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Effect of some Selected Insecticides on the Activity of Invertase at Different Stages of Pentatomid Bug *Cyclopelta siccifolia* W.

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Abstract
The invertase enzyme which has been reported to occur in the digestive tract of several insects is believed to be an important enzyme for digestion and utilization of sucrose by insects. In the present investigation the effect of different insecticides such as Endosulfan, Monocrotophos, Methomyl, Phosphomidon and Carbaryl on invertase activity has been carried out at different stages of Pentatomid bug *Cyclopelta siccifolia* W. with lethal concentrations of respective insecticides. The data revealed that maximum decrease in Invertase activity was detected with (45%) at 24 hours. In case of II instar nymphs the least activity was observed with Carbaryl and it was -75.20% at 24 hours. In IV instar nymphs endosulfan showed its supremacy by reducing the activity by -8.5% in comparison with control. The overall results revealed that the activity of invertase varies with different insecticide treatments and it has been concluded that least activity was recorded with Carbaryl at II instar stage compared to other insecticides.

***Key words*:** Petatomid bug, *Cyclopelta siccifolia*, Invertase, Insecticides

Introduction

The Pentatomid bug *Cyclopelta siccifolia* W. is a major pest on economically important tree *Pongamia pinnata*. The insect comprises 7 instar nymphal stages; all stages are phytophagus, mainly depending upon sucking the plant sap. The digestive enzymes in insects are commonly found in the salivary secretions and regions of digestive tract have been reviewed (House, 1965). The digestive enzymes in insects generally adapted to the specific diet on which the species feed (Wigglesworth, 1963). The invertase enzyme has been reported to occur in digestive tract of several insects is believed to be important for digestion and utilization of sucrose by insects. In the present investigation the impact of different insecticides on the digestive enzyme invertase has been studied.

Materials and methods

To conduct bio-assay and effect of different insecticides on the activity of Invertase in adults and different selected instars of *Cyclopelta siccifolia* W, the insects were exposed to lethal concentrations of different insecticides such as Endosulfan, Monocrotophos, Carbaryl, Methomyl and Phosphomidon. The insects were collected from *Pongamia pinnata* tree from near by Applied Zoology Department, Kuvempu

University, Bhadra Reservoir Project area. The treated insects were washed thoroughly, legs, head and wings were removed and grained in chilled glass tissue grinder along with 0.7% NaCl. The homogenate was centrifuged for 5000 rpm for 30 min. The aliquot of the supernatant was filtered through glass wool to remove fatty material. The enzyme assay was carried out according to Ishaaya and Swiriski (1970). The optimum pH, optimum temperature, substrate concentration and incubation time were determined earlier and the pH was 5.6, optimum temperature 45°C, substrate concentration 3% and incubation time 60 min.

Results and discussion

The insects treated with lethal concentrations of different insecticides revealed varied results with varied duration. In adults the activity of invertase decreased (-45.53%) with Monocrotophos followed by remaining insecticides such as Methomyl (-43.34%), Carbaryl (-42.60%), Endosulfan (-41.53%) and Phosphomidon (-40.24%) respectively (Table 1). In II instar nymphs rapid decrease in the activity of invertase was witnessed with Carbaryl and it was -75.20% at 24 hours. The other insecticides ranked the consecutive positions (Table 2). In IV instar nymphs the supremacy in invertase enzyme inhibition was evidenced by Endosulfan (-8.5%). The activity of invertase in the IV instar was least affected by the impact of insecticides, it was Monocrotophos(-3.90%), Methomyl (-3.51%), Phosphomidon (-3.1%) and Carbaryl (-1.10%) (Table 3). In VI instar nymphs decrease in invertase activity was maximum with Methomyl and it was -34.30%. The other insecticides such as Endosulfan, Monocrotophs, Phosphomidon and Carbaryl the inhibition rate was lower (Table 4). At 48 hours least activity was observed with Methomyl in adults, II and VI instar nymphs. In case of IV instar nymphs the decrease in the activity of invertase was high with Endosulfan.

In the present investigation the activity of digestive enzyme invertase was used as parameter for studying the effect of insecticides. It has been observed that at 24 hours least activity of invertase was observed with Carbaryl in II instar nymphs. At 48 hours concern the activity was highly declined in presence of Methomyl in II instar. So the invertase activity was minimum in presence of insecticides in II instar stage. These observations are in conformity with findings of Vatsala and Choklingum (1986) who observed the effect of insecticides resulting into the inhibition of digestive enzymes in *Spodoptera litura* and same type of observation was also made by Lomte and Patil (1989) on army worm caterpillar *Mythimia separata.* Similar observation was made by Rekha *et al*. (2000). Kuruppasamy *et al*. (2001) showed the reduction in enzyme synthesis is due to the direct effect of toxicants on the synthesis.

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Table 1. Effect of different insecticides on the activity of Invertase in adult Pentatomid bug *C. siccifolia* W.

	24 hours	**48 hours**
Endosulfan	23.97±0.02 (-41.23%)	15.80±0.002 (-56±1%)
Monocrotophos	22.33±0.36 (-45.53%)	16.11±0.05 (-58.4%)
Methomyl	23.23±0.36 (-43.23%)	14.96±0.05 (-58.4%)
Phosphomidon	24.5±0.21 (-40.24%)	17.9±0.35 (-50.2%)
Carbaryl	23.53±0.40 (-42.60%)	16.81±0.18 (-53.30%)
Control	41.0±0.04	36.0±0.007

± indicate standard error each value is the mean of 6 replications
Enzyme activity for Invertase expressed in terms of µg glucose/ml/mg tissue/hour.

Table 2. Effect of different insecticides on the activity of Invertase in II instar nymphs of Pentatomid bug *C. siccifolia* W.

	24 hours	**48 hours**
Endosulfan	19.98±0.06 (-47.2%)	10.83±0.2 (-58.82%)
Monocrotophos	18.35±0.35 (-51.71%)	12.40±0.14 (-52.85%)
Methomyl	19.10±0.03 (-49.68%)	10.20±0.007 (-61.21%)
Phosphomidon	18.33±0.35 (-51.71%)	12.40±0.14 (-52.85%)
Carbaryl	18.58±0.21 (-75.20%)	13.0±0.03 (-50.57%)
Control	37.96±0.20	26.30±0.14

± indicate standard error each value is the mean of 6 replications
Enzyme activity for Invertase expressed in terms of µg glucose/ml/mg tissue/hour.

Table 3. Effect of different insecticides on the activity of Invertase in IV instar nymphs of Pentatomid bug *C. siccifolia* W.

	24 hours	**48 hours**
Endosulfan	23.40±0.62 (-8.5%)	16.40±0.16 (-53.37%)
Monocrotophos	24.66±0.5 (-3.90%)	15.5±0.1 (-46.92%)
Methomyl	24.7±0.15 (-3.51%)	16.06±0.05 (-51.57%)
Phosphomidon	24.8±0.36 (-3.1%)	16.60±0.22 (-49.7%)
Carbaryl	24.86±0.36 (-1.01%)	16.60±0.22 (-49.83%)
Control	25.6±0.51	33.03±0.05

± indicate standard error each value is the mean of 6 replications
Enzyme activity for Invertase expressed in terms of µg glucose/ml/mg tissue/hour.

Table 4. Effect of different insecticides on the activity of Invertase in VI instar nymphs of Pentatomid bug *C. siccifolia* W.

	24 hours	**48 hours**
Endosulfan	25.80±0.19 (-32.2%)	16.40±.0.16 (-32.37%)
Monocrotophos	26.8±0.09 (-29.6%)	15.1±0.05 (-56.8%)
Methomyl	25.03±0.27 (-34.30%)	15.1±0.03 (-56.8%)
Phosphomidon	27.46±0.1 (-27.9%)	17.03±0.05 (-51.3%)
Carbaryl	27.53±0.64 (-27.82%)	17.03±0.05 (-51.3%)
Control	38.16±0.05	35.0±1.6

± indicate standard error each value is the mean of 6 replications
Enzyme activity for Invertase expressed in terms of µg glucose/ml/mg tissue/hour.

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