PPm
LC_{100}	24.15 PPm
Estimated Safe Concentration	
a. Burdick (1967)	2.233
b. Edward & Brown (1966)	0.604
c. Hart etal. (1945)	2.731
d. Konar (1970 – 1971)	4.318

III. RESULT

The acute toxicity and effects of duration of sub lethal exposure to malathion were determined in the Indian catfish (Heteropneustes fossilis). H. fossilis exposed to the pesticide for 24,48,72 & 96 hr. showed muscle glycogenesis with concomitant hyperglycemia at all intervals. Malathion was also associated with hyperchloremia at 48 & 96 hr. Various biochemical alternations was observed due to malathion toxicity include inhibition of acetyl cholinesterase enzyme, impaired metabolism of carbohydrate, protein and lipid metabolism and alterations in enzymes.

Malathion induced alterations in histopathology of H. fossilis are extensively studied. Vacuolization & presence of Sinusoid spaces in liver tissue were observed along with hyperaemia and degenerative changes.

Exposure to different concentrations of Malathion was shown to cause significant spatial discrimination impairments, response latency, reduction in swimming activity and impaired learning. Developmental alterations were observed as a result of effects of non – lethal concentrations of malathion in H. fossilis.

It has been also noticed that fishes were exposed to malathion started exhibiting behavioral changes. Behavioral changes included irregular, erratic and darting swimming movements of the fishes, hyper excitability, loss of equilibrium and sinking of the fishes to the bottom.

The fish specimens exposed to diverged concentrations of malathion revealed significantly greater DNA damage in their blood cells than the controls group. The fish exposed to the lower concentration of malathion shown relatively an insignificant GDI compared to the control one.

IV. CONSLUSION

It is evident that malathion presented in aquatic ecosystems can affect H. fossilis in different ways. These insecticides induce serious biochemical alterations in fishes and in extreme cases, paralyze them completely by inhibiting acetylcholinest erase enzyme in synapse. Finally, it is concluded that malathion is highly toxic to fish and impose life threatening effect on fish at both lethal and sub lethal concentrations. Hence, it is essential to prevent natural water bodies from pesticides contamination by having checks and balances at the point and non – point sources of pollution.

V. REFERENCES

Annes, M.A. (1975) :- Acute toxicity of four organophosphorus insecticides to a fresh water teleost. Channa punctuates (Bloch) Pakistan J. 2001.7, 135 – 147.

Agrawal, S.K.Rai A.K. Banerjee, T.K. and Mittal. A.K. (1979) :- Histophysiology of the epidermal mucous cells in relation to salinity in a freshwater teleost, H. fossilis.

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

Pandey B.N., A.K. CHANCHAL and M.P. Singh (1976) :- Effect of Malathion on oxygen consumption and blood parameters of channa punctatus. Indian J. Zootomy 27 : 95 – 100

Roy P.K. and J.S.D. Munshi (1988) :- Oxygen consumption and ventillation rate of a fresh water major carp, cirrhinus mrigala in fresh and malathion treated waters. J.Environ. Biol 9 : 5 – 13