Effect of Endosulfan on digestive enzymes of Land Slug *Laevicaulis alte*.

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ABSTRACT

To meet the increasing food demands, several types of pesticides are used for controlling various types of agricultural pests. As such many useful non-target organisms also have the toxic effect of pesticide. Most of the pesticides interfere with the enzyme action and produce many physiological and biochemical changes in the bodies of non-target organisms. Gastropods exposed to toxicants for even a short span of time may produce considerable destruction of the internal organs especially their enzymatic architecture. The present investigation was therefore, undertaken to study the alterations produced in the digestive enzymes amylase and invertase in the gastropod, *Laevicaulis alte* after treatment of endosulfan.

Keywords: Pesticide, Pest, Enzyme, Toxicant.

INTRODUCTION:

Gastropods exposed to toxicants for even a short span of time may produce considerable destruction of the internal organs especially their enzymatic architecture. Majority of enzymes are functional in various metabolic pathways and changed pattern of enzyme activity induced by pesticide, is the surest indicator of functional disorder, enzyme assays and estimation of metabolites have been proposed as valid biochemical means of monitoring toxicity. Pollutants act at the biochemical level, at a number of sites but an organism may be able to adapt by normal homeostatic mechanisms, so that enzyme inhibition may reduce the overall fitness of an organism. Enzyme bio-assays remain, however, useful techniques in looking for sub lethal effects of toxic pollution.

Molluscs show a variety of digestion patterns as they have learnt to feed in different ways due to their ability to adapt themselves to life in so many different types of habitats. The comparative physiology of digestion in molluscs has been reviewed by Vanwheel (1961). The correlation between digestive enzymes and diet has been established but specific characterization of different enzymes of different animals presents many interesting and puzzling question (Prosser, 1973). Several workers have reported the effect of pesticides and heavy metals on enzyme activity in molluscs, which was shown by either depletion of enzymes (Jackim et al., 1970; Hinton and Koehing, 1975) or elevation of enzymes (Banerjee et al., 1978; Verma and Prasad, 1972).

Biswas and Ghosh (1968) elaborated amylolytic, proteolytic and lipolytic enzyme activity in molluscs, which was shown by either depletion of enzymes (Jackim et al., 1970; Hinton and Koehing, 1975) or elevation of enzymes (Banerjee et al., 1978; Verma and Prasad, 1972).Thus, enzyme bioassay can provide diagnostic means to assess change or injury caused to organism due to exposure to pollutants. In clinical medicine, serum enzyme analysis has been used for decades to diagnose, both the site and extent of organ injury (Schmidt and Schmidt, 1976). Eboua N. Wandan and et.al.(October 2010) studied impact of the insecticide endosulfan on the growth of the African giant snails and shows that the weight gain of snails was very weak and was not stable after the application of the insecticide.

Concillia Monde and et.al,(18 March 2016)worked on Effects of Endosulfan on Predator–Prey Interactions Between Catfish and Schistosoma Host Snails and found that Exposure to sublethal concentrations of endosulfan resulted in significant differences in catfish rate of predation. Mohamed A. Radwan (04th October 2016) has studied Comparative Toxic Effects of Some Pesticides with Different Modes of Action

Against the Land Snail, Theba pisana and concluded that of the tested pesticides showed molluscicidal potential against the white garden snail, T. pisana. Although several workers have reported the effect of different pollutants on enzyme activity, little information is available regarding the effect of pesticides on digestive and metabolic enzymes of the gastropods

The present investigation was therefore, undertaken to study the alterations produced in the digestive enzymes amylase, invertase, protease and lipase metabolic enzyme, arginase in the gastropod, L. alte after treatment of endosulfan.

MATERIAL AND METHODS:

Medium sized terrestrial snail *Laevicaulis alte* (8 to 10 cm in length and 2 to 3 cm in width) used in the present study were collected from Kalwan Taluka area. They were acclimatized to the laboratory conditions for four to five days. The air temperature was 31.25° +2.2173°. Since the animals are micro feeders, no special food was supplied during the experiment.

To study the effect of pesticides endosulfan on the enzyme activity of gastropods, *L. alte* were exposed to lethal concentration (LC50 ppm of 96 hrs) for acute treatment. The active and acclimatized medium sized animals were divided into five groups, one group was maintained as control and from the remaining four, each one was separately exposed for acute treatment of pesticides up to 96 hours during pre-reproductive, reproductive and post-reproductive period. After an interval of 24 hours enzyme activity of treated and control animals was determined up to 96 hours during pre-reproductive, reproductive and post-reproductive periods.

For digestive enzymes such as amylase and invertase the animals were dissected and the digestive gland was taken out, cleaned and homogenized in ice cold distilled water.

RESULTS

The enzyme activities were studied in the control and pesticide treated slugs *Laevicaulis alte*. The results are summarized in figures 1 to 6. The activities of different digestive enzymes treated with different pesticides were found to be dependent on the chemical nature of pesticide and period of exposure along with reproductive status of the gastropods.

1) Amylase (Figs. 1 to 3):

The amylase activity was significantly decreased in the digestive gland of *Laevicaulis alte* after pesticidal exposure this decrease was between 21.1028% ($P < 0.01$) to 94.7223% ($P < 0.001$) in pre-reproductive period, 31.5578% ($P < 0.001$) to 56.1922 % in reproductive period and between and 45.6244% ($P < 0.001$) to 49.5403% ($P < 0.001$) in post-reproductive period.

Fig.1 : Changes in the Amylase activity of *Laevicaulis alte* after acute pesticidal stress during Pre-reproductive period.

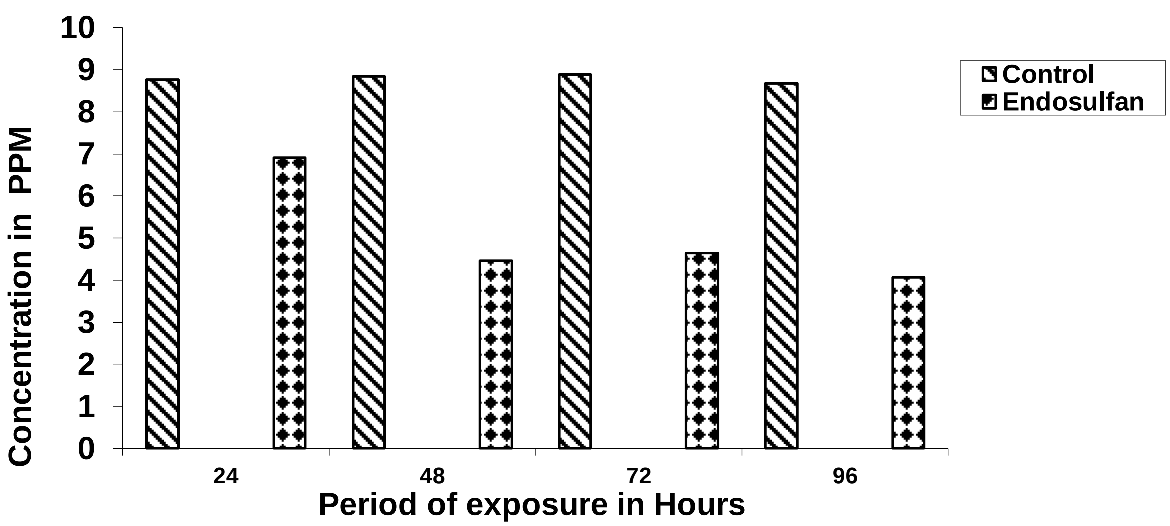


Fig. 2: Changes in the Amylase activity of *Laevicaulis alte* after acute pesticidal stress during reproductive period.

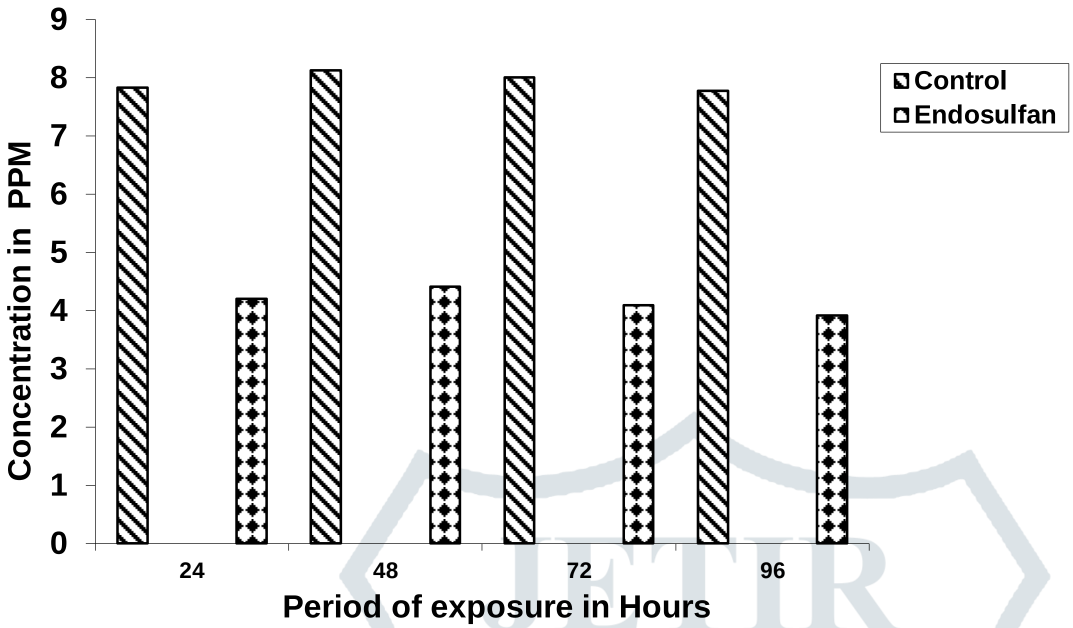
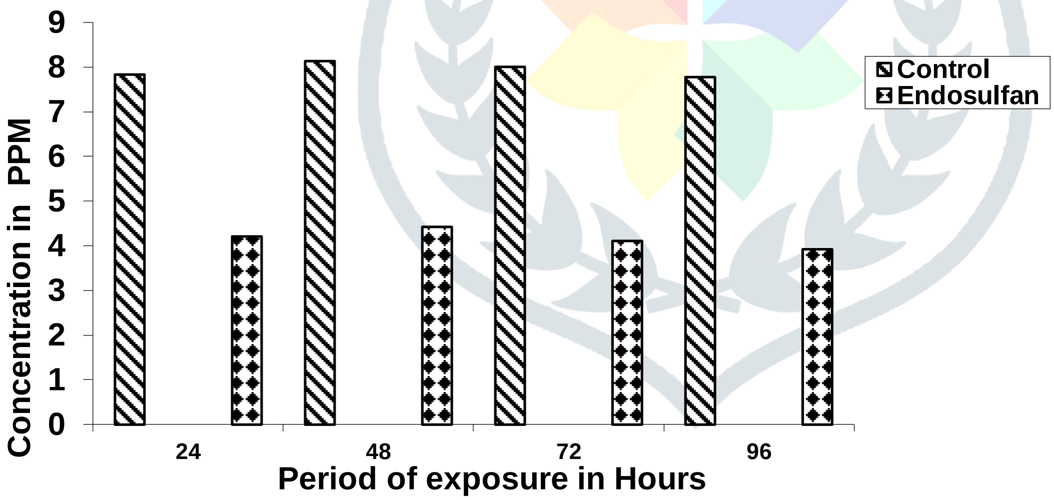


Fig. 3 : Changes in the Amylase activity of *Laevicaulis alte* after acute pesticidal stress during Post-reproductive period.



2) Invertase (Figs. 4 to 6):

After acute exposure to pesticides, the inhibition of enzyme activity was observed

In endosulfan percent decrease was observed from 21.45 % ($P < 0.001$) to 54.21 % ($P < 0.001$) in pre-reproductive period, 49.2173 % ($P < 0.001$) to 59.6247 % ($P < 0.001$) in reproductive and from 41.0223 % ($P < 0.001$) to 58.7616 % ($P < 0.001$) in post reproductive period. A constant depletion in invertase activity was observed after the stress of pesticides used.

Fig.4 : Changes in the invertase activity of *Laevicaulis alte* after acute pesticidal stress during Pre-reproductive period.

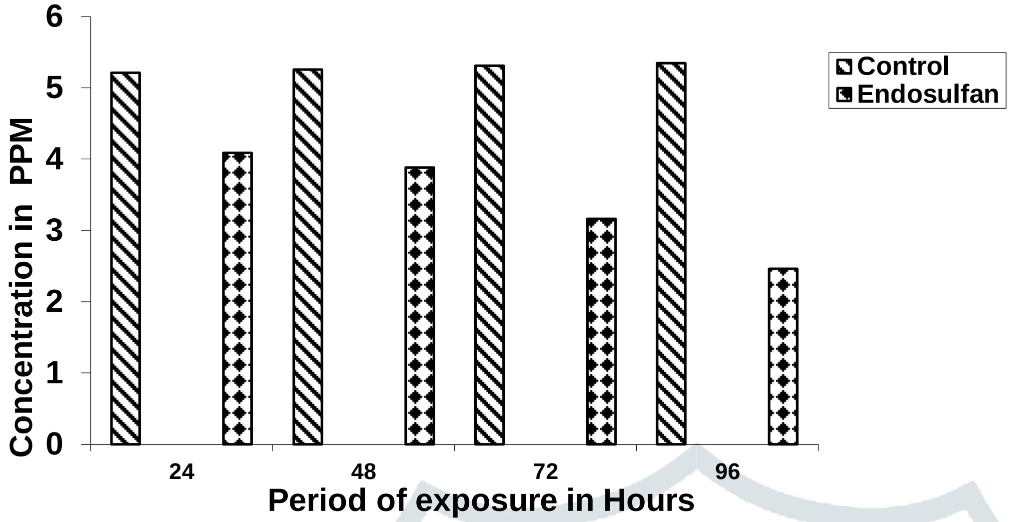


Fig. 5 : Changes in the invertase activity of *Laevicaulis alte* after acute pesticidal stress during reproductive period.

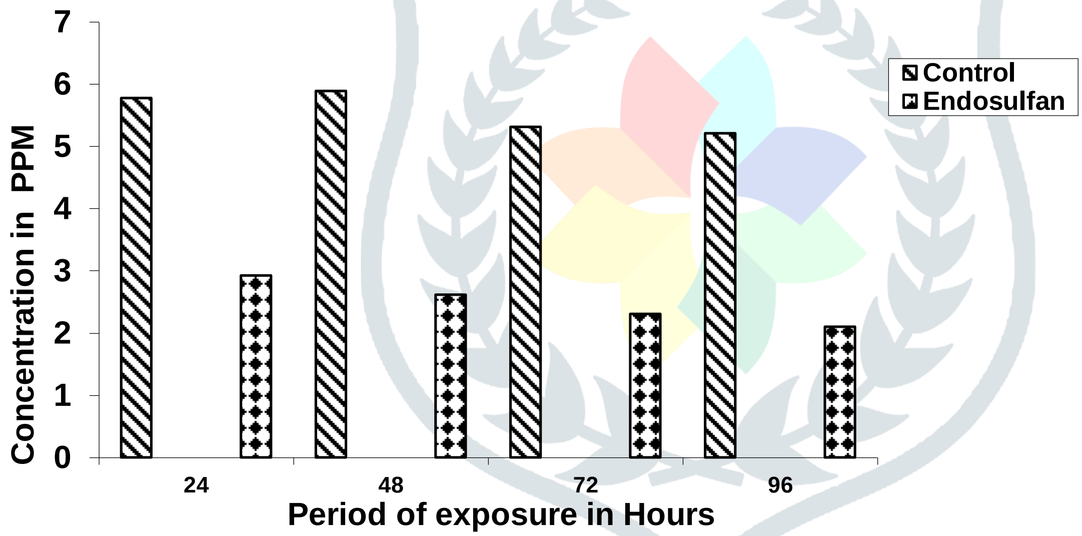
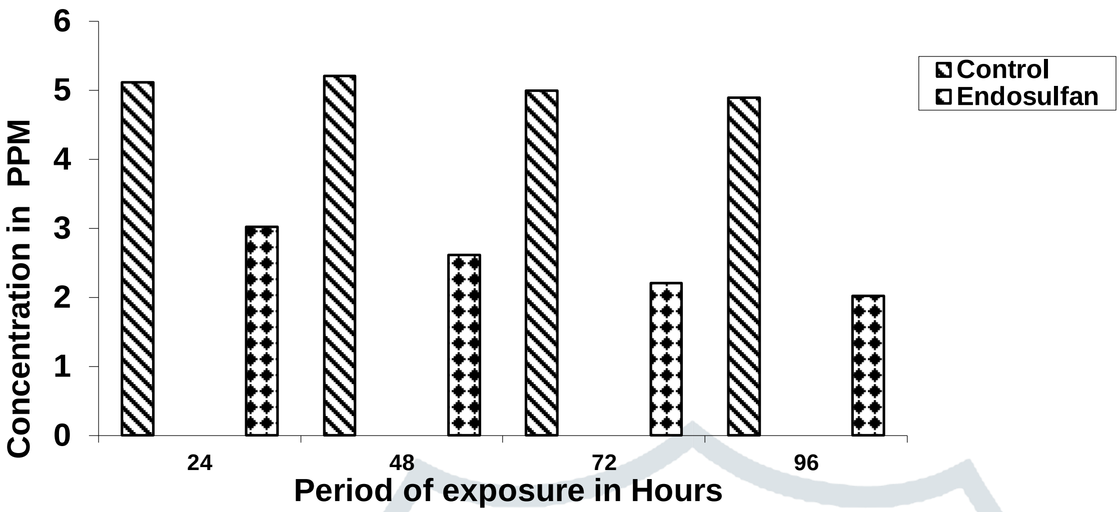


Fig. 6 : Changes in the invertase activity of *Laevicaulis alte* after acute pesticidal stress during Post-reproductive period.



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