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Original Research Paper

Comparative Study on the Effect of phytotoxins from *Acacia sinuata* (Merr.) on Haematological Parameters of some Freshwater Fishes

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ABSTRACT

The plant *Acacia sinuata* (Merr.) shows piscicidal properties. The economically important freshwater fishes (*Labeo rohita, Catla catla* and *Cyprinus carpio*) were exposed to sublethal concentration (75 ppm) of alcoholic extract of the leaves of *Acacia sinuata* for 96 hrs. The toxic compounds in the leaves of *Acacia sinuata* showed piscicidal properties and induced haemolysis and affected almost all haematological parameters. All the parameters in blood except E.S.R. were found to be decreased in all the fishes, while E.S.R. was increased after 96 hrs of intoxication. Comparatively, haemolytic activity was lowest in *C. catla,* and highest in *L. rohita.* The results have been discussed in relation to mortality, metabolic activity and behaviour of these fishes.

INTRODUCTION

There are immediate pathological changes shown in blood before external signs of poisoning can be seen. The change in the haematological parameters give significance in assessing the physiological response of fishes (Joshi et al. 1980). As in human medicine, the assessment has been done by many workers to diagnose the disease condition of fishes (McCay & Vars 1931, Hesser 1960, Blaxhall & Daiseley 1973). Recently, haematological experiments have been done to measure the impact of various toxicants on fishes.

The data on the effect of some toxicants on fish blood are available from the studies of Panigrahi & Mishra (1978), Agrawal et al. (1979), Rai & Qayyum (1984), Thakur & Pandey (1990) and Varadraj et al. (1993). However, the studies on the effects of piscicidal compounds of plants on haematological parameters in fish are scanty. Hence, the present paper reports the comparative study on the haemolytic activity of phytotoxin from *A. sinuata* in freshwater fishes *L. rohita, C. catla* and *C. carpio.*

MATERIALS AND METHODS

The leaves of *Acacia sinuata* were collected, air dried and powdered mechanically. The ethanol extract of *A. sinuata* was dried in vacuum desiccator.

The healthy adults of the fish *L. rohita, C. catla* and *C. Carpio* with average length of 10 cm and weight of 120 g were collected from the local tanks. Fishes were kept in glass aquaria with continuous supply of tap water. They were acclimatized in laboratory conditions for a week.

The fishes of each species were exposed for 96 hr to the sublethal concentration (95 ppm) of ethanol extract of leaves of *A. sinuata.* A control set was maintained. After intoxication for 96 hr, two

fish of each species were taken out and anaesthetized. Fishes were wiped with blotting paper. Blood samples were collected in syringe rinsed with anticoagulant, by restoring to cardiac puncture, and stored in glass tubes layered with anticoagulant (EDTA).

The total R.B.C. and W.B.C. counts were determined through improved Naebaur's haemocytometer using Hayem's diluting fluid for R.B.C. count containing 30% glacial acetic acid, and methyl violet for W.B.C. count. Haemoglobin (Hb) concentration of blood was determined by Sahli's haemometer. Haematocrit values (packed cell volume, PCV) was determined by Wintrobe's haematocrit pipettes; for this purpose blood was centrifuged for 30 minutes at 4000 rpm. The mean corpuscular volume (MCV), mean cell haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were calculated by standard methods (Bauer 1990). Erythrocyte sedimentation rate (ESR) was determined by Westergern method (Bauer 1990).

RESULTS AND DISCUSSION

Data on the effects on haematological parameters of blood of the fishes *L. rohita, C. catla* and *C. carpio* after exposure to alcoholic extract (95ppm) of leaves *of A. sinuata* for 96 hr are given in Table 1.

In control set, values of R.B.C. count, W.B.C. count, Hb percentage, PCV, MCV, MCH, MCHC and ESR after 96 hr were observed as $2.67 \times 10^6/mm^3$, $23.80 \times 10^3/mm^3$, 11.70 g%, 27.85 dl, 104.30 μm^3, 43.82 pg, 42.01 dl and 2.75 mm/hr respectively, in fish *L. rohita* while after intoxication for 96 hr these values were found respectively as $2.51 \times 10^6/mm^3$, $21.80 \times 10^3/mm^3$, 9.80 g%, 23.25 dl, 100.59μm^3, 39.04 pg, 38.88 dl and 2.95 mm/hr. This shows increase in all the parameters except ESR in fish *L. rohita.* Likewise, these values of different blood parameters expect ESR were increased in the other fishes also.

The fall in the data of R.B.C. count, W.B.C. count, Hb percentage, PCV, MCV and MCH is in agreement with Pandey (1976), Hooper & Sundurman (1978) and Bhatt & Farshwan (1992) who have reported among malathion, low temperature, nickel sulphide and phytotoxin treated fishes.

In this investigation when *L. rohita, C. catla* and *C. carpio* were treated with phytotoxin from *A. sinuata,* it enters into the body and then into the blood stream of fishes. The entry of phytotoxin in the blood affects erythrocytes and leucocytes. The injury of blood cells further results into decreased R.B.C. count, W.B.C. count, Hb percentages, MCV, HCH and MCHC. This type of fall in the percentage of haematological parameters in fishes was also observed by Kiptoon et al. (1982), Veenba Gerg et al. (1991) and Bhatt & Farshwan (1992).

Increase in ESR was also observed in this experiment. This type of increase in ESR was observed by Bhat & Singh (1985) who were of the opinion that decreased PCV and increased ESR are effect of degradation of blood proteins in intoxicated fishes.

By the comparative study of the data of haematological parameters, it is concluded that the phytotoxin from *A. sinuata* is comparatively more effective in *L. rohita* than the other two fishes. It can be concluded that phytotoxin from *A. sinuata* induces haemolysis in the freshwater fishes *L. rohita, C. catla* and *C. carpio* which affects oxygen carrying capacity of blood and respiratory metabolism. This effect on respiratory metabolism increases the rate of mortality in the fishes.

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Table 1: Phytotoxin from *A. sinuata* induced haematological values at 96 hours of intoxication.

No.	Heamatological Parameters	Name of the fish					
		L. rohita		*C. catla*		*C. carpio*	
		Control	Intoxicated	Control	Intoxicated	Control	Intoxicated
1.	R. B. C. count ($\times 10^6$/mm^3)	2.67	2.51 (5.99)	4.03	3.89 (3.47)	3.96	3.85 (2.78)
2	W. B. C. count ($\times 10^3$/mm^3)	23.80	21.80 (8.40)	35.80	33.40 (6.70)	28.30	36.20 (27.92)
3	Haemoglobin (Hb) (g %)	11.70	9.80 (16.24)	9.70	8.70 (10.31)	12.80	11.50 (10.16)
4	PCV (dl)	27.85	25.25 (9.34)	39.20	36.70 (6.38)	39.50	36.70 (7.09)
5	MCV(μm^3)	104.30	100.59 (3.56)	97.27	94.34 (3.01)	99.75	95.32 (4.44)
6	MCH (pg) ($\times 10^3$/mm^3)	43.82	39.04 (10.91)	24.06	22.36 (7.07)	32.32	29.87 (7.58)
7	MCHC (dl)	42.01	38.88 (7.45)	24.74	23.10 (4.20)	32.40	31.33 (3.30)
8	ESR (mm/hr)	2.75	2.95 (7.27)	3.30	3.75 (13.64)	3.35	3.92 (17.01)

Values in parentheses show percentage, increase or decrease in diferent haematological parameters.

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