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STUDIES ON THE SERPENTINE LEAFMINER *Liriomyza tirifolii* (BURGESS) AND ITS HYMENOPTEROUS PARASITOIDS IN NORTH SINAI, EGYPT

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ABSTRACT

The percentage of infestation caused by the larvae of *Liriomyza trifolii* (Burgess) varied from 23.21 % and 52.08 % in the first season and from 30.83 % and 50.0 % in the second season at El-Arish locality. On the other hand, the percentage of infestation at Rafah locality ranged between (19.48 % and 49.25 %) and (16.88 and 47.68 %) in the first season and the second season, respectively.

The average percentage of parasitism caused by the hymenopterous parasitoids at El-Arish locality were 89.16 % and 87.43 % during the first season 2001 / 2002 and the second season 2002 / 2003, respectively.

At Rafah locality, the average rates of parasitism were 84.58 % and 83.53 % during the first season and the second season, respectively.

INTRODUCTION

The leafminer of both genera *Liriomyza* and *phytomyza* (Diptera: Agromyzidae) are cosmopolitan and are economically important pests of many agricultural crops (Spencer, 1973). In Egypt, *L. trifolii* (Burgess) was recorded as serious pest attacking broad bean, peas, Lentil (Hammad, 1955; Assem, 1966; Hafez et al., 1970; Dimetry, 1971; Attia, 1989 and Eid, 1998). At the present time L. *trifolii* has become an important pest attacking broad bean (Mesbah and sheriff, 1994 and Awadalla, 1998). Cowpea (Awadalla and Fathy, 1998) and Tomato (Sharaf El –Din 1994). Four parasitoids were encountered by Hafez et al (1974) as parasitoids of *Liriomyza* spp.these parasitoids were *Diglyphus* sp., *Hemiptarsenus zilahisebossi* (Eulophidae) as a larval parasitoids; *Opius* sp. (Barconidae), *Halicoptera* sp. (Pteromalidae) as pupal parasitoids. *Diglyphus* sp. proved to be the most common and efficient parasitoid on *L trifolii.* (Prieto and De ulloa, 1982; Parrella et al, 1983). Both *Diglyphus* sp. and *opius* sp. are widely spread allover the country except at Aswan Govemorate, whereas *Halticoptera* sp. and *H. zilahisebossi* are restricted only to Giza and Qalubia Governrates and at a very low rate. (Hafez et al 1974).

The present study was conducted to evaluate the percentage of infestation caused by the larvae of *Liriomyza trifolii* as well as the hymenopterous parasitoids on the immature stages of the insect pest.

MATERIALS AND METHODS

This study had been carried out during two seasons, (2001-2002) and (2002-2003) in El-Arish and Rafah localites in North Sinai Govemorate. Sampling was carried out in fixed areas at weekly intervals. The number of larvae and pupae varied in each search according to there

Availability. Each infested leaf with larvae and pupae was kept in a glass vial (10x4 cm). The vial was covered with muslin kept in position by

means of a rubber band until the parasitoid emergence. All emerging parasitoids were collected and identified.

Percentage of infestation by faba bean leafminer, *L. trifolii* in the field.

Percentage of infestation by Faba bean leafminer, *L. trifolii* was carried out in Faba bean fields in El-Arish and Rafah in North Sinai Governorate. Ten plants were chosen from the field and the number of infested leaflets related to the whole number of leaflets in the plant was estimated. The average percentage of infestation was then calculated.

Percentage of parasitism:

The percentage of parasitism by all species obtained from collected samples of faba bean was calculated. A study of fluctuation of percentages of parasitism of larvae and pupae of *L.trifolii* was made.

RESULTS AND DISCUSSIONS

The hymenopterous parasitoids that emerged in the laboratory from the leafminer *L. trifolii*.

Samples of *L. trifolii* larvae and pupae collected from faba bean fields during the two seasons of investigation (2001-2002) and (2002-2003) gave rise to the following species of parasitoids (Table 1).

Table (1): The hymenopterous parasitoids emerged from *L. trifolii* immature stages in the laboratory.

Parasitoids	Family	Host stage
Halticoptera sp.	Pteromalidae	Larval -Pupa stage
Diglyphus isaea	Eulophidae	Larval stage
D. crossinervis	Eulophidae	Larval stage
Chrysocharis sp.	Eulophidae	Larval -Pupa stage
Neochrysocharis sp.	Eulophidae	Larval stage

Percentage of infestation

Ten plants were chosen from the field and the number of infested leaflets related to the whole number of leaflets in the plant was obtained. Data are presented in Tables 2, 3, 4 & 5

El-Arish locality

The percentage of infestation ranged between 23.21 % in the second week of January 2002 and 52.08 % in the second week of March 2002 during the first season 2001 / 2002, (Table 2). The average percentage of infestation was 29.9 %. On the other hand, the percentage of infestation in the second season 2002 / 2003 at El-Arish locality ranged between 30.83 % and 50.0 % in the second week of February 2003, respectively (Table 3). The average percentage of infestation in the second season 2002 / 2003 at El-Arish locality was 40.27 %.

Table (2): Percentages of infestation by *L. trifolii* in faba bean fields (10 plants examined per sample) in El-Arish, North S Inai d uring (2001/2002) season.

Sampling date	No. of leaves in the sample		Total no. of leaves in the sample	% Infestation
	Infested	Un Infested		
26/12/2001	17	80	97	39.5
2/1/2002	32	57	89	35.96
9/1	26	86	112	23.21
16/1	53	84	137	38.69
23/1	53	102	155	34.19
30/1	81	78	159	50.94
6/2	80	109	189	42.23
13/2	95	110	205	46.34
20/2	87	128	215	40.47
27/2	60	150	210	28.57
6/3	80	145	225	35.56
13/3	125	115	240	52.08
20/3	60	131	191	31.41
27/3	58	139	224	37.95
Total	732	1514	2448	
Average percentage of infestation				29.90

Table (3): Percentages of infestation by *L. trifolii* in faba bean fields (10 plants examined per sample) in El-Arish, North Sinai during (2002/2003) season.

Sampling date	No. Of leaves in the sample		Total no. Of leaves in the sample	% Infestation
	Infested	Un infested		
11/1/2003	24	45	69	34.78
18/1	31	59	90	34.44
25/1	38	79	117	32.48
½	55	69	124	44.36
8/2	41	92	133	30.83
18/2	70	94	164	42.68
22/2	83	83	166	50.00
1/3	86	107	193	44.56
8/3	116	124	240	48.33
15/3	94	139	233	40.34
23/3	77	133	210	36.67
29/3	133	135	268	46.50
4/4	87	142	229	37.99
12/4	60	125	185	32.43
Total	975	1426	2421	
Average percentage of infestation				40.27

Table (4): Percentages of infestation by *L. trifolii* in faba bean fields (10 plants examined per sample) in Rafah, North Sinai during (2001/2002season).

Sampling date	No. of leaves in the sample		Total no. of leaves in the sample	% Infestation
	Infested	Un Infested		
26/12/2001	15	62	77	19.48
2/1/2002	44	64	108	40.74
9/1	38	74	112	33.93
16/1	49	76	125	39.2
23/1	67	123	190	35.26
30/1	61	106	167	36.53
6/2	68	102	170	40
13/2	94	105	199	47.24
20/2	88	120	208	42.32
27/2	75	126	201	37.31
6/3	74	160	234	31.62
13/3	111	124	235	47.23
20/3	84	114	198	42.42
27/3	98	114	198	49.25
Total	966	1470	2422	
Average percentage of infestation				39.88

Table (5) Percentages of infestation by *L. trifolii* in faba bean fields (10 plants examined per sample) in Rafah, North Sinai during (2002/2003) season.

Sampling date	No. of leaves in the sample		Total no. of leaves in the sample	% Infestation
	Infested	Un Infested		
15/1/2003	15	58	73	16.88
22/1	39	54	93	41.94
29/1	24	96	120	20
5/2	45	74	119	37.82
12/2	59	130	189	31.22
19/2	56	89	145	38.62
26/2	58	111	169	34.32
5/3	83	125	208	39.9
12/3	98	144	242	40.5
19/3	70	147	217	32.26
26/3	81	143	224	36.16
2/4	113	124	237	47.68
9/4	77	139	216	35.65
16/4	100	126	226	44.24
Total	918	1560	2478	
Average percentage of infestation				37.05

Rafah locality:

The percentage of infestation ranged between 19.48 and 49.25 % in the last week of December 2001 and the end of March 2002, respectively (Table4). The average percentage of infestation during the first season 2001 / 2002 at Rafah locality was 29.88 %.

On the other hand, the minimum percentage of infestation in the second season 2002 / 2003 was 16.88 at the beginning of this study, 2003, while the maximum percentage of infestation was 47.68 % in the first week of April 2003 (Table5). The average percentage of infestation at Rafah locality during the second season 2002 / 2003 recorded 37.05 %.

Percentage of Parasitism:

Number of larvae were chosen at evaluate of the percentage of parasitism. Ecto- Parasitized larvae were easily manipulated. Other larvae remained from the chosen sample were dissected under stereomicroscope to determine the parasitized larvae. Data are shown in Tables (6, 7 & 8)

Table (6): Percentages of parasitism in samples of *L. trifolii* larvae collected from faba bean fields in El-Arish, North Sinai during (2001/2002) season

Sampling date	No. of larvae in the sample		Total no. of larvae in the sample	% Parasitism
	Parasitized larvae	Non-Parasitized larvae		
26/12/2001	13	3	16	68.25
2/1/2002	11	2	13	70.62
9/1	12	5	17	79.59
16/1	15	0	15	100
23/1	13	0	13	100
30/1	3	5	8	100
6/2	7	0	7	60.5
13/2	24	0	24	80.98
20/2	9	0	9	100
27/2	8	0	8	100
6/3	11	1	12	91.67
13/3	9	0	9	100
20/3	8	0	8	100
27/3	5	2	7	71.42
Total	148	18	166	
Average percentage of parasitism				89.16

Table (7): Percentages of parasitism in samples of *L. trifolii* larvae collected from faba bean fields in El-Arish, North Sinai during (2002/2003) season

Sampling date	No. of larvae in the sample		Total no. of larvae in the sample	% Parasitism
	Parasitized larvae	Non-Parasitized larvae		
11/1/2003	13	3	16	81.25
18/1	11	2	13	84.62
25/1	12	5	17	70.59
1/2	15	0	15	100
8/2	13	0	13	100
18/2	3	5	8	37.50
22/2	10	0	10	100
1/3	24	0	24	100
8/3	9	0	9	100
15/3	8	0	8	100
23/3	8	4	12	91.67
29/3	9	0	9	100
4/4	5	2	7	71.42
12/4	6	0	6	100
Total	146	21	167	
Average percentage of parasitism				87.43

El-Arish locality:

The percentage of parasitism caused by hymenopterous parasitoids varied from 60.5 % and 100 % during the first season 2001 / 2002 (Table 6).

On the other hand, the percentage of parasitism ranged between 37.50 % and 100 % during the second season 2002 / 2003 at El-Arish locality (Table 7).

In conclusion, data presented in table 6 and 7 indicated at that, the average percentage of parasitism at the larvae of *L. trifolii* caused by the hymenopterous parasitoids at El-Arish locality were 89.16 % and 87.43 % during the first season 2001 / 2002 and the second season 2002 / 2003, respectively.

Rafah locality:

In conclusion, data presented in table 8 and 9 indicated at that, the average percentage of parasitism at the larvae of *L. trifolii* caused by the hymenopterous parasitoids at Rafah locality were 84.58 % and 83.53 % during the first season 2001 / 2002 and the second season 2002 / 2003, respectively.

Table (8): Percentages of parasitism in samples of *L. trifolii* larvae collected from faba bean fields in Rafah, North Sinai during (2001/2002) season.

Sampling date	No. of larvae in the sample		Total no. of larvae in the sample	% Parasitism
	Parasitized larvae	Non-Parasitized larvae		
26/12/2001	14	4	18	93.33 *
2/1/2002	9	1	10	90
9/1	15	4	19	78.95
16/1	15	3	18	83.33
23/1	13	1	14	92.86 *
30/1	8	1	9	88.89
6/2	9	1	10	90 *
13/2	17	3	20	85
20/2	8	1	9	88.89 *
27/2	8	2	10	80
6/3	12	2	14	85.71
13/3	17	2	19	89.47
20/3	15	0	15	100 *
27/3	17	0	17	100
Total	170	32	201	
Average percentage of parasitism				84.58

Table (9): Percentages of parasitism in sample of *L. trifolii* larvae collected from faba bean fields in Rafah, North Sinai during (2002/2003) season:

Sampling date	No. of larvae in the sample		Total no. of larvae in the sample	% Parasitism
	Parasitized larvae	Non-Parasitized larvae		
15/1	13	2	15	86.67 *
22/1	8	6	14	57.67
29/1	10	1	11	90.91
5/2	21	1	22	95.47 *
12/2	8	4	12	66.67
19/2	6	2	8	60
26/2	8	1	9	88.89 *
5/3	15	5	20	75
12/3	12	0	12	100 *
19/3	9	0	9	100
26/3	6	6	12	100
2/4	9	0	9	92.783
9/4	7	0	7	100 *
16/4	10	0	10	100
Total	142	28	170	
Average percentage of parasitism				83.53

Field observation showed the predator *Chrysoperia carniea* Steph . *Thrips* sp. and some coccinellids feeding on the larvae of *L. trifolii* in faba bean fields in the two localities El-Arish and Rafah during the two successive seasons 2001/ 2002 and 2002/ 2003.

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دراسات علي صانعة أنفاق أوراق الفول و طفيلياتها في شمال سيناء

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تنوعت النسبة المئوية للإصابة بصانعه أنفاق أوراق الفول في مركز العريش من٢٣,٢١ % إلي ٥٢,٠٨ %% في الموسم الأول، ومن ٣٠,٨٣ % إلى ٥٠% في الموسم الثاني . وعلي الجانب الأخر تراوحت نسب الإصابة في مركز رفح ما بين ١٩,٤٨% إلى ٤٩,٢٥% و ١٦,٨٨% الي ٤٧,٦٨% في الموسم الأول والثاني علي الترتيب.وكان متوسط نسب التطفل بطفيليات الهيمينوبتروس في مركز العريش ٨٩,١٦% و ٨٧,٤٣% في الموسم الأول عام٢٠٠١/٢٠٠٢ والموسم الثاني عام ٢٠٠٢/٢٠٠٣ علي الترتيب . إما في مركز رفح كان متوسط نسب التطفل يترامح ما بين ٨٤,٥٨% و ٨٣,٥٣% أثناء الموسم الأول والثاني علي الترتيب