

**LARVAL POPULATION OF *LIRIOMYZA CONGESTA* (BECK.)
(DIPTERA: AGROMYZIDAE) ON FABA BEAN AND ITS
RELATION TO CERTAIN WEATHER FACTORS AT KAFR
EL-SHEIKH GOVERNORATE, EGYPT**

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Abstract

An experiment was carried out at the Agricultural Research Station, Kafr El-Sheikh, to study the larval population of *Liriomyza congesta* (Beck.) on faba bean plants and its relation to certain weather factors (weekly means of temperature and relative humidity) as well as the number of its generations during 1991/92 and 1992/93 seasons.

Weekly mean numbers of live larvae of *L. congesta* revealed that larval population was lower during 1991/92 than 1992/93. Three population peaks were observed and three generations of larvae took place between December and April. For both seasons of investigation, the highest peak occurred by March 9.

Weekly means of temperature exhibited positive correlation with larval population during both seasons, but the effect of the same weather factor was insignificant during the first season and highly significant during the second one. On the other hand, relative humidity induced negative and insignificant relationship during both seasons. The combined effect of the two considered weather factors was more pronounced on larval population during the second season as it was responsible for 73.90% of the changes in population in 1992/93 compared to 58.53% in 1991/92.

INTRODUCTION

The leaf miner, *Liriomyza congesta* (Beck.) is one of the most important insect pests infesting faba bean in the field causing considerable damage to the yield (Saleh and Guirguis, 1976; Foster and Sanchez, 1988 and Aly and Makadey, 1990). It is needed to carry out field based monitoring to provide the farmer with a decision-making tool and also to follow the progress of population development up to a pre-defined number of insects or action threshold. It is important in any monitoring programme to select an appropriate sampling technique (Dent, 1991). The number of fo-

lar mines does not provide an accurate estimate of leaf miner density since mines do not disappear after larval emergence (Johnson *et al.*, 1980). Accordingly, the count of live larvae technique was tested in this study. As stated by Dent (1991), the seasonal phenology of insect numbers, the number of generations and the level of insect abundance at any location are influenced by the environmental conditions at that location.

The objective of this investigation is to study the population density of *L.congesta* (Beck.) larvae on faba bean plants and its relation to certain weather factors as well as the number of its generations.

MATERIALS AND METHODS

Population density of the leaf miner *L.congesta* (Beck.) larvae on faba bean plants was determined at the Agricultural Research Station Farm, Kafr El-Sheikh, during 1991/92 and 1992/93 seasons. The experimental field was divided into four plots of 1/4 feddan each. Plots were cultivated with faba bean Giza 3 variety in mid-November, received normal agricultural practices and chemical control was entirely avoided.

To assess the population density of *L.congesta* larvae, five plants were chosen at random from every plot. Three leaflets representing the three levels (upper, middle and lower) of the chosen plants were placed in polyethylene bags and transferred to the laboratory for inspection. Numbers of larvae found per leaflet were then counted. The number of *L.congesta* generations was calculated as described by Audemard and Milaire (1975) and Jacob (1977).

The daily records of temperature and relative humidity during the inspection period were obtained from the Meteorological Department at Sakha Res. Station. Weekly means of the two considered weather factors were used to calculate the simple correlation and partial regression values according to Fisher (1950).

RESULTS AND DISCUSSION

1. Population fluctuation

Table 1 shows the weekly mean numbers of *L.congesta* larvae/5 leaflets of faba bean during 1991/92 and 1992/93 seasons. Obtained results revealed that in both seasons of investigation larvae started to appear in few numbers on December 22, then increased towards a first peak of 14.5 and 14.7 larvae/5 leaflets by Feb-

ruary 9 for 1991/92 and 1992/93, respectively. Thereafter, population decreased to 7.7 and 10.5 larvae/5 leaflets, then tended to increase gradually to reach a second high peak of 17.0 and 32.5 larvae for the first and second season, respectively by March 9. A third population peak of 11.5 and 20 larvae took place on April 6. Larval population was generally higher during the second season than the first one. This may be due to the difference in weather conditions and/or abundance of natural enemies.

Table 1. Weekly numbers of *Liriomyza congesta* (Beck) larvae on broad bean plants during the two seasons 1991/92 and 1992/93 at Sakha region, Kafr El-Sheikh governorate.

Sampling date Month Day		1991/92			1992/93		
		No. of larvae/5 leaflets	Mean weather conditions		No. of larvae/5 leaflets	Mean weather conditions	
			Air Temp. (°C)	R.H. (%)		Air Temp. (°C)	R.H. (%)
Dec.	22	2.0	11.7	67.9	2.0	12.2	50.9
	29	2.0	12.0	69.4	2.0	11.6	54.0
Jan.	5	2.5	10.4	72.3	2.0	11.5	58.2
	12	2.0	12.4	72.3	2.5	9.6	59.9
	19	5.0	12.8	71.2	2.5	10.9	56.3
	26	5.0	12.1	71.3	3.5	11.5	52.5
Feb.	2	4.5	12.4	76.7	4.5	11.7	61.2
	9	14.5	11.8	79.7	14.7	9.6	62.2
	16	7.7	11.2	65.7	10.5	9.7	62.0
	22	8.7	10.3	68.5	11.5	11.5	58.0
Mar.	2	10.5	7.6	74.2	15.0	15.9	59.1
	9	17.0	12.2	70.1	32.5	14.5	58.9
	16	8.5	14.8	65.0	22.0	11.6	58.8
	23	8.5	14.8	66.2	9.0	13.5	56.2
Apr.	30	7.7	16.6	70.5	15.0	15.5	61.1
	6	11.5	16.8	64.4	20.0	14.3	50.7
	13	4.0	20.6	64.8	9.0	16.1	51.4

The approximate number of *L. congesta* generations was calculated by weekly numbers during the two seasons 1991/92 and 1992/93. Generation lines were es-

established by plotting percentages of accumulated weekly counts on a semilogarithmic paper. Fig. 1 shows three generations between December and April in both seasons of investigation. These generations lasted for 8, 4 and 5 weeks, respectively. Such results agree with findings of Saleh and Guirguis (1976), Hassanein (1989), Aly and Makadey (1990) and Abd El-Fatah (1991) who found three distinct peaks of *L. congesta* larvae on faba bean.

2. The effect of temperature and relative humidity on larval population

Table 2 shows the relationship between the number of *L. congesta* larvae and two main weather factors (mean temperature and mean relative humidity) during 1991/92 and 1992/93 seasons. Statistical analysis revealed that the relationship between the weekly mean temperature and larval population was positive, but insignificant during the first season. During the second season, this effect was positive and highly significant. This means that temperature was within the optimum range for larval activity in the first season and below that optimum in the second one.

In respect to relative humidity, the relationship to population was negative and insignificant during both seasons. In other words, it was within the optimum range for population activity. These findings agree with the results obtained by Abd El-Rahim *et al.*, (1974) who found that the population density of *L. congesta* larvae increased with increase of temperature and decrease of relative humidity.

The combined effect of the two considered weather factors on larval population as a percentage of explained variance refers that they were responsible for 58.53 and 73.90% of the changes in the population of *L. congesta* larvae in 1991/92 and 1992/93, respectively.

Table 2. Simple correlation (*r*), partial regression (*b*) and explained variance (E.V) of *Liriomyza congesta* (Beck.) larvae on weekly mean temperature and relative humidity (R.H.) on broad bean plants during 1991/92 and 1992/93 seasons at Sakha region, Kafr El-Sheikh governorate.

Season	Factor	"r"	P	"b"	P	F	P	E.V. %
1991/92	Weekly mean temperature (°C)	+ 0.137	-	+ 20.13	-	2.25	-	58.53
	Weekly mean R.H. (%)	-0.296	-	+32.83	-			
1992/93	Weekly mean temperature (°C)	+0.615	1%	+22.5	-	5.65	1%	73.50
	Weekly mean R.H. (%)	-0.058	-	+29.15	5%			

P = Probability level.

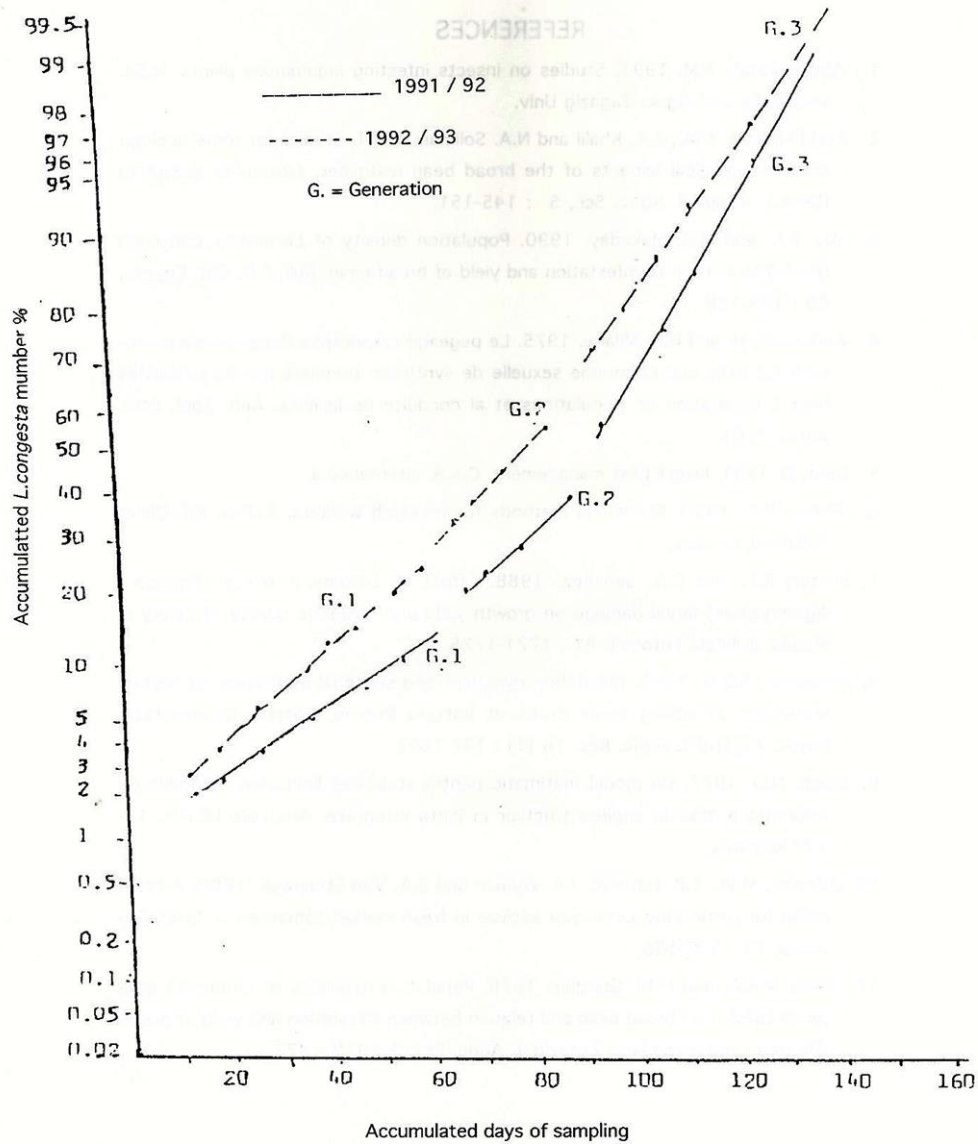


Fig.1. Durations and numbers of *Liriomyza congesta* (Beck.) field generations on broad bean plants during 1991/92 and 1992/93 seasons at Kafr El-Sheikh governorate.

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تعداد يرقات ذبابة أوراق الفول البلدى وعلاقته ببعض العوامل الجوية بمنطقة كفر الشيخ

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أجريت تجربة حقلية بمزرعة محطة البحوث الزراعية بسخا - محافظة كفر الشيخ لدراسة تعداد يرقات ذبابة أوراق الفول (*Liriomyza congesta* (Beck.) على نباتات الفول البلدى وعلاقته بعاملين جويين هما المتوسط الأسبوعى لكل من درجة الحرارة والرطوبة النسبية كما تم تحديد عدد الأجيال للآفة خلال موسمى ١٩٩٢/٩١ و ١٩٩٣/٩٢ .

وبتتبع متوسط التعداد الأسبوعى لليرقات كان التعداد فى الموسم الثانى أعلى منه فى الموسم الأول. ولوحظ أن لتعداد الحشرة ثلاثة ذروات حدثت أعلاها فى التاسع من مارس فى كلا الموسمين. ووجد أن للحشرة ثلاثة أجيال على الفول البلدى فى الفترة من ديسمبر الى ابريل من كل موسم.

ووجدت علاقة موجبة بين درجة الحرارة وتعداد اليرقات خلال موسمى الدراسة، وكانت هذه العلاقة غير معنوية فى الموسم الأول وعالية المعنوية فى الموسم الثانى . بينما كانت العلاقة سالبة وغير معنوية بين الرطوبة النسبية وتعداد اليرقات خلال موسمى الدراسة. وكان التأثير المشترك لدرجة الحرارة والرطوبة النسبية معا على تعداد اليرقات أقوى خلال الموسم الثانى عنه فى الموسم الاول حيث كان هذان العاملان مستولان عن تغير قدره ٧٣,٩٠٪ فى التعداد لموسم ١٩٩٣/٩٢ مقابل ٥٨,٥٣٪ لموسم ١٩٩٢/٩١ .