

PARASITISM PERCENTAGES ON *APHIS CRACCIVORA* KOCH. ON FABA BEAN AND COWPEA PLANTS IN NEWLY RECLAIMED LAND IN EGYPT

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Abstract

The population densities of the cowpea aphid, *Aphis craccivora* Koch on faba bean and cowpea plants and its parasitoids were studied at El-Khattara district, Sharkia Governorate, Egypt in 2010 – 2011 and 2011-2012 seasons. It recorded three peaks on faba bean and cowpea plants every season. *A. craccivora* on faba bean was associated with three primary parasitoids being *Diaeretiella rapae* (M'Intosh), *Aphidius colemani* Viereck and *Ephedrus* sp. and only one Hyperparasitoid, *Aphidencertus* sp.. Primary parasitoid *D. rapae* was the highly dominant species by relative density 54.15 and 51.99%, followed by *A. colemani* 25.65 and 25.43%, *Ephedrus* sp. (14.05 and 14.07%), while the hyperparasitoid *Aphidencertus* sp., occurred by 6.15 and 8.51%, during 2010 /2011 and 2011 /2012 seasons, respectively. *A. craccivora* on cowpea was associated with only two primary parasitoids species *Lysiphlebus fabarum* and *Trioxys* sp., only one hyperparasitoid species of the family Pteromalidae. Primary parasitoid *L. fabarum* was the most dominant species by relative density 56.22 and 61.24%, while *Trioxys* sp. was recorded by 26.32 and 21.48% and Pteromalidae by 17.46 and 17.28% during 2010 and 2011 season respectively. Highest rates of parasitism 21.67% were recorded in the 2nd week of February 2010-2011 and 22.34% in the 4th week of February 2011-2012 on faba bean plants, meanwhile it were 20.37% and 11.37% in the first week of September 2010 and in the 2nd week of September during the two season cowpea plants. The seasonal means of parasitism rates were (9.80 and 8.78%), on faba bean plants during two seasons, respectively. While it obtained 8.14 and 4.68% on cowpea plants during the two season, respectively. Total developmental period of *L. fabarum* was investigated at three temperatures (10, 20 and 30°C). The duration was longest at 10°C. Generally, developmental periods of different stages of the parasitoid shorted as the temperature increased from 10 to 30°C, total developmental period ranged between 8.81 and 21.54 days, respectively.

Key words: Estimation, Parasitism, *Aphis craccivora*, Faba Bean, Cowpea

INTRODUCTION

Aphids are considered a group of insect pests of which the economic importance increases with the development of agriculture (Stary , 1976). Faba bean is an essential food crop that provides a major source of protein for humans and domestic animals. Cowpea is mainly cultivated for local consumption, either at green

shell stage for fresh market or at mature stage for dry seeds. Cowpea aphid, *Aphis craccivora* Koch. is considered one of the most injurious pests infesting faba bean and cowpea plants in Egypt (Selim *et al.*, 1987, El-Defrawi *et al.* 2000, Ragab *et al.* 2002 and Saleh 2004 and 2009). It suck the plant sap causing a decrease in plant vitality, and consequently reduce the crop yield. In addition, aphids are considered the most serious vectors of plant viruses which may induce destruction of the infested crop. Biological control is a main factor of integrated control programs including parasitoids, predators and pathogens Sarhan 1976 and Maghraby, 2012 in Egypt, recorded. The parasitoid *Diaeretiella rapae* (M'Intosh) was, for the first time, recorded in association with the field population of *A. craccivora*, infesting broad bean in Mansoura district. Also, Ragab *et al.* (2002a), in Egypt, found the three parasitoids *D. rapae*, *Lysiphlebus fabarum* (Marshall) and *Ephedrus* spp. It also parasitized many aphid species, *Myzus persicae*, *Pentalonia nigronervosa*, *Acyrtosiphon pisum*, *Sitobion avenae*, *Shizaphis graminum* and *Aulacorthum solani* (Stary and Stechmann, 1990). Therefore, the present study aims to throw some lights on the parasitoids species associated with aphids infested faba bean and cowpea plants. Also estimation of parasitism rate in the cultivated fields in newly reclaimed sandy areas and life cycle of *L. fabarum* on *A. craccivora* at 10, 20 and 30 °C at 65 ± 5%R.H..

MATERIALS AND METHODS

1. Survey and estimation of parasitism in the field:

Field studies were carried out during 2010/2011 and 2011/2012 on faba bean plants and (2011 & 2012) seasons on cowpea plants, at El-Khattara district, Sharkia Governorate. *A. craccivora* population was estimated on faba bean plants through weekly random samples of twenty aphids infested leaves of faba bean and cowpea. Samples were transported to the laboratory and all aphid individuals on leaves / sample were counted. Aphids were supplied with fresh host leaves and kept in Petri dishes (50 aphids / Petri dish) until formation of mummies. The emerged parasitoids were mounted and identified by Prof. Dr. A. El-Heneidy, Biological Control Department, Plant Protection Research Institute, Agricultural Research Center, Giza, Egypt. Rates of parasitism and hyperparasitism were estimated according to Farrell and Stufkens (1990) as:

$$\text{Percentage of parasitism} = \frac{A+B}{A+B+C} \times 100$$

Where:

A= Number of mummified aphids counted at the date of inspection.

B=Number of mummified host appeared during the laboratory rearing

C= No of unparasitized aphids.

2. Biological studies

2.1. Life cycle of *Lysiphlebus fabarum* on nymphs *A. craccivora*

A laboratory culture of *A. craccivora* was maintained under laboratory conditions. Nymphs of *A. craccivora* were reared on caged young seedlings of *V. faba* grown after sowing in wet sawdust. A laboratory culture of *L. fabarum* started with mummies obtained from the field. Mummified aphids were placed singly in small glass tubes until emergence of adult parasitoid which were fed on sugar solution (30%). To determine the durations of different immature stages of *L. fabarum* on nymphs *A. craccivora* at three temperatures (10, 20 and 30°C), nymphs were confined with the parasitoid in a chimney glass for four hours. Thirty nymphs of parasitized host aphids were daily dissected to determine the development of different immature stages of the parasitoid.

2.2. Sex ratio

Sex ratio of *L. fabarum* recovered from *A. craccivora* was determined and obtained data were statistically analyzed using, Costat (1990) computer program.

RESULTS AND DISCUSSION

1. Survey and estimation of parasitism in the faba bean and cowpea fields

1.1. Survey and estimation of parasitism in the faba bean field

The weekly counts of aphids on faba bean plants during 2010/2011 and 2011/2012 seasons are given in (Tables 1 and 2). During the first season, the infestation started to appear on the 3rd week of November (24.9 and 65.3%R.H.), while appeared during the 3rd week of November (24.7°C and 61.8%R.H.) in the second season.

The following is a list of hymenopterous primary and hyper parasitoid species that emerged from cowpea aphid *A. craccivora* during the period of study:

On faba bean

Primary parasitoids: *Diaeretiella rapae* (M'Intosh) *Aphidius colemani* Viereck and *Ephedrius* sp.

Hyperparasitoids : *Aphidencyrthus* sp.

On cowpea

Primary parasitoids: *Lysiphelous fabarum* and *Trioxys* sp. Hyperparasitoid:

Belong to family Pteromalidae.

Table 1. Survey and relative densities of *Aphis craccivora* Koch. parasitoids on faba bean and cowpea plants cultivated in the newly reclaimed sandy area of El-Khattara district, Sharkia Governorate, Egypt during two successive seasons.

Species	Family	Faba bean			
		2010/2011		2011/2012	
		Number	%	Number	%
Primary parasitoids:					
<i>Diaeretiella rapae</i> (M'Intosh)	Aphidiidae	555	54.15	458	51.99
<i>Aphidius colemani</i> Viereck		263	25.65	224	25.43
<i>Ephedrus persica</i>		144	14.05	124	14.07
Hyperparasitoids:					
<i>Aphidencertus</i> sp.	Encyrtidae	63	6.15	75	8.51
Total		1025	100	881	100
		Cowpea			
		2010		2011	
		Number	%	Number	%
Primary parasitoids:					
<i>Lysiphlebus fabarum</i> (Mars.)	Aphidiidae	425	56.22	248	61.24
<i>Trioxys</i> sp.		199	26.32	87	21.48
Hyperparasitoids:					
Unidentified species	Pteromalidae	132	17.46	70	17.28
Total		756	100	405	100

Table 2. Parasitism percentage of *Aphis craccivora* Koch. infested faba bean plants, cultivated in El-Khattara district, Sharkia Governorate, Egypt during 2010/2011 season.

Sampling date (weeks)	<i>A. craccivora</i>	No. of parasitized aphid (mummies)			Total parasitism %	Emerged parasitoids								Total	Mean °C	Mean R.H.
						Primary parasitoids						Hyperparasitoid				
		<i>D. rapae</i>		<i>A. colemani</i>		<i>Ephedrus sp.</i>		<i>Aphidencyrthus sp.</i>								
		No.	%	No.		%	No.	%	No.	%						
Nov. 3 rd	230	0	0	0	0	0	0	0	0	0	0	0	0	0	24.9	65.3
4 th	345	0	5	5	1.45	3	100	0	0	0	0	0	0	3	23.7	65.3
Dec. 1 st	450	4	8	12	2.67	5	50	3	30	2	20	0	0	10	22.1	70.8
2 nd	775	12	19	31	4.0	14	53.85	8	30.77	4	15.38	0	0	26	21.7	61.6
3 rd	840	14	38	52	6.19	29	64.45	10	22.22	6	13.33	0	0	45	22.1	64.8
4 th	1892	58	92	150	7.93	90	69.23	24	18.46	16	12.31	0	0	130	22.1	57.0
5 th	2435	105	125	230	9.45	102	52.31	68	34.87	25	12.82	0	0	195	21.4	73.3
Jan. 1 st	902	35	90	125	13.86	68	63.55	24	22.43	15	14.02	0	0	107	22.2	68.6
2 nd	654	34	85	119	18.20	64	64.65	22	22.22	13	13.13	0	0	99	21.2	64.6
3 rd	580	30	52	82	14.14	40	60.61	15	22.73	8	12.12	3	4.54	66	20.6	65.6
4 th	320	8	23	31	9.69	12	44.45	7	25.93	4	14.81	4	14.81	27	20.1	63.3
Feb. 1 st	240	5	19	24	10.0	6	28.57	4	19.05	3	14.28	8	38.10	21	19.5	63.5
2 nd	420	38	53	91	21.67	42	52.50	22	27.50	12	15.0	4	5.0	80	19.4	58.3
3 rd	214	16	24	40	18.69	14	43.75	6	18.75	4	12.50	8	25.0	32	25.6	60.8
4 th	330	14	32	46	13.94	15	36.59	10	24.39	6	14.63	10	24.39	41	24.4	63.1
Mar. 1 st	684	29	56	85	12.43	24	34.28	16	22.86	14	20	16	22.86	70	21.6	65.8
2 nd	315	22	28	50	15.87	12	30.77	14	35.90	8	20.51	5	12.82	39	25.9	61.7
3 rd	205	10	16	26	12.68	7	36.84	5	26.32	4	21.05	3	15.79	19	26.7	65.6
4 th	182	3	10	13	7.14	5	50	3	30	0	0	2	20.0	10	21.8	63.7
5 th	140	0	8	8	5.71	3	60	2	40	0	0	0	0	5	23.9	59.7
Apr. 1 st	63	0	0	0	0	0	0	0	0	0	0	0	0	0	27.3	57.0
Total	12216					555	54.15	263	25.66	144	14.05	63	6.14	1025		
Mean	581.71± 127.41				9.80± 1.36	26.43± 6.6	47.45± 4.9	12.52± 3.28	22.59± 2.41	6.86± 1.47	11.71± 1.58	3.0± 0.94	8.73± 2.52	48.81± 10.96		

However, Selim *et al.* (1987), reported that *A. craccivora* was parasitized by *Aphidius colemani* and *L. fabarum* in faba bean fields, in 1996 Abdel-Samad recorded *L. fabarum* as a parasitoid on *A. craccivora* in Egypt. Moreover, Abdel-Samad (1996), Ragab (1996) and Saleh (2009) recorded *Trioxys angelicae* (Hal.) as parasitoid of *A. craccivora*.

The present results agree with those of Ragab *et al.* (2002b), Saleh (2009) and Maghraby (2012), who found that *D. rapae*, *L. fabarum* and *Ephedrus* sp. as parasitoids on *A. craccivora* in Egypt. Abdel-Samad and Ahmed (2006), recorded *L. fabarum*, *A. matricariae* and *Trioxys* sp. were found attacking *A. craccivora* on faba bean cultivars.

On faba bean plants

The primary parasitoid *D. rapae* was the most dominant species with mean relative densities (54.15 and 51.99%) during the two seasons respectively. Meanwhile, the mean relative densities of *A. colemani* were 25.65 and 25.43% respectively, but *Ephedrus* sp., recorded 14.05 and 14.07%, respectively. The hyperparasitoid *Aphidencertus* sp. recorded 6.15 and 8.51% respectively, (Table 1).

The percentage of parasitism ranged from 1.45 to 21.67, at the ranges of 23.7 & 19.4°C and 65.3 & 58.3%R.H., respectively, in the first season 2010/2011, Table (2). In the second season, percentage of parasitism ranged from 2.50 to 22.34% on the 4th week of November at 21.8°C and 61.2% R.H. (Table, 3). Highest percentage of parasitism reached 22.34% on the 4th week of February at 19.4°C and 60.7%R.H. Total means of parasitism rates by *D. rapae*, *A. colemani*, *Ephedrus* sp. and *Aphidencertus* sp. were 9.80 and 8.78% during 2010/2011 and 2011/2012 seasons, respectively, (Tables 2 and 3).

Table 3. Parasitism percentage of *Aphis craccivora* Koch. infested faba bean plants cultivated in El-Khattara district, Sharkia Governorate, Egypt during 2011/2012 season.

Sampling date (weeks)	<i>A. craccivo ra</i>	No. of parasitized aphid (mummies)			Total parasitism %	Emerged parasitoids								Total	Mean °C	Mean R.H.
						Primary parasitoids						Hyperparasitoid				
		<i>D.rapae</i>		<i>A. colemani</i>		<i>Ephedrius</i> sp.		<i>Aphidencyrthus</i> sp.								
		No.	%	No.		%	No.	%	No.	%						
Nov. 3 rd	160	0	0	0	0	0	0	0	0	0	0	0	0	0	24.7	61.8
4 th	320	0	8	8	2.50	6	100	0	0	0	0	0	0	6	21.8	61.2
Dec. 1 st	458	0	12	12	2.62	9	100	0	0	0	0	0	0	9	22.3	66.4
2 nd	615	3	14	17	2.76	11	73.34	2	13.33	2	13.33	0	0	15	19.8	61.6
3 rd	714	12	23	35	4.90	20	64.51	8	25.81	3	9.68	0	0	31	16.5	57.8
4 th	820	21	25	46	5.61	24	60	12	30	4	10	0	0	40	16.9	59.6
5 th	942	30	48	78	8.28	33	49.25	22	32.84	12	17.91	0	0	67	17.6	51.0
Jan. 1 st	1530	45	84	129	8.43	55	52.38	35	33.33	15	14.29	0	0	105	16.6	60.8
2 nd	840	20	30	50	5.95	21	48.84	12	27.91	10	23.25	0	0	43	16.8	61.4
3 rd	720	18	31	49	6.81	20	47.62	14	33.33	8	19.05	0	0	42	15.2	60.0
4 th	640	16	30	46	7.19	18	46.15	14	35.90	7	17.95	0	0	39	17.3	60.0
Feb. 1 st	635	20	34	54	8.50	23	52.27	13	29.55	6	13.64	2	4.54	44	18.1	59.6
2 nd	612	25	39	64	10.46	27	49.09	10	18.18	12	21.82	6	10.91	55	16.1	60.1
3 rd	414	28	50	78	18.84	28	46.67	12	20	13	21.67	7	11.66	60	17.3	60.2
4 th	940	90	120	210	22.34	93	51.67	47	26.11	22	12.22	18	10	180	19.4	60.7
Mar. 1 st	310	25	40	65	20.97	23	41.82	12	21.82	5	9.09	15	27.27	55	19.9	60.8
2 nd	220	10	19	29	13.18	8	40	4	20	3	15	5	25	20	17.6	59.1
3 rd	375	20	22	42	11.20	14	40	3	8.57	2	5.71	16	45.72	35	18.0	58.4
4 th	210	14	16	30	14.29	17	68	2	8	0	0	6	24	25	21.1	59.0
5 th	125	0	12	12	9.60	8	80	2	20	0	0	0	0	10	20.7	57.6
Apr. 1 st	35	0	0	0	0	0	0	0	0	0	0	0	0	0	21.7	59.1
Total	11635	332	623	955		458	51.99	224	25.43	124	14.07	75	8.51	881		
Mean	554.05± 77.04				8.78± 1.38	21.81± 4.45	52.93± 5.39	10.67± 2.61	19.27± 2.68	5.90± 1.34	10.70± 1.79	3.57± 1.28	7.58± 2.76	41.95± 8.85		

One hyperparasitoid *Aphidencertus* sp. was recorded in few numbers from the 3rd week of January, to 4th week of March in the first season, Table (2), and from the first week of February to the 4th week of March, in the second season, Table (3). Total means of hyperparasitism rates were 3.0 and 3.57% during the two seasons respectively (Tables 2 and 3). However, Abou-Attia *et al.* (2001) and Saleh *et al.* (2009) recorded *Aphidencyrthus* sp. (Encyrtidae), found on faba bean plants.

1.2. Survey and estimation of parasitism in the cowpea field

The weekly counts of aphids on cowpea plants during 2010 and 2011 seasons are given in Tables 4 and 5. During the first season the infestation started on the 3rd and 4th week of June at means 30.5°C & 63.6%R.H. and 27.8°C & 59.0%R.H., respectively.

The following is a list of hymenopterous primary and hyperparasitoid species that emerged from *A. craccivora* during the period of study:

Primary parasitoids: *Lysiphlebus fabarum* (Mars.) and *Trioxys* sp.

Hyperparasitoids: One unidentified species of Pteromalidae

The present results agree with those of Stary and Erdelen (1987), in Yemen, who mentioned that *A. colemani* was the dominant parasite reared from *A. craccivora* on *Vigna* sp., Cruz *et al.* (1992), in Portugal, mentioned that *Diaeretiella* sp. and *Trioxys* sp. were a primary parasitoid of *A. craccivora* in cowpea fields. Youssif (2009), in Egypt, found that the most dominant primary parasitoids were *D. rapae*, *A. colemani*, *Aphidius* sp. and *Trioxys* sp. and unidentified species of hyperparasitoids belonged to the two families, Pteromalidae and Cynipidae on *A. craccivora* infested cowpea plants.

On cowpea plants:

The primary parasitoid *Lysiphlebus fabarum* was the most dominant species with mean relative densities 56.22 and 61.24% during 2010 and 2011 seasons respectively. While *Trioxys* sp. recorded 26.32 and 21.48%, respectively, the Pteromalidae was represented by 17.46 and 17.28%, respectively, (Table 1).

Table (4), showed that the percentage of parasitism ranged from 2.35 to 20.37%, on the first week of July and first week of September at means 34.0 & 29.7°C and 67.4 & 66.0%R.H., respectively, during the first season. In the second season, (Table 5), percentage of parasitism ranged between 1.09 and 11.37%, on the 4th week of July and 2nd week of September at means 31.4 & 28.3°C and 62.6 & 61.8%R.H., respectively. Total means of parasitism rates by *L. fabarum*, *Trioxys* sp. and Pteromalidae, recorded 8.14 and 4.68% during 2010 and 2011 seasons respectively. One species of hyperparasitoid from the family Pteromalidae was recorded in few numbers from 4th week of July to 4th week of September recording three peaks of population density by 10,15 and 30 individuals/ sample on the 5th week of July, 4th week of August and 3rd week of September at means 35.3, 31.4 and 28.3°C and 70.1, 67.0 and 62.6%R.H. respectively, during the first season (Table, 4).

Table 4. Parasitism percentage of *Aphis craccivora* Koch. infested cowpea plants, cultivated in El-Khattara district, Sharkia Governorate, Egypt during 2010 season.

Sampling date (weeks)	<i>A. craccivora</i>	No. of parasitized aphid (mummies)			Total parasitism %	Emerged parasitoids						Total	Mean °C	Mean R.H.
						Primary parasitoids				Hyperparasitoid Pteromalidae				
		A	B	Total		<i>Lysiphlebus fabarum</i>		<i>Trioxys</i> sp.						
						No.	%	No.	%	No.	%			
Jun., 3 rd	20	0	0	0	0	0	0	0	0	0	0	0	30.5	63.6
4 th	85	0	0	0	0	0	0	0	0	0	0	0	32.7	64.3
Jul., 1 st	170	0	4	4	2.35	2	100	0	0	0	0	2	34.0	67.4
2 nd	230	2	5	7	3.04	3	60	2	40	0	0	5	32.9	64.1
3 rd	518	5	18	23	4.44	12	66.67	6	33.33	0	0	18	34.2	70.0
4 th	685	14	25	39	5.69	18	62.07	9	31.03	2	6.90	29	34.8	70.4
5 th	845	32	37	69	8.17	24	51.06	13	27.66	10	21.28	47	35.3	70.1
Aug., 1 st	514	28	31	59	11.48	20	54.05	10	27.03	7	18.92	37	35.4	73.3
2 nd	416	25	30	55	13.22	23	65.71	7	20	5	14.29	35	36.3	73.4
3 rd	675	62	36	99	14.67	48	51.06	14	27.66	10	21.28	72	34.1	72.0
4 th	1724	109	150	259	15.02	122	67.03	45	24.73	15	8.24	182	31.4	67.0
Sep., 1 st	820	72	95	167	20.37	82	63.07	30	23.08	18	13.85	130	29.7	66.0
2 nd	519	41	52	93	17.92	26	36.11	25	34.72	21	29.17	72	28.2	64.3
3 rd	1345	83	64	147	10.93	32	34.78	30	32.61	30	32.61	92	28.3	62.6
4 th	710	28	15	43	6.06	10	31.25	8	25	14	43.75	32	29.7	67.8
Oct., 1 st	118	4	2	6	5.08	3	100	0	0	0	0	3	29.1	69.0
2 nd	45	0	0	0	0	0	0	0	0	0	0	0	27.0	65.0
Total	9439				138.44	425	56.22	199	26.32	132	17.46	756		
Mean± SE	555.23± 112.39				8.14± 1.57	25.0± 7.92	49.58± 7.31	11.71± 3.22	20.40± 3.48	7.76± 2.22	12.37± 3.32	44.47± 12.47		

Table 5. Parasitism percentage of *Aphis craccivora* Koch. infested cowpea plants, cultivated in El-Khattara district, Sharkia Governorate, Egypt during 2011season.

Sampling date (weeks)	<i>A. craccivora</i>	No. of parasitized aphid (mummies)			Total parasitism %	Emerged parasitoids						Total	Mean °C	Mean R.H.
		A	B	Total		Primary parasitoids				Hyperparasitoid Pteromalidae				
						<i>Lysiphlebus fabarum</i>		<i>Trioxys</i> sp.						
						No.	%	No.	%	No.	%			
Jun., 3 rd	0	0	0	0	0	0	0	0	0	0	0	0	26.5	58.4
4 th	25	0	0	0	0	0	0	0	0	0	0	0	27.8	59.0
Jul., 1 st	72	0	0	0	0	0	0	0	0	0	0	0	29.6	59.4
2 nd	125	0	4	4	3.20	2	100	0	0	0	0	2	30.7	64.0
3 rd	340	2	5	7	2.06	3	60	2	40	0	0	5	30.5	64.1
4 th	548	2	4	6	1.09	3	75	1	25	0	0	4	31.4	62.6
5 th	814	5	15	20	2.46	8	61.54	3	23.08	2	15.38	13	31.3	59.7
Aug., 1 st	940	14	22	36	3.83	14	58.33	6	25	4	16.67	24	29.5	63.3
2 nd	1225	40	65	105	8.57	46	62.16	18	24.33	10	13.51	74	27.5	63.4
3 rd	921	32	22	54	5.86	22	53.66	7	17.07	12	29.27	41	29.8	68.3
4 th	514	28	24	52	10.12	16	53.33	6	20	8	26.67	30	28.4	61.0
Sep., 1 st	720	30	25	55	7.64	18	51.43	8	22.86	9	25.71	35	28.5	61.6
2 nd	950	42	66	108	11.37	50	68.49	13	17.81	10	13.70	73	28.3	61.8
3 rd	645	31	22	53	8.22	23	67.65	7	20.59	4	11.76	34	28.4	62.0
4 th	580	18	24	42	7.24	12	60	5	25	3	15	20	29.3	63.2
Oct., 1 st	840	38	27	65	7.74	28	62.22	9	20	8	17.78	45	27.1	65.5
2 nd	224	6	5	11	4.91	3	60	2	40	0	0	5	29.2	66.5
3 rd	115	0	0	0	0	0	0	0	0	0	0	0	25.6	62.8
Total	9598	288	330	618	84.31	248	61.24	87	21.48	70	17.28	405		
Mean± SE	533.22±88.95				4.68±0.89	13.78±3.62	49.66±6.91	4.83±1.19	17.82±3.05	3.89±1.03	10.30±2.48	22.5±5.69		

In the second season, 2011, (Table , 5), Pteromalidae was present from the 5th week of July to the first week of October recording three peaks of population density 12, 10 and 8 individuals/ sample on 3rd week of August, 2nd week of September and first week of October at means 29.8, 28.3 and 27.1°C and 68.3, 61.8 and 65.5%R.H., respectively.

Biological studies

Life cycle of *L. fabarum* on nymphs of *A. craccivora* on faba bean and cowpea at 10, 20 and 30°C.

Table (6) showed that temperature played a important role influencing the period of development of *L. fabarum* on *A. craccivora*. Generally, developmental periods of different stages of the parasitoid were shortened by temperature increased from 10 to 30°C. At 10°C, the incubation period of egg averaged 4.98 days, the larval period 8.28 days, while the pupal stage recorded 8.33 days. The total developmental periods was 21.54 days.

At 20°C, the incubation period of eggs was 2.82 days , larval period was 5.09 days, while pupal stage recorded 5.06 days. The total developmental periods averaged 12.42 days.

Correspondent periods at 30°C, were 1.97, 3.24 and 3.61, respectively. The average of total developmental period of the parasitoid *L. fabarum* lasted 8.81 days. These results agree with those of Tone and Nakashima (2008).

Table (5) showed that the adult longevity was longest at 10°C, and also that of females was longer than males at the three temperatures (10, 20 and 30°C). Recorded longevities of males and females were 6.30 & 8.73, 4.18 & 6.17 and 3.15 & 4.20 days at the three temperatures, respectively.

Sex ratio

A total number of 340 *L. fabarum* adults emerged from 490 *A. craccivora* mummies showing 69.39% emergence. The number of females was 176 and 164 for males. The sex ratio was 1.073 females: 1 male.

Table 6. Developmental periods of immature stages and longevity of adults in days of the parasitoid *Lysiphlebus fabarum* on *A. craccivora* infesting faba bean plants at 10, 20 and 30°C and 60±5%R.H.

Temp.°C	10	20	30
Duration	mean ± S.E	mean ± S.E	mean ± S.E
Egg	4.98±0.15	2.82±0.09	1.97±0.02
Larva	8.28±0.27	5.09±0.06	3.24±0.07
Pupa	8.33±0.15	5.06±0.11	3.61±0.07
Immature stages	21.54±0.26	12.42±0.10	8.81±0.13
Longevity:			
♂	6.3±0.37	4.18±0.05	3.15±0.06
♀	8.73±0.22	6.17±0.16	4.20±0.04

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نسب التطفل على من اللوبيا *Aphis craccivora* Koch. على نباتات الفول واللوبيا فى الاراضى المستصلحة حديثا فى مصر

شحته على محمد على

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تم دراسة الكثافة العددية لمن اللوبيا *Aphis craccivora* Koch. الذي يصيب نباتات الفول البلدى واللوبيا وطفيلياته الحشرية فى منطقة الخطارة محافظة الشرقية ، مصر خلال مواسم الدراسة ٢٠١٠/٢٠١١ ، ٢٠١١/٢٠١٢ حيث سجل من اللوبيا ثلاث قمم للنشاط على نباتات الفول البلدى واللوبيا خلال عامى الدراسة . وسجلت ثلاثة أنواع من الطفيليات الأولية مصاحبة لمن اللوبيا على الفول البلدى هى :

Diaerettiella rapae (M'Intosh), *Aphidius colemani* Viereck and *Ephedrus* sp.

ونوع واحد فقط من الطفيليات الثانوية هو *Aphidencertus* sp. حيث كان الطفيل الأولى *D. rapae* أكثرها تواجدا حيث سجل كثافة نسبية (٥٤.١٥ ، ٥١.٩٩%) ، ثم *A. colemani* (٢٥.٦٥ ، ٢٥.٤٣%) ، ثم *Ephedrus* sp. (١٤.٠٥ ، ١٤.٠٧%) بينما سجل الطفيل الثانوى *Aphidencertus* sp. (٦.١٥ ، ٨.٥١%) خلال موسمى التجارب على التوالى . بينما كان يصاحبه على نباتات اللوبيا

نوعان فقط من الطفيليات الأولية هما *Lysiphlebus fabarum* and *Trioxys* sp.

ونوع واحد من الطفيليات الثانوية من فصيلة Pteromalidae . فكان الطفيل الأولى *L. fabarum* أكثرها تواجداً بكثافة نسبية (٥٦.٢٢ ، ٦١.٢٤%) ، *Trioxys* sp. (٢٦.٣٢ ، ٢١.٤٨%) بينما سجل الطفيل الثانوى من فصيلة Pteromalidae (١٧.٤٦ ، ١٧.٢٨%) خلال موسمى الدراسة ٢٠١٠ و ٢٠١١ على التوالى . وكان متوسط نسبة التطفل الكلية من الطفيليات الاولية على نباتات الفول (٩.٨ ، ٨.٧٨%) أثناء موسمى الدراسة على التوالى بينما كانت (٨.١٤ ، ٤.٦٨%) على نباتات اللوبيا خلال موسمى الدراسة على التوالى .

سجل أعلى معدل للتطفل (٢١.٦٧%) فى الأسبوع الثانى من فبراير ٢٠١٠/٢٠١١ ، ٢٢.٣٤% فى الأسبوع الرابع من فبراير ٢٠١١/٢٠١٢ على نباتات الفول البلدى . بينما كانت (٢٠.٣٧% ، ١١.٣٧%) فى الأسبوع الأول من سبتمبر ٢٠١٠ والأسبوع الثانى من سبتمبر خلال موسمى الدراسة على نباتات اللوبيا . وكذلك تم دراسة دورة حياة الطفيل *Lysiphlebus fabarum* على ثلاث درجات حرارة (١٠ ، ٢٠ ، ٣٠م) حيث استغرقت فترة أطول على درجة حرارة ١٠م (٢٧.٣٦ يوما) بينما قصرت هذه الفترة إلى (١٠.٢٥ يوما) على درجة حرارة ٣٠م .