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CONTROL OF THE LEAF MINER, *MELANAGROMYZA PHASEOLI* ATTACKING KIDNEY BEAN PLANTS BY BIO-CONTROL AGENTS UNDER FIELD CONDITIONS

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ABSTRACT: ***Effect of field applications of four pesticides was evaluated in the control of the leaf miner Melanagromyza phaseoli which attacking kidney bean plants Variety Giza 6. Used compounds were: Bactospeine, Profect, Ferotecto and Actellic. After first application, results showed that the highest value of reduction percentage was recorded for Actellic followed by Bactospeine, Ferotecto and Profect, respectively and the highest infestation percentage were recorded for Profect, Bactospeine and Ferotecto followed by Actellic. Results of second application cleared that the highest reduction percentage was recorded for Actellic followed by Bactospeine, Ferotecto and Profect, respectively, and percentages of infestation recorded highest value for Profect followed by Ferotecto, Bactospeine and Actellic, respectively. After third application, the highest value of reduction percentage was recorded for Actellic, followed by Ferotecto, Bactospeine and Profect, respectively. Infestation percentages recorded the highest value for Profect and after that Ferotecto, Bactospeine and Actellic. After last application on faba bean plants, results showed that Actellic recorded the highest reduction percentages followed by Profect, Bactospeine and Ferotecto, while, Profect recorded the highest values of infestation followed by Bactospeine, Ferotecto and Actellic, respectively.***

Key words*: Leaf miner, Melanagromyza phaseoli, kidney bean, Biological control, Bactospeine, Profect, Ferotecto and Actellic*.

INTRODUCTION

Leaf miner insects became one of the most economic pests to many vegetable and fruit crops which attack leaves through making small mines between the upper and lower epidermis layer of the leaves. The most important species of these leaf miners in Egypt were: *Liriomyza trifolii, Melanagromyza phaseoli,* and *Phytomyza atricornis.* These insects caused a great damage to many of crops especially in the immature stages of plant age. Many chemical pesticides were tested successfully against these pests meanwhile, to protect our environment from chemical pollution which produced from the mass and hazard using of these chemicals, there were an international hope to use the pesticides produced from biological origin like

fungi, bacteria, and some special plant extracts. From these points the aim of this research is to evaluate three biological pesticides against the leaf miner *Melanagromyza phaseoli* in comparison with one chemical pesticide under field conditions in the fields of kidney bean plants.

MATERIALS AND METHODS

To evaluate the efficacy of four compounds i. e. Bactospeine (*Bacillus thuringiensis*), Profect (Virus + Bacteria) active ingredient 2 + 5 %, Ferotecto: (Virus) 4 %, and Actellic (Pirimophos–methyl). Three kirats (one kirat = 175 M^2) were cultivated at the Experimental Farm of the Faculty of Agriculture at Shibin El-Kom with kidney bean plants variety Giza 6.

Soil was divided into five sections, each section was consisted of 14 lines; each 4 lines represented one replicate and between each replicate one line was left as an interval.

The four compounds were applied as spray treatments , three times with 15 days as intervals between applications with the field concentration (1.5 g/one liter of water for the biocide compounds, and 3.75 ml /one liter of water for Actellic pesticide).

Each treatment was replicated three times in addition to three replicates as a check.

Samples represented 15 leaves, from each replicate, were collected separately in plastic bags and transferred to the laboratory and examined carefully by naked eye to record the number of survived larvae to calculate the mortality percentages.

Henderson and Tilton formula (Fleming and Retnakaram, 1985) was applied to determine the reduction percentages.

$$\text{Reduction\%} = \left[1 - \frac{\text{Treatment after X Control before}}{\text{Treatment before X Control After}} \right] X\ 100$$

RESULTS AND DISCUSSION

Control of *Melanagromyza phaseoli* infesting kidney bean plants using four pesticides (three applications) under field conditions:

Data obtained in Tables (1, 2 and 3) show the effect of field sprays of each compound on the stem miner fly (*Melanagromyza phaseoli*) attacking kidney bean plants cultivated in the Experimental Farm of the Faculty of Agriculture at Shibin El-Kom district, Minufiya Governorate.

The three biocides (Bactospeine, Profect and Ferotecto) and chemical compound (Actellic) were used for control of *M. phaseoli* on kidney bean plants after germination and the beginning of infestation, three sprays were carried out with 15 days intervals.

Data on the leaf miner infestation of the first and second sprays were determined after 5, 10 and 15 days from application and the third spray was determined only after 7 and 15 days.

Results of the first spray treatments (Table1), after 5 days of germination, reduction percentages and percentages of infestation were: 72.0, 53.0, 70.0 and 75.0 % Reduction percentages, and 20.0, 10.0, 10.0 and 10.0 % infestation.

Table (1) : Reduction percentages (R) and percentages of infestation (Inf.)of *M. phaseoli* as affected different pesticides applied on kidney bean plants under field conditions (first application).

Pesticides	Pre-treatment Average numbers of larvae per15 leaf	Post treatment						Average	
		5 days		10 days		15 days			
		R.%	Inf.%	R.%	Inf.%	R.%	Inf.%	R.%	Inf.%
Bactospeine 150g/100 L water	8.0	72.0	20.0	78.0	50.0	66.0	30.0	82.0	33.3
Profect 150g/100 L water	8.0	53.0	10.0	67.0	40.0	64.0	60.0	68.0	36.7
Ferotecto 150g/100 L water	5.0	70.0	10.0	71.0	30.0	65.0	40.0	77.0	26.7
Actellic 375ml/100 L water	3.0	75.0	10.0	83.0	20.0	84.0	30.0	80.7	20.0
Untreated (Control)	6.0	-	40.0	-	70.3	-	80.0	-	63.4

The highest values for biocides were recorded after 10 days, resulted 78.0, 67.0 and 71.0% reduction percentages for Bactospeine, Profect and Ferotecto, respectively, while Actellic recorded 83.0 % reduction percentages, and the infestation percentages for all previous compounds were: 50.0, 40.0, 30.0 and 20.0% respectively. After 15 days, reduction percentages recorded 66.0, 64.0, 65.0 and 84.0 % and infestation values recorded 30.0, 60.0, 40.0 and 30.0 % for all compounds, respectively.

Total average of reduction of the larvae of the fly were: 82.0, 68.0, 77.0 and 80.7 % reduction for the four compounds, respectively, where the first one recorded the highest value of reduction, while, infestation were 33.3, 36.7, 26.7 and 20.0 % where Profect treatment recorded the highest value of larvae infestation.

Results in (Table 2) recorded the reduction percentages and infestation values of the second spray 5, 10 and 15 days after application.

After 5 days, reduction percentages and percentages of infestation for used compounds (Bactospeine, Profect, Ferotecto, and Actellic), were: 72.0, 61.0, 63.0 and 80.0 reduction percentages, respectively, and 10.0, 20.0, 10.0 and 10.0 percentages of infestation, respectively.

Table (2): Reduction percentages (R) and percentages of infestation (Inf.)of *M. phaseoli* as affected by different pesticides applied on kidney bean plants under field conditions (second application).

Pesticides	Pre-treatment Average numbers of larvae per15 leaf	Post treatment						Average	
		5 days		10 days		15 days			
		R.%	Inf.%	R.%	Inf.%	R.%	Inf.%	R.%	Inf.%
Bactospeine 150g/100 L water	7.0	72.0	10.0	59.0	20.0	17.0	30.0	49.3	20.0
Profect 150g/100 L water	13.0	61.0	20.0	33.0	40.0	10.0	50.0	34.7	36.7
Ferotecto 150g/100 L water	8.0	63.0	10.0	76.0	20.0	40.0	20.0	59.7	16.7
Actellic 375ml/100 L water	5.0	80.0	10.0	42.0	20.0	42.0	20.0	54.7	16.7
Untreated (Control)	37.0	-	85.2	-	90.0	-	90.0	-	88.4

After 10 days, reduction percentages were: 59.0, 33.0, 76.0 and 42.0 %, while the infestation of insects were: 20.0, 40.0, 20.0 and 20.0 %, respectively.

After 15 days, the reduction percentages were: 17.0, 10.0, 40.0 and 42.0 %, and 30.0, 50.0, 20.0 and 20.0 % values of infestation, respectively.

Total averages of reduction were: 49.3, 34.7, 59.7 and 54.7 %, and 20.0, 36.7, 16.7 and 16.7 percentages of infestation, respectively.

Ferotecto recorded the highest value of reduction percentages after the second spray, while Profect treatment recorded the highest infestation percentage of the leaf miner under study.

Data of the third spray (Table 3) were recorded after 7 and 15 days. After 7 days of spray applications, reduction percentages of the leaf miner

population were: 60.0, 53.0, 52.0 and 20.0 % , while the percentages of leaf infestations were: 20.0, 40.0, 20.0 and 30.0 % for the four compounds, respectively.

Table (3): Reduction percentages (R) and percentages of infestation (Inf.)of *M. phaseoli* as affected by different pesticides on kidney bean plants under field conditions (third application).

Pesticides	Pre-treatment Average numbers of larvae per 15 leaf	Post treatment				Average	
		7 days		15 days			
		R %	Inf.%	R%.	Inf.%	R%	Inf.%
Bactospeine 150g/100 L water	6.0	60.0	20.0	45.0	30.0	52.5	25.0
Profect 150g/100 L water	12.0	53.0	40.0	41.0	40.0	47.0	40.0
Ferotecto 150g/100 L water	5.0	52.0	20.0	34.0	30.0	38.0	25.0
Actellic 375ml/100 L water	3.0	20.0	30.0	27.0	30.0	23.5	30.0
Untreated (Control)	38.0	-	90.0	-	90.0	-	90.0

After 15 days, reduction percentages of the leaf miner population were: 45.0, 41.0, 34.0 and 27.0% , while the percentages of larvae infestation were: 30.0, 40.0. 30.0 and 30.0 %, respectively.

Total averages of reduction percentages which were calculated after the third spray for Bactospeine, Profect, Ferotecto and Actellic were: 52.5, 47.0, 38.0 and 23.5% reduction and 25.0, 40.0, 25.0 and 30.0% infestation, respectively.

Bactospeine recorded the highest value of reduction percentage and Profect treatment recorded the highest percentages of larval infestation.

Finally it could be concluded that , after first application, Bactospeine recorded the highest reduction percentages followed by Actellic, Ferotecto and Profect, respectively, while, Profect recorded the highest infestation percentage followed by Bactospeine, Ferotecto and Actellic, respectively. After second application, the highest value of reduction percentage was recorded for Ferotecto after that Actellic, Bactospeine and Profect,

respectively, and the highest infestation percentage was recorded at Profect treatment followed by Bactospeine and after that Ferotecto and Actellic. After the third application on kidney bean plants Bactospeine treatment recorded the highest reduction percentages of the leaf miner under study , followed by Profect, Ferotecto and Actellic, respectively.

These results are in harmony with those obtained by Dash (1990) who tested seven insecticides tested for their effectiveness against *Phytomyza atricornis* , and Jitender-Kumar and Kashyap (1998) who control *Phytomyza atricornis* on pea plants using organophosphoric insecticides. In addition, Lin *et al.,* (1998) tested organo-phosphorus insecticides against *Liriomyza sativae.* Durairaj (2000) was assess the critical stage for the insecticidal application to control the pigeon pea fly, *Melanagromyza obtusa*. In Egypt, Omar and Faris (2000) conducted studies to evaluate the effect of insecticides, Reldan, Evisect, Vertemic (abamectin) and Neemazal (azadirachtin) on the yield component of kidney bean cultivars : Paulista, Bronco, Xera and Savanna, and on the broad bean leaf miner, *Liriomyza trifolii*. Reldan was the most effective in controlling leaf miner population followed by Evisect Vertemic and Neemazal in terms of effectively. Chaudhuri and Senapati (2001) stated in India that field evaluation of synthetic (0.05% malathion , 0.05% ddvp (dichlorvos) , and 0.01% avermectin (abamectin) and biological agents (azadirachtin , *Bacillus thuringiensis*, *Beauveria bassiana*, and nuclear polyheresies virus or npv) as pesticides against the pests of tomato , viz . leaf miner (*Liriomyza trifolii*) , revealed that the biologically originated pesticides were more effective over synthetic pesticides. Chandrakar and Shrivastava (2002) in India conducted a field experiment on the control of pest complex in Pigeon pea cv. Asha. The pest complex at poding stage comprised *Helicoverpa armigera*, *Exelastis atomosa*. *Melanagromyza obtusa* and *Clavigralla gibbosa*. All the treatments gave significant reduction in pest population over control. Sharma *et al.,* (2003) In India evaluated seven insecticides against pea leaf miner, *Phytomyza atricornis* , on pea. All the insecticides significantly reduced the mean leaf miner population compared to the untreated control. Recently in Egypt, Gomaa *et al*., (2005) found that the use of more selective materials as Protecto , Bactospeine (*Bacillus thurangiensis*) and Spinosad as microbial control agents decreased sharply the population of the leaf miner (*Liriomyza trifolii*) infecting broad bean plants. Paraikovic *et al.,* (2006) stated that the mortality of the leaf miner *Liriomyza trifolii* was monitored 5, 10, 15 and 25 days after insecticide treatment (Trigard 75 WP Confider Sl200, and Vertemic) of the gerbera crop in a greenhouse in Croatia. Ramesh and Ukey (2007) tested the effect of botanicals, microbial and newer insecticides alone with conventional insecticides against the tomato leaf miner (*Liriomyza trifolii*) in India. Abamectin 0.002% was found to be the most effective treatment in reducing leaf miner infestation.

The use of pesticides from biological origin had no adverse effects on health, environment, and natural enemies of crop pests, making them compatibly with future pest management program.

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مكافحة حشرة صانعات الانفاق فى الفاصوليا باستخدام بعض المبيدات البيولوجية تحت الظروف الحقلية

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الملخص العربى :

أُجري هذا البحث لدراسة إمكانية استخدام بعض المواد البيولوجية فى مكافحة ذبابة الفاصوليا(Tryon) *Melanagromyza phaseoli* التى تصيب نباتات الفاصوليا صنف جيزة ٦ تحت الظروف الحقلية.

حيث تم دراسة تأثير تطبيق الرش المتكررلأربعة مبيدات فى خفض أعداد يرقات ذبابة الفاصوليا التي تهاجم الفاصوليا صنف جيزة ٦ والمركبات المستخدمة هي: الباكتوسبين – البروفيكت – الفيروتكتو – الاكتيلك. تم رش المبيدات المستخدمة ٣مرات بعد ٥ يوم من الإنبات وبفارق زمنى ١٥ يوم بين كل رشة واخرى وتم عد اليرقات بعد ٥، ١٠ ، ١٥ يوم من الرشة الأولى والثانية وبعد ٧ ، ١٥ يوم من الرشة الثالثة .

بعد الرشة الأولى سجل مركب الباكتوسبين أعلى نسبة خفض تلاه مركب الاكتيلك ثم الفيروتكتو ثم البروفيكت بينما سجلت معاملة البروفيكت أعلى نسبة إصابة يليه الباكتوسبين ثم الفيروتكتو ثم الاكتيلك.

وبعد الرشة الثانية سجل أعلى نسبة خفض لليرقات لمركب الفيروتكتو وبعد ذلك الاكتيلك ثم الباكتوسبين ثم البروفيكت أما أعلى نسبة إصابة سجلت فى معاملة البروفيكت يليه الباكتوسبين وبعد ذلك الفيروتكتو و الاكتيلك .

وسجلت الرشة الثالثة (الأخيرة) أعلى نسبة خفض لليرقات فى معاملة الباكتوسبين ثم البروفيكت ثم الفيروتكتو ثم الاكتيلك وأعلى نسبة إصابة كانت فى معاملة البروفيكت يليه الاكتيلك ثم الباكتوسبين و الفيروتكتو.

وقد أعطى البحث إمكانية استخدام الرش المتكرر للمبيدات الحيوية فى مكافحة صانعات الأنفاق بديلا عن استخدام المبيدات الكيميائية التى تلوث البيئة وتضر بالصحة العامة للإنسان .