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EVALUATION OF TWO ORGANOPHOSPHORUS INSECTICIDES ON *Liriomyza trifolii* (DIPTERA: AGROMYZIDAE) AND THE ASSOCIATED PARASITOID *Diglyphus isaea* ON BROAD BEANS

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ABSTRACT

Two organophosphorus insecticides Diazinon (Nasrcidol EC 60%) and Malathion (Agrothion EC 57%) that recommended for controlling dipterous leafminers were evaluated for their effects on the population of *Liriomyza trifolii* and its associated parasite, during all parasitoid season (2000-2001). Both tested treatments caused decrease in the population density of *Liriomyza trifolii*. Comparing the effect of the two selected organophosphorus insecticides (Nasrcidol EC 60% and Agrothion EC 57%) Nasrcidol EC 60%: was relatively more toxic and effective than Agrothion EC 57% in the first and second spray in controlling *Liriomyza trifolii* population on broad bean plant and slightly less toxic on its parasitoid *Diglyphus isaea.* From this study it could be concluded that both Nacrcidol EC 60 % caused excellent control of the leafminer and exhibited selectivity effect on the parasitoid.

INTRODUCTION

The economic importance of broad bean (*Vicia faba)* crop to Egyptians is essential. The importance of broad bean lies in its nutritional value as roughage and as a major source of protein of high biological value, energy, minerals and vitamins.

Leafmining genus such as *Agromyza*, *Liriomyza* and *Phytomyza* (Diptera: Agromyzidae) occur worldwide and are economically important pests for many agricultural crops (Spencer 1973; Heinz and Parrella 1990).

The serpentine leafminer *Liriomyza trifolii* is a major pest of broad bean in Egypt (Assem, 1966; El-Nahal and Assem, 1970; Dimetry, 1972; El-Kifl *et al.,* 1974; Shalaby *et al.,* 1980; Parrella *et al.,* 1982; Schreiner *et al.,* 1986; Mowafy, 1988; Attia, 1989; Attia, 1990; Hannou and Hegazi, 1996 and Hammad, 2000).

The significant damage caused by agromyzids results mainly from larval feeding, the mines that they are making and punctures in the leaves made by adult females (Spencer 1973; Johnson *et al.,* 1983; Parrella *et al.,* 1985 and Trumble *et al.,* 1985).

Species of the genus *Diglyphus* constitute is one of the more important groups of parasites that attack *Liriomyza* spp leafminer. Almost every survey of the parasite fauna associated with these leafminers has reveal one or more *Diglyphus* spp. (Parrella and Robb, 1985 and Parrella *et al.,* 1989).

Organophosphorus insecticides are now used for controlling the leafminers on vegetables. However, leafminers tolerance for

organophosphorus insecticides has been reported (Getzin 1960). Organophosphorus insecticides have been widely used against leafminers as a chemical control schedules in Egypt.

Natural control by hymenopterous parasites, often is an important factor in maintaining low leafminer populations but the indiscriminate use of insecticides seriously affects the leafminer- parasite relationship (Hills and Taylor, 1951, Parrella *et al.,* 1989).

The objective of this study is to evaluate the effect of two tested organophosphorus insecticides namely; Nasrcidol EC 60% and Agrothion EC 57 % on the population of *Liriomyza trifolii* and its parasitoid *Diglyphus isaea* on the broad bean plant.

MATERIALS AND METHODS

Field trials :

The field trials were conducted on the broad bean plant (*Vicia faba*), cultivar Giza 462 during the winter season of year 2000-2001 at the Agricultural Expermental Farm of Sabahia, Alexandria. Faba bean seeds were sown on November 25th. The experimental area was divided into plots of about 4 x 4 m each.

Treatments with two organophosphorus insecticides (Nasrcidol EC 60% and Agrothion EC 57%) were applied with knapsack sprayer at the rate of 200 liters / feddan. The concentration of both insecticides was 500 cm3 /100 L water, (1 L/feddan). Insecticide treatments were replicated three times. Three plots were left without spraying and considered as control. Fifteen leaflets per plot were randomly sampled before spray and 48 hr, 5 days, 7 days, 10 days and 15 days post-treatment by removing three infested leaflets from the top, middle and bottom strata of each plant to determine the effect of Nasrcidol EC 60 % and Agrothion EC 57% on leafminer and parasite population.

The collected leaflets were placed in paper bags, transferred to the laboratory and observed by using a binocular microscope where a number of mines, live and dead larvae, no evidence of parasitism and moribund larvae (externally parasitoid), alive and dead parasite were recorded before and after 48 hr, 5, 7 and 10 days.

A second spray treatment by the same two organophosphorus insecticides were applied to the same area after 15 days from the first spray and samples of infested leaflets were taken weekly till the 7th week of the second spray.

Statistical analysis of the collected data was carried out according to Cohort, Software, Inc. (1986).

RESULTS AND DISCUSSION

Two organophosphorus insecticides (Nasrcidol EC 60% and Agrothion EC 57%) were tested on broad bean (*Vicia faba)* cultivar Giza 462 to evaluate their toxicity on the serpentine leafminer *Liriomyza trifolii* population and its parasitoid *Diglyphus isaea.* The obtained data in Table (1) and Fig. (1) illustrated the results of Nasrcidol EC 60% and Agrothion EC 57% treatments in the first spray.

Fig1

Table (1) : Effect of tested organophosphorus insecticides (Nasrcidol EC 60% and Agrothion EC 57%) on the leafminer *Liriomyza trifolii* and the population of its parasitoid *Diglyphus isaea* broad bean field (First spray).

ling	Treat-ment	Mines	Avg.no.of Larvae/leaf	Mortality %	Parasitism %	Mortality %	
						Host	Parasitism
Zero Time	1*	3.06 b	0.97 a	0.60 c	0.53 a	0.53 a	0.00 a
	2*	3.27 c	1.40 b	0.53 b	0.53 a	0.53 a	0.00 a
	3*	2.40 a	0.97 a	0.20 a	0.60 a	0.60 b	0.00 a
48 hr	1*	3.83 c	1.43 b	0.43 a	1.17 b	1.17 b	0.00 a
	2*	2.70 b	0.03 a	1.90 c	0.40 a	0.00 a	0.40 b
	3*	2.37 a	0.07 a	1.60 b	0.40 a	0.07 a	0.33 b
5 days	1*	2.90 c	0.43 b	0.77 a	1.10 c	1.10 b	0.00 a
	2*	2.27 b	0.00 a	1.73 c	0.97 b	0.07 a	0.90 c
	3*	2.03 a	0.00 a	1.00 b	0.43 a	0.00 a	0.43 b
7 days	1*	3.37 a	0.60 b	0.53 a	1.53 c	1.53 b	0.00 a
	2*	2.47 b	0.033 a	1.67 c	0.17 a	0.07 a	0.10 b
	3*	2.33 a	0.03 a	1.50 b	0.40 b	0.03 a	0.37 c
10 days	1*	2.87 c	0.67 b	0.50 a	1.17 c	1.17 b	0.00 a
	2*	2.63 b	0.00 a	1.97 c	0.33 b	0.10 a	0.23 c
	3*	2.03 a	0.00 a	1.47 b	0.10 a	0.10 a	0.10 b
15 days	1*	2.90 c	0.40 a	0.20 a	1.33 c	1.33 c	0.00 a
	2*	2.20 a	0.47 ab	0.43 b	0.53 a	0.50 a	0.03 a
	3*	2.47 b	0.33 a	0.43 b	0.67 b	0.67 b	0.00 a

1* = Control **2* = Nasrcidol EC 60%** **3* = Agrothion EC 57%**

L.S.D.0.05 = 0.0743

Regarding the number of mines there were significant differences between the two insecticide treatments and control before spray (Zero time). After 48 hr, 5 days, 7days, 10 days there were significant differences between control and both treatments. Also there were significant differences between the two insecticides treatments.

The alive larvae of *Liriomyza trifolii* were significantly lower in both treatments than the control through the study reaching zero level on the 10th day.

Regarding the mean number of dead larvae (unparasitized and parasitized larvae) there was significant increase in their mean number in both treatments than control. They reached the maximum significant increase with Nasrcidol EC 60% on the 5th day of spray. On the 7th day there was significant difference between control and both treatments. This may be due to the parasite effect which reached its maximum level at the 7th day (1.53) while the mean number of the parasite was markedly decreased in both treatments due to the effect of the insecticides on the alive parasite (0.07, 0.03) respectively.

The mean number of the alive parasites showed significant decrease in both treatments than control through the whole period of study. However, it

started to show slight increase in both treatments in the 10th day post-treatment.

After two weeks from the first spray the mean number of mines started to increase in the control and Agrothion EC 57%. Also the alive larvae started to appear in both treatments while the mean number of alive individuals of the parasite showed significant increase in both treatments. There was significant decline in the mean number of dead parasite in both treatments compared with their previous count on the 10th day.

The explanation of the previous results may be due to the toxic effect of both organophosphorus treatments (Nasrcidol EC 60% and Agrothion EC 57%) which decreased the number of mines, alive larvae, and alive parasite. After two weeks, their toxicity showed marked decline manifested by the increase in number of mines, alive individuals of larvae and alive parasite again. For this reason a second spray was done. These results are in agreement with those of Liebee 1981; Parrella and Keil 1984 and Cox *et at.,* 1995. Also the previous results are in agreement with those obtained by Getzin, 1960; Oatman and Kennedy 1976; Jhonson *et al.,*1980 and Weintraub and Horowitz 1998 who stated that once the insecticides was applied, the balance that existed between the host and its parasitoid is disrupted.

The results obtained from the second spray are shown in Table (2) and Fig. (2). A gradual decrease in the mean number of mines in both treatments reaching maximum significant decline on the 7th week. Also the mean number of the alive larvae showed significant decrease in both treatments than control reaching zero on the 3rd and 5th week, then they gradualy increased during the 6th and 7th week in Nasrcidol EC 60% treatment while it was zero in the 7th week for Agrothion EC 57% treatment.

On the contrary the mean number of the dead larvae showed significant increase in both treatments than control reaching the maximum on the 3rd week then their mean number showed gradual decrease reaching the maximum significant decline on the 7th week .

Regarding the alive individuals of the parasite, the mean number showed that they were still less than control till the 3rd week, then there was a gradual increase in its mean number reaching significant increase on the 7th week.

Comparing the effect of the two selected organophosphorus insecticides (Nasrcidol EC 60% and Agrothion EC 57%): Nasrcidol EC 60% was relatively more toxic and effective than Agrothion EC 57% in the first and second spray in controlling *Liriomyza trifolii* population on broad bean plant and slightly less toxic on its ectoparasitoid *Diglyphus isaea.* From this study, it could be concluded that both tested insecticides (Nasrcidol EC 60% and Agrothion EC 57%) have excellent control and they both decreased the population of the leafminer *Liriomyza trifolii* but they have decimated the population of its parasitoid *Diglyphus isaea* on broad bean plant.

Fig2

Table (2) : Effect of tested organophosphorus insecticides (Nasrcidol EC 60% and Agrothion EC 57%) on the leafminer *Liriomyza trifolii* and the population of its parasitoid *Diglyphus isaea* broad bean field (Second spray).

Time of Sampling	Treat-ment	Mines	Avg.no.of Larvae/leaf	Mortality %	Parasitism %	Mortality %	
						Host	Parasitism
Zero Time	1*	2.90 c	0.40 b	0.20 a	1.33 c	1.33 c	0.00 a
	2*	2.20 a	0.47 c	0.43 b	0.53 a	0.50 a	0.03 a
	3*	2.47 b	0.33 a	0.43 b	0.67 b	0.67 b	0.00 a
1 week	1*	2.93 c	0.27 b	0.37 a	1.20 c	1.20 b	0.00 a
	2*	2.03 a	0.00 a	0.97 c	0.30 a	0.00 a	0.30 b
	3*	2.13 b	0.00 a	0.80 b	0.73 b	0.00 a	0.73 c
2 weeks	1*	2.83 c	0.07 c	0.43 a	1.17 c	1.17 c	0.00 a
	2*	2.13 a	0.00 a	0.93 c	0.50 a	0.00 a	0.50 b
	3*	2.57 b	0.10 b	0.83 b	0.64 b	0.07 b	0.57 c
3 weeks	1*	3.50 c	0.30 b	0.27 a	1.17 c	1.17 b	0.00 a
	2*	2.13 a	0.00 a	0.97 c	0.50 a	0.00 a	0.50 b
	3*	2.20 b	0.00 a	0.90 b	0.63 b	0.00 a	0.63 c
4 weeks	1*	3.20 c	0.20 c	0.17 a	1.63 b	1.63 b	0.00 a
	2*	1.83 a	0.03 b	0.57 b	0.66 a	0.03 a	0.63 b
	3*	2.00 b	0.00 a	0.57 b	0.63 a	0.03 a	0.60 b
5 weeks	1*	3.03 c	0.13 b	0.30 a	1.60 c	1.60 b	0.00 a
	2*	1.57 a	0.00 a	0.70 b	0.20 a	0.03 a	0.17 b
	3*	2.23 b	0.00 a	0.87 c	0.27 b	0.07 a	0.20 b
6 weeks	1*	2.23 c	0.27 b	0.20 a	0.90 c	0.90 c	0.00 a
	2*	1.43 a	0.03 a	0.83 c	0.03 a	0.00 a	0.03 b
	3*	1.67 b	0.07 a	0.70 b	0.14 b	0.07 b	0.07 b
7 weeks	1*	1.47 b	0.03 b	0.07 a	0.57 c	0.57 b	0.00 a
	2*	1.10 a	0.07 b	0.27 b	0.33 b	0.23 a	0.10 c
	3*	0.97 a	0.00 a	0.23 b	0.26 a	0.23 a	0.03 b

1* = Control **2* = Nasrcidol EC 60%** **3* = Agrothion EC 57%**

L.S.D.0.05 = 0.0743

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تقييم استخدام مبيدين فسفوريين على ذبابة الفول والطفيل المصاحب لها على نبات الفول

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تم تقييم مبيدين فسفوريين عضوين وهما ديازينون (نصرسيدول ٦٠%) و ملاثيون (اجروثيون ٥٧%) فى مكافحة نافقات الاوراق لدراسة تأثيرهما على أعداد ذبابة الفول والطفيل المرتبط بها وذلك فى الموسم الشتوي لنبات الفول (٢٠٠٠-٢٠٠١). ولقد أظهرت النتائج ان كلا المبيدين أدى الى تناقص الكثافة العددية لذبابة الفول وبمقارنه تأثير كلا المبيدين وجد ان نصر سيدول ٦٠% كان اكثر تأثيرا بعد الرشه الاولى والثانية فى مكافحة صانعة الانفاق على نبات الفول

وكان اقل تأثيرا على الطفيل. ومن هذه النتائج نستنتج ان كلا المبديين الفسفوريين كان لهما تأثير ممتاز فى مكافحة نافقات الاوراق ولكن كلاهما تسبب فى احداث التأثير السام على الطفيل المرتبط بذبابة الفول.