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### Co-Existence of Pests and the Associated Predators Inhabiting Cucumber, *Cucumis sativus* L. (Fam. Cucurbitaceae) at Assiut Governorate

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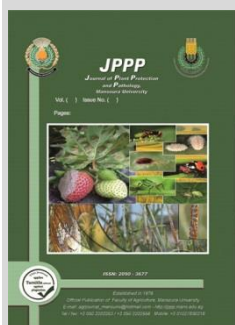
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#### ABSTRACT

The present study is carried out at the experimental farm of Assiut University, during the period started from 2014 to 2016 growing seasons of cucumber. The faunistic composition of pests and their associated predators inhabiting cucumber plants, *Cucumis sativus* L revealed the presence of 39 species of arthropods belonged to 13 orders and 28 families as well as some species of true spiders. From the species collected, 4 species are considered as abundant pests, 2 species as less abundant pests, 11 species slightly abundant, 18 beneficial arthropods and some unidentified true spider and 4 species are considered as pollinators and visitors. The collected species can be classified as piercing-sucking pests, leaf feeders, and leaf miners. In general member of 7 insect orders (Orthoptera, Thysanoptera, Hemiptera, Homoptera, Lepidoptera, Diptera and Acari) and 13 families (Acridiidae, Gryllotalpidae, Gryllidae, Thripidae, Pentatomidae, Aleyrodidae, Aphididae, Cicadellidae, Noctuidae, Agromyzidae) beside four families of order Acari (Iolinidae, Tarsonemidae, Tetranychidae and Tydidae) were recorded inhabiting cucumber plants during spring and summer plantations of cucumber at Assiut governorate in session (2014-2016). The green lacwing, *Chrysoperla carnea* Steph, the hover fly, *Eupeodes corollae* (F.) (= *Syrphus corolla* F.) and the lady beetles, *Coccinella undecimpunctata* L., were the most abundant predator species. Species such as *Lapidura riparia* Pall, *Orius* sp., *P. alferii* Koch. and some unidentified species of true spiders were collected occasionally and in scarce numbers.

**Keywords:** Cucumber, Insect pests, Predators, Assiut.



#### INTRODUCTION

The cucumber, *Cucumis sativus* L. (Fam. Cucurbitaceae) is one of the most important vegetable cash crops and has significant economic values (Karaman *et al.*, 2007). In Egypt, the cultivated area of cucumber was increased during the last years for local consumption and exportation. It reached about 49702 feddans (20874.84 Hectares) during spring and summer plantations with the production reached about 45667 tons (Anonymous, 2014).

Cucumber plants are usually infested with various pests, which threaten the yield, e.g. cotton aphid, *Aphis gossypii* (Glover.); onion thrips, *Thrips tabaci* L.; whitefly, *Bemisia tabaci* (Genn.), and the two spotted spider mite, *Tetranychus urticae* Koch. In the case of heavy infestation, these pests are causing serious damage to plants leading to great reduction in the yield (Duffus, 1987 and Mohamed *et al.*, 2011).

The present study is conducted to survey and to determine the dominance and abundance degrees of pests and the associated predators inhabiting cucumber plants in Assiut governorate.

#### MATERIALS AND METHODS

The studies were conducted at the experimental farm of Plant Protection Department, Faculty of Agriculture, Assiut University during the period from 2014 to 2016. An area of about quarter feddan (1050 m<sup>2</sup>) was divided into equal plots. Each plot was 1/400 of feddan (3

x 3.5 m<sup>2</sup>; 6 rows / plot) and was cultivated with cucumber (variety Embratour) in a randomized complete block design. All recommended agricultural practices were performed, and no chemical treatments were used during the study period. Cucumber plants were planted in three successive seasons (2014, 2015 and 2016) in spring and summer plantations. During spring plantations, the seeds were sown on March 28, 2015 and April 3, 2016, whereas in summer plantations seeds were sown on June 15, 2014 and on June 23, 2015.

In order to survey the arthropods associated with the cucumber plants, leaf sampling and pitfall traps methods were used. Leaf samples were taken when the plants became high enough to permit successful samples. Samples were taken weekly and continued throughout the growing season until the end of the season. The number of species and the number of individuals for each species within each sample were counted and recorded at each inspection date.

Pitfall traps were placed in the center of each plot. The trap was prepared by imbedding a wide mouth, ½ liter size glass jar in the soil and the top of the jar was even with soil surface. The jars were partially filled with crude commercial alcohol over which a thin layer of kerosene was poured to prevent evaporation. Twenty jars were used weekly. The contents of the traps were generally replaced weekly. Specimens were removed from the liquid by pouring the trap contents through a fine-mesh screen, and then transferred to 75% ethyl alcohol after being washed several

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times with acetone in order to remove the kerosene (Khalil et al., 1975). Collected species were identified and counted.

**Statistical analysis**

Dominance and abundance degrees (%) of the identified species were calculated according to the formula of Facylate (1971) as following:

**Dominant degree (D)**

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

**Where:** (t) = total number of each species during the collecting period. (T) = total number of all species during the collecting period.

**Abundant degree (A)**

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

**Where,**

(n) = total number of samples in which each species appeared.

(N) = total number of samples taken all over the season.

**RESULTS AND DISCUSSION**

**1- Survey of pests and the associated predators recorded on cucumber plants**

Data presented in Table (1) showed a partial taxonomic list of the arthropod pests and associated natural enemies recorded by leaves and pitfall traps sampling during spring and summer plantations of cucumber plants cultivated in Assiut governorate (2014-2016). Results indicated a presence of 39 species of arthropods belonged to 28 families and 13 orders as well as some species of true spiders (unidentified). From the species collected, 4 species are considered as abundant pests, 2 species were less abundant, 11 species were low abundant, 18 beneficial arthropods, and unidentified species of true spiders and 4 species are considered as pollinators and visitors.

**1- Pests**

Intensive and extensive observations indicated that the collected species can be classified as piercing-sucking pests, leaf feeders, and leaf miners. In general 7 orders (Orthoptera, Thysanoptera, Hemiptera, Homoptera, Lepidoptera, Diptera and Acari) and 13 families (Acridiidae, Gryllotalpidae, Gryllidae, Thripidae, Pentatomidae,

Aleyrodidae, Aphididae, Cicadellidae, Noctuidae, Agromyzidae, as well as four families of Acari order (Iolinidae, Tarsonemidae, Tetranychidae and Tydidae) were recorded inhabiting cucumber plants during spring and summer plantations of cucumber at Assiut (2014-2016 sessions). Species belonging to order Lepidoptera were collected as larvae by direct observations on the plants and presented by family Noctuidae. Two species were belonged to this order, *Agrotis ipsilon* (Rott.) and *Spodoptera littoralis* (Boisd.). Four species of order Orthoptera, grasshopper, *Heteracris littoralis* (Rumb.) and *Acrotylus insubricus* (Scopli) (Fam.: Acridiidae), the mole cricket, *Gryllotalpa gryllotalpa* L., (Family: Gryllotalpidae) and *Gryllus domestich* (L.) (Fam.: Gryllidae) were recorded during this study. Collected species which pierce the tissue and suck the sap of the cucumber plants are belonging to order Homoptera, Hemiptera and Thysanoptera as well as the two-spotted spider mite of the order Acari. The common pricing-sucking pests were the cotton aphid, *A. gossypii* (Aphididae), the cotton white flies, *B. tabaci* (Aleyrodidae), the leafhopper, *Empaosica* spp. (Cicadellidae) and the onion thrips, *T. tabaci* (Thripidae). Laboratory examination of the randomly collected cucumber leaves revealed the presence of the two spotted spider mite *T. urticae* (Tetranychidae) which was common on the cucumber leaves throughout the whole growing season.

These results are in accordance with those obtained by El-Dabi (1999) and Amro (2008) who reported a taxonomic list of arthropod pests and predators recovered from a cucurbit plantation. However, Ahmed (2003), Hagrass et al. (2008), Ghallab et al. (2011), Abd El-Wahab et al. (2012), Gameel (2013) and Metwally et al. (2013) reported that *B. tabaci*; *A. gossypii*; *T. tabaci*; *Empoasca* spp. are the most important piercing-sucking insects of cucumber crop. Two spotted spider mite, *T. urtica* was found to be as an economic pest infesting cucurbit plants (Farrag et al., 1982; Abou-Taka and Zahdy, 1990; El-Maghraby et al., 1994; Ali, 1995 and Abou-El-Saad, 2015).

**Table 1. A partial taxonomic list of the arthropod pests and the associated natural enemies inhabiting cucumber plants in Assiut governorate during 2014-2016 seasons.**

Order	Family	Scientific name	Common name	Frequency	Notes
<b>I – Pests</b>					
Orthoptera	Acridiidae	<i>Heteracris (Thisoicetrus) littoralis</i> (Rumb.)	Grasshopper	**	P
		<i>Acrotylus insubricus</i> (Scopli)	Common Digging grasshopper	**	P
	Gryllotalpidae	<i>Gryllotalpa gryllotalpa</i> (L.)	Mole cricket	*	P
	Gryllidae	<i>Gryllus domestica</i> L.	Field cricket	*	P
Thysanoptera	Thripidae	<i>Thrips tabaci</i> Lind.	Onion thrips	***	L
		<i>Thrips palmi</i> Karny.	Melon thrips	*	L
Hemiptera-Heteroptera	Pentatomidae	<i>Nezara veridula</i> L.	Stink bug	*	L-P
	Aleyrodidae	<i>Bemisia tabaci</i> (Genn.)	Whitefly	***	L
Hemiptera-Homoptera	Aphididae	<i>Aphis gossypii</i> Glover.	Melon aphid (cotton aphid)	***	L
	Cicadellidae	<i>Empoasca</i> spp.	Leaf hoppers	*	L
Lepidoptera	Noctuidae	<i>Agrotis ipsilon</i> (Rott.)	Cut worm	*	P
		<i>Spodoptera littoralis</i> (Boisd.)	Egyptian cotton leaf worm	*	L
Diptera	Agromyzidae	<i>Agromyza pussilla</i> Meig	Leaf miners	*	L
	Iolinidae	<i>Pronematus</i> sp.		*	L
Acari	Tarsonemidae	<i>Polyphagotarsonemus latus</i> (Banks)	Broad mite	*	L
	Tetranychidae	<i>Tetranychus urticae</i> Koch	Two-spotted spider mite	***	L
	Tydidae	<i>Tydes</i> sp.		*	L

**2- Predators**

As shown in Table (1), fifteen species were identified as entomophagous in addition to true spider (unidentified). They are belonging to 7 orders (Dermaptera, Thysanoptera, Hemiptera, Neuroptera, Coleoptera, Diptera and Acari as well as some of unidentified species of true spiders. Results also indicated that these species are

belonging to 11 families (Labiduridae, Thripidae, Anthocoridae, Miridae, Lygaeidae, Chrysopidae, Carabidae, Coccinellidae, Staphylinidae, Syrphidae and Phytosidae). The green lacewing, *C. carnea* (Stephens), the hover fly, *Eupeodes corollae* (F.) (syn. *Syrphus corollae* Fabricius) and the lady beetles, *C. undecimpunctata* L, were relatively the most abundant predator species. In

addition, species such as *L. riparia* (Pallas), *Orius* spp., *P. alferii* Koch. and some unidentified species of true spiders were collected occasionally and in scarce numbers.

The previously results showed that, onion thrips, *T. tabaci*, whitefly, *B. tabaci* and cotton aphid, *A. gossypii*, in addition to the two-spotted spider mite, *T. urticae* and broad mite, *P. latus* (Banks) are considered to be the most important piercing-sucking arthropod pests infesting cucumber plants during spring and summer plantations. The piercing sucking insects, *A. gossypii*, *B. tabaci*, and *T. tabaci* were recorded as common pests infesting cucumber plants in many parts of the world as recorded by Abd El-

Kareim, 1980; Mukhamediev and Akhmedov, 1984; Omar *et al.*, 1988; Hilije *et al.*, 1993; Mineo *et al.*, 1994; Tonhasca *et al.*, 1994; Kamel *et al.*, 2000; Gameel and Sayed, 2008 and Younes *et al.*, 2010. The common spider mite, *T. urticae* was found to be as an economic pest infesting cucurbit plants (Farrag *et al.*, 1982; Perring, 1987; El-Maghraby *et al.*, 1994; Ali, 1995; Kamel *et al.*, 2000 and Balkema *et al.*, 2003). The present results generally agree with those of El-Maghraby *et al.*, (1994); Ali (1995) and Bachatly and Sedrak (1997) who reported that *C. impicta* was the most common predator species associated with the cucumber pests.

**Table 1.Cont.**

Order	Family	Scientific name	Common name	Frequency	Notes
<b>II - Predators</b>					
Dermaptera		<i>Labidura riparia</i> Pall.	Giant earwig	**	P
Thysanoptera	Labiduridae	<i>Scolothrips sexmaculatus</i> (pergande)	six-spotted thrips	*	L
	Anthrocoridae	<i>Orius</i> sp.	Flower bug	*	L
Hemiptera -Heteroptera	Miridae	<i>Campylomma impicta</i> (Wagner)	Plant bug	**	L
	Lygaeidae	<i>Geocoris</i> sp.	Big eyed bug	*	L
Neuroptera	Chrysopidae	<i>Chrysoperla carnea</i> (Steph.)	Lace wing	*	L
	Carabidae	<i>Pheropsophus africanus</i> (Dejean)	Bombardier beetles	*	L
		<i>Coccinella undecimpunctata</i> L.	eleven-spotted lady beetle	**	L
		<i>Coccinella septempunctata</i> L.	Seven-spotted ladybird	*	L-P
Coleoptera	Coccinellidae	<i>Coccinella novemnotata</i> Herbst	Nine - spotted Lady Beetle	*	L
		<i>Adonia variegata</i> (Goeze)	Thirteen-dpotted lady beetle	*	L
	Staphylinidae	<i>Paederus alferii</i> Koch	Rove beetle	*	L
Diptera	Syrphidae	<i>Eupeodes corollae</i> (F.) (= <i>Syrphus corolla</i> F).	Hover fly	*	L=P
Acari	Phytoseidae	<i>Amblyseius swirskii</i> (Berlese)	Swirski mite	*	L
		<i>Typhlodromus</i> sp.	-	*	L
True spider		Unidentified species	True spider	**	P

\* = Rare; \*\* =Less abundant; \*\*\* = Common

L = leaf sampling; P = Pitfall trap sampling

**2- Dominance and abundance degrees of the pests and the associated predators inhabiting cucumber plants**

**1- Spring plantations**

**1- Pests**

The field studies, through the period extended from 2015 to 2016 seasons, show that the most serious pests on cucumber plants during spring plantations were: the two-spotted spider mite, *T. urticae*; whitefly, *B. tabaci*; onion thrips, *T. tabaci* and cotton aphid, *A. gossypii*.

In 2015 season, data in Table (2) show that the *T. urticae* seems to be the most important economic pest as indicated by the highest value of dominance and abundance degrees (79.85 and 100%, respectively). However, relatively low dominance degree of *B. tabaci* and *T. tabaci* (11.74% and 8.35%, respectively) corresponded with high abundance degree (100%) revealed that these species could be of economic importance if the environmental conditions changed into their favor. Meanwhile, *A. gossypii* which had low values of dominance and abundance degrees (0.06 and 60.00%, respectively) is expected to be of a little importance and play little role as a pest in cucumber during spring plantation.

Data during 2016 season indicated that *T. urticae* also is the most important economic pest as indicated by the highest value of dominance (74.93%) and abundance degree (100%) (Table 3). However, the relatively low dominance degree of *B. tabaci* and *T. tabaci* (13.24% and 11.77%, respectively) which also had a high abundance degree (100%) indicated that these two species could be of economic importance if the environmental conditions changed into their favor. Meanwhile, *A. gossypii* which had low values of dominance and abundance degrees (0.06

and 60.00%, respectively) is expected to be of a little importance as a pest in cucumber during spring plantation.

**Table 2. Dominance and abundance degrees of the pests and the associated predators inhabiting cucumber plants during spring plantations, 2015 season, in Assiut governorate.**

Species	Dominance		Abundance (%)
	No. /leaf± SD	(%)	
Pests			
<i>A. gossypii</i>	0.28±0.49	0.06	60.00
<i>B. tabaci</i>	52.55±33.25	11.74	100.00
<i>T. urticae</i>	357.43±163.81	79.85	100.00
<i>T. tabaci</i>	37.38±14.65	8.35	100.00
Total	447.64	100.00	---
Predators			
<i>C. impicta</i>	1.56±0.76	58.65	100.00
<i>C. undecimpunctata</i>	0.36±0.26	13.53	100.00
<i>S. sexmaculatus</i>	0.74±0.36	27.82	100.00
Total	2.66	100.00	---

**Table 3. Dominance and abundance degrees of the pests and the associated predators inhabiting cucumber plants during spring plantations, 2016 season, in Assiut governorate.**

Species	Dominance		Abundance (%)
	No. /leaf± SD	(%)	
Pests			
<i>A. gossypii</i>	0.28±0.49	0.06	60.00
<i>B. tabaci</i>	56.61±29.04	13.24	100.00
<i>T. urticae</i>	320.28±104.16	74.93	100.00
<i>T. tabaci</i>	50.30±18.99	11.77	100.00
Total	2219.46	100.00	---
Predators			
<i>C. impicta</i>	1.12±0.60	52.34	100.00
<i>C. undecimpunctata</i>	0.41±0.21	19.16	100.00
<i>S. sexmaculatus</i>	0.61±0.41	28.50	80.00
Total	2.14	100.00	---

**2- Predators**

Data presented in Table (2) show that mired bug, *C. impicta* (Wagner), eleven spotted lady beetle, *C. undecimpunctata* and *S. sexmaculatus* (pergande) were the predator species, which were recorded on cucumber plants during spring plantations.

In 2015 season, the *C. impicta* seemed to be the most common important economic predator as indicated by the highest value of dominance and abundance degree (58.65% and 100%, respectively). However, the highest abundance degrees (100.00%) of *C. undecimpunctata* and *S. sexmaculatus* which had low dominance degrees (13.53% and 27.82%) indicated that these species are of a little economic importance.

During 2016 season, data in Table 3 show also that *C. impicta* seemed to be the most important predator as indicated by the relatively high value of dominance and abundance degrees (52.34% and 100%, respectively). However, *C. undecimpunctata* and *S. sexmaculatus* which had lower values of dominance degrees (19.16% and 28.50%) are expected to be of little economic importance.

**2- Summer plantations**

**1- Pests**

During summer plantations (2014 and 2015), five species of the common pests were recorded, cotton aphid, *A. gossypii*; whitefly, *B. tabaci*, onion thrips, *T. tabaci*, broad mite, *P. latus* and two- spotted spider mite, *T. urticae* (Table 4).

In 2014 season, data in Table 4 show that *T. urticae* and *B. tabaci* seems to be the most important economic pests as indicated by the highest values of dominance (42.27% and 28.21%, respectively) and abundance degree (100%). However, the highest abundance degree (100%) of *P. latus* and *T. tabaci* which had relatively high dominance degree (16.35% and 10.29%, respectively) indicated that these species could be of economic importance if the environmental conditions changed into their favor. Meanwhile, *A. gossypii* which had low values of dominance and abundance degrees (2.88% and 85.71%, respectively) is expected to be of a little economic importance.

During 2015 season, data in Table 5 show that *B. tabaci* seems to be the most economic pest during summer plantation as indicated by the highest value of dominance (74.50%) and abundance degree (100%). However, the highest abundance degree of *T. tabaci*, *T. urticae* and *P. latus* which had relatively high dominance degrees (7.63%, 7.26% and 10.39%, respectively) indicated that these species could be of economic importance. Meanwhile *A. gossypii* which had low values of dominance and abundance degrees (0.22% and 60.00%, respectively) is expected to be of a little economic importance during summer plantation.

**2- Predators**

Data presented in Table (4) show that eleven spotted lady beetle, *C. undecimpunctata*, *C. impicta* and *S. sexmaculatus*, were recorded in association with the pests infesting cucumber plants during summer plantations.

In 2014 season, data in Table (4) show that *C. impicta* seems to be of relatively high economic importance as indicated by arelatively high value of dominance and abundance degrees (63.64% and 100%, respectively). However, *C. undecimpunctata* and *S. sexmaculatus* which had low dominance degrees (8.39% and 27.97%, respectively) indicated that these species may be don't play an effective role in the control of cucumber pests .

**Table 4. Dominance and abundance degrees of the pests and the associated predators inhabiting cucumber plants during summer plantations, 2014 season, in Assiut governorate.**

Species	Dominance		Abundance (%)
	No. / leaf± SD	(%)	
Pests			
<i>A. gossypii</i>	2.11±1.72	2.88	85.71
<i>B. tabaci</i>	20.67±13.15	28.21	100.00
<i>P. latus</i>	11.98±7.65	16.35	100.00
<i>T. urticae</i>	30.97±47.16	42.27	100.00
<i>T. tabaci</i>	7.54±3.83	10.29	100.00
Total	73.27	100.00	---
Predators			
<i>C. impicta</i>	0.91±0.59	63.64	100.00
<i>C. undecimpunctata</i>	0.12±0.08	8.39	85.71
<i>S. sexmaculatus</i>	0.40±0.31	27.97	85.71
Total	1.43	100.00	---

During 2015 season, data in Table 5 show also that *C. impicta*, *C. undecimpunctata* and *S. sexmaculatus* which had little values of dominance degrees (59.81, 11.21 and 28.97%, respectively) is expected to be of a little economic importance in controlling pests in cucumber during summer plantations in Assiut.

**Table 5. Dominance and abundance degrees of the pests and the associated predators inhabiting cucumber plants during summer plantations, 2015 season, in Assiut governorate.**

Species	Dominance		Abundance (%)
	No. / leaf± SD	(%)	
Pests			
<i>A. gossypii</i>	0.28±0.59	0.22	60.00
<i>B. tabaci</i>	96.22±19.73	74.50	100.00
<i>P. latus</i>	13.42±7.82	10.39	80.00
<i>T. urticae</i>	9.37±9.52	7.26	100.00
<i>T. tabaci</i>	9.86±4.02	7.63	100.00
Total	129.15	100.00	---
Predators			
<i>C. impicta</i>	0.64±0.46	59.81	100.00
<i>C. undecimpunctata</i>	0.12±0.09	11.21	100.00
<i>S. sexmaculatus</i>	0.31±0.25	28.97	80.00
Total	1.07	100.00	---

In general, the data indicated that the number of pests on cucumber plants were higher during spring plantations than that during summer plantation. This may be attributed to the environmental conditions particularly temperature. During spring season, temperature seemed to be more suitable for development and multiplication of the pests. The previous results also indicated that *T. urtica* and *B. tabaci* were the most piercing-sucking pests of cucumber in the studied area. This finding is in general congruity with those documented by Abd El-Kareim, 1980; Omar *et al.*, 1988; Kamel *et al.*, 2000; Gameel and Sayed, 2008 and Gameel, 2013.

However, the results showed also that the population of *T. urtica* was higher during spring plantation (338.85 individuals /leaf) than that of *B. tabaci* (54.58 individual/leaf) (Table 4). In contrast, *B. tabaci* dominated *T. urtica* during summer plantation. The average number of *B. tabaci* during summer plantation was 58.44 individual/leaf as compared with 20.17 individual/leaf for *T. urtica*.

In addition, the results showed that the number of predators was relatively low during both seasons and not correlated with the pest populations. Additional researches are needed to assess relationships between the population density of the piercingsucking pests and the predators in cucumber plantation in the area. Previous studies in Egypt

are in agreement with the present findings and reported that cucumber plants harbored aphids, whitefly, and thrips as well as the red spider mite (Herakly, 1972; Abou-Aiana and Draz, 1993; El-Desouki *et al.*, 2008 and Younes and El-Sebaey, 2013). The common spider mite, *T. urticae* was found to be as an economic pest infesting cucurbit plants (Farrag *et al.*, 1982; El-Maghraby *et al.*, 1994; Ali, 1995; Kamel *et al.*, 2000 and Balkema *et al.*, 2003).

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## تواجد الآفات والمفترسات المصاحبة لها القاطنة محصول الخيار بأسبوط

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أجريت الدراسة الحالية بمزرعة كلية الزراعة جامعة أسبوط خلال الفترة ٢٠١٤ حتى ٢٠١٦ من مواسم زراعة الخيار. أوضح التركيب النوعي للآفات الحشرية والمفترسات المصاحبة لها القاطنة محصول الخيار تواجد ٣٩ نوعا من مفصليات الأرجل التي تنتمي إلى ١٣ رتبة حشرية، ٢٨ عائلة حشرية، بالإضافة إلى العناكب الحقيقية. أوضحت النتائج وجود أربعة أنواع من الآفات الحشرية تعتبر آفات وفيرة في حين يتواجد نوعين أقل وفرة، ١١ نوعا تعتبر قليلة الأهمية بالإضافة إلى ١٨ نوعا من مفصليات الأرجل نافعة وكذا العناكب الحقيقية. يمكن تقسيم الأنواع المتحصل عليها إلى حشرات ثاقبة ماصة وحشرات تتغذى على الأوراق وصناعات انفاق.