

APHIS CRACCIVORA KOCH. AND PREDATORS ON FABA BEAN AND COWPEA IN NEWLY RECLAIMED AREAS IN EGYPT

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Abstract

The population density of the cowpea aphid, *Aphis craccivora* Koch. and its associated predators on faba bean and cowpea fields were studied at El-Khattara district, Sharkia Governorate, Egypt in 2010-2011 and 2011-2012 seasons. *A. craccivora* had three peaks on faba bean for each season the first peak was during the fourth week of December , the second one was in the second week of February, where the last peak was in the first week of March (2010–2011 season), The three peaks of 2011-2012 were recorded in the first week of January, the fourth week of February and the second week of March 2012. There was one peak only on cowpea in the third and fourth week of July in 2011 and 2012, respectively. The common predators observed in faba bean and cowpea fields were: *Coccinella undecimpunctata* L., *Chrysoperla carnea* Steph., *Paederus alfieri* (Koch.), *Orius* sp., *Syrphus* sp. *Scymnus* sp. and *Cydonia vicina isis* (Muls.)

Regarding predators on faba bean, two peaks were found in the first weeks of February and second week of March (37 and 79 predators/ 100 plants) during the first season 2010-2011, also, two peaks were found in the third week of February and second week of March (61 and 58 predators / 100 plants), respectively in 2011-12 season.

On cowpea, however, also two peaks were found in the fourth week of July and second week of August (89 and 69 predators/ 50 plants), respectively in 2011 season, while, one peak was found in the third week of July (78 predators/ 50 plants) in 2012.

Statistical analysis showed that temperature and relative humidity had different effects (significant or insignificant) on insects under investigation.

Key words: *Aphis craccivora*, aphid predators, biological control, faba bean , cowpea

INTRODUCTION

Aphids are the most important insect pests of different crops all over the world, (Ibrahim, 1994). On the other hand, faba bean and cowpea plants are of the most important crops in Egypt.

Aphis craccivora Koch., is considered one of the most injurious pests infests these plantations, and other leguminous species causes by sucking the plant sap

records in Egypt (El-Heneidy *et al.*, 1998, El-Defrawi *et al.*, 2000 , Abdel-Rahman *et al.*, 2005) and in other countries such as Srikanth and Lakkundi, 1990 , Sharma and Yadav, 1994 in India and Kuroli *et al.*, 1999 in Hungary, and indirect damage by transmission of many virus diseases (El-Defrawi *et al.*, 2000 and Ortiz *et al.*, 2006).

The use of insecticides in controlling aphids generally, leads to many problems, not only increasing resistant strains of aphids to these chemical substances, but also in induction of pollution to man and beneficial insects such as bees and other pollinators, insect parasitoids and predators (Maghraby, 2012).

The relationship between *A. craccivora* infested faba bean and cowpea plants and its aphidophagous insects have drawn the attention of many investigators such as: El-Heneidy *et al.* (1998), El-Defrawi *et al.*, (2000) and Mandour *et al.*, (2006).

Therefore, this investigation aims to study the role of aphidophagous insects in reducing the cowpea aphid population on faba bean and cowpea plants in the newly reclaimed sandy areas of El-Khattara district, Sharkia Governorate, which may be helpful in (IPM) crops management in faba bean and cowpea crops.

MATERIALS AND METHODS

The field experiments

These experiments were carried out to study seasonal abundance of *Aphis craccivora* Koch., survey and seasonal abundance of insect predators associated with *A. craccivora* and their relative densities, in El-Khattara district, Sharkia Governorate during the two successive growing seasons (faba bean 2010-2011 and 2011-2012, cowpea 2011 and 2012). An area of half feddan was cultivated with faba bean, *Vicia faba* L., cultivar Giza 2. The sowing dates were in the second week of October in both seasons. In case of cowpea, the cultivated area was also half feddan, was cultivated with cowpea, *Vigna unguiculata* (L.) cultivar karem 7 were sown in the first week of June 2011 and 2012.

Normal agricultural practices were used in the due time and no chemical control was applied.

The sampling

One hundred faba bean plants and fifty cowpea plants were weekly examined carefully from seed germination until the end of the season. The samples were examined at random by means of the cross side method, the number of aphid and predators were counted directly in the field and in few cases laboratory rearing was necessary for the predacious immatures till the adults emergence to be identified and counted.

Climatic factors (temperature and relative humidity):

Daily records of both maximum and minimum temperatures along with relative humidity were obtained during the periods of the two seasons from the Agrometeorological Station at Abou-Kbeer district, which located about 30 k.m. from the experimental farm in El-Khattara district. The relationship between weekly numbers of *A. craccivora*, predators and corresponding weekly of temperature and relative humidity, simple correlation values were calculated according to SAS , 1999.

RESULTS AND DISCUSSION**1. Population density of the cowpea aphid, *Aphis craccivora* on faba bean and cowpea plants:****1.1. On faba bean plants:**

The data in the first season (2010-2011) showed that the mean population density of *A. craccivora* on faba bean plants gradually increased as the growing season progressed to reach its maximum (31.2 aphids/ plant) in the first week of March, then the mean number of aphids gradually decreased towards the end of the season , (Table , 1).

In the second season (2011/ 2012), the general mean population density of *A. craccivora* on faba bean plants generally increased during the growing season to reach its peak of 44.07 aphids/ plant in the fourth week of February, (Table, 1).

There were three peaks for each season, they were 8.97, 24.90 and 31.2 individuals /plant during the fourth week of December, the second week of February and the first week of March in the first season, while they were 14.50 , 44.07 and 41.2 individuals/ plant during the first week of January , the fourth week of February and the second week of March during the second season. The mean numbers of *A. craccivora* during the two studied seasons were 9.56 and 16.97 individuals/plant respectively Table, (1). The present results are in agreement with the findings of the following El-Defrawi *et al.*, (2000) who mentioned that *A. craccivora* had two main periods of activity with maximum counts

Table 1. Seasonal abundance of *Aphis craccivora* on faba bean plants cultivated during the two seasons 2010-2011 and 2011-2012 in the newly reclaimed sandy area, El-Khattara district.

Date of inspection (weeks)	The first season 2010-2011			Date of inspection (weeks)	The second season 2011-2012		
	Means				Means		
	Aphid / plant	Temp. °C	R.H. %		Aphid /plant	Temp. °C	R.H. %
Nov., 2010 ^{3rd}	1.61±0.5	24.9	65.3	Nov., 2011 ^{4th}	2.30±0.2	21.8	61.2
4 th	1.83±0.7	23.7	65.4	Mean	2.30±0.2		
Mean	1.72±0.11			Dec. 1 st	2.91±0.6	22.3	66.4
Dec., 1 st	2.27±1.2	22.1	70.8	2 nd	3.45±0.4	19.8	61.6
2 nd	2.90±0.9	21.7	61.6	3 rd	3.86±1.0	16.5	57.8
3 rd	3.20±1.0	22.1	64.8	4 th	4.12±1.2	16.9	59.6
4 th	8.97±0.8	22.1	57.0	Mean	3.58±0.26		
5 th	3.75±1.4	21.4	73.3	Jan., 2012 ^{1st}	14.5±1.4	17.6	51.0
Mean	4.22±1.21			2 nd	5.80±1.8	16.6	60.8
Jan., 2011 1 st	3.87±1.6	22.2	68.6	3 rd	8.40±2.2	16.9	61.4
2 nd	4.14±1.3	21.2	64.6	4 th	9.02±1.7	15.2	60.0
3 rd	4.58±2.1	20.6	65.6	5 th	12.07±2.3	17.3	60.0
4 th	8.14±1.7	20.1	63.3	Mean	9.96±1.51		
Mean	5.18±1.00			Feb., 1 st	17.0±4.5	18.1	59.6
Feb., 1 st	11.91±2.7	19.5	63.5	2 nd	24.2±5.1	16.1	60.1
2 nd	24.90±3.0	19.5	58.3	3 rd	37.35±4.7	17.3	60.1
3 rd	19.31±3.7	25.6	60.8	4 th	44.07±3.8	19.4	60.7
4 th	15.30±3.2	24.4	63.1	Mean	30.65±6.14		
Mean	17.85±2.80			Mar., 1 st	39.6±6.3	19.9	60.6
March 1 st	31.2±4.1	21.6	65.8	2 nd	41.2±4.9	17.6	59.1
2 nd	28.7±3.3	25.9	61.7	3 rd	38.7±6.3	18.0	58.4
3 rd	24.2±2.9	26.7	65.6	4 th	29.2±3.1	21.1	59.0
4 th	16.3±3.5	21.8	63.7	Mean	37.17±2.71		
5 th	14.51±2.9	23.9	59.7	Apr., 1 st	17.2±4.5	20.7	57.6
Mean	22.98±3.30			2 nd	19.1±2.9	21.7	59.1
Apr., 1 st	5.4±2.1	27.3	57.0	Mean	18.15±0.95		
General mean	9.56±3.54			General mean	16.97±5.89		

during the 3rd week of December and February. On the other hand, Saleh *et al.*, 1972 and Abdel-Samad, 1996 mentioned that the total number of *A. craccivora* on faba bean plants reached its maximum during the last week of March. In contrast, Selim *et al.*, (1987) stated that *A. craccivora* had one peak on broad bean on 27th of January 1980, then declined rapidly during March.

1.2. On cowpea plants:

The data in 2011 season, showed that the mean population density of *A. craccivora* on cowpea plants gradually increased as the growing season progressed to reach its maximum, (130.1 aphids/ plant) in the third week of July. After that, the mean number of aphids gradually decreased towards the end of the season Table, (2).

Table 2. Seasonal abundance of *Aphis craccivora* on cowpea plants, during 2011 and 2012 seasons, in the newly reclaimed sandy area, El-Khattara district.

Date of inspection (weeks)	The first season 2011			The second season 2012		
	Means			Means		
	Aphid /plant	Temp. °C	R.H. %	Aphid /plant	Temp. °C	R.H. %
Jun. , 3 rd	4.3±1.3	30.5	63.6	2.1±0.8	26.5	58.4
4 th	15.9±2.4	32.7	64.3	10.6±1.7	27.8	59.0
Mean	10.1±5.8			6.35±4.3		
Jul., 1 st	26.1±5.0	34.0	67.4	16.34±2.9	29.6	59.4
2 nd	49.6±4.7	32.9	64.1	33.02±4.5	30.7	64.0
3 rd	130.1±6.4	34.2	70.0	76.4±6.1	30.5	64.1
4 th	121.5±5.6	34.8	70.4	99.81±5.3	31.4	62.6
Mean	81.83±25.9			56.4±19.2		
Aug., 1 st	101.4±3.8	35.3	70.1	69.0±4.8	31.3	59.7
2 nd	84.9±6.1	35.4	73.3	41.2±3.5	29.5	63.3
3 rd	31.7±3.4	36.3	73.4	18.4±2.7	27.5	63.4
4 th	20.5±2.7	34.1	72.0	11.3±1.9	29.8	68.3
Mean	59.63±19.8			34.98±13.0		
Sept., 1 st	11.4±3.1	31.4	67.0	7.8±1.1	28.4	61.0
2 nd	5.6±4.3	29.7	66.0	3.5±0.6	28.5	61.6
3 rd	4.1±1.3	28.2	64.3	2.3±0.9	28.3	61.8
4 th	1.9±0.9	28.3	62.6	0	28.4	62.0
Mean	5.75±2.0			3.4±1.6		
General mean	39.33±18.71			25.28±12.58		

In 2012 season, the general mean population density of *A. craccivora* on cowpea plants generally increased during the growing season to reach its peak of 99.81 aphids /plant in the fourth week of July. The mean numbers of *A. craccivora* during the two seasons were 39.33 and 25.28 individuals/ plant, respectively (Table, 2). The obtained results was similar to those of Saleh *et al.*, (1972) in Egypt who stated that *A. craccivora* was the most injurious pest attacking broad bean and cowpea in upper Egypt owing to the favourable weather conditions.

2. Population density of predators attacking *Aphis craccivora* on faba bean and cowpea plants during the period of study:

2.1. On faba bean plants:

Six species of predators were recorded during the two seasons of this study. These predators were *Coccinella undecimpunctata* L., *Chrysoperla carnea* (Steph.), *Paederus alfieri* (Koch), *Syrphus* sp., *Orius* sp. and *Scymnus* sp., Table, (3).

The occurrence of these predators in the two seasons could be descendingly arranged as follow: *C. undecimpunctata* was the dominant predator species with a rate of occurrence reached 31.26% and 29.16% from the total numbers of predators found during the two seasons, respectively. *C. carnea* represented the second category with a percent of 18.45% and 20.96% in the first and the second season, respectively. The rest predators arranged descendingly as follow, *P. alfieri* (17.33%), *Orius* sp. (12.62%) , *Syrphus* sp. (11.3%) and *Scymnus* sp. (9.04%) in the first season Table, (3), whereas in the second season they arranged descendingly as follow, *P. alfieri* (15.03%), *Scymnus* sp. (13.21%), *Orius* sp. (11.39%) and *Syrphus* sp. (10.25%) Table, (4).

In the first season, the population density of whole predators started with low densities till reached its maximum (79 individuals/ 100 plants) on the second week of March, then gradually decreased till the end of the season. One additional peak 37 individuals / 100 plants was found on the first week of February Table , (3).

In the second season, the total number of predators was fluctuated and increased gradually to reach its maximum, (61 individuals/100 plants) on the third week of February. An additional peak was found in the second week of March, (58 individuals/ 100 plants), respectively Table (4). These results are in accordance with the findings of Kesten , 1975 and Abdel-Samad, 1996 who reported that *Coccinellids* , *Syrphids* and *Chrysopa* sp. were the most important predators attacking *A. craccivora* .

Table 3. Seasonal abundance of the predatory insects associated with *Aphis craccivora* on faba bean plants during 2010-2011 season in the newly reclaimed sandy area, El-Khattara district.

Date of inspection (weeks)	<i>C. undecimpunctata</i>	<i>C. carnea</i>	<i>P. alferii</i>	<i>Orius</i> sp.	<i>Syrphus</i> sp	<i>Scymnus</i> sp.	Total	Corresponding means of	
								Temp. °C	R.H. %
Nov. , 3 rd	0	0	0	0	0	0	0	24.9	65.3
4 th	2	0	0	0	0	0	2	23.7	65.4
Mean	1.0 ±1.0	0	0	0	0	0	1.0 ±1.0		
Dec., 1 st	2	0	0	0	0	0	2	22.1	70.8
2 nd	3	0	1	0	0	0	4	21.7	61.0
3 rd	5	0	0	0	0	1	6	22.1	64.8
4 th	6	1	2	0	2	2	13	22.1	57.0
5 th	12	2	0	0	0	4	18	21.4	73.3
Mean	5.6 ±1.75	0.6 ±0.4	0.6 ±0.4	0	0.4 ±0.39	1.4 ±0.75	8.6 ±2.9		
Jan., 2011 1 st	8	1	1	2	3	2	17	22.2	68.6
2 nd	6	3	3	1	2	4	19	21.2	64.6
3 rd	3	4	2	3	1	1	14	20.6	65.6
4 th	8	8	4	2	2	2	26	20.1	63.3
Mean	6.25 ±1.18	4.0 ±1.5	2.5 ±0.64	2.0 ±0.4	2.0 ±0.41	2.25 ±0.63	19.0 ±2.5		
Feb., 1 st	14	6	8	2	4	3	37	19.5	63.5
2 nd	16	4	6	4	3	2	35	19.6	58.3
3 rd	15	14	9	6	4	4	52	25.6	60.8
4 th	14	11	6	9	6	7	53	24.4	63.1
Mean	14.75 ±0.48	8.75 ±2.3	7.25 ±0.75	5.25 ±1.49	4.25 ±0.63	4.0 ±1.08	44.25 ±4.78		
March, 1 st	16	13	13	11	7	5	65	21.6	65.8
2 nd	20	14	15	15	9	6	79	25.9	61.7
3 rd	12	8	11	6	3	2	42	26.7	65.6
4 th	2	5	8	4	8	3	30	21.8	63.7
5 th	0	3	2	2	4	0	11	23.9	59.7
Mean	10.0 ±3.9	8.6 ±2.2	9.8 ±2.26	7.5 ±2.37	6.9 ±1.16	3.2 ±1.06	45.4 ±13.56		
Apri., 1 st	2	1	1	0	2	0	6	27.3	57.0
Total	166	98	92	67	60	48	531		
%	31.26	18.45	17.33	12.62	11.30	9.04	100		
General mean	6.6± 2.1	3.83± 1.6	3.52± 1.65	2.46± 1.31	2.59± 1.06	1.81± 0.67	20.71± 8.0		

Table 4. Seasonal abundance of the predatory insects associated with *Aphis craccivora* on faba bean plants during 2011-2012 season in the newly reclaimed sandy area, El-Khattara district.

Date of inspection (weeks)	<i>C. undecimpunctata</i>	<i>C. carnea</i>	<i>P. alferii</i>	<i>Scymnus</i> sp.	<i>Orius</i> sp.	<i>Syrphus</i> sp	Total	Corresponding means of	
								Temp. °C	R.H. %
Nov. , 4 th	0	0	0	0	0	0	0	21.8	61.2
Mean	0	0	0	0	0	0	0		
Dec., 1 st	1	0	0	0	0	0	1	22.3	66.4
2 nd	3	0	0	0	0	1	4	19.8	61.6
3 rd	2	0	0	1	0	2	5	16.5	57.8
4 th	5	0	2	3	0	1	11	16.9	59.6
Mean	2.75 ±0.9	0	0.5 ±0.5	1 ±0.71	0	1 ±0.41	5.25 ±2.1		
Jan., 2012 1 st	7	0	5	5	0	1	18	17.6	51.0
2 nd	5	1	3	2	0	2	13	16.6	60.8
3 rd	3	3	2	4	2	3	17	16.9	61.4
4 th	8	2	3	2	1	2	18	15.2	60.0
5 th	6	3	2	3	2	1	17	17.3	60.0
Mean	5.8 ±0.86	1.8 ±0.58	3.0 ±0.55	3.2 ±0.65	1 ±0.45	1.8 ±0.37	16.6 ±0.93		
Feb., 1 st	7	5	3	5	3	3	26	18.1	59.6
2 nd	8	10	4	3	2	3	30	16.1	60.1
3 rd	13	14	10	9	9	6	61	17.3	60.1
4 th	10	9	5	4	5	5	38	19.4	60.7
Mean	9.5 ±1.32	9.5 ±1.8	5.5 ±1.6	5.25 ±1.3	4.75 ±1.5	4.25 ±0.8	38.75 ±7.82		
March, 1 st	11	13	6	3	5	4	42	19.9	60.6
2 nd	15	9	10	8	10	6	58	17.6	59.1
3 rd	9	10	5	3	7	3	37	18.0	58.4
4 th	5	7	3	2	3	1	21	21.1	59.0
Mean	10 ±2.1	9.75 ±1.25	6.0 ±1.47	4 ±1.35	6.25 ±1.5	3.5 ±1.04	37.75 ±8.0		
Apri., 1 st	8	6	2	1	1	1	19	20.7	57.6
2 nd	2	0	1	0	0	0	3	21.7	59.1
Mean	5±3.0	3 ±3.0	1.5 ±0.35	0.5 ±0.5	0.5 ±0.51	0.5 ±0.5	10.5 ±8.5		
Total	128	92	66	58	50	45	439		
%	29.16	20.96	15.03	13.21	11.39	10.25	100		
General mean	5.51± 1.57	4.0± 1.84	2.75± 1.04	2.32± 0.87	2.08± 1.11	1.84± 0.69	18.14± 6.75		

2.2. On cowpea plants:

Seven species of predators were found during the two seasons of this investigation. These predators were *C. undecimpunctata*, *Syrphus* sp., *C. carnea*, *Scymnus* sp., *Orius* sp., *Cydonia vicina isis* (Muls) and *P. alferii* . The occurrence of these predators in the first season 2011 could be descendingly arranged as follow:

C. undecimpunctata was the dominant predator species with a rate of occurrence reached, 33.48%. *Syrphus* sp. represented the second one with a percent of 18.06% from the total numbers of predators found in the first season, whereas the rest predator arranged descendingly as follow, *C. carnea* 13.22%, *Scymnus* sp., 12.11%, *Orius* sp., 11.23% , *C. Vicina isis* 7.27% and *P. alferii* 4.63% (Table 5).

In 2011 season, the population density of whole predators started with low densities till reached its maximum (89 individuals/ 50 plants) on the fourth week of July. One additional peak (69 individuals/ 50 plants) was found in the second week of August (Table, 5).

The occurrence of the same predators in the second season 2012 could be descendingly arranged as follow:

C. undecimpunctata was the dominant predator species with a rate of occurrence reached (30.65%) from the total number of predators. *Syrphus* sp. (19.36%), *Scymnus* sp., (16.33%), *C. carnea* (14.57%), *Orius* sp., (8.79%), *C. vicina isis* (5.78%) and *P. alferii* (4.25%) (Table 6).

In 2012 season, the total number of predators was fluctuated and increased gradually to reach its maximum (78 individuals/ 50 plants) in the third week of July, (Table, 6).

The present results agree with those of Metwally (1998) who stated that, *C. undecimpunctata* , *S. interruptus* and *O. albidipennis* were associating with *A. craccivora* on cowpea plants. Abd-Elsamed *et al.*, (2011) mentioned that *C. undecimpunctata* was represented by 16.88 and 23.96%, *C. vicina isis* , 7.14 and 5.73%, *C. vicina nilotica* 4.11 and 3.65%, *M. corollae* 3.25 and 2.86%, *C. carnea* 3.68 and 3.13% on *A. craccivora* infested cowpea during 2009 and 2010 seasons, respectively in Egypt.

Table 5. Seasonal abundance of the predatory insects associated with *Aphis craccivora* on cowpea plants during 2011 season in the newly reclaimed sandy area, El-Khattara district.

Date of inspection (weeks)	<i>C. undecimpunctata</i>	<i>Syrphus</i> sp.	<i>C. carnea</i>	<i>Scymnus</i> sp.	<i>Orius</i> sp.	<i>C. vicina isis</i>	<i>P. afflicti</i>	Total	Corresponding means of	
									Temp. °C	R.H. %
Jun., 3 rd	0	0	0	0	0	0	0	0	26.5	58.4
4 th	3	3	2	1	0	1	0	10	27.8	59.0
Mean	1.5 +1.5	1.5 +1.5	1.0± 1.0	0.5 +0.5	0	0.5 +0.5	0	5.0± 5		
Jul., 1 st	8	5	4	4	3	1	0	25	29.6	59.4
2 nd	17	15	6	9	7	2	2	58	30.7	64.0
3 rd	26	6	13	11	12	5	4	77	30.5	64.1
4 th	24	22	10	10	8	7	8	89	31.4	62.6
Mean	18.75 +4.07	12.0 +4.02	8.25 +2.01	8.5 +1.6	7.5 +1.85	3.75 +1.38	3.5 +1.71	62.25 +13.96		
Aug., 1 st	16	7	7	5	6	3	2	46	31.3	59.7
2 nd	20	16	8	9	7	6	3	69	29.5	63.3
3 rd	14	3	5	4	4	4	2	36	27.5	63.4
4 th	12	2	3	2	1	3	0	23	29.8	68.3
Mean	15.5 +1.7	7.0 +3.2	5.75 +1.11	5.0 +1.5	4.5 +1.3	4.0 +0.71	1.75 +0.63	43.5 +9.72		
Sep., 1 st	8	2	2	0	2	1	0	15	28.4	61.0
2 nd	4	1	0	0	1	0	0	6	28.5	61.6
3 rd	0	0	0	0	0	0	0	0	28.3	61.8
4 th	0	0	0	0	0	0	0	0	28.4	62.0
Mean	3.0± 1.9	0.75 +0.48	0.5 +0.5	0	0.75 +0.48	0.25 +0.25	0	8.5 +6.65		
Total	152	82	60	55	51	33	21	454		
%	33.48	18.06	13.22	12.11	11.23	7.27	4.63	100		
General mean	9.69 +4.35	5.31 +2.63	3.87 +1.88	3.5 +2.0	3.19 +1.74	2.12 +1.01	1.31 +0.84	30.5 +14.11		

Table 6. Seasonal abundance of the predatory insects associated with *Aphis craccivora* on cowpea plants during 2012 season in the newly reclaimed sandy area, El-Khattara district.

Date of inspection (weeks)	<i>C. undecimpunctata</i>	<i>Syrphus</i> sp	<i>Scymnus</i> sp.	<i>C. carnea</i>	<i>Orius</i> sp.	<i>C. vicina isis</i>	<i>P. affierii</i>	Total	Corresponding means of	
									Temp. °C	R.H. %
Jun., 3 rd	2	0	0	0	0	0	0	2	26.5	58.4
4 th	4	3	2	3	0	0	0	12	27.8	59.0
Mean	3.0 ±1.0	1.5 ±1.5	1.0 ±1.0	1.5 ±1.5	0	0	0	7± 5.0		
Jul., 1 st	6	5	4	5	1	0	0	21	29.6	59.4
2 nd	10	7	6	6	4	1	3	37	30.7	64.0
3 rd	25	17	9	14	5	3	5	78	30.5	64.1
4 th	23	14	10	8	7	2	6	70	31.4	62.6
Mean	16.0 ±4.71	10.75 ±2.84	7.25 ±1.38	8.25 ±2.02	4.25 ±1.25	1.5 ±0.65	3.5 ±1.32	51.5 ±13.49		
Aug., 1 st	17	10	13	7	7	5	2	61	31.3	59.7
2 nd	14	8	10	5	5	2	2	46	29.5	63.3
3 rd	8	6	7	3	3	4	0	31	27.5	63.4
4 th	6	5	4	4	1	2	0	22	29.8	63.3
Mean	11.25 ± 2.56	7.25 ±1.11	8.5 ±1.94	4.75 ± 0.85	4.0 ±1.3	3.25 ±0.75	1.0 ±0.58	40.0 ±8.57		
Sep., 1 st	4	0	0	3	2	1	0	10	28.4	61.0
2 nd	3	2	0	0	0	3	0	8	28.5	61.6
3 rd	0	0	0	0	0	0	0	0	28.3	61.8
4 th	0	0	0	0	0	0	0	0	28.4	62.0
Mean	1.75 ±1.03	0.5 ±0.5	0	0.75 ±0.75	0.5 ±0.5	1.0 ±0.71	0	4.5 ± 2.63		
Total	122	77	65	58	35	23	18	398		
%	30.65	19.36	16.33	14.57	8.79	5.78	4.25	100		
General mean	8.0 ±3.4	5.0 ±2.42	4.19 ±2.15	3.81 ±1.72	2.19 ±1.12	1.44 ±0.68	1.13 ±0.83	25.75 ±11.79		

3. Effect of temperature and relative humidity on the population densities of *Aphis craccivora* and its associated predators on faba bean and cowpea plants during two successive seasons:

3.1. On faba bean

The correlation between number of *C. undecimpunctata* and mean relative humidity was negative highly significant ($r=0.6708$). On the other hand, the correlation between the number of *Scymnus* sp. and maximum temperature was negative significantly correlation in the second season (Table , 7).

3.2. On cowpea

The results in Table, (7) revealed that highly positive significant correlation was found between number of *A. craccivora* and maximum temperature and mean relative humidity in the first season ($r=0.6815$ and 0.7283 respectively), as well as, between the minimum temperature and *A. craccivora* in the second season ($r=0.7704$). The correlation between the number of *C. undecimpunctata* ($r=0.5508$) and *P. alfieri* ($r=0.6178$) and maximum temperature was positive significantly correlation in the first season, while the number of *C. carnea* was positively correlated with the maximum temperature in both seasons, ($r=0.6611$ and 0.5789 respectively). Meanwhile the correlation between the number of *Orius* sp., *Scymnus* sp. and the maximum temperature were highly positive significant correlation in the first season (0.6663 and 0.6852 respectively).

In the second season, also the correlation coefficient between the number of *C. undecimpunctata* and *C. carnea* was highly positive significant correlation with the minimum temperature ($r = 0.7231$ and 0.6954 , respectively) whereas the same results were obtained with the mean relative humidity, in the first season ($r = 0.7557$ and 0.7262) respectively.

The correlation between the number of *P. alfieri* and *Syrphus* sp. with minimum temperature was highly positive significant in the second season, while it was positive significant with *Scymnus* sp. in the same season.

The correlation between the number of *P. alfieri* and *Orius* sp. with the mean relative humidity, was positive significant (0.5999 and 0.6970 respectively) in the first season, meanwhile it was highly positive significant correlation with *Scymnus* sp. and *C. vicina isis* in the first season, respectively. These results are in general agree with those of Hassanein *et al.*, (1992) and El-Maghraby *et al.*, (2008)

Table 7. Simple correlation between *Aphis craccivora* Koch. infested faba bean and cowpea plants and its associated predatory insects (X_1) and maximum temperature (X_2), minimum temperature (X_3) and mean relative humidity (X_4) during the two successive seasons in the newly reclaimed sandy area of El-Khattara district, Sharkia Governorate, Egypt

Variable	Faba bean						Cowpea					
	r1-2		r1-3		r1-4		r1-2		r1-3		r1-4	
	2010/11	2011/12	2010/11	2011/12	2010/11	2011/12	2011	2012	2011	2012	2011	2012
1. Aphid <i>Aphis craccivora</i>	0.2398	-0.3528	0.0389	-0.1049	0.1783	-0.0588	0.6815**	0.4036	-0.2052	0.7704**	0.7238**	-0.0187
2. Predatory insects <i>C. undecimpunctata</i>	0.0843	-0.3681	-0.1910	-0.0119	-0.0142	-0.6708**	0.5508*	0.4119	-0.3121	0.7231**	0.7557**	0.0618
<i>C. carnea</i>	0.2994	-0.1959	0.0393	-0.2682	0.2179	-0.0097	0.6611*	0.5789*	0.2593	0.6954**	0.7262**	0.1013
<i>P. alferii</i>	0.2289	-0.3529	0.0861	0.0924	0.1878	-0.1335	0.6178*	0.4314	-0.1526	0.7887**	0.5999*	-0.0950
<i>Orius sp.</i>	0.3285	-0.2262	0.1473	-0.2226	0.2286	0.0542	0.6663**	0.2648	-0.2392	0.6246	0.6970*	0.2069
<i>Syrphus sp.</i>	0.2218	-0.3794	0.0549	-0.1974	0.1722	0.0244	0.3357	0.5002	-0.0822	0.7564**	0.2230	0.1314
<i>Scymnus sp.</i>	0.1012	-0.5599*	-0.1393	0.1464	0.2286	-0.0729	0.6852**	0.2958	-0.2273	0.5436*	0.6988**	0.3104
<i>C. vicina isis</i>							0.5436*	-0.0140	-0.2461	0.3396	0.7643**	0.4303
Total insect predators	0.2329	-0.3528	-0.0054	-0.0995	0.1563	-0.0378	0.6582*	0.4237	-0.2642	0.7172**	0.7399**	0.1542

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من اللوبيا *Aphis craccivora* Koch. ومفترساته الحشرية على نباتات الفول البلدى واللوبيا فى المناطق الرملية المستصلحة حديثا فى مصر

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أجريت هذه الدراسة فى منطقة الخطارة بمحافظة الشرقية خلال الموسمين الزراعيين ٢٠١٠/٢٠١١ و ٢٠١١/٢٠١٢ للتعرف على الكثافة العددية لحشرة من اللوبيا *Aphis craccivora* Koch. والمفترسات المصاحبة لها فى حقول الفول البلدى واللوبيا .

أوضحت النتائج أن لمن اللوبيا ثلاث ذروات على محصول الفول البلدى خلال موسمى الدراسة كانت فى الأسبوع الرابع من ديسمبر والأسبوع الثانى من فبراير والأسبوع الاول من مارس خلال الموسم الأول ٢٠١٠-٢٠١١ بينما فى الموسم الثانى ٢٠١١-٢٠١٢ كانت خلال الأسبوع الأول من يناير والأسبوع الرابع من فبراير والأسبوع الثانى من مارس على محصول الفول البلدى .

بينما أظهرت النتائج وجود ذروة واحدة خلال موسمى الدراسة ٢٠١١ و ٢٠١٢ على محصول اللوبيا فى الأسبوع الثالث والرابع من يوليو على التوالي .

كذلك تم حصر سبعة أنواع من المفترسات وهى أبو العيد ذوالأحدى عشر نقطة واسد المن والرواغة وبقة الاوريس وحشرة السيرفس والاسكمنس وابو العيد الاسود فى حقول الفول البلدى واللوبيا والتي تؤثر بشكل معنوى على تطور وسير الإصابة بالمن.

بالنسبة لحقول الفول البلدى تم تسجيل ذروتين فى الأسبوع الأول من فبراير ، الأسبوع الثانى من مارس (٣٧ ، ٧٩ مفرس/ ١٠٠ نبات) فى الموسم الأول ٢٠١٠-٢٠١١ بينما تم تسجيل ذروتين خلال الموسم الثانى ٢٠١١-٢٠١٢ فى الأسبوع الثالث من فبراير و الاسبوع الثانى من مارس (٦١ ، ٥٨ مفرس / ١٠٠ نبات) على التوالي .

أما بالنسبة لمحصول اللوبيا فتم تسجيل ذرتين خلال الاسبوع الرابع من يوليو والاسبوع الثانى من أغسطس (٨٩ ، ٦٩ مفرس / ٥٠ نبات) فى الموسم الاول ٢٠١١ بينما تم تسجيل ذروة واحدة خلال الموسم الثانى ٢٠١٢ فى الاسبوع الثالث من يوليو (٧٨ مفرس / ٥٠ نبات) .

وأوضحت نتائج التحليل الاحصائى أن لدرجة الحرارة والرطوبة النسبية تأثير معنوى على بعض الحشرات وتأثير غير معنوى على البعض الآخر .