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RESEARCH ARTICLE

IMPACT OF INSECTICIDE (QUINALPHOS) ON THE BIOCHEMICAL COMPONENTS OF THE FISH *Labeo Rohita*

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ABSTRACT

The biochemical components like protein, carbohydrate and lipid were estimated quantitatively in the tissues of liver, kidney, muscle and gill of control and insecticide treated fishes. The fishes were treated with the sublethal concentration of 6.6 ppm for 1, 2, 3, 10and 20 days. The protein, carbohydrate and lipid level of 20 days. The protein, carbohydrate and lipid level of liver, kidney, muscle and gill of the control fish was very high when compared with the treated ones. In treated fish the protein content of liver, kidney, muscle and gill were greatly reduced. Maximum reduction was observed at 20 days exposure. The carbohydrate and lipid content of the liver, kidney, muscle and gill are showed similar declining trend at different exposure periods. Maximum reduction was observed at 3 days and long term exposure periods.

INTRODUCTION

Pesticides and herbicides are widely used to kill the harmful pests and weeds. The compounds percolate through soil and finally enter the sea through soil and rivers, and streams. The chemicals are non–degradable pollutants which contaminate the global ecosystems and enter the food chains. They accumulate in the bodies of aquatic plants and animals and become more concentrated at higher trophic levels (Biomagnification). The herbicides can cause death of fishes either directly or due to the starvation by destruction of food chain. Many herbicides have shown to effect the growth and reproduction of fishes with evidence of tissue damage (Verma and Raji, 2000). Most of the synthetic organic pesticides of organochlorines, organophosphates and caramates are extremely toxic to nontarget populations of fresh water fauna, adversely affecting the complex food web, population dynamics and food web energetics (Chandra *et al.,* 2001). These investigations linked the pesticides to a number of reactions, which could explain their adverse effects on the morphology and physiology of a number of fresh water organisms (Ghosh *et al*., 2002).

MATERIAL AND METHODS

The fresh water fish, *Labeo rohita* (body length 5-7 cms, body weight 5-6 gm) were colleted from Aliyar Dam and acclimatized to laboratory condition for 2 weeks in a large cement tanks (6 x 4 x 3) at (24 ± 3°C). The fishes were fed regularly with conventional diet rice bran and oil cause 1:1 ration feeding was stopped one day prior to the start of the experiment. Technical grade of Quinalphos, a insecticide was used in the investigation. Batches of 10 healthy fishes were exposed to different concentration of the insecticide. LC_{50} value for 72 hrs was calculated by using probit analysis (Finney, 1971). Five groups of fishes were exposed to 6.06ppm (sublethal concentration) of 72 hrs LC_{50} valued concentration of the Quinalphos for 1, 2, 3, 10 and 20 days respectively. Another group was maintained as control at the end of each exposure period fishes were scarified and tissues such as liver, kidney, muscle and gill were dissected and removed. The tissues were homogenized with 80% methanol centrifuged at 3500 rpm for 15 minutes and the clear supernatant was used for analysis of different parameters. The total protein was estimated following the method of Lowery *et al*. (1951). Carbohydrate was estimated using the method of Hedge and Hofreiter (1962) and lipid was estimated using the method of Richmond (1973) the results were expressed as mg/g wet weight of the tissue.

RESULTS AND DISCUSSION

The changes in protein, carbohydrate and lipid levels in different tissues of fish, after the treatment with Quinalphos are presented in Table 1, 2 and 3. While analyzing the changes in the protein, carbohydrate and lipid it became clear that they fluctuated during different intervals of treatment. The level of protein was found to be decreased in all the tissues in comparison to control. The extent of decrease in protein was more in high concentration upon 20 days exposure (Table1) In the tissues, the trend of decrease in protein content was muscle > kidney > liver > gill. The percentage decrease ranged from 40.89 to 89.38 in muscle, 47.93 to 87.41 in kidney, 28.02 to 87.19 in liver and 6.81 to 80.05 in gill. The

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Table 1. Change in the level of Protein (mg/g) in different tissues of the fish, *Labeo rohita* exposed to different durations and concentration (6.6 ppm) of the insecticide, Quinalphos

Name of the Tissues		Exposure Periods				
		1 day	2 days	3 days	10 days	20 days
Liver	Control	6.32 ± 0.01	6.32 ± 0.01	6.32 ± 0.01	6.32 ± 0.01	6.32 ± 0.01
	Experimental	4.55 ± 0.08***	3.02 ± 0.03***	2.51 ± 0.06***	0.99 ± 0.05***	0.81 ± 0.02
	't' value	1.41	6.93	5.25	3.66	5.80
	% change	-28.02	-52.23	-60.30	-84.34	-87.19
Gill	Control	4.26 ± 0.03	4.26 ± 0.03	4.26 ± 0.03	4.26 ± 0.03	4.26 ± 0.03
	Experimental	3.97 ± 0.06*	3.48 ± 0.02***	2.79 ± 0.05***	2.20 ± 0.32***	0.85 ± 0.08***
	't' value	8.07	1.58	4.55	2.51	1.35
	% change	-6.81	-18.31	-34.51	-48.36	-80.50
Kidney	Control	4.05 ± 0.20	4.05 ± 0.20	4.05 ± 0.20	4.05 ± 0.20	4.05 ± 0.20
	Experimental	2.11 ± 0.03***	1.64 ± 0.05***	1.13 ± 0.08***	1.97 ± 0.06***	0.51 ± 0.02***
	't' value	1.75	4.04	1.12	1.16	2.44
	% change	-47.93	-59.53	-72.11	-51.38	-87.41
Muscle	Control	6.97 ± 0.06	6.97 ± 0.06	6.97 ± 0.06	6.97 ± 0.06	6.97 ± 0.06
	Experimental	4.12 ± 0.03***	2.85 ± 0.05***	1.81 ± 0.02***	1.81 ± 0.08***	0.74 ± 0.06
	't' value	1.28	1.64	5.81	1.96	1.62
	% change	40.89	-59.11	-74.0	-74.03	-89.38

Results are mean (±SD) of 6 observations; % = percent increase / decrease over control;
* = Significant at 0.5 level; *** = Significant at 0.001 level.

Table 2. Change in the level of Carbohydrate (mg/g) in different tissues of the fish, *Labeo rohita* exposed to different durations and concentration (6.6 ppm) of the insecticide, Quinalphos

Name of the Tissues		Exposure Periods				
		1 day	2 days	3 days	10 days	20 days
Liver	Control	41.82 ± 0.03	41.82 ± 0.03	41.82 ± 0.03	41.82 ± 0.03	41.82 ± 0.03
	Experimental	21.62 ± 0.03***	9.2 ± 0.16***	9.2 ± 0.63***	6.07 ±0.00***	8.25± 0.08***
	't' value	1.68	3.19	1.80	3.67	1.53
	% change	-41.7	-78	-78	-85.5	-80.27
Gill	Control	55.2 ± 0.05	55.2 ± 0.05	55.2 ± 0.05	55.2 ± 0.05	55.2 ± 0.05
	Experimental	42.59 ± 0.08***	33.24±0.028***	21.48±0.03***	21.58±0.06***	11.62±0.05***
	't' value	7.27	6.45	5.97	8.36	2.82
	% change	-22.85	-39.79	-61.09	-60.91	-78.95
Kidney	Control	55.21 ± 0.05	55.21 ± 0.05	55.21 ± 0.05	55.21 ± 0.05	55.21 ± 0.05
	Experimental	51.98 ± 0.03***	19.57 ± 0.02***	8.56 ± 0.08***	5.21 ± 0.06***	9.61 ± 0.05***
	't' value	8.42	1.34	2.09	3.50	1.97
	% change	-5.85	-64.55	-84.50	-90.56	-82.59
Muscle	Control	64.31 ± 0.03	64.31 ± 0.03	64.31 ± 0.03	64.31 ± 0.03	64.31 ± 0.03
	Experimental	13.64 ± 0.06***	9.31 ± 0.05***	7.21 ± 0.08***	39.51±0.02***	16.52±0.03***
	't' value	1.29	1.19	2.19	1.53	5.27
	% change	-78.79	-85.52	-88.79	-38.56	-77.31

Results are mean (±SD) of 6 observations; % = percent increase / decrease over control;
* = Significant at 0.5 level; *** = Significant at 0.001 level.

Table 3. Change in the level of Lipid (mg/g) in different tissues of the fish, *Labeo rohita* exposed to different durations and concentration (6.6 ppm) of the insecticide, Quinalphos

Name of the Tissues		Exposure Periods				
		1 day	2 days	3 days	10 days	20 days
Liver	Control	101.28 ± 0.08	101.28 ± 0.08	101.28 ± 0.08	101.28 ± 0.08	101.28 ± 0.08
	Experimental	39.47 ± 0.03***	26.22 ± 0.06***	17.31±0.08***	30.55±0.05***	19.2 ± 0.02
	't' value	1.16	9.82	8.85	7.47	4.15
	% change	-61.03	-74.11	-82.91	-69.84	-81.04
Gill	Control	77.69 ± 0.06	77.69 ± 0.06	77.69 ± 0.06	77.69 ± 0.06	77.69 ± 0.06
	Experimental	0.91 ± 0.03***	4.58 ± 0.10***	3.29 ± 0.02***	27.62±0.05***	15.62±0.08***
	't' value	4.49	3.14	3.11	3.47	4.49
	% change	-98.21	-94.10	-95.77	-64.45	-79.89
Kidney	Control	54.32 ± 0.02	54.32 ± 0.02	54.32 ± 0.02	54.32 ± 0.02	54.32 ± 0.02
	Experimental	31.68 ± 0.05***	22.67 ± 0.08***	9.64 ± 0.06***	17.25±0.03***	13.52±0.02***
	't' value	5.07	1.59	1.84	6.13	7.29
	% change	-41.68	-58.27	-82.25	-68.24	-75.11
Muscle	Control	124.36 ± 0.02	124.36 ± 0.02	124.36 ± 0.02	124.36 ± 0.02	124.36 ± 0.02
	Experimental	17.23 ± 0.06***	15.0 ± 3.0***	10.68±0.01***	20.89±0.02***	10.84±0.08***
	't' value	1.68	4.36	1.77	4.26	5.80
	% change	-86.15	-87.94	-91.41	-83.20	-91.28

Results are mean (±SD) of 6 observations; % = percent increase / decrease over control;
* = Significant at 0.5 level; *** = Significant at 0.001 level.

muscle showed the highest percentage decrease (89.38) in protein content might be due to increased amino acid pool and increased level of plasma proteins (Kapilla and Ragothaman, 1999). The toxic effect of organophosphate insecticide on protein content in the fresh water fish, *Channa punctantus* have revealed the significant reduction of protein content may be due to increased utilization of protein to meet out the energy demand when the fish is under stress condition (Jaroli *et al*., 2005). 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 (Shanthi *et al*., 2009). From the present study it is concluded that the above biochemical parameters 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.

The present observation indicated that the extent of decrease in lipid was more in high concentration upon 3 days exposure (Table 3). In the tissues, the trend of decrease in lipid content was muscle > Gill > liver > kidney. The percentage decrease ranged from 86.15 to 91.41 in muscle, 61.03 to 82.91 in Gill, 91.41 in muscle, 64.45 to 98.21 in liver and 41.68 to 82.25 in kidney. The liver showed the highest percentage decrease (98.21) in lipid content. In the present study the maximum reduction of carbohydrate content was observed upon 20 days exposure in gill (Table 2) and maximum reduction in the organs like liver and kidney during 10 days exposure and in muscle during 3 days exposure. In the tissues, the trend of decrease in carbohydrate content was kidney > liver > gill > muscle. The percentage decrease ranged from 5.85 to 90.56 in kidney, 41.7 to 85.5 in liver, 22.85 to 78.95 in Gill and 38.56 to 88.79 in muscle. The kidney showed the highest percentage decrease (90.56) in carbohydrate content.

Carbohydrates are the primary and immediate source of energy. In stress conditions its reserve levels depleted to meet energy demand of the fish. Depletion of carbohydrate may be due to direct utilization for energy generation and demand caused by active compound induced hypoxia (Raamakrishna and Sivakumar, 1993).

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