

Cereal Aphid Species (Homoptera : Aphididae) Infesting Wheat Plants and their Aphidophagous Insects at El-Khattara District, Sharkia Governorate, Egypt

Youssif , M. A. I.¹; SH. A. M. Ali² and Walaa M. M. Helaly¹

¹Plant Prot. Dept., Fac. of Agric. , Zaazig Univ., Zagazig, Egypt

²Plant Protection Research Institute , Dokki, Egypt

* Corresponding author: Mohammed Ahmed Ibrahim Youssif

Tel.: +201006980317 E-mail address: m.youssif1@yahoo.com



ABSTRACT

Studies on cereal aphids infesting wheat plants and their aphidophagous insects were carried out in newly reclaimed sandy area at El-Khattara district, Sharkia Governorate, Egypt during 2015-2016 and 2016-2017 growing seasons. The obtained results are summarized as follows: Four aphid species, i.e., *Shizaphis graminum* (Rondani), *Rhopalosiphum maidis* (Fitch), *Rhopalosiphum padi* (Linnaeus) and *Macrosiphum avenae* (Fabricius) were found infesting wheat plants. Cereal aphids infested wheat plants from the first week of January till the last week of April. The highest populations of aphids were recorded in the first week of March and in the second week of April with counts of 711 and 1503 individuals/ sample in the first and second seasons, respectively. Six predaceous insect species belonging to four orders and five families were surveyed associated with aphid species infesting wheat plants. Coleopterous species were the most dominant, followed by the neuropterous ones, with general relative densities of 41.70 and 21.10 % of the total recorded predators, successively. Among all recorded predaceous species, *Chrysoperla carnea* (Stephens), *Coccinella undecimpunctat* L., and *Coccinella septempunctata* L., were the most dominant species, comprised 21.10, 15.68 and 15.26 % of the total count of the predators, respectively. The total recorded predators showed that means of 1:61.62 and 1:118.73 predators: prey ratios in the first and second seasons, respectively. Five species of hymenopterous parasitoids were emerged from mummified individuals of cereal aphids, namely, *Diaeretiella rapae* (M'Intosh), *Aphidius colemani* Viereck, *Aphidius matricariae* Haliday, *Ephedrus* sp. and *Praon* sp. The most dominant parasitoids were *D. rapae* and *A. colemani* with general relative densities of 35.32 and 27.12% respectively. The fluctuations of the total percentages of parasitism indicated three peaks in the first season and two ones in the second season. The mean percentage of parasitism during the first season was relatively high (6.41%) in comparison with that in the second one (3.60%). The correlation between cereal aphids populations and percentages of parasitism in both seasons were positive high significant

Keywords: Cereal aphids, Predators, Parasitoids, Wheat, Seasonal abundance.

INTRODUCTION

Wheat, *Triticum aestivum* L. (Family: Gramineae) is one of the most important cereal crops in Egypt. It is used for human food, as well as in animal and poultry feeding. The Egyptian Agricultural Policy aims to increase wheat production to reduce the gap between the consumption and production. The grown wheat area in Sharkia Governorate is about 381492 Feddan with an average production of about 2.700 tons / feddan (Anonymous, 2017). Quite a lot of aspects are to blame for the low yield of wheat crop production worldwide. Wheat, in all over the world has the largest cultivated area and the quantity produced is more than what of any other crop leading wheat producing countries are China, Russia, USA, France and Canada (Shah, 1994).

Most of arthropod pests belong to seven major orders: Orthoptera, Homoptera, Hemiptera, Coleoptera, Diptera, Lepidoptera and Hymenoptera. Among these cereal aphids are gaining importance since their population has increased over the last few years (Atwal, 1976; Ghanem and El-Adl (1983); Hatchett *et al.*, 1987; El-Serafy, 1999; El-Heneidy *et al.*, 2004; Youssef, 2006 and Ahmad *et al.*, 2016).

Aphids are serious insect pests attacking wheat plants in Egypt, mentioned by Tantawi, (1985), who recorded losses in crop averaged 7.5 – 18.7% of the total wheat production in Middle and Upper Egypt. Chemical insecticides induced major well known problems such as health hazards to human and animals, destruction of biological control agents and increased resistance of insects to insecticides, (Picard, 1987). Recently, entomologists suggested Integrated Pest Management (IMP), using all other control methods which emphasize a biological control (Sehüler *et al.*, 1999).

Since, the aphidophagous insects have an important role in suppressing aphid populations, the present work was conducted in the newly reclaimed pesticides-free area at El-Khattara district, Sharkia Governorate, to contribute concerning the following points:

1. Surveying the cereal aphids species and their associated aphidophagous insects on wheat plants.
2. Seasonal abundance of cereal aphids and their associated aphidophagous insects on wheat plants.
3. Effect of prevailing temperatures and relative humidities on the aphids and their aphidophagous insect.

MATERIALS AND METHODS

Field experiments were conducted in the newly reclaimed sandy areas, at El-Khattara district, Sharkia Governorate, Egypt during two successive wheat growing seasons of 2015-2016 and 2016-2017.

An area of one feddan was sowed with wheat, *Triticum aestivum* L., variety Miser 1 in the first week of November in each 2015 and 2016 years. Normal agricultural practices were used in the due time and no chemical control was applied.

To study the population fluctuations of aphids and aphidophagous insects, ten tillers of wheat infested with aphids were weekly selected, then picked up, placed in paper bags and transferred into laboratory, where carefully examined by the aid of a stereoscopic microscope. Nymphs and adults of aphid were directly counted. Predators in most cases were directly counted, and in some few cases laboratory rearing was necessary for the immature stages till the emergence of the adults. The predaceous 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 aphid 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.

The parasitoids and predators were identified in Biological control Dept., Plant Prot. Res. Inst., Giza, Egypt with the help of Prof. Dr. Ahmed H. El - Heneidy, Chief of Biological Control Researchers. Prevailing temperatures and relative humidities were obtained from the Meteorological Station in Zagazig Region.

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

RESULTS AND DISCUSSION

1. Survey and seasonal abundance of aphid species infesting wheat plants:

1. Survey of aphid species

Four aphid species belonging to Homoptera, Aphididae were recorded infesting wheat plants, i.e., *Ropalosiphum padi* (Linnaeus), *Schizaphis graminum* (Rondani), *Ropalosiphum maidis* (Fitch) and *Macrosiphum* (=Sitobion) *avenae* (Fabricius).

The obtained results are in agreement with those of Tawfik and El-Husseini (2002), El-Bouhssini *et al.*, (2003), El-Heneidy *et al.*, (2004), Yossef (2006) and Ahmad *et al.*, (2016). They mentioned that wheat is attacked by a few numbers of pests. The most injurious were aphids, *S. graminum*, *S. avenae*, *R. maidis*, *R. padi* and *Diuraphis noxia* Mord. Also, Vandereycken *et al.*, (2015) recorded six species of aphid infested wheat plants namely: *S. avenae*, *Sitobion fragariae* Wolker, *R. Padi*, *R. maidis*, *Roplasiphum insertum* Walker and *S. graminum*.

a. Seasonal abundance of aphids

The differentiation of aphids infesting wheat plants 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 wheat plants under the prevailing climatic conditions through the two successive seasons of 2015-2016 and 2016-2017.

In the first season, the data arranged in Table (1) indicated that the aphid infestation occurred during the period from the 1st week of January till the 4th week of April 2017. During this period, the aphid population was fluctuated to showed three peaks. The first one, 524 aphids / sample was in the 2nd week of February at means of 14.9 °C and 57.2 % RH. The second and highest peak, 711 aphid / sample was in the 1st week of March at means of 22.4 °C and 49.57% RH. The third and lowest one, 274 individuals/ sample, took place in the 1st week of April at means of 22.7°C and 53.71% RH. The maximal and minimal monthly total counts were found during March and January with 2132 and 401 individuals, respectively. The mean numbers of the aphids during the season was 256.21 individuals / sample.

Table 1. Seasonal abundance of aphid species infesting wheat plants cultivated in newly reclaimed sandy area at El- Khattara district, Sharkia Governorate during the two successive growing seasons of 2015-2016 and 2016-2017.

Weekly date of sample	Number of aphids/sample (10 tillers)		Corresponding means of			
	2015 - 2016	2016- 2017	Temp. °C		RH %	
Dec., 4 th	0	20	21.0	18.0	66.6	59.5
Total	0	20				
Jan., 1 st	25	60	18.7	18.3	64.3	61.5
2 nd	66	133	18.3	17.2	66.9	60.2
3 rd	90	242	14.6	17.7	64.4	60.0
4 th	220	461	13.7	16.7	62.3	63.2
5 th	-	706	14.0	16.3	60.5	60.1
Total	401	1602				
Feb., 1 st	352	878	15.1	18.5	68.1	59.3
2 nd	524	472	15.4	15.3	60.5	63.2
3 rd	419	633	16.1	16.3	60.9	63.7
4 th	504	782	15.4	18.5	60.8	59.3
Total	1799	2765				
Mar., 1 st	711	1021	15.5	21.3	63.0	58.2
2 nd	509	845	14.8	19.9	69.5	63.3
3 rd	389	782	14.6	19.2	70.0	62.1
4 th	275	918	14.3	18.3	63.0	60.3
5 th	248	-	18.9	19.3	63.1	62.0
Total	2132	3566				
Apr., 1 st	274	1027	20.6	20.3	63.4	59.2
2 nd	194	1503	15.7	20.0	66.1	53.9
3 rd	63	1050	15.8	25.9	64.3	50.3
4 th	5	490	26.0	22.3	64.8	53.9
Total	536	4070				
May, 1 st	-	285	25.9	23.5	59.3	55.2
2 nd	-	40	26.5	24.9	52.3	50.3
Total		325				
General total	4868	12348				
Mean	256.21	588.00				

Data of the second season in Table (1) indicated similar trend, whereas three peaks were recorded . The first one was the highest, with a number of 1503 aphids/ 10 tillers, occurred during 2nd week of April at means of 20.0°C and 53.9% RH. The second peaks was recorded in the 1st week of March with number of 1021 aphids/ 10 tillers at means of 21.3°C and 58.2% RH. The third and intermediate one, 878 aphids / sample, was recorded in the 1st week of February at means of 18.5 and 59.3. The highest and lowest monthly total number of the aphids were found during December and April, with counts of 20 and 4070 individuals, respectively. The mean numbers of the aphids during the seasons was 588.0 individuals / samples . The aphids population in the second season was relatively higher as compared with that in the first one, with counts of 12348 and 4868 individuals, respectively. The obtained results are in agreement with those of the following investigators. Ali and Darwish (1990) in Assiut, Egypt who indicated that the population density of aphids reached 10% of the maximum population density in mid March. Ali *et al.*, (1991) in Egypt revealed that the numbers of *S. graminum* and *R. padi* peaked in late February and in the first half of March during two respective seasons. El-Heneidy *et al.* (2004), reported that

the population densities of cereal aphids on wheat plants in Sakha and Sides region occurred in high numbers during February and March.

Rana (2005) indicated that *S. avenae* population was the highest during the second week of March and started declining gradually and disappeared in the second week of April. Also, Abd El-Megid *et al.* (2007) in Egypt, indicated that the infestation by aphids on wheat started during the 2nd week of February. The population reached a peak during the 1st week of March and disappeared towards the end of April. Vandereycken *et al.* (2015) reported that the population densities of aphids infesting wheat plants occurred during March. Ahmed *et al.* (2016) in Pakistan revealed that the mean number of infestation of aphid population in wheat (7.87) was recorded on the crop sown on 15th October which gradually decreased up to 2.32 in crop sown on 1st January. The aphid infestation on wheat started from 4th week of January to 3rd week of March increased from 0.67 to 14.40 which decreased up to 1.82 respectively during 2nd week of April.

There were negative high significant and positive insignificant correlations between mean of temperatures and numbers of the aphid during the two respective seasons (Table 2). Also, relative humidities had insignificant effects, being negative insignificant in the first and second seasons, respectively.

2. Survey and Seasonal abundance of the natural enemies associated with wheat aphids.

1. Survey and relative densities of the predaceous insects:

Data presented in Table (3), showed that seven predaceous species belonging to six families and five

orders were recorded. The orders could be arranged ascendingly according to their general relative densities during the two successive seasons of study as follows : Acarina (9.43%), Hemiptera (13.34%), Diptera (14.43%), Neuroptera (21.10%) and Coleoptera (41.70%). Acarina species included unidentified several species. Hemiptera was represented only by *Orius laevigatus* Fabricius. (Anthocoridae). Diptera was found only by *Metasyrphus corollae* (Fabricius). Neuroptera was recorded by one species, *Chrysoperla carnea* (Stephens). Coleopterous ones were *Coccinella septempunctata* Linnaeus, *Coccinella undecimpunctata* Linnaeus (Coccinellidae) and *Paederus alfieri* (Koch) (Staphylinidae).

Table 2. Simple correlation coefficient (r) and simple regression coefficient (b) between weekly mean numbers of aphids infesting wheat plants 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, 2015-2016 and 2016-2017.

Considered weather factor	r (Values)		b (Values)	
	First season	Second season	First season	Second season
Numbers of aphid and mean temp. °C	-0.578**	0.157 ^{n.s}	-7.930	2.003
Numbers of aphid and mean RH %	-0.192 ^{n.s}	-0.120 ^{n.s}	-2.248	-2.147

n.s = Non significant

** = Highly significant

Table 3. Survey and relative densities of aphidophagous insect predators associated with aphids infesting wheat plants cultivated in newly reclaimed sandy area at El- Khattara district, Sharkia Governorate during 2015 - 2016 and 2016 - 2017 growing seasons.

Order	Family	Species	2015 - 2016		2016 - 2017		General	
			No.	%	No.	%	No.	%
Acarina	Unidentified	(True spiders) Unidentified species	73	10.93	40	7.53	113	9.43
Total			73		40		113	
%				10.93		7.53		9.43
Hemiptera	Anthocoridae	<i>Orius laevigatus</i> Fabricius	94	14.07	66	12.43	160	13.34
Total			94		66		160	
%				14.07		12.43		13.34
Diptera	Syrphidae	<i>Metasyrphus (=Syrphus) corollae</i> (Fabricius)	111	16.62	62	11.68	173	14.43
Total			111		62		173	
%				16.62		11.68		14.43
Neuroptera	Chrysopidae	<i>Chrysoperla carnea</i> (Stephens)	171	25.60	82	15.44	253	21.10
Total			171		82		253	
%				25.60		15.44		21.10
Coleoptera	a. Coccinellidae	<i>Coccinella septempunctata</i> Linnaeus	79	36.07	104	37.01	183	36.60
		<i>Coccinella undecimpunctata</i> Linnaeus	77	35.16	111	39.50	188	37.60
		<i>Paederus alfieri</i> (Koch)	63	28.77	66	23.49	129	25.80
Total	b. Staphylinidae		219		281		500	
%				32.78		52.92		41.70
General total			668		531		1199	
%				100.00		100.00		100.00

Abd El-Megid *et al.*, (2007) recorded five insect predators belonging to three orders and four families associated with wheat aphids. They were *C. undecimpunctata*, *C. septempunctata*, *P. alfieri*, *C. carnea* and *M. corollae*. Also, the present results coincided with those of Ghanim and El-Adl (1983), El-Heneidy and Attia (1988), Alhag *et al.*, (1996), Abou -Elhagag and Abdel-Hafez (1998) who stated that the most imported predators

attacking wheat aphids were coccinellids, chrysopid and staphylinids. Also, Vandereycken *et al.*, (2015) surveyed seven aphidophagous ladybirds viz., *C. undecimpunctata*, *C. septempunctata*, *Coccinella quinquepunctata* Linnaeus, *Harmonia axyridis* Pallas, *Hippodamia undecimnotata* Schneider, *Hippodamia variegata* Goeze and *Propylea quatuordecimpunctata* Linnaeus on aphids, infesting wheat plants.

According to Ahmad *et al.* (2016) *C. carnea*, *Syrphus* sp., *Coccinella* sp. and *Episyrphus balteatus* De Geer) were recorded associating with aphids on wheat plants.

Junhe *et al.*, (2017) in China, recorded six predaceous species associated with cereal aphids infested wheat plants namely : *C. septempunctata*, *Syrphus nitens* (Zetterstedt), *Syrphus cylindrical*, *Chrysopa sinica* (Tjeder), *Chlaenius pallipes* Gebler and *Pardosa astrigera*.

2. Seasonal abundance of aphidophagous insect predators:

The seasonal abundance of aphidophagous insect predators are presented in Tables 4 and 5.

1. *Chrysoperla carnea* (Stephens)

During the first season (Table 4), the first occurrence of this predator was detected in the 4th week of January associated with 220 aphids individuals at means of 11.7 °C and 66.7 % RH.

It must be noted that, the aphid started to appear three weeks before. Afterwards, the number of the green lacewing was fluctuated between eight and twelve individuals reaching its peak of occurrence, 24 individuals, in the 2nd week of April associated with 194 aphids at means of 26.4 °C and 40.7 % RH.

Table 4. Seasonal abundance of aphidophagous insect predators in relation to cereal aphids, temperature and relative humidity on wheat plants cultivated in newly reclaimed sandy area at El- Khattara district, Sharkia Governorate during the first growing season of 2015-2016 .

Weekly date of samples	Number of collected aphid	Number of collected predators								Corresponding means of			
		Coleopterous		Neuropterous	Hemipterous	Dipterous		True spider	Total number	Predators : prey ratio	Temp. °C	RH. %	
		<i>C. septempunctata</i>	<i>C. undecimpunctata</i>	<i>P. affertii</i>	<i>C. carnea</i>	<i>O. leavigatus</i>	<i>S. corollae</i>						
Jan.,2016	1 st	25	0	0	0	0	0	0	0	0	0:25.0	14.4	50.0
	2 nd	66	2	0	0	0	0	0	0	2	1:33.0	15.7	60.0
	3 rd	90	3	0	2	0	0	0	0	5	1:18.0	14.3	53.4
	4 th	220	4	3	3	1	0	0	0	11	1:20.0	11.7	66.7
	Total	401	9	3	5	1	0	0	0	18	1:22.28		
Feb.,	1 st	352	8	8	5	6	0	3	0	30	1:11.73	13.0	67.5
	2 nd	524	6	6	7	8	0	6	2	35	1:14.97	14.9	57.2
	3 rd	419	5	5	5	5	3	7	4	34	1:12.32	20.3	46.4
	4 th	504	3	4	4	3	4	8	6	32	1:15.75	19.5	51.0
	Total	1799	22	23	41	22	7	24	12	131	1:13.73		
March,	1 st	711	12	10	8	12	6	12	10	70	1:10.16	22.4	49.5
	2 nd	509	8	8	6	10	5	7	7	51	1:9.98	20.5	48.7
	3 rd	389	6	6	3	13	6	8	5	47	1:8.28	21.8	43.0
	4 th	275	3	5	2	15	8	10	8	51	1:5.39	20.0	47.7
	5 th	248	2	3	2	16	10	12	9	54	1:4.59	21.6	43.8
	Total	2132	31	32	21	66	35	49	39	273	1:7.81		
April,	1 st	274	4	6	4	18	12	16	12	72	1:3.81	22.7	53.7
	2 nd	194	10	8	7	24	15	10	7	81	1:2.40	26.4	40.7
	3 rd	63	3	3	5	22	18	7	3	61	1:1.03	25.8	44.7
	4 th	5	0	2	0	18	7	5	0	32	1:0.16.0	28.2	36.4
	Total	356	17	19	16	82	52	38	22	246	1:45.0		
General total		4868	79	77	63	171	94	111	73	668			
Predators :prey ratio			1:61.62	1:63.22	1:77.27	1:28.47	1:51.79	1:43.86	1:66.68	1:7.29			

The maximum total monthly count of the predator, 82 individuals, was recorded during Mach. The lowest value, one individuals, was obtained during January. The mean of predator: prey ratio during the season was 1: 28.47.

In the second season (Table 5), the first appearance of the predator was detected in the 4th week of January with two individuals/ 461 aphids at means of 16.7°C and 63.2% RH. Its population increased gradually, reaching a peak of 14 predators / 1021 aphids in the first week of March at means of 21.3 °C and 58.2% RH. The maximum monthly total number, 38 green lacewing / 3566 aphids, was recorded during March, and the lowest one, six predators / 1602 aphids, occurred during January. The predators : prey ratio during the season was 1 : 150.59.

The mean number of the predator fluctuated during December and January, and increased gradually to reach its maximum during February and March, then decreased towards the end of the seasons, in April.

Many investigators mentioned that the important role of *C. carnea* in suppressing aphids population on wheat and maintaining them under the economic injury levels. El-Aish- Hana *et al.*, (2004) recorded *C. carnea* as main predator of cereal aphid on wheat and barley plants, El-Heneidy *et al.*, (2004) stated that the trend of the population density of the predators depends mainly on densities of aphids. Abd El-Megid *et al.*, (2007) stated that the highest number of the *C. carnea*, five individuals, was recorded during the 2nd week of March associated with 147 aphids. The number of the green lacewing decreased

gradually till disappeared completely at the end of the seasons.

Vandereycken *et al.*, (2015) revealed that *C.carnea* was recorded early in the season and played a substantial role in suppressing aphid populations and maintaining them below the economic injury level. The mean numbers of the predator per trap per week were 0.127 and 0.134 during two successive seasons of study. Ahmed *et al.* (2016) reported that the highest mean number population of *C. carnea* was seen on wheat (0.16) sown on 1st November, *C. carnea* appeared on wheat (0.07) during 2nd week of February which increased up to 0.30, respectively during 3rd week of March and then declined.

2. *Metasyrphus corolla* (Fabricius):

In the first season, the data obtained in Table (4) revealed that predator was detected during the period from the 1st week of February till the 4th week of April. The predator population appeared two peaks during the season. The first one, 12 individuals / 711 aphids, occurred in the 1st week of March, synchronized with the highest population of the aphid at mean of 22.4 °C and 49.5 % RH. The second peak, 16 predators/ 274 aphids, was recorded in the 1st week of April at means of 22.7 °C and 53.7 % RH. The highly total monthly count, 49 individuals, was obtained during March. The mean ratio of Predator : prey ratios during the season was 1:43.86.

Table 5. Seasonal abundance of aphidophagous insect predators in relation to cereal aphids, temperature and relative humidity on wheat plants cultivated in newly reclaimed sandy area at El- Khattara district, Sharkia Governorate during the second growing season of 2016-2017.

Weekly date of samples	Number of collected aphid	Number of collected predators								Corresponding means of			
		Coleopterous			Neuropterous	Hemipterous	Dipterous	True spider	Total number	Predators : prey ratio	Temp. °C	RH. %	
		<i>C. septempunctata</i>	<i>C. undecimpunctata</i>	<i>P. alferii</i>	<i>C. carnea</i>	<i>O. leavigatus</i>	<i>S. corollae</i>						
Dec.,2016 ,4 th	20	0	0	0	0	0	0	0	0	0	0:00.0	18.0	59.5
Total	20	0	0	0	0	0	0	0	0	0	0:00.0		
Jan., 2017 1 st	60	2	0	0	0	0	0	0	0	2	1:30.0	18.3	61.5
2 nd	133	3	1	0	0	0	0	0	0	4	1:33.25	17.2	60.2
3 rd	242	3	3	0	0	0	0	0	0	6	1:40.33	17.7	60.0
4 th	461	4	5	2	2	0	2	0	15	1:30.73	16.7	63.2	
5 th	706	5	7	3	4	0	2	0	21	1:33.62	16.3	60.1	
Total	1602	17	16	5	6	0	4	0	48	1:33.38			
Feb., 1 st	878	8	7	4	6	0	4	2	31	1:28.32	18.5	59.3	
2 nd	472	12	10	5	11	3	3	3	47	1:10.04	15.3	63.2	
3 rd	633	7	12	5	8	5	2	5	44	1:14.39	16.3	63.7	
4 th	782	5	16	6	6	6	2	7	48	1:16.29	18.5	59.3	
Total	2765	32	45	20	31	14	11	17	170	1:16.26			
March, 1 st	1021	15	18	17	14	12	6	8	90	1:11.34	21.3	58.2	
2 nd	845	13	12	8	10	18	8	6	67	1:12.61	19.9	63.3	
3 rd	782	10	9	6	8	7	5	4	49	1:15.96	19.2	62.1	
4 th	918	8	6	5	6	5	4	3	37	1:24.81	18.3	60.3	
Total	3566	46	45	36	38	42	23	21	243	1:14.67			
April, 1 st	1027	6	5	3	4	10	10	2	40	1:25.68	20.3	59.2	
2 nd	1503	3	0	2	3	8	8	0	24	1:62.63	20.0	53.9	
3 rd	1050	0	0	0	0	0	6	0	6	1:175.00	25.9	50.3	
4 th	490	0	0	0	0	0	0	0	0	0:490.00	22.3	53.9	
Total	4070	9	5	5	7	18	24	2	70	1:58.14			
May, 1 st	285	0	0	0	0	0	0	0	0	0:285.00	23.5	55.2	
2 nd	40	0	0	0	0	0	0	0	0	0:40.00	24.9	50.3	
Total	325	0	0	0	0	0	0	0	0	0:325.00			
General total	12348	104	111	66	82	66	62	40	531				
Predators :prey ratio		1:118.73	1:111.24	1:187.09	1:150.59	1:187.09	1:199.16	1:308.07	1:23.25				

In the second season, the data presented in Table (5) demonstrated that this predator was observed from the 4th week of January till the 3rd week of April. During this period, the predator population showed three peaks during the season. The first lower activity peak records four predators / 878 aphids in the 1st week of February at means of 18.5 °C 59.3 % R. H. The second and intermediate one,

eight predators / 845 aphids, was recorded in the 2nd week of March at means of 19.9 C and 63.3% R.H. The third peak records 10 predators/ 1027 aphids, was detected in the 1st week of April at means of 20.3 and 59.2% RH. The maximum total monthly counts 24 individuals/ 4070 aphids was recorded during April while the minimum value of four predators/ 1602 aphids was obtained during

January. The predator showed a mean ratio of one individual to 199.16 aphids during the season. Abd El-Megid *et al.* (2007) stated that the total monthly count of *M. corollae* was 15 and eight individuals during February and March, respectively. The mean of predator : prey ratio was 1: 55.22. Also, Ahmad *et al.*, (2016) reported that the highest mean number population of *M. corollae* was recorded on wheat (0.27) sown on 1st week of November. Syrphid flies appeared on wheat (0.04) during 2nd week of February and their mean number increased up to 0.70, respectively during 3rd week of March.

3. *Coccinella septempunctata* Linnaeus:

In the first season, the data obtained in Table (4) demonstrated that this predator was observed from the 2nd week of January to the 3rd week of April. The population fluctuated, showing three peaks. The first peak, eight predators/ 352 aphids, took place in the 1st week of February at means 13.0 °C and 67.59% RH. The second and highest one of 12 individuals /711 aphids, was found in the 1st, week of March at means of 22.4 °C and 49.5% RH. The third peak, 10 predators/ 194 aphids was obtained in the 2nd week of April at means of 26.4 °C and 40.7% RH. The highest total monthly number of 31 predators / 2132 aphids was recorded during March, while the lowest value of nine predators / 401 aphids, was noticed during January. The mean Predator prey ratio of *C. septempunctata* : aphids during the season was 1: 61.62.

As shown in Table (5) in the second season of study, the ladybird beetle was detected through the period from the 1st week of January to the 2nd week of April, showed two peaks of activity. The first one, 12 predators/ 472 aphids, was in the 2nd week of February at means of 15.3°C and 63.2 % RH. The second and highest peak, 15 predators / 1021 aphids, took place in the 1st week of March at means of 21.3°C and 58.2 % RH. The highly total monthly count of the predator, 46 individuals /3566 aphids, was found during March, while the minimum value, nine predators /4070 aphids, was obtained during April. The predator indicated a mean ratio of 1: 118.73 preys.

Khan *et al.*,(2003) stated that peak population of *C. septempunctata* in the middle of March, declined onward and came to a sudden end by the last week of April on wheat plants infesting with aphids. Also, Sajoqi *et al.* (2009) recorded the highest number of *C. septempunctata* during the 3rd week of March. The population of ladybird beetle started decline with the decrease in aphid population and in the last week of April the lowest population of the predator was recorded.

4. *Coccinella undecimpunctata* Linnaeus:

In the first season, as shown in Table (4), the predator was detected from the 4th week of January till the 4th week of April. Generally the predator population was fluctuated, showing three peaks. The first one showed eight predators/ 352 aphids in the 3rd week of February at means of 13.0 °C and 67.59% RH. The second peak with ten predators / 711 aphids, took place in the 1st week of March. The third one of eight predators/ 194 aphids, was recorded in the 2nd week of April at means of 26.4 °C and 40.71% RH. The maximum total monthly counts, 32 individuals / 2132 aphids, was recorded during March, while the

minimum value of three predators / 401 aphids was obtained during January. The predator showed a mean ratio of one individual to 63.22 aphids during the season.

In the second season (Table 5), the number of the predator was relatively higher as compared with that in the first season. The predator started to appear with one individual in the 2nd week of January, three weeks later after appearance of the aphid infestation. The predator population was fluctuated showing a distinct peak of 18 predators/ 1021 aphids, synchronized with that of the aphid in the 1st week of March at means of 21.3°C and 58.2% RH. The maximum monthly total counts of 45 predators occurred in February and March, while the lowest value of five predators/ 4070 aphids was recorded during April. The mean of predator : prey ratio during the season was 1: 111.24.

Abd El-Megid *et al.* (2007) stated that the maximum monthly total count of *C. undecimpunctata* was recorded during April. Meanwhile, the lowest value, one individual, was obtained during February. The mean of predator : prey ratio during the season was 1: 30.77. Ahmed *et al.* (2016) mentioned that the population of *C. undecimpunctata* was started on wheat crop sown on 15th October which gradually declined by subsequent sowing dates. The highest population of ladybird beetle was recorded on wheat crop sown on 1st November ranging from 0.15 which declined up to 0.07 in crop sown on 1st January.

5. Total number of aphidophagous predators in relation with aphid infestation :

Data of the first season (Table 4), indicated that the initial aphids infestation was recorded in the second week of January 2015, while the first record of the aphidophagous predators, two individuals, was in the 2nd week of January, one week later, at means of 15.7 °C and 60.00% RH. The population of the predators was fluctuated showed that three peaks. The first one took place in the 2nd week of February with count of 35 predators/ 524 aphids, synchronized with the peak of the aphid, at means of 14.9 °C and 57.2 % RH. The second peak of 70 individuals / 711 aphids was recorded in the first week of March at means of 22.4 °C and 49.57% RH. The third and highest one, 81 individuals / 194 aphids, took place in the 2nd week of April at mean of 26.4 °C and 40.7% RH. The maximum monthly total count, 273 predators / 2132 aphids was recorded during March, while the minimum one, 18 predators / 401 aphids, was obtained during January. The predators: prey ratio during the season showed a mean of 1: 7.29.

As shown in the second season (Table 5), the aphidophagous predators started to appear in the 1st week of January 2017 with count of two individuals, while the initial aphids infestation was recorded in the last week of December 2016, one week later. The number of the predators increased gradually, reaching its first peak in the 2nd week of February with value of 47 predators/ 472 aphids at means of 15.3°C and 63.2 % RH. The second peak of 90 predators / 1021 aphids, was recorded in the 1st week of March, synchronized with the peak of the aphids at means of 21.3°C and 58.2% RH. While the third peak 40 individuals / 1027 aphids, took place in the 1st week of April at means of 20.3°C and 59.2% RH. The maximum

Table 8. Parasitism percentages of aphids infesting wheat plants cultivated in newly reclaimed sandy area at El- Khattara district, Sharkia Governorate during 2015 – 2016 and 2016 - 2017 growing seasons.

Weekly date of samples	Number of				Parasitism %		Corresponding means of			
	collected aphids		emerged parasitoids				Temp. °C		R H%	
	2015-2016	2016-2017	2015-2016	2016-2017	2015-2016	2016-2017	2015-2016	2016-2017	2015-2016	2016-2017
Dec., 4 th	0	20	0	0	0.00	0.00	15.7	18.0	63.43	59.5
Total	0	20	0	0						
Mean					0.00	0.00				
Jan., 1 st 2016	25	60	0	0	0.00	0.00	14.4	18.3	50.00	61.5
2 nd	66	133	0	0	0.00	0.00	15.7	17.2	60.00	60.2
3 rd	90	242	0	0	0.00	0.00	14.3	17.7	53.43	60.0
4 th	220	461	5	0	2.27	0.00	11.7	16.7	66.71	63.2
5 th	-	706	-	8	-	1.13	-	16.3	-	60.1
Total	401	1602	5	8						
Mean					1.25	0.50				
Feb., 1 st	352	878	12	16	3.41	1.82	13.0	18.5	67.59	59.3
2 nd	524	472	25	12	4.77	2.54	14.9	15.3	57.29	63.2
3 rd	419	633	30	20	7.16	3.16	20.3	16.3	46.43	63.7
4 th	504	782	32	30	6.35	3.84	19.5	18.5	51.00	59.3
Total	1799	2765	99	78						
Mean					5.50	2.82				
Mar., 1 st	711	1021	35	40	4.92	3.92	22.4	21.3	49.57	58.2
2 nd	509	845	30	50	5.89	5.92	20.5	19.9	48.71	63.3
3 rd	389	782	25	36	6.43	4.60	21.8	19.2	43.00	62.1
4 th	275	918	32	40	11.64	4.36	20.0	18.3	47.71	60.3
5 th	248	-	38	-	15.32	-	21.6	-	43.86	-
Total	2132	3566	160	166						
Mean					7.50	4.66				
Apr., 1 st	274	1027	20	44	7.30	4.28	22.7	20.3	53.71	59.2
2 nd	194	1503	18	52	9.28	3.46	26.4	20.0	40.71	53.9
3 rd	63	1050	10	50	15.87	4.76	25.8	25.9	44.71	50.3
4 th	5	490	0	30	0.00	6.12	28.2	22.3	36.43	53.9
Total	536	4070	48	176						
Mean					8.96	4.32				
May, 1 st	-	285	-	16	-	5.61	-	23.5	-	55.2
2 nd	-	40	-	0	-	0.00	-	24.9	-	50.3
Total	-	325	-	16	-					
Mean						4.92				
General total	4868	12348	312	444						
General mean					6.41	3.60				

Table 9. Simple correlation and simple regression between weekly numbers of aphids and the numbers of emerged parasitoids on wheat plants in newly reclaimed sandy area at El-Khattara district, Sharkia Governorate during the two successive growing seasons, 2015-2016 and 2016-2017..

Seasons	r (Values)	b (Values)
First season (2015 – 2016)	0.830**	50.82
Second season (2016 -2017)	0.877**	76.840

**= Highly significant

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أنواع من النجيليات التي تصيب نباتات القمح ومقاتلاته الحشرية في منطقة الخطارة بمحافظة الشرقية - مصر محمد أحمد إبراهيم يوسف¹ ، شحته على محمد على لاشين² ولاء مجاهد محمد يوسف هلال¹ ¹ قسم وقاية النبات - كلية الزراعة - جامعة الزقازيق - مصر ² معهد بحوث وقاية النباتات - الدقى - مصر

اجريت تلك الدراسة بهدف حصر ودراسة الوفرة الموسمية لأنواع من النجيليات التي تصيب القمح والمقرسات والطفيليات الحشرية المرتبطة خلال موسمي ٢٠١٦/٢٠١٦ و ٢٠١٦/٢٠١٦ بالخطارة بمنطقة مستصلحة حديثا بمحافظة الشرقية. وقد أوضحت النتائج الاتي: يصيب القمح أربعة أنواع من من النجيليات هي : *Ropalosiphum padi* (Linnaeus), *Schizaphis graminum* (Rondani), *Ropalosiphum maidis* (Fitch) , *Macrosiphum (=Sitobion) avenae* (Fabricius). من النجيليات يصيب القمح من الأسبوع الأول من يناير حتى نهاية أبريل في الموسم الأول وتستمر الإصابة بالمن حتى الأسبوع الثاني من مايو خلال الموسم الثاني . سجلت أعلى تعدادات للمن في الأسبوع الأول من مارس والأسبوع الثاني من أبريل وبأعداد ٧١١ و ١٥٠٣ فرد / العينة في الموسمين الأول والثاني ، على التوالي . تم حصر ستة أنواع حشرية تتبع أربعة رتب وخمس عائلات كمقرسات مرتبطة بمن النجيليات التي تصيب نباتات القمح ، الأنواع التابعة لرتبة غمدية الأجنحة كانت الأكثر سيادة ، تلاها نوع تابع لرتبة شبكية الأجنحة بكثافة نسبية عامة ٤١.٧٠ و ٢١.١٠ % من العدد الكلي للمقرسات ، على التوالي. من بين كل الأنواع كانت الأنواع أسد المن الأخضر ، أبى العيد ذو الاحدى عشر نقطة و أبو العيد ذو السبع نقط الأكثر سيادة بنسب ٢١.١٠ ، ١٥.٦٨ و ١٥.٢٦ % من العدد الكلي للمقرسات الحشرية ، على التوالي كان متوسط نسب المقرسات الى المن ١ : ٦١.٦٢ و ١ : ١١٨.٧٣ في الموسمين الأول والثاني ، على التوالي. تم حصر خمسة أنواع من الطفيليات الغشائية الأجنحة كطفيليات مرتبطة بمن النجيليات هي : *Diaeretiella Haliday*, *Ephedrus sp.* , *Praon sp.* , *matricariae rapae* (M'Intosh), *Aphidius colemani* Viereck, *Aphidius* سيادة بكثافة نسبية عامة ٣٥.٣٢ و ٢٧.١٢ % على التوالي. أظهرت التقلبات في نسب التطفل الكلية ثلاث ذروات في الموسم الأول وذروتين في الموسم الثاني وكان متوسط نسبة التطفل في الموسم الأول أعلى نسبيا (٦.٤١ %) مقارنة بالموسم الثاني (٣.٦٠ %). وجد ارتباط موجب معنوي وموجب عالي المعنوية بين كلا من العدد الكلي للمقرسات والتعداد الأسبوعي للمن خلال موسمي الدراسة على التوالي ، كما وجد ارتباط موجب وعالي المعنوية بين عدد الطفيليات وعدد المن خلال موسمي الدراسة .