J. Biol. Control, 14(1): 5-7, 2000

Toxicity of certain insecticides to predatory green lacewing, *Chrysoperla carnea* Stephens (Neuroptera: Chrysopidae)

G. SRINIVASAN* and P. C. SUNDARA BABU
Department of Agricultural Entomology
Tamil Nadu Agricultural University
Coimbatore 641 003, Tamil Nadu, India
E-Mail: vctnau@vsnl.com

ABSTRACT: **Insecticides showed distinct deleterious effects on different life stages of predatory green lacewing, *Chrysoperla carnea* Stephens. Abamectin caused the maximum egg mortality of 25.2 per cent as against 6.3 per cent in control. Carbaryl affected the grubs more and the mortality was 83.3 per cent. Endosulfan and abamectin had no adverse influence on the grubs and the grub mortality was only 3.3 and 6.7 per cent, respectively. Adult emergence was highly affected by carbaryl, which recorded only 10.00 per cent as against 93.33 per cent adult emergence in control. The time taken for cent per cent mortality of adults in control was 23.33 days, but in the case of quinalphos (0.04%), it was 0.66 days and the fecundity was 0.5 eggs as against 160.4 eggs in control.**

KEY WORDS: *Chrysoperla carnea*, insecticides, toxicity

Insecticides are indispensable for the management of pests of agricultural crops. However, use of broad-spectrum insecticides has not only resulted in the reduction of crop pests but also other beneficial organisms like parasitoids and predators. In order to conserve the natural enemies present in the field, use of safer insecticides or alternative methods of application are resorted. There has been increasing interest in the use of predatory green lacewing, *Chrysoperla carnea* Stephens for the control of several crop pests. Hence, attempts were made to evaluate the toxicity of certain common insecticides to *C. carnea*.

MATERIALS AND METHODS

Laboratory studies were conducted to assess the effect of some insecticides (Table 1) on different stages of *C. carnea* at Tamil Nadu Agricultural University, Coimbatore during 1996. The isogenic culture of *C. carnea* maintained in the Insectary, Department of Entomology, Tamil Nadu Agricultural University, Coimbatore was utilized for the studies.

Effect on eggs

The eggs along with stalk collected in brown paper strips were sprayed with different insecticides separately using a hand atomizer and the egg mortality was recorded after 24h of treatment. Each treatment was replicated three times with 75 eggs per treatment.

Effect on grubs

UV treated eggs of *Corcyra cephalonica*

● Central Institute for Cotton Research - Regional station, Coimbatore 641 003, Tamil Nadu.

Stainton were sprayed with different concentrations of insecticides separately and the eggs were shade dried for 10 min. For each treatment, 300 eggs were treated with insecticide. One hundred insecticide treated eggs were transferred to test tubes of size 20x3.5cm. First instar grubs of *C. carnea* were transferred to these test tubes at the rate of 10 per tube. Each treatment was replicated thrice with 30 grubs per treatment. After the grubs completely consumed the treated eggs, they were provided with untreated *Corcyra* eggs until pupation. Observations were made on the grub mortality, per cent pupation and adult emergence.

Effect on adults

The adults were fed with 10 per cent honey solution containing different concentrations of insecticides given in Table 1. Five pairs of *C. carnea* adults were allowed in separate plastic containers per replication and three replications were maintained per treatment. In control, the adults were fed with 10 per cent honey solution alone. The eggs laid in each treatment were collected daily by keeping a brown paper sheet of size 21x 6cm along the inner side of the plastic containers. Observations were made on the adult longevity and female fecundity.

The data collected were subjected to analysis of variance and the treatment mean values were compared using Duncan's Multiple Range Test (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Studies conducted to evaluate the ovicidal action of insecticides revealed that abamectin (0.003%) caused the maximum egg mortality of 25.18 per cent (Table 1). Other insecticides though had affected the eggs of *C. carnea*, the effect was not statistically different from the control. The

Table 1. Effect of insecticides on *Chrysoperla carnea*

Treatment/ concentration	Hatcha-bility (%)	Egg mortality (%)	Grub mortality (%)	Grubs pupated (%)	Adult emergence (%)	Adult longevity (days)	Eggs laid per female (no.)
Carbaryl (0.1%)	93.05a (74.71)	6.95a (15.29)	83.33d (65.91)	16.66c (18.43)	10.00c (18.43)	1.66c	14.7c
Endosulfan (0.07%)	91.93a (73.50)	8.07a (16.50)	6.66a (14.96)	93.33a (71.57)	90.00a (71.57)	15.33b	131.0b
Quinalphos (0.05%)	92.58a (74.19)	7.42a (15.81)	70.00b (56.79)	30.00b (33.21)	30.00b (33.21)	1.66c	11.3c
Quinalphos (0.04%)	91.09a (72.63)	8.91a (17.37)	76.66c (61.11)	23.33c (28.88)	23.33b (28.88)	0.66c	0.5d
Monocrotophos (0.072%)	92.07a (73.64)	7.93a (16.36)	66.66b (54.73)	33.33b (35.26)	30.33b (33.42)	1.33c	13.13c
Abamectin (0.003%)	74.82b (58.15)	25.18b (30.21)	3.33a (10.53)	96.66a (79.47)	90.00a (71.57)	18.66ab	144.0ab
Control	93.71a (75.48)	6.29a (14.52)	3.33a (10.53)	96.66a (79.47)	93.33a (75.03)	23.33a	160.4a

Figures within parentheses are arcsine- transformed values.
Means followed by the same letter in a column are not significantly different (P = 0.05).

grub mortality was the lowest (3.33%) in control and abamectin (0.003%) followed by endosulfan 0.07 per cent (6.66%). Highest mortality of 83.33 per cent was caused by carbaryl (0.1%) and the mortality was 76.66 per cent in quinalphos (0.04%) and these results are in agreement with the findings of Krishna Moorthy (1985). Pupation was observed to be same (96.66%) for both control and abamectin (0.003%) and these were on par with endosulfan 0.07 per cent (93.33%). Quinalphos (0.04%) and carbaryl (0.1%) recorded the lowest pupation of 23.33 and 16.66 per cent, respectively. The lowest adult emergence was in carbaryl 0.1 per cent (10.0%) while it was 93.3 per cent in control. Adult emergence was 30.3 per cent in monocrotophos (0.072%) and it was on par with quinalphos 0.05 per cent (30.0%) and 0.04 per cent (23.3%). Endosulfan and abamectin recorded 90.00 per cent adult emergence and proved safe when compared to other insecticides and the safety of endosulfan to *C. carnea* was also reported by Elzen *et al.* (1998). The longevity of adults was highly influenced by insecticides when compared to control where it was 23.3 days. Cent per cent mortality of adults occurred in 18.7 and 15.3 days in abamectin (0. 003%) and endosulfan (0.07%), respectively. In other treatments, adult longevity ranged from 1.66 days in carbaryl (0.1%) and quinalphos (0.05%) to 0.66 days in quinalphos (0.04%). Highest number of eggs (160.4) were laid in control followed by abamectin 0.003 per cent (144.0). The number of eggs laid were much less in other treatments and that was 14.7, 13.1 and 11.3 in carbaryl (0.1%), monocrotophos (0.072%) and quinalphos (0.05%), respectively. The lowest number of eggs (0.5) was laid in quinalphos (0.04%).

High toxicity of carbaryl (Hassan *et al.*, 1987), monocrotophos and quinalphos (Singh and Verma, 1986) to *Chrysopa* reported earlier, agrees with the present results. Toda and Kashio (1997) also reported that most of the organophosphate insecticides tested against *C. carnea* showed higher levels of toxicity. Based on the investigations carried out to assess the toxicity of insecticides to *C. carnea* it was found that endosulfan (0.07%) and abamectin (0.003%) are least toxic to *C. carnea.*

REFERENCES

Elzen, G. W., Elzen, P. J. and King, E . G. 1998 . Laboratory toxicity of insecticides to *Orius insidiosus, Geocoris punctipes, Hippodamia convergens* and *Chrysoperla carnea. Southwestern Entomology*, **23**(4): 335-342

Gomez , K. A. and Gomez , A. A. 1984. *Statistical procedures for Agricultural Research.* John Wiley and Sons, New York, pp. 207-215.

Hassan, S. A., Albert, F., Bigler, F., Blaisinger, P., Bogenschutz, H., Boller, J. J., Viggiani and Vanwets winkel, G. 1987. Results of the third joint pesticide-testing programme by IOBC/WPRS working group "Pesticides and beneficial organisms". *Journal of Applied Entomology*, **103**: 92-107.

Krishna moorthy, A. 1985. Effect of several pesticides on eggs, larvae and adults of the green lacewing, *Chrysopa scelestis* Banks. *Entomon*, **10**: 21-28.

Singh , O. P. and Varma, G. C. 1986. Comparative toxicities of some insecticides to *Chrysopa carnea* (Chrysopidae, Neuroptera) and *Trichogramma brasiliense* (Trichogrammatidae, Hymenoptera), two arthropod natural enemies of cotton pests. *Agriculture Ecosystems and Environment*, **15**: 23-30.

Toda , S. and Kashio , T. 1997. Toxic effect of pesticides on the larvae of *C. carnea. Proceedings of the Association for Plant Protection of Kyushu* , **43**: 101-105