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EFFECT OF MALATHION ON A FRESH WATER FISH *CYPRINUS CARPIO*

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Static bioassay experiments conducted under laboratory conditions on *Cyprinus carpio* using sublethal concentration of (0.21 mg/l) malathion. The effect of malathion on different biochemical components in liver and body muscles was determined. A significant biochemical depletion were observed both in liver and muscle. The toxic effect of malathion was two-fold more in liver than the muscles.

INTRODUCTION

In recent years, the use of pesticides has increased many fold in different parts of the world. Pesticides in whatever form they are, when applied finally are found to contaminate, and even accumulate in the water ecosystem. The danger of pesticides to several aquatic organisms even in minute concentration, is amply reported by Metelev *et al.* (1983). The present work was initiated on the toxic observations of malathion on a fresh water fish, *Cyprinus carpio*. The study included bioassay experiments using the fish as a test organism under controlled conditions in the laboratory, taking into consideration all the precautions and procedures given by APHA (1980).

MATERIALS AND METHODS

The fresh water edible fish, *Cyprinus carpio* were brought from Mettur Dam and acclimatized in the tap water under laboratory conditions, with free of possible contamination. Fish at fingerling stage with more or less uniform size of 8 cm and weighing 7 to 8 g were selected for the treatment. For each treatment five fishes in triplicate were taken in rectangular jars, each containing five liters of water with recorded temperature, pH, DO, salinity etc. The pesticide used in this investigation is malathion, an organophosphate. The dilution of pesticide was made as per the standard described by APHA (1980).

To study the effect of malathion on biochemical composition of tissues, fishes were exposed to sublethal concentration 0.20 mg/l of malathion for 120 hrs bioassay test (toxicity test). At the end of the experiment, the fishes were sacrificed from controlled and experimental jars. The liver and muscles were removed for biochemical analysis. Protein was estimated by the method described by Lowry *et al.* (1951), glycogen was estimated by the method reported by Dubois *et al.* (1956) and lipids estimated using sulphophenolin method of Bames & Blackstock (1973).

RESULTS AND DISCUSSION

The values of glycogen, protein and lipid contents of control and treated fishes of *C. carpio* are given in Table I. Student's t - test was applied to test the significance of the results at $P<0.001$ and $P<0.005$ level. The mean percent of protein, glycogen and lipid in liver and muscles were 29.6, 30.15, 48.0 and 25.0, 93.05, 15.31%, respectively. The decrease in protein content in liver of the exposed fish indicates the protein conversion of tissue protein into soluble fractions reaching the blood for utilization in different metabolic activities during stress as reported by Aness (1974).

Depletion of protein in liver and body muscle, also suggested that the degradation of protein and an intensive proteolysis, resulting in the increase of free amino acids to be fed into tricarboxlic cycle (TCA cycle) through aminotransferable system, as keto acid to cope with high energy demand (Kabeer *et al.*, 1978). The decreased amount of protein in liver may also indicate the utilization of protein in meeting the fundamental nitrogen demand of the body. Dubale & Awasthi (1980) expressed their views with regard to the depression in protein level may be due to defective protein synthesis by altering relationship between ribosomes and membrane of the endoplasmic reticulum.

The muscle glycogen content of *C. carpio* treated with sublethal (0.21 mg/l) concentration of malathion showed decreased level from that of control but not significant statistically ((Table I). Perhaps the fall in glycogen level in the muscle is due to expenditure of energy for constant movements aided by muscular actions (Grant & Schottger, 1972).

Table I : Biochemical changes in liver and muscle content of *C. carpio* exposed to 2.1 mg/ml malathion for 120 hrs. Each value is the mean (± S.D.) of 5 individual observations.

Tissue	Parameters unit (mg/g wet weight)		
	Protein	**Glycogen**	**Lipid**
Liver			
Control	8.03 ± 1.32	1.36 ±0.4	3.80 ± 2.20
Experimental %	5.65 ± 0.62	0.95 ± 0.25	1.96 ±0.04
	-29.6%	-30.15%	-48%
Significant level	P<0.01	P<0.001	P<0.001
Muscle			
Control	1.40 ± 0.5	0.72 ± 0.36	7.38 ± 0.85
Experimental %	1.05 ± 0.45	0.05 ± 0.01	6.25 ± 0.82
	-25%	-93.05%	-15.31%
Significant level	P<0.05	P<0.001	NS

Manoharan & Subbaiah (1982) also have observed the disturbed carbohydrate metabolism under toxic stress. Anaerobic stress resulting in the breakdown of tissue glycogen (Mcleay & Brown, 1979).

In the present study the liver glycogen declines significantly from normal levels of 1.36 to 0.95 mg/g (P<0.001) after exposure to sublethal dose of malathion (Table I). Many workers have reported the depletion of liver glycogen in different species of fishes when subjected to lethal concentration of toxicants (Sastry, 1978). Another possibility might be due to glycogenolysis by the action of catacholamines to be secreted during stress which was reported by Larson (1973).

The lipid content in liver and muscles in the normal fishes, in the present observation, were also found to be 3.80, 7.38 mg/g. After exposure to malathion concentration the lipid content were decreased to 1.96 in liver and 6.25 mg/g in muscle. These results clearly indicate that the malathion is capable of inducing, significant alternations in lipid content in some tissues of *C. carpio*. Similar decreased level of lipid content was reported by Ghosh (1986) in pollutant exposed fish, *Barbus stigma.*

It can be pointed out that the excess activity of mucle and liver was due to the toxic effect resulting in the utilization of the lipid. The accumulation of malathion in brain may cause the

disintegration of nerve cells, clotting of blood and reduce the oxygen transport to the brain (Panigrahi & Mishra, 1980), which may decrease the lipid and glycogen contents. These observations are in confirmation with Grant & Mehrle (1970), Dhanapakiam (1996) and Dhanapakiam *et al.* (1998) who also reported the decrease in total lipid content in fishes exposed to different pollutants or toxicants.

The observed depletion of lipid content in liver and muscle is either due to action uptake of lipid components by the tissues for utilization cellular or increased lipolysis or mitrochondrial injury which impaired the function of citric acid cycle and affects fatty acid oxidation mechanism (Crobett, 1974; Singh & Singh, 1980; Ware, 1980). Phospholipids of body muscle declined which indicated that the pectoral muscles may have more demand energy resulting in the mobalisation of oxidation of phospholipids (Jothi *et al.*, 1989).

Thus it is concluded that the toxicity of the sublethal concentration of malathion causes imbalance in biochemical aspect which has a direct reflection on biological activities, thereby indirectly the fish productivity would be minimized. The present investigation hence suggestive that enough care should be taken while using the pesticides to edible and other economically important fishes for the betterment of the society. We must make awareness to the farmers to use the biological control as an alternative methods in pest management, which cause severe damage to the crops.

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