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## RESEARCH ARTICLE

### HAEMATOLOGICAL CHANGES IN RESPONSE TO A PESTICIDE IN THE FRESH WATER FISH *NOTOPTERUS NOTOPTERUS*

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#### ABSTRACT

Applications of synthetic pesticides is one of the methods used to increase agriculture production, due to their long term persistence, slow degradability and toxicity affects other organisms. Present study was carried out to investigate the effect of profenofos on the haematology of the fish *Notopterus notopterus*. Fishes were exposed at sub lethal concentration of profenofos, thereafter blood was assayed for selected haematological parameters. Reduction in the number of RBC, Hb, and WBC indicating anemia. Whereas increased activity of blood sugar, blood urea, total cholesterol, serum triglyceride, alkaline phosphate, SGPT, SGOT indicated hepatic tissue damage. Decrease in serum uric acid and serum potassium indicates changes in ionic regulations.

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#### INTRODUCTION

The use of pesticide has increased several folds in India and is expected to increase in the forthcoming years. According to Hussain *et al.* (2002) more than one forth (27%) of the pesticides were being consumed are used on the fruits and vegetables. Pesticides play an important role in modern agriculture by providing consistent, reliable and reasonably complete control against harmful pests with less cost and effort while on the other hand considered as powerful aquatic pollutant. The pesticidal pollution has become a global problem due to its extensive use, pollution of aquatic system is wide spread. Pesticides reach to aquatic system by direct application though spray drift, aerial spraying, erosion and their run off from agricultural land to aquatic system. The effect of pesticide pollution of aquatic system depends not only with the characteristics of the pesticides and its concentration, but also with the nature and biology of the aquatic system. Fishes in their aquatic system meet many stresses like temperature, light, food availability, dissolved oxygen contents, salinity etc which effect their metabolic process in many ways. Accordingly, the variations appear in the amount of various metabolites in different tissues and blood.

The fluid part of blood that is plasma contains 90% water, total solids, organic substance, salt, total protein, serum albumin etc. Thus function of blood and plasma serve to maintain the constancy of the internal environment and to co relate the different parts of the body. The blood is one of the principle mean by which the organism behaves as a functional unit. There is growing interest in the development of behavioural markers to assess the sub lethal effects of toxicant, behavior is considered as promising tool in ecotoxicology (Cohn & Mcphail 1996). Objective of the current study was to determine sub lethal concentration of profenofos a organophosphorous insecticide and its effects on haematology in the freshwater fish *Notopterus notopterus*.

#### MATERIALS AND METHODS

From the Bhima river near Jewergi, Karnataka, India. The living and healthy specimens of *Notopterus notopterus* were collected and kept in glass aquaria, fishes were acclimatize for 15 days prior to the experiment. After acclimatization some of these fishes were used for the determination of LC 50 value. The preliminary experiment showed that 96h, LC50 of profenofos found to be 0.7mg/l, therefore in this study, the sub lethal concentration of profenofos 0.07mg/l were considered (1/10<sup>th</sup> of 90h LC 50). Healthy adult 20 fishes of nearly equal weight were taken and transferred to glass aquaria in the

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laboratory, water was changed every alternate day and they were fed with goat liver or egg white. A total of 20 healthy fishes were used for this study, they were divided into two groups of 10 fish each the first group was kept in pesticide free water and served as control and the second one was exposed to 1/10<sup>th</sup> of LC50. The exposure period lasted 45 days, after which blood samples were taken from the experimental and control fishes. All haematological parameters such as Hb, WBC, RBC count were determined using Neubaur's haemocytometer according to Dacie and Lewis (1984). Blood biochemistry was determined by centrifugation to get the serum and biochemical parameter such as serum glucose, uric acid, serum potassium, triglycerides, serum creatinine, blood urea total cholesterol, alkaline phosphate, SGPT and SGOT were measured using the protocols provided in the commercial kit purchased.

## RESULTS

The effect of exposure to sub-lethal concentration of profenofos for haematological parameters of *Notopterus notopterus* was studied. The haematological parameters for the treated fish and those of the fish from the control groups after 45 days showed significant difference. It was observed that there is a significant decrease in Haemoglobin, RBC, WBC, serum uric acid and serum potassium as compare to the control group. Result concerning random blood sugar, mean blood urea, mean serum creatinine, mean total cholesterol, mean serum triglyceride, potassium exhibited increase in their values and alkaline phosphate, SGPT, and SGOT values increased significantly in experimental groups as compared to control group (Table).

## DISCUSSION

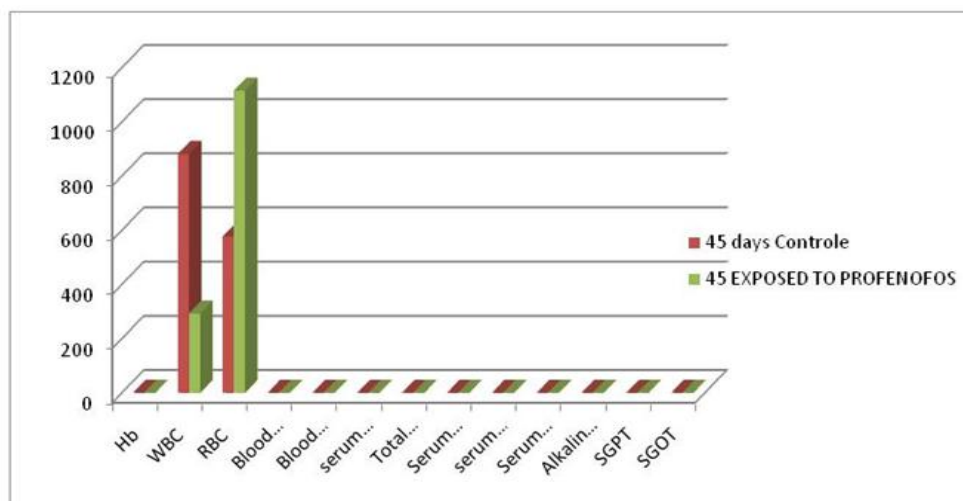
According to Barton stressors evoke non-specific responses in fish which enables the fish to cope with the disturbance and maintenance of its homeostatic states. If severe or long lasting, the response then becomes maladaptive and threatens the fish health and wellbeing. Therefore, in the presence of stressors (pollutants/contaminants), blood parameters and also blood chemistry can be employed to determine diseased conditions and metabolic disturbance in fish (Celik, 2004). In the present investigation it was observed that low level sublethal exposure of pesticide affects haematology. It is important to examine the toxic effects of pesticides in fish since they constitute an important link in food chain and their contaminations by pesticides imbalance the aquatic system. SGOT and SGPT are important diagnostic tools in medicine and are use to detect the toxic effect of various pollutants (Nelson and Cox 2000).

Our results show that profenofos exposure significantly increases the activity of both the enzymes of *Notopterus notopterus* after two weeks at a dose of 0.07mg/l in all exposed groups. The total leukocyte and erythrocyte count was decreased which might be due to malfunctioning of the haematopoietic system caused by exposure to profenofos. Agrahari, et al. (2007) observed an increase in SGOT and SGPT in the blood of *C. punctatus* following treatment with mercuric chloride and monocrotophos respectively. Similar observation has been noticed in the fish *N.notopterus* for the enzyme SGPT and SGOT. The effect of profenofos is evident from the results obtained in the present investigation there was a significant increase in blood glucose suggesting the impact of

45 Days Exposed to Profenofos

Blood parameters	Controle	45 Days Exposed
Hb	12.37±0.15	11.55±0.15
WBC	278333.33±882.09	193850±293.03
RBC	297000±577.46	190500±1115.77
Blood sugar	23.57±0.34	25.75±0.27
Blood urea	31.66±0.25	32.25±0.31
Serum creatinine	1.23±0.13	1.26±0.04
Total cholesterol	121.80±0.60	151.50±0.38
Serum triglyceride	32.88±0.22	33.23±0.19
Serum uric acid	1.96±0.01	0.81±0.07
Serum pottasium	12.20±0.09	10.60±0.15
Alkaline phosphate	35.31±0.19	39.75±0.16
SGPT	23.02±0.20	36.25±0.20
SGOT	21.65±0.14	31.25±0.20

N=10 Mean value with ± SE



profenofos on *N.notopterus*. Although the increase in blood glucose level after profenofos has been established beyond doubt, the reason for such an increase deserves attention. It is possible that this organophosphate might have entered into the liver tissue causing the breakdown of glycogen into glucose molecule, which are ultimately released into the blood. The blood sugar level gradually increases with increasing exposure period when treated with quinolphos on *Oreochromis mossambicus* (Das and Mukherjee, 2000).

Muni Anand *et al.* (2000) noticed a significant elevation in the glucose and total phosphorus in *Notopterus notopterus* which were exposed to 96 hrs LC 50 of Aldrin and Malathion. The work of Jyothi and Narayan (2000) on a freshwater fish exposed to two pesticides namely, carbaryl and phorate, showed that there was an increase in urea and uric acid. Serum cholesterol is an important biochemical component. The results obtained in the present investigation reveal a significant increase in serum cholesterol level in *N.notopterus* to profenofos exposure. Dekundey *et al* reported a significant increase in cholesterol level of *Channa punctatus* after arsenic treatment indicating blood hyper lipids, anemia due to hyper lipid metabolism.

### Conclusion

From the results obtained, it can be concluded that profenofos is moderately toxic. Exposure to sub-lethal concentration of profenofos resulted in significance haematological and biochemical alterations suggest that the treated fishes were faced serious metabolic crisis. The elevated values of RBC count, hemoglobin concentration and hematocrit values in the exposed fish are indicative of stress mediated effect on RBC, haemoglobin SGPT, SGOT blood urea, uric acid, cholesterol, sugar, alkaline phosphate and potassium levels by the fish. The results clearly indicate that the usage of the pesticides in the fields may be a threat to both aquatic fauna and flora as well as humans.

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