

ENZYMOLOGICAL INDICES OF FRESHWATER FISH *CHANNA ORIENTALIS* (Sch.) EXPOSED TO CYPERMETHRIN AND FENVALERATE

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Key Words : Enzymological indices , Cypermethrin , Fenvalerate , *Channaorientalis* .

Abstract : Toxicity study was conducted on Freshwater Fish *Channaorientalis* to evaluate the enzyme activity of two Pesticides, Cypermethrin and Fenvalerate upto 96 hrs at a duration of 24, 48, 76, and 96 hrs, which shown toxic effect of Cypermethrin and Fenvalerate on Acid phosphatase. In present study Cypermethrin was found to be more toxic than Fenvalerate to the experimental fish, *Channaorientalis*.

Introduction: In Vertebrates and Invertebrates, Cypermethrin acts mainly on nervous system. Cypermethrin is both stomach and Contact poison (Jin and Webster, 1998). It has been shown to inhibit ATPase enzyme involved in movement of ions against a concentration gradient which are regulated by active transport, this action is especially critical to fish and aquatic insect, where ATPase enzyme provide the energy to active transport, are very important at the sites of oxygen exchange. ATPase inhibition and disruption of active transport, possibly affect ion movement and ability to maintain ion balance and disrupt respiratory surfaces, indicating that Cypermethrin is inherently more toxic to aquatic organism (Siegfried, 1993). In pond water that contained apparently lethal concentration of Cypermethrin (5ppb) because the chemical was absorbed on to suspended solids (Crossland, 1982).

The use of synthetic pyrethroid for control various pests is regularly increasing. They are drained into rivers, tanks and pools resulting to pollute aquatic environment. Such chemicals are toxic to non target species and hamper human health too via ecological cycling and biological magnification. Aquatic pollution is greatly affecting the metabolism of fishes and some time heavy mortality has been experienced. A major part of world's food is being supplied fish source, so it is essential to secure the health of fishes. Among the pyrethroids, Fenvalerate is widely used as synthetic toxicant that causes severe metabolic disorders in fishes (Coats et.al., 1979, Reddy et.al., 1989, Reddy and Philip, 1994, Thakur and Bais 2000). It has been extensively popularized because of high insecticidal potency, low mammalian toxicity and very short persistence. However, Fenvalerate is extremely toxic to fish. The extreme toxicity of Fenvalerate to fish due to efficient gill uptake in efficient detoxification, elimination and sensitivity at the site of action (Bradbury et.al., 1997, Coats et.al., 1989, Tripathi et.al., 2001). Thus low rate of Fenvalerate elimination and metabolism appears to play an important role on the pesticidal activity of this insecticide (Bradbury et.al., 1986). So for there are much limited response dealing with the effects Cypermethrin & Fenvalerate on enzyme activity of freshwater fish. Therefore, it is considered of an interest to analyse the effect of Cypermethrin & Fenvalerate on fish enzyme, Glutamate oxaloacetate transaminase.

Material And Methods:

The freshwater fish, *Channaorientalis* were collected from Amravati local market and Rushi lake of Karanja (lad), (M.S., India) and maintained in the laboratory conditions in large aquarium to the maximum number 2 lit/gm of fish weight for a period of one month for acclimatization in aerated well water. Fishes were fed daily with ad-libitum and boiled eggs. Fishes weighing about 15 gm. and 10 cm in length were selected for evaluation or actual toxicity study. Fishes were starved for 48 hrs. before the start of experiments and kept separately in a group of 10 fishes in each aquarium (test container about 20 lit. capacity). They were kept clean and away from visual and mechanical disturbances. The various physico-chemical factors of test water such as temperature, pH (by pH meter), Conductivity (by Conductometer), Acidity, Alkalinity, Hardness, dissolved Oxygen and salinity were calculated daily during the toxicity test (following the method described in APHA). The test water was changed after every day average value and every alternate day average value of all these environmental parameters were recorded. The pesticides Cypermethrin and Fenvalerate were added to the test water to obtain the described concentration. Then healthy fishes were exposed to various concentration of pesticides for 24, 48,

64, 72, 96 hrs. period respectively. Simultaneously the control aquarium was also maintained without pesticide concentrations. The fishes that survived for the test were sacrificed, by pitching, their different tissues like Liver, Kidney, Brain, Muscle and Gill were taken out for enzyme study. The required tissues from fish were immediately removed and weighed. The extracts were prepared in Mortar & Pestle using ice cold 0.25 m sucrose solution. All extracts were used as early as possible and stored in the deepfreeze when required too. Substrate buffer (pH 9.0) was prepared by mixing 3ml.of petroleum ether,80 ml. of distilled water, 0.5 gm.of Sodium glycerophosphate and 0.0424 gm. of sodium barbiturate.

The effect of Cypermethrin on Glutamate oxaloacetate transaminase in different experimental groups (values are significant between $p < 0.01$ to $p < 0.001$).

Sr. No.	Group	Liver		Kidney		Muscle	
		Control	Expt.	Control	Expt.	Control	Expt.
1	Normal Pesticide	56.16± 3.32	53.53± 3.40	40.58± 2.86	38.32± 2.56	40.22± 3.78	39.92± 3.10
2	Low pH Alk. 8.5pH	58.28± 2.125	55.38± 2.39	42.21± 1.38	40.32± 1.37	41.35± 1.35	38.72± 2.82
3	Acidic pH 6.5	52.39± 2.38	51.29± 1.28	37.52± 2.35	35.25± 1.29	38.23± 1.72	36.85± 1.25
4	Hardness (100-200ppm)	48.35± 1.35	46.21± 2.73	33.72± 1.42	32.38± 1.25	35.29± 1.38	33.27± 2.83
5	Salinity (1.2%)	45.27± 2.35	42.62± 2.12	30.92± 1.82	28.28± 2.38	31.32± 1.25	28.65± 2.65

Sr. No.	Group	Liver		Kidney		Muscle	
		Control	Expt.	Control	Expt.	Control	Expt.
1	Normal Pesticide	57.28± 40.10	55.38± 9.88	40.66± 2.44	40.26± 2.00	40.88± 2.36	36.210± 3.32
2	Low pH Alk. 8.5pH	58.28± 21.25	56.37± 1.28	42.21± 1.38	41.05± 1.28	41.35± 1.35	39.76± 2.21
3	Acidic pH 6.5	52.39± 2.38	50.28± 1.35	37.9± 2.35	35.23± 2.25	38.73± 1.72	36.72± 1.38
4	Hardness (100-200ppm)	48.35± 1.95	45.39± 1.72	33.72± 1.41	32.28± 1.27	28.29± 1.38	32.65± 1.25
5	Salinity (1.2%)	45.27± 2.35	43.72± 1.32	30.92± 1.82	29.35± 1.36	31.32± 01.25	30.25± 1.72

The effect of Cypermethrin on Glutamate oxaloacetate transaminase enzyme in different TheThe effect of Fenvalerate on alkaline phosphatase enzyme in different experimental groups (values are significant between $p < 0.01$ to $p < 0.001$).

Result and Discussion :

The Glutamate oxaloacetate transaminase activity was decreased in the tissues of *Channaorientalis* treated with Cypermethrin & Fenvalerate. In control fishes the Glutamate oxaloacetate transaminase activity was maximum at 24 hrs. then gradually reduced upto 96 hrs. Maximum activity was recorded in liver & then followed by Kidney & Muscle. In experimental group of fishes the Glutamate oxaloacetate transaminase activity was significantly reduced in liver, kidney & muscle.

Conclusion: Over all view concluded that very low quantity of pesticides affects aquatic organism and their metabolic activity.

References :

- 1) APHA (2005): Standard methods for the examination water and waste water 20th Ed., Washington, DC.
- 2) Bradbury et.al.,(1986): Toxicokinetics of fenvalerate in rainbow trout (*Salmo gairdneri*) Environmental toxicology and Chemistry v. 5. No. 6 p. 567-576.
- 3) Bradbury et.al.,(1987): Physiological response of rainbow trout to acute Fenvalerate intoxication: Pesticide biochemistry and physiology v.27,no.3,p.275-288.
- 4) Crossland (1982): Aquatic toxicology of Cypermethrin : Fate and Biological effect in pond experiments :Aquatic toxicology v. 2., No. 4, p. 205-222
- 5) Coats et.al. ,(1979): Toxicity of four synthetic pyrethroid insecticide to rainbow trout. Bulletin of Environmental contamination and toxicology v.23,no.1-2,p.250-255.
- 6) David M, S.B.Mushigiri and Prashanth (2002): Toxicity of Fenvalerate to the freshwater fish *Labeo rohita* (Ham.) Biol.v.29(1).
- 7) Hill, F.R.(1989): Aquatic organism and Pyrethroids, Pesticide Science v.27,p.429-465.
- 8) Jin ,H.and G.R.B.Webster (1998): Persistence, penetration and surface availability of cypermethrin and its major degradation in elmbark, J. of Agri. Food Chem.v.46,p.2851-2857.
- 9) Reddy et.al.,(1989): Toxicity of synthetic pyrethroid insecticide, Fenvalerate and Cypermethrin to the fish *Cyprinus carpio*, Environmental ecology v.7 no.4 p.1016-1018.
- 10) Reddy and Philip(1994): In vivo inhibition of AchE and ATPase activities in the tissues of freshwater fish, *Cyprinus carpio* exposed to technical grade Cypermethrin. Bull. Environmental contamination toxicology.52,p.619-626.
- 11) Siegfried, B.D.(1993): Comparative toxicity of Pyrethroid insecticide to terrestrial and insects. Environmental toxicology and Chemistry 12:1683-1689.
- 12) Thakur,P.B and V.S.Bais (2000): Toxic effects of Aldrin and Fenvalerate on certain hematological parameters of freshwater teleost, *Heteropneustes fossilis* (Bloch.). J.Environmental Biology 21(2):161-163.
- 13) Tripathi et.al.,(2001): Biological effects of Fenvalerate to freshwater fish *C. batrachus*, Int. current trends in environmental science: ABD publisher , Jaipur India.