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Research Article

EFFECT OF CARBOSULFAN ON BIOCHEMICAL PROFILE OF LIVER AND MUSCLE IN FRESH WATER CYPRINID, GARRA MULLYA (SYKES)

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ABSTRACT

Alteration in physiological functions and of body structures are the most important detectable parameters of pollution effects at individual as well as population level. Changes in biochemical composition of liver and muscle tissue of fresh water fish *Garra mullya* (Sykes) exposed to lethal (3.4903 ppm) and sub lethal (0.6980 ppm) concentrations of carbosulfan along with control animals were studied. The total glycogen, protein and lipid content in liver and muscle of fish *Garra mullya* decreased in acute and chronic treatment of carbosulfan. Chronic exposures to low levels of pesticides have more significant effect on fish pollution than acute poisoning.

INTRODUCTION

Pesticides have been defined as "economic poisons employed to regulate the impact of noxious animals and plants upon our life and economy" (Thomann and Nicolson, 1963). Fishes forms the important trophic level in an aquatic food chain and toxicants may reach to human after the consumption of fishes in polluted water. Fishes are rich in high quality, balanced and easily digestible protein, vitamins and polyunsaturated fatty acids. Ravichandran *et al*, (2010) reported fishes as good source of immense antimicrobial peptide that defends against dreadful human pathogens. Quality of the flesh of fish for human consumption depends on its biochemical composition (Hernandez *et al*, 2001), physiological condition and habitat of fish (Ravichandran *et. al*, 2011). Proteins play an important role in energy production. Normally, under stressed condition tissue proteins in aquatic animals activates compensatory mechanism (Wigglesworth, 1972). Protein metabolism is considered the most sensitive physiological response to environmental stress. Carbohydrates form one of the most important sources of energy precursor when exposed to toxicant stress. Glycogen and total free sugars are the main carbohydrates in fishes. Lipids are heterogeneous group of fatty acids and serves as metabolic reserves with high energy value.

Biochemical alteration in the animal tissue exposed to varying amount of toxicants is the first indication of the stress in the organism (Venkataramana *et.al* 2006). The biochemical studies helps to find out the effects of pollutants on different metabolism of fish (Kajare *et. al,* 2000). Review of literature revealed scanty report on the toxic effects of pesticides on biochemical contents in the tissues of *Garra mullya.* The present study investigated carbosulfan induced variation in glycogen, protein and lipid in the tissues of fresh water fish *G. mullya* (Sykes) after acute and chronic exposure.

MATERIALS AND METHODS

Garra mullya, fresh water cyprinid fish were collected from Bhaware dam, Navapur and brought to the laboratory for acclimatization. Acclimatized fishes were exposed to lethal concentration (3.4903 ppm) for 96 hours and to sub lethal concentration (0.6980 ppm) for 21 days. At the end of exposure period liver and muscle tissues of sacrificed fishes were isolated at the interval of 24 hours for lethal treatment as well as 7 days for sublethal treatment and used to investigate carbosulfan induced changes in biochemical profile. The amount of total protein was estimated by using Lowry's method (Lowry *et.al,* 1951). Glycogen was estimated by Anthrone reagent method (Dezwaan and Zandee, 1922).

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Vanillin reagent method of Barnes and Blackstoch (1973) was used to estimate the amount of total lipids.

RESULTS AND DISCUSSION

Results obtained in the present study are summarized in Table 1 and Table 2. Toxic substances present in the immediate surroundings of the organisms changes the physiology of organism and affect the protein level. Organisms need sufficient energy to reduce toxic effect of pollutant which is supplied from protein, glycogen and lipid. The decrease in the protein content seems to be due to utilization of protein for metabolic activities and also due to increased breakdown of protein to meet high energy demands when fishes are exposed to pesticidal stress conditions. According to Dezwaan and Zandee (1972), depletion in glycogen level might be due to anoxic and hypoxic condition that increases carbohydrate metabolism under stress condition.

In the present study depletion of glycogen content in liver and muscle of *Garra mullya* after pesticidal stress indicates physiological manifestation of stress in fish exposed to toxicants. Rao and Rao (1979) noticed significant decrease in glycogen content of fresh water fish on exposure of methyl parathion. The caloric value of lipids reported to be twice than that of the equivalent weight of protein and carbohydrates. Decline in total lipid content was reported by Leela et al; (2002) in liver, muscle, and gill of *Tilapia mossambica* under the stress of phosalone. Decline in the lipid content obtained during present investigation are similar to the findings reported by earlier workers.

CONCLUSION

It is concluded that lethal and sublethal exposure of *G. mullya* to carbamate pesticide Carbosulfan promoted massive utilization of glycogen, protein and lipid from liver and muscles in order to meet the increased energy requirement of

Table 1 Biochemical Profile of liver and muscle in *Garra mullya* (Sykes) exposed to lethal conc. (3.4903 ppm) of Carbosulfan.

Parameters	Tissue	Control	24 hrs range Mean ± S.D	48 hrs range Mean ± S.D	72 hrs range Mean ± S.D	96 hrs range Mean ± S.D
Protein	Liver	59.19 ± 0.82	56.64 ±* 0.81 4.30 %	53.51 ±** 0.79 9.59 %	52.36±*** 0.13 11.53 %	51.27 ±*** 0.21 13.38 %
	Muscle	85.17 ± 0.72	81.63 ±** 0.40 4.15 %	76.69 ±*** 0.30 9.95 %	74.55 ±*** 0.60 12.46 %	72.38 ±*** 0.5 15.01 %
Glycogen	Liver	38.08 ± 0.15	35.72±*** 0.32 6.19 %	33.24 ±*** 0.39 12.71 %	32.75 ±*** 0.40 13.99 %	29.64 ±*** 0.46 22.16 %
	Muscle	51.47 ± 0.38	47.19 ±*** 0.40 8.31 %	45.25 ±*** 0.41 12.08 %	43.33 ±*** 0.50 15.81 %	42.68 ±*** 0.5 17.07 %
Lipid	Liver	7.03 ± 0.46	6.75 ±NS 0.25 3.97 %	6.55 ±NS 0.33 6.87 %	5.93 ±* 0.14 14.81 %	5.77 ±* 0.15 18.00 %
	Muscle	9.56 ± 0.20	8.95 ±* 0.20 6.37 %	8.21 ±** 0.14 14.14 %	7.87 ±*** 0.16 17.67 %	7.44 ±*** 0.15 22.17 %

Table 2 Biochemical Profile of liver and muscle in *Garra mullya* (Sykes) exposed to sub lethal conc. (0.6980 ppm) of Carbosulfan.

Parameter	Tissue	7 Days range Mean ± S.D		14 Days range Mean ± S.D		21 Days range Mean ± S.D	
		Control	Treatment	Control	Treatment	Control	Treatment
Protein	Liver	59.01 ± 0.68	56.13±* 0.53 4.8%	57.69 ± 0.65	54.19 ± ** 0.51 6.06%	56.04 ± 0.66	52.05 ± ** 0.49 7.11%
	Muscle	83.25 ± 0.82	79.19 ±* 0.86 4.87%	83.06 ± 0.78	77.79 ± ** 0.69 6.34%	82.97 ± 0.81	75.69 ± ** 0.87 8.77%
Glycogen	Liver	37.06 ± 0.11	34.15±*** 0.38 2.79 %	36.85± 0.15	34.23 ±** 0.39 8.10 %	36.15± 0.19	31.37±** 0.81 13.22 %
	Muscle	48.88 ± 0.15	45.35±*** 0.48 7.22 %	46.69± 0.64	44.51 ±** 0.55 8.58 %	48.27 ± 0.57	41.35 ±*** 0.64 14.33 %
Lipid	Liver	7.53± 0.63	6.70 ±NS 0.62 11.10 %	7.16 ± 0.55	5.83 ±NS 0.48 18.60 %	7.25 ± 0.65	5.12 ±* 0.34 29.36 %
	Muscle	9.89 ± 0.20	8.77 ±NS 0.52 11.34 %	9.62 ± 0.51	8.11 ±* 0.39 15.72 %	9.71 ± 0.35	7.89 ±* 0.38 18.69 %

1. Each value is a mean of three observations ± S.D
2. (+) or (-) indicate percent variations over control.
3. Values are significant at N. S. = Not Significant.

* = P < 0.05; ** = P < 0.01; *** = P < 0.001

enhanced metabolic activity. Chronic exposures to low levels of carbosulfan have more significant effect on fish than acute poisoning. Biochemical changes induced by pesticide bring about metabolic disturbances, changes in behaviour and physiology of the fishes.

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