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Variation in Tissue Composition in Different Organs of Notopterus notopterus Treated with Chlorinated Camphene and Organophosphate

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ABSTRACT

In this paper, the effect of three sublethal concentrations (1/4th, 1/8th and 1/12th of 96 hr LCg) of Chlorinated Camphene and Organophosphate, on gonado-somatic index (GSI), hepato-somatic index (HSI) and water, lipid and non-lipids contents of ovary, liver, kindy, blood and condition factor [K] of Notopterus notopterus for a period of 25 days have been workedout. Results obtained revealed that the values of GSI, HSI and K increased, lipid and water in the ovary, liver and kidney decreased while the water in blood and lipid in the liver increased in Notopterus notopterus exposed to Chlorinated Camphene and Organophosphate.

Keywords- Gonado-somatic index, Hepato-somatic Indes, Condition factor, Notopterus notopterus, non-lipid and lipids.

I. INTRODUCTION

Last few decades have witnessed a remarkable use of pesticides to control the insect pest and disease vectors. The pesticides enters in aquatic ecosystem with the run off of rain water and adversely affect the aquatic biota. However, very little work is available on the effect of pesticides on tissues composition of the fishes. So the present investigation was undertaken to evaluate the toxicity effects of Chlorinated Camphene (Toxaphene) and Organophosphate (Naled or Dibrum) on water, lipid and non-lipids contents of blood kidney, liver and overy of Notopterus notopterus measured as gonado-somatic index (GSI), hepatosomatic index
(HSI) and condition factor (K).

II. MATERIALS AND METHODS

The fish Notopterus notopterus of the size range of 9 to 11 cm and weight 50 to 60 gms were collected from various water resources of the district. Fishes of both the sexes were taken without any discrimination. However, the GSI calculation, only female fishes were used.

Before experimentation, the fishes were place in a dilute bath of 0.01 mg/1 KMn, solution for about 15 to 25 minutes to avoid any possibility of dermal infection and then acclimatized for 5 day to the laboratory condition and fed with frog muscles and liver, twice a week. Commercial grade Chlorinated Camphene (Toxaphene) and Organophosphate (Naled or Dibrum)

Table 1: The values of gonado-somatic (GSI), Hepato-somatic (SHI) indices and condition factor (K) of Notopterus notopterus after 25 days exposure to Chlorinated Camphene and Organophosphate.

Control and fractions of 96 hr LCSO	GSI	HSI	CF
		Chlorinated Camphene	
Control	1.97 ±0.08	0.99 ±0.07	0.53 ±0.05
1/4th	2.14 ±0.12 (8.48)	1.04 ±0.06 (4.19)	0.63 ±0.08 (23.00)
1/8th	2.02±0.13 (3.29)	1.01 ±0.05 (2.05)	0.58 ±0.04 (19.00)
1/12th	2.01 ±0.09	0.99 ±0.06	0.58 ±0.03
		Organophosphate	
Control	1.97±0.08	0.91± 0.09	0.50±0.05
1/4th	2.14 ±0.12 (8.23)	0 99 ± 0.07 (9.25)	0.62±0.06 (20.00)
1/8th	2.11±0.12 (6.59)	0.98±0.05 (8.15)	0.59±0.09 (18.00)
1/12th	2.01 ±0.11 (1.53)	0.97 ±0.05 (7.05)	0.52±0.05 (2.00)

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were taken and the required concentrations (1/4th, 1/8th and 1/12th of 96 hr LCo) were prepared. The 96 hr LCg of Chlorinated Camphene is 0.62 mg/l and of Organophosphate is 6.2 mg/1). The 10 each acclimatized Notopterus notopterus were exposed to different fractions of 96 hr LCg for the period of 25 days. Test solutions were renewed evary 4th day as to remove the debris and to maintain the required concentrations of pesticides and dissolved oxygen. The physico-chemical characteristics of the experimental solution and control water were observed and noted temperature range between 18.2 and 26.4°C, pH between 7.2 and 7.5, D.O. between 6.1 and 7.0 mg/l and total alkalinity between 40 and 48 mg/l.

Lee and Meier (1967) procedures were applied for tissues composition study. The water content present in tissues was estimated by drying fish tissue at 55°C in oven. The lipid was extracted from the dried caracases through peteroleum ether by Soxhlet apparatus. The water content in the blood was determined by Kuroda's Method (1941). The HSI and GSI values were calculated by adopting the following formula:

$$\text{HSI} = \frac{\text{Liver weight}}{\text{Body weight}} \text{X } 100$$

$$\text{GST} = \frac{\text{Ovary weight}}{\text{Body weight}} \text{X } 100$$

Table 2: Alterations in body composition of various tissues of Notopterus notopterus after 25 days exposure to Chlorinated Camphene and Organophosphate.

Tissues	Control	Chlorinated Camphene			Organophosphate		
		1/4th	1/8th	1/12th	1/4th	1/8th	1/12th
Ovary	74.43 ±4.00	60.18 ± 3.87 (12.42)	68.82 ±3.42 (7.53)	70.18 ±3.50 (5.71)	60.31 ±3.47 (7.82)	62.34 ±3.78 (4.72)	64.03 ±3.45 (2.14)
	2.48 ±0.43	1.32 0.56 (46.77)	1.82 0.37 (26.61)	1.48 0.51 (40.32)	1.08 0.29 (16.92)	1.09 0.18 (16.15)	1.15 0.28 (11.54)
	23.09 ±1.31	33.50 ±1.17 (45.06)***	29.36 ±1.18 (27.14) **	28.34 ± 1.98 (22.72)*	32.61 ±1.32 (1.98)	36.57 ±1.97 (9.92)	34.82 ±2.00 (4.66)
Liver	75.83 ±4.18	69.44 ±4.27 (8.52)	71.92 ±4.32 (5.15)	73.12 ±4.13 (3.57)	66.34 ±3.41 (5.05)	69.10 ±3.13 (1.10)	61.36 ±4.72 (12.18)
	2.23±0.48	3.02 ±0.18 (29.61)	2.38 ±0.33 (2.14)	2.92 ±0.31 (25.32)	2.20 ±0.30 (26.66)	2.09 ±0.34 (16.11)	1.85 ±0.28 (2.77)
	21.84 ±1.77	27.54 ±2.15 (26.09)	25.70 ±1.90 (17.67)	25.96 ±1.66 (18.86)	31.38 ±2.77 (18.13)	28.81 ±1.58 (28.83)*	36.89 ±1.99 (3.175)
Kidney	70.48 ±4.12	60.24 ±3.24 (14.52)	63.48 ±3.85 (9.93)	64.32 ±3.48 (8.74)	66.10 ±4.17 (4.58)	68.10 ±3.87 (2.05)	67.36 ±3.48 (3.12)
	2.48 ±0.24	1.82 ±0.19 (26.61)	1.92 ±0.16 (22.58)	2.00 ±0.21 (19.35)	2.34 ±0.26 (6.77)	2.45 ±0.21 (2.39)	2.40 ±0.28 (4.38)
	27.04 ±1.31	38.96 ±1.85 (44.08)***	34.60± 2.17 (27.88)*	33.68 ±1.68 (24.55)*	31.32 ±1.17 (12.09)	29.45 ±1.68 (5.32)	30.24 ±1.32 (8.19)
Blood	84.09 ±4.36	91.17 ±3.15 (8.41)	89.81 ±3.15 (6.85)	83.17 ±3.23 (1.09)	90.35 ±4.38 (4.00)	88.43 ±4.47 (1.79)	87.16 ±5.13 (0.33)
	0.52 ±0.032	0.48 ±0.036 (7.96)	0.51 ±0.03 (1.92)	0.50 ±0.028 (3.84)	0.40 ±0.021 (16.66)	0.46 ±0.026 (4.16)	0.47 ±0.019 (2.08)
	15.39 ±1.31	8.35 ±0.75 (45.74)	9.68 ±0.87 (37.10)*	16.33 ±1.33 (6.10)	9.25 ±0.74 (26.87)	11.11 ±0.91 (12.77)	12.37 ±0.89 (2.21)

All values are in g% and expressed as mean ± S.E. of five observations, Values shown in parentheses are % alterations. Values are significant at P* < 0.05; **P < 0.01; ***P < 0.001

Ponderal index or condition factor 'K' was calculated by Hile (1936) formula as:

$$\text{K} = \frac{\text{W}}{\text{L3}} \text{X } 100$$

Where K = Condition factor or Ponderal factor
W= Body weight
L= Standard length of fish

The ' test of Fisher (1950) was employed to calculate the statistical significant difference between control and experimental observations.

III. RESULTS AND DISCUSSION

The alterations in different values like HSI, GSI and K, in pesticides exposed fish are given in Table 1 and lipid, non-lipid and water in ovary, liver, kidney and blood in Table 2.

The values of HSI, GSI and K increased and found to be concentration dependent in pesticides exposed Notopterus notopterus. The increase in GSI and HSI might be due to the reduction in body weight of the fish exposed to Chlorinated Camphene and Organophosphate. Holmberg et al., (1972) recorded considerable loss in the body weight of Anguilla anguilla

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exposed to chemicals. Larson etal. (1976) observed the reduction in liver size of flounder (Pleuronectes flusus) exposed to cadmium. Johansson et al., (1972) exposed the brown trout (Salmo trutta) to PCB and observed a significant increase in ISI. Grant and Merle (1970) observed a significant different ($P<0.05$) in GSI of gold fish, exposed to 430 mg endrin/kg body wt/day for 104 days, but observed insignificant difference in pII, HSI and GSI in rainbow trout fed 4.3, 14.5, 43.0 and 145.0 ug endrin/kg body wt/day for 163 days. Further, the increase in GSI and ISI in fishes after exposure to pesticides have been reported by Bansal (1979) and Gupta (1980). The water and lipids contents (Table 2) of the ovary, liver and kidney decreased in pesticides exposed Notopterus notopterus. However, the water in the blood increase and lipid decrease at different concentrations. The maximum (14.52%) and insignificant decrease in water content was observed in liver of Notopterus notopterus exposed to 1/4 fraction of Chlorinated Camphene. The maximum decrease 46.77% decrease in lipid of ovary was observed in Notopterus notopterus exposed to Chlorinated Camphene. All these facts indicate that Chlorinated Camphene is more toxic as compare to organophosphate. Similarly, the lipid in liver increased about 29.61% in Notopterus notopterus after Chlorinated Camphene exposure.

The data obtained in the present investigation are useful and will help to future workers is ready reference for toxicity index (TI). Various scientists have worked out the body composition of fish in relation to size, age (Lover, 1938), sex and locality (Zinevici, 1970).

Matrajan and Srinivasan (1962) reported be dy composition of 36 fresh water fishes and observed that the moisutre contents of fish ranged between 75 and 80% and fats between 0.2 and 6.97%. They also derived a relation that fat contents varied inversely with moisture. Similarly, Anonym (1962) observed the moisture contents in fresh water fish between 70 and 80%.

Water plays a vital role in the physiology of animals. Animal suffers a physiological dysfunction due to scarcity of water percentage in the body. Maynard and Looshi (1962) reported that animal may die due to even 10% loss of its body water. The hydration of liver and kidney may be due to increased metabolic activity of these organs under various toxicant stresses. In. the blood, the moisture content increased while lipid decreased in Chlorinated Camphene and Organophosphate exposed Notopterus notopterus. Authors also observed a decrease in lipid content in all tissues of pesticides exposed Notopterus notopterus, except in liver. The decreased in lipid content might be due to the increased breakdown of fats into fatty acids or due to muscular exhaustion due to pesticides toxicity.

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