



RESEARCH ARTICLE

THE EFFECT OF PROFENOFOS ON HAEMATOLOGICAL INDICES OF FRESH WATER TELEOST FISH (*Notopterus notopterus*)

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ABSTRACT

Profenofos is commonly used pest control in the agricultural fields surrounding freshwater reservoirs. This study was conducted to determine the acute toxicity of organophosphate pesticide and its effects on some haematological parameters of fresh water teleost fish *Notopterus notopterus*. The experimental groups showed decreased RBC, and Hb at 24 and 96 hrs exposures, and WBC value were found decreased at 24 hrs and increased at 96 as compared to control groups respectively. The results of examinations of blood profile indicate marked neurotoxic effect of profenofos in fishes. The changes in values of both erythrocyte and leukocyte profile after exposure to profenofos based preparation may be referred to disruption of haematopoiesis as well as to a decrease on non-specific immunity of the fish.

INTRODUCTION

Fish form an important class of Organisms on the basis of their use as nutritive food and are a useful indicator of pollution. It is necessary to monitor certain clinical parameters in order to determine the lethal and sublethal concentrations of pesticides as pollutants on the physiology of fish. Use of haematological parameters as indicators of stress provide, valuable information concerning the physiological reaction of fish in a changing environment and provides an ideal tool for toxicological studies. For studying the effects of toxicants blood is an important component as it is highly susceptible to environmental fluctuations (Panday and Pandey, 2001). For the biologist fish haematology is an essential tool, as a sensitive indicator of vital physiological, nutritional status, health, disease, stress as well as biochemical functions in response to changing environmental conditions. The compositions of blood of fishes vary with changing conditions of the environment and respond immediately to any change in water quality because of their intimate contact through gill surface. Variations in the haematological parameters of fish, in relation to different pollutants have been studied by Ramesh and Saravanan (2008), Svobodova *et al.*, (2003), Das and Bhattacharya (2002). Haematological parameters such as erythrocyte count, Hb concentration, haematocrit value vary in fish in response to

various toxicants. The natural physiological functioning of an organism gets disturbed on exposure to toxicant stress. It effect induces first at cellular or even at molecular level, but ultimately causes physiological, pathological and biochemical alterations. Pesticide pollutants acts as stress inducing agents which affect the functional state of tissues of the exposed organisms, all the pollutants are not toxic but all pesticides are toxicants. Many pesticides have been reported to produce a number of biochemical changes in fish both at lethal and more often at sublethal levels. Since aquatic environment is the ultimate sink for all pollutants resulting changes in ion concentrations, organic constituents, enzyme activity, endocrinal activity in fish have been attributed to pesticides.

Hence aquatic toxicity testing has become an integral part of the process of environmental hazard evaluation of the toxic chemicals. The analysis of haematological profile is a biomarker for diagnosing and identifying the physiological consequences of sublethal contamination. Since haematological parameters reflect the poor condition of fish more quickly than other commonly measured parameters, and since they respond quickly to change in environmental conditions. The present work was aimed to verify the assumption whether technical grade or commercial formulations of profenofos in sublethal concentration can influence changes in the haematological parameters of *Notopterus notopterus* in order to show toxic effects as indices of the pesticide stress.

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MATERIALS AND METHODS

Alive, healthy and disease free fish *Notopterus notopterus* irrespective of the sex were collected from local fisherman and brought to the laboratory. The collected fishes were maintained in glass aquaria of 40 L capacity, the fishes were kept for acclimatization to the laboratory conditions for one week prior to the experiment. The water of the aquaria is changed alternately then dead animals were removed to avoid any contaminations. The preliminary experiment was performed to know the LC50 of the profenofos for *N.notopterus*, the experiment showed that 96h, LC50 of profenofos was found to be 0.7mg/l, in this study, the sublethal concentration of profenofos 0.07mg/l was considered (1/10th of 96h LC50). Healthy adult fishes of nearly equal weight were taken and fed with goat liver or egg white. A total of 30 healthy fishes were used for the study and they were divided into three groups of 10 fish each, the first group was kept in pesticide free water and serve as control, second group was exposed to 1/10th of LC50 for 24 hrs and the third group is exposed to median lethal concentration of pesticide for 96 hrs. At the end of the experiment blood samples were taken from the experimental and control fishes.

Collection of blood

Blood was drawn from the caudal vein using 1ml syringe and kept for 30 min in slant position without disturbance. The haematological parameters RBC, WBC and Hb were determined using an auto analyzer sysmex xp100. The significance of sample means between control and profenofos treated fishes was tested by using ANOVA.

RESULTS

The change in haematological parameters of the fish *Notopterus notopterus* exposed to acute toxicity of profenofos is presented in (Table 1).

Table 1. Showing Haematological parameters of *N.notopterus* exposed to profenofos

	Hb	WBC	RBC
24 Hrs 0.07	12.25±0.38	112.23±3.11	1.78±0.04
Control	12.65±0.22	124.78±0.25	1.88±0.02
96 Hrs 0.07	10.45±0.30	154.4±3.77	1.625±0.04
Control	12.78±0.08	147.45±4.99	1.97±0.002

N=10 Mean value with ± SE

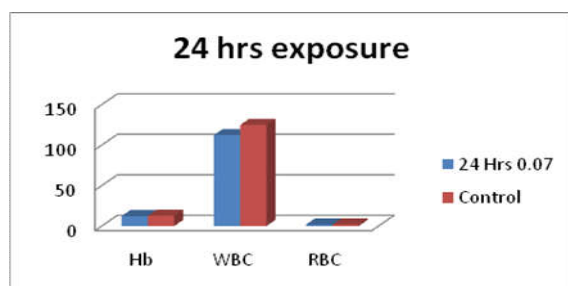


Fig. 1. Bar Diagram showing 24 hrs exposure to profenofos

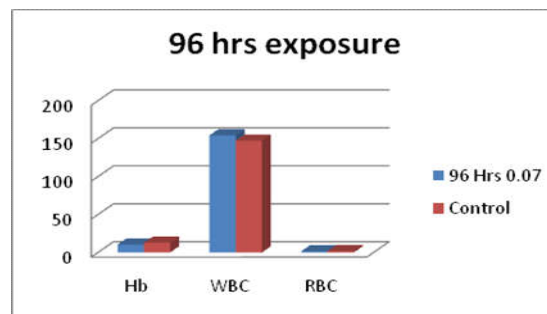


Fig. 2. Bar Diagram showing 96 hrs exposure to profenofos

During acute (0.07 ppm) treatment for 24 and 96 hrs it is observed that RBC, and Hb value was decreased, where as WBC values was decreased at 24 hrs and increased at 96 hrs exposures (Fig 1 &2) respectively compare to control one.

DISCUSSION

A reduction in the haematological values, indicated anemia in the pesticide exposed fish may due to erythropoiesis, haemosynthesis or due to an increase in the rate of erythrocyte destruction in haematopoietic organs (Jenkins *et al.*, 2003 and Saxena, 2003). In the present study, the decrease in the RBC count during the acute treatment might have resulted from sever anemic state or haemolysis power of toxicant (profenofos). Changes in blood cell profiles have been reported in *Cyprinus carpio* due to the effect of diazinon by Svoboda *et al.*, (2001). Kumar and Barthual (1991) have observed decreased erythrocyte level in fish subjected to stressful condition. Decreased trend in RBC and Hb number was pointed out by many workers (Indra *et al.*, 1998; Muniyan 1999). The increased in WBC count can be correlate with increase in antibody production which helps in survival and recovery of the fish exposed to sublethal concentration of pesticide (Joshi *et al.*, 2002). The present findings also show hypersensitivity of leucocytes for profenofos and these changes may be due to immunological reaction to produce antibodies to cope up with stress induced by profenofos. Thus increase in WBC count in the present study indicates stress condition of the fish caused by profenofos which might produced hypoxia and gill damage. The effects of environmental stressors on the peripheral blood of fishes are well documented in the literature. ATR is toxic; often bioaccumulative and persistent (Fernando *et al.*, 1992). Hussein *et al.* (1996) reported decreased RBCs number, hemoglobin concentration and haematocrit percentage of *Oreochromis nitoticus* and *Chrysichthyes auratus* when exposed to 3 and 6 mg/l ATR. Erythrocyte level was found to be depressed in fishes subjected to stressful conditions. Changes in the erythrocyte profile suggest a compensation of oxygen deficit in the body due to gill damage and the nature of the changes shows a release of erythrocytes from the blood depots (Drastichova *et al.*, 2004). In present study, the decrease in the RBCs and haemoglobin content might have resulted from the lowering of the oxygen content of the water due to the presence of profenofos in the test media. Leucocytes play an important role in the nonspecific or innate immunity, and the leukocyte count/activity can indicate the health status of a fish. The present study indicates that the WBC counts

were decreased in fish exposed to 24 hrs sublethal concentration of profenofos. Banaee *et al.* (2008) observed significant decrease of leucocyte count of common carp during exposure to sublethal concentration of diazinon. Perhaps these changes have direct toxic effects on the kidney and spleen.

Conclusion

The above observations clearly reveals that the short term exposure of *Notopterus notopterus* at sub lethal concentration of profenofos was sufficiently effective in disrupting physiological processes of fish and it may be recovered from the ill effect of pesticide by providing healthy environment.

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