

EFFECT OF IMIDACLOPRID INSECTICIDE ON GLYCOGEN CONTENT IN THE MUSCLE TISSUES OF FRESH WATER FISH, *RASBORA DANICONIUS* (HAMILTON, 1822).

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ABSTRACT

The indigenous freshwater fish *Rasbora daniconius* was used for the present experiment to validate the toxic effect of Imidacloprid insecticide. When subjected to increasing concentration of imidacloprid (Nicotine insecticide) acute exposure to different doses of lethal concentrations respectively i.e. 24 hrs, 48 hrs, 72 hrs and 96 hrs with imidacloprid at 5.6 mg, 4.5 mg, 2.9 mg and 1.8 mg respectively. A decrease in the glycogen level was observed in muscle tissue of test fish, it shows the possible effect of insecticidal toxicity. As the fish, *Rasbora daniconius* is largely consumed by people, it is necessary to know the toxic effect of imidacloprid on biochemical changes in muscle tissue.

Figure: 01

References: 16

Tables: 02

KEY WORDS: *Rasbora daniconius*, Imidacloprid, Glycogen, Toxicity.

Introduction

Stress is the first indicator to know that biochemical changes occurring in the body of a fish and during the stress animal requires sufficient energy. Stored Glycogen is being used as a source of energy during mild stress. Energy supplies from reserve materials i.e. Glycogen, Protein and Lipid⁵. It is a little attention was paid to study the changes glycogen level in muscle of freshwater fish *Rasbora daniconius*, as it is an economically important fish.

Increasing use of pesticides for the control of pests in agriculture including commercial and household production of vegetables causes potential health hazards to live stock, especially to fish, frogs, birds, and mammal¹³.

Freshwater becomes a critical natural resource due to number of reasons. Indian economy usually dependent on agricultural crop production, and to achieve the increased ratio in crop production pesticides are wildly being used by farmers, pesticides play an important role in maintaining the agricultural production by protecting all kinds of crops from vector born diseases and pest attack. But the residue of such

pesticides and insecticides reach the ecosystem and create hazardous problems to the aquatic life.

The purpose behind present study is to estimate the alteration in glycogen content in muscle of *Rasbora daniconius* by the influence of Imidacloprid. Increased use of pesticide may be having toxic effects on a wide range of non-target organism. Fish and many other aquatic species are the victim of agricultural pesticides. In the present study effect of Insecticide Imidacloprid on content of glycogen level in muscle tissue of *Rasbora* fish was observed as *Rasbora daniconius* is easily available in rivers, streams and ponds and is very much popular in the poor section of people for its taste and availability at affordable price, hence it is essential to have a comprehensive knowledge of food value and chemical composition to know how far the fish consumed by the people can actually fulfill their energy requirement.

Materials and Methods

Healthy adult freshwater fish *Rasbora daniconius* were collected from "Jatwada" Dam near 5 km. from Aurangabad city, and brought to the laboratory, and acclimatized to laboratory condition and aerated for 48 hours exposed to next three days conditioning at room temperature. Fishes were fed with commercial feed diet daily during this period, Feeding were stopped 24 hours

before toxicity tests, dechlorinated water is necessary to maintain fish as it helps to stabiles its composition and to eliminate residual chlorine which is otherwise considered highly toxic to fishes. Artificial aeration and feeding stopped during toxicity tests. Physico chemical parameters were regularly reported and listed in the Table-1

TABLE-1: The physico-chemical parameters of the acclimatized water (average values).

Temperature	28°C (27°C - 28°C)
Dissolved oxygen	6.2 mg/L ()
Total hardness	72 ppm ()
pH	7.4 (7.1 - 7.5)

Healthy fishes of similar size and weight (7.2 ± 06)cm. and weight (0.780 ± 0.7) were taken and then moved into the same sized glass aquarium containing dechloronited tap water with 20 liter water,10 fishes transferred to each aquaria. Fishes were exposed for 24 hrs, 48 hrs, 72 hrs and 96 hrs with stock solution of imidacloprid 5.6 mg, 4.5 mg, 2.9 mg and 1.8 mg respectively.

Water was changed every day to avoid the accumulation of metabolic waste, and it helps to maintain the concentration constant. After exposure

period fishes were dissected carefully and muscle was taken out. For the estimation of glycogen content 10 mg muscle dissected out from both control and treated fishes separately and added 5 ml of KOH solution and for further estimations was carried out accordingly to the Anthrone reagent method (Siefer *et.al*, 1950).

Results and Discussion

Imidacloprid exposed muscle tissues of *Rasbora daniconius* showed glycogen content of mg/gm wet weight for muscle.

TABLE-2: Glycogen content in the liver of fish *Rasbora daniconius* when exposed to Imidacloprid for a period of 24 hrs, 48 hrs, 72 hrs and 96 hrs.

	Exposure period in hrs.			
	24 hrs.	48 hrs.	72 hrs.	96 hrs.
Control	0.472 ±0.002	0.472 ±0.002	0.472 ±0.002	0.472 ±0.002
Exposure Mean	0.464 ±0.004	0.451 ±0.006	0.428 ±0.004	0.412 ±0.003
SD	0.0724	0.0634	0.0557	0.0492

SD=Standard deviation, *Values are expressed in mg/100mg of wet tissue weight (Mean ± SD);*

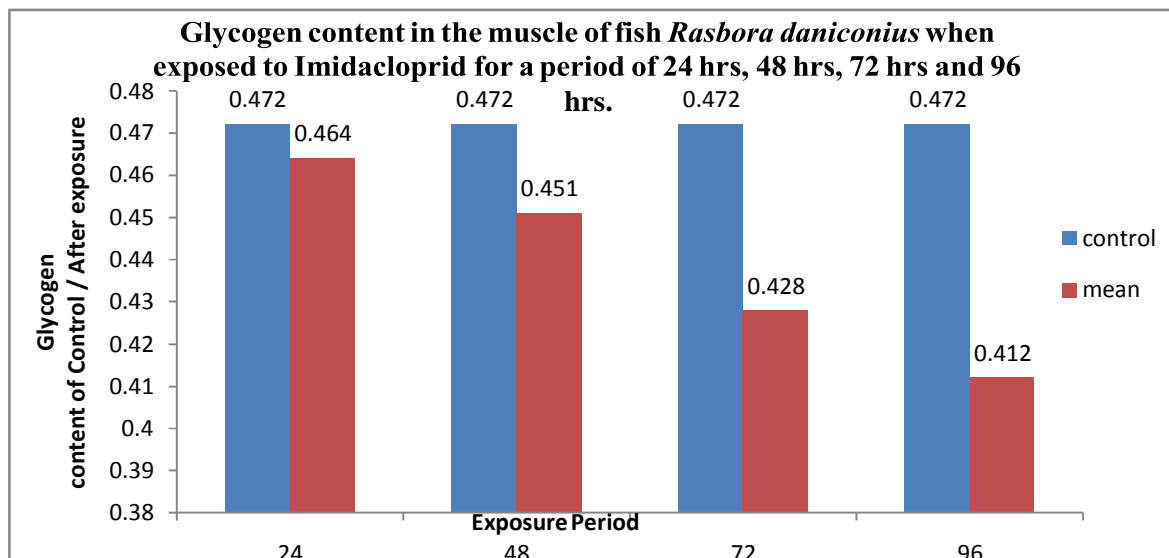


Fig.1: Glycogen content in the muscle of fish *Rasbora daniconius* when exposed to Imidacloprid for a period of 24 hrs, 48 hrs, 72 hrs and 96 hrs.

Table-2 shows glycogen content decreased in the muscle tissue after exposure if Imidacloprid. Glycogen is the major principle and immediate source of energy during the stress² observed that decrease level of glycogen in the fresh fish *Tilapia mossambica* treated with sodium fluoride. It was suggested that the increased glycogenolysis decreases glycogen content in the liver of *Clarius batrachus* exposed to Malathion⁶ noticed that decrease in the glycogen level in *Tilapia mossambica* chronically exposed to Thiodon, due to extreme increase in energy requirement. These was observed depletion in glycogen content after exposure fresh water fish *Channa gachua* to quinalphos.^{7,12, 14} observed decrease in the glycogen level of the muscle of the fish *Colisa fasciata* & *Cyprinus carpio* and observed decrease in muscle tissue glycogen level and related it to the hypoxia condition under which stored glycogen may be utilized by the fish *Tilapia mossambica* exposed to Thiodon. The decrease in the glycogen level can be due to rapid

breakdown to circulate glucose in to the circulatory system to attain the requirement energy². Similar observations have been noticed by other researchers⁸. They who observed decreased level in the glycogen content of the muscle due to the enhanced oxidation through HMP-pathway. These were observed in stress condition carbohydrate reserve depleted to meet energy demand⁹. The decrease level in the glycogen and glucose suggested the possibility of active glycogenolysis as reported.

Conclusion

In the present studies the decrease of glycogen level in the muscle tissue observed in *Rasbora daniconius* treated with imidacloprid, can be due to glycogenolysis in order to meet energy demand under the insecticide stress as per the view expressed by other researchers.

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Imidacloprid exposed muscle tissues of *Rasbora daniconius* show protein content of mg/gm wet weight for muscle.

TABLE-2: Protein content in the muscle of fish *Rasbora daniconius* when exposed to Imidacloprid for a period of 24 hrs, 48 hrs, 72 hrs and 96 hrs.

	Exposure period in hrs.			
	24 hrs.	48 hrs.	72 hrs.	96 hrs.
Control	22.10 ± 0.02			
Exposure Mean	14.70±0.035	12.25±0.028	8.28 ± 0.026	5.42 ± 0.030
SD	0.0824	0.0634	0.0557	0.0492

SD=Standard deviation, *Values are expressed in mg/100mg of wet tissue weight (Mean ± SD)*

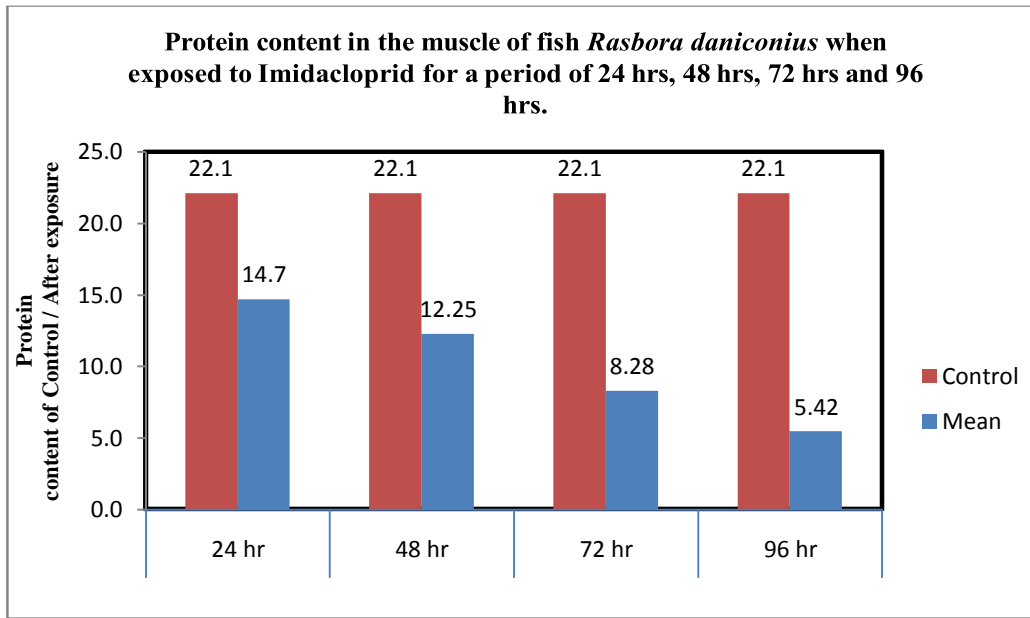


Fig.1: Protein content in the muscle of fish *Rasbora daniconius* when exposed to Imidacloprid for a period of 24 hrs, 48 hrs, 72 hrs and 96 hrs.

In the present study freshwater fish *Rasbora daniconius* when exposed to lethal and sublethal concentrations of Imidacloprid shows significant decrease in the protein content in muscle tissues of the fish. The depletion may be due to increased proteolysis for the utilization of metabolism.

Workers observed decreased value of Protein content in all the tissues when exposed to insecticide (Herbal Plant Extract) in liver, kidney, muscle and gills and others observed in gill and liver of protein levels decreased whereas amino acids increased when *O. mossambicus* was exposed to sublethal concentrations of copper. The depletion of protein content in brain and muscle tissue of fresh water fish, *Oreochromis mossambicus* (*Tilapia*) was due to the utilization of protein to counteract the toxicant stress caused by copper. The increase in amino acid may be due to proteolysis and were routed through gluconeogenesis for increasing the energy supply to cope up with the heavy metal copper stress.

These was change in protein pattern of the liver tissues of Fytran exposed *Channa punctatus*³ and concluded

that Fytran is a pesticide which was badly reducing the population rate of *Channa punctatus* as it badly affects its reproductive system.

It was reported that total protein in muscles 23.20 mg/g after sub lethal concentration at 96 hours treated 17.80 mg/g decreased and liver protein 23.12 mg/g treated fish 19.40 mg/g changes accrued 13.58% kidney protein level 9.60 mg/g after treatment in sub lethal concentration in 96 hours 6.24 mg/g were decreased when exposed to Monocrotophos in muscles, liver and kidney of freshwater fish *Catla catla*⁹.

Conclusion

All the reports support in the present observation that the content of protein in the muscle of *Rasbora daniconius* exposed to acute and chronic concentrations of Imidacloprid, significant alteration in protein content may be due to increased proteolysis activity and the excess use of protein for metabolic process.

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