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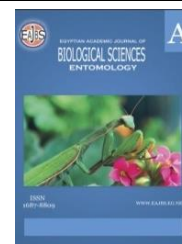


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**Some Factors Affecting the Population Density of Faba Bean Leafminer Fly,  
*Liriomyza trifolii* In Menoufia Governorate**

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**ABSTRACT**

The present investigation was conducted during 2018/2020 seasons in Menoufia governorate, to study the effect of three faba bean varieties, weather factors and three levels of fertilization on the population density of *Liriomyza trifolii* L. The obtained results stated that the population density recorded two peaks during the first season (2018-2019) on Misr1 and Misr 2 varieties, while three peaks on Giza 843. During the second season (2019-2020) three peaks of abundance occurred on Misr1 and Giza 843, while on Misr 2 occurred four peaks. The larval population reached the highest value of 40.9, 54.4 and 59.8 larvae/leaf (1<sup>st</sup>. season), while in the second season recorded 37.1, 37.7 and 47.5 larvae/leaf for the three varieties, Misr1 and Misr 2 varieties and Giza 843, respectively. The highest infestation percentage was recorded 100% in 1<sup>st</sup>. season, while in 2<sup>nd</sup> season recorded 100, 98.4 and 92.3% on the three varieties, respectively. Data obtained revealed no significant differences between the three varieties when fertilized with the three levels, while significant differences were recorded between Misr 1 and Misr 2 compared with Giza 843 variety during both seasons of study.

**INTRODUCTION**

In general, most agricultural lands are cultivated with vegetable crops for local consumption and export. The most important crops are leguminous plants squash, cucumber, muskmelon, watermelon, pumpkin and tomato (Galand *et al.*, 2005) Leaf mining insects are seen to play a serious role to these crops, where they cause great damage to both quality and quantity. The successful establishment and range expansion of leaf mines has undoubtedly been due to the large quantities of its primary host plants that are grown in the region, the suitable abiotic conditions and the absence of many parasites that limit growth in population (Henderickson and Plummer,1993), *Leromyza trifolii*, the American serpentine leaf miner fly is well known as a serious pest thought the world (Kashiwagi *et al.*, 2005). The population density of *Liromyza trifolii* was studied on three faba bean varieties affected by weather factors and three levels of fertilization at Shiben El-Kom, Menoufia.

## MATERIALS AND METHODS

To study the ecology of faba bean leafminer faly, *Liromyza trifolii*, this investigation was carried out on a special farm at Shibben El-Kom, the population density was determined on three faba bean varieties and three levels of fertilization were studied during the period of extended from September 2018 till March 2020.

Faba bean varieties: Misr 1, Misr 2 and Giza 843.

Planting dates: September 2018 in the first season and October 2019 in the second one.

### Experiment:

To carry out the experiment, in an area of 500 m<sup>2</sup>, each variety was cultivated with three replicates. After germination, weekly leaf samples were picked up at random from each variety (15 leaves) in paper bags and transferred into the laboratory. Immature stage (larvae) and mines were counted. The quotient of increase was calculated to determine the peaks of abundance:

$$\text{Quotient of increase} = \frac{\text{Average number of any period}}{\text{Average number of preceding period}}$$

### Fertilization:

Super Phosphate with cultivation during the two seasons nitrate was added 7 weeks after planting during two seasons.

The area was divided into three sections and each part was cultivated with three varieties at complete random design with three replicates of variety and the three-section were fertilized by three levels of recommended, half recommended and 1.5 recommended levels.

## RESULTS AND DISCUSSION

### A-The Effect Faba Bean Varieties On:

#### 1-Population Fluctuation:

Data obtained in **tables (1 and 2)** reveal that the population density of *Liriomyza trifolii* fluctuated on 3 varieties of faba bean plants (Misr 1, Misr 2 and Giza 843) throughout the season of the plantation.

The results as shown in Table (1) cleared that the larval population of *L. trifolii* on the 3 varieties of faba bean during the first season of 2018\2019 started through the 3<sup>rd</sup> week of December 2018 on the three varieties Misr1, Misr2 and Giza 843 with an average number of 0.5, 0.5 and 0.7 larvae\leaf, respectively. The population increased gradually reaching the first peak of abundance for each variety, Misr 1 recorded 1<sup>st</sup> peak during the 4<sup>th</sup> week of January 2019 (17.6 larvae \leaf), Misr 2 recorded 12.0 larva\leaf during the same week, while Giza 843 recorded the first peak during the first week in January 2019 (2.9 larvae\leaf). The second peak occupied the last week of February 2019 recording 68.7 larvae\leaf, on the first week of March 2019 reached 75.4 larvae\leaf and on the 4<sup>th</sup> of January, 2019 the average number was 15.8 larvae\leaf for the three varieties, respectively. The third peak was recorded on Giza 843 variety only with an average number of 85.1 larvae\leaf during the first week of March 2019.

During the second season of 2019\2020, the results presented in table (showed that the larval population started during the 4<sup>th</sup> week of November 2019 recording the lowest average number after that the population increased gradually recording the first peak in the first week of December 2019 (3.6 larvae\leaf) on Misr 1 during the last week of November 2019 (2.5 larvae\leaf) for Misr 2, while during the first week of January 2020

### Some Factors Affecting the Population Density of Faba Bean Leafminer Fly

reached 15.0 larvae\leaf on Giza 843. The second peak occurred during the first week of February 2020, the first week of January 2020 and the first week of February 2020 with an average number of 29.8, 13.4 and 47.6 larvae\leaf for the three varieties, respectively. The 3<sup>rd</sup> peak was recorded in the three varieties during different periods occupying the 4<sup>th</sup> week of February; the first week of the same month, and the second week of March 2020 for Misr 1, Misr 2 and Giza 843 reaching 44.1, 37.1 and 55.0 larvae\leaf, respectively.

Misr 2 variety recorded the 4<sup>th</sup> peak during the second week of March 2020 with an average number of 40.2 larvae\leaf.

**Table 1:** average numbers of *Liriomyza trifolii* larvae and mines per leaf of three faba bean varieties quotient of increase and infestation percentage during 2018/2019 at Shebin- El-Kom.

Date \ Varieties	Misr 1				Misr2				Giza843				Average	
	Mines	Larvae	Quotient of increase	% Infestation (mines)	Mines	Larvae	Quotient of increase	% Infestation (mines)	Mines	Larvae	Quotient of increase	% Infestation (mines)	C	R.H
21-12-2018	4.3	0.5	0.0	88.9	3.7	0.5	0.0	80.0	4.6	0.7	0.0	86.7	13.8	60
28-12-2018	3.0	1.6	3.2	60.0	3.6	1.9	3.8	66.7	4.6	2.6	4.1	80.0	13.4	69
average	3.7	1.1	3.2	74.5	3.7	1.2	3.8	73.4	4.6	1.5	4.1	83.4	13.6	64.8
4-1-2019	4.3	2.4	1.5	77.8	5.8	3.9	2.0	71.1	4.8	2.9	0.7	66.7	13.8	58
11-1-2019	6.2	3.5	1.5	72.3	5.6	3.9	1.0	68.0	4.1	2.5	1.8	58.9	14.0	68
18-1-2019	8.1	4.5	1.3	66.7	5.4	3.9	1.0	64.4	6.6	4.2	1.8	51.1	11.3	65
25-1-2019	23.6	17.6	3.9	86.7	16.4	12.0	3.1	66.7	18.7	15.8	3.8	73.3	13.9	56
average	10.6	7.0	2.1	75.9	9.1	5.9	1.8	67.6	8.6	6.4	2.0	62.5	13.3	61.8
1-2-2019	15.5	10.9	0.6	91.1	13.5	9.5	0.8	80.0	17.6	13.0	0.8	86.7	13.3	55
8-2-2019	15.8	12.7	1.2	91.1	18.9	15.8	1.7	86.7	16.8	13.5	1.1	77.8	10.2	58
15-2-2019	21.9	15.9	1.3	80.0	27.2	20.3	1.3	97.8	21.9	18.0	1.3	93.3	11.9	56
22-2-2019	40	30.0	1.9	93.3	33.9	29.1	1.4	100.0	51.5	39.5	2.2	97.7	15.6	63
28-2-2019	103	68.7	2.3	100	78.6	58.5	2.0	100.0	101.1	66.0	1.6	100.0	15.0	69
Average	39.2	27.6	1.5	91.1	34.4	26.6	1.44	92.9	41.8	30.0	1.4	91.1	13.2	60.2
7-3-2019	108.3	66.7	1.0	100	131.6	75.4	1.3	100.0	138.5	85.1	1.4	100.0	20.1	65
14-3-2019	107.4	33.3	0.5	100	116	48.3	0.6	100.0	108.6	48.8	0.3	100.0	11.4	63
21-3-2019	115.2	22.9	0.7	100	100.1	39.5	0.8	100.0	98.4	45.4	0.9	100.0	14.7	58
average	110.3	40.9	0.7	100	115.9	54.4	0.9	100.0	115.2	59.8	0.9	100.0	15.4	62.0

In general data in the Table (1) during the first season (2018/2019) cleared that, the total average of *Liriomyza trifolii* population on the three varieties of faba bean plants recorded two peaks of abundance for Misr1 the highest one appeared on 28 February 2019 was an average number of 68.7 individuals\leaf, Misr 2 variety recorded two peaks, the highest one on 7 March 2019 with an average number of 75,4 individuals\leaf, while Giza 843 had three peaks, the highest one recorded average number of 85.1 individuals\leaf during 7 March 2019.

On the other hand, the second season (2019/2020) data in table (2) showed that the first variety (Misr 1 recorded three peaks, the highest one occupied on 28 February 2020 with an average number of 44.1 larvae\leaf the second variety (Misr2 recorded 4 peaks, the highest of them occurred on 13 March 2020 (40.2 larvae\leaf) and the 3<sup>rd</sup> variety recorded 3 peaks of abundance, the highest one was recorded during 13 March 2020 (55.0 larvae\leaf).

With regard to the monthly average with regard to *L.trifolii* on different varieties, the obtained showed that the highest average occurred during March of both seasons of study recording 40.9, 54.4 and 59.8 individuals \leaf for the first season, while attained 37.1, 37.7, 47.5 individuals\leaf for the second one on the three varieties, respectively. Also, the monthly average showed that the differences between the population density of the three varieties occurred obviously during the most abundant month (March) and the most abundant variety (Giza 843) with a monthly average number of 59.8 larvae\leaf and 47.5 larvae\leaf during both seasons.

These results are in agreement with Choudary and Rosaiah (2000) who revealed that the leaf miner commenced from the 3<sup>rd</sup> week of November and reached a peak in the 4<sup>th</sup> week of January. A second peak was observed in the second week of February.

Also, Saradhi and Patnaik (2004) cleared that, the infestation of *L.trofolii* was maximum during the second week of February on French beans and tomatoes. Recently, Reddy and Kumar (2005) mentioned that the peak abundance of *L.trofolii* was observed from March to April.

## **2-Damage of *Liromyza trifolii*:**

### **a-Infestation Percentage:**

Data in Tables (1&2) revealed that the infestation percentages calculated monthly differed from variety to other and from season to other on faba bean plants recording the highest value during March 2019 where it was 100% on the three varieties (2018/2019), while in the second season (2019/2020), the highest percentages were 100, 98.4 ad 92.3% during March 2020 January 2020, and March 2020 for the three varieties Misr 1, Misr 2 and Giza 843, respectively.

### **b-The Average Number of Mines:**

The obtained results show the integration between infestation percentage and the average number of mines causing the damage.

Data cleared that the average numbers of mines per compound leaf varied between varieties and seasons, in the first season (2018/2019) the average ranged between 3.0-115.2, 3.6-131.6 and 4.1-138.5 mines/leaf, while in the second one (2019/2020) the average varied 1.3-81.6, 0.6-83.0 and 0.4-98.1 mines/leaf on the three varieties, respectively. Generally, the results cleared that the highest average of mines was recorded on Giza 843 variety during both seasons of study followed by Misr 2 and Misr 1 variety, respectively.

Regarding, the average number of mines and the infestation percentage, the data obtained revealed that *L.trifolii* infest the three varieties with different levels with no significant preference since the infestation percentage reached 100% on different tested varieties. Lakshmiarayana (1992) found that the mines covered 20-60% of the leaf area in older leaves of castor-bean and the severity of the attack was low to negligible as crop growth progressed and infestation declined from mid-September onwards.

### **B- The Effect of Weather Factors:**

The periods which are preferable for population increase were known by the value of the quotient of increase, these values show the limits of the preferable zone. During the first season, the values of the quotient of increase for the first variety as the highest value was 3.9 at 13.9 C. and 56.0% RH on 25 January 2019 (Misr1); on Misr 2 variety the highest value was 3.8 at 13.4C. and 69.0% RH. during 28 December 2018 and it reached the highest value on Giza843 during December 28, 2018, at 13.4 C. and 69.0% RH. (4.1). In the second season, the quotient of increase recorded the highest values of 1.8 and 1.9 on 30 Nov. and 21 Dec. 2019, when the weather factors ranged from 14.1-20.3C. and 61.0-68.0% RH., respectively (Misr 1). On Misr2 the highest quotient of increase value was 5.0 on 30 Nov 2019 at 20.3 and 68.3% RH. also, Giza 843 recorded 4.0 on 30 Nov. 2019. The obtained results are supported by Deepesh-Sharma *et.al.* (1997) who stated that the mean temperature of around 26 C. was most conducive for the population build-up of *L.trifolii*, while Choudary and Rosaiah (2000) mentioned that, the minimum temperature and evening relative humidity had a negative correlation. In addition a positive non-significant correlation between the seasonal abundance of *L.trifolii* and the maximum and minimum temperature.

### **C- The Effect of Fertilization on The Population of *L.trifolii*:**

Three varieties of faba bean were cultivated and three levels of fertilization (recommended, 0.5 recommended and 1.5 recommended) were applied for each variety.

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**Table 2:** average numbers of *Liriomyza trifolii* larvae and mines per leaf of three faba bean varieties quotient of increase and infestation percentage during 2018/2019 at Shebin- El-Kom.

Date	Misr 1				Misr2				Giza843				average	
	Mines	Larvae	Quotient of increase	% Infestation (mines)	Mines	Larvae	Quotient of increase	% Infestation (mines)	Mines	larvae	Quotient of increase	% Infestation (mines)	C	R.H
23-11-2019	1.3	1.2	0.0	37.7	0.6	0.5	0.0	20.0	0.4	0.3	0.0	46.7	17	64
30-11-2019	3.2	2.2	1.8	80.0	3.1	2.5	5.0	70.0	2.0	1.2	4.0	60.0	20.3	68
average	2.3	1.7	1.8	58.9	1.9	1.5	5.0	45.0	1.2	0.8	4.0	53.4	18.6	66.0
7-12-2019	4.9	3.6	1.6	77.8	2.9	2.1	0.9	80.0	4.6	2.7	2.3	84.4	17.7	68
14-12-2019	7.0	3.2	0.9	91.1	5.6	2.8	1.3	96.7	6.8	3.6	1.3	91.1	18.3	78
21-12-2019	10.2	6.0	1.9	86.7	11.8	7.2	2.6	96.7	9.8	4.9	1.4	80.0	15.3	66
28-12-2019	14.3	8.7	1.5	90.0	13.9	10.3	1.4	98.3	14.2	10.0	2.0	85.6	14.0	61
average	9.1	5.4	1.5	86.4	8.6	5.6	1.6	92.9	8.9	5.3	1.8	85.3	16.3	68.3
4-1-2020	18.7	11.7	1.3	93.3	17.1	13.4	1.3	100.0	18.6	15.0	1.5	91.1	20.5	82
11-1-2020	20.0	13.3	1.1	90.0	14.0	9.9	0.7	96.7	17.8	11.9	0.8	88.9	13.4	64
19-1-2020	21.7	14.8	1.1	86.7	11.0	6.3	0.6	96.7	17.1	8.8	0.7	86.7	13.8	60
26-1-2020	30.1	22.3	1.5	91.2	31.3	21.7	3.4	100.0	41.3	28.2	3.2	93.4	14.1	61
Average	22.6	15.5	1.3	90.3	18.4	12.8	1.5	98.4	23.7	15.9	1.6	90.0	15.5	66.8
2-2-2020	43.3	29.8	1.3	95.6	51.6	37.1	1.7	100.0	65.4	47.6	1.7	100.0	15.7	57
9-2-2020	43.2	23.4	0.8	95.6	46.8	29.4	0.8	100.0	47.3	32.2	0.7	95.6	14.0	58
15-2-2020	42.9	16.9	0.7	95.6	41.9	21.6	0.7	96.7	29.1	16.7	0.5	91.1	12.7	73
22-2-2020	49.2	30.5	1.8	97.8	57.6	26	1.2	88.4	45.5	20.8	1.2	93.4	15.5	66
28-2-2020	55.4	44.1	1.4	100.0	73.3	30.2	1.2	80.0	61.9	25.0	1.2	95.6	19.3	59
Average	46.8	28.9	1.2	96.9	54.2	28.9	1.1	93.0	49.8	28.5	1.1	95.1	15.4	62.5
6-3-2020	68.5	39.4	0.9	100.0	78.5	35.2	1.2	90.0	80.0	40.0	1.6	93.4	16.2	65
13-3-2020	81.6	34.7	0.9	100.0	83.6	40.2	1.1	100.0	98.1	55.0	1.4	91.1	18.0	51
Average	75.1	37.1	0.9	100.0	81.1	37.7	1.1	95.0	89.1	47.5	1.5	92.3	17.1	58

Data obtained as shown in Table (3) reveal that the lowest total average of larvae was 208.6 larvae/leaf occurred on Misr1 variety was treated with 0.5 recommended and the highest total average of larvae was recorded on Giza 843 variety (328.2 larvae/leaf), while the lowest total average of mines occurred on Misr 2 when it was fertilized with 0.5 recommended and the highest total average appeared on Giza 843 variety with 1.5 recommended, during the first season of study. On the other hand, during the second season, the highest total average of larvae occurred with 1.5 recommended (366.4 larvae/leaf) on Giza 843 variety, while the lowest value (216.7) was recorded on Misr 1 variety. The total average of mines reached the highest value of 576.4mines/leaf, while the lowest total average was 378.5 mines//leaf on Misr 1 variety with 0.5 recommended.

As for, infestation percentage, the highest value occurred for 1.5 recommended on the cultivated varieties and ranged between 94.4% and 96.8% during both seasons of study. While the remaining treatments recorded infestation percentages varied from 80.8%-90.3% during both seasons of study.

In general, statistical analysis showed insignificant differences between the three treatments of fertilization on the cultivated varieties, while the analysis of variance recorded significant differences between Misr1and Misr2 compared with Giza843variety during both seasons of study.

The present results in this study should in mind, when planning *L.trifolii* control strategy, although, the rate of infestation differed in different studied varieties, while the infestation percentages reached more than 80% in the three varieties.

**Table 3:** Total average of *Liriomyza trifolii* larva and mines per leaf affected by three levels of fertilization during the 2018-2019 and 2019-2020 seasons at Shibben El-Kom.

Fababeen Variety	Levels of fertilization									
	Recommended			½ Recommended			1½ Recommended			
	Mine/leaf	larva/leaf	% infestation	Mine/leaf	larva/leaf	% Infestation	Mine/leaf	larva/leaf	% Infestation	
<b>2018-2019</b>										
Misr 1	456.8	221.2	86.3	436.6	208.6	84.0	568.6	246.6	95.8	
Misr 2	440.3	262.5	84.4	425.4	245.4	80.8	556.8	285.4	94.4	
Giza 843	545.2	327.7	88.7	538.4	310.2	90.3	586.6	228.2	96.8	
<b>2019-2020</b>										
Misr 1	395.5	246.4	86.3	378.5	228.2	90.8	536.4	254.2	96.4	
Misr 2	424.6	236.4	85.7	398.4	216.7	89.6	518.4	274.6	95.2	
Giza 843	510.3	323.7	85.6	496.4	318.8	90.6	576.4	366.4	96.2	
L.S.D. 0.05	2018-2019		Mine: 66.1 Larva: 45.6			2019-2020			Mine: 71.8 Larva: 52.4	

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## ARABIC SUMMARY

بعض العوامل التي تؤثر على الكثافة العددية لذبابة اوراق الفول *Liriomyza trifoli* في منطقة شبين الكوم محافظة المنوفية

باسم محمد احمد الدفراوي

قسم الحشرات الاقتصادية والحيوان الزراعي – كلية الزراعة – جامعة المنوفية

أجريت هذه الدراسة لتقدير الكثافة العددية لذبابة اوراق الفول على ثلاثة اصناف من الفول البلدي مع تسجيل درجات الحرارة والرطوبة وتأثيرها ودراسة تأثير ثلاثة مستويات من التسميد (الموصي به، نصف الموصي به، واحد ونصف الموصي به) في مزرعة خاصة بشبين الكوم , منوفية. وقد توصلت الي النتائج التالية:

سجلت الآفة ذروتين في الموسم الأول (2018-2019) على صنفى مصر 1 ومصر 2 بينما سجلت ثلاث ذروات على جيزة 843. اما في الموسم الثاني (2019-2020) سجلت الآفة ثلاث ذروات على مصر 1 وجيزة 843 وأربعة على مصر

وقد بلغت الكثافة العددية اعلي تعداد لليرقات 40,9 على مصر 1, 54,4 على مصر 2 وكانت 59,8 يرقة/ورقة على جيزة 843 في الموسم الأول، اما الموسم الثاني سجلت 37,1 37,7 :47,5 يرقة/ورقة على الثلاثة اصناف على التوالي. كما بلغت النسبة المئوية للأصابة على الأصناف الثلاثة في الموسم الأول 100% بينما سجلت 98,4%, 92,3%, في الموسم الثاني على التوالي. كما سجلت اعلي متوسط لعدد الأنفاق 115,3 : 131,6 , 138,6 نفق/ورقة (موسم اول) و 81,6, 83,6, 98,1 نفق/ورقة (موسم ثان) على الأصناف الثلاثة على التوالي واوضحت النتائج عدم وجود فروق معنوية بين الأصناف الثلاثة للفول عند تسميدها بالمستويات الثلاثة بينما سجلت فروق معنوية بين كل من صنفى مصر 1 ومصر 2 مقارنة بصنف جيزة 843 خلال موسمي الدراسة.

ولوحظ من النتائج رغم اختلاف معدل الأصابة بين الأصناف محل الدراسة الا ان النسبة المئوية للأصابة غطت أكثر من 80% من مسطح اوراق الأصناف التي شملتها الدراسة ولذلك يجب ان يؤخذ هذا في الاعتبار عند رسم سياسة مكافحة هذه الآفة على اصناف الفول البلدي.