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Aphid Species (Homoptera : Aphididae) Infesting Navel Orange Tress and Their Aphidophagous Insect at El-Khattara District, Sharkia Governorate, Egypt

Youssif, M. A. I.*; Walaa M. M. Helaly and Sherin M. M. Y. Helaly



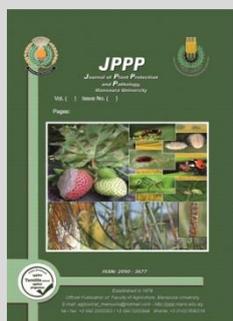
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Plant Prot. Dept., Fac. of Agric. , Zagazig Univ., Zagazig, Egypt

ABSTRACT

Studies on aphids infesting navel orange trees and their aphidophagous insect were conducted in newly reclaimed sandy area at El-Khattara district, Sharkia Governorate, Egypt during 2020 and 2021 seasons. The obtained results are summarized as follows: Four aphid species were recorded infested navel orange trees. 23 predaceous insect species belonging to four orders and eight families were recorded. Coleopterous species were the most dominant, followed by the dipterous and neuropterous with general relative densities of 45.04, 26.44 and 24.46 % of the total recorded predators, successively. Four species of lacewing belonging to two families were recorded i.e. *C. carnea* , *Chrysemosa jeanneli* (Navás) (Chrysopidae), *Wesmaelius navasi* (Andréu) and *Symphorobius fallax* (Navás) (Hemerobiidae). The second and third species were first record in Egypt and afro-tropical region according to the distribution map number (136 and 106) , provided by the British Museum , respectively. Among all recorded predaceous species, *Chrysoperla carnea* (Stephens), *Coccinella undecimpunctat* L., *Sphaerophoria flavicauda* Zett. and *Coccinella septempunctata* L., were the predominant species, comprised 18.55, 17.90, 11.21 and 9.23 % of the total recorded predators, successively. Eight parasitoids species were recorded viz., *Diaeretiella rapae* (M'Intosh), *Aphidius colemani* Viereck, *Aphidius matricariae* Haliday , *Aphidius* sp., *Lysiphlebus fabarum* (Mars.), *Trioxys* sp. , *Ephedrus* sp. and *Praon* sp. (Aphidiidae). The most dominant parasitoids were *D. rapae* , *A. colemani*, *A. matricariae* and *Aphidius* sp., with general relative densities of 59.69 ,17.52 , 8.12 and 7.48 % , respectively. There were positive highly significant correlations between weekly numbers of the aphids and emerged parasitoids in both seasons.

Keywords: Aphids, Predators, Parasitoids, Aphidophagous Insects, navel orange, Seasonal abundance, New species.



INTRODUCTION

Citrus is one of the most important fruit crop in Egypt which characterized with high nutritive value, health for the human specially children, in addition the exported citrus quantity and or local citrus consumption beside several industries of fruits or other parts of the tree, make the citrus first crop in Egypt. However, navel orange trees cultivated in Egypt and reached to 100676 fed. and the fruit production reached to 1663284 ton (Anonymus,2016). Citrus fruits are marketed mainly as fresh fruit or as processed juice (Pena *et al.*, 2007). The citrus industry is one of the main components of Mediterranean agriculture, helping to guarantee incomes in underprivileged rural zones. As well, citrus fruits provide the main source of vitamin C in the Mediterranean Basin, contributing to the general nutritional supply (Dambier *et al.*, 2011). The orchard of citrus trees in Egypt is affected by numerous species of insect pests a year round. The most common sucking pests which attack citrus are aphids, mealy bugs, scales insects and mites.

Recently, entomologists suggested Integrated Pest Management (IPM) using all control methods to emphasize the biological necessity of control agents (Dent, 1999 and Schüler *et al.*, 1999). So, the present work was conducted in the newly reclaimed pesticides- free area at El-Khattara district, Sharkia Governorate, Egypt, to contribute and provide information concerning the following points:

1. Survey of aphids species and their associated aphidophagous insects on navel orange trees.

2. Seasonal abundance and relative densities of aphids species and their associated aphidophagous insects on these trees.
3. Effect of prevailing temperatures and relative humidities on the aphids and their aphidophagous insect .

MATERIALS AND METHODS

Survey, relative densities and seasonal abundance of aphidophagous insects associated with aphids infesting navel orange trees during 2020 and 2021 seasons.

Sampling

Samples were taken weekly, it took place as soon as the newly vegetative growth appeared to record the first date of occurrence of aphid infestation and follow their fluctuation all over the year. An area of about three feddans cultivated with navel orange trees was chosen for this study. The experiments were conducted in areas whereas normal agricultural practices were used in due time and no chemical control was applied. Five homogeneous trees of about the same age, size, vigour and shape were selected at random from each fruit trees under investigation and marked for the present study. Ten leaves of different size were picked, from the different sites, peripheral, inner zone, lower and middle strata of the tree, thus, the sample consisted of fifty infested leaves / sample. The collected samples were kept each in a polyethylene bags, and carefully transferred to the laboratory, to be examined under a stereoscopic microscope.

Nymphs and adults of aphids were directly counted. Predators in most cases were directly counted, and in some few

* Corresponding author.

E-mail address: mayoussif80@yahoo.com Tel.: +201006980317

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cases laboratory rearing was necessary for the immature stages till the emergence of the adults. The predacious larvae which observed on the collected samples, were separated and reared individually in Petri- dishes (10 cm diameter), provided with aphid individuals until pupation and emergence of the adults. Mummified individuals of the aphids were transferred gently from the infested samples using a fine brush, to test tubes (15x1 cm), covered with pieces of cotton wool and were kept till emergence of the parasitoids. Adults and nymphs of the aphids were reared in glass jars on pieces of plant leaves until mummification of the parasitized individuals. Emerged parasitoids were collected, counted and identified.

Unknown aphid species specimens were sent to the Natural History Museum (British Museum) for identification. These species were identified by Prof. Dr. Hannah Cornish, Research Entomologist Systematic Entomology, Department Communications and Taxonomic Services Unit, Natural History Museum (British Museum), UK.

The parasitoids were identified in Biological Control Department, Plant Protection Research Institute, Giza, Egypt with the help of Prof. Dr. Ahmed R. Hamed, Chief of Biological Control Researchers.

Prevailing temperatures and relative humidities were obtained from the Meteorological Station in Zagazig Region.

Statistical Analysis

Simple correlation and simple regression values were calculated according to COSTAT Computer Program (2005).

RESULTS AND DISCUSSION

Survey and seasonal abundance of aphid species infesting navel orange trees:

Survey of aphid species

Four aphid species belonging to Homoptera, Aphididae were recorded infesting leaves of navel orange, i.e., *Aphis gossypii* (Glover), *Aphis citricola* (van der Goot), *Myzus persicae* (Sulzer) and *Aphis craccivora* Koch .

Güncan, et al., (2008) recorded five aphid species infesting trees of navel orange were *A .spiraecola*, *A. craccivora* , *T. aurantii*, *M. persicae* and *A. gossypii* .

The obtained results are in agreement with those of Ali (2009), Youssif (2015), Lebbal and Laamary (2016) and Kalaitzaki et al., (2019). They mentioned that navel orange trees attacked by many number of pests. The most injurious were aphids, *A. gossypii*, *A.citricola*, *M. persicae*, *A. craccivora*, *Aphis nerii* (Boyer) and *Macrosiphum euphorbiae* (Thomas).

Also, Mohsen (2019). recorded two species of aphids infested navel orange trees namely : *A. gossypii* and *A.citricola*.

Seasonal abundance of aphids

The differentiation of aphids infesting leaves of navel orange were not taken into consideration during the course of this investigation. So, aphids will be referred to the counting of different aphid species.

Data represented in Table (1) illustrated the fluctuations in the population of aphid complex on leaves of navel orange under the prevailing climatic conditions through the two successive seasons of 2020 and 2021.

In the first season, the data presented in Table (1) reveal that the aphid infestation occurred during the period from the 1st week of April till the 3rd week of August 2020. During this period, the aphid population was fluctuated to showed five peaks. The first one, 690 specimens / sample was in the 1st week of May at means of 23.3 °C and 61.1 % RH. The second lower activity

peak of 365 aphid / sample was in the 4th week of May at means of 30.7 °C and 59.9% RH. The third one, 910 individuals/ sample, took place in the 3rd week of June at means of 27.7°C and 60.7% RH. The fourth and highest peak with 949 specimens / sample was in the 2nd week of July at means of 30.3 °C and 67.7% RH. The fifth peak, 535 aphid / sample was in the 3rd week of July at means of 29.5 °C and 65.0% RH. The highest and lowest monthly total numbers of the aphids were recorded during July and August with counts 2729 and 230 individuals, respectively. The mean numbers of the aphids during the season was 334.36 individuals / sample.

Table 1. Seasonal abundance of aphid species infesting leaves of navel orange in the newly reclaimed sandy area at El-Khattara district, Sharkia Governorate during 2020 season.

Weekly date of sample and monthly count	Number of aphids /sample (50 leaf)				Total aphids	Corresponding means of	
	<i>A.gossypii</i>	<i>A.citricola</i>	<i>M.persicae</i>	<i>A.craccivora</i>		Temp. °C	R.H. %
					Aphid species		
Apr., 1 st	10	10	0	0	20	22.2	52.2
2 nd	35	15	0	0	50	22.4	55.6
3 rd	53	50	0	0	103	25.1	58.4
4 th	83	100	0	0	183	29.2	67.9
5 th	130	340	12	20	502	28.3	60.9
Total	311	515	12	20	858		
May, 1 st	200	380	30	80	690	23.3	61.1
2 nd	220	110	25	75	430	25.5	59.7
3 rd	230	50	20	60	360	29.9	59.5
4 th	310	40	15	0	365	30.7	59.9
Total	960	580	90	215	1845		
Jun., 1 st	120	35	10	0	165	27.7	63.3
2 nd	150	10	7	30	197	30.4	60.5
3 rd	850	10	5	45	910	27.7	60.7
4 th	340	12	3	67	422	28.9	61.9
Total	1460	67	25	142	1694		
Jul., 1 st	300	10	2	140	452	30.9	68.9
2 nd	840	7	2	100	949	30.3	67.7
3 rd	500	5	0	30	535	29.5	65.0
4 th	540	3	0	10	553	30.0	66.5
5 th	240	0	0	0	240	30.2	65.3
Total	2420	25	4	280	2729		
Aug., 1 st	100	0	0	0	100	33.5	68.5
2 nd	80	0	0	0	80	31.8	68.9
3 rd	50	0	0	0	50	30.1	66.5
4 th	0	0	0	0	0	29.3	68.3
Total	230	0	0	0	230		
General total	5381	1187	131	657	7356		
Mean	224.59	53.95	5.95	29.86	334.36		

Data arranged in Table (2) revealed that in the second season, 2021, the aphid infestation occurred as in the first season from the 1st week of April till the third one of August. Aphids population indicated three peaks during the season. The first peak, 569 individuals/ sample, took place in the first week of May at means of 25.6 °C and 62.2% RH. The second and highest one, 980 individuals/sample was in the 3rd week of June at means of 28.5 °C and 61.8% RH. The third and lowest one, 383 individuals/sample during the 2nd week of July at means of 29.9 °C and 61.7% RH.

The highest and lowest monthly total number of the aphids were recorded during June and August, with counts of 1867 and 63 individuals, successively. The mean numbers of the aphids during the seasons was 271.32 individuals / samples. The aphids population in the first season was

relatively higher as compared with that in the second one, with counts of 7356 and 5969 specimens, successively.

Table 2. Seasonal abundance of aphid species infesting leaves of navel orange in the newly reclaimed sandy area at El-Khattara district, Sharkia Governorate during 2021 season.

Weekly date of sample and monthly count	Number of aphids /sample (50 leaf)					Corresponding means of	
	Aphid species					Temp. °C	R.H. %
	<i>A.gossypii</i>	<i>Acitricola</i>	<i>Mpersiae</i>	<i>Acrucivora</i>	Total aphids		
Apr., 1 st	18	8	0	0	26	23.8	57.7
2 nd	35	10	0	0	45	21.2	54.2
3 rd	66	59	0	0	125	22.8	52.2
4 th	130	115	0	0	245	27.8	62.2
5 th	100	288	0	15	403		
Total	349	480	0	15	844		
May, 1 st	220	300	20	29	569	25.6	62.2
2 nd	370	99	18	65	552	28.8	60.2
3 rd	388	44	17	42	491	27.8	60.9
4 th	122	22	12	10	166	29.5	58.5
Total	1100	465	67	146	1778		
Jun., 1 st	100	70	1	0	171	29.9	62.4
2 nd	210	12	3	22	247	31.1	59.4
3 rd	950	18	0	12	980	28.5	61.8
4 th	420	17	0	32	469	27.1	62.8
Total	1680	117	4	66	1867		
Jul., 1 st	220	5	1	100	326	30.8	62.9
2 nd	350	5	3	25	383	29.9	61.7
3 rd	300	2	2	25	329	31.5	63.0
4 th	240	1	2	14	257	31.0	62.8
5 th	122	0	0	0	122	30.8	61.5
Total	1232	13	8	164	1417		
Aug., 1 st	25	0	0	0	25	32.5	67.5
2 nd	20	0	0	0	20	30.3	68.3
3 rd	18	0	0	0	18	31.5	66.5
4 th	0	0	0	0	0	30.3	68.3
Total	63	0	0	0	63		
General total	4424	1075	79	391	5969		
Mean	201.09	48.86	3.59	17.77	271.32		

The obtained results are in agreement with those of the following investigators. Ali (2009) in Egypt who indicated that the population density of aphids reached to the maximum population density in 3rd week of June.

Lebbal and Laamary (2016) reported that the population densities of aphids on navel orange trees occurred in high numbers during May and July.

Kalaitzaki *et al.*, (2019) indicated that the infestation by aphids on navel orange trees started during the 3rd week of May. The population reached a peak during the 4th week of June and disappeared towards the end of August.

Mohsen (2019) in Egypt revealed that the numbers of *A.gossypii* peaked in last week of April and in the first half of May during two respective seasons.

There were positive insignificant and negative high significant correlations between mean of temperatures and numbers of the aphids during the two respective seasons (Table 3). Also, relative humidities had positive insignificant effects, being negative insignificant in the first and second seasons, respectively.

Table 3. Simple correlation coefficient (r) and simple regression coefficient (b) between weekly mean numbers of aphids infesting navel orange trees and corresponding means of temperature (°C) and relative humidity (RH%) in newly reclaimed sandy area at El-Khattara district, Sharkia Governorate during the two successive growing seasons, 2020 and 2021.

Considered weather Fa factor	r (Values)		b (Values)	
	First season 2020	Second season 2021	First season 2020	Second season 2021
Numbers of aphids and mean temp. °C	0.042 ^{ns}	-0.731 ^{**}	0.577	-10.138
Numbers of aphids and mean R.H. %	0.079 ^{ns}	-0.297 ^{ns}	1.688	-5.426

^{ns} = Non significant ^{**} = Highly significant

Survey and Seasonal abundance of the aphidophagous insect predators.

Survey and relative densities of aphidophagous insect predators:

Data given in Table (4) show the relative densities of aphidophagous insect predators associated with aphids on leaves of navel orange during 2020 and 2021 seasons. As shown, 23 predaceous species belonging to eight families and four orders were recorded.

The orders could be arranged asendingly according to their general relative densities during the two successive seasons of study as follows : Hemiptera (4.06%), Neuroptera (24.46%), Diptera (26.44%) and Coleoptera (45.04%). Hemipterous species included *Orius albidipennis* (Reut.), *Orius laevigatus* Fieb. and *Orius niger* (Wolff) (Anthocoridae), Neuropterous ones were *Chrysoperla carnea* (Stephens), *Chrysemosa jeanneli* Navás, *Wesmaelius navasi* (Andréu) and *Symphorobius fallax* Navás. Dipterous predators specimens were *Sphaerophoria flavicauda* Zett., *Xanthogramma aegyptium* Wied., *Metasyrphus* (= *Syrphus*) *corollae* (Fabr.), *Paragus aegyptius* Macq., *Scaeva albomaculata* Macq. (Syrphidae), *Aphidoletes aphidimyza* (Rond.) (Cecidomyiidae), *Leucopis puncticornis aphidivora* Rond. (Ochthiphilidae) and Coleopterous ones were *Coccinella undecimpunctata* L., *Coccinella septempunctata* L., *Coccinella 9-punctata* L., *Hippodamia variegata* Goeze, *Scymnus interruptus* (Goeze), *Scymnus syriacus* Mars., *Cydonia vicina nilotica* Muls., *Cydonia vicina isis* Cr. (Coccinellidae) and *Paederus alfieri* (Koch) (Staphylinidae).

The present results coincided with those of Aliev and Kurbanov (1981) in USSR, mentioned that *C. carnea* is one of the most active chrysopids associated with *A. gossypii* on citrus including navel orange and mandarin trees. Michelena and Sanchis (1997) in Spain, found that the predators included *C. carnea* and *C. septempunctata* were abundant when aphid populations peaked, whereas chrysopids appeared later when aphid numbers decreased in orange (cv. Oroval, navel orange and mandarin) orchards.

Güncan, *et al.*, (2008) who stated that the most imported predators attacking citrus aphid infesting navel orange trees were *C. undecimpunctata*, *C. carnea*, *A. aphidimyza* and *S. corolla*.

Ali (2009) recorded five insect predators belonging to four orders and four families associated with aphids infesting leaves of navel orange. They were *C. undecimpunctata*, *A. aphidimyza*, *O. albidipennis*, *C. carnea* and *M. corollae*.

Table 4. Survey and relative densities of aphidophagous insect predators associated with aphids infesting leaves of navel orange in the newly reclaimed sandy area at El-Khattara district, Sharkia Governorate during 2020 and 2021 seasons

Order	Family	Species	2020		2021		General	
			No.	%	No.	%	No.	%
Hemiptera	Anthocoridae	<i>Orius albidipennis</i> (Reut.)	13	1.50	25	1.92	38	1.75
		<i>Orius laevigatus</i> Fieb.	11	1.27	19	1.46	30	1.38
		<i>Orius niger</i> (Wolff)	8	0.92	12	0.92	20	0.92
Total			32	3.69	56	4.31	88	
%								4.06
Neuroptera	a.Chrysopidae	<i>Chrysoperla carnea</i> (Stephens)	190	21.91	212	16.31	402	18.55
		<i>Chrysemosa jeanneli</i> Navás	40	4.61	45	3.46	85	3.92
	b.Hemerobiidae	<i>Wesmaelius navasi</i> (Andréu)	12	1.38	14	1.08	26	0.21
		<i>Symphorobius fallax</i> Navás	7	0.81	10	0.77	17	0.78
Total			249	28.72	281	21.62	530	
%								24.46
Diptera	a. Syrphidae	<i>Sphaerophoria flavicauda</i> Zett.	33	3.81	210	16.15	243	11.21
		<i>Xanthogramma aegyptium</i> Wied.	25	2.88	90	6.92	115	5.31
		<i>Metasyrphus</i> (=Syrphus) <i>corollae</i> (Fabr.)	20	2.31	53	4.08	73	3.37
		<i>Paragus aegyptius</i> Macq.	18	2.08	42	3.23	60	2.77
		<i>Scaeva albomaculata</i> Macq.	17	1.96	22	1.69	39	1.80
	b.Cecidomyiidae	<i>Aphidoletes aphidimyza</i> (Rond.)	11	1.27	18	1.38	29	1.34
	c. Oecthiplidae	<i>Leucopis puncticornis aphidivora</i> Rond.	10	1.15	4	0.31	14	0.65
Total			134	15.46	439	33.77	573	
%								26.44
Coleoptera	a. Coccinellidae	<i>Coccinella undecimpunctata</i> L.	188	2.08	200	15.38	388	17.90
		<i>Coccinella septempunctata</i> L.	85	9.80	115	8.85	200	9.23
		<i>Coccinella 9-punctata</i> L.	55	6.34	42	3.23	97	4.48
		<i>Hippodamia variegata</i> Goeze	36	4.15	40	3.08	76	3.51
		<i>Scymnus interruptus</i> (Goeze)	23	2.65	33	2.54	56	2.58
		<i>Scymnus syriacus</i> Mars.	21	2.42	18	1.38	39	0.81
		<i>Cydonia vicina nilotica</i> Muls.	18	2.08	25	1.92	43	1.98
		<i>Cydonia vicina isis</i> Cr.	16	1.85	30	2.31	46	2.12
	b. Staphylinidae	<i>Paederus alfieri</i> (Koch)	10	1.15	21	1.61	31	1.43
	Total			452	52.13	524	40.30	976
%								45.04
General total			867		1300		2167	
%				100.00		100.00		100.00

Bouhachem, (2014) recorded 16 species of natural enemies on citrus aphids infesting navel orange, eight predators and eight parasitoids. Among predators preying on aphid colonies, five coccinellids with a frequency of 6% were the most abundant predators: *C. septempunctata*, *Scymnus subvillosus* (Goeze), *Adalia bipunctata* (L.), *Chilocorus bipustulatus* (Linnaeus) and *Hippodamia variegata* (Goeze), then less abundant one cecidomyiid (3%): *A. aphidimyza*, one chrysopid (0.2%): *C. carnea*, and one syrphid fly larvae (0.6%): *Episyrphus balteata*.

Seasonal abundance of the main aphidophagous insect predators in relation to aphids, temperature and relative humidity:

Total Orius species:

The seasonal abundance of *O. albidipennis*, *O. laevigatus* and *O. niger* were represented as total numbers of *Orius* species.

Data given in Table (5) reveal that in the first, 2020, season, of study, *Orius* species began to appear with five individuals in the 1st week of May till the 2nd week of June. During this period, the predators population showed two peaks of activity. The first one, ten individuals / 360 aphids, took place in the 3rd week of May at means of 29.9°C and 59.5% RH. The second peak with four individuals / 165 aphids, occurred in the first week of June, at means of 27.7°C and 63.3% RH. Thereafter the predator number was decreased gradually and completely disappeared in July and August. The maximum total monthly number, 25 predators / 1845 aphids, was obtained

during May. *Orius* species during the whole season appeared a mean of one individual: 229.88 aphids.

As shown from the obtained data in Table (6), in the second season, 2021, the *Orius* species were occurred from the 1st week of May till the 3rd week of June. During this period, the predators population showed two peaks of activity. The first one, 18 individuals/ 491 aphids, took place in the 3rd week of May at means of 27.8 °C and 60.9% RH. The second peak with 14 specimens / 171 aphids, occurred in the first week of June, at means of 29.9°C and 62.4 % RH. The predator population showed the highest value of 38 specimens / 1778 aphids during May , while only 18 predators/ 1867 aphids was recorded during June. The mean ratio of predator: prey was 1:106.59.

Chrysoperla carnea (Stephens)

Data arranged in Table (5) and plate (1) revealed that in the first, 2020, season, of study, *C. carnea* began to appear with five individuals / 103 aphids was in the 3rd week of April, two weeks late after the first record of the aphid. The population of this predator indicated two peaks of activity. The first one, 30 individuals/ 690 aphids, took place in the 1st week of May at means of 23.3°C and 61.1% RH. The second and highest peak with 35 lacewings / 910 aphids, occurred in the third week of June, at means of 27.7°C and 60.7% RH. Thereafter the predator number was decreased gradually and completely disappeared in the end of season. The predator population showed the highest value of 85 specimens / 1694 aphids during June , while only 28 predators/ 858 aphids was recorded during April. The mean ratio of predator: prey was 1:38.72.

Table 5. Seasonal abundance of aphidophagous insect predators in relation to aphids, temperature and relative humidity on navel orange trees in the newly reclaimed sandy area at El-Khattara district, Sharkia Governorate during 2020 season.

Weekly date of samples and monthly count	Number of collected aphids	Number of collected predators										Corresponding means of				
		Hemipterous		Neuropterous			Dipterous			Coleopterous		Total number	Predators : prey ratio weekly	Temp. °C	RH%	
		<i>Orius</i> species	<i>C. carnea</i>	<i>C. jeanneli</i>	<i>W. navasi</i>	<i>S. fallax</i>	Syrphid species	<i>A. aphidimyza</i>	<i>L. puncticornis</i>	<i>aphidivora</i>	Coccinellid species					<i>P. affieri</i>
Apr., 1 st	20	0	0	0	0	0	0	0	0	0	0	0	0	0:20	22.2	52.2
2 nd	50	0	0	0	0	0	0	0	0	0	0	0	0	0:50	22.4	55.6
3 rd	103	0	5	0	0	0	5	0	0	10	0	20	1:5.15	25.1	58.4	
4 th	183	0	10	0	0	0	13	0	0	17	0	40	1:4.58	29.2	67.9	
5 th	502	0	13	0	0	0	14	0	0	31	0	58	1:8.66	28.3	60.9	
Total	858	0	28	0	0	0	32	0	0	58	0	118				
May, 1 st	690	5	30	3	1	0	25	1	3	53	1	122	1:5.66	23.3	61.1	
2 nd	430	8	25	7	3	3	30	3	2	41	2	124	1:3.44	25.5	59.7	
3 rd	360	10	10	10	7	4	15	2	1	31	5	95	1:3.79	29.9	59.5	
4 th	365	2	7	6	1	0	10	1	0	23	2	52	1:7.02	30.7	59.9	
Total	1845	25	72	26	12	7	80	7	6	148	10	393				
Jun., 1 st	165	4	10	7	0	0	1	0	0	18	0	40	1:4.13	27.7	63.3	
2 nd	197	3	20	4	0	0	0	0	0	15	0	42	1:4.69	30.4	60.5	
3 rd	910	0	35	2	0	0	0	4	0	41	0	82	1:11.10	27.7	60.7	
4 th	422	0	20	1	0	0	0	0	4	33	0	58	1:7.28	28.9	61.9	
Total	1694	7	85	13	0	0	1	4	4	107	0	221				
Jul., 1 st	452	0	5	0	0	0	0	0	0	30	0	35	1:12.91	30.9	68.9	
2 nd	949	0	0	0	0	0	0	0	0	53	0	53	1:17.91	30.3	67.7	
3 rd	535	0	0	0	0	0	0	0	0	25	0	25	1:21.40	29.5	65.0	
4 th	553	0	0	0	0	0	0	0	0	19	0	19	1:29.11	30.0	66.5	
5 th	240	0	0	0	0	0	0	0	0	2	0	2	1:120	30.2	65.3	
Total	2729	0	5	0	0	0	0	0	0	129	0	134				
Aug., 1 st	100	0	0	0	0	0	0	0	0	0	0	0	0:100	33.5	68.5	
2 nd	80	0	0	0	0	0	0	0	0	0	0	0	0:80	31.8	68.9	
3 rd	50	0	0	0	0	0	0	0	0	0	0	0	0:50	30.1	66.5	
4 th	0	0	0	0	0	0	0	0	0	0	0	0	0:0	29.3	68.3	
Total	230	0	0	0	0	0	0	0	0	0	0	0				
General total	7356	32	190	40	12	7	113	11	10	442	10	867				
Predators : prey ratio		1:229.88	1:38.72	1:183.9	1:613	1:1050.86	1:65.10	1:668.73	1:735.6	1:16.64	1:735.6		1:8.48			



(1) *Chrysoperla carnea* (Stephens)



(2) *Chrysemosa jeanneli* Navás



(3) *Wesmaelius navasi* (Andréu)



(4) *Sympherobius fallax* Navás

Plate 1. Four species of lacewings associated with aphids infesting navel orange trees, the second and the third species first record in Egytpt and afrotropical region.

Table 6. Seasonal abundance of aphidophagous insect predators in relation to aphids, temperature and relative humidity on navel orange trees in the newly reclaimed sandy area at El-Khattara district, Sharkia Governorate during 2021 season.

Weekly date of samples and monthly count	Number of collected aphids	Number of collected predators											Corresponding means of					
		Hemipterous	Neuropterous				Dipterous			Coleopterous				Predators : prey ratio weekly	Temp. °C	RH %		
		<i>Orius</i> species	<i>C. carnea</i>	<i>C. jeanneli</i>	<i>W. navasi</i>	<i>S. fallax</i>	Syrphid species	<i>A. aphidimyza</i>	<i>L. puncticornis</i>	<i>L. aphidivodra</i>	Coccinellid species	<i>P. alfieri</i>	Total number					
Apr., 1 st	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0:26	23.8	57.7
2 nd	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0:45	21.2	54.2
3 rd	125	0	3	0	0	0	0	0	0	0	13	0	16	16	1:7.81	22.8	52.2	
4 th	245	0	10	0	0	0	5	0	0	21	0	36	36	36	1:6.81	27.8	62.2	
5 th	403	0	15	3	0	1	41	0	0	35	0	95	95	95	1:4.24			
Total	844	0	28	3	0	1	46	0	0	69	0	147	147	147				
May, 1 st	569	3	25	7	2	3	73	1	0	61	1	176	176	176	1:3.23	25.6	62.2	
2 nd	552	10	11	13	7	6	62	5	2	40	3	159	159	159	1:3.47	28.8	60.2	
3 rd	491	18	8	9	3	0	43	10	1	25	5	122	122	122	1:4.02	27.8	60.9	
4 th	166	7	5	7	1	0	20	2	1	20	0	63	63	63	1:2.63	29.5	58.5	
Total	1778	38	49	36	13	9	198	18	4	146	9	520	520	520				
Jun., 1 st	171	14	11	3	1	0	13	0	0	25	0	67	67	67	1:2.55	29.9	62.4	
2 nd	247	3	13	2	0	0	10	0	0	21	10	59	59	59	1:4.19	31.1	59.4	
3 rd	980	1	33	1	0	0	90	0	0	51	2	178	178	178	1:5.51	28.5	61.8	
4 th	469	0	21	0	0	0	35	0	0	25	0	81	81	81	1:5.79	27.1	62.8	
Total	1867	18	78	6	1	0	148	0	0	122	12	385	385	385				
Jul., 1 st	326	0	17	0	0	0	10	0	0	37	0	64	64	64	1:5.09	30.8	62.9	
2 nd	383	0	13	0	0	0	9	0	0	59	0	81	81	81	1:4.73	29.9	61.7	
3 rd	329	0	12	0	0	0	3	0	0	31	0	46	46	46	1:7.15	31.5	63.0	
4 th	257	0	11	0	0	0	2	0	0	21	0	34	34	34	1:7.56	31.0	62.8	
5 th	122	0	4	0	0	0	1	0	0	18	0	23	23	23	1:5.30	30.8	61.5	
Total	1417	0	57	0	0	0	25	0	0	166	0	248	248	248				
Aug., 1 st	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0:25	32.5	67.5	
2 nd	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0:20	30.3	68.3	
3 rd	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0:18	31.5	66.5	
4 th	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0:0	30.3	68.3	
Total	63	0	0	0	0	0	0	0	0	0	0	0	0	0	0:63			
General total	5969	56	212	45	14	10	417	18	4	503	21	1300	1300	1300				
Predators : prey ratio		1:106.59	1:28.16	1:132.64	1:426.36	1:596.9	1:14.31	1:331.61	1:1492.25	1:11.87	1:284.24	1:1300	1:4.59	4.59				

As shown from the obtained data in Table (6), in the second season, 2021, the predator was occurred from the 3rd week of April till the last week of July. During this period, the green lacewing population showed two peaks of activity. The first one, 25 individuals/ 569 aphids, took place in the 1st week of May at means of 25.6 °C and 62.2% RH. The second and highest peak with 33 ladybeetles / 980 aphids, occurred in the third week of June, synchronized with the peak of the aphids, at means of 28.5°C and 61.8% RH. The predator population showed the highest value of 78 specimens/1867 aphids during July, while only 28 predators/ 884 aphids was recorded during April. The mean ratio of predator: prey was 1:28.16.

***Chrysemosa jeanneli* Navás**

According to the distribution map number 136 which provided by the Natural History Museum (British museum), the Chrysopid, *C. jeanneli* is first record in Egypt and its geographical distribution was given as in Africa: Namibia, South Africa, Botswana, Kenya, Tanzania and Swaziland.

In the first season, 2020, data presented in Table (5) and plate (1), showed that lacewing started to appear in the first week of May with tree individuals / 690 aphids. Then, the lacewing population was fluctuated, showing two peaks. The first peak with ten specimens/ 360 aphids, occurred in the 3rd week of May at means of 29.9°C and 59.5%RH. The second one, seven lacewings/ 165 aphids, in the first week of June at means of 27.7°C and 63.3% RH. The highest total monthly number, 26 predators/ 1845 aphids, was recorded during May,

while only 13 predators/ 1694 aphids was recorded during June. The mean ratio of predator: prey was 1:183.9.

In the second season, 2021, data given in Table (6), indicate that the predator was detected from the 5th April week of July till the 3rd week of June. During this period, the lacewing population showed one peak of count with 13 individuals /552 aphids in the 2nd week of May at means of 28.8 °C and 60.2% RH. The maximum monthly total number, 36 predators/ 1778 aphids was recorded during May, and the lowest one, three predators/ 844 aphids, occurred during April. The predator prey ratio during the season was 1:132.64.

***Wesmaelius navasi* (Andréu)**

According to the geographical distribution map number 106 which obtained from the Natural History Museum (British Museum), the hemerobiid, *Wesmaelius navasi* (Andréu) is a first record in afrotropical region. The predator was recorded in Europe (Madrid, Malta, Makaromesien, Creta, Marruecos, Conary and France). Asia (Anatolia, Iraq, Israel, Afghanistan, Pakistan, China, Iran, Lebanon, Armenia and Palestine). America (California). This is the first record of the predator in Egypt.(NHM Reg.No.15902013.)

As clearly shown from the obtained data in Table (5) and plate (1) in the first, season, 2020 the brown lacewing, *W. navasi* was recorded only in May. The population of this predator indicated the unique peak, seven individuals/ 360 aphids, took place in the 3rd week of May at means of 29.9°C and 59.5% RH. The mean ratio of predator: prey was 1:613.00

In the second season, 2021, data given in Table (6), indicate that predator was detected from the 1st week of May till the 1st week of June. During this period, the brown lacewing population showed one peak of count with seven individuals /552 aphids in the 2nd week of May at means of 28.8 °C and 60.2% RH. The predator population showed the highest value of 13 specimens / 1778 aphids during May , while only one predator / 1867 aphids was recorded during June. The mean ratio of predator: prey was 1:426.36.

Total syrphid species:

The seasonal abundance of *S. flavicauda*, *X. aegyptium*, *M. corolla*, *P. aegyptius* and *S. albomaculata* were represented as total numbers of syrphid species .

In the first season , 2020, data obtained in Table (5) , reveal that the first record of syrphids, five individuals/ sample, started two weeks late after the first appearance of the aphids , 103 individuals / sample, in the 3rd week of April at means of 25.1°C and 58.4% RH. Then, the syrphids population was increased reaching its highest peak of 30 predators/430 aphids in the 2nd week of May at means of 25.5°C and 59.7% RH. The syrphids population was fluctuated with a tendency to decrease, but it was found until the last sample in the first week of June. The maximum total monthly number, 80 predators/ 1845 aphids, occurred during May and the lowest ones, one predator/ 1694 aphids, were obtained during June. The mean ratio of syrphid species: aphids during the season was 1:65.10.

As shown from the obtained data in Table (6) , the first occurrence of syrphids in the second , 2021, season with five individuals/ 245 aphids was in the 4th week of April, three weeks late after the first record of the aphid. Syrphids population indicated two peaks during the season. The first one, 73 individuals/ 569 aphids, took place in the 1st week of May, at means of temperature and relative humidity were 25.6°C and 62.2%RH., respectively. The second and highest one, 90 syrphids/ 980 aphids, was in synchronization with the peak of aphids, occurred in the 3rd week of June at means of 28.5°C and 61.8%RH. The maximum total monthly numbers, 198 predators/ 1778 aphids, was recorded during May, followed by 148 predators/ 1867 aphids and 25 predators / 1417 aphids during June and July , successively. The mean ratio of syrphid species: aphids during the season was 1:14.31.

Total coccinellid species:

The seasonal abundance of *C. undecimpunctata*, *C. septempunctata*, *C. 9- punctata*, *H. variegata*, *S. interruptus*, *S. syriacus*, *C. vicina nilotica* and *C.vicina isis* were represented as total numbers of coccinellid species .

Data given in Table (5) , revealed that in the first, 2020, season, of study, coccinellid species began to appear with ten individuals/ 481 aphids / sample in the 3rd week of April . Then, the coccinellids population was fluctuated, showing three peaks during the period till the last week of July. The first peak with 53 specimens/ 690 aphids, occurred in the 1st week of May at means of 23.3°C and 61.1%RH. The second and lowest one, 41 coccinellids / 910 aphids, in the 3rd week of June at means of 27.7°C and 60.7% RH. The third peak with 53 Ladybeetles/ 949 aphids, was in synchronization with the peak of aphid, occurred in the 2nd week of July at means of 30.3°C and 67.7%RH. The highest total monthly number, 148 predators/ 1845 aphids, was recorded during May, and the lowest one, 58 predators / 858 aphids, occurred during April. The predators : prey ratio during the season was 1:16.64.

The obtained data in Table (6) cleared that in the second season, 2021 , the coccinellid species was occurred from the 3rd week of April till the 5th week of July. During this period, the ladybeetles population showed four peaks of activity. The first and highest peak, 61 individuals/ 569 aphids, took place in the 1st week of May at means of 25.6°C and 62.2% RH. The second and lowest peak with 25 ladybeetles / 171aphids, occurred in the 1st week of June, at means of 27.7°C and 63.3% RH. The third peak , 51 predators/ 980 aphids , was recorded in the 3rd week of June at means of 27.7 °C and 60.7 % RH. The fourth peak records 59 predators/ 383 aphids, was detected in the 2nd week of July at means of 30.3 and 67.6% RH. The ladybeetles population showed the highest value of 166 specimens / 1417 aphids during July , while only 69 predators/ 844 aphids was recorded during April. The mean ratio of predator: prey was 1:11.87.

Total number of aphidophagous insect predators in relation with aphids infestation :

In the first, 2020 season, data presented in Table (5), reveal that the predators occurred from the 3rd week of April till the 5th week of July. During this period, the predators population showed three peaks of activity. The first and highest peak, 125 predators/ 430 aphids, took place in the 2nd week of May at mean of 25.5°C and 59.7% RH. The second peak, 82 predators/ 910 aphids, took place in the 3rd week of June at mean of 27.7°C and 60.6%RH. Thereafter, the predators population was decreased gradually to record its minimum value , 53 individuals / 949 aphids in the 2nd week of July at means of 30.3°C and 67.7% RH. The highest total monthly counts of 394 predators / 1845 aphids, was found during May, while the lowest value of 118 predators / 858 aphids was found during April. The mean of predators: prey ratio during the whole season was 1: 8.48. Data presented in Table (6) showed that in the second, 2021, season, the predators were observed all- round the season with exception of August. Their population indicated four peaks of activity. The first one, 176 individuals / 569 aphids, was detected in the first week of May, at means of 25.6°C and 62.2%RH. The second and lowest peak, 67 predators/ 171 aphids, took place in the 1st week of June at mean of 29.9°C and 62.4%RH. The third and highest one, 178 predators/ 980 aphids, took place in the 3rd week of June at mean of 28.5°C and 61.84%RH. The fourth and intermediated one 81 predators/ 383 aphids, occurred in the 2nd week of July at means of 29.9°C and 61.7%RH. The highest total monthly number, 520 predators/ 1778 aphids, was recorded during May, and the lowest one, 147 predators/844 aphids, occurred during April. The predators: prey ratio during the season was 1: 4.59.

Statistical analysis in (Table 7) indicated that there were positive highly significant and positive insignificant correlations between aphids and predators count during the two successive seasons, whereas (r) values were 0.637** and 0.336^{ns} during the first and second seasons, respectively.

Table 7. Simple correlation and simple regression between weekly numbers of aphids and numbers of predators on navel orange trees in the newly reclaimed sandy area at EL-Khattara district, Sharkia Governorate during during 2020 and 2021 seasons

Season	r (Values)	b (Values)
First season (2020)	0.637**	113.499
Second season (2021)	0.336 ^{ns}	88.640

ns = Non significant ** = Highly significant

Survey and relative densities of the parasitoids and the parasitism percentages:

Survey and relative densities of the parasitoids:

Data obtained in Table (8) and plate (2) indicated that eight primary parasitoid species were recorded. The parasitoids could be arranged descendingly according to their general relative densities during the two seasons of study as follow: *Diaeretiella rapae* (M'Intosh), *Aphidius colemani* Viereck, *Aphidius matricariae* Haliday, *Aphidius* sp., *Lysiphlebus fabarum* (Mars.), *Trioxys* sp., *Ephedrus* sp. and *Praon* sp. (Aphidiidae) with 59.69, 17.52, 8.12, 7.48, 4.33, 1.13, 0.89 and 0.84 % of the total collected parasitoids, successively.

Different results are recorded by several investigators as follow:

Stary, (1976) revealed that *A. matricariae* is a parasitoid of that aphids on navel orange trees. Tomanović, et al. (2009) reported that *Ephedrus* sp. attack citrus aphid infesting navel orange trees.

Žikić, et al., (2009) stated that the most important parasitoid was *L. fabarum*, parasitized in all aphid species of the genus encountered, *A. gossypii*, *M. persicae* and *T. aurantii* and developed successfully to adult in

accounting over 10% of the parasitoids. *A. matricariae* was the first in abundance on *M. persicae* (42%) compared to *A. gossypii* (8%) and *T. aurantii* (7%) but it was not detected on *A. spiraecola*. The third frequent parasitoid was *T. angelicae* (9%) and the fourth one *L. testaceipes* (6.5%).

Table 8. Survey and relative densities of aphid parasitoids on navel orange in the newly reclaimed sandy area at El-Khattara district, Sharkia Governorate during 2020 and 2021 seasons.

Species	Family	2020		2021		General	
		Number	%	Number	%	Number	%
<i>Diaeretiella rapae</i> (M'Intosh)	Aphidiidae	533	51.90	680	67.66	1213	59.69
<i>Aphidius colemani</i> Viereck		244	23.75	112	11.14	356	17.52
<i>Aphidius matricariae</i> Haliday		85	8.28	80	7.96	165	8.12
<i>Aphidius</i> sp.		77	7.50	75	7.46	152	7.48
<i>Lysiphlebus fabarum</i> (Mars.)		55	5.36	33	3.28	88	4.33
<i>Trioxys</i> sp.		13	1.27	10	1.00	23	1.13
<i>Ephedrus</i> sp.		10	0.97	8	0.80	18	0.89
<i>Praon</i> sp.		10	0.97	7	0.70	17	0.84
Total		1027	100.00	1005	100.00	2032	100.0



Plate 2. Eight insect parasitoid species parasitized on aphids infesting navel orange trees during 2020 and 2021 seasons

Bouhachem, (2014) recorded 16 species of natural enemies on citrus aphid infesting navel orange trees, eight predators and eight parasitoids. Parasitoids have the second most important activity to reduce the citrus aphid (5.1%) and were identified as *A. matricariae*, *A. colemani*, *Ephedrus persicae* Froggatt, *L. fabarum*, *L. testaceipes*, *Praon volucre* (Haliday), *Trioxys angelicae* Haliday, and *D. rapae*. They also found two hyperparasitoids belonging to genera *Pachyneuron* and *Phaenoglyphis*. Among aphid enemies, the four parasitoids *L. fabarum*, *A. matricariae*, *T. angelicae*, and *L. testaceipes*, and the lady beetle *S. subvillosus*, seem interesting to be used in an IPM program.

Different results are recorded by several investigators as follows: Ali (2009) indicated that parasitoids, *D. rapae*, *Aphidius* spp., and *Charips* sp. attack citrus aphid infested trees of navel orange.

Parasitism percentages:

In the first season, 2020, data obtained in Table (9) reveal that the parasitism occurred during the period from the 4th week of April till the 1st week of August. The parasitism percentages were fluctuated to show six peaks. The first and lowest one, 9.29%, occurred in the 4th week of April at means of 29.2°C and 67.9% RH. The second peak, 15.59%, took place in the 2nd week of May at means of 25.5°C and 59.7%RH. The third one, 22.19%, was recorded in the 4th week of May at means of 30.7 °C and 59.9%RH. The fourth and highest one, 23.70%, occurred in the 4th week of June at means of 28.9°C and 61.9% RH. The fifth one, 18.32%, occurred in the 3rd week of July at means of 29.5°C and 65.0% RH. The sixth one, 11.00 %, occurred in the 1st week of August at means of 33.5°C and 68.5% RH. The highest monthly mean of parasitism percentages, 17.13%,

took place during May, while the lowest one, 4.78%, was observed during August. The mean percentage of parasitism during the whole season, 13.96%.

Table 9. Parasitism percentages of aphids infesting navel orange trees in the newly reclaimed sandy area at El-Khattara district, Sharkia Governorate during 2020 season.

Weekly date of samples and monthly count	Number of		Parasitism %	Corresponding means of	
	collected aphids	emerged parasitoids		Temp. °C	R.H %
Apr., 1 st	20	0	0.00	22.2	52.2
2 nd	50	0	0.00	22.4	55.6
3 rd	103	0	0.00	25.1	58.4
4 th	183	17	9.29	29.2	67.9
5 th	502	43	8.57	28.3	60.9
Total	858	60			
Mean			6.99		
May, 1 st	690	135	19.57	23.3	61.1
2 nd	430	53	15.59	25.5	59.7
3 rd	360	47	13.06	29.9	59.5
4 th	365	81	22.19	30.7	59.9
Total	1845	316			
Mean			17.13		
Jun., 1 st	165	35	21.12	27.7	63.3
2 nd	197	30	15.23	30.4	60.5
3 rd	910	90	9.89	27.7	60.7
4 th	422	100	23.70	28.9	61.9
Total	1694	255			
Mean			15.05		
Jul., 1 st	452	85	18.81	30.9	68.9
2 nd	949	133	14.01	30.3	67.7
3 rd	535	98	18.32	29.5	65.0
4 th	553	53	9.58	30.0	66.5
5 th	240	16	6.67	30.2	65.3
Total	2729	385			
Mean			14.11		
Aug., 1 st	100	11	11.00	33.5	68.5
2 nd	80	0	0.00	31.8	68.9
3 rd	50	0	0.00	30.1	66.5
4 th	0	0	0.00	29.3	68.3
Total	230	11			
Mean			4.78		
General total	7356	1027			
Mean			13.96		

Data arranged in Table (10) indicated that the parasitism in the second season, 2021, was recorded from 3rd week of April till the last week of July. During this period the parasitism percentages were fluctuated to record four peaks. The first one, 22.67%, was found in the 1st week of May at means of 25.6°C and 62.2% RH. The second peak, 21.08%, took place in the 4th week of May at means of 29.5°C and 58.5% RH. The third one, 20.65%, occurred in the 2nd week of June at means of 31.1°C and 59.4%RH. The fourth and highest one, 30.06%, occurred in the 4th week of June at means of 27.1°C and 62.8%RH. The highest monthly mean of parasitism percentages, 19.41%, was obtained during July, while the lowest one with value of 10.66% was recorded during April. The mean percentage of parasitism during the season, 16.84%, was obviously higher as compared with that in the first one.

Statistical analysis (Table 11) indicated that there were positive highly significant correlations between weekly numbers of the aphids and numbers of emerged parasitoids, being (r = 0.899**) and (r = 0.874**) during the first and second seasons, successively.

Table 10. Parasitism percentages of aphids infesting navel orange trees in the newly reclaimed sandy area at El-Khattara district, Sharkia Governorate during 2021season.

Weekly date of samples and monthly count	Number of		Parasitism %	Corresponding means of	
	collected aphids	emerged parasitoids		Temp. °C	R.H %
Apr., 1 st	26	0	0.00	23.8	57.7
2 nd	45	0	0.00	21.2	54.2
3 rd	125	10	8.00	22.8	52.2
4 th	245	25	10.20	27.8	62.2
5 th	403	55	13.65		
Total	844	90			
Mean			10.66		
May, 1 st	569	129	22.67	25.6	62.2
2 nd	552	67	12.14	28.8	60.2
3 rd	491	52	10.59	27.8	60.9
4 th	166	35	21.08	29.5	58.5
Total	1778	283			
Mean			15.92		
Jun., 1 st	171	30	17.54	29.9	62.4
2 nd	247	51	20.65	31.1	59.4
3 rd	980	135	13.78	28.5	61.8
4 th	469	141	30.06	27.1	62.8
Total	1867	357			
Mean			19.12		
Jul., 1 st	326	95	29.14	29.9	61.7
2 nd	383	85	22.19	31.5	63.0
3 rd	329	50	15.20	31.0	62.8
4 th	257	35	13.62	30.8	61.5
5 th	122	10	8.20	29.9	61.7
Total	1417	275			
Mean			19.41		
Aug., 1 st	25	0	0.00	32.5	67.5
2 nd	20	0	0.00	30.3	68.3
3 rd	18	0	0.00	31.5	66.5
4 th	0	0	0.00	30.3	68.3
Total	63	0			
Mean			0.00		
General total	5969	1005			
Mean			16.84		

Table 11. Simple correlation and simple regression between weekly numbers of aphids and the numbers of emerged parasitoids on navel orange trees in the newly reclaimed sandy area at El-Khattara district, Sharkia Governorate during the two successive seasons, 2020 and 2021.

Seasons	r (Values)	b (Values)
First season (2020)	0.899**	185.031
Second season (2021)	0.874**	184.602

**= Highly significant

Different results are recorded by several investigators as follows: Ali (2009) indicated that the parasitoids, *D. rapae*, *Aphidius* spp., and *Charips* sp. attack citrus aphid infested trees of navel orange.

Bouhachem (2014) who mentioned that the parasitism of citrus aphid infesting navel orange by *D. rapae* occurred in 1st week of May and reached a peak in June (5.1%).

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أنواع المنّ التي تصيب أشجار البرتقال بسره ومقتاتاته الحشرية في منطقة الخطارة بمحافظة الشرقية - مصر محمد أحمد إبراهيم يوسف*، ولاء مجاهد محمد يوسف هلالى و شيرين مجاهد محمد يوسف هلالى قسم وقاية النبات – كلية الزراعة – جامعة الزقازيق – مصر

اجريت تلك الدراسة بهدف حصر ودراسة الوفرة الموسمية والكثافة النسبية لأنواع المنّ التي تصيب أشجار البرتقال بسره والمفترسات والطفيليات الحشرية المرتبطة خلال موسمي 2020 و2021م بالخطارة كمنطقة مستصلحة حديثاً بمحافظة الشرقية. وقد أوضحت النتائج الآتي: يصيب أشجار البرتقال بسره أربعة أنواع من المنّ. تم حصر 23 نوع من المفترسات الحشرية تتبع أربعة رتب وثمانى عائلات. الأنواع التابعة لرتبة غمدية الأجنحة كانت الأكثر سيادة، تلاها الأنواع التابعة لرتبة ذات الجناحين ثم الأنواع التابعة لرتبة شبكية الأجنحة بكثافة نسبية عامة 45,04، 26,44 و 24,46% من التعداد الكلى للمفترسات، على الترتيب. تم حصر أربعة أنواع من أسد المنّ تابعة لعائلتين عائلة أسد المنّ الخضراء و عائلة أسد المنّ البنية وهم: *Chrysoperla carnea* (Stephens)، *Chrysemosa jeanneli* (Navas) (Chrysopidae)، *Wesmaelius navasi* (Andreu) و *Symphorobius fallax* and يعتبر النوع الثاني والثالث أول تسجيل في مصر وأفريقيا (Navas (Hemerobiidae). طبقاً لخريطة التوزيع الجغرافية رقم (136 و 106) والواردة من المتحف البريطاني بلندن *Coccinella*، *Chrysoperla carnea* (Stephens)، على الترتيب. كانت الأنواع *Coccinella* و *Sphaerophoria flavicauda* Wied.، *undecimpunctata* L. الأكثر سيادة ممثلين 18,55، 17,90، 11,21 و 9,23% من التعداد الكلى للمفترسات، على الترتيب. تم حصر ثمانية أنواع من الطفيليات الغشائية الأجنحة كطفيليات مرتبطة بالمنّ هي: *Aphidius matricariae* Haliday، *Aphidius colemani* Viereck، *Diaeretiella rapae* (M'Intosh)، *Aphidius* sp.، *Lysiphlebus fabarum* (Mars.)، *Trioxys* sp.، *Ephedrus* sp. و *Praon* sp. (Aphidiidae). كانت الأنواع الأكثر سيادة *D. rapae*، *A. colemani*، *A. matricariae* و *Aphidius* sp. بكثافة نسبية عامة 59,69، 17,52، 8,12 و 7,48% على التوالي. وجد ارتباط موجب وعلی المعنوية بين كلا من التعداد الأسبوعي للمنّ وعدد الطفيليات الخارجة خلال موسمی الدراسة.