



Original Research Article

Effect of Lindane to enzyme activity in the tissues of Liver, Muscle and Brain of freshwater fish, *Cyprinus carpio*

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ABSTRACT

The wide spread use of synthetic organic pesticides over decades has led to their frequent exposure in the environment. Also acute and chronic exposures of humans to pesticides occur during their commercial production and their application. Synthetic pesticides are deliberately sprayed on crops or agricultural land to increase food production but these agrochemicals are not very selective in producing their effects. They are toxic to many non-target species and contaminate the environment. Hence, a need was felt to investigate a effect of sublethal exposure of Organ chlorine pesticide Lindane to enzyme content of GOT, GPT, ALP, ACP and LDH in the liver, muscle and brain of freshwater fish *Cyprinus carpio*. At the end of each exposure period, fishes were sacrificed and tissues were removed and analysed for enzyme activity. It was found that GOT, GPT and LDH increased to the maximum level (after Lindane exposure) when compared to the controls (100%) and ACP,ALP were decreased from the control at 10, 20 and 30 days in the liver, muscle and brain, respectively at LC₅₀ exposure. The median lethal concentration was found to be 0.32 ppm.

Keywords: pesticide, enzyme, *Cyprinus carpio*, sublethal

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1. Introduction

Aquaculture apart from agriculture is common in India, where fish, the non-target organisms are directly exposed to pesticides used for the control of insects and pests. The pesticides affect the survival, growth rate, fecundity and reproductive activity of fish. Toxic substances even in very low concentration which is sublethal have been reported to

interfere with basal metabolism and suppressed reproduction, steroid genesis, lipid metabolism, degenerative changes in gonadotropin cells and reduction in interstitial cells size, gonadotropin levels act as reproductive biomarkers and also as endocrine disruptors (Singh and Vandana Singh, 2006).

2. Materials and methods

They were collected from the Aliyar fish farm, pollachi stocked and acclimatized for a time period of 10-15 days in the laboratory conditions in glass aquaria containing dechlorinated water. The water of the aquarium was aerated continuously through stone diffusers connected to a mechanical air compressor. Water temperature ranged between $26 \pm 5^{\circ}\text{C}$ and the pH was maintained between 6.6 and 8.5. Fish were fed twice daily alternately with rice bran and oil cakes. For the present study, matured adult fishes were exposed to different concentrations viz LC50 of Lindane for 10, 20 and 30 days continuously. Three replicates of ten fishes for each concentration of the pesticides were used. In these aquaria water was replaced daily with fresh treatment of pesticides. Each experiment was accompanied by its respective control.

ALP both in blood and other tissues was determined by kind and king's method, (1954). This method is based on the principle that the Alkaline phosphatase from serum converts phenyl phosphate to inorganic phosphate and

phenol at P^{H} 10. ACP in blood and tissues was estimated by king's method, (1959) using SPAN diagnostic reagent kit. Quantitative estimation of GOT in the sample was done following the methods of Reitman and Frankle, (1957). The procedure adopted for the estimation of Glutamate pyruvate transaminase (GPT) (or) Alanine transaminase (ACT) was the same as for the GOT except that the substrate used here was alanine and the inoculation period allowed was 30 minutes. Serum LDH was analysed using LDH test kit (AGAPPE Diagnostics, INDIA) based on SCE recommended method (Wei Bhaar, 1975).

After each exposure periods tissues such as liver, muscle and brain were dissected and removed. The tissues (10 mg) were homogenized in 80% methanol, centrifuged at 3500 rpm for 15 minutes and the clear supernatant was used for the analysis of enzymological parameters (ALP, ACP, GOT, GPT and LDH). The data were analysed statistically at $t < 0.01$. To test their significance the t values were calculated by Student's t-test.

3. Results & Discussion

In the present study the 96 h LC₅₀ value of Lindane to *Cyprinus carpio* was determined to be 0.32 ppm. The enzyme content such as ACP and ALP levels were significantly decreased ($p < 0.05$) whereas GOT, GPT, LDH

contents were significantly increased ($p < 0.05$) in Lindane treated fish throughout the exposure period when compared to that of their control groups.

Table I: Changes in the Enzyme Activity in the Tissues of *Cyprinus carpio* on Long term Exposure Due to Lindane

Sample (mg/g wet tissue)	Exposure Periods			
	Control	10 days	20 days	30 days
GOT % change	0.351±0.16	0.527±0.08 50.14	0.703±0.33 100.28	0.818±0.07 133.04
GPT % change	0.461±0.26	0.473±0.35 2.60	0.503±0.31 9.11	0.651±0.16 41.21
ACP % change	0.461±0.26	0.299±0.03 35.14	0.283±0.06 38.61	0.660±0.13 43.16
ALP % change	0.444±0.14	0.351±0.16 20.94	0.226±0.04 49.09	0.195±0.27 56.08
LDH % change	1.045±1.26	1.179±0.33 12.82	1.187±0.53 13.58	1.233±1.37 17.99

Values are mean \pm SD, n=5, Figures in Parenthesis are percentage decrease over control. * - Significant at 5% ($t < 0.05$)
** - Significant at 1% ($t < 0.01$), NS – Non Significant

The increase in GOT and GPT activity may be due to decrease in metabolic activity, disruption of enzyme system by blocking active sites and tissue damage. Radha krishnan nair and Jasmine, (2010) reported the increased activity of GOT and GPT in the intestine tissues of the fish, *Catla catla* on exposed to Triazophos. The increase in LDH level indicates metabolic changes, that is the glycogen catabolism World Journal of Pharmacy and Biotechnology

and glucose shift towards the formation of Lactate in stressed fish, primarily the muscle tissue (Simon *et al.*, 1993). The decreased activities of ACP and ALP indicate disturbance in cell organelles like endoplasmic reticulum and membrane transport system. Similar findings decreased ACP were reported in *Labeo rohita* on exposure to Arsenic was studied by Nchumbeni *et al.* (2007).

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