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Impact Of Pyrethroids On The Haematoloical Aspects Of *Channa Punctatus* With Special Reference To Alphamethrin.

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ABSTRACT

A bioassay experiment was conducted to examine the effect of alphamethrin on some blood parameters of *Channa punctatus*. Four concentrations viz. 0.0015625, 0.003125, 0.0125 and 0.025 ppm of alphamethrin were prepared. Lethal value was obtained at 0.025 ppm and all the experimental fish died within 24 hrs. At sublethal concentrations, alphamethrin induced remarkable changes in protein concentration, blood density, bleeding time and clotting time of this fish. Protein concentration was decreased after exposure to 0.0125 ppm alphamethrin for 30 days, while little change was observed in the blood density of fish due to the exposure to alphamethrin, but bleeding times and clotting time were enhanced. The changes became more significant with the increase in concentration of alphamethrin and exposure period. The results suggests that alphamethrin is capable of inducing alterations in the normal haematological values of *Channa punctatus*. Possible mode of action of alphamethrin in *Channa punctatus* is discussed.

Keywords: Pyrethroid, Toxicity, Haematology, *Channa punctatus*, alphamethrin

INTRODUCTION

Pesticides used in agriculture pose a significant threat to aquatic animals, particularly fish, which are one of mankind's primary sources of protein-rich food(Jaiprakash and Shettu 2013). The majority of pyrethroid chemicals enter the aquatic environment via runoff water from agricultural operations, drift during forest spraying, and direct spraying of water bodies (Tripathi and Singh 2013). Alphamethrin (3-(2,2-dichlorophenyl)-2,2-Dimethyl cyno (3- Phenoxyphenyl) methyl ester) is an important member of the family of synthetic pyrethroids which are being used very commonly in agriculture and forestry to control several pests of various crops and other plants but at the same time these compounds when reach in water bodies with runoffs cause toxicity in aquatic non target organisms including fish (Jolly et al 1978 Shires, 1983; Rouaud et al, 1985; Nath of al. 1996; Thakur and Bais. 2000; Moore and Waring 2001; Saxena and Seth, 2002a & band, Seth and Saxena, 2003) and their toxicity level increases as we move up in the food chain (Brown, 1978). The persistence of toxic pyrethroids in aquatic environment is dangerous and toxicity to fish is harmful to human being through fresh water edible fishes.

The study of toxicity to organisms is an essential first step for the evaluation of the effect of pesticides for achieving the objective viz. to determine the safer concentration and to formulate the safe application of pesticides (Sprague, 1969, 1970 and 1973). Blood is a pathophysiological reflector of the body because it is highly susceptible to the changes in its internal and external environment and physicomorphological changes in the blood indicate the alterations in the quality of environment and haematological parameters play an important role in the diagnosis of the functional status of the exposed fish. Assessments of haematological parameters might be effective for monitoring pesticide stress and can provide valuable information on the physiological responses of fish to changing environmental conditions (Agrahari et al. 2006). Therefore, the present work is done to evaluate the effect of alphamethrin on fresh water fish *Channapunctatus* by studying the changes in the hematology of this fish.

MATERIAL AND METHODS

Channa punctatus was obtained from local water bodies and acclimatized in the laboratory in aquarium for 10 days and then divided in four experimental groups and one control group in different aquaria containing 0.0015625and 0.0125 ppm of alphamethrinThe fish were reared till their death or a maximum period of 30days whichever was earlier. During this period fish were sacrificed at an interval of 5 days to examine the effect of alphamethrin on their hematology.

Blood was collected by cutting the caudal peduncle, using heparin as anticoagulant Protein concentration of the blood was estimated by the method of Lowry et al (1951) and the density of blood was measured bychloroform benzene method. Bleeding time and clotting time were recorded by capillary tube method.

RESULTS

The results of the present studies are summarized from table 1 to 4. Protein concentration (34.38%) andBlood density (15.55%) were reduced in experimental fishes after exposure to 0.0125 ppm alphamethrin for30 days (Tables 1 and 2, respectively), Bleeding time (43.29%) and clotting time (53.31%) were also increased in experimental fishes after exposure to 0.0125 ppm alphamethrin for 30 days (Tables 3 and 4, respectively) those changes were greater and quicker with increase in the dose of alphamethrin.

Table 1

Effect of alphamethrin on protein concentration (in mg/ml) of *Channa punctatus*

Conc. of in ppm	0 DAY	5 DAY	10 DAY	15 DAY	20 DAY	25 DAY	30 DAY
Control	107.50	105.00	104.17	102.50	105.00	101.66	106.67
	±5.99[a]	± 5.9	±5.89	±5.8	±5.9	±5.8	±5.9
		22.32[b]	3.10	44.65	22.32	25.43	60.77
0.0015625	-	95.83	92.50	86.67	82.50	79.17	73.33
		±5.6	±5.55	±5.37	±5.24	±5.14	±4.94
		58.73	11.20	15.44	21.43	22.12	31.25
0.003125	-	92.50	86.67	82.50	77.50	74.17	71.67
		±5.55	±5.37	±5.24	±5.08	±4.97	±4.89
		11.90	16.80	19.51	26.19	27.04	32.81
0.0125	-	88.33	85.00	80.00	77.50	74.17	70.00
		±5.43	±5.32	±5.16	±5.08	±4.97	±4.83
		15.88	18.40	21.95	26.19	27.04	34.38

a= mean of six individuals ± SE; B = percent decrease in protein concentration

Table 2

Effect of alphamethrin on blood density (in mg/ml) of *Channa punctatus*

Conc. of in ppm	0 DAY	5 DAY	10 DAY	15 DAY	20 DAY	25 DAY	30 DAY
Control	1.08	1.08	1.08	1.08	1.08	1.08	1.08
	±0.6[a]	± 0.6	±0.6	±0.6	±0.6	±0.6	±0.6
		0.00[b]	0.00	0.00	0.00	0.00	0.00
0.0015625	-	1.07	1.06	1.05	1.04	1.01	0.99
		±0.60	±0.60	±0.60	±0.16	±0.23	±0.15
		0.93	1.85	2.78	3.41	6.11	8.30
0.003125	-	1.04	0.98	0.98	0.98	0.91	0.91
		±0.58	±0.58	±0.58	±0.58	±0.58	±0.58
		3.70	9.63	9.63	9.63	15.55	15.55
0.0125	-	0.98	0.91	0.91	0.91	0.91	0.91
		±0.58	±0.58	±0.58	±0.58	±0.58	±0.58
		9.63	15.55	15.55	15.55	15.55	15.55

Table 3

Effect of alphamethrin on bleeding time (in second) of *Channa punctatus*

Conc. of in ppm	0 DAY	5 DAY	10 DAY	15 DAY	20 DAY	25 DAY	30 DAY
Control	18.50	15.33	16.33	16.17	18.50	19.67	24.67
	±2.48[a]	± 2.26	±2.33	±2.32	±2.48	±2.56	±2.87
		17.13[b]	11.73	12.59	0.00	6.32	33.35
0.0015625	-	17.33	18.50	20.00	21.50	22.67	24.33
		±2.40	±2.48	±2.58	±2.68	±2.75	±2.85
		13.05	13.29	23.68	16.22	15.25	1.38
0.003125	-	18.67	20.33	20.83	22.00	18.33	23.50
		±2.49	±2.60	±2.63	±2.71	±2.47	±2.80
		21.79	24.49	28.82	18.92	6.81	4.74
0.0125	-	20.83	22.00	23.17	25.00	26.33	29.17
		±2.63	±2.71	±2.78	±2.89	±2.96	±3.12
		35.88	34.72	43.29	35.13	33.86	18.24

a= mean of six individuals ± SE; b = percent increase in bleeding time

Table 4

Effect of alphamethrin on blood clotting time (in seconds) of *Channa punctatus*

Conc. of in ppm	0 DAY	5 DAY	10 DAY	15 DAY	20 DAY	25 DAY	30 DAY
Control	12.50	12.33	13.00	12.83	15.83	16.00	18.17
	±2.04[a]	± 2.03	±2.08	±2.07	±2.30	±2.31	±2.46
		1.36[b]	4.00	2.64	26.64	28.00	45.36
0.0015625	-	13.50	15.33	17.00	18.50	19.67	20.67
		±2.12	±2.26	±2.38	±2.48	±2.56	±2.62
		9.49	17.92	32.50	16.87	22.94	13.76
0.003125	-	15.17	16.50	18.50	15.83	15.00	20.00
		±2.25	±2.34	±2.48	±2.30	±2.24	±2.58
		23.03	26.92	44.19	0.00	6.25	10.07
0.0125	-	17.17	18.33	19.67	21.67	23.50	25.50
		±2.39	±2.47	±2.56	±2.69	±2.80	±2.91
		39.25	41.00	53.31	36.89	46.87	40.34

a= mean of six individuals ± SE; b = percent increase in blood clotting time

DISCUSSION

According to the findings of Shaluei et al., 2012) Pyrethroids can readily permeate inside the gills, even at meagre quantities in the water, rendering fish the most susceptible to the pesticide. Madsen et al (1996) also reported that fishes are affected upon exposure to low levels of pyrethroids. Hill (1989) observed that high toxicity to fish in water without particulate matter caused adverse changes in productivity of aquatic ecosystem. The haematological parameters have been effectively used as sensitive diagnostic indicators of pyrethroid poisoning. As fish cannot adequately metabolise pyrethroids, their susceptibility to aqueous pyrethroid exposure is exacerbated (Borges et al. 2007). By modulating the activities of many enzymes and metabolites, pesticide accumulation in tissue causes many physiological and biochemical changes in fish (Sarma et al. 2013).

The present investigations show that prolonged exposure of *Channa punctatus* to alphamethrin in water induced a variety of anomalies in its hematology (Dhawan and Kaur, 1996 and Khalaf, 1999).

The behavioral response of *Channa punctatus* towards alphamethrin was totally dependent on concentration and period of exposure. When *Channa punctatus* was exposed to high concentrations of alphamethrin, secretion of mucus from the body was observed. They showed hyper-excitability, increased aerial excursion and increased opercular movements. Fishes often showed jerky movements and tried to jump out of the aquaria. Subsequently fish became lethargic progressively and they lost their balance. Ultimately, the fish sank to the bottom and (Radhaih and Rao, 1988).

Data presented here show that exposure to alphamethrin caused significant changes in protein concentration of *Channapunctatus*. Depletion in tissue protein in fishes exposed to some pesticides was reported by several workers (Dubale and Awasthi, 1984; Ghosh and Chatterjee, 1988 Ramos and Herrera, 1996) These workers reported that the pesticidal stress influences the conversion of tissue protein content into soluble fractions reaching in the blood for utilization. The reduction in the protein concentration in the present findings is in agreement with the findings of earlier workers.

The clotting time of blood in *Channa punctatus* was found increased after exposure to alphamethrin which might be due to thrombocytopenic effect. Hougle (1971) and Lone and Javaid (1976) demonstrated that fish with disease or organophosphate toxicosis show increased bleeding time and clotting time.

The findings of the present study indicate that the alphamethrin is capable of causing significant alterations in protein concentration, blood density, bleeding time and clotting time in *Channa punctatus*. Though the fish were apparently healthy and mortality was not observed, their entire physiology was disturbed due to the accumulation of deltamethrin in their body.

Conclusion

The results of the present investigations show that the entire physiology of *Channa punctatus* was disturbed and they were under stress during alphamethrin exposure. This may be due to accumulation of residue of alphamethrin in blood and various other tissues of this fish.

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