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ACUTE EFFECT OF SUMITHION ON CERTAIN BLOOD PARAMETERS AND MORTALITY RATE OF FISH, *HETEROPNEUSTES FOSSILIS* (BLOCH)

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ABSTRACT

The acute toxic effect of the toxicant sumithion (50% E.C.) on mortality rate (after 24, 48, 72 and 96 h), total RBC count and haemoglobin content (after 48 and 72 h) on *Heteropneustes fossilis* was investigated at four concentrations (9.7, 10.1, 10.7 and 11.1 ppm). The sumithion treated fishes showed lower RBC and Hb levels than the untreated ones. A gradual decrease in the total RBC counts and Hb contents was recorded with increasing concentrations of toxicant after 72 h but the blood showed fluctuating values after 48 h of treatment.

Extensive use of various toxicants have been found to be highly toxic to the aquatic environment including economically important fishes. These toxicants not only change environmental conditions but they also cause physiological, biochemical and morphological disturbances in fishes. It has been proved that haematological characteristics are valuable in monitoring responses of fish on exposure to different toxicants (Eister, 1965; Agrawal *et al.* 1979; Mahajan and Juneja, 1979; Rai and Qayyum, 1981; Raizada and Gupta, 1982). An attempt is made in the present investigation to study the effect of Sumithion (50% E.C.) on the mortality rate, total RBC counts and Hb content of the fish, *Heteropneustes fossilis.*

Healthy specimens of *H. fossilis,* ranging from 13-16 cm in length were procured from the local fish market at Agra during 1980. They were acclimatised in dechlorinated tap water for seven days and fed daily on artificial fish food. The feeding was discontinued two days before the test. The temperature (14-17°C) and pH (7.1 - 7.4) of water were maintained at a constant level. Following standard bioassay methods (APHA, 1975), the critical range between 9.7 and 11.1 ppm of Sumithion was evaluated. The final experiment was conducted by using the four concentrations (9.7, 10.1, 10.7 and 11.1 ppm) in four aquaria containing 40 litre of dechlorinated tap water and ten fishes. A control aquarium with ten fishes was also maintained simultaneously under identical conditions. The number of fishes were noted after 24, 48,72 and 96 h (Table I). Changes in survival number of fishes survival were found to be significant as seen from the values given in Table II.

Blood samples were collected from the control as well as Sumithion treated fishes for the estimation of total RBC counts and Hb content after 48 and 72 h through the caudal vein into double oxalated vials. The method as outlined by Dacis and Lewis (1969) was adopted for the analysis of blood parameters.

Table I. : *Survival rate of fish at different concentrations.*

Concentration (ppm)	No.of fish	24 h	48 h	72 h	96 h
9.7	10	10	10	10	8
10.1	10	10	8	7	5
10.7	10	8	5	3	2
11.1	10	5	3	1	0
Total	40	33	26	21	15

Table II. : *Analysis of variance of the survival rate of fishes.*

Variables	D.F.	S.S.	M.S.S.	'F' values
Concentration	3	117.80	39.27	26.18
Time	3	38.05	12.69	8.45
Error	9	13.45	1.50	

Table values of 'F' at 5% level of significance for concentration = 2.9 For time = 3.2

The changes in the total RBC counts and Hb content that occured after the treatment with Sumithion are given in Table III. The sumithion treated fishes showed low values of RBC counts and Hb content in comparison to those observed in control. A gradual decrease in both the blood parameters was observed after 72 h of exposure with the increasing

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Table III. : Total RBC counts and Hb content of H.fossilis in different concentrations of Sumithion (50% E.C.) during different time periods (values are mean ± S.E.)

Concentration (ppm)	48 h		72 h	
	RBC counts ($x10^6/mm^3$)	Hb content (9%)	RBC counts ($x10^6/mm^3$)	Hb content (9%)
9.7	0.90 ± 0.030	8.75 ± 0.114	0.86 ± 0.022	7.16 ± 0.087
10.1	1.12 ± 0.016	10.89 ± 0.039	0.63 ± 0.002	7.00 ± 0.050
10.7	0.73 ± 0.007	7.38 ± 0.035	0.54 ± 0.002	6.04 ± 0.019
11.1	0.64 ± 0.003	6.23 ± 0.037	0.52 ± 0.001	6.01 ± 0.008

Control RBC counts = 1.46 ± 0.032 x $10^6/mm^3$

Hb content = 11.9 ± 0.022 9 %

concentration of the Sumithion. Treated fishes after 48 h showed fluctuating values in the RBC counts and Hb content which initially decreased 9.7 ppm followed by an increase in 10.1 ppm. However, at 10.7 and 11.1 ppm concentrations a declining trend was recorded.

The effects of various toxicants on the blood of fishes and invertebrates have been investigated by various researchers (Panigrahi, 1977; Saad *et al.,* 1973). A sharp fall in the RBC counts and Hb content in *Channa punctatus* and *Anabas testudineus* has been studied by Panday *et al.,* (1976) and Panigrahi (1977) when the fishes were exposed to Malathion and mercury. Recently, Rai and Qayyum (1981) have also studied the toxic effect of mercuric chloride on *Catla catla* and recorded a gradual fall in the RBC count and Hb content with the increasing time period. They suggested that this alteration may be due to the stress on the haemopoitic organs, caused by mercury intoxication but the observation of Shammi and Qayyum (1982) are contrary to the above findings. The reported the haematanic condition (increase in RBC counts and Hb content) in *Clarias batrachus* in 5,50 and 100 ppm concentrations of carbary1 intoxicant.

In the present study, by Sumithion induced low values in RBC counts and Hb content in comparison to control fishes (Table III). The fluctuation in the blood parameters after the treatment with Sumithion may be due to the disturbances in the metabolic activities of the haemopoitic organs and depressed tissue respiration due to the toxic effect of Sumithion. In the stress condition fish exhibits asphyxiation due to respiratory failure and anaerobic glycolysis is enhanced. Thus, these physiological changes suggest prevalance of hypoxic environment in the blood in the treated fish which causes haemodilution (decrease in the RBC counts and Hb content). With the results, the volume of the blood increases or decreases reflecting the condition of the blood parameters when exposed to different concentrations of Sumithion. The study suggests that blood bioassay in fish can be considered as a useful method for assessing acute effect of the toxicant.

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