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ESTIMATION OF THE CHANGES INDUCED IN THE ENZYME ACTIVITY IN FRESH WATER SNAIL *Pilaglobosa* UPON EXPOSING TO SUB-LETHAL CONCENTRATIONS OF ROGOR

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Pronounced changes are noted in the activities of enzymes in tissues of *Pilaglobosa* after exposure to sub-lethal concentrations of rogor for 15 days. In gills, digestive glands and muscles, a significant inhibition is observed in the activities of succinic dehydrogenase, aspartate aminotransferase, alanine amino transferase and acid phosphatase. Increase in activity of lactose dehydrogenase and alkaline phosphate is also significant. These changes in activities of enzymes indicate disturbance in metabolic functions.

INTRODUCTION

Insecticides are known to affect dehydrogenase enzyme systems in the fish body such as succinic dehydrogenase and lactic dehydrogenase (Koundinya and Ramaumurthy, 1978), Reduction in activity of enzymes such as LDH, SDH, GOT and GPT of muscle and liver tissues of *Tilapia mossambica* exposed to Thiodan has been reported by Gaikwad (1981). Rath and Mishra (2016) studied the effect of Dichlorvos on brain and liver acetylcholinesterase action in *Tilapia mossambica*. Acute and chronic effects of Diazinon on activities of dehydrogenases in the digestive system of a freshwater fish, *Channa punctatus* have been reported by Sastry and and Sharma (1980). Bakthavathsalam (2012) studied the effects of furadan on the activities of aspartate and alanine aminotransferases in liver, kidney and intestine of *Anabas testidineus*.

The present study, therefore, deals with effects of Rogor on the activities of the following enzymes in gills, digestive glands and muscles of *Pilaglobosa.*

I. Dehydrogenases:-

a) Lactate dehydrogenase or LDH (EC 1.1.1.27)

b) Succinic dehydrogenase or SDH (1.3.99.1)

II. Aminotransferases:-

a) Aspartate aminotransferase or AAT or Glutamic oxaloacetic transaminase or GOT (EC 2.6.1.1).

b) Alanine aminotransferase or AIAT or Glutamic pyruvic transaminase or (GPT) EC 2.6.1.2).

MATERIALS AND METHODS

The snails were exposed to three sublethal concentratios (0.02, 0.12 & 0.22 mg/L) of Rogor for a period of 15 days according to the static bioassay procedure. Animals were maintained in freshwater at room temperature 28°C +2. A control group was also maintained simultaneously for 15 days as given earlier. At the end of test period, gills, digestive glands and muscles were obtained by sacrificing the control and treated snails. The tissues were homogenized with appropriate buffer solutions and centrifuged to obtain clear supernatants as an enzyme source after proper dilution. From the same solution protein content was estimated by the method recommended by Lowry et al (1951). Enzyme assays were carried out according to the methods given below:

Lactate dehydrogenase (LDH)-

The method described by Bergmeyer et al (1965) was used for assaying the activity of LDH in homogenates of gill, digestive glands and muscle of control and experimental *Pilaglobosa*. The change in the optical density was read on spectrophotometer, Uvicon 810 kontron, in the UV range at 340 nm at one minute interval for 5 minutes.

Succinic dehydrogenase (SDH)

The SDH activity was measured as per the spectrophotometric method described by Slatter and Bonner (2018). Optical density read at 400 nm on spectrophotometer, Uvicon 810 Kontron, at an interval of one minute for six minutes.

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Aspartate aminortransferase (AAT or GOT)

The method described by Bergmeyer and Bernt (1965a) was followed for assaying the AAT activity in tissue homogenates of *Pilaglobosa*.

Alanine aminotransferase (AIAT or GPT).

AIAT activity was assayed by the method described by Bergmeyer and Bernt (1965b). The optical density was measured at 546 nm on Spectronic 20.

RESULTS AND DISCUSSION

Data on the levels of various enzymes studied in gills, digestive glands and muscles of control and Rogor exposed *Pilaglobosa* are presented in Table 1.1, 1.2, 1.3, 1.4. Percent changes in the enzyme levels of tissues of Rogor treated snails from that of control are indicated in the Tables mentioned above.

From the data presented in Table 1.1 and 1.2 it is clear that sublethal concentrations of rogor caused changes to different magnitudes in succinic and lactic dehydrogenase activities in these three tissues of *Pilaglobosa*. However the effect of rogor appears to be different on lactic and succinic dehydrogenase enzyme levels. SDH was inhibited and LDH was stimulated in all the three tissues of the snails at all three exposure concentrations (0.02, 0.12 and 0.22 mg/L) Maximum inhibition (52.64%) of SDH activity and maximum stimulation of LDH activity (109.47%) was observed in muscles and gills respectively, of Snails at 0.22 mg/L exposure concentration while minimum inhibition of SDH (9.84%) and minimum stimulation of LDH (3.03%) was observed in digestive glands at 0.02 mg/L exposure concentration of rogor (Table-1.1 and 1.2)

The inhibitory effect of rogor on SDH activity in *Pilaglobosa* tissues appears to be concentration dependent. The SDH activity reduced significantly in all the three tissues of all rogor treated snails (0.02 0.12 and 0.22 mg/L) with the maximum inhibition of enzyme in the 0.22mg/L exposure group.

Organophosphorus pesticides have been known to have inhibitory effect on the SDH activity in different animals including bivalve molluscs.

A general reduction in the activity of the two transaminases (AAT and AIAT) is evident from Table 1.3 and 1.4). the AAT (GOT) levels decreased significantly in all the selected tissues in snails *Pilaglobosa* exposed to 0.02, 0.12 and 0.22 mg/L rogor except in the gills snails exposed to 0.02 mg/L.

The AIAT activity also showed significant depression (15 to 76%) in the gills of snails at all exposure concentrations while the decrease (10-17%) in the muscles was not significant at these exposure concentrations. In the digestive glands AIAT activity decreased significantly at the 0.02 mg/L and 0.12 mg/L rogor but the decrease was not significantly at the 0.02 mg/L and 0.12 mg/L rogor but the decrease was not significant in digestive glands of snails exposed to 0.22 mg/L rogor.

Much as 76.71% decrease in AIAT level while the drop in digestive glands was 24.12%

On the basis of the study of activities of the selected enzymes (LDH, SDH, AAT and AIAT) it appears that the exposure of *Pilaglobosa* to sublethal concentrations (0.02, 0.12 and 0.22 mg/L) of rogor for 15 days caused significant alterations in the activities of these enzymes disturbing various metabolic activities.

Table 1.1 : Lactic dehydrogenase (LDH) activity (unit/0.1 mg. Protein) in different tissues of *P. globosa* exposed to rogor for 15 days

Exposed to rogor concentration	LDH activity (unit/0.1 mg. Protein) in different tissues of *Pilaglobosa*		
	Gills	Digestive gland	Muscle
Control (0.00)	6.23 ± 0.64	8.88 ± 0.72	6.11 ± 0.49
0.02	8.23 ± 1.44 (–31.81%)	9.15 ± 2.12 (+3.03%)	6.38 ± 0.67 (+4.46%)
0.12	11.69 ± 2.12 (+87.66%)	11.62 ± 2.09 (+30.89%)	7.18 ± 1.38 (+17.48%)
0.22	13.05 ± 2.01 (+109.47%)	11.78 ± 2.63 (+32.71%)	9.95 ± 1.52 (+62.86%)

Values are mean ± S.D. of 5 determinations

Value s in parenthesis indicate % variation from control

*=P<0.05

Table 1.2 Succine Dehydrogenase (SDH) activity(unit/0.1 mg, Protein) in different tissues of *P. globosa exposed* to rogor for 15 days

Exposed to rogor concentration	LDH activity (unit/0.1 mg. Protein) in different tissues of *Pilaglobosa*		
	Gills	Digestive gland	Muscle
Control (0.00)	5.28 ± 0.14	5.07 ± 0.15	4.89 ± 0.21
0.02	3.89 ± 0.369 (–26.24%)	4.57 ± 0.17 (–9.84%)	4.19 ± 0.23 (–14.29%)
0.12	3.77 ± 0.18 (–28.59%)	3.49 ± 0.23 (–31.27%)	4.06 ± 0.35 (–16.91%)
0.22	3.69 ± 0.21 (–30.06%)	3.12 ± 0.35 (–38.52%)	2.31 ± 0.45 (–52.64%)

Values are mean±S.D of 5 determinations

Value S in parenthesis indicate % variation from control

*=P <0.05

Table 1.3 Aspartate aminotransferase (AAT or GOT) activity (unit/ 0.1 mg. Protein) in different tissues of *P. globosa* exposed to rogor for 15 days

Exposed to rogor concentration mg/L	AAT activity (unit / 0.1 mg Protein) in different tissues of *Pilaglobosa*		
	Gills	Digestive gland	Muscle
Control (0.00)	4.60 ± 0.76	5.32 ± 0.064	4.87 ± 0.019
0.02	4.56 ± 0.279 (–0.746%)	4.86 ± 0.233 (-8.63%)	4.38 ± 0.160 (–10.03%)
0.12	3.61 ± 0.305 (–21.37%)	3.05 ± 0.237 (–42.63%)	4.57 ± 0.073 (–6.25%)
0.22	3.12 ± 0.144 (–32.09%)	3.85 ± 0.255 (–27.67%)	3.7 0± 0.189 (–23.93%)

Values are mean ± S.D of 5 determinations

Value s in parenthesis indicate % variation from control

*= P <0.05

Table 1.4 Alanine Aminotransferase (AlAT or GPT) activity (unit/0.1 mg. Protein) in different tissues of P globosa exposed to rogor for 15 days.

Exposed to rogor concentration mg/L	AlAT activity (unit / 0.1 mg Protein) in different tissues of *Pilaglobosa*		
	Gills	Digestive gland	Muscle
Control (0.00)	4.76 ± 0.129	4.95 ± 0.933	5.96 ± 0.531
0.02	4.01 ± 0.347 (-15.78%)	3.50 ± 0.246 (-29.29%)	5.35 ± 0.249 (-10.25%)
0.12	2.02 ± 0.100 (-57.62%)	2.61 ± 0.190 (-47.23%)	5.06 ± 0.44 (-15.08%)
0.22	1.11 ± 0.151 (-76.71%)	3.76 ± 0.240 (-24.12%)	4.92 ± 0.722 (-17.38%)

Values are mean ± S.D. of 5 determinations

Value s in parenthesis indicate % Variation from control

*=P <0.0

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