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Relative abundance of the major piercing-sucking pests and their associated natural enemies on coriander plants (Coriandrum sativum L.) in Assiut Governorate

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ABSTRACT :

The present work was carried out at Shotb and Abnoub locations, Assuit Governorate, Upper Egypt throughout two successive coriander growing seasons, 2011/2012 and 2012/2013.The obtained results showed that coriander plants harbored 55 and 43 insect species belonging to 41, 31 families and 9, 9 orders in shotb and Abnoub locations, respectively. Among these species, (29, 26); (6, 4); (7, 4) and (16, 11) were recorded as pests, predators, parasitoids and pollinators and visitors in Shotb and Abnoub, respectively. The order Hymenoptera had the highest number of species (16, 13, species) followed by Diptera (9, 9 species) in both Shotb and Abnoub, respectively. Results also indicated that, regardless of the seasons, aphids (different species) were the most abundant piercing-sucking insect pests on coriander plants, representing 59.00 and 83.14 %, followed by T. tabaci which represented 38.12 and 15.57 % of the grand total of sucking pests. The Empoascae spp. and Campylomma spp. were less abundant and represented only an average of 2.09 and 0.09 % for Empoascae spp. and 1.10 and 1.19 % for Capylomma spp. of the grand total of piercing-sucking pests in Shotb and Abnoub locations, respectively. Concerning the relationships between abiotic and biotic factors with the aphid populations, results also indicated that the studied variables were together responsible for 58.49 % of the aphid population changes in Shotb location, while 64.57 % were recorded in Abnoub location. The change of the aphid populations varied with the plant age (23.46 and 39.73 %), maximum temperature (20.34 and 12.16 %) and natural enemies (4.76 and 4.21 %) in Shotb and Abnoub locations, respectively. Minimum temperature was found to be related with the population of aphid species only in Abnoub location (7.28 %).

INTRODUCTION

In Egypt, Coriandrum sativum L. is an important crop that occupies a prime position in medicinal and aromatic plants. It is used in medicine as carminative and diuretic agent, as well as in the preparation of many household medicines to cure bed cold, seasonal fever, nausea and stomach disorders (Fahmy et al., 2014). It is considered as one of the most important producer countries of the medicinal and aromatic plants, because of its suitable environment. Coriander plants are subjected to be attacked by different insect species, which cause a great damage in their quality and quantity, and affecting the productivity of these plants. Piercing sucking pests are the most destructive insects on these plants

(Butani, 1984; Ali, 1988; EL-Sayed et al., 1990; El-Sayed, 1993; EL-Kordy et. al., 1999); Afsah, 2005; and Chaudhary et.al 2009. On the other side, coriander fields may harbor beneficial insects, such as predators, parasitoids, pollinators and visitors, which play an important role in controlling the pests and subsequently improving the productivity of these plants (Rashad, 1976 and 1978; Hussein and Abd EL-Aal, 1982; AL-Qarni, 2005; Abd EL-Moniem and Abd EL-Wahab, 2006 and Abd-EL-Karim et al., 2011).

Population dynamics of destructive and beneficial species in relation to abiotic and biotic factors have been studied by (EL-Kordy et al. 1999; Abd EL-Wahab et al., 2009; Ayres and Schneider, 2009 and Khaliq et al., 2014).

The infestation of coriander plants by insect pests and associated natural enemies has received comparatively limited attention by entomologists. Thus the present work aimed to surveying of arthropod fauna in coriander fields and studying the population of the most common sucking pests and their natural enemies, as well as studying the relationship of some abiotic and biotic factors on the main pests.

MATERIALS AND METHODS

The work here was conducted in Assiut Governorate in two different locations, namely Shotb district (as clay lands, 10 Km south-west of Assuit city) and Abnoub district (as reclaimed lands, 25 Km north-east of Assuit city) during two coriander growing successive seasons, 2011/2012 and 2012/2013. In each location, about 0.25 feddan of coriander plants was selected yearly from field owned by local farmers, and divided into 4 equal plots .Normal agricultural practices were performed by the farmers themselves and no insecticides were applied during the study period. Sampling and entomological survey was begun by sweep-net technique when the plants started to appear above the ground. Twenty five double sweeps were taken four times from each experimental field. The collected specimens were transferred into the laboratory in plastic bags, then inspected and counted. Samples were taken weekly when the migration of insects onto the crop from overwintering sites began, and continued through the time till insect population and their natural enemies declined to lower undetectable levels.

The numbers of specimens within each inspection data were recorded. Specimens of unknown species were kept in glass vials containing 75% ethyl alcohol for later identification. Identification was made at the Plant Protection Research Institute, Agricultural Research Center.

To study the population fluctuations of the major piercing-sucking pests, predators and parasitoids on coriander plants in both locations, the average numbers of these insects were obtained from the previously mentioned samples.

Meteorological data (temperature, relative humidity and soil temperature at 5 cm) were obtained from the Central Laboratory of Agricultural Climate for Assiut region, ARC, MOA at Giza. The relationships between abiotic (temperature, relative humidity and soil temperature at 5 cm), biotic factors (plant age and natural enemies) and the population of the main piercing-sucking pests were analyzed using multiple regression analysis.

RESULTS AND DISCUSSION

Survey of arthropod fauna associated with coriander plants:

A partial taxonomic list of pests and their natural enemies recovered by sweep-net and direct observation from coriander plants at Assiut during 2011/2012 and 2012/2013 growing seasons is presented in Table (1).

1.1. SHOTB LOCATION:

Data in Table (1), recorded 56 insect species belonging to 41 families pertaining to 10 orders on coriander plants in this location. Of these, 28 species were pests, 7 species were predators, 6 species were parasitoids and 15 species were pollinators and visitors. Some unidentified species of true spiders were also collected. The order Hymenoptera recorded the highest, numbers of species (16 species), followed by Diptera (9 species), Coleoptera and Homoptera (7 species for each), Hemiptera, Lepidoptera and Orthoptera (4 species for each), Neuroptera (2 species), Odonata (2 species) and Thysanoptera (single species).

1.2. ABNOUB LOCATION:

In this location, 43 insect species belonging to 32 families and 9 orders were found on coriander plants (Table 1). Among these species, 23 species were recorded as pests, 5 species were predators, 4 species were parasitoid and 11 species were pollinators and visitors. Unidentified species of true spiders (order, Araneida) were also counted. The Hymenopterous insects were the dominant component (13 species) followed by Diptera (7 species), Hemiptera and Homoptera (6 species for both), Coleoptera (5 species), Orthoptera (3 species) and orders Lepidoptera, Neroptera, and Thysanoptera (a single species for each). The present results are in accordance with those obtained by AL-Qarni (2005) who recorded 63 species belonging to 9 families, 71 genera and 10 orders on coriander plants in Saudi Arabia. Abdel-Moniem and Abdel-Wahab (2006) found fourteen phytophagous insect species and six insect predators on roselle plants. Also, Ismail et al. (2010) recorded 10 insect species belonging to 8 families and 5 orders as insect pests and 8 species of predaceous insects belonging to 6 families and 4 orders on marjoram plants. It could be generally observed that, the order Hymenoptera recorded high number of species followed by Diptera. These findings are in harmony with those obtained by (Rashad, 1976 and 1978; EL-Hefny et al.1979, Yousif-Khalil et al., 1989 and Darwish et al., 1991). In addition, AL-Gamidi (2005) recorded 23, 20 and 16 hymenopterous and 10, 6 and 7 dipterious species on coriander plants in three different locations in Saudi Arabia. The author also found that, the most important genera of the hymenopterous pollinators were Andrena, Apis, Holicutus, Diles and Polistes. Mohamed and Whitney (1999) observed that C. sativum received high visitation by beneficial natural enemies. Chaudhary et al. (2009) indicated that coriander plants are attacked by A. gossypii, A. spiraecola, H. coriandri and M. persicae. In general, the results also indicated that there were 5 genera (Taylorilygus, Spilostethus, Galeatus, Baryscapus and Heoleracris) noticed only in Abnoub location, while 18 genera were recorded in Shotb location only

(Anthrenus, Scymnus, Drosophila, Anopheles, Oxycarenus, Psylla, Vespa, Chrysis, Microptitis, Ephedrus, Vanessa, Cosmolyce, Agrotis, Cueta, Hemianax, Ischnura, Gryllus and Truxalis). The numbers of insect species were high in Shotb as compared with Abnoub location. This variation in the insect species on the same plant species in two different locations may be due to the mainly difference in the nature of soil in the both locations and/ or, the low establishment of arthropod fauna in Abnoub, as compared to Shotb location as a result of long periods of cultivation of the land in the latter area.

2- SEASONAL ABUNDANCE OF PIERCING-SUCKING PESTS AND THEIR NATURAL ENEMIES:

The common sucking pests in the above mentioned locations were identified as aphids (Aphis craccivora Koch, A. gossypii Glov., Myzus persicae Sulz. and Rhopalosiphum maidis Fitch), onion thrips (Thrips tabaci Lind.), leaf hoppers (Empoascae spp.) and leaf bugs (Campylomma spp.). On the other side, Coccinella undecimpunctata L., Chrysoperla carnea Steph., Syrphus corolla Fab. and Scymnus spp., were the most common predatory species, while, Diaeretiella rapae (M'Intosh), Aphidius colemani Viereck, Praon necans Mackauer, Ephedrus plagiator (Nees)) were the most common primary parasitoid species.It is noteworthy that the other pests and natural enemies were observed in very low numbers, therefore, they are not included in the present interpretation. Data of population densities expressed in terms of weekly mean numbers/25 double sweeps are summarized in Tables (2 and 3).

2.1. SHOTB LOCATION:

The population fluctuation of the major sap-sucking insect pests and their associated natural enemies (predator and parasitoids) were determined during 2011/12 and 2012/13 seasons on coriander plantations (Table 2).

2.1.1. 2011/2012 SEASON

Data in Table (2) indicated that the mean numbers of aphids (total aphid species) increased gradually from the 4th wk. of January with peak on March, 4 and an average of 520.00 aphids /25 net strokes. It showed gradual decrease in numbers from March, 15 till the end of the season. Onion thrips ranked the second with similar behavior of that showed by aphids. Data showed 4 peaks for their on coriander plants on February, 2 and 23, and March, 8 and 29 with an average of 175.25, 310.00, 84.25 and 139.25 individuals/25 net strokes. Leaf hoppers and plant bugs ranked as the third and fourth sap-sucking pests. These species showed a single peak on January, 26 and February, 23 with an average of 3.00 and 6.25 individuals/25 net strokes for leaf hoppers and leaf bugs, respectively. In this season, about 4386.50 average number of individuals collected during the whole coriander growing season, there were 3134.25 individuals of aphids represented 71.45%, 1228.00 individuals of onion thrips represented 28.00% , 9.75 individuals of leaf hoppers represented 0.22% and 14.50 individuals of leaf bugs represented 0.33% of the grand total of sucking pest species. Table (2) also indicated that, the predator and parasitoid species were observed in few numbers throughout the whole growing season. The maximum numbers (2.00 and 42.00 individuals/25 net strokes were recorded

during the 1st wk of April for predator and parasitoids, respectively.

2.1.2. 2012/2013 SEASON:

Seasonal abundance of the main sucking pests and the associated predators and parasitoids are summarized in Table (2). The aphid species began to appear on coriander plants in extremely low numbers (8.00 aphids/25 net strokes) during the 2nd wk of January. Three peeks were recorded to this pest on January, 17, February, 7 and March, 3 with an average of 40.75, 114.25 and 95.00 aphids/25 net strokes. Numbers of aphids showed a sharp decrease and approximately vanished from the field during the beginning of April. The population of T. tabaci in this season occurred throughout the period extended from the 2nd wk. of January until the 1st wk. of April. It started with low numbers of 2.25 individuals/25 net strokes, and the numbers fluctuated to give four peaks, 39.75, 269.75, 237.50 and 71.75 individuals/25 net strokes on the 4th, 2nd, 1st, and 4th wk. of January, February and March, respectively. The infestation of coriander plants with Empoasca spp. and Campylomma spp. began to appear during the 2nd and 3rd wk. of January, respectively. Then the population established on the plants and developed slowly to reach the highest density of 24.00 and 23.25 individuals/25 net strokes during 4th and 2nd wk of January and February for Empoasca spp, respectively. Meanwhile, the highest density of Campylomma spp. (10.00 individuals/25 net strokes) was recorded on the 2nd and 4th wk February and March, respectively.The present results in Table (2) also indicated that aphids, onion thrips, leaf hoppers and leaf bugs represented 23.82, 65.98, 7.07 and 3.13 % of the total sap-sucking pest species recovered from coriander plants during this season. As shown in Table (2) the predator and parasitoid species were observed in association with the first detection of pests on the plants. Number of the predator and parasitoid species were fluctuated throughout the whole growing season to give two main peaks for each (23.50 and 56.50) and (11.50 and 8.50) individuals/25 net strokes during the 1st wk and 4th wk of March and the 2nd and 1st wk of February and April for the predators and the parasitoids, respectively.

2.2 ABNOUB LOCATION:

The change in the population densities of sucking pests and the associated predator and parasitoid species on coriander plants during 2011/2012 and 2012/2013 seasons are presented in Table (3).

2.2.1. 2011/2012 SEASON:

Table (3) showed that the individuals of aphids began to appear in the field in a relatively low level (0.75 aphid/25 net strokes) during the 1st wk. of February. Thereafter, the population tended to fluctuate and increase gradually through February and the beginning of March. The maximum level (319.50 aphids/25 net strokes) was attained during the 3rd wk. of March. The number of aphids showed a sharp decrease and approximately vanished from the field during the end of season. Onion thrips showed approximately the same trend of aphids. The population of this species reached its maximum level (25.00 individuals/25 net strokes) during the 2nd wk. of March. Leaf hoppers and leaf bugs were observed in scarce numbers throughout the whole coriander growing season. The numbers of Empoasca spp. were observed only in the

4th and the 2nd wk. of January and March, respectively by 0.25 individuals/25 net strokes, whereas the highest level of Campylomma spp. (16.00 individuals/25 net strokes) was recorded during the 2nd wk. of March. During 2011/2012 season, about 827.25 individuals (total sucking pests) were collected from coriander fields. There were 730.75, 68.75, 0.50, 27.25 individuals represented 88.33, 8.31, 0.06 and 3.29 % of aphids, T. tabaci, Empoasca spp. and Campylomma spp, respectively.

On the other side, the insect predators were detected in the field during the 4th wk. of January in few numbers (0.25 individual/25 net strokes), then declined from the field during February until the 2nd wk. of March. The maximum level (21.25 individuals/25 net strokes) was recorded during the 4th wk. of March. Concerning the aphid parasitoids, it's clear that the individuals were appeared two weeks after aphids were first observed in the field with low level (0.25 parasitoid/25 net strokes). The maximum level (8.00 parasitoids/25 net strokes) was recorded during the 2nd wk. of March before the maximum level of aphids by one weak.

2.2.2. 2012/2013 SEASON:

Data in Table (3) show that, aphid species were first appeared in coriander fields during the 2nd wk. of December. Its numbers increased and fluctuated to attain a peak of 305.75 aphids/25 net strokes during the 2nd wk. of February. Concerning to the population of T. tabaci, it is clear that, its population followed nearly the same trend as aphid populations. The pest appeared in the field from the 2nd wk. of December up to the end of the season with a peak of abundance (28.25 individuals/25 net strokes) during the 2nd wk. of January. The Empoasca spp. and Campylomma spp. were appeared in coriander field in extremely scarce numbers during the whole growing season with a peak of 0.50 and 0.75 individuals/25 net strokes during the 4th and the 2nd wk. of February and March for Empoasca spp. and Campylomma spp., respectively. The present results also indicated that, the numbers of aphids, T. tabaci, Empoasca spp. and Campylomma spp. species represented 88.44, 11.28, 0.12 and 0.16 % of the grand total of sucking pests recovered from coriander plants during 2012/2013 season.

It could be generally concluded that aphids were the most abundant sucking pests in coriander fields over two seasons and two localities represented 59.00 and 83.14 % of the grand total of sucking insects in Shotb and Abnoub Locations, respectively, followed by T. tabaci which represented 38.12 and 15.57 %. Empoasca spp. and Campylomma spp. were less abundant and represented only an average of 2.09 and 0.09 % for Empoasca spp. and 1.10 and 1.19 % for Campylomma spp.

Previous studies (Dawood, 1971; Hussien, 1982; EL-Gendi, 1988; Abou-Elhagag and Abdel-Hafez, 1999; and El-kordy et al., 1999 and Ismail, 2001; Pons and Lumbierres, 2004) summarized that aphids are considered to be the most serious pests and caused serious reduction in the annual yield of ornamental and aromatic plants. In addition, Ismail et al. (2010) reported that the major insect pests in marjoram field were A. gossypii, E. decipiens and Campylomma impecta. From the above mentioned results, aphids are considered the major insect pests on coriander plants during

the period of study. Thus this investigation focuses mainly on the seasonal abundance of the aphids in relation to some abiotic and biotic factors (Tables 4, 5, 6 and 7).

2.3. RELATIONSHIP BETWEEN SOME ABIOTIC AND BIOTIC FACTORS WITH THE POPULATION ABUNDANCE OF APHIDS:

Multiple regression analysis was used in order to declare the relationship between some abiotic factors (temperature, relative humidity and soil temperature at 5 cm) and biotic factors (plant age and natural enemies) and the population density of aphids on coriander plants in two different studied locations (Table 8).

2.3.1. SHOTB LOCATION:

As shown in Table (8), simple correlation analysis revealed that plant age (x1) had significant positive relationship with the population of aphids (r = 0.52). Maximum temp. (x2), min. temp. (x3), min. soil temp. at 5 cm (x7) and natural enemies (x8) had negatively insignificant relation (r = -0.37, -0.35, -0.02 and -0.07, respectively). Maximum R.H. (x4) had significant negative relation (r = -0.45).

On the contrary, min. R.H. (x5) and max. soil temp. at 5 cm (x6) had positively insignificant relation (r = 0.13 and 0.03, respectively).

The coefficient of determination (R2 x 100) showed that the eight tested variables related to changes on aphid populations by 58.49%.

The most relative factors were plant age, maximum temperature and natural enemies, since their relationship were, 23.46, 20.34 and 4.76%, respectively.

2.3.2. ABNOUB LOCATION:

Table (8) also shows that simple correlation coefficient of the plant age (x1), max. temp. (x2) and min. temp. (x3) were highly positive significant (r = 0.63, 0.65 and 0.49, respectively). Maximum R.H. (x4), min. R.H. (x5), min. soil temp. at 5 cm (x7) and natural enemies (x8) had positively insignificant correlation (r= 0.35, 0.07, 0.37 and 0.18, respectively) but the max. soil temp. at 5 cm (x6) had insignificant negative correlation (r = -0.21). The multiple regression analysis revealed that the eight studied variables were correlated with 64.57% of the changes in the aphid populations. Most the changes in aphid populations however were correlated to plant age (39.73%), maximum temperature (12.16%), minimum temperature (7.28%) and natural enemies (4.21%).

In general, the obtained results in Shotb location revealed that the eight mentioned variables were together correlated with 58.49% of the changes of the population density of aphids.

On the other side, in Abnoub location, the eight variable were correlated together with 64.57% of changes of the aphid populations. Nearly similar results were obtained by (Sengonca and klingauf, 1973; Prasad et al., 1984; Mohamed,1986; Sharma and Yadva, 1994; Hassanein et al., 1995; EL-Kordy et al., 1999 and Abdel-Wahab et al., 2009). Regardless of location the changes of the population dynamic of aphids attributed to mainly plant age, maximum temperature and natural enemies. Khaliq et al. (2014) mentioned that, generally, both abiotic (temperature, humidity and light) and biotic factors (host, vegetative, biodiversity,

crowding and diets) stresses significantly influence the insects and their population dynamics. In summary, the changes of the population dynamics of the aphids depends on the combination effects of plant age, weather factors (mainly maximum temperature) and natural enemies.

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Table (1): Partial taxonomic list of arthropods fauna recorded associated with coriander plants in Assiut Governorate during two successive seasons (2011/2012 and 2012/2013).

Order	Family	Scientific name	Note (1)
Coleoptera	Dermestidae	Trogoderma sp.	AXSE
		Anthrenus sp	AXS
	Coccinellidae	Coccinella undecimpunctata L.	BXSE
		Hippodamia convergens Guérin-Méneville	BXSE
		Scymnus spp.	BXS
	Chrysomelidae	Bruchus rufimanus Boh.	AXSE
	Scarabaeidae	Tropinota squalid Scop.	AZSE
Diptera	Calliphoridae	Lucilia caesar L.	DXZSE
	Muscidae	Musca domestica L.	DXSE
	Sarcophagidae	Sarcophaga carnaria L.	DXZSE
	Syrphidae	Syrphus corolla Fabr.	BXSE
	Agromyziodae	Liriomyza congesta (Beck.)	AXSE
	Ulidiidae	Physiphora alceae Preyssler	DXSE
	Drosophilidae	Drosophila sp.	AXS
	Culicidae	Anopheles sp.	DXS
	Tabanidae	Tabanus eggeri Schiner	DXZSE
Hemiptera	Miridae	Campylomma spp.	AXSE
		Taylorilygus pallidulus Blanchard	AXE
	Lygaeidae	Nysius graminicola Kolnati	AXSE
		Oxycarenus hyalinipennis Costa	AXS
		Spilostethus pandurus (Scopoli)	AXE
	Anthocoridae	Orius sp.	BXSE
	Tingidae	Galeatus scrophicus Saunders	AXE
Homoptera	Cicadellidae	Empoasca decipiens Paoli	AXSE
		Empoasca lypica Deber.	AXS
	Psyllidae	Psylla sp.	AXSE
	Aphididae	Aphis craccivora Koch	AXSE
		Aphis gossypii Clover	AXSE
		Myzus persicae Sulzer	AXSE
		Rhopalosiphum maidis Fitch	AXSE
Hymenoptera	Xylocopidae	Xylocopa aestuans L.	DZSE
	Eumenidae	Eumenes maxillosus F.	DXZSE
	Sphecidae	Philanthus Abd el Kader S. et F.	DXZSE
	Vespidae	Polistes gallica L.	DXZSE
		Vespa orientalis L.	DXZS
	Chrysididae	Chrysis nitidula F.	CXZS
	Andrenidae	Andrena spp.	DXZSE
	Apididae	Apis mellifera L.	DXSE
	Braconidae	Microplitis sp.	CXZS
		Diaeretiella rapae (M'Intosh)	CXSE
		Aphidius colemani Viereck	CXSE
		Praon necans Mackauer	CXSE
		Ephedrus plagiator (Nees)	CXS
	Cynipoidea	Alloxysta sp.	AXSE
	Ceraphronoidea	Dendrocerus sp.	AXSE
	Chalcididae	Chalcidus sp.	AXSE
		Baryscapus szoecsi Erdös	CXE
Lepidoptera	Nymphalidae	Vanessa cardui L.	AZS
	Pieridae	Pieris rapae L.	AZSE
	Lycaenidae	Cosmolyce baeticus L.	AZS
	Noctuidae	Agrotis ipsilon Hufn.	AZS
Neuroptera	Chrysopidae	Chrysoperla carnea Steph.	BXSE
	Myrmeleontidae	Cueta variegate Klug.	BXS
Odonata	Aeshnidae	Hemianax ephippiger Selys	DZS
	Agrionidae	Ischnura senegalensis Rambur	DZS
Orthoptera	Gryllidae	Gryllus domesticus L.	AXZS
	Acrididae	Acrotylus insubricus Scop.	AXZSE
		Truxalis longicornis Krauss	AXZS
		Ochrilidia gracilis Krauss	AXZSE
		Heteracris littoralis (Rambur)	AXZE
Thysanoptera	Thripidae	Thrips tabaci Lind.	AXSE
Araneida	Various familes	Unidentified species	BXSE

These results based on weekly samples in two locations.

A -Pest **B - Predator** **C- Parasitoid** **D- Pollinator or& visitor**

S- Shotb **E- Abnoub** **X- sweep net method** **Z – Direct method**

Table (2): Mean numbers of piercing-sucking pests infesting coriander plants and their natural enemies, Shotb district, 2011/2012 and 2012/2013 seasons.

Mean number of individuals/25 double sweeps													
2011/2012 season							2012/2013 season						
Sampling date	Sucking pests				N.enemies		Sampling date	Sucking pests				N.enemies	
	Aphids	Onion Thrips	Leaf hoppers	Leaf bugs	Predators	Parasitoids		Aphids	Onion Thrips	Leaf hoppers	Leaf bugs	Predators	Parasitoids
Jan. 26	17.75	49.25	3.00	1.50	1.00	0.75	Jan. 10	8.00	2.25	5.00	0.00	0.25	0.75
Feb. 2	110.00	175.25	2.75	0.00	0.75	0.00	17	40.75	31.50	15.00	0.75	0.75	2.25
9	123.50	116.00	0.25	2.00	1.00	0.50	27	25.75	39.75	24.00	5.75	4.75	1.25
19	290.00	145.50	0.75	2.00	0.25	0.25	Feb. 3	17.75	13.50	11.75	0.00	0.25	0.75
23	355.75	310.00	1.25	6.25	0.75	3.25	7	114.25	269.75	23.25	10.00	1.00	7.75
March 1	432.00	16.50	0.00	0.00	0.50	1.00	14	42.25	178.25	18.00	7.75	2.75	11.50
4	520.00	47.50	1.00	0.00	0.00	2.75	21	32.00	190.50	14.50	8.75	14.75	5.75
8	386.50	84.25	0.00	0.00	0.25	2.00	March 3	95.00	237.50	1.75	2.50	23.50	0.75
15	351.25	30.00	0.00	0.00	1.25	2.25	16	7.00	5.00	0.00	1.00	8.75	0.25
22	249.50	14.25	0.25	1.00	0.25	3.25	23	3.50	38.50	0.50	3.75	53.00	0.75
29	149.50	139.25	0.25	1.00	1.25	30.25	30	3.00	71.75	0.50	10.00	56.50	6.75
April 5	148.50	100.25	0.25	0.75	2.00	42.00	April 6	0.75	2.25	1.50	1.00	18.25	8.50
Total	3134.25	1228.00	9.75	14.50	9.25	88.25	Total	390.00	1080.50	115.75	51.25	184.50	47.00
(%)	71.45	28.00	0.22	0.33	-	-	(%)	23.82	65.98	7.07	3.13	-	-

Table (3): Mean numbers of piercing-sucking pests infesting coriander plants and their natural enemies, Abnoub district, Assiut 2011/2012 and 2012/2013 seasons.

Mean number of individuals/25 double sweeps													
2011/2012 season							2012/2013 seasons						
Sampling date	Sucking pests				N. enemies		Sampling date	Sucking pests				N. enemies	
	Aphids	Onion Thrips	Leaf hoppers	Leaf bugs	predators	parasitoids		Aphids	Onion Thrips	Leaf hoppers	Leaf bugs	Predators	Parasitoids
Dec. 29	0.00	0.00	0.00	0.00	0.00	0.00	Dec. 4	0.00	0.00	0.00	0.00	0.00	0.00
Jan. 1	0.00	0.00	0.00	0.00	0.00	0.00	14	0.25	2.00	0.25	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	19	1.00	5.75	0.00	0.00	0.50	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	26	7.50	18.50	0.25	0.00	0.75	0.50
26	0.00	0.00	0.25	0.00	0.25	0.00	31	14.50	14.25	0.00	0.50	1.25	0.25
Feb. 2	0.75	0.25	0.00	0.00	0.00	0.00	Jan. 9	32.00	25.50	0.25	0.00	1.25	0.25
9	0.50	1.25	0.00	0.00	0.00	0.00	15	43.50	28.25	0.00	0.25	1.50	0.50
16	9.50	7.25	0.00	0.00	0.00	0.25	23	17.75	3.50	0.00	0.25	3.00	0.00
23	38.00	1.50	0.00	2.25	0.00	0.00	30	130.50	12.75	0.00	0.00	2.50	0.50
March 1	29.00	0.00	0.00	0.50	0.00	0.25	Feb. 7	232.00	14.25	0.00	0.25	16.50	2.00
8	53.50	16.00	0.00	7.25	2.00	6.00	14	305.75	17.25	0.00	0.25	13.50	1.25
15	245.25	25.00	0.25	16.00	1.25	8.00	21	220.75	19.00	0.00	0.25	5.00	0.75
22	319.50	16.50	0.00	1.25	11.25	2.25	28	201.00	8.50	0.50	0.00	6.25	0.00
29	34.75	1.00	0.00	0.00	21.25	0.00	March 9	138.25	2.00	0.50	0.75	1.25	0.25
Total	730.75	68.75	0.50	27.25	36.00	16.75	Total	1344.75	171.50	1.75	2.50	53.25	6.25
(%)	88.33	8.31	0.060	3.29	-	-	(%)	88.44	11.28	0.12	0.16	-	-

Table (4): Population densities of aphid species infesting coriander plants in relation to some abiotic and biotic factors, Shotb, Assiut, 2011/2012.

Sampling date	Average no. of individuals /25 double sweeps								
	(1)Total aphids	Biotic factors		Abiotic factors					
		Plant age (days)	(2)Natural enemies	Temperature ◦C		R.H. (%)		Soil temp. at 5 cm	
				Max.	Min.	Max.	Min.	Max.	Min.
Jan. 26	17.75	20	1.75	20.14	5.29	77.00	19.00	22.29	9.42
Feb. 2	110.00	27	0.75	19.00	7.57	69.00	22.14	21.57	9.43
9	123.50	34	1.50	19.50	6.86	69.71	14.29	21.29	10.00
19	290.00	43	0.50	21.60	8.60	73.30	13.70	22.00	12.00
23	355.75	47	4.00	24.00	6.25	78.75	23.50	26.00	11.25
March 1	432.00	54	1.50	22.71	8.57	72.14	19.00	26.57	12.29
4	520.00	57	2.75	20.00	6.33	80.00	14.00	26.00	12.67
8	386.50	61	2.25	25.00	8.00	81.50	17.25	30.50	13.75
15	351.25	68	3.50	27.14	11.86	67.57	14.71	32.57	15.86
22	249.50	75	3.50	22.86	6.57	78.57	14.57	30.00	13.71
29	149.50	82	31.50	25.86	8.43	76.71	8.57	32.86	14.86
April 5	148.50	89	44.00	31.14	12.43	71.14	8.00	35.00	18.57
Total	3134.25	-	97.50	-	-	-	-	-	-

(1) Sum of the average number of the four aphid species (*A. Craccivora, A. gossypii, M. persicae* and *R. maidis*).

(2) Sum of the average number of predator and parasitoid species.

Table (5): Population densities of aphid species infesting coriander plants in relation to some abiotic and biotic factors, Shotb, Assiut, 2012/2013.

Sampling date	Average no. of individuals /25 double sweeps								
	(1)Total aphids	Biotic factors		Abiotic factors					
		Plant age (days)	(2)Natural enemies	Temperature ◦C		R.H. (%)		Soil temp. at 5 cm	
				Max.	Min.	Max.	Min.	Max.	Min.
Jan. 10	8.00	20	1.00	19.86	7.86	75.71	20.14	20.80	10.00
17	40.75	27	3.00	21.43	7.00	77.57	21.29	22.00	8.86
27	25.75	37	6.00	26.30	13.80	75.80	22.80	23.40	12.10
Feb. 3	17.75	4	1.00	25.86	12.57	83.57	27.57	22.71	10.14
7	114.25	8	8.75	29.00	13.00	77.25	22.00	24.50	12.25
14	42.25	3	14.25	27.71	11.71	78.71	18.29	25.86	11.86
21	32.00	10	20.50	27.14	11.71	75.71	19.86	26.43	13.14
March 3	95.00	20	24.25	30.90	13.00	74.80	10.70	29.50	14.40
16	7.00	33	9.00	31.00	12.62	74.31	8.69	34.62	17.16
23	3.50	40	53.75	27.29	11.57	64.57	11.71	33.71	17.71
30	3.00	47	63.25	32.00	11.29	75.86	4.86	35.57	17.00
April 6	0.75	54	26.75	34.43	14.86	70.57	10.71	37.29	20.00
Total	390.00	-	231.50	-	-	-	-	-	-

(1) Sum of the average number of the four aphid species (*A. Craccivora*, *A. gossypii*, *M. persicae* and *R. maidis*).

(2) Sum of the average number of predator and parasitoid species.

Table (6): Population densities of aphid species infesting coriander plants in relation to some abiotic and biotic factors, Abnoub, Assiut, 2011/2012.

Sampling date	Average no. of individuals /25 double sweeps								
	(1)Total aphids	Biotic factors		Abiotic factors					
		Plant age (days)	(2)Natural enemies	Temperature ◦C		R.H. (%)		Soil temp. at 5 cm	
				Max.	Min.	Max.	Min.	Max.	Min.
Dec. 29	0.00	30	0.00	21.29	8.43	73.29	23.14	21.14	8.71
Jan. 5	0.00	37	0.00	19.50	7.63	78.75	22.88	19.29	9.00
12	0.00	44	0.00	19.29	5.00	63.43	13.00	20.14	7.86
19	0.00	51	0.00	18.43	4.71	79.75	17.29	20.71	8.86
26	0.00	58	0.25	20.14	5.29	77.00	19.00	22.29	9.43
Feb. 2	0.75	65	0.00	19.00	7.57	69.00	22.14	21.57	10.43
9	0.50	72	0.00	19.57	6.86	13.21	69.71	21.29	10.00
16	9.50	79	0.25	22.43	9.71	72.29	17.29	20.57	12.14
23	38.00	86	0.00	22.14	6.14	77.43	22.71	26.14	11.86
March 1	29.00	93	0.25	22.71	8.57	72.14	19.00	28.57	13.29
8	53.50	100	8.00	22.85	7.28	80.86	15.86	32.57	15.86
15	245.25	107	9.25	27.14	11.86	67.57	14.71	30.00	13.71
22	319.50	114	13.50	22.86	6.57	78.57	14.57	30.00	13.71
29	34.75	121	21.25	25.86	8.43	76.71	8.57	32.86	14.86
Total	730.75	-	52.75	-	-	-	-	-	-

(1) Sum of the average number of the four aphid species (*A. Craccivora*, *A. gossypii*, *M. persicae* and *R. maidis*).

(2) Sum of the average number of predator and parasitoid species.

Table (7): Population densities of aphid species infesting coriander plants in relation to some abiotic and biotic factors, Abnoub, Assiut, 2012/2013.

Sampling date	Average no. of individuals /25 double sweeps								
	(1)Total aphids	Biotic factors		Abiotic factors					
		Plant age (days)	(2)Natural enemies	Temperature ◦C		R.H. (%)		Soil temp. at 5 cm	
				Max.	Min.	Max.	Min.	Max.	Min.
Dec. 4	0.00	20	0.00	29.57	12.43	74.00	13.29	27.86	15.29
14	0.25	30	0.00	25.10	10.70	75.70	18.50	24.40	12.60
19	1.00	35	0.50	24.40	10.50	79.80	18.50	24.60	12.20
26	7.50	42	1.25	23.43	8.86	75.00	21.71	23.57	12.00
31	14.50	47	1.50	25.20	12.20	83.40	24.80	22.40	10.80
Jan. 9	32.00	56	1.50	20.89	7.44	74.11	16.22	21.11	11.89
15	43.50	62	2.00	20.00	7.00	77.67	22.00	21.71	8.43
23	17.75	70	3.00	26.13	11.75	74.38	19.25	23.63	11.13
30	130.50	77	3.00	25.43	14.29	79.43	27.57	22.14	11.86
Feb. 7	232.00	85	18.50	27.50	12.50	81.75	24.38	23.63	11.00
14	305.75	92	14.75	27.71	11.71	78.71	18.29	25.86	11.86
21	220.75	99	5.75	27.14	11.71	75.71	19.86	26.33	11.33
28	201.00	106	6.25	31.14	13.29	79.57	13.14	27.86	13.43
March 9	138.25	115	1.50	28.33	11.67	6.44	8.44	31.11	15.00
Total	1344.75		59.50						

(1) Sum of the average number of the four aphid species (*A. Craccivora, A. gossypii, M. persicae* and *R. maidis*).

(2) Sum of the average number of predator and parasitoid species.

Table (8) : Relationship between certain abiotic and biotic factors and the dynamics of aphid populations infesting coriander plants in two locations, Assiut, 2011/2012 and 2012/2013 seasons.

Studied Location	Stadum	Variable removed								
		Non	Abiotic factors						Biotic factors	
			Temperature ◦c		R.H. (%)		Soil temp. at 5 cm		Plant age (days) (x1)	Natural enemies (x8)
			Max.(x2)	Min. (x3)	Max.(x4)	Min. (x5)	Max.(x6)	Min. (x7)		
Shotb	R	-	-0.37	-0.35	-0.45*	0.13	0.03	-0.02	0.52*	-0.07
	R2 × 100	58.49	-	-	-	-	-	-	-	-
	Efficiency (%)	-	20.34	0.03	3.73	2.26	2.35	1.56	23.46	4.76
Abnoub		-	0.65*	0.49*	0.35	0.07	-0.21	0.37	0.63*	0.18
	R2 × 100	64.57	-	-	-	-	-	-	-	-
	Efficiency (%)	-	12.16	7.28	0.03	0.86	0.05	0.25	39.73	4.21

r = Correlation coeffient.

R^2 = Coefficient of determination.

***= Significant at 0.5% of probability.**

الوفرة النسبية لأهم الآفات الثاقبة الماصة وما يصاحبها من أعداء حيوية علي نباتات الكزبرة (Coriandrum sativum L.) في محافظة أسيوط

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الملخص العربي:

أجريت هذه الدراسة في منطقتين مختلفتين في محافظة أسيوط لفترة امتدت لموسمين خلال عامي ٢٠١١/٢٠١٣ بهدف حصر لمفصليات الأرجل المصاحبة لنباتات الكزبرة، وكذلك دراسة التذبذبات والوفرة الموسمية لأهم الحشرات الثاقبة الماصة، هذا بالاضافة الي بيان ارتباط بعض العومل الغير حيوية والحيوية علي التغيرات التي تحدث في تعداد حشرات المن. ولقد كانت النتائج المتحصل عليها كالآتي:

تم حصر عدد ٥٥ ، ٤٣ من الأنواع الحشرية التابعة لعدد ٤١ ، ٣١ عائلة تنتمي الي ٩ ،٩ رتبة حشرية في كل من منطقتي شطب و أبنوب علي التوالي ، وقد صنفت هذه الحشرات الي (٢٩، ٢٦) آفات ؛ (٦، ٤) مفترسات؛ (٧ ، ٤) طفيليات و (١٦ ، ١١) ملقحات وحشرات زائرة في كل من شطب و أبنوب علي التوالي، كما بينت الدراسة ايضا أن رتبة الحشرات غشائية الأجنحة Hymenoptera كانت تمتلك اكثر الانواع تعدادا (١٦ ، ١٣) يليها رتبة ثنائية الاجنحة Diptera (٩ ، ٩) في كل من شطب و أبنوب علي الترتيب.

بينت النتائج أيضا أنه خلال الموسمين أن حشرات المنّ (أنواع متعددة) كانت أكثر الحشرات الثاقبة الماصة وفرة علي نبات الكزبرة حيث كونت نسبة ٥٩%، ٨٣.١٤% يليها حشرات تربس القطن والتي مثلت بنسبة ٣٨.١٢ %، ١٥.٥٧% من المجموع الكلي للحشرات الثاقبة الماصة. في حين كانت حشرات Campyloma spp , .Empoascae spp. اقل انتشارا علي نباتات الكزبرة حيث كونت ٢.٠٩% و ٠.٠٩% بالنسبة لحشرة Empoascae spp. وكونت١.١٠%، ١.١٩% لحشرة Campyloma spp. وذلك من المجموع الكلي للحشرات الثاقبة الماصة في كل من منطقتي شطب و أبنوب علي الترتيب.

أظهرت نتائج التحليل الأحصائي أن العوامل المدروسة كانت مرتبطة بالتغيرات في تعداد حشرات المن بحوالي ٥٨.٤٩% في منطقة شطب، بينما كانت هذه العوامل مرتبطة بنسبة ٦٤.٥٧% بالتغير في تعداد حشرات المن بمنطقة أبنوب، كما وجد أن التغير في تعداد حشرات المن خلال فترة الدراسة ارتبط اساسا بعمر النبات بنسبة (٢٣.٤٦%، ٣٩.٧٣%)، الحرارة العظمي (٢٠.٣٤%، ١٢.١٦%)، الأعداء الحيوية (٤.٧٦%، ٤.٢١%) في كل من منطقتي شطب وأبنوب علي التوالي. كما وجد أن درجة الحرارة الصغري ارتبطت بالتغيرات في تعداد المن في منطقة أبنوب فقط بنسبة ٧.٢٨%.