



## ALTERATIONS IN HAEMATOLOGICAL PARAMETERS OF A FRESH WATER TELEOST, *CHANNA STRIATUS* EXPOSED TO SUBLETHAL CONCENTRATION OF CYFLUTHRIN

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### Abstract

Pyrethroids are synthetic analogues of natural pyrethrins and are used extensively in chemical formulations for pest control. Effects of sublethal exposure of cyfluthrin, a type II synthetic pyrethroid pesticide, on *Channa striatus* were observed for 30 days. Blood was collected from the control and exposed groups after 15 and 30 days and used for haematological studies. The results showed a significant decrease in total erythrocytic count, haemoglobin concentration, packed cell volume, mean corpuscular volume and increase in total leucocyte count, mean corpuscular haemoglobin concentration in exposed groups. The study indicates a significant toxicological impact of cyfluthrin on experimental fish with marked changes in haematological parameters.

**Keywords:** Cyfluthrin, Pyrethroid, *Channa striatus* and Haematological parameters.

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### Introduction

Pesticides are toxic chemicals designed to kill target pests and harmful insects. Improper handling and misuse of these pesticides often resulted in pollution of aquatic environment affecting the non-target organisms including fish. The contribution of pesticides towards chemical pollution of the freshwater ecosystems have turned out to be a major and serious problem (Holden, 1972). Widespread contamination of aquatic ecosystem by pesticides has been responsible for massive fish kills (Saunders, 1969). Fishes constitute a cheap and valuable source of human food including proteins, fats etc. Continued exposure to these highly toxic substances is envisaged to be a potential hazard to the health of fish (Anees, 1974).

Pyrethroid pesticides are very potent pest control agents. These are synthetic derivatives of pyrethrins, obtained from *Chrysanthemum* flowers. Cyfluthrin is a type II synthetic pyrethroid widely used in various insecticide formulations to control harmful insects and pests (Bhushan et al., 2013). Pyrethroids have been reported to be highly toxic to non-target aquatic organisms including fish [Bradbury & Coats, 1989; Selvi et al., 2008]. Due to improper handling these pesticides may enter into aquatic environment where they may disturb the normal physico-chemical properties of water. These pesticides may cause significant damage to biochemical and physiological processes of important vital organs of fish (Banaee et al., 2011).

Studies on haematological parameters are considered as important indicators for the overall physiological status of an organism. Any physical or chemical change in water is reflected in the components of fish blood (Blaxhal & Daisy, 1973). The presence of toxicants in the water results in

deviations from the normal range of blood parameters. Hence, haematological tests serve as important diagnostic tools in toxicological studies. RBC and WBC counts, haemoglobin concentration, PCV, MCV and MCHC are some of the most important haematological parameters of diagnostic significance (Blaxhal & Daisy, 1973).

*Channa striatus* is a common freshwater teleost fish found in India. It is an air-breathing, hardy and economical fish. It can be easily reared in laboratory and is very suitable for toxicological studies.

### Material and Methods

Live healthy specimens of fish were procured from a local source. The fish were brought to the laboratory and treated with potassium permanganate solution to avoid any dermal infections. The fish were acclimated to laboratory conditions for ten days prior to experiment. Fish were fed commercial fish food. Important water parameters like temperature, pH, dissolved oxygen and hardness were constantly monitored during whole experiment.

Technical grade cyfluthrin was procured from Bayer Vapi India Ltd., Gujarat. Cyfluthrin was dissolved in acetone to prepare a stock solution which was further diluted to prepare the desired test concentrations of cyfluthrin.

Fish were divided into three groups for haematological studies. Group I was the control group. Group II and Group III were the experimental groups. Fish in experimental groups were exposed to a sublethal concentration of cyfluthrin (0.45 µg/L) for 15 and 30 days. This concentration of cyfluthrin was 1/10th of the 96 h LC<sub>50</sub>. Feeding was stopped 24 hours prior to blood collection. For the study of haematological parameters, blood was collected after 15 days

and 30 days. Estimation of haematological parameters was done by standard methods. Total erythrocyte count (TEC) and total leucocyte count (TLC) were estimated by improved haemocytometer. Hb concentration was estimated by Sahli's haemoglobinometer and packed cell volume was measured by the method described by Wintrobe et al., 1981.

## Results and Discussion

The results of this study are presented in table-I

Table-I

Haematological parameters of *Channa striatus* after sublethal treatment of cyfluthrin (0.45µg/L) for 15 and 30 days

Parameter	Group I (Control)	Experimental groups		Significance level
		Group II (15 Days exposure)	Group III (30 Days exposure)	
<b>TEC</b> (million/mm <sup>3</sup> )	3.19±0.03	2.83±0.07	2.57±0.11	P<0.001
<b>TLC</b> (cells/mm <sup>3</sup> )	8840±28.66	9440±28.56	10440±16.27	P<0.001
<b>HbC</b> (g/dl)	12.56±0.14	09.46±0.08	08.53±0.11	P<0.001
<b>PCV</b> (%)	46.56±1.35	34.43±1.45	30.20±0.56	P<0.001
<b>MCV</b> (fl)	138.14±3.24	129.24±5.80	112.79±4.64	P>0.05
<b>MCHC</b> (g/dl)	26.97±0.50	27.47±0.98	28.24±0.76	P>0.05

Values are mean±SEM for three replicates.

The present investigation was conducted to evaluate the effect of cyfluthrin on *C. striatus* by using selected haematological parameters. This study showed a significant decrease in total erythrocyte count, haemoglobin concentration, haematocrit percentage and mean corpuscular volume in both the experimental groups (Group II & III) in comparison to control fish (Group I). Total leucocyte count and mean corpuscular haemoglobin concentration showed a significant increase in both the experimental groups in comparison to control fish. The results of the present investigation are in agreement with previously reported studies for pyrethroid pesticides in fishes. Almost similar results have also been reported by various workers. Atamanalp *et al.* (2002) reported an increase in TEC, Hb, MCHC and decrease in PCV, MCV and TLC in rainbow trout, *Oncorhynchus mykiss* after cypermethrin intoxication. Akhtar *et al.* (2021) reported reduced levels of TEC, Hb conc., PCV and elevated levels of TLC in *Schizothorax*

*esocinus* after exposure to cypermethrin. Dorucu and Girgin (2001) observed decrease in TEC, Hb, PCV, TLC, MCV and increase in MCHC in *Cyprinus carpio* after cypermethrin intoxication while, Cakmak and Girgin (2003) reported decrease in TEC, TLC, Hb, HCT, MCHC and increase in MCV after cypermethrin intoxication. Vani *et al.* (2011) observed significant decrease in TEC, TLC, Hb conc. in fingerlings of *Catla catla* after exposure to deltamethrin. Jayaprakash and Shettu (2013) reported decrease in TEC, Hb, PCV, MCHC and increase in TLC, MCV in *Channa punctatus* after exposure to deltamethrin. Ullah *et al.* (2014) observed decrease in TEC, Hb, HCT in *Tor putitora* after cypermethrin intoxication; Uddin *et al.* (2022) observed significant increase in TLC and decrease in TEC, Hb in *Mystus cavasius* after cypermethrin exposure. Dawood *et al.* (2020) reported reduction in WBC count, RBC count and Hb in *Oriochromis niloticus* after exposure to deltamethrin. Similar findings were reported by Patole *et al.* (2016) for fenvalerate in *C. punctatus* and Khan *et al.* (2018) for cypermethrin in *Labeo rohita*.

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