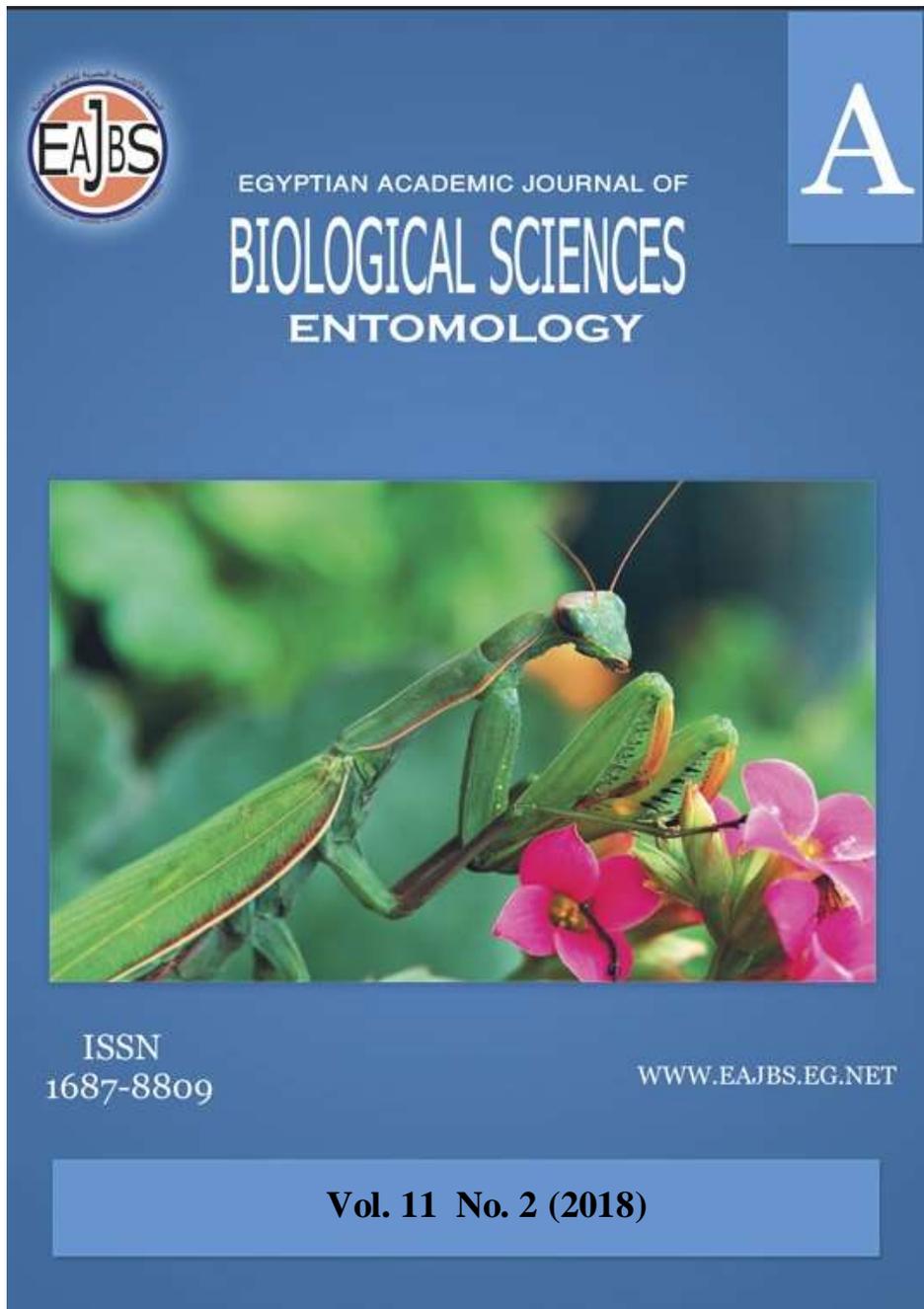


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A New List to the Entomofauna Associated with Faba Bean, *Vicia faba* L. (Fabales: Fabaceae) Grown in El-Kharga Oasis, New Valley Governorate, Egypt.

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ABSTRACT

Survey of the insect pests and their natural enemies associated with faba bean was conducted at El-Kharga Oasis, New Valley Governorate (Egypt) during the months of mid-October to April of 2015 and 2017. In total 15614 insects belonging to 7 orders and 16 families were collected and identified. The most abundant orders were Hymenoptera (7 families) and followed by Hemiptera (3 families). The most common pest species were cowpea aphid, *Aphis carccivora* Koch, leafhoppers, *Empoasca* sp., and black cutworm, *Agrotis ipsilon* (Huf.) Beneficial insects collected included several predatory families (Coccinellidae, Chrysopidae and Sphecidae) but only low numbers of parasitoids (Pteromalidae) and pollinators (Apidae and Halictidae). The results of this study represent an important baseline data for the design and implementation of strategies for faba bean protection in Egypt.

INTRODUCTION

The New Valley Governorate is the largest governorate in Egypt (Mahbob and Mahmoud, 2013) which represent 37.6 % of the total area of Egypt and about 56 % of western desert area (Gameel, 2013). Recently, many promising and powerful agricultural works were started in this area.

Faba bean, *Vicia faba* L. considered one of the most economic important field crops cultivated in El-Kharga Oasis, New Valley Governorate (Gameel, 2014). It is one of the best sources of protein for human and animals not only in Egypt but also in the Middle East and Africa (Abdel-Monaim, 2013). Also, faba bean has the ancillary benefits of nitrogen fixation and thus a reasonably low fertility requirement. Faba bean plants are subjected to be attacked by seasonal major insect pests which cause serious damage directly or indirectly to crop production (Ali and Rizk 1980; Sharma and Yadav, 1994; El-Defrawi *et al.*, 2000; Mohamed, 2003; Gameel, 2014 and Mesbah *et al.*, 2016). Any assessment of a crop's potential in a region would be aided by the knowledge of the insect fauna that would be associated with its production. To cope with the lack of information concerning the entomofauna associated with faba bean during its different developmental stages in New Valley

Governorate. The present study aimed to survey the insects associated with this crop during two successive seasons. It hoped to be the baseline data for more prospective studies.

MATERIALS AND METHODS

Field experiments were conducted in a farm in El-Kharga Oasis – New Valley for studying the entomofauna associated with faba bean. The cultivar (Wadi 1) was planted in one feddan and divided into four replicates during the two successive seasons of 2015/2016 and 2016/2017 (mid-October to April). Plants were examined for occurrence of insects during early morning to early evening to survey the entire photophase. Observations of predacious and parasitic activity against insect herbivores were recorded whenever possible then specimens were collected and prepared for identification. Insects were mounted and identified to species where possible through the use of systematic keys and direct comparisons with museum specimens housed at the Ain Shams University Collection (ASUC). The data collection methods include:

Direct Counting:

The visual counts started after the 3rd week of plant emergence and continued through the flowering and fruiting stages until the harvest time. Samples were taken randomly every week from 10 plants for each replicate. Collected specimens were preserved in 70% ethanol until identification.

Yellow Sticky Traps:

The traps are made of yellow, opaque polyvinyl material (peak reflectance wave length, 57 nm) covered with a strongly diluted sticky paste base (poly - isobutene), made the surface viscous, but not thick (Ali, 1995). Each trap was stocked on a steel stalk carrier on a suitable high for faba bean. Traps were collected every week and examined in the laboratory using high magnifying lens.

Yellow Pan Water Traps:

The traps were installed in the center of each replicate and adjusting according to the plant height. Pans were made of aluminium and painted by a yellow colour and filled with water and then emptied two times weekly by using a fine – mesh screen. Collected samples were kept in glass vials containing 70% ethanol for identification.

Dominance and abundance degrees of the collected species were estimated according to the formula of (Facylate, 1971)

$$D = t / T \times 100,$$

Where,

D =Dominance percentage

t = Total number of each species during the collecting period.

T = Total number of all species were collected during the collecting period.

$$A = n / N \times 100,$$

Where,

A =Abundance percentage.

n =Total number of samples in which each species appeared.

N =Total number of samples taken all over the season.

RESULTS AND DISCUSSION

Insects found in association with faba bean during the two seasons 2015/2016 and 2016/2017 in El-Kharga Oasis, New Valley Governorate were identified and divided into pests, predators, parasitoids and pollinators as shown in Tables 1 and 2.

Data indicated the presence of 22 insect species belonged to 18 genera under 16 families and 7 orders.

Data revealed also that 0.5 % of the total collected insect species were recorded using yellow pan water traps, meanwhile 46.6 % through direct counting method and 52.9 % were collected using yellow sticky traps.

The common insect pests in two seasons were (*Aphis carccivora* Koch., *Empoasca* sp., *Agrotis ipsilon* (Huf.), *Cosmolyce baeticus* L. and *Thrips* sp.). Also, *Carpocoris pudicus* (Poda) was recorded during the first season only. Moreover, (*Silba adipata* McAlpine and *Silba* sp.) were recorded in the second season only.

Concerning to the insect pests, during the first season the results showed that, the most dominant insect pests were *A. craccivora* (54.3%) and *Empoasca* sp. (41.16%) followed by *C. baeticus* (1.6%) and *A. ipsilon* (0.30%). The highly percentages of abundance (73.7, 31.8 and 15.8 %) were recorded with *Empoasca* sp., *A. craccivora* and *A. ipsilon*, respectively Table (3).

Nearly, the same trend of data was observed during the second growing season of (2016/2017) where, cowpea aphid, leafhoppers, blue butterfly and black cutworm represented about (54.5, 42.5, 1.4 and 0.15 %), respectively. The maximum percentages of abundance (90.5, 76.5, 19.05 and 14.3 %) were obtained with *A. craccivora*, *Empoasca* sp., *A. ipsilon* and *Thrips* sp., respectively.

On the other hand, the most dominant predators in both first and second seasons were *Coccinella septempunctata* L. and *Coccinella undecimpunctata* L. by 1.3 and 0.5 %, respectively for the first season, with 47.4 and 31.6 percentage of abundance, respectively, The green lacewing, *Chrysoperla carnea* (Steph), showed moderate abundance percentages in first and second seasons as 42.1 and 19.05 %, respectively.

Compsomeria carbonaria Lepeletier, *Colpa carbonaria* (Klug), *Polistes gallicus* L., *Andrena priesnerella* Spinola, *Andrena savignyi* Spinola and *Dibrachys cavus* (Walker), were recorded as parasitoids during the study time. Moreover, the most abundant parasitoids were *Dibrachys cavus* by 10.5 % for the first season and 4.8 % for the second season followed by *Compsomeria carbonaria*, *Colpa carbonaria*, *Andrena priesnerella* and *Andrena savignyi*.

Finally, honey bee, *Apis mellifera* L. was the most dominant and abundant pollinator in both seasons as mentioned in the table.

From previous data it can be concluded that, the common insect pests and its associated beneficial insects inhabiting faba bean fields under El-Kharga Oasis conditions were *A. craccivora*, *Empoasca* sp., *C. baeticus*, *A. ipsilon*, *C. septempunctata*, *C. undecimpunctata* and *Ch. Carnea*. These results in agreement with (Ali, and Rizk, 1980; Mohammad and Mahmoud, 1986; Sharma and Yadav, 1994; El-Heneidy *et al.*, 1998; El-Defrawi *et al.*, 2000; Mohamed, 2003; Aly, 2014; Gameel, 2014 and Mesbah *et al.*, 2016) who recorded nearly the trend of data in different Governorates of Egypt on faba bean plants.

It is highly recommended to use a device strategy to control excessive populations of cowpea aphids, *Aphis carccivora*. Koch and *Agrotis ipsilon* (Huf).

More attention and studies should be directed towards the role of natural enemies in maintaining the biological balance in addition, using new eco-friendly

alternatives such as plant extracts for controlling these pests under the conditions of this region and specially in light of a decision issued by the Ministry of Agriculture in 1995 prevents the use of traditional pesticides in the control of pests in the New Valley Governorate.

Table (1) Identification of some insect pests associated with *Vicia faba* form El-Kharga Oasis, New Valley Governorate

Order and Family	Scientific name	Common name	Note	First season	Second season	Method of collection
Insect pests						
Thysanoptera						
Thripidae	<i>Thrips</i> sp.		sap – sucker	+	+	W
Hemiptera-Homoptera						
Cicadellidae	<i>Empoasca</i> sp.	leafhoppers	sap – sucker	+	+	S
Aphididae	<i>Aphis carceivora</i> . Koch	Cowpea aphid.	sap – sucker	+	+	D, S and W
Pentatomidae	<i>Carpcoris pudicus</i> (Poda)	Shield bug	sap – sucker	+		W
Lepidoptera						
Noctuidae	<i>Agrotis ipsilon</i> . (Huf.)	Black cutworm	Foliage – feeder	+	+	D
Lycanidae	<i>Cosmolyce baeticus</i> L.	Blue butterfly	Flower and pod feeder	+	+	D
Diptera						
Lonchaeidae	<i>Silba adipata</i> McAlpine	Mediterranean black fig fly.	Fruit - feeder		+	W
	<i>Silba</i> sp				+	W

D: Direct count, S: sticky trap, W: water trap and (+) sample present.

Table (2) Identification of some beneficial insects associated with faba bean, *Vicia faba* L. from El-Kharga Oasis, New Valley Governorate.

Order and Family	Scientific name	Common name	First season	Second season	Method of collection
Predators					
Neuroptera					
chrysopidae	<i>Chrysoperla carnea</i> (Steph)	Green lacewing	+	+	S, D and W
Coleoptera-Polyophaga					
Coccinellidae.	<i>Coccinella septempunctata</i> L	Ladybird beetles.	+	+	D and W
	<i>Coccinella undecimpunctata</i> L.		+	+	
	<i>Exochomus nigripennis</i> Erichson		+		
	<i>Hippodamia variegata</i> (Goeze)	The variegated ladybug	+	+	
Hymenoptera					
Sphecidae	<i>Tachysphex albocinctus</i> (Lucas)	Digger wasp	+		W
Parasitoids					
Hymenoptera					
Scoliidae	<i>Compsomeria carbonaria</i> Lepeletier	The scoliid wasp	+		W
	<i>Colpa carbonaria</i> (Klug)		+		
Vespidae	<i>Polistes gallicus</i> L	Paper wasp		+	W
Andrenidae	<i>Andrena priesnerella</i> Spinola		+	+	W
	<i>Andrena savignyi</i> Spinola		+	+	W
Pteromalidae	<i>Dibrachys cavus</i> (Walker)		+	+	W
Pollinators					
Hymenoptera					
Apidae	<i>Apis mellifera</i> L.	Honey bee	+	+	W
Halictidae	<i>Halictus</i> sp	Furrow Bees		+	W

D: Direct count, S: sticky trap, W: water trap and (+) sample present

Table (3) Dominance and abundance percentages of entomofauna collected from faba bean, *Vicia faba* L. during 2015/2016 and 2016/2017 seasons at El-Kharga Oasis.

Second season		First season		Taxon
Abundance %	Dominance %	Abundance %	Dominance %	
Insect pests				
19.05	0.15	15.8	0.3	<i>A. ipsilon.</i>
9.5	1.4	10.5	1.6	<i>C. baeticus</i>
90.5	54.5	31.6	54.3	<i>A. carccivora</i>
-	-	5.3	0.02	<i>C. pudicus</i>
76.5	42.5	73.7	41	<i>Empoasca</i> sp.
14.3	0.05	10.5	0.07	<i>Thrips</i> sp.
4.8	0.01	-	-	<i>S. adipata</i>
4.8	0.01	-	-	<i>Silba</i> sp.
Predators				
-	-	26.3	0.08	<i>T. albocinctus</i>
47.6	1.1	47.4	1.3	<i>C. sptempunctata</i>
19.05	0.44	31.6	0.5	<i>C. undecimpunctata</i>
-	-	5.3	0.02	<i>E. nigripennis</i>
19.05	0.08	42.1	0.46	<i>C. carnea</i>
4.8	0.01	-	-	<i>H. variegata</i>
Parasitoids				
4.8	0.07	10.5	0.1	<i>D. cavus</i>
-	-	5.3	0.02	<i>C. carbonaria</i>
-	-	5.3	0.02	<i>C. carbonaria</i>
4.8	0.01	5.3	0.02	<i>A. priesnerella</i>
4.8	0.02	5.3	0.07	<i>A. savignyi</i>
4.8	0.03	-	-	<i>P. gallicus</i>
Pollinators				
14.3	0.07	10.5	0.08	<i>A. mellifera</i>
0.01	0.03	-	-	<i>Halictus</i> sp

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