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Original Research Article

Cholesterol alteration in a fresh water fish, *Labeo rohita* after exposure to an insecticide polo

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A B S T R A C T

In acute toxicity (24 hrs to 96 hrs) experiment the freshwater fish, ***Labeo rohita*** were exposed for 1.2 ppm, 2 ppm, 3 ppm, 4 ppm and 5 ppm to the broad spectrum insecticide Polo. The LC50 value of Polo was found to be 1.9 for 96 hrs. Under laboratory conditions, fishes were exposed to lethal concentration of Polo. After this, tissues like liver and gonads were obtained separately from the control and experimental group. These tissues were used for biochemical estimation. The cholesterol content in above tissues found to decrease considerably when exposed to an insecticide Polo as compared to control group.

Introduction

Various pesticides, heavy metals, industrial wastes and other pollutants contaminate our environment on large scale. From industrial and agricultural operations, toxic compounds find their way into the natural water resources and affect the aquatic organisms (Tilak *et al.*, 2007). They affect mostly on non target organisms like fish, prawns, crabs, etc. The contamination of freshwater may have devastating effects on the ecological balance of the recipient environment and a diversity of aquatic organisms (Vosyliene and Jankaite, 2006). Among pesticides, insecticides are most toxic compounds used for controlling insect pests. Most insecticides ultimately find their way into rivers, lakes and ponds (Vryzas *et al.*, 2009; Arjmandi *et al.*, 2010).

The need for a complete assessment of their potential toxicological hazards to man and domestic animals have assumed greater importance (Mariya Dasu *et al.*, 2013). The insecticide, Polo was used largely in agricultural area for controlling mites, aphids and jassids on cotton, vegetables nymphs and adults. Therefore, polo was selected to study its toxic effects on biochemical component – cholesterol in liver and gonads of freshwater fish, *Labeo rohita*.

Materials and Methods

The fishes *Labeo rohita* were collected from the Gadad and Girna river dams near Chalisgaon city, Dist. Jalgaon, Maharashtra, India. They were collected from their natural habitat and brought to the laboratory. The fishes were acclimated to laboratory

conditions for 15 days into 1000 liter capacity tank previously washed with potassium permanganate prior to subjecting them to experiments. The acclimated 10 healthy and active fishes of uniform size and weight were selected for experiment. Two groups of these fishes were formed. One group was considered as experimental group exposed to lethal concentration of Polo as 1.2 ppm, 2 ppm, 3 ppm, 4 ppm and 5 ppm for 24, 48, 72 and 96 hrs. Another group without pollutants was considered as control. After treatment, the control and experimental fishes were gently separated and used for estimation of their cholesterol contents. The total cholesterol contents were estimated by using Knobil method (Knobil *et al.,* 1954). The amount of cholesterol content was expressed in terms of cholesterol / 100 mg of wet wt. of tissues. Each observation was confirmed by taking at least five replicates. Standard deviation and probability tests were performed as described by Bailey (1965).

Results and Discussion

The depletion in cholesterol contents in liver and gonads after acute exposure by an insecticide Polo as compare to the control were observed. The depletion in cholesterol was increased as the period of exposure increased. The maximum depletion occurred in the liver followed by gonads. The results are summarized in table and graph.

Cholesterol constitutes the vital organic substance, playing an important role in energy metabolism. The toxicity stress which suppresses the activity of a number of enzymes responsible for lipid transformation ultimately causing disturbances in lipid metabolism and leads decreased value of cholesterol (Ganeshwade, 2012). The alteration in cholesterol content may be due to its utilization in corticosteroidogenesis and also impairment in the synthesis of cholesterol (Vasanthi *et al.,* 2013). Cholesterol are derivatives of fats and lipids, a decrease in the level of lipid have occurred due to the use of these fats as alternative source of energy (Jagadeesana and Darcusb, 2012).

According to Mani and Saxena, (1985) the loss of the lipid may be a consequence of inhibition of lipid synthesis and mobilization of stored lipids. Virk and Sharma, (1999) studied biochemical changes induced by nickel and chromium in the liver of *Cyprinus carpio* and observed significant decline in the cholesterol level of liver. They stated this may be due to toxicity stress which suppresses the activity of a number of enzymes responsible for lipid transformation ultimately causing disturbance in lipid metabolism and leads decrease in values of cholesterol. The reduction in hepatic and ovarian cholesterol content may also result in altered vitellogenesis and steroidogenesis (Sindhe *et al.,* 2002).

Decrease in lipid levels in the liver of *Cirrhina mrigala* (Ham) after fenthion exposure were also noticed by Israel Stalin et al., (2012). According to Yazhini, Jagdeesan and Sheela Darcus,(2012) considerable reduction in biochemical contents will reduce the nutritional value of such economically important edible fish deteriorating their quality and at the same time will become hazardous to the consumers due to its bioaccumulation of the pesticide incorporated in it. Loss of lipids noticed due to inhibited lipid synthesis and mobilizing the stored lipid, either through β oxidation or through a gradual unsaturation of lipid molecules as stated by Jha, (1991).

In the present investigation decreasing cholesterol level in the liver and gonads of freshwater fish, *Labeo rohita* is due to an

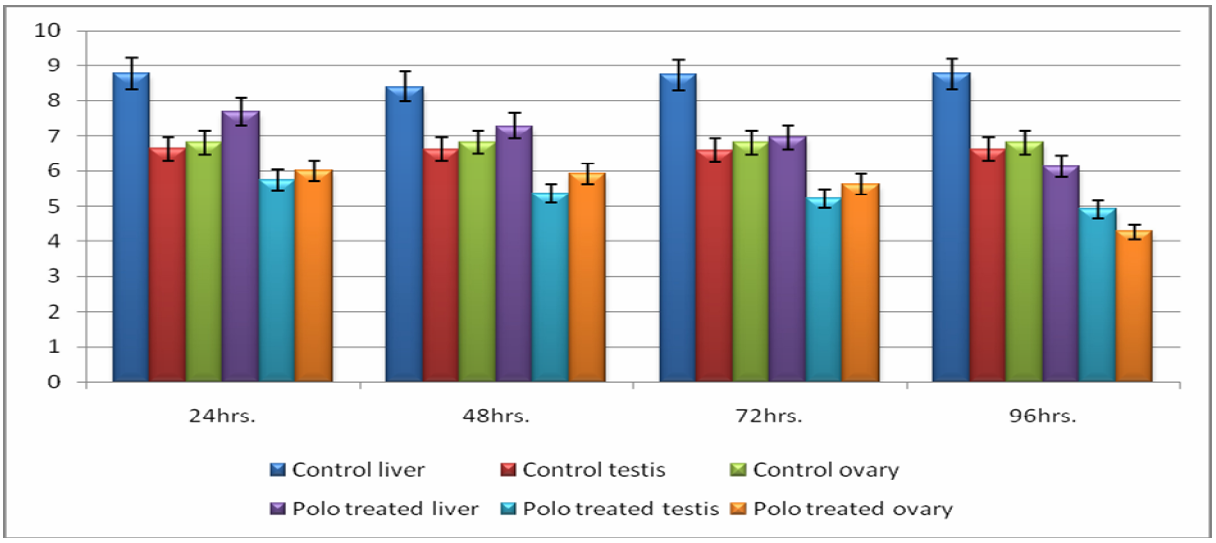
increase in lipid utilization to meet additional energy requirements under stress. Similar findings were noted by, Shelke Abhay D., (2013); Piska et al., (1992); Venkatramana et al., (2006); D. V. Muley et al., (2007); Remia et al., (2008).

Table.1 Toxic impact of insecticide Polo on cholesterol content in liver and gonads of a freshwater fish, *Labeo rohita* after acute treatment

Tissue	Treatment		Acute		
		24hrs.	**48hrs.**	**72hrs.**	**96hrs.**
Liver	Control	8.7683 ±0.001407***	8.3845 ±0.001349***	8.7375 ±0.001378***	8.7569 ±0.0014***
Testis	Control	6.6248 ±0.001462***	6.6135 ±0.001442***	6.5926 ±0.001166***	6.6122 ±0.001183***
Ovary	Control	6.8133 ±0.002190***	6.8241 ±0.002121***	6.8136 ±0.001442***	6.8142 ±0.002159***
Liver	Polo	7.6932 ±0.001140***	7.2864 ±0.002190***	6.9601 ±0.001048***	6.1246 ±0.001029***
Testis	Polo	5.7468 ±0.001***	5.3639 ±0.009591***	5.2252 ±0.009273***	4.9192 ±0.009055***
Ovary	Polo	5.9979 ±0.002***	5.9081 ±0.002624***	5.6243 ±0.002731***	4.2801 ±0.001856***

Values expressed as mg/100mg of wet wt. of tissue; ± indicates S.D. of five observations; Values are significant at P<0.001***

Graph.1 Variation in cholesterol content of liver and gonads of freshwater fish, *Labeo rohita* after acute exposure to an insecticide Polo



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