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Studies on the Effect of Pesticide Endosulfan 35% EC on the Lipid Content of the Fresh Water Fish, *Catla catla*

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Abstract: ***Pesticides are one of the most potentially harmful chemicals introduced into the environment. The acute and sublethal toxicity of the pesticide Endosulfan 35% EC on the fingerlings of Catla catla was evaluated to determine its effect on the cholesterol values. The fish was exposed to varying levels of the toxicant concentrations using static bioassay to determine the median lethal concentration. The LC50 value is 0.4 ppm. Four groups of fishes were exposed in 0.4ppm concentration for 24, 48 and 72 hours. Another group was maintained as control. The exposures of fish to various concentrations were observed to cause progressive reduction in the cholesterol values when compared to control. Pesticides usage in agricultural fields to control pests is extremely toxic to non target organisms like fish and affects fish health through impairment of metabolism, sometimes leading to mortality. Present study is a review of potential adverse effects of pesticides and pollutants in fish. The aquatic ecosystem is contaminated by indiscriminate and wide spread of pesticides and other metallic pollutants in controlling the agriculture pests. Biochemical studies are good parameters which help to see the effect of pesticide on biochemical composition of vital tissue of fish.***

Keywords: Cholesterol, Catla catla, Endosulfan, Toxicity

1. Introduction

In recent years, the high rate of increase in human population and rapid pace of industrialization have created problem of disposal of waste waters. The domestic wastes and untreated or partially treated industrial effluents, supplemented with pollutants like heavy metals, pesticides and many organic compounds, have greatly contributed to massive fish death of aquatic ecosystems. These toxic chemicals and metals have changed the quality of water that affects the fish and other aquatic organisms. Pesticides and herbicides are widely used to kill the harmful pests and weeds.

Hence, pesticides have become an increasingly serious source of chemical pollution to the environment due to their extensive usage in agriculture and public health protection programs Cholesterol is an important and prominent lipid present in all living systems and plays an important role in body metabolism. The degree of toxicity produced by the poisonous substance is dose independent upon environmental conditions such as temperature, pH, oxygen content and presence of residue molecules (1), (2). It is well known that protein, carbohydrates and lipid play a major role as energy precursors in fish under stress conditions. The proteolytic enzymes participate in the breakdown of protein molecules into amino acids and these amino acids are in turn oxidized to give energy for body function (3).

Pollutants can produce metabolic changes at cellular levels by a way of influencing enzyme systems. Many authors have reported the changes in acid and alkaline proteases in fish exposed to sub lethal levels of pesticides. Thus the pesticides intoxification has disturbed the normal functioning of cells with the resultant alterations in the fundamental biochemical mechanisms in fish. This would in turn result in the mortality of fish on chronic exposure to the pesticide. In addition, the pesticide might be deposited in fish accidentally or by means of contaminated water bodies with pesticide and it might lead to harmful consequences in human beings on continuous consumption of those fish.

2. Materials and Methods

Endosulfan 35% EC acts as a contact poison in a wide variety of insects and mites on coffee, cotton and other crops. It can be used as a wood. During rainy season along with running water, Endosulfan 35% EC insecticides enter the fresh water resources and results into aquatic pollution. Fish (*Labeo rohita)* were collected and kept in laboratory conditions for one month in a large cement tank.. The physical and chemical analyses of the water were carried out (4). Fish were divided into four groups (each containing 10 fish) where three were experimental and one group as control. Acute toxicity study was carried out using the standard guidelines (EPA/ROC, 1998) to determine the median lethal (LC50) levels of endosulfan35%EC in various concentrations.

The mortality of fish (%) was assessed by exposure to 0.4ppm of Endosulfan for 24, 48, 72 hours. At the end of each exposure, the tissues such as liver, muscle, kidney and gill were collected by dissecting the animal and stored at -20ºC for biochemical parameters studies. The tissue of liver, muscle, kidney and gill was homogenized in glass homogenizer separately, using 10 mL distilled water and centrifuged at 3000 rpm for 10 minutes. 0.5 mL of supernatant was taken in a clean test tube and the supernatant was used to analysis the different parameters.

Cholesterol was estimated based on enzymatic method using cholesterol esterase, cholesterol oxidase and peroxide. Lipids serve as energy source for fish metabolism and hence reveal their importance during stress condition(5). Decrease in muscle lipid indicates that lipid hydrolysis might be accelerated to derive energy to overcome toxic stress (6).

The disturbance of fat metabolism is an indication of impairment of pancreatic functions (7).

3. Result and Discussion

The cholesterol content in the liver tissues exposed to pesticide Endosulfan 35% EC 18. 80, 18. 61, 11. 80 and 24. 40 mg/g in control after 24, 48 and 72 hours exposures. Kidney recorded 29. 63, 18. 45 and 15. 49 mg/g when exposed to 0.4 ppm of Endosulfan 35% EC and in control it is recorded 32. 84 mg/g for 24, 48 and 72 hours exposures. Muscle tissue was found to contain 32. 10, 29. 21 and 37. 83 mg/g in 0.4 ppm Endosulfan 35% EC and 32. 56 mg/g of cholesterol in control for 24, 48 and 72 hours exposure periods. The amount of cholesterol in gill were 19. 45, 11. 57 and 7. 98 mg/g in 0.4 ppm of Endosulfan 35% EC in exposure periods. In control the amount of cholesterol was found to be 22. 48 mg/g in 24, 48 and 72 hours respectively.

Cholesterol is an important normal body constituent used in the structure of cell membranes, synthesis of bile acid and synthesis of steroid hormone. Moreover, lipids in fish also contribute to the buoyancy mechanism. Thus any change in lipid metabolism effect the ability of fish to store energy obtains nutrients and in long term the stability to survive.

The percentage decrease is high in 72 hours for muscle. Maximum decrease of cholesterol level is found in gill. Decrease in amount of lipid may possibly due to the utilization of lipid to meet additional energy requirement

Table 1: Changes in lipid content (mg/g) in the liver, kidney, muscle and gills of *Labeo rohita* exposed to pesticide Dimethoate 30% EC for different periods.

Tissue mg/g	Exposure Concentration 0.4ppm	Exposure periods		
		24hours	48 Hours	96Hours
Liver	Control Experiment 't' value % change	24. 40±0.35 18. 80± 0.28 29** 22. 95	24. 40±0.35 18. 61± 0.14 35. 79** 23. 72	24. 40±0.35 11. 80± 0.526 46** 51. 63
Kidney	Control Experiment 't' value % change	32. 84±0.35 29. 6±5 0.32 16. 26** 9. 71	32. 84±0.35 18. 45± 0.30 70.93** 43. 81	32. 84±0.35 15. 49± 0.26 90.73** 52. 83
Muscle	Control Experiment 't' value % change	32. 56±0.30 32. 10± 0.26 3. 913** 1. 412	32. 56±0.30 29. 21± 0.32 19. 37** 10.28	32. 56±0.30 37. 8±3 44. 71 75. 35** 16. 81
Gills	Control Experiment 't' value % change	22. 48±0.50 19. 45± 0.35 12. 06** 13. 47	22. 48±0.50 11. 57± 0.39 0.169** 48. 53	22. 48±0.50 7. 98± 0.08 64. 98** 64. 50

Results are mean (±SD) of 5 observations, % = percent increase/decrease over control. Parenthesis denotes 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. Pesticide is present in the environment with other similar organophosphate compounds; additive responses to organophosphate compounds may induce lethal or sublethal effects in fish. It is, therefore, a matter of great public health significance to regularly monitor the pesticide residues in foods and humans in order to assess the population exposure to this pesticide. Besides, for a safe use of this pesticides more experimental work should be performed to determine the concentration and time of exposure that do not induce significant sub-lethal effects on fish

under stress. Arockiya Reta and John Milton have showed declining trend of lipid content of the brain, gill, kidney, liver and muscle on exposure to carbamate in the fish, Oreochromis mossambicus. The decrease in cholesterol content was observed, it might be possible that Endosulfan causes general damage, blockage of enzyme system for steroidogenesis.

The reduced cholesterol level may be due to the inhibition of cholesterol biosynthesis in the liver or due to reduced absorption of dietary cholesterol. However, it was reported that the decline of cholesterol may be due to utilization of fatty deposits instead of glucose for energy purpose. Lipid is an important of prominent role in all living system and plays an important role in body metabolism. The lipid level was found to be decreased in the tissues of fish could be due to the utilization of lipid for energy demand under the condition of stress (8).

Cholesterol serves as energy source for fish metabolism and hence reveals their importance during stress condition (Jezreiska *et al.,* 1982). The disturbance of fat metabolism is an indication impaired pancreatic functions (Jayantherao *et al.,* 1984). The percentage decrease was found to be more in kidney. Decrease in muscle lipid indicates that lipid hydrolysis might be accelerated to derive energy to overcome pesticide stress. The elevated lipid level in the hepatic tissues may be due to the varying nature of diet supplied to the fish during the tenure of investigation, species variation, age, hardness of water(9).

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