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The use of asemic pesticide and black pepper extract to control the leafminer *Liriomyza trifolii* on bean and natural enemies of insect

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Abstract

This study was performed in a bean field belongs to Plant Protection Department at College of Agriculture/University of Baghdad for the period between the 15th of March to 20th of June, 2017. Results shown the fluctuation of the leafminer population density when the highest population density was 4. 1mines per leaf in the 22nd of May. The lowest population density was 0.6mine/leaf in the 4th of April. Asemic pesticide scored highest mortality percent which was 90% on larvae two weeks after treatment. Whereas it scored 30% mortality on larvae one week of application. Lower mortality percentages were scored on leaf miner pupae which were 63.3 and 16.66% one and four weeks of treatment, respectively. Black pepper extract treatment scored 20% highest mortality percent on larvae and pupae one and 3days of treatment, respectively. While it scored the lowest mortality percentages on larvae and pupae which were 0.33% and 10% one week after treatment. A hymenopteran parasite belonged to the family Eulophiodae was reported during the study period.

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Introduction

The common bean *Phaseolus vulgaris* belongs to the family *Fabaceae*. It is grown worldwide for green pod or dry seed production. The possible origin of common bean is Southern America (Free encyclopedia, 2017).

It has a high nutrition value as it contains a high carbohydrate content. Common bean is attacked by many pests including insects and arthropods like mites, aphids, green stink bugs, cutworms and leaf miners. Leaf miners can damage bean plants through larvae feeding on tissue located between the upper and lower leaf surfaces. Larvae make different shaped tunnels when feed on affected leaves and interfering leaf functions. Furthermore, damaged tissue caused by insect feeding may enable microorganisms invasion. Leaf miners make long, curvy and thin layer tunnels (AL-Jorany, *et al*, 2016).

The lifecycle of *L. trifolii* may vary based on temperature which is ranged from 24-28°C from egg to adult (Joshi, 2007). It attack I99 a wide host range including many economic plants. Many parasitoids were reported by Flaih and AL-Zubaidy (2009). on *L. trifolii* including *Diglyphus isaea*, *Pediobius m acanthi*, *Neochrysocharis formosa*, *Opius* spp and *Diaeretiella rapae*.

Several controlling methods have been applied against *L. trifolii* including chemical pesticides and natural extracts. Mau and Martin Kessing (2007) indicated Cyromazine and abamectin can be used against leaf miners. In addition, the use of neem seed extract against vegetable leaf miner pupae and larvae resulted in 90-91.8% and 89.7-90.6% mortality percentages, respectively at 15 and 20g per ml^{-1} concentrations.

It is essential to search for chemical pesticide alternatives against leaf minors, which are eco- safe and have no side effect against food chain and non-targeted organisms especially natural enemies Marinbo, *et al.* (2016). This study was aimed to investigate *L. trifolii* as this pest was recently spread and can cause economic losses in Iraq.

Material and methods

Black pepper fruit extract

Black pepper extract was prepared by ethyl acetate (CH_3 $COOC_2H_5$) extraction using Soxhlet extracter as follows:

About 50g of black pepper fruit powder was placed on bended filter paper size 25cm in diameter, transferred to a volumetric flask then 300-400ml of ethyl acetate was added. The mixture was left for 24h then extracted using rotary evaporator for 6h at 100rpm at 40°C to concentrate the mixture and remove the solvent. The extract was collected in glass containers and preserved at 20°C (AL-Khazraji, 2015). About 20ml of the extract was diluted with 80ml water and applied to test its efficacy to control the leaf miner using the same sampling procedure for the pesticide treatment.

Treatments

About 2ml of the pesticide mixed with one letter of water was sprayed on leaf miner infested plants using 2L hand sprayer. Leaf samples were collected after 1, 3, 5, 7 and 14 days of treatment then transferred to the lab for microscopic examination to estimate mortality percent.

Leaf samples

Leaf samples were collected from common bean var hybrid polo F1 the Producing company Semilias Fito Spain grown in field ($400m^2$) located at Plant Protection Department-College of Agriculture / university of Baghdad during the period between the 15th of May and 20th of June 2017. About 15 leaf samples per line were collected randomly from bean plants grown in six lines, preserved in polyethylene bags and transferred to the laboratory for leaf miner examination. Further leaf sample batches were preserved in plastic boxes sealed with organza clothe and a rubber band to collect parasitoid adults. After they emerged, parasitoid adults were preserved in tubes containing preserving material.

Results and discussion

Results revealed the population density of *L. trifolii* fluctuated during data collection period (Fig. 1). The highest population density of leaf miner was 4.2mines/leaf in the 22nd of May 2017, while the

lowest was 0.2mine/leaf in the 15th of March 2017. Two peaks 2.7 and 2.4mines/leaf were scored for *L. trifolii* in the 2nd and 22nd of May, 2017, respectively. The population density started increasing from March the 23rd when scored 2.8mines /leaf, then decreased up to 2.6mines/leaf in the 18th of April. Later, population density gradually increased up to 3.7mines/leaf in the 9th of May, decreased to score 2.6mines/leaf in the 16th of May and then decreased up to 4.1mines/leaf in the 22nd of May. Finally, *L. trifolii* population density gradually decreased to score 2mines/leaf in the 20th of June, 2017.Statistical analyses showed the least significant difference (LSD) was 0.63 at 5% probability (P) level.

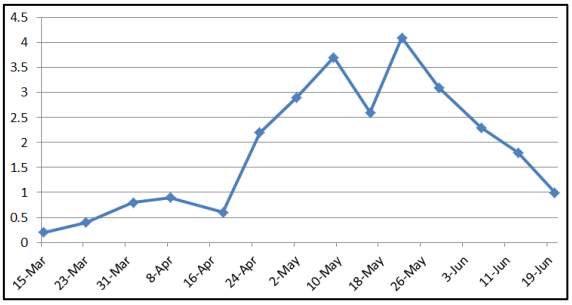

Fig. 1. Illustrates population densities for *L. Trifolii*.

Yildirim and Aunay (2011) studied the efficacy of some foliar fertilizers treatments, like calcium nitrate, fulvic acid and their combinations against, *L. trifolii* population density which decreased to score 4.45 and 4.65 larvae/leaf five weeks after fulvic acid and calcium nitrate treatments, respectively. Whereas, the combination treatment could decrease the number of leaf miner larvae to score 3.6 larvae/leaf compared to 4.74 larvae/leaf for control treatment. When studied population dynamic and control of some bean pests in Egypt Ammar *et al.* (2001) showed the highest population density of *L. trifolii* was 159 and 196 for the bean growing season in 2011 and 2012, respectively.

The insecticide and miticide asemic 18EC showed high efficacy against *L. trifolii* larvae but it was less effective against pupae (Table1). The highest mortality percent was 90% while the lowest was 30% two and four weeks after treatment, respectively. Four pupae treatment, the highest mortality percent was 63.33% two weeks of treatment compared to 10% for control treatment.

The lowest pupal mortality percent was 16.7% four weeks after treatment. In addition, pupal mortality percentages were 23.3 and 53.3% one and three weeks of treatment respectively. The LSD values were 9.99 and 25.14. Ethyl acetate black pepper extract treatment (2%) varied in activity between *L. trifolii* larvae and pupae (Table2). Pupal mortality percent scored 10.66, 10 and 0.33% 3days, 5days and one week after treatment, respectively, compared to 0% for control treatment. Similar mortality percent 20% was scored for both pupae and larvae three days after treatments (Table2). When efficacy of mineral oil mixed with lufcnuron was evaluated, the mixture showed high affectivity against for the mixture *L. trifolii*. The mortality percent scored 81.08% while it scored 60.13% for actelie.

Table 1. Shows Effect of the pesticide Asemic in larvae and virgins of *L. Trifolii*.

Treatment	Mortality percentages				L.S.D.
	One week	Two week	Three week	Four week	
Larvae	50	90	70	30	9.99
Control	1	2	1	1	
Pupae	23.3	63.3	53.3	16.7	25.14
Control	2	1	1	1	

Table 2. Shows Alcohol Extract Treatment of *L. trifolii*.

Transactions	1 day	3 day	5 day	1 week	2 week	average
The larvae	2.000	1.667	1.000	0.333	0.667	1.133
Comparison	0.000	0.000	0.000	0.000	0.000	0.000
The average	1.000	0.833	0.500	0.167	0.333	
The virgins	1.000	2.000	1.667	2.000	1.000	1.533
Comparison	0.000	1.000	0.000	0.000	0.000	0.200
The average	0.500	1.500	0.833	1.000	0.500	

L.S.D.05 for larval treatments = 0.3586

L.S.D.05 for days = 0.5670

L.S.D.05 for virgin transactions = 0.0471

L.S.D.05 for days = 0.0745

Similar results were obtained by Azam *et al.*, (2003) when used ethanol extracted leaves and seeds of *Acaia nilotica*, *Annona squamosal*, *Azadirachta indica*, *Boswellia sacra*, *Crotalaria juncea*, *Myrtus communis*, *Jatropha dhofarica* and *Sueda aegyptica* plants at 1, 2, 3 and 4% concentartions. They indicated *L. trifolii* mortality percent scored 28% for all plant extract treatments. The highest mortality percent was 94% for *A. indica* at all four concentrations.

Facknath and Lalljee (2005) found that the high concentration of calcium and phosphorus fertilizers decreased the infection of *L. trifolii* due to the repellent effect of these fertilizers against the leaf miner.

Table 3. Shows the names of the parasites *L. Trifolii.*

Family	Order	Name
Eulophidae	Hymenoptera	*Diglyphus isaaea*
Eulophidae	hymenoptera	*pediobius matallicus*

The results of the (Table3) The presence of the parasite (*Diglyphus isaaea*), from the family and the rank of Eulophidae Hymenoptera and spam (*pediobius matallicus*) and who returns to the family of the same rank and the same former snooped which have a role in reducing the population density of the lesion *L. trifolii* and that the balance of nature created since the beginning of creation as the spyware is vital for each enemy (Al-Zubaidi, 1992). Flaih (2009) referred to the presence of the following parasites on leaf minor of ornamental plants.

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