



## Hamatological response in a freshwater fish *Channa Striatus* exposed to endosulfan pesticide

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### Abstract

In the present study the fish *Channa striatus* were exposed to 0.0035 ppm concentration of endosulfan pesticide for 96 hours. The haematological parameters such as Red Blood corpuscles (RBC), White Blood corpuscles (WBC), blood glucose and haemoglobin (Hb) were studied. The parameters such as RBC and Hb were decreased where as WBC and blood glucose increased.

### INTRODUCTION

As many toxicants are being introduced into the environment of fishes, such as heavy metals, phenolic derivatives, detergents and pesticides etc. in sublethal doses one would expect the possibility of some haematological changes taking place substantially result in abnormal fish behavioural pattern in laboratory tests due to some toxicants accumulated in fish tissues.

In fishes the constituents of blood are influenced by many factors viz temperature, salinity, oxygen, hydrogen ion concentration of the water which affects the respiratory metabolism and consequently perhaps the blood constituents also therefore it is difficult to establish the normal values for the class as a whole extensive data is collected for different species and also within a species under different conditions, same range of values can be arrived the data so collected can form a valuable diagnostic aid in fisheries, as a deviation from the normal and serve as a definite clue of the physiological.

Many workers studied haematology of fish Birendra Kumar and Banerjee ,1990 observed the lethal toxicity of sevin (carbaryl) on blood parameters in *Clarias batrachus*. Prasanta Nanda ,1997 studied the effect of nickel stress on Indian

cat fish, *Heteropneustes fossilis* and observed the haematological changes. Bhoopathy and Gunasegar ,1999 observed the physiological changes due to sublethal concentration of potassium dichromate in the exotic fish *Oreochromis mossambicus* (Trewaves). Ramesh, 2001 studied the toxicity of copper sulphate on haematological parameters in cyprinus *carpio*. Amitkumar *et al.*, 2010 studied effect of endosulfan on haematology of *clarias batrachus* Masud and Singh 2013, observed haematological changes in *Cyprinus carpio* and David *et al.*, 2015 studied haematology in *cirrhinus mrigala* exposed to deltamethrin.

### MATERIALS AND METHODS

In the present investigation, live specimens of *Channa striatus* were collected from paithan and were brought to the laboratory without any mechanical injury. The fishes were maintained in glass aquaria and were allowed to acclimatize for nearly about four weeks before being used for the test. To determine the effect of acute treatment of endosulfan pesticide on haematological parameters a separate set of experiment was specially run for the short term of 96 hours. Ten fishes were exposed for a period of 96 hours to the LC50 values. The 96 hours LC50 values of endosulfan is 0.0035 ppm

after completion of short term exposure the blood from the caudal peduncle of fish was taken with the help of sterile disposable syringe. The blood was taken in bulb and heparin was used as an anticoagulant. After taking the blood the blood parameters like RBC, WBC haemoglobin and blood glucose were calculated. Simultaneously, a control tank was also maintained. Red blood corpuscles and white blood corpuscles were enumerated using Hayem's solution and WBC diluting fluid on Neubaur's improved double chamber counting slide. Blood glucose was estimated by using phenol sulphuric acid method. Hemoglobin was estimated by Sahli haemoglobin method (Sahli, 1962).

## RESULTS AND DISCUSSION

Biochemical alterations were observed in different haematological parameters of *Channa striatus* after exposure to endosulfan pesticide for acute toxicity. In general the pattern of alteration was similar to that as observed in various pesticides. It was also observed that alterations were dependent on the concentrations and specific toxicant. During the acute treatment (0.0035 ppm concentration of endosulfan) the haematological parameters of red blood corpuscles, haemoglobin were decreased while the white blood corpuscles and blood glucose were increased after exposure to 96 hrs. toxicity shown in Table No.1.

Sharma *et al.*, 1982 reported that CCl<sub>4</sub> intoxication induced significant changes in erythrocyte number and differential count of white blood corpuscles in *Clarias batrachus*. The decrease in the number of RBC is due to loss of water from the plasma to the tissue or the haemopoietic organ might have affected which could have reduced the production of red blood corpuscles. Sekar *et al.*, (1996) showed that decrease in the RBC and WBC of *Mystus vittatus* exposed to sublethal concentration of phosphomidon decreased trend in WBC suggested the haematological toxicity of phosphomidon. Similar observation is reported by Same observation is noted by Masud and Singh, 2013 and David *et al.*, 2015.

Bhoopathy and Gunasegar, (1999) showed that the white blood corpuscles increased in number, in the fish exposed to K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> clearly exhibiting immune system response to the toxicant but the red blood corpuscles number decreased significantly in the fish exposed to the same toxicant which was due to the damage inflicted by the toxicant to the erythroblasts that produce the

RBC and also to the existing RBC. Ramesh, 2001 showed that the fish *Cyprinus carpio* exposed to copper sulphate toxicant shows increase in the erythrocyte and leucocyte counts during the acute toxicity.

Erythrocyte level was found to be depressed in fishes subjected to stressful conditions. The reduction in erythrocyte may be caused either by the inhibition of erythropoiesis or by the destruction of red blood cells. Iwama *et al.* 1986 reported that the destruction of haemopoietic tissue in kidney and spleen result in decreased blood cell production and consequent reduction in erythrocyte count. Same observation is noted by Masud and Singh, 2013, David *et al.*, 2015.

WBC or leucocytes are one of the important components in blood. They protect the animal during injury, haemorrhage and attack by foreign compounds. They exhibit phagocytic action. Increase in the leucocytes has an adaptive value to meet the stressful condition and defence mechanism.

In the present study decrease in Red blood corpuscles due to inhibition of erythropoiesis and increase in white blood corpuscles which exhibits that the immune system response to the pesticide in *Channa striatus* exposed to endosulfan pesticide during acute toxicity treatment. Verma *et al.*, 1998 reported that there was decrease in the haematological percentage in *Oreochromis mossambicus* exposed to agrofens for 96 hours. A drastic decline in blood contents of the exposed fish was observed. This decline was obviously due to diminishing TEC, inadequate haemoglobinization of erythrocytes may also be a cause for the decline in sewage exposed *Heteropneustes fossilis* was observed by Narain and Nath, 1982. Rangaswamy, 1984 observed that there is a continuous breakdown of glycogen reserve to meet the energy demand of the fish as a result of pesticide stress thus increasing the blood glucose level. Another reason for the hyperglycemic condition might be the hypoxic condition to which the animal has been exposed where oxygen consumption of the fish has been reduced after exposure to endosulfan. Thus endosulfan stress also might be induced hyperglycemia through glycogenolysis.

Srinivas *et al.*, (2001) reported that the fish *Catla catla* exposed to malathion and dichlorovos pesticide showed that the blood glucose level was increased. Srinivas *et al.*, (2001) reported that there was significant reduction in haemoglobin after

exposing to the pesticides malathion and dichlorovos for acute treatment. The reduction in haemoglobin indicates the occurrence of acute anaemia due to diazinon pesticide Svoboda *et al.*, (2001) reported that the haemoglobin is decreased in the fish *Cyprinus carpio* exposed to pesticide. Amitkumar *et al.*, 2010 observed that the fish

*Clarias batrachus* exposed to endosulfan shows that blood glucose level was increased.

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**Table 1: Changes in haematological parameters in fresh water fish *Channa striatus* exposure for short term ( 96 hrs.)**

Parameters	Short term exposure	
	Control	Endosulfan 0.0035 PPM
RBC 10 <sup>6</sup> /mm <sup>3</sup>	2.44 ± 0.031	1.90 ± 0.027
WBC 10 <sup>3</sup> /mm <sup>3</sup>	16.840 ± 0.623	18.820 ± 0.848
Blood Glucose mg/100ml	68.0 ± 4.404	87.0 ± 4.123
Hb (gm %)	11.8 ± 0.753	8.9± 0.673

Each value is a mean of 10 observation ± S.D.

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