



EFFECT OF DIMETHOATE ON THE BIOCHEMICAL COMPOSITION IN THE MUSCLES OF FRESHWATER FISH *LABEO ROHITA*

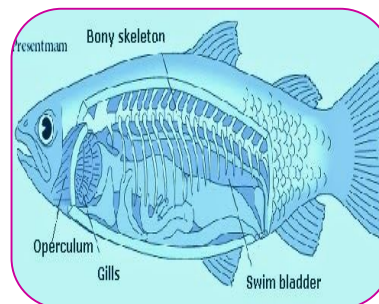
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ABSTRACT

The biochemical changes in muscles of test fish *Labeo rohita* exposed to lethal (LC_{50} of 96 hours i.e. 9.204 ppm) and sub lethal concentration ($1/10^{th} LC_{50}$ i.e. 0.9204 ppm) of dimethoate. Biochemical changes in muscles tissue were analyzed after exposure period. The lipid, protein and glycogen, contents are decreased in the muscles when compare with the control group. The level glycogen, protein and lipid were decreased in lethal and sub lethal exposures.

KEY WORDS: Glycogen, Protein, Lipid, Dimethoate, *Labeo rohita*.



INTRODUCTION

Fish is one of the most important sources of food. It is reported that more than 8.5 million of tones of fish are required annually to meet the present day demand of fish protein in the world. But fish habitat is affected by various pollutants. Fishes are very sensitive to a wide variety of toxicants in water; various species of fish shows uptake and accumulation of many contaminants or toxicants such as pesticides (Herger *et.al.*, 1995). Accumulation of pesticides in tissues produces many physiological and biochemical changes in the fishes and freshwater fauna by influencing the activities of several enzymes and metabolites (Nagarathamma and Ramamurthi, 1982). The alteration in biochemical contents in different tissues of fish due to toxic effects of different heavy metals and pesticides have been reported by number of workers (Gupta *et al.*, 1987; Khan *et al.*, 1992; sobha,*et.al* 2007 James and Sampath, 1995; Das *et al.*, 1999; Khare and Singh, 2002; Hadi *et al.*, 2009). These chemicals have entered in to the aquatic system and create pollution which pose a great threat to aquatic organisms. There are several reports regarding the effects of pesticides (Arunachalam *et.al* 1985) on physiology of fish. The pesticides used in pest control programmes also produce many physiological and biochemical changes in freshwater organism particularly the fish (Girija 1984). The alteration of biochemical contents in different tissues of fish is due to toxic effects of different heavy metals and pesticides have been reported by many workers (Saxena *et.al.*, 1989, Khan *et.al.*, 1992, Virk and Sharma 1999, Rawat *et.al.*, 2002).

The biochemical characteristic and particularly the qualitative and quantitative occurrence of the major biochemical components viz protein, fats, carbohydrates etc. of the fish are prime importance as they determine nutritive value of the fish.

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MATERIALS AND METHODS:

The test fish *Labeo rohita* were collected from Manjara River, Latur district and brought to laboratory. These fishes were observed for any pathological symptoms and then placed in 0.1% potassium permanganate (KMnO₄) for 2 minutes so as to avoid any dermal infection. The fish were then washed with water and acclimatized to laboratory conditions for two weeks and water was changed every day and fishes were inspected for disease conditions in glass aquaria. During acclimatization the fishes were provided with a diet consisting of live earthworms. Food supply was withdrawn 24 hours prior to experimentation. A commercial grade of pesticide, Dimethoate - 30% EC was used for bioassay test. A stock solution of the toxicant was prepared and few concentrations from stock solution were prepared as the dilution technique (APHA, 1998). For the estimation of biochemical analysis the laboratory acclimatized fishes almost same size measuring 9 ± 2 cm and weighing about 7 ± 2 gms were selected for experimentation and divided into two groups of 10 fishes per aquarium. Group 'A' served as control was kept in tap water. Group 'B' was exposed to lethal (9.204 ppm) and group 'C' served as sublethal concentration of dimethoate (0.9204).

The physicochemical parameters were analyzed during the experimental period, by the standard methods suggested by APHA (1998). For the biochemical analysis of muscles were selected and the fishes were sacrificed immediately at the end of exposure period i.e 96 hours and muscles were excised rapidly and processed for the biochemical estimations after homogenizing the required media. The following standard methods were used for the determination of biochemical analysis. Glycogen estimation was done by Anthrone reagent (Seifer *et.al.* 1950). The protein contain analyzed by Lowery method (Lowery, *et.al* 1951). Lipid estimation was done by chloroform methanol method suggested by (Ramnik Sood, 2006). All values were expressed in mg/gm wet. wt. of tissues.

RESULTS:

In the present investigation the biochemical changes in muscles of test fish *Labeo rohita* exposed to lethal (LC₅₀ of 96 hours i.e. 9.204ppm) and sub lethal concentration (1/10th LC₅₀ i.e. 0.9204 ppm) of dimethoate. The effect of dimethoate on the muscles of *Labeo rohita* at lethal and sub lethal concentration on the glycogen, protein and lipid content in control group were 15.12, 21.14 and 68.12 mg/gm/wt of tissues Where as in lethal concentration 12.78, 18.04 and 59.01 mg/gm/wt and sub lethal concentration 14.08, 19.10 and 6 mg/gm/wt respectively. The percent increased of glycogen was maximum in muscles (15.47 % and 6.87 %) In the Protein content increased trend of change was observed i.e. 3.1 % in lethal and 2.04 % in sublethal concentration where as in lipid 9.11 % in lethal and 5.63% in sub lethal concentration. The increased trend was observed in lethal and sub lethal concentration lipid < protein < glycogen. The biochemical changes in the muscles of *Labeo rohita* depicted in table no.1 and illustreated in fig. no. 1

Table 1: Biochemical changes induced by dimethoate in the muscles of *Labeo rohita*.

Sr. No	Parameters	Control group 'A'	Lethal group 'B' (9.204ppm)	Change %	SubLethal group 'C' (0.9204ppm)	Change %
1	Glycogen	15.12 \pm 0.47	12.78 \pm 0.28 (15.47 %)	2.34	14.08 \pm 0.10 (6.87 %)	1.04
2	Protein	21.14 \pm 0.38	18.04 \pm 0.11 (14.66 %)	3.1	19.10 \pm 0.58 (9.64 %)	2.04
3	Lipid	68.12 \pm 0.23	59.01 \pm 0.47 (13.37 %)	9.11	62.49 \pm 0.64 (8.26 %)	5.63

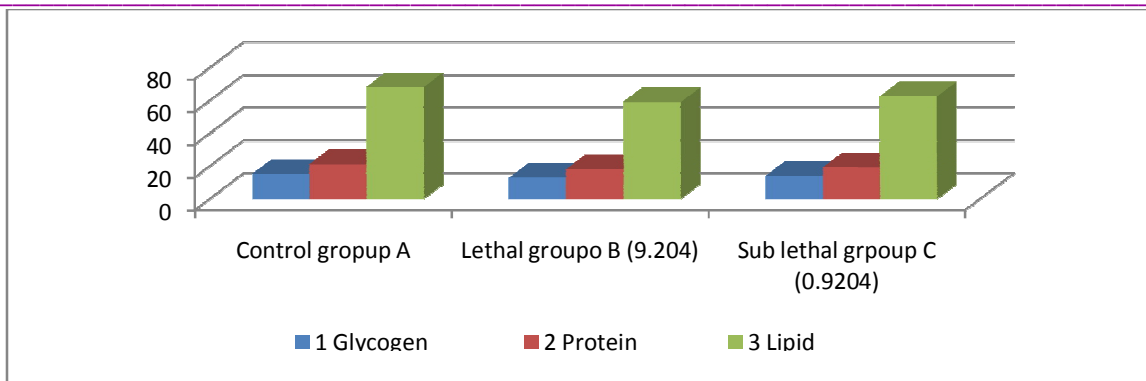


Fig. no. 1 Showing the effect of Dimethoate on the gill of *Labeo rohita*.

DISCUSSION:

Nagaraju Bantu and Rathnamma Vatika (2013) Studies effect of Dimethoate on mortality and biochemical changes of freshwater fish *Labeo rohita* (Hamilton) observed that the glycogen content in the different tissues in muscles 19.15, 7.18 and 5.29 at control, sublethal and lethal concentration respectively. Bais *et.al* (2011) studied on the effects of cadmium chloride on the glycogen content of different tissues of the *Ophiocephalus striatus* and reported that level in muscle, gill, liver, kidney and heart is significantly decreases in experimental fishes over the control group of fishes. The level of decrease in different organs in the following manner kidney > liver > gills > heart > muscle.

K. Satyavardhan (2013) studies on the effect of fenvalerate™ and Malathion™ on biochemical constituents of freshwater fish *Ctenopharyngodon idella* (Valenciennes) reported that glycogen content in gill, liver, kidney and muscle were 35.10, 82.22, 25.39 and 35.07 mg/g wet weight of tissue in control were as in lethal concentration 19.95, 53.21, 16.93 and 15.12 mg/g wet weight of tissue. He stated that depletion of glycogen content was noticed in exposed fish but significant decrease in glycogen content was noticed in muscles tissues in lethal exposure. A fall of glycogen level it might be due to the over activity of muscle under pesticides stress. The similar results were observed in the present investigation. Kapil *et al.* (1999) working on mercury, copper and cadmium induced changes in the total protein levels in muscle tissue on edible fish. *Bolephthalmus dissumeri* and reported that the decreased protein content in the fish may be due to the increase in amino acid quantity inhibition in the protein content was possible due to non-selective blocking of phosphorylation process in the central nervous system and tissues. Tilak *et al.* (2003) reported when exposed to sublethal concentration of fenvalerate both technical grade and 20% EC, the total protein content was decreased in gill, liver, kidney, brain and muscle tissues of *Channa punctatus*.

Parate and Kulkarni (2003) reported that cypermethrin also decreases total protein content in the gills and muscles of freshwater crab, *Paratelphusa jacquimntii*. It was due to alternative source of energy under the stress condition. Nagaraju Bantu and Rathnamma Vatika (2013) Studies effect of Dimethoate on mortality and biochemical changes of freshwater fish *Labeo rohita* (Hamilton) observed that the protein content in the different tissues in muscles 53.4, 52.0 and 51.15 mg/g weight of tissue at control, sublethal and lethal concentration respectively. In the kidney 55.4, 47.4 and 43.1 mg/gm weight of tissue at control, sublethal and lethal concentration of dimethoate. K. Satyavardhan (2013) studies on the effect of fenvalerate™ and Malathion™ on biochemical constituents of freshwater fish *Ctenopharyngodon idella* (Valenciennes) reported that protein content in gill, liver, kidney and muscle were 55.00, 65.00, 60.00 and 90.00 mg/g wet weight of tissue in control were as in lethal concentration 32.00, 46.00, 49.00 and 52.00 mg/g wet weight of tissue.

Vutukuru (2005) reported gill and muscles glycogen reduced in the fresh water fish *Esomus danricus* exposed to sublethal concentration of copper toxicity.

Medford and Mackay, (1978) studied protein and lipid content of gonads, liver and muscle of *Esox lucius* in relation to gonad growth they found total liver protein of females was 163% that of males, female liver size decreased significantly before spawning low fat storage depots were observed in other sex. Murthy and Devi (1982) studied effect of endosulfan and its isomers on tissue, protein, glycogen and lipid in the fish *Channa punctatus* and reported that significant decrease in protein, glycogen and lipid in liver and muscle, whereas increase in protein and glycogen of kidney, changes induced by isomer 'A' were more striking than those induced of isomer 'B'.

In the present investigation, it has been found that decrease in biochemical components of all tissues due to the toxicity stress of dimethoate concentration.

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