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Survey of Entomopathogenic Fungi and Parasitoids on Two Aphid Species on Wheat Crop in Gharbia Governorate, Egypt

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ABSTRACT

The present work was carried out during two successive wheat growing seasons, being 2015/16 and 2016/17 in three locations, Gharbia governorate to survey the cereal aphids and their natural enemies. Two cereal aphids were found: *Rhopalosiphum padi* (L.) occurred from December to April and *Sitobion avenae* (F.) was found during March and April. Two entomopathogenic fungi were isolated from the two cereal aphids. The fungus, *Lecanicillium lecanii* isolated from *R. padi* and the seasonal fungal incidence percentage were 4.35±0.43 and 7.28±2.1% in the two seasons. Also, the fungus *Erynia neoaphidis* isolated from *S. avenae* and the seasonal fungal incidence percentage were 7.28±2.1 and 8.0±0.88% in the two seasons, respectively. In addition to the last fungus isolated from *R. padi* for the second season and the seasonal fungal incidence percentage was 1.43±0.29%. Two primary aphid parasitoids were found in the two seasons: the first primary parasitoid was *Aphidius rhopalosiphi* and the seasonal percentage of parasitism on *R. padi* and *S. avenae* were 1.21±0.18 and 2.06±0.65% for the first season and 2.37±0.08 and 3.13±0.27% for the second season. The second primary parasitoid was *Praon volucre* and the seasonal percentage of parasitism on *R. padi* and *S. avenae* were 0.56±0.16 and 3.54±0.40% for first season and 1.63±0.35 and 4.20±0.36% for second season. The primary aphid parasitoids were attacked by three secondary parasitoids by the end of seasons on both aphid species except for *R. padi* parasitoids was found in the middel of the first season. It was observed that some aphid mummies not emerged to parasitoids on both aphid species on the two seasons except on the first season was not recorded on *R. padi* mummies. Results appeared the role of entomopathogenic fungi and aphid parasitoids as natural mortality factors of cereal aphids in Egypt.

Keywords: Entomopathogenic fungi, parasitoids, aphids, Wheat crop, Egypt.

INTRODUCTION

Wheat (Triticum aestivum L.) is the most important gramineaous crop in Egypt. Cereal aphids became serious pests attacking wheat plants in the field in Egypt (Abdel-Rahman et al., 2000 and Sigsgaard 2002). Rhopalosiphum padi (L.) and Sitoboin avenae are the more serious pests on cereal, causing damage to wheat and many crops (El-Heneidy et al., 1999 and Abdel-Rahman et al., 2006). The economic importance of aphids is attributed to their high reproductive potential. In addition, the increase acerage of wheat, barley and maize necessitate increased amounts of fertilizers rendered plants more favourable to aphid development (Suss and Colombo, 1982).

The entomopathogenic fungi are considered among the biological control agents against insect pests including aphids (Sewify, 1999 and Abdel-Rahman et al., 2006).

Primary parasitoids are frequently reported as major factors suppressing populations of cereal aphids and can cause sudden decline of dense populations (Feng et al., 1992 and Ali et al., 2001). Several authors reported on the influence of parasitoids on the population dynamics of cereal aphids among them (Zhang et al., 1999; El-Heneidy et al., 2001; Abou-Attia et al., 2003 and Neveen,Gadallah et al., 2017).

Therefore, the aim of the present study was to monitor seasonal abundance of aphid species and survey of entomopathogenic fungi and primary and secondary parasitoids of aphid species on wheat plants.

MATERIALS AND METHODS

1- Population size of aphid species

The present experiments was carried out at Gharbia governorate in three locations: these were Seperbia, Tanta, the experimental farm of El-Gemmieza Agricultural Research Station, El-Santa and Ebchawaiy, Qutour during two successive seasons of 2015/16 and 2016/17. In each location about 1/2 feddan was cultivated with wheat (Gemmieza 9 cultivar) by mid November during the seasons, all regular conventional agricultural practies were normally performed and no chemical insecticides were used during the study period. Weekly whole plant samples consisted of ten plants for each location were randomly selected from the December 1st to the end of the growing seasons at the mid of April in each location. Samples were completely picked with its roots, placed individually in paper bags and transferred to the laboratory, Faculty of Agriculture, Tanta University for examination. In each sample, different species of aphids were counted by fine hair-brush under binocular sterioscope to estimate the population of aphids. Specimens were collected in small glass vials containing 70% ethyl alcohol for identitication. Aphid species were identified by Institute of Plant Protection Research, Piercing – sucking insects Department, ARC. Giza.

2- Entomopathogenic fungi on aphids populations

Collected specimens were kept in paper bags, transferred to laboratory, spread on a sheet of white paper. Aphids species were identified and counted in the same day. For each sample, dead aphids of each species were washed in running water, immersed in 1% sodium hypochlorite for 30 second to remove external contamination, washed twice in sterile water and exposed to mycosis test as described by (Lacey and Brooks, 1997) in which dead insects were recorded and individually placed on filter papers saturated with water inside sterilized Petri dishes and maintained at 25± 2°C for 7 days and fungus growth was observed. Cadavers showing external growth of an entomopathogenic fungus were considered killed by the fungus. The entomopathogenic fungi isolates were confirmed from the Mycology Center, Faculty of science, Assiut University (AUMC).

3- Seasonal activity of aphid parasitoids

To determine the seasonal activity of both primary and secondary aphid parasitoids, mummies of each aphid species were collected and kept individually in small glass tubes (1x5cm.) covered with musillin

cloth until emergence of adult parasitoids. The species of parasitoids were identified and percentage of parasitism caused by parasitoids was calculated in each sampling date according to Feng *et al*., (1992) as follow:

$$\text{Mortality \%} = \frac{\text{Number of mummifed aphids}}{\text{Total number of aphids}} \times 100$$

Statistical analyses.

Computation was done using computer software Minitab 16.

RESULTS AND DISCUSSION

Data in Tables (1-2) show the population size of different aphid species and the incidence of entomopathogenic fungi isolates on wheat plants in three locations at El-Gharbia Governorate during two successive wheat-growing seasons of 2015/16 and 2016/17.

1- Population size of aphid species

1- The first season:

Data in Table 1 indicated that two aphid species were found during wheat-growing season of 2015/16: Birdcherry-oat aphid, *Rhopalosiphum padi* (L.) (Homoptera: Aphididae) and English Grain Aphid, *Sitobion avenae* (F.) (Homoptera: Aphididae). *R. padi* was found on the plants all over the season except the fourth week of February and the first two weeks of March and April with average total of 351.67±4.33 aphids sampled through the season. There were two peaks of *R. padi* 83.33±4.41 and 51.67±4.37 aphids on the first week of January and the fourth week of March, respectively. While *S. avenae* was found by the end of the season from the fourth week of February to the second week of April where 1786±99 aphids were sampled through the season. There was one peak of *S. avenae* 906±54.2 aphids on the fourth week of March.

2- The second season:

Two aphid species were found during wheat-growing season of 2016/17 in Table 2: *R. padi* was found on the plants all over the season except the first and fourth weeks of February with 1934±95.2 aphids sampled through the season. There were two peaks of *R. padi* 36.67±4.1 and 989.33±47.2 aphids on the fourth week of Decamber and the first week of April, respectively. While *S. avenae* was found on the end of the season from the fourth week of February to the second week of April in the second season with 2343±91 aphids were sampled through the season. There was one peak of *S. avenae* 1047±36.1 aphids on the first week of April.

Results agree with those of El-Heneidy (1991) who found that the aphid *R. padi* was the dominant species on wheat in upper Egypt. Also, Hafez (1994) found that *S. avenae* occurred on wheat during March and April in Qualiubia governorate and the infestation by *R. padi* extended from January to April.

2- Entomopathogenic fungi on aphids populations

1- The first season:

Data in Table 1 indicate that two entomopathogenic fungi on aphids populations were found during wheat-growing season of 2015/16: *Lecanicillium lecanii* R. Zare & W. Gams (Ascomycota : Sordariomycetes) and *Erynia neoaphidis* Remaudière and Hennebert (Zygomycetes: Entomophthorales). The fungus, *L. lecanii* was found on the aphid *R. padi* on wheat plants around the stem under the ground for one month from the fourth week of December to the thrid week of january. In spite of the fungus, *L. lecanii* was not isolated on the aphid *S. avenae*. The highest incidence percentage of *L. lecanii* was on the third week of January with 22.69±6.31 % and the seasonal fungal incidence percentage was 4.35±0.43%. While the fungus, *E. neoaphidis* was not isolated on the aphid *R. padi* but it was isolated on the aphid *S. avenae* on pneumatic parts of wheat plant for five weeks from the second week of March to the second week of April. The highest incidence percentage of *E. neoaphidis* was found on the second week of April with 30.50±7.06 % and the seasonal fungal incidence percentage was 7.28±2.1 %.

2- The second season:

Data in Table 2 indicate that two entomopathogenic fungi on aphids populations were found during wheat-growing season of 2016/17: The fungus, *L. lecanii* was found on the aphid *R. padi* around the stem of wheat plants under the ground for three weeks from the first to third week of January. The highest incidence percentage of *L. lecanii* was on the first week of january with 8.11±3.49 % and the seasonal fungal incidence was 0.16±0.01%. Also, the fungus, *L. lecanii* was isolated on the aphid *S. avenae* on pneumatic wheat plant parts for the last three weeks of the season. The highest incidence of *L. lecanii* was on the second week of April with 3.85±0.76% and the seasonal fungal incidence percentage was 1.43±0.29%. While the fungus, *E. neoaphidis* was not isolated on the aphid *R. padi* but was isolated on the aphid *S. avenae* on pneumatic wheat plant parts for the last five weeks of the season. The highest incidence of *E. neoaphidis* was found on the second week of April with 12.70±1.69 % and the seasonal fungal incidence percentage was 8±0.88 %.

Results agree with those of Ozino *et al*., (1988) who recorded the incidence of five pathogenic fungi on *S. avenae* collected from wheat, maize and barley in several areas of Piemonte, Italy. Specimens collected infected by *Erynia planchoniana* were 10-33.3%, by *Erynia neoaphidis* 3.3-32.4%, by *Verticillium lecanii* 6.7-16.7%, by *Fusarium oxysporum* 4.3-20% and by *F. tricinctum* 6.7-10%. Also, Eilenberg *et al*., (1996) recorded the infection of *R. padi* by three pathogenic fungi *Entomophthora planchoniana*, *Erynia neoaphidis* and *Conidiobolus obscurus* in winter wheat. In similar stduy, El-Shami (2001) found that the pathogenic fungi *Verticillium lecanii* and *Conidiobolus obscurus* were isolated from the aphid *R. padi* on wheat plants at the end of February and the beginning of March.

Table 1. Population size of two aphid species and the incidence of entomopathogenic fungi isolates on wheat plants in El-Gharbia governorate during 2015/16 season.

Sampling dates	Species of aphids					
	Rhopalosiphum padi			*Sitoboin avenae*		
	Mean of healthy aphids/10 plants	Entomopathogenic fungi species *Lecanicillium lecanii*		Mean of healthy aphids/10 plants	Entomopathogenic fungi species *Erynia neoaphidis*	
		Mean of infected aphids	% of infected aphids		Mean of infected aphids	% of infected aphids
1st week of Dec.	12±1.15	0	0	0	0	0
2nd week	11.33±1.45	0	0	0	0	0
3rd week	28.67±3.38	0	0	0	0	0
4th week	37±3.21	1±1	2.70±2	0	0	0
1st week of Jan.	83.33±4.41	4.33±0.88	5.2±0.82	0	0	0
2nd week	58.33±3.48	1.67±0.88	2.86±1.41	0	0	0
3rd week	39.67±2.91	9±1.53	22.69±6.31	0	0	0
4th week	17.67±2.60	0	0	0	0	0
1st week of Feb.	1.67±0.67	0	0	0	0	0
2nd week	3.33±0.33	0	0	0	0	0
3rd week	0.33±0.33	0	0	0	0	0
4th week	0	0	0	4.67±0.88	0	0
1st week of Mar.	0	0	0	39.33±2.6	0	0
2nd week	0	0	0	56.67±3.84	0.33±0.33	0.59±0.95
3rd week	7.67±2.03	0	0	107.33±7.84	1.33±0.66	1.24±0.57
4th week	51.67±4.37	0	0	906±54.2	9.67±3.48	1.07±0.31
1st week of Apr.	0	0	0	420.67±54.2	42±4.73	9.98±0.84
2nd week	0	0	0	251.33±4.5	76.67±25.1	30.50±7.06
Total	351.67±4.33	16±1.53	4.35±0.43	1786±99	130±29.1	7.28±2.1

Table 2. Population size of two aphid species and the incidence of entomopathogenic fungi isolates on wheat plants in El-Gharbia governorate during 2016/17 season.

Sampling dates	Species of aphids							
	Rhopalosiphum padi					*Sitoboin avenae*		
	Mean of healthy aphids/10 plants	Entomopathogenic fungi species				Mean of healthy aphids/10 plants	Entomopathogenic fungi species	
		Lecanicillium lecanii		*Erynia neoaphidis*			*Erynia neoaphidis*	
		Mean of infected aphids	% of infected aphids	Mean of infected aphids	% of infected aphids		Mean of infected aphids	% of infected aphids
1st week of Dec.	32±2.65	0	0	0	0	0	0	0
2nd week	25.33±3.76	0	0	0	0	0	0	0
3rd week	12.33±1.76	0	0	0	0	0	0	0
4th week	36.67±4.1	0	0	0	0	0	0	0
1st week of Jan.	12.33±1.33	1±0.57	8.11±3.49	0	0	0	0	0
2nd week	15.33±2.03	0.67±0.33	4.35±2.25	0	0	0	0	0
3rd week	25.33±2.91	1.33±0.33	5.26±1.88	0	0	0	0	0
4th week	2.33±0.33	0	0	0	0	0	0	0
1st week of Feb.	0	0	0	0	0	0	0	0
2nd week	1.67±0.33	0	0	0	0	0	0	0
3rd week	0.33±0.33	0	0	0	0	0	0	0
4th week	0	0	0	0	0	1.33±0.31	0	0
1st week of Mar.	3.33±0.66	0	0	0	0	5.33±0.66	0	0
2nd week	14±2.65	0	0	0	0	10±2.08	0.33±0.33	3.33±2.22
3rd week	38.67±3.18	0	0	0	0	91.67±6.64	3.33±2.4	3.64±2.14
4th week	404.67±50.7	0	0	4.33±0.33	1.07±0.06	379±32.1	16.33±1.45	4.31±0.65
1st week of Apr.	989.33±47.2	0	0	11±3.79	1.11±0.32	1047±36.1	65.33±6.94	6.24±0.52
2nd week	320.33±25.1	0	0	12.33±3.28	3.85±0.76	808.67±39.3	102.67±21.3	12.70±1.69
Total	1934±95.2	3±0.57	0.16±0.01	27.66±6.57	1.43±0.29	2343±91	187.99±29	8±0.88

3- Seasonal activity of aphid parasitoids

1- The first season:

Data in Table 3 illustrate the role of aphid parasitoids as a natural mortality factor of cereal aphids during wheat-growing season of 2015/16. Two primary aphid parasitoids were found in the two seasons: *Aphidius rhopalosiphi* De Stefani-Perez (Hymenoptera: Braconidae) and *Praon volucre* (Haliday) (Hymenoptera: Braconidae). The parasitoid *A. rhopalosiphi* was found on the aphid *R. padi* in the middle of season for one month from the third week of January to the second week of February. The highest percentage of parasitism by *A. rhopalosiphi* was on the first week of February with 30±14.5 % and the seasonal parasitism was 1.21±0.18%. Also, The parasitoid, *A. rhopalosiphi* was found on the aphid *S. avenae* in the last four weeks of the season. The highest percentage of parasitism by *A. rhopalosiphi* was on the third week of March with 7.51±1.67 % and the seasonal parasitism was 2.06±0.65%.

While the second primary parasitoid, *P. volucre* was found on the aphid *R. padi* in the mid season from the fourth week of January to the second week of February. The highest percentage of parasitism by *P. volucre* was caculated on the first week of February it was 20±7.64% and the seasonal parasitism was 0.56±0.16%. Also, The parasitoid, *P. volucre* was found on the aphid *S. avenae* in the last four weeks of the season. The highest percentage of parasitism by *P. volucre* was recorded on the third week of March resulted in 6.17±1.68 % and the seasonal parasitism was 3.54±0.04%.

Primary aphid parasitoids were attacked by three hymenopterous hyperparasitoids species as secondary parasitoids, namely *Alloxysta* sp. (Figitidae) ; *Syrphophagus aphidivorus* (Mayr) (Encyrtidae) and *Pachyneuron aphidis* (Bouché) (Pteromalidae). The secondary parasitoids were found on the aphid parasitoids of *R. padi* in the fourth week of January and the second week of February. The highest percentage of parasitism on aphid parasitoids by the secondary parasitoids was recorded on the second week of February, 6.67±6.67 % and the seasonal parasitism was 0.19±0.09%. Also, The secondary parasitoids were found on the aphid parasitoids of *S. avenae* in the last three weeks of the season. The highest percentage of parasitism on aphid parasitoids by the secondary parasitoids was on the second week of April with 4.46±0.98% and the seasonal parasitism was 1.50±0.45%. It was observed that some aphid mummies were not emerged to parasitoids: in case of *R. padi* was not recorded, while in case of *S. avenae* mummies which not emerged to parasitoids were on the first and second weeks of April with 0.81±0.29 and 0.62±0.02%, respectively and the seasonal percentage was 0.28±0.09%.

2- The second season:

Data in Table 4 demonstrate the role of aphid parasitoids as a natural mortality factor of cereal aphids during wheat-growing season of 2016/17. The parasitoid, *A. rhopalosiphi* was found on *R. padi* for the last five weeks, from the second week of March to the second week of April and the highest percentage of parasitism by *A. rhopalosiphi* was computed on the third week of March where 13.79±1.84 % and the seasonal parasitism was 2.37±0.08%. The parasitoid, *A. rhopalosiphi* was found on *S. avenae* in the second week of March and continued to the second week of April and the highest percentage of parasitism by *A. rhopalosiphi* was recorded on the fourth week of March, 9.12±1.29 % and the seasonal parasitism was 3.13±0.27%. While the second primary parasitoid, *P. volucre* was found on *R. padi* in the last five weeks and the highest percentage of parasitism by *P. volucre* was recorded on the second week of March where 13.21±3.22 % and the seasonal parasitism was 1.63±0.35%. Also, The parasitoid, *P. volucre* was found on the aphid *S. avenae* in the last four weeks of the season. The highest percentage of parasitism by *P. volucre* was on the first week of April with 6.71±0.57% and the seasonal parasitism was 4.20±0.36%.

Secondary parasitoids were found on the aphid parasitoids of *R. padi* in the last five weeks of the season. The highest percentage of parasitism on aphid parasitoids by the secondary parasitoids was recorded on the second week of April, 3.97±0.56% and the seasonal parasitism was 1.32±0.10%. Also, The secondary parasitoids were found on the aphid parasitoids of *S. avenae* in the last four weeks of the season. The highest percentage of parasitism on aphid parasitoids by the secondary parasitoids was on the first week of April with 2.26±0.14% and the seasonal parasitism was 2.06±0.10%. It was observed that some aphid mummies did not emerge as adult parasitoids: in the case of the aphid of *R. padi* were on the first and second weeks of April and in entire season was 0.07±0.04%. While *S. avenae* mummies non emergence occurred in the last three weeks and in the season and was 0.13±0.02%.

In a similar study, Feng *et al*., (1992) investigated the parasitoids of cereal aphids on wheat, barly and maize in south wastern Idaho, USA from 1986 to 1989 they identified six species of primary parasitoids and five species of hyperparasitoids from the mummies of seven species of aphids. Also, Hafez (1994) found that the parasitoids *Aphidius* sp. and *P. volucre* attaked aphids infesting wheat, the percentage of parasitism reached the highest level at the end of April. The hyperparasitoids *Alloxysta* sp. was found.

This study added to previous works which throw a light on the importance of entomopathogenic fungi and parasitoids as natural elements against cereal aphids especial *R. padi* and *S. avenae* on wheat plants. Accordingly it encourage to use this natural elements as bilogical control agents.

Table 3. Population size of two aphid species and their mortality by aphid parasitoids on wheat plants in El-Gharbia governorate during 2015/16 season.

Sampling date	Species of aphids															
	Rhopalosiphum padi							*Sitoboin avenae*								
	Mean of healthy aphids/10 plants	Parasitoid species						Mean of healthy aphids/10 plants	Parasitoid species							
		Aphidius rhopalosiphi		*Praon volucre*		Secondary			*Aphidius rhopalosiphi*		*Praon volucre*		Secondary		Non emerged	
		No.	%	No.	%	No.	%		No.	%	No.	%	No.	%	No.	%
1st week of Dec.	12±1.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2nd week	11.33±1.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3rd week	28.67±3.38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4th week	37±3.21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1st week of Jan.	83.33±4.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2nd week	58.33±3.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3rd week	39.67±2.91	1.33±0.33	3.36±1.03	0	0	0	0	0	0	0	0	0	0	0	0	0
4th week	17.67±2.60	1.33±0.33	6.67±2.65	0.67±0.33	3.33±1.84	0.33±0.33	1.67±1.67	0	0	0	0	0	0	0	0	0
1st week of Feb.	1.67±0.67	1±0.57	30±14.5	0.67±0.33	20±7.64	0	0	0	0	0	0	0	0	0	0	0
2nd week	3.33±0.33	0.67±0.33	13.33±5.95	0.67±0.66	13.33±9.52	0.33±0.33	6.67±6.67	0	0	0	0	0	0	0	0	0
3rd week	0.33±0.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4th week	0	0	0	0	0	0	0	4.67±0.88	0	0	0	0	0	0	0	0
1st week of Mar.	0	0	0	0	0	0	0	39.33±2.6	0	0	0	0	0	0	0	0
2nd week	0	0	0	0	0	0	0	56.67±3.84	0	0	0	0	0	0	0	0
3rd week	7.67± 2.03	0	0	0	0	0	0	107.33± 7.84	9.33± 1.76	7.51± 1.67	7.67± 1.76	6.17± 1.68	0	0	0	0
4th week	51.67± 4.37	0	0	0	0	0	0	906± 54.2	25.67± 3.84	2.62± 0.37	48.33± 8.69	4.93± 0.56	1± 0.57	0.10± 0.06	0	0
1st week of Apr.	0	0	0	0	0	0	0	420.67± 54.2	3.33± 0.88	0.74± 0.21	9.33± 2.40	2.08± 0.48	16± 5.69	3.53± 1.27	3.67± 1.2	0.81± 0.29
2nd week	0	0	0	0	0	0	0	251.33± 4.5	1.33± 0.88	0.50± 0.29	3± 0.57	1.12±. 08	12± 1.73	4.46± 0.98	1.67± 0.66	0.62± 0.02
Total	351.67± 4.33	4.33± 0.66	1.21± 0.18	2± 0.57	0.56± 0.16	0.67± 0.66	0.19± 0.09	1786± 99	39.67± 7.06	2.06± 0.65	68.33± 11.6	3.54± 0.40	29±7. 55	1.50± 0.45	5.33± 1.86	0.28± 0.09

Table 4 . Population size of two aphid species and their mortality by aphid parasitoids on wheat plants in El-Gharbia governorate during 2016/17 season.

Sampling dates	Species of aphids																	
	Rhopalosiphum padi									*Sitoboin avenae*								
	Mean of healthy aphids/ 10 plants	Parasitoid species								Mean of healthy aphids/10 plants	Parasitoid species							
		Aphidius rhopalosiphi		*Praon volucre*		Secondary		Non emerged			*Aphidius rhopalosiphi*		*Praon volucre*		Secondary		Non emerged	
		No.	%	No.	%	No.	%	No.	%		No.	%	No.	%	No.	%	No.	%
1st week of Dec.	32±2.65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2nd week	25.33±3.76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3rd week	12.33±1.76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4th week	36.67±4.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1st week of Jan.	12.33±1.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2nd week	15.33±2.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3rd week	25.33±2.91	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4th week	2.33±0.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1st week of Feb.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2nd week	1.67±0.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3rd week	0.33±0.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4th week	0	0	0	0	0	0	0	0	0	1.33±0.31	0	0	0	0	0	0	0	0
1st week of Mar.	3.33±0.66	0	0	0	0	0	0	0	0	5.33±0.66	0	0	0	0	0	0	0	0
2nd week	14±2.65	1± 0.57	7.14± 3.91	2.33± 0.33	13.21± 3.22	0.33± 0.33	1.89± 2.08	0	0	10± 2.08	0.33± 0.33	3.23± 2.22	0	0	0	0	0	0
3rd week	38.67±3.18	5.33± 1.45	13.79± 1.84	1.67± 0.33	3.60± 0.88	0.67± 0.66	1.44± 1.19	0	0	91.67± 6.64	2.67± 1.20	2.70± 1.11	3.67± 1.2	3.71± 1.13	0.67± 0.33	0.68± 0.31	0	0
4th week	404.67± 50.7	23.33± 4.10	5.77± 1.19	11.33± 2.85	2.56± 0.92	4± 1	0.90± 0.32	0	0	379± 32.1	41± 3.46	9.12± 1.29	22.33± 2.03	5.35± 0.67	7± 0.57	1.56± 0.08	0.33± 0.33	0.07± 0.06
1st week of Apr.	989.33± 47.2	17.33± 2.96	1.75± 0.21	17± 3.21	1.65± 0.37	8.67± 1.45	0.84± 0.10	0.33± 0.33	0.03± 0.03	1047± 36.1	26.67± 3.48	2.26± 0.25	77.33± 4.41	6.71± 0.57	26.67± 2.40	2.26± 0.14	2± 0.75	0.17± 0.04
2nd week	320.33± 25.1	1.33± 0.66	0.42± 0.20	1± 0.57	0.30± 0.15	13.33± 2.33	3.97± 0.56	1± 0.57	0.30± 0.15	808.67± 39.3	10.33± 1.86	1.23± 0.27	5.33± 1.45	0.64± 0.19	19± 1.53	2.25± 0.18	1± 0	0.12± 0.005
Total	1934± 95.2	48.33± 0.66	2.37± 0.08	33.33± 6.17	1.63± 0.35	27± 1.15	1.32± 0.10	1.33± 0.88	0.07± 0.04	2343± 91	81±4. 62	3.13± 0.27	108.67± 6.01	4.20± 0.36	53.33± 4.33	2.06± 0.10	3.33± 0.66	0.13± 0.02

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REFERENCES

Abdel-Rahman, M. A. A.; A. Y. Abdel-Mallek and G. H. A. Hamam (2006). A comparative abundance of entomopathogenic fungi of cereal aphids in Assiut, Egypt. Egypt. J. Biol. Pest. Control. 16(1/2):39-43.

Abdel-Rahman, M. A. A; M. A. K. Nasser and A. M. Ali (2000). Incidence of Hymenopterous parasitoids attacking cereal aphids in wheat filed in upper Egypt. Assiut J. Agric. Sci. 31(2): 317-328.

Abou-Attia, F. A., Boraei, H.A.; El-Agamy, F. M. and Salem, F. A.k. (2003). Survey and population fluctuation of primary and secondary parasitoids of some aphid species on flour crops and parasitoid of *Coccinella undecimpunctata* at Kafr El-Shaeikh. The first int. Egyptian Romanian Conf., Zagazig, Egypt, 61-76.

Ali, A.M.; Abdel-Rahman, M.A.A. and Ahmed, A.A. (2001). Host preference of some small-grain aphid parasitoids (Hymenoptera: Aphidiidae) in southern Egypt. International Symposium, Organic Agriculture in the Mediterranean Basin, Agadir-Maroc 7-10 October 2001, 492-503.

Eilenberg J.; Steenberg and C. Nielsen (1996). Natural occurrence of entomophthorales on cereal aphids: a comparison of prevalence studies and cadavers counts. Proceedings of the first joint meeting (of the working groups), Poznan, Poland, 27 August – 1 September.

El-Heneidy, A. H (1991). Seasonal abundance of aphids and their natural enemies in wheat fields in upper Egypt. Egypt. J. Biol. Pest Cont., 1(1): 5-10.

El-Heneidy, A. H; A. Hussian and M. El-Hariry (1999). Aphides and their natural enemies on wheat plants. Bull. Agric. Res. 3:492-516.

El-Heneidy, A. H; D. Donzalez; P. Stary; Dalia. A and M. A. El-Khawas (2001). Survey of primary and secondary parasitoid species of cereal aphids in Egypt. Egypt. J. Biol. Pest cont., 11: 193-194.

El-Shami I. A.(2001). Studies on biological control of some aphid species. PHD. Thesis, Fac. Agric., Minufiya Univ. Egypt. Pp 154.

Feng, M.G.; Johanson, J.D. and Halbert, S.E. (1992). Parasitoids (Hymenoptera: Aphidiidae and Aphelinidae) and their effect on aphid (Homoptera: Aphididae) populations in irrigated grain in southeastern Idaho. Environ. Entomol., 1433-1440.

Hafez, A. A. (1994). Increasing the role of biocontrol agents against cereal aphids infesting wheat in Qalubia-Egypt, Egypt. J. Biol. Pest Control, 4(2): 57-71.

Lacey, L. A. and W. M. Brooks (1997). Initial handling and diagnosis of diseased insects. In: Lacey, L.A. (Ed.), Manual of Techniques in Insect Pathology. Academic Press, San Diego, CA, pp.1–15.

Neveen S. Gadallah; A. H. El-Heneidy, Samar M. Mahmoud and N.G. Kavallieratos (2017). Identification key, diversity and host associations of parasitoids (Hymenoptera: Braconidae: Aphidiinae) of aphids attacking cereal crops in Egypt. Zootaxa 4312 (1): 143–154.

Ozino O. I.; Arzone and A. Alma (1988). Entomogenous fungi of *Sitobion avenae* (f.) in Piedmont cereal crops. Redia, 71:173-183.

Sewify, G. H. (1999). Evaluation of the entomopathogenic fungus *Beauveria bassiana* (Balsamo) Vuillemin for controlling three lepidopterous pests infesting maize in Egypt. Proceeding of the first regional symposium for applied biological control in Mediterranean countries, Cairo, Egypt, 1998. 203-210.

Sigsgaard (2002). A survey of aphids and aphid parasitoids in cereal fields in Denmark, and the parasitoids' role in biological control. Journal of Applied Entomology 126, 101-107.

Suss, L. and M. Colombo (1982). Cereal aphids. Informatore Fitopatologico, 32(6): 7-12.

Zhang, H.; Jianshe, L.I; Zhang, H.J. and Liang, Y.H. (1999). Studies on aphid host selection by parasite larvae of *Allothrombium ovatum* (Acari: Trombidiidae). System. Appl. Acarol., 4: 91-95.

حصر للفطريات الممرضة للحشرات والطفيليات علي نوعين من أنواع المَنْ بحقول القمح في محافظة الغربية بمصر

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تمت الدراسات الحالية خلال موسمي محصول القمح ٢٠١٥/٢٠١٦ و٢٠١٦/٢٠١٧ في ثلاث مناطق بمحافظة الغربية لحصر أنواع منْ الغلال واعدائها الطبيعية. حيث وجد نوعان من منْ الغلال وهما منْ الشوفان *Rhopalosiphum padi* (L.) وجد علي القمح من ديسمبر حتي ابريل ومنْ الغلال الانجليزي *Sitobion avenae* (F.) وجد خلال شهري مارس وابريل. تم عزل نوعان من الفطريات الممرضة للحشرات من علي نوعي المنْ. تم عزل الفطر *Lecanicillium lecanii* من علي منْ الشوفان *R. padi* وكانت نسبة تواجد الفطر السنوية ٤.٣٥±٠.٤٣ و ٧.٢٨±٢.١ % في كلا الموسمين. ايضا تم عزل الفطر *Erynia neoaphidis* من حشرة منْ الغلال الانجليزي *S. avenae* وكانت نسبة تواجد الفطر السنوية ٧.٢٨±٢.١ و ٠.٨٨±٨ % في كلا الموسمين علي التوالي بالاضافة الي انه تم عزله من منْ الشوفان *R. padi* في الموسم الثاني وكانت نسبة تواجد الفطر السنوية ٠.٢٩ ±١.٤٣% . كما وجد طفيليات اولية علي المن في كلا الموسميين: الطفيل الاول كان *Aphidius rhopalosiphi* وكانت نسب التطفل السنوية علي منْ الشوفان *R. padi* ومن الغلال الانجليزي *S. avenae* هي ١.٢١±٠.١٨ و ٢.٠٦±٠.٦٥ % للموسم الاول و ٢.٣٧±٠.٠٨ و ٣.١٣±٠.٢٧ % للموسم الثاني. وكذلك وجد الطفيل الاولي الثاني *Praon volucre* وبلغت نسب التطفل السنوية علي منْ الشوفان *R. padi* ومنْ الغلال الانجليزي *S. avenae* ٠.٥٦±٠.١٦ و ٣.٥٤±٠.٤٠ % للموسم الاول و ١.٦٣±٠.٣٥ و ٤.٢٠±٠.٣٦ % للموسم الثاني.وقد وجد ان طفيليات المنْ الاولية تهاجم بثلاث طفيليات ثانوية في نهاية الموسمين لنوعي المنْ ما عدا طفيليات منْ الشوفان *R. padi* بالموسم الاول حيث وجدت في منتصف الموسم. كما لوحظ بعض مومياوات المنْ التي لم يخرج منها طفيليات بكلا نوعي المنْ بكلا الموسمين فيما عدا الموسم الاول لم يسجل علي مومياوات منْ الشوفان *R. padi* . تظهر هذه النتائج دور الفطريات الممرضة للحشرات وطفيليات المنْ كعوامل موت طبيعية علي منْ الغلال في جمهورية مصر العربية.