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BIOCHEMICAL CHANGES IN GLYCOGEN CONTENT OF THE FISH *RASBORA DANICONIUS* DURING LETHAL AND SUB -LETHAL EXPOSURE TO DIMETHOATE

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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 glycogen content control group were 15.12, 12.72, 55.14 and 14.11 mg/gm/wt of tissues in muscle, gill liver and kidney and in experimental group in lethal and sub lethal concentration were 12.78 & 14.08 mg/gm/wt of tissues in muscles, 9.01 & 10.22 mg/gm/wt of tissues in gill, 42.30 & 48.28 mg/gm/wt of tissues in liver and 11.12 & 12.01 mg/gm/wt of tissues in kidney respectively. The disturbance in the glycogen profile is one of the outstanding biochemical lesions due to the toxicity of dimethoate. In the lethal and sub lethal concentration the glycogen contents are decreased in the all tissues when compare with the control group. This might be due to increase in glycogenolysis and anoxic stress condition caused by toxicant.

Keywords :- Lethal and sublethal concentration, Dimethoate, Glycogen, 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%

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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 Seifer *et.al.* (1950) were used for the determination glycogen estimation was done by Anthrone reagent.

RESULTS:

In the present investigation the effect of dimethoate on the different tissues at lethal and sub lethal concentration the glycogen content in control group were 15.12, 12.72, 55.14 and 14.11 mg/gm/wt of tissues in muscle, gill liver and kidney respectively whereas the glycogen content in experimental group in lethal and sub lethal concentration were 12.78 & 14.08 mg/gm/wt of tissues in muscles, 9.01 & 10.22 mg/gm/wt of tissues in gill, 42.30 & 48.28 mg/gm/wt of tissues in liver and 11.12 & 12.01 mg/gm/wt of tissues in kidney. The percent decrease of glycogen was maximum in gill (29.16 % and 19.65 %) followed by liver (23.28 % and 12.44 %), in kidney (21.19 % and 14.88 %) and (15.17 % and 6.87 %) in muscle 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.

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 glycogen 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. Koundinya and Ramamurthy (1979) reported decrease in glycogen content of liver and muscle of fish, *Sarotherodon mossambica* exposed to sumithion. Kabeer Ahmmad Sahib, *et al.*, (1980) worked on corelation between subacute toxicity of malathion and AChE inhibition in the tissue of the teleost, *Tilapia mossambica* and reported that the decrease in glycogen level under pesticidal stress. Parvathi (1982) worked on physiological and biochemical responses of carps, *Cyprinus carpio*, *Labeo rohita* and *Cirrihina mrigala* subjected to malathion exposure to different temperatures and reported that, the decrease in glycogen and increase in glucose.

Sridevi (1991) observed the decrement of glycogen with corresponding increase in blood glucose level in fish *Labeo rohita*. Ravishanker *et al.* (1992) has reported the decrease in glycogen content in the tissue of fish *Cyprinus carpio* exposed to cypermethrin. Kulkarni *et al.,* (2005) reported that the glycogen content in foot showed significant decrease after 24 hours of

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exposure. In hepato pancreas no significant decrease in glycogen content were observed after 24 hours but in gills the glycogen content showed significant decrease after 24, 48, 72 and 96 hours of exposure provide when compared with control. Venkataramana, *et al.*, (2006) worked on impact of malathion on the biochemical parameters of gobid fish, *Glossogobius giuris*, showed that the maximum depletion of glycogen content during 72 and 76 hours after treatment with 0.5 ppm malathion. The impact of contaminants on the aquatic ecosystem can be assessed by measuring the biochemical parameters in fish that respond specifically to specific toxicant (Petrivalsky *et al.*, 1997).

The glycogen is the main component of carbohydrate and it is the major source of energy in the every living organism. Some workers showed the investigation on carbohydrate metabolism in response to toxic chemicals (Yeragi and Koli, 2000). Mehjbeen Javed *et.al* (2013) studied on the assessment of heavy metal (Cu, Ni, Fe, Co, Mn, Cr, Zn) pollution in effluent dominated rivulet water and their effect on glycogen metabolism and histology of *Mastacembelus armatus* and it was observed that liver (298.68) of the fish most influenced and had highest metal load followed by kidney (278.119), gills (213.63) and integument (46.86). Muscles (44.64) was least influenced by heavy metals. This clearly indicates that each tissue have different capacity of accumulation. Devendra Pal Singh and Arvind Kumar (2013) studied on changes in liver glycogen contents in fresh water fishes due to cobalt toxicity and shows changes in liver glycogen concentration are always seen in fish exposed to variety of chemical and physical stress. A consistent decrease in hepatic glycogen was observed at both 2.5 and 5.0 ppm treatments. The mean reduction in liver glycogen was 14.78%, 7.63%, 9.54% in *Labeo rohita, Cirrinia.mrigala* and *Cyprinus carpio* respectively.

Seema Tewari (2019) studied on Effect of cadmium on glycogen content in muscle, liver, gill and kidney tissues of freshwater fish *Channa punctatus* (Bloch) observed that the glycogen content was depleted significantly in muscle, liver, gill and kidney tissues of *Channa punctatus* after Cd exposure. Mohammad Illiyas Hussain *et,al.* (2015) Studied on acute toxicity, behavioral response and biochemical composition of blood of common carp, *Catla catla* (Hamilton) to an Organophosphate Insecticide, Dimethoate and result was evident that the glycogen content decreased in the blood of *Catla catla* under the toxicity of Dimethoate. Tasneem and Yasmeen (2020) Studies on Biochemical changes in carbohydrate metabolism of the fish – Cyprinus carpio during sub -lethal exposure to biopesticide – Derisom and reported that the carbohydrate metabolism in gill, liver, kidney, and muscle is disrupted on exposure to biopesticide – Derisom to some extent. The alterations were tissue specific and hence can be used as an important indicator of pesticide pollution.

CONCLUSION:

The amount of glycogen after exposure of 96 hours lc 50 showed highest amount in liver followed by muscle, kidney and gill. The glycogen content in order of decreased in toxicant exposed fish observed in following manner Liver > Muscle > Kidney > Gill at lethal and sub lethal concentration. Decrease amount of glycogen shows in present study this may be due to the toxic stress in the stress condition of an organism needs sufficient energy which is supplied from reserved glycogen. The decrease in glycogen content may be due to the inhibition of hormones which contribute to glycogen synthesis.

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Table 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*

Sr. No	Tissues	Control group 'A'	Lethal group 'B' (9.136ppm)	SubLethal group'C' (0.9136ppm)
1	Muscle	15.12± 0.47	12.78± 0.28 (15.47 %)	14.08± 0.10 (6.87 %)
2	Gill	12.72± 0.31	9.01± 0.09 (29.16 %)	10.22± 0.25 (19.65 %)
3	Liver	55.14± 0.41	42.30+ 0.76 (23.28 %)	48.28± 0.61 (12.44 %)
4	Kidney	14.11± 0.28	11.12± 0.16 (21.19 %)	12.01± 0.11 (14.88 %)

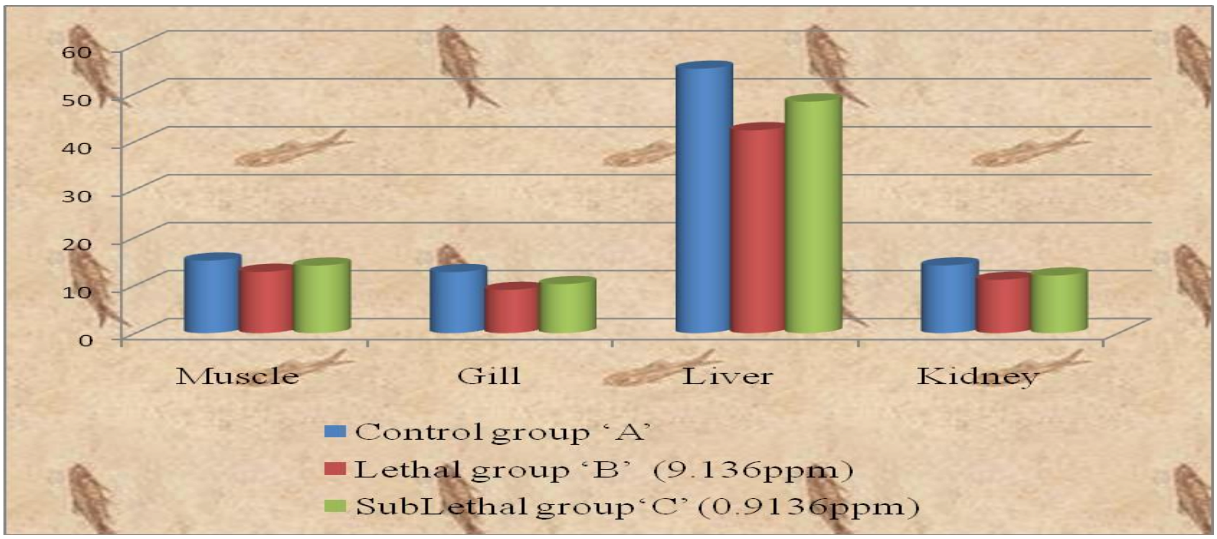

Figure No. 1. Effect of lethal and sublethal concentration of dimethoate on glycogen content of muscle, gill, liver and kidney of fish following 96 hours exposure to *Rasbora daniconius*.

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