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ORIGINAL ARTICLE

BIOCHEMICAL EFFECT OF ORGANOPHOSPHATE PESTICIDE MALATHION ON PROTEIN, LIPID AND GLYCOGEN CONTENT OF *LABEO ROHITA*

K. Kalaiarasi[1], R.S. Magar[2], D. Shalini[3], Savita Nalawade[4], Veena Mahajan[5], Rizwan M. Khan[6] and Virendra K. Sangode[7]*

[1]Department of Biotechnology, Sree Narayana Guru College, Coimbatore - 641 105, India.
[2]Department of Zoology, Shri Datta Arts, Commerce and Science College, S.R.T.M. University, Nanded - 431 712, India.
[3]Department of Biotechnology, K.G. College of Arts and Science, Coimbatore - 641 035, India.
[4]Department of Zoology, D. P. Bhosale College, Koregaon - 415 501, Affiliated to Shivaji University, Kolhapur - 416 004, India.
[5]Department of Zoology, J.M. Patel Arts, Commerce and Science College, Bhandara, Affiliated to R.T.M. Nagpur University, Nagpur - 440 033, India.
[6]Department of Zoology, Radhabai Kale Mahila Mahavidyalaya, Ahmednagar - 414 001, India.
[7]Department of Zoology, M.B. Patel College of Arts Commerce and Science, Sadak Arjuni - 441 807, Dist Gondia, India.
*Corresponding author e-mail : Virendra K. Sangode, e-mail: virendrasangode03@gmail.com

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ABSTRACT : Agricultural pesticide industry is blooming like never before their occurs overuse of chemical pesticide which will be let run off through nearly by fresh water resources without knowing the fact of effect of this harmful pesticide on aquatic organisms. Pesticides have an innate capacity to cause damage to physiological system of vertebrate causing them to weight loss and at certain ppm level it lead to mortality too. Considering above fact the present study deals with the effect of malathion for short duration (24 to 96 h) on muscle protein of *Labeo rohita* (Hamilton). The body muscle showed reduction in protein content during sub lethal treatment. In the different concentration of malathion with the increased concentration of malathion the protein, lipid and glycogen content decreased.

Key words : *Labeo rohita*, malathion, muscle protein, sub lethal toxicity.

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INTRODUCTION

For centuries, pesticides have been used in agriculture to enhance food production by eradicating unwanted insects and controlling disease vectors. These pesticides ultimately reach the aquatic systems through different pathways affecting various aquatic organisms.

Fishes are highly sensitive to water contamination. Hence pollutants such as insecticides, herbicides may significantly affect some physiological and biochemical process when they accumulate in the tissues of fish (Nagarathnamma and Ramamurthy, 1982; Singh *et al*, 2010; Rao *et al*, 2021).

Among these pesticides, organophosphorus compounds are commonly used insecticides. Organophosphates are widely used throughout the world as an important group of pesticides, due to their insecticidal property, less toxicity, less persistence and rapid biodegradability in the environment (Singh *et al*, 2010). Malathion is commonly used organophosphorus pesticide. While most of the Malathion will stay in the areas where it is applied, some part of it can move to areas away from where it was applied by rain, fog and wind. Once malathion is introduced into the environment, it may cause serious intimidation to aquatic organisms and is notorious to cause severe metabolic disturbances in non-target species like fish and fresh water mussels (USEPA, 2005). *Labeo rohita* is common fresh water fish abundantly present in local River. It is one of the major sources of food of poor population in local area.

The present study was designed to evaluate the impact of sub-lethal concentration of 0.4, 0.8, 0.12 ppm of malathion on body muscle protein in fresh water fish *L. rohita* during exposure period of 24, 48, 72 and 96 hours. It has been recorded that malathion shows potent biodegradability, susceptible to photolysis as well hydrolysis with lesser persistent capability in nature. Besides this property it can thrive in nature in abiotic parameters such water and soil affecting aquatic fishes (Magare and Patil, 2000).

MATERIALS AND METHODS

For present study, commercial grade malathion (50% EC, manufactured by Coromandal Fertilizer Limited, Coromandal House, Pesticide Division, Coimbatore India was procured from the local market. Healthy specimens of *L. rohita* were collected from local River. Their average length and wet weight were 7.5±1.7 cm and weight 8.2±0.5 g, respectively. Fishes were treated with 0.1% $KMnO_4$ solution for 2 minutes to avoid any dermal infection. The fish stock was then maintained in 100 liter glass aquaria for 14 days to acclimatize under laboratory condition. The fishes were fed with fish pellets and rice bran on alternate days. A stock solution was prepared in acetone and mixed in water to obtain required dilutions. The LC_{50} value for 96 hours of malathion was determined by procedure of Gould *et al* (2012). The LC_{50} of malathion for 96 hours for *L. rohita* was 2 mg/liter. Fishes were exposed to sub lethal concentrations of 0.4, 0.8, and 0.12 ppm of malathion, simultaneously control group was also maintained. Total protein content was determined according to the method of Lowry *et al* (1951). Glycogen was assayed by Anthrone method described by Carroll *et al* (1956). The lipid estimation was done by using the Bligh and Dyer method (Bligh and Dyer, 1959).

RESULTS AND DISCUSSION

Protein content

Changes in protein of body muscle of *L. rohita* is presented in Table 1. The protein level of body muscle decreased during different intervals of treatment. In the present investigation the protein content at control experiment in 24, 48, 72 and 96 hours was 122, 121, 122 and 122 mg/g body weight of muscles but different concentration of organophosphates malathion at 0.4 ppm the protein content in 24, 48, 72 and 96 hours was 120, 117, 112 and 110 mg/g body weight of fish respectively. In the concentration of 0.8 ppm it was 105, 103, 100 and 97 mg/g body of weight of muscles at 24, 48, 72 and 96 hours, respectively. In the concentration 1.2 ppm 93.01, 91.05, 87, 83 mg/g body weight of muscle of the fish at 24, 48, 72, and 96 hours, respectively.

Lipid Content

The lipid content at control experiment in duration of 7, 14, 21 and 28 days was 93.28, 92.00, 93.00 and 93.00 mg/g body weight of muscles but different concentration of organophosphates malithion at 0.4 ppm the lipid content in 24, 48, 72 and 96 hours was 89.21, 70.93, 68.28 and 50.93 mg/gm body weight of fish, respectively (Tables 2 and 3).

Glycogen content

The glycogen content at control experiment in duration of different concentration of organophosphates malithion at 0.4 ppm the lipid content in 24, 48, 72 and 96 hours was 16.99, 14.27, 10.15 and 8.56 mg/g body weight of fish, respectively. Changes in glycogen content of body muscle of *L. rohita* is presented in Table 3. The lipid content of muscle tissue showed decreasing trend with increase in the intervals of the treatment (Table 3).

Protein is most characteristic organic compound found in the living cell while the protoplasm of the cell is composed of protein. They play vital role in the process of interaction of cellular medium. In experimentation, after 96 hours the decline in protein content was observed. This fall from the next onward day be attributed to the constantly increasing contact of the pesticide with the bio system, which ultimately resulted in protein breakdown. Kabeer (1979) showed increase in protein content in fish, *Tilapia mossambica* (Peters) treated with methyl parathion and malathion. Even most of the workers found that, there was reduction in protein contents in various tissues of the animal under different stress conditions. The decrease in protein content may be due

Table 1 : Protein content (mg/g) in body muscle of *Labeo rohita.*

Concentration (ppm)	Duration			
	24 h	48 h	72 h	96 h
Control	122.00 ± 0.11	121.00 ± 0.16	122.00 ± 0.19	122.00 ± 0.21
0.4	120.00 ± 0.8	117.00 ± 0.7**	112.00 ± 0.2	110.00 ± 0.9
0.8	105.00 ± 0.11	103.00 ± 0.13	100.00 ± 0.19***	97.00 ± 0.21
1.2	93.01 ± 0.11*	91.05 ± 0.16	87.00 ± 0.17	83.00 ± 0.20

Values are mean ±SD of six replicates, * $P<0.05$, ** $P < 0.01$, *** $P > 0.01$, significant when student's test was applied between control and experimental groups.

Table 2 : Table showing Lipid content (mg/g) of muscle tissue of *Labeo rohita* after exposure to sub lethal doses of Malathion in days intervals.

Concentration (ppm)	Duration (in days)			
	7	14	21	28
Control	93.28± 0.3	92.00± 0.2	93.00± 0.3	93.00± 0.3
Experimental	84.02± 0.4	60.06± 0.5	56.28± 0.2	53.54± 0.3

Values are mean ±SD of six replicates, * P<0.05, ** P < 0.01, *** P > 0.01, significant when student's test was applied between control and experimental groups.

Table 3 : Table showing total Lipid and Glycogen content (mg/g) of muscle tissue of *Labeo rohita* after exposure to sub lethal doses of Malathion.

Time in hours	Total lipid	Glycogen
Control	94.50±1.34	20.15±1.12
24 hr	89.21±1.33	16.99±1.52***
48 hr	70.93±2.12***	14.27±1.03
72 hr	68.28±1.92***	10.15.±1.49
96 hr	50.93±1.49	8.56±0.85

Values are expressed as mg/g wet weight of tissue. Values are mean ± SD of six replicates, * p Â 0.05, ** P Â 0.01, *** p Ã0.01, significant when students 's test was applied between control and experimental groups.

to reduced protein synthesis and increased proteolysis. Joseph (1987) observed the effect of copper on biochemical composition of *Cyprinus carpio* L. and found that total protein content of the brain, liver and muscle were declined. Ramalingam and Ramalingam (1982) stated that proteins expected to involve in the compensatory mechanism of stressed organisms. Similar observation was made by Jagadeessan and Mathivanan (1999). Chandravathy and Reddy (1994) suggested that decline in the muscle protein content might be due to reduced protein synthesis, increased proteolysis and also due to utilization for metabolic process under lead toxicity. Rao *et al* (1987) and Baskaren *et al* (1989) reported reduction in protein content could be due to its utilization to mitigate the energy demand when the fish is under stress. Decrease in protein content at sub lethal exposure of malthion to fresh water fish, *L. rohita* suggest the possible utilization of protein for various metabolic purposes and enhanced proteolysis to meet the high energy demand under pesticide stress. According to Patil and David (2009) there occurs change in total structural and soluble proteins of fish, with reports on high proteolytic activity. According to Hai *et al* (1995) valid reason of protein decline is oxidative stress which brings changes in free radical productions.

Our study also get support from the data given by Ahmed *et al* (2012), who studied on *Clarius gariepinus* (Burchel) which shows effect on biochemical composition in muscle glycogen level as well protein. Similarly, our finding is also supported by Thenmozhi *et al* (2010).

The depletion in glycogen, lipid content of muscle tissue is supported with data may be due to physiological utilization of body lipid fats in cell repair and tissue regeneration mechanism. Similar findings were also observed by Harper (1983). Rao *et al* (2021) also revealed that when the fish were exposed to sub lethal concentration of the insecticide Malathion variations were observed in different biochemical constituents *i.e.* proteins, carbohydrates and ninhydrine positive substances were decreased in all the tissues of *L. rohita*.

CONCLUSION

In the present investigation, the effect of organophosphate Malathion of the protein content of *L. rohita* changes is found due to the effect of Malathion. In the different concentration of malathion, with the increased concentration of malathion the protein, lipid and glycogen content decreased during the study period. Therefore the accumulation of pesticide in the water body primarily affects the non-target organisms especially fish and get deposited in different tissues. These fish enter into the food chain and affect the humans and causes deleterious health effects. Hence, the usage of the pesticides should be restricted to a minimal concentration to have a healthy ecosystem.

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