

## Relative Toxicity of Certain Insecticides to *Adelencyrtus mayurai* (Subba Rao), A Parasitoid of Sugarcane Scale Insect, *Melanaspis glomerata* (Green)

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### ABSTRACT

Toxicity of seven insecticides viz., carbosulfan, dimethoate, malathion, monocrotophos, cypermethrin, decamethrin and fenvalerate each at three concentrations were tested for their relative toxicity to *Adelencyrtus mayurai* (Subba Rao), the principal parasitoid of sugarcane scale insect, *Melanaspis glomerata* (Green), by exposing the adults to the treated surface. At recommended concentration, both fenvalerate (31.3% mortality) and deltamethrin (49.9%) proved to be less toxic to the adult parasitoids. Malathion caused 93.0% mortality, while the other insecticides inflicted cent per cent mortality. The mortality increased with increase in the concentration of the insecticides and decreased with increase in time lag between treatment with insecticide and exposure of the parasitoid to the treated surface.

KEY WORDS : *Adelencyrtus mayurai*, parasitoid, *Melanaspis glomerata*, insecticide susceptibility

*Adelencyrtus mayurai* (Subba Rao) (Encyrtidae:Hymenoptera) is an important and widely distributed uniparental parasitoid of sugarcane scale insect, *Melanaspis glomerata* (Green) (Venkateswara Rao, 1983; Easwaramoorthy and Kurup, 1986; Easwaramoorthy *et al.*, 1983, 1986). Under field conditions, the average level of parasitization observed was 8.68 per cent (Venkateswara Rao and David, 1986). Attempts made on mass multiplication and field colonisation against *M. glomerata* has given promising results (Anon., 1989). To combat scale insect menace, chemical control measures combined with detashing is currently recommended. It is essential to know the safety of the insecticides recommended for the control of scale insect to the principal parasitoid so as to integrate various control methods. In the present study, the relative contact toxicity of seven insecticides as foliar sprays to *A. mayurai* was determined.

### MATERIALS AND METHODS

Seven insecticides viz., carbosulfan (Marshal 24 EC), dimethoate (Rogor 30 EC), malathion (Malamar 50 EC), monocrotophos

(Nuvacron 36 WSC), cypermethrin (Ripcord 10 EC) and decamethrin (Decis 2.8 EC) were selected based on their efficacy in the control of the scale insect (Muralikrishna, 1984). Three concentrations of each insecticide, a recommended dose, half the recommended dose and one and half times the recommended dose (Table 1) were tested. Cane pieces of 15 cm, colonised with sparse population of scale insect (Easwaramoorthy and Shanmugasundaram, 1991) were sprayed with the insecticide solution. After shade-drying, the lower cut end of the cane piece was planted in a tray containing sand. Filter paper cut to the size of the base of the chimney was kept surrounding the cane sett. Top end of the chimney was covered with a muslin cloth held in position by a rubber band.

Twenty five freshly-emerged parasitoids were released into each chimney, containing the insecticide-treated cane setts with host insects. Setts dipped in water served as control. The treatments were replicated four times. Cotton swab dipped in 50% honey placed on the inner side of the chimney served as food for the

parasitoids. After confinement of the parasitoids inside the chimney for one hour, they were transferred to fresh chimnies containing untreated cane setts colonised with scale insects. Mortality was recorded after 24 hours.

In the second experiment, the cane setts were treated with recommended dose of the insecticides. The cane setts were exposed to the parasitoids 1, 24, 48 and 72 hours after treatment. The experiment was conducted as detailed under the first experiment.

Mortality data were converted into arc sine  $\times \sqrt{\text{percentage}}$  after converting zero values to 0.1 and analysed using 'F' test.

## RESULTS AND DISCUSSION

At the normal recommended dose, significantly low mortality (31.3%) of the parasitoid was recorded in decamethrin treatment. This was followed by fenvalerate (49.9%). Malathion recorded a significantly higher mortality of 93.0%. Dimethoate, carbosulfan, monocrotophos and cypermethrin caused 100% mortality of the parasitoids (Table 1).

When all the three concentrations were considered together, significantly less mortality (48.8%) was observed in fenvalerate followed by decamethrin (53.0%). Malathion and dimethoate recorded 89.6 and 98.4% mortality

respectively. Cypermethrin, carbosulfan and monocrotophos caused 100% mortality at all the three doses tested. Between the different doses tested, low dose of the insecticide (half the recommended dose) was found to be significantly less toxic (65.8%) followed by recommended dose (71.9%). Dosage above the recommended concentration was highly toxic and it caused 83.6% mortality.

Cent per cent mortality was observed even when the parasitoids were exposed 72 h after treatment in monocrotophos, carbosulfan and cypermethrin (Table 2). Dimethoate and malathion retained fairly high degree of toxicity even at 72 h. Though cypermethrin was more toxic compared to decamethrin initially, at 48 and 72 h after treatment it showed significantly less mortality.

From the study it can be inferred that synthetic pyrethroids like fenvalerate and decamethrin were relatively safer to *A. mayurai* than the other insecticides tested. Synthetic pyrethroids were reported to be less harmful to several other parasitoids (Waddil, 1978; Wilkinson *et al.*, 1979; Mani and Krishnamoorthy, 1984; Varma *et al.*, 1988) and a dipteran parasitoid *Sturmiopsis inferens* Tns (Easwaramoorthy *et al.*, 1990). However, cypermethrin was found to be highly toxic to the parasitoid. The insecticides, malathion and dimethoate which are currently recommended for scale insect control were found to be more

Table 1. Effect of different concentrations of insecticides on the mortality of *A. mayurai*

Insecticide	Concentration tested (%)			Adult mortality* at concentration (%)			
	Low	Recom- mended	High	Low	Recom- mended	High	Pooled mean
Malathion	0.05	0.1	0.15	78.0 <sup>c</sup>	93.0 <sup>c</sup>	97.6 <sup>b</sup>	89.6 <sup>c</sup>
Dimethoate	0.04	0.08	0.12	95.3 <sup>d</sup>	100.0 <sup>d</sup>	100.0 <sup>d</sup>	98.4 <sup>d</sup>
Fenvalerate	0.005	0.01	0.015	23.7 <sup>a</sup>	49.9 <sup>b</sup>	73.0 <sup>a</sup>	48.9 <sup>a</sup>
Cypermethrin	0.01	0.02	0.03	100.0 <sup>e</sup>	100.0 <sup>d</sup>	100.0 <sup>d</sup>	100.0 <sup>e</sup>
Carbosulfan	0.01	0.02	0.03	100.0 <sup>e</sup>	100.0 <sup>d</sup>	100.0 <sup>d</sup>	100.0 <sup>e</sup>
Monocrotophos	0.1	0.2	0.3	100.0 <sup>e</sup>	100.0 <sup>d</sup>	100.0 <sup>d</sup>	100.0 <sup>e</sup>
Decamethrin	0.01	0.02	0.03	29.7 <sup>b</sup>	31.3 <sup>a</sup>	98.3 <sup>c</sup>	53.0 <sup>b</sup>
Mean				65.8	71.9	83.6	

\* Means followed by the same letters are not different statistically (P=0.05) by LSD

**Table 2. Per cent mortality of *A. mayurai* adults exposed to insecticides at different intervals after treatment**

Treatment	Adult mortality (%) h post treatment*				
	1	24	48	72	Mean
Malathion 0.1%	100.0 <sup>c</sup>	88.0 <sup>c</sup>	91.1 <sup>c</sup>	79.1 <sup>c</sup>	89.6 <sup>c</sup>
Dimethoate 0.08%	100.0 <sup>c</sup>	100.0 <sup>d</sup>	100.0 <sup>d</sup>	93.8 <sup>d</sup>	98.4 <sup>d</sup>
Fenvalerate 0.01%	62.2 <sup>b</sup>	52.0 <sup>a</sup>	42.7 <sup>a</sup>	38.7 <sup>a</sup>	48.8 <sup>a</sup>
Cypermethrin 0.02%	100.0 <sup>c</sup>	100.0 <sup>d</sup>	100.0 <sup>d</sup>	100.0 <sup>e</sup>	100.0 <sup>e</sup>
Carbosulfan 0.02%	100.0 <sup>c</sup>	100.0 <sup>d</sup>	100.0 <sup>d</sup>	100.0 <sup>e</sup>	100.0 <sup>e</sup>
Monocrotophos 0.1%	100.0 <sup>e</sup>	100.0 <sup>d</sup>	100.0 <sup>d</sup>	100.0 <sup>e</sup>	100.0 <sup>e</sup>
Decamethrin 0.01%	55.4 <sup>a</sup>	53.3 <sup>b</sup>	54.0 <sup>b</sup>	50.0 <sup>b</sup>	53.0 <sup>b</sup>

\* Means followed by the same letters are not different statistically (P=0.05) by LSD

harmful to the parasitoid. In an earlier study, malathion was observed to be extremely toxic to this parasitoid, when exposed 72 h after treatment. Similarly, in the case of dimethoate only 25.3 per cent survival was noticed when the parasitoids were exposed to 7 days after treatment (Renuka Devi, 1985) indicating their harmful effects to the parasitoid.

#### ACKNOWLEDGEMENT

The authors are thankful to Dr. K. Mohan Naidu, Director, Sugarcane Breeding Institute for his encouragement and to the ICAR for funding the AP Cess Fund Scheme under which this work was carried out.

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