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Recent Trends in Applied Zoology

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Chapter 03

Effect of Dimethote on Biochemical Changes In Lipid Content During Lethal And Sub Lethal Exposure To The Freshwater Fish, *Rasbora Daniconius*

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Abstract:

The present investigation has been undertaken to investigate, the effect of lethal and sublethal concentrations of dimethoate at 96 hoiurs LC_{50} lethal 9.136 ppmand sub lethal concentration 0.9136 ppm on lipid content control group were 68.12, 65.30, 81.12 and 61.78 mg/gm/wt of tissues in muscle, gill, liver and kidney respectively. and in experimental group lethal and sublethal concentration were 59.01 & 62.49 mg/gm/wt of tissues in muscles, 49.23 & 58.10 mg/gm/wt of tissues in gill, 68.01 & 72.08 mg/gm/wt of tissues in liver and 55.25 & 60.01 mg/gm/wt of tissues in kidney. The percent decrease of lipid was maximum in gill (24.60 % and 22.02 %) followed by liver (16.17 % and 11.14 %), in muscle (13.37 % and 8.26 %) and (10.56 % and 2.86 %) in kidney to the lethal and sub lethal concentration of dimethoate for 96 hours exposure period.

Key words: Lethal and sublethal concentration, Dimethoate, Lipid, *Rasbora danionius*.

Introduction:

The major causes of aquatic pollution are the industrial effluents that contain a large array of toxic substances including heavy metals Cebria *et.al* (2003). Pesticides play an important role in maintaining agricultural production through the protection of all types of crops from pest attack and vector-borne diseases, but some pesticides have adverse effects on fish and other non-target animals. Organophosphate (OP) compounds are extensively used in the fields of agriculture as well as public health, making up 50% of the insecticides use worldwide, because such compounds can degrade promptly due to their non-persistent nature by Kumar and Ansari (1986). Food is important source of energy for all living organisms. Food energy is used for building up body tissue, which further signifies that balance diet is necessary for proper functioning of body. Among various kinds of human food

resources the fish occupies an important place due to its good nutritive value and large protein contents. The contamination of aquatic ecosystems by pesticides causes harmful effects on health, growth, survival and reproduction of aquatic animals especially fishes, which constitute an important source of food for human and animal consumption (Banaee *et al*., 2008). Fishes are extremely sensitive to any kind of pollutants present in the water. Hence, pesticides may cause significant alterations in certain biochemical processes in the tissues of fish (John, 2007). The aim of the present study is to estimate the biochemical changes of glycogen contents in various tissues of *Rasbaora daniconius* during lethal and sublethal exposure to Dimthoate.

Material and Methods:

The test fish *Rasbora daniconius* 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 permagnate ($KMnO_4$) 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. During acclimatization the fishes were provided live earthworm as a diet. Food supply was withdrawn 24 hours prior to experimentation. A commercial grade of pesticide, Dimethoate - 30% EC was used for bioassay test.

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 (9.136 ppm) and group 'C' served as sublethal concentration of dimethoate (0.9136). For the biochemical analysis muscle, gill, liver and kidney were selected and the fishes were sacrificed immediately at the end of exposure period i.e 96 hours and tissue like muscle, gill liver and kidney were excised rapidly and processed for the biochemical estimations after homogenizing the required media. Standard methods suggested by Lipid estimation was done by standard chloroform methanol method suggested by (Ramnik Sood, 2006). All values were expressed in mg/gm wet. wt. of tissues.

Results:

In the present investigation has been undertaken to investigate, the effect of lethal and sublethal concentrations of dimethoate at 96 hoiurs LC_{50} lethal 9.136 ppmand sub lethal concentration 0.9136 ppm on lipid content control group were 68.12, 65.30, 81.12 and 61.78 mg/gm/wt of tissues in muscle, gill, liver and kidney respectively. and in experimental group lethal and sublethal concentration were 59.01 & 62.49 mg/gm/wt of tissues in muscles, 49.23 & 58.10 mg/gm/wt of tissues in gill, 68.01 & 72.08 mg/gm/wt of tissues in liver and 55.25 & 60.01 mg/gm/wt of tissues in kidney. The percent decrease of lipid was maximum in gill (24.60 % and 22.02 %) followed by liver (16.17 % and 11.14 %), in muscle (13.37 % and 8.26 %) and (10.56 % and 2.86 %) in kidney to the lethal and sub lethal concentration of dimethoate for 96 hours exposure period. The values are represented in table no. 1 and graphically represented figure no. 1.

Table No. 1.Effect of lethal and sublethal concentration of dimethoate on Lipid content of muscle, gill, liver and kidney of fish following 96 hours exposure to *Rasbora daniconius.*

Sr. No	Tissues	Control group 'A'	Lethal group 'B' (9.136ppm)	SubLethal group'C' (0.9136ppm)
1	**Muscle**	68.12± 0.23	59.01± 0.47 **(13.37 %)**	62.49± 0.64 **(8.26 %)**
2	**Gill**	65.30± 0.31	49.23± 0.37 **(24.60 %)**	58.10± 0.39 **(11.02 %)**
3	**Liver**	81.12± 0.55	68.01± 0.37 **(16.17 %)**	72.08± 0.88 (11.14 %)
4	**Kidney**	61.78± 0.53	55.25± 0.18 **(10.56 %)**	60.01± 0.44 **(2.86%)**

All values are expressed in mg/gm/wet.wt of tissues. Each values are the mean of six observation (±SD), Bracket values indicates % variation over control. Values are significant.

Discussion:

The results obtained from the present study show that the values of lipid in tissues muscle, gill, liver and kidney in the lethal and sub lethal concentration of dimethoate on the glycogen contents are decreased in the all tissues at 96 hours when compare with the control group. The results obtained in the present investigation are in correlation with the results obtained by many other researchers. Choudhary *et al.*, (1981) studied the effect malathion on the behaviour and body composition of the *Hetropneustes fossilis* an found that the water and lipid contents of the whole body and ovary decreased as compared to control, where as liver water increased with the increasing concentration of malathion. Tantarpale *et al.*, (2003)

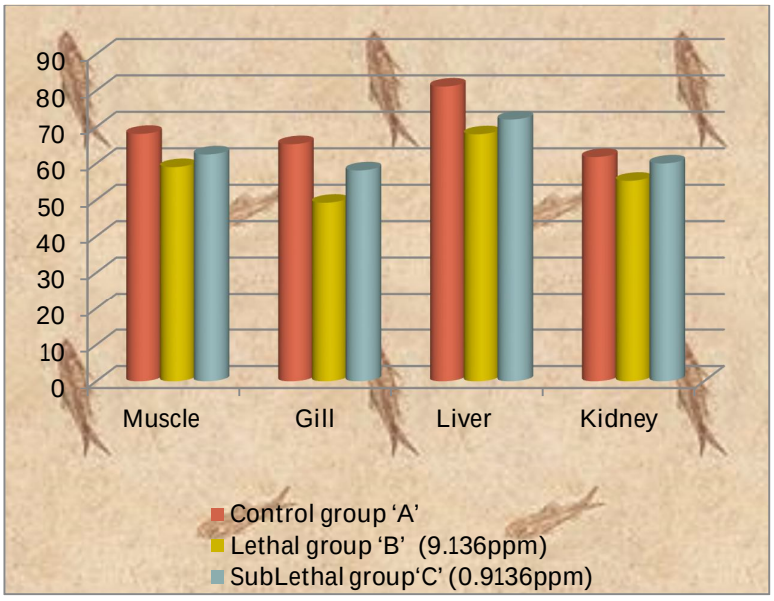

Figure No. 1. Effect of lethal and sublethal concentration of dimethoate on glycogen content of

muscle, gill, liver and kidney of fish following 96 hours exposure to *Rasbora daniconius*

reported that decrease in total lipid content might be due to utilization of lipid during the toxic stress. Amanulla Hameed *et al*. (2004) study on effect of butyllin toxicity of lipid metabolism in an easturine mussel, *Sunetta scripta* and reported that body tissue, significant decrease in the digestive gland was noticed and the percentage of lipid content decreased from 3.6 to 2.1, 3.7 to 1.6 and 3.2 to 1.0 at 24, 48, 72 and 96 hour respectively. Kulkarni *et al.*, (2005) reported that the no significant change in total lipid content in foot for each exposure period was observed when compared with control and no significant changes in total lipid content in hepatopancreas also at each exposure period was observed when compared with control and same result was observed in gills. Similar result reported by Khalid Shareef *et al.* (1986) while studied on biochemical changes induced by malathion on the body organ of fish. Murly and Devi (1982) studied the effect of endosulfan and its isomers on tissue protein, glycogen and lipids in the fish, *Channa punctatus* and found that changes induced in the total protein, glycogen and lipid content of some choosen tissues of the freshwater fish, *Channa punctatus*, exposed to technical endosulfan and its isomers for 96 hours in a continuous flow of water. Technical endosulfan significantly increased the protein and glycogen of kidney and protein content of the brain. Millikin (1983) studied

the interactive effects of dietary protein and lipids on growth and protein utilization in striped bass and found dietary combinations of crude protein. The seasonal variations in the biochemical composition like protein, lipid and glycogen in *Garra mullya* was carried out and the percentages with respect to each month of the year picture of the fish (Somwanshi, 1983). Palanichmy *et al.* (1986) worked on sublethal effects of selected pesticides on protein, carbohydrates and lipid content of muscle and liver of *Oreochroms mossambicus*, observed that the decrease in protein content.

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 spawing 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, where as increase in protein and glycogen of kidney, changes induced by isomer 'A' were more striking than those induced of isomer 'B'.

Baigh Md Azahar *et al.* (1991), worked on hepatochlor on selected biochemical aspects in the functionally different muscles of *Channa punctatus* observed that the organic constituent like carbohydrate glycogen, protein, free amino acid, lipids metabolites like Pyruvic acid and lactic acid were altered in the functionally different muscles of hepatochlor exposed fish. Maruthi *et al*. (2000) worked on effect of sugar mill effluent on oxygen consumption of freshwater fish *Channa punctatus*, observed that decrease in glycogen, total protein, lipid with increasing concentration of distillery effluent indicate a decrease in energy supply metabolism through oxidative pathways which ultimately lead to less growth in the fish, *Channa punctatus*. A. Mohamed (2006) studied on effect of sublehtal toxicity of some pesticides on growth parameters, haematological properties and total production of Nile tilapia (*Oreochromis niloticus*) and water quality ponds and reported that the effect of sublethal doses of dimethoate and Malathion on growth parameters of glycogen depletion was observed when chloropyriphos, an organaophosphate *Oreochromis niloticus* glycogen, protein and lipid in fish muscle gradually decreased with increased pesticidial concentrations, the effect of sublethal doses of Dimethoate and Malathion in *Oreochromis niloticus* bioaccumulated in the liver was higher than the gill or muscle.

Conclusion:

The effect of dimethoate on the different tissues at lethal and sublethal concentration the lipid content in control group were 68.12, 65.30, 81.12 and 61.78 mg/gm/wt of tissues in muscle, gill, liver and kidney respectively. The lipid content in experimental group in lethal and sublethal concentration were 59.01 & 62.49 mg/gm/wt of tissues in muscles, 49.23 & 58.10 mg/gm/wt of tissues in gill, 68.01 & 72.08 mg/gm/wt of tissues in liver and 55.25 & 60.01 mg/gm/wt of tissues in kidney. The percent decrease of glycogen was maximum in gill (24.60 % and 22.02 %) followed by liver (16.17 % and 11.14 %), in muscle (13.37 % and 8.26 %) and (10.56 % and 2.86 %) in kidney to the lethal and sub lethal concentration of dimethoate for 96 hours exposure period. The lipid content after exposure of lethal and sub lethal concentration of dimethoate the decease trend in all the tissues were observed the decreasing trend as liver > muscle > kidney> gill.

In the present investigation, it has been found that decrease in lipid Content of all tissues. Decrease in lipid contents in all tissues muscle, gill, liver and kidney might be due to meet energy demand of fish under pesticide stress.

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