FIELD STUDIES ON BROAD BEAN LEAFMINER, *LIRIOMYZA CONGESTA* (BECK.) A. VARIETAL RESISTANCE. B.SPATIAL DISTRIBUTION OF LARVAE UNDER CONDITIONS OF KAFR EL-SHEIKH GOVERNORATE, EGYPT

A.S. EL-KHOULY[2], M.M. METWALLY[2], R.M. SALEM [1], H.A. HELAL[2] AND A.B. EL-MEZAIEN[2]

1 Plant Protection Research Institute, Agricultural Research Centre, Giza, Egypt.

2 Faculty of Agriculture, Al-Azhar University, Cairo.

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Abstract

Larval population of the broad bean leafminer, *Liriomzya congesta* B.infested four faba bean varieties; Giza 402, Giza 3, Giza 461 and Reina Blanca and three breeding lines; 714, 716/1039 and 716/1024 was studied in 1991/92 season and repeated in 1992/93 without the breeding line 716/1024. The spatial distribution of the insect at three different levels (lower, middle and upper) of the plants of all faba bean varieties and breeding lines was also determined. Studies were made under natural infestation conditions in the field. Obtained data revealed that Reina Blanca variety was more susceptible to infestation with *L.congesta* in both seasons, while Giza 3 and breeding line 716/1039 were relatively the least susceptible ones for 1991/92 and 1992/93 seasons, respectively. The highest numbers of larvae were recorded in the middle leaflets of the plant in all tested varieties and breeding lines while the lowest number was obtained in the upper leaflets of the plant in all tested varieties and breeding lines while the lowest number was obtained in the upper leaflets. Such results help in the *L.congesta* management on faba bean fields.

INTRODUCTION

The faba bean leafminer, *Liriomyza congesta* (Beck.) is among the most important field pests of faba bean in Egypt; it causes considerable damage to the yield (Saleh and Guirguis, 1976 and Aly and Makadey 1990). Chemical control of this insect pest creates several problems for human being and the environment. Consequently, it was practical to seek out some safe approaches to manage this pest.

Screening of varieties of faba bean to infestation with leafminer is becoming of vital interest. Therefore, the investigation was carried out to study the suscepti-

bility of some faba bean varieties and breeding lines to infestation with *Liriomyza congesta* as well as the spatial distribution of this insect throughout 1991/92 and 1992/93 bean seasons.

MATERIALS AND METHODS

Faba bean varieties; Giza 402, Giza 3, Giza 461 and Reina Blanca, and breeding lines 714, 716/1039 and 716/1024 were evaluated for their suscetibility to infestation with the leafminer, *Liriomyza congesta* (Beck.) as well as it's spatial distribution under field conditions at Sakha region, Kafr El-Sheikh during 1991/92 season and were repeated in 1992/93 season without breeding line 716/1024. The involved varieties and breeding lines were cultivated in mid-November, 1991 and 1992 in complete randomized block design with four replicates for each variety or breeding line. The usual recommended agricultural treatments were followed without any chemical control throughout the growing seasons .

To estimate the population densities of *L.congesta* larvae, five plants were chosen at random from each plot. Three leaflets representing, upper, middle and lower levels of the chosen plant were placed in polyethylene bags and transferred to the laboratory for inspection. Numbers of larvae found per each leaflet were counted and recoded. Duncan's multiple range test (1955) at 5% level was used to reveal the significance among the means of larvae on the involved varieties and breeding lines.

RESULTS AND DISCUSSION

Susceptibility of some faba bean varieties and breeding lines to infestation with *L.congesta*.

Data presented in Table 1 show the number of *L.congesta* larvae in 15 leaflets of the tested varieties and breeding lines during the inspection period in 1991/92 season. It is clear that the larvae of the leafminer were found on all the tested varieties and breeding line nearly in the same time.

The population of larvae peaked three times on all tested varieties and breeding lines; on 9th Feberuary, 9th March and 6th April. The second peak proved to be the highest one.

The highest infestation happened in case of Reina Blanca with a mean of 27.72 larvae/15 leaflets, while Giza 3 harboured the lowest number of larvae with a mean of 18.64. Other varieties and breeding lines were of moderate infestation and could

Table 1. Mean number of larvae of *Liriomya congesta* (Beck.) per 15 leaflets settled on 7 selected broad bean varieties and breeding lines under field condition at Sakha region (Kafr El-Sheikh Governorate) during 1991/92 season.

Date of sampling / Varieties and breeding lines	Dec. 1991		Jan. 1993				Feb. 1993				Mar. 1993					Mar. 1993		Total	Mean
	22	29	5	12	19	26	2	9	16	23	2	9	16	23	30	6	13		
Giza 402	6.25	8.0	7.5	8.0	15	15.25	13.5	15.0	12.0	26.25	31.75	50.5	25.50	25.25	23.25	34.25	12.75	320.00	18.82 b
Giza 3	2.75	8.75	9.75	12.5	13.5	21.0	11.25	15.0	10.0	21.75	30.25	42.5	23.50	21.75	26.25	32.25	14.75	317.00	18.64 b
Giza 461	5.75	9.25	10.75	11.75	13.25	17.75	16.5	35.0	20.75	36.5	32.25	43.75	20.00	37.25	38.75	35.00	10.75	395.00	23.23 ab
Reina Blanca	5.0	7.25	7.5	8.75	10.00	21.0	21.0	45.0	30.0	31.0	40.5	57.75	37.50	36.00	40.50	50.50	2.20	471.25	27.72 a
* B.L. 714	6.0	6.25	6.5	8.5	9.00	16.0	13.25	35.0	20.0	26.75	35.5	60.5	38.25	26.25	27.25	52.50	15.75	403.25	23.72 ab
* B.L. 716/1039	9.5	11.25	13.0	13.25	15.5	23.5	17.50	30.0	13.0	25.0	31.0	50.5	34.50	30.75	34.75	41.75	10.50	404.45	23.80 ab
* B.L. 716/1024	6.25	7.75	9.5	10.75	13.25	19.5	11.75	25.0	8.0	23.5	28.25	43.0	23.00	31.25	34.25	47.75	14.25	357.00	21.00 ab

* B.L = Breeding line

Means followed by the same letter are not significantly different.

be arranged as follow: 716/1039 (23.80 larvae), 714 (23.72 larvae), Giza 461 (23.23 larvae), 716/1024 (21.00 larvae) and Giza 402 (18.82 larvae).

The data recorded in Table 2 clear the number of leafminer larvae on only four varieties and two breeding lines during the season of 1992/93. The results revealed that the larval population in the second season was almost similar to that recorded in the first one, where, Reina Blanca was the highest infested variety (32.05 larvae/15 leaflets) and the lowest infested one was breeding line 716/1039 with a mean of 18.70 larvae. The rest varieties were of moderate infestation and could be arranged as in a descending order as follows: Giza 402 (22.55 larvae), 714 (22.05 larvae), Giza 461 (20.63 larvae) and Giza 3 (19.42 larvae).

Generally, such differences in susceptibility of the faba bean varieties and breeding lines to *L.congesta* infestation may be due to the morphological characters (colour and shape of the plant, cel wall thickness and the leaf solidness) and/or physioligcal characters (repellents and attractants) of plant in addition to the difference in environmental conditions in the two seasons.

The mentioned results are in the same trend with the findings of Saleh and Guirguis (1976), Hassanein (1989), Aly and Makadey (1990) and Abd El-Fatah (1991) who found that three distinct peaks of *L.congesta* larvae were recorded on broad bean. Also, Moussa *et al.* (1994) mentioned that the highest infestation with *L.congesta* happened in case of Reina Blanca while the lowest infestation occurred in case of variety Giza 3 improved.

The spatial distribution of *L.congesta* larvae on the different faba bean varieties and breeding lines

The mean number of *L.congesta* larvae per five leaflets in each of three levels of the plant of all the faba bean varieties and breeding lines during 1991/92 and 1992/93 seasons, were recorded in Table 3. For example, the mean number of *L.congesta* larvae infested Giza 402 was 3.14, 9.40 and 6.28 larvae/5 leaflets for upper, middle and lower level, respectively during 1991/92 season. Throughout 1992/1993 this mean became 6.20, 9.05 and 7.30 for upper, middle and lower level, respectively. It is obvious that the number of larvae was significantly low in the upper leaflets of the plant, while the highest number of larvae was recorded in the middle leaflets. Lower leaflets had a moderate number of larvae. This holds true for each variety or breeding line in the two tested seasons. These results are due to the *L.congesta* females behaviour, since they prefer to lay eggs on the upper level (young leaflets), which became in the middle level upon hatching as a result of plant

Table 2. Mean number of larvae of *Liriomya congesta* (Beck.) per 15 leaflets settled on 6 selected broad bean varieties and breeding lines under field condition at Sakha region (Kafr El-Sheikh Governorate) during 1992/93 season.

Date of sampling / Varieties and breeding lines	Dec. 1991		Jan. 1993				Feb. 1993				Mar. 1993					Mar. 1993		Total	Mean
	22	29	5	12	19	26	2	9	16	23	2	9	16	23	30	6	13		
Giza 402	4.7	5.75	5.25	6.00	6.75	17.50	9.25	17.25	10.0	7.25	38.5	65.5	40.25	39.00	39.75	46.00	24.75	383.50	22.55 b
Giza 3	3.0	2.50	3.00	2.75	2.00	11.00	8.25	9.00	5.0	28.75	31.75	50.5	31.50	36.75	39.75	45.25	19.50	330.25	19.42 b
Giza 461	5.5	5.75	5.50	5.75	6.00	6.75	9.75	24.75	18.25	37.75	41.75	45.75	20.50	32.50	31.50	36.50	16.75	350.75	20.63 b
Reina Blanca	6.0	7.00	5.50	7.50	7.75	10.25	13.50	22.25	14.0	43.5	44.5	97.25	67.00	57.75	45.00	59.25	27.00	545.00	32.05 a
* B.L. 714	5.2	5.75	5.50	7.50	7.00	14.75	10.75	14.75	11.0	31.35	33.75	70.0	33.75	28.25	29.50	45.75	20.00	375.00	22.05 b
* B.L. 716/1039	3.2	3.50	4.00	4.75	3.75	12.75	6.00	14.50	5.5	39.75	33.5	61.25	21.25	20.50	25.00	40.25	19.50	318.00	18.70 b

* B.L = Breeding line

Means followed by the same letter are not significantly different.

growing. Rarely larvae were existed on the lower level due to the ecolosion of full grown larvae.

These results are in agreement with those reported by El-Attar (1980) and Aly and Makady (1990) who stated that the larval population of *L.congesta* in the middle leaflets of bean in each variety exceeded that in the lower and the upper leaflets, in addition, the population density of larvae was significantly correlated with the plant age .

Finally, the gained results lead to the conclusion that Reina Blanca variety was the most susceptible to infestation with *L.congesta* during the two seasons. Also, the highest number of larvae was recorded in the middle leaflets of the plant in each variety and breeding line while the lowest number of larvae was obtained in the upper leaflets of the plants. Such findings might be useful in the integrated pest control (IPC).

Table 3. Mean number of larvae of *Liriomya congesta* (Beck.) per 5 leaflets in each of three levels of seven broad bean varieties and breeding lines during 1991/92* and 1992/93** successive seasons at Sakha region, Kafr El-Sheikh Governorate.

Level / Varieties and breeding lines	Upper		Middle		Lower		Total	
	91/92	92/93	91/92	92/93	91/92	92/93	91/92	92/93
Giza 402	3.14	6.20	9.40	9.05	6.28	7.30	18.82	22.55
Giza 3	3.20	5.0	8.14	8.30	7.30	6.12	18.64	19.42
Giza 461	5.0	5.32	9.15	8.15	9.08	7.16	23.23	20.63
Reina Blanca	4.25	7.62	13.17	14.33	10.30	10.10	27.72	32.05
Breeding line 714	4.30	6.0	10.22	9.13	9.20	6.92	23.72	22.05
Breeding line 716/1039	5.20	4.26	10.30	7.32	8.30	7.12	23.80	18.70
Breeding line 716/1024	4.5		9.5		7.0		21.0	
T o t a l	29.59	34.4	69.88	56.28	57.46	44.72	156.93	135.4

* F value between levels = 70.70 P = 1% L.S.D. 0.05 = 1.41, L.S.D. 0.01 = 1.98

** F value between levels = 24.75 P = 1%, L.S.D. 0.05 = 1.37, L.S.D. 0.01 = 1.92

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تعداد يرقات صانعة الأنفاق فى أوراق الفول البلدى وتوزيعها الفراغى على بعض أصناف وسلالات الفول البلدى تحت الظروف الحقلية بمحافظة كفر الشيخ

عبد المنعم سليمان الخولى٢ ، منير محمد متولى٢ ، رمضان محمد بهى الدين سالم١ ،
هلال أحمد هلال٢ ، الانصارى بلتاجى المزين١

١ معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الجيزه .

٢ كلية الزراعة – جامعة الازهر – القاهرة.

درس تعداد صانعة الانفاق فى اوراق الفول البلدى على سبعة أصناف وسلالات فول بلدى وهى جيزة ٤٠٢ ، وجيزة ٣ ، وجيزة ٤٦١ ، ورينا بلانكا والسلالة ٧١٤، والسلالة ٧١٦ / ١.٣٩، والسلالة ٧١٦ / ١.٢٤ خلال الموسم الزراعى ١٩٩١ / ١٩٩٢ ثم أعيدت نفس الدراسة خلال موسم ١٩٩٢ / ١٩٩٣ بدون السلالة ٧١٦ / ١.٢٤ . تم أيضا تحديد التوزيع الفراغى لتلك الافة على ثلاث مستويات مختلفة (الأسفل – الأوسط – العلوى) لنباتات الأصناف والسلالات تحت الدراسة.

أوضحت النتائج المتحصل عليها أن رينا بلانكا أكثر الأصناف والسلالات إصابة بصانعة الأنفاق فى كلا الموسمين، بينما صنف جيزة ٣ والسلالة ٧١٦ / ١.٣٩ أقل الأصناف والسلالات إصابة في كلا الموسمين ١٩٩١ / ١٩٩٢ ، ١٩٩٢ / ١٩٩٣ على الترتيب. سجل أعلى تعداد ليرقات صانعة الأنفاق على الوريقات الوسطية (المستوى الأوسط) للنبات وأقل تعداد لتلك اليرقات على الوريقات العليا (المستوى العلوى) لنباتات جميع الأصناف والسلالات المختلفة.