

THE TOXIC EFFECT OF PESTICIDE CYPERMETHRIN 25% EC ON THE PROTEIN METABOLISM OF THE FRESH WATER FISH *LABEO ROHITA*

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ABSTRACT

The pesticides Cypermethrin 25% EC insecticide has been used for the present study. It is a new highly active pyrethroid insecticide. It is primarily a caterpillar insecticide. Significant differences were observed in protein metabolism of *Labeo rohita* exposed to concentration of 0.4 ppm for 24, 48 and 72 hours respectively. The toxic effect of the pesticide Cypermethrin 25% EC were analysed after each exposure period, fishes were sacrificed and tissues such as liver, gill, muscle and kidney were dissected and removed. Samples were tested for protein analysis. Decreased content of protein was observed when compared to control. The results indicated the toxic nature of the insecticide Cypermethrin 25% EC.

Keywords: Cypermethrin, *Labeo rohita*, Protein, Liver.

1. INTRODUCTION

Environmental pollution, especially water pollution has been increasing at an alarming rate due to rapid industrialization, civilization and green revolution. The pesticide enter into the aquatic ecosystem through various routes affecting adversely to the aquatic biota. Nutritive value of fish is determined by its biochemical composition. Glycogen is the only immediately available reserve of blood glucose. Pesticides are a group of heterogeneous compounds with proven toxicity and serious implications for man, animals, and the environment, still they are used regularly world over in agriculture and health programmes. The aquatic ecosystem as greater part of the natural environment is also faced with the threat of a shrinking genetic base and biodiversity due to indiscriminate use of pesticides.

Fishes are among the most vulnerable fauna in the water bodies that are affected by chemical pollutants. They are particularly sensitive to the influence of pesticides and other pollutants because they are able to uptake and retain the dissolved xenobiotic in water and thus a good indicator of the health status of aquatic bodies. However now it has been possible to assess the relative well being of the fishes and use them as indicator of the relative well being of the aquatic system. Assessment can be performed at different levels of organisation, from whole fish communities (*e.g.* fish assemblages) down to the molecular level (*e.g.* gene expression). However, many of the tests conducted

are subjective and do not prove sufficient in environmental hazard evaluation. In terms of present utility biochemical tests are ranked higher and crucial in determining changes that may occur in fishes. The changes may be of some value in assessing the impact of exposure under natural conditions and may also serve as tools for biological monitoring.

2. MATERIALS AND METHODS

Cypermethrin 25% EC insecticides enter the freshwater resources and results into aquatic pollution. Pesticides are well known example for causing more toxic effects in teleost. Bulk of sample of fishes (*Labeo rohita*) ranging in weight from 4-5 gms and measuring 4-6 cm in length were procured from Tamil Nadu Fisheries Department, Aliyar, Tamilnadu. Fishes were acclimatized in the laboratory conditions for one month in large cement tank. The tank was washed using 1% KMnO₄ to prevent fungal infection prior to stocking. The fishes were fed regularly with conventional diet rice bran and oil cake 1:1 ratio. Feeding was stopped one day prior to the start of the experiment. Fishes about the same size irrespective of sexes were selected for the experiment. The tap water free from contaminants was used as dilution water for the present study.

The physico-chemical analyses of water used in the experiment were carried out using the method (APHA, 2005). Batches of 10 healthy fishes were exposed to different concentration of pesticide Cypermethrin 25% EC to calculate the LC₅₀ value by using the method of Finney, (1971). One more set of

fishes are maintained as control in tap water. Appropriate narrow range of concentration was used to find the median lethal concentration using a minimum of 10 fishes for each concentration and the mortality was recorded for every 24 hours upto 72 hours. In 0.4 ppm out of 10 fishes 5 are died at 72 hours. Thus 0.4 ppm is selected as LC50. Four groups of fishes were exposed in 0.4 ppm concentration of the pesticide Cypermethrin 25% EC for 24, 48 and 72 hours respectively. Another group was maintained as control. At the end of each exposure period, fishes were sacrificed and tissues such as liver, gill, muscle and kidney 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 analysis of different parameters. Total protein concentration was estimated by the method (Lowry *et al.*, 1951).

3. RESULTS AND DISCUSSION

Liver tissues showed 1.80, 0.42 and 0.19 mg/g of protein in 0.4 ppm of Cypermethrin 25% EC pesticide and 2.20 mg/g of protein in control after 24,48,72 hours exposures. Table 1 shows the decreased value of protein content in kidney as 0.99, 0.72 and 0.31 mg/g in 0.4 ppm of Cypermethrin 25% EC and 1.57 mg/g in control after 24,48 and 72 hours exposures. In muscle tissues 1.13, 0.79 and 0.39

mg/g of protein in 0.4 ppm of Cypermethrin 25% EC exposures and 1.99 mg/g in control after 24,48,72 hours respectively. The protein level in gill is also reduced. In control the protein level is 3.21 mg/g. It is decreased to 2.65, 1.75, 1.02 mg/g in 0.4 ppm of Cypermethrin 25% EC exposure for 24,48 and 72 hours respectively.

Environmental stress invokes compensatory metabolic activity in the organs of an animal through modification and modulation of the quantity and quality of problems. Gill is an important organ because of its direct contact with water, which allows the pesticides to enter through it and get accumulated in the fish body. The percentage decrease of protein is greater in gill. It is maximum in 72 hours. The percentage decrease is 68.22. It was reported that the alteration in protein value may also be related to some structural changes in the liver, the arrangement of hepatic words leading to the alteration of liver metabolism (Ganeshwade, 2011 and 2012). The decrease in liver protein is also attributed to the inhibition of protein synthesis. The decrease in protein content suggests an increase in proteolytic activity and possible utilization of its products for metabolic purpose. The fall in protein level during exposure may be due to increased catabolism and decreased anabolism of proteins (Sreekala *et al.*, 2013). A significant reduction in the levels of proteins and glycogen (Tilak *et al.*, 1980).

Table 1. Changes in Protein content (mg/g) in the Liver, Kidney, Muscle and Gills of Labeo rohita exposed to pesticide Cypermethrin 25% EC for different periods.

Tissue mg/g	Exposure Conc. 0.4ppm	Exposure periods		
		24 Hours	48 Hours	96 Hours
Liver	Control	2.20±0.07	2.20±0.07	2.20±0.07
	Experiment	1.80± 0.06	0.42± 0.03	0.19± 0.04
	't' value	10.98**	50.75**	53.95**
	% change	18.18↓	80.70↓	91.36↓
Kidney	Control	1.57±0.03	1.57±0.03	1.57±0.03
	Experiment	0.99±0.01	0.72± 0.04	0.31± 0.04
	't' value	30.28**	33.58**	50.44**
	% change	36.94↓	54.14↓	80.25↓
Muscle	Control	1.99±0.03	1.99±0.03	1.99±0.03
	Experiment	1.13± 0.04	0.79± 0.04	0.39±0.21
	't' value	35.03**	54.28**	17.18**
	% change	43.21↓	60.30↓	80.40↓
Gills	Control	3.21±0.04	3.21±0.04	3.21±0.04
	Experiment	2.65± 0.03	1.75± 0.03	1.02± 0.03
	't' value	21.15**	66.31**	94.54**
	% change	17.44↓	45.48↓	68.22↓

Results are mean (±SD) of 5 observations % = percent increase/decrease over control. Parenthesis denotes the percentage. C = Control, E = Experiment

4. CONCLUSION

From the present study it is concluded that the above biochemical parameter could be used as a non specific biomarkers with regard to the effects of toxicants on organisms. It is also suggested that the random use of fertilizers and pesticides must be avoided for preserving our aquatic resources.

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