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Toxic effects of insecticides on haematological parameters of local cat fish *Mystus vittatus*.

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Abstract- To study the effect of an organothiophosphate insecticide phenthoate on different haematological parameters in the striped dwarf catfish *Mystus vittatus*, an attempt has been made in the present work. A decrease in RBC count, Hb content and PCV as compared to control was seen on treatment of sub-lethal concentration of phenthoate (96 hrs). In lower concentration of phenthoate the TLC showed rising trend in comparison to control but in higher concentration presented an opposite trend i.e. decline in TLC. However Lymphocyte and Monocyte showed significant increase in their percentage. Dose dependent effects were seen. The reasons for such changes have been discussed in detail.

Keywords : Blood, Phenthoate, TLC, *Mystus vittatus*

INTRODUCTION

An important indicator to assess the physico-pathological state in human as well as for fishes is Hematology. It is the science or study of blood, blood-forming organs and blood diseases. Many toxicants are known to cause serious physiological damages at a very low concentration. In recent decades measurements of sub lethal changes in physiological functions of fishes have been attempted.¹ The hematological parameters have been studied most commonly for evaluation of toxicity of any toxicant. The alterations in hematological parameters like red cell counts, hemoglobin content, blood oxygen carrying

capacity, blood clotting time etc. are taken as the direct effect of a toxicant.²

Organophosphates are used in agriculture, homes, gardens and veterinary practices. In the past decade, several Organophosphates have been discontinued for use, including chlorpyrifos, which is no longer registered for home use, and parathion, which is no longer registered for any use.³ All share a common mechanism of cholinesterase (enzymes present in the central nervous system) inhibition and can cause similar symptoms. Phenthoate is also a widely used organothiophosphate insecticide and is highly toxic.⁴

All the existence of flora and fauna is threatened by the agro-chemicals, as they adversely affect the ecological balance leading to unwanted mortality of aquatic biota

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including fishes.^{5,6} The effects of agro-chemical on haematology of several fish Species were studied by toxicologists in recent years, but there is little information on the effects of phenthoate on fish blood.⁷ Present investigation is an attempt to record the haematological parameters in *Mystus vittatus* when exposed to various concentrations of phenthoate.

MATERIALS AND METHODS

Live specimens of *Mystus vittatus* were brought to the laboratory after being collected from the local fish market at Madhepura. 0.1% KMNO₄ solution was used to wash the fish to avoid skin infection. The fishes were fed daily with chopped goat liver & fish food for 10 days to get them acclimatized to the laboratory condition. The pesticide used in the present study is phenthoate. It is a broad spectrum organothiophosphate pesticide with trade Name -phendal, coromandel, salvo. The Molecular formula is - C₁₂H₁₇O₄PS₂. It is used against a variety of pests on a variety of crops including paddy.

In the experiment, fishes of healthy conditions and almost of same age group and average body weight 40.0 ± 0.98gm were used. Utilizing 10 fishes in each concentration, the fishes were exposed to various sublethal

concentration of 10 ppm, 20ppm, 25ppm of phenthoate for 96 hrs. along with the control set. The fishes were taken out of the aquarium with least stress using a hand net during the experiment. Using MS222 (Sandoz) dissolved in water each fish was lightly anaesthetized⁸. Using hypodermic needle fixed on to a 2ml sterilized syringes a cardiac puncture was made to collect blood samples, each fish being sampled once. Sodium citrate (3.8%) has been used as an anticoagulant since it does not alters the size of the red cells and the chance of Haemolysis is minimized. It is the best anticoagulant as it does not interfere during the estimation of electrolytes in comparison to other anticoagulants.

RESULTS

The effect of different concentration of phenthoate after 96hrs exposure on the blood parameters in the striped dwarf catfish, *Mystus vittatus* have been presented in Table.1. As compared to control treatment with this pesticide caused significant decrease in RBC Count, Hb content and PCV. But by increasing concentration of Phenthoate, TLC initially showed increase then decrease as compared to control. However Lymphocyte and Monocyte showed significant increase in their percentage. The effects were dose dependent.

Table 1. Effects of various concentration of phenthoate on haematological parameters of striped dwarf catfish, *Mystus vittatus*

Parameters	Control	10 ppm (parts per million)	15 ppm	20 ppm	25ppm
RBC (millions/mm ³)	1.8 ± 0.02	1.5 ± 0.001	1.4 ± 0.02	1.3 ± 0.12	1.2 ± 0.01
Hb (g%)	8.1 ± 0.03	8.0 ± 0.12	7.2 ± 0.1	7.1 ± 0.8	6.8 ± 0.2
PCV (%)	14 ± 0.03	12 ± 0.42	11.3 ± 0.5	10.5 ± 0.9	9.1 ± 0.1
Leucocyte (millions/mm ³)	23.8 ± 0.09	29.21 ± 0.12	26.5 ± 0.3	24.4 ± 0.2	21.2 ± 0.2
Lymphocyte (%)	46.2 ± 0.1	51.2 ± 0.2	53.0 ± 0.1	59.6 ± 0.14	65.1 ± 0.12
Monocyte (%)	1.2 ± 0.08	1.8 ± 0.1	2.1 ± 0.1	2.4 ± 0.2	2.6 ± 0.2

DISCUSSION

The effects of Pollutants on the blood in different species of fishes have been studied by several investigators.^{4,7} But quite variable effects of different types of pesticide on different species are seen so far. The toxicity of individual insecticide to different species of fish is

difficult to compare since the range of toxicity of insecticides depends on various factors⁸. In different species of fishes, even the same chemicals behave differently. It has been found that phenthoate caused significant decrease in RBC Count, I-lb content and PCV values as compared to control in the present study of

Mystus vittatus. But by increasing concentration of Phenthoate, TLC initially increase then decrease as compared to control. However significant increase in the Lymphocyte and Monocyte percentage was seen. The effects were dose dependent. Thus our result in *Mystus vittatus* is on the same tracks. Further investigation is required to ascertain whether this effect is direct or indirect due to changes in plasma volume.

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