INCIDENCE OF CEREAL APHIDS AND SEASONAL ABUNDANCE OF THEIR PARASITOIDS IN WHEAT FIELDS IN SOHAG (UPPER EGYPT)

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Abstract: Field experiments were conducted at Shandaweel Agric. Res. Station, Sohag, A.R.C. Incidence of cereal aphids and their associated parasitoids on wheat variety Sakha 93 were studied during two successive seasons of 2003/2004 and 2004/2005. Results indicated that wheat plants were infested by 4 cereal aphids as the oat aphid, *Rhopalosiphum padi* (L.), the greenbug, *Schizaphis graminum* (Rond.), the corn leaf aphid, *Rhopalosiphum maidis* (Fitch) and the english grain aphid, *Sitobion avenae* (F.).

R. padi was the most dominant cereal aphids followed by *S. graminum*, *R. maidis* and *S. avenae* during 2004 and 2005 seasons. The cereal aphids started to appear on January 20th and 25th during 2004 and 2005 seasons, respectively, and their population increased to the maximum level on March 16th and 22nd during 2004 and 2005 seasons. The population then decreased to reach its lowest level on April 6th and 3rd during 2004 and 2005 seasons, respectively, till they vanished completely from wheat plants on April 13th and 10th during 2004 and 2005 seasons, respectively. Five species of aphid parasitoids were identified during the two seasons. Recorded parasitoids were *Diaretiella rape* (M'Intosh), *Praon spp.* (Mackauer), *Aphidius colemani* (Viereck), *Aphidius matricariae* (Haliday) and *Trioxys spp*. The first and second parasitoid were the most dominant, however, *A. colemani*, *A. matricariae* and *Trioxys spp* were the least dominant parasitoids. The high percentage of parasitism was noticed in March for the all parasitoids, whereas, the lowest percentage of parasitism was observed in February during both seasons. Regarding seasonal abundance to these parasitoids. *D. rape* and *P. necans* were occurred from the first of February to the end of third week of March during both seasons. *A. matricariae* was observed from 10 to 15th February to the end of third week of March during two years. However, *A. colemani* was noticed from 10-22 February till the third week of March during both seasons. *Trioxys spp* was distributed with very few numbers from the end of first week of March till the end of this month.

Statistical analysis of multiple regression indicated that parasitoids and plant age, in 2004 season, and parasitoids, maximum temperature and then the age of the plant, in 2005 season played the most important role in controlling cereal aphid populations in wheat fields.

Key words: cereal aphids, parasitoids, wheat.

Introduction

Aphids are the important insect pests attacking wheat plants causing considerable reduction in the yield and the grain quality (Tantawi 1985 and El-Heneady *et al.*, 1990). The damage of aphids to wheat is a result of sucking the plant sap producing honeydew on which sooty moulds grow and the availability of transmission plant viruses (Jones and Jones, 1974).

Wheat plants are infested with *R. padi*, *S. graminum*, *R. maidis* and *S. avenae* (Abdel-Rahman, 1997). The important role of parasitoids as a bio-control agents in wheat fields mentioned by El-Heneidy and Attia (1989), Ibrahim (1990), El-Heneidy (1991), Ibrahim and Afifi (1991). Abdel-Rahman *et al.* (2000), Ali *et al.* (2001), Dalia Abd Alla (2002), Nassef *et al.* (2002) and Abou-Attia *et al.* (2003). Therefore, the goal of this study was to study the incidence of four cereal aphid species and their seasonal abundance of their parasitoids in Sohag (upper Egypt), and then to clarify the effect of plant age, parasitoids, temperature and relative humidity on the occurrence of these pests during the two successive wheat growing seasons of 2003/2004 and 2004/2005 in wheat fields.

Materials and Methods

This study was conducted at Shandaweel Agric. Res. Station, Sohag during two successive seasons 2003/2004 and 2004/2005. An area of about ½ feddan was divided into six equal plots. Seeds of the wheat variety Sakha 93 were planted in rows on 25th November 2003 and 27th November 2004. All normal agricultural practices were used. The area was kept free of any insecticide sprays. Random sample of 60 tillers (10 tillers/plot) were inspected weekly. Sampling started from January to late April.

Regarding with the parasitoids weekly samples consisted of 200 living cereal aphids were randomly collected from infested wheat plants and transferred to the laboratory for parasitism determination. The emerged parasitoid adults were identified in the Department of Biological Control Research at the Plant Protection Research Institute.

Dominance (%) was estimated according to Facylate (1971), whereas percentage of parasitism was calculated according to Feng *et al.* (1992) and Wraight *et al.* (1993) as (number of mummies / total number of alive aphids) x 100.

The meteorological data of temperature as well as the averaging relative humidity were recorded at each inspection date. Records were obtained from the Meteorological Station at El-Minsha region, Sohag Governorate.

The relationships between the population of cereal aphids and the meteorological factors as well as the parasitoids and the age of the plant, within the inspected periods were

analyzed by using multiple regression analysis.

Results and Discussion

1- Incidence of cereal aphid species on the new wheat variety (Sakha 93):

As shown in Table (1), the new wheat variety (Sakha 93) was infested with four cereal aphids species i.e., *R. padi, S. graminum, R. maidis* and *S. avenae* during 2004 and 2005 seasons. The general picture of the population of cereal aphids in 2005 season was higher than 2004 season (4132.4 individuals/tiller).The results also show that the initial infestation of cereal aphids occurred on 20th and 25th January (5.3 and 9.1 individuals/tiller) during 2004 and 2005 seasons, respectively, and increased gradually to reach its peak on March 16th and 22nd (699.3 and 1058.8 individuals / tiller) during 2004 and 2005 seasons,

Table(1): Average number and percentages of cereal aphid species infesting wheat plants during 2004 and 2005 seasons.

Sampling date	Avg. No. aphids / tiller				Total
	R. padi	*S. graminum*	*R. maidis*	*S. avenae*	
2004 season					
Jan. 20	5.3	0.0	0.0	0.0	5.3
Jan. 27	3.8	0.0	1.1	0.0	14.9
Feb. 3	30.1	0.0	2.3	0.0	32.4
Feb. 10	45.3	5.3	3.4	0.0	54.0
Feb. 17	80.2	36.2	10.4	0.0	126.8
Feb. 24	140.7	50.4	20.4	2.1	213.6
March 2	155.3	70.4	35.7	7.6	269.0
March 9	290.7	95.3	8.1	10.5	404.6
March 16	460.4	222.3	2.3	14.3	699.3
March 23	210.2	80.4	0.0	2.1	292.7
March 30	170.4	45.3	0.0	0.0	215.7
April 6	56.3	20.2	0.0	0.0	76.5
April 13	0.0	0.0	0.0	0.0	0.0
Total	1658.7	625.8	83.7	36.6	2404.8
%	69	26	3.5	1.5	100
2005 season					
Jan. 25	9.1	0.0	0.0	0.0	9.1
Feb. 1	40.8	9.3	5.7	0.0	55.8
Feb. 8	70.6	26.4	9.9	0.0	106.9
Feb. 15	100.2	66.7	33.2	0.0	200.1
Feb. 22	180.7	96.3	49.1	0.3	326.4
March 1	220.3	140.7	8.3	5.1	374.4
March 8	350.3	298.3	1.1	9.2	658.9
March 15	577.3	350.4	0.0	13.6	941.3
March 22	611.2	430.2	0.0	17.4	1058.8
March 29	210.4	75.4	0.0	2.3	288.1
April 3	69.3	43.3	0.0	0.0	112.6
April 10	0.0	0.0	0.0	0.0	0.0
Total	2440.2	1537.0	107.3	47.9	4132.4
%	59	37.2	2.6	1.2	100

respectively. The results also indicated that *R. padi, S. graminum, R. maidis* and *S. avenae* represented 69 and 59%, 26 and 37.2%, 3.5 and 2.6% and 1.5 and 1.2% of grand total, respectively in 2004 and 2005 seasons. The population then decreased to reach its lowest level (76.5 and 112.6 individuals/tiller) on April 6th and 3rd during 2004 and 2005 seasons, respectively. These results are similar to El-Heneidy and Attia (1989), who mentioned that the most dominant cereal aphids on wheat plants were *R. padi* followed by *S. graminum, R. maidis* and *S. avenae*. Also, Alhag *et al.* (1996) in Saudia Arabia referred that *R. padi* and *S. graminum* were the most abundant cereal aphids in wheat fields, whereas *R. maidis* and *S. avenae* existed in low densities. Similarity, Nassef *et al.* (2002) and Mahmoud (2005) found that *R. padi* and *S. graminum* were the most dominant cereal aphid species.

2.Seasonal abundance of aphid parasitoids in wheat fields:

Data in Table (2) indicated that 5 associated parasitoids of cereal aphids in wheat plants were surveyed i.e., *Diaretiella rape, Praon spp., Aphidius matricariae, Aphidius colemani* and *Trioxys spp.* The most dominant parasitoids were *D. rape* and *P. spp.* (41.5-40.2% and 25.8-27.3% dominance) during 2004 and 2005 seasons, respectively. However, the percentage of dominance of other remain parasitoids i.e., *A. maticariae, A. colemani* and *Trioxys spp.* were (18.0-17.8%), (12.0-11.2%) and (2.7-3.5%) during 2004 and 2005 wheat seasons, respectively. Therefore, *D. rape* and *P. spp.* were the most efficient parasitoids species as biological control agents for their highest value, of dominance.

Regarding the population fluctuations and percentage of parasitism of the 5 parasitoids, data showed that the first case of parasitism was observed during the first week of February (3.5-2.0%) up to third week of March with a percent parasitism of (58.0-90.5%) during 2004 and 2005 seasons, respectively. Maximum parasitism (58.0-90.5%) was found on 16-15th March during two seasons, respectively. *D. rape* was observed from 3rd to 1st February (2.5-2.0% parasitism) up to the 23-22 March (20.0-25.5% parasitism) during 2004 and 2005 seasons, respectively. Maximum parasitism was observed from 16-15 March (25-32.5% parasitism) during 2004 and 2005 seasons, respectively. *P. spp.* was observed from 3-8 February (1.0-2.5% parasitism) to 23-22 March (9.0-16.5 % parasitism), maximum parasitism was observed from 9-15 March (17-20.5% parasitism) during 2004 and 2005 seasons, respectively. *A. matricariae* detected from 10-15 February with a percent parasitism (1.5-0.5 %) up to 23-22 March with a percent parasitism (5.5-7.5%) during 2004 and 2005 seasons, respectively. Maximum parasitism was observed on 9-15 March with a percentage

parasitism (12.5-16.5 %) during 2004 and 2005 seasons, respectively. *A. colemani* was observed from 10-22 February with a percent parasitism (0.5-1.5 %) up to 23-22 February with a percent parasitism (3.5-4.5%) during 2004 and 2005 seasons, respectively. However, maximum parasitism was found from 9 to 15 March with a percentage parasitism (9.0-12.0 %) during 2004 and 2005 seasons, respectively. *Trioxys spp.* distributed from 8-9 March during both seasons.

El-Hariry (1979) identified three parasitoids i.e., *D. rape, Aphidius colemani* and *A. matricariae* in wheat field in Beni Suef, Egypt. El-Heneidy (1991) surveyed *D. rape, Aphidius spp., Trioxys spp.* and *Praon spp.* in Upper Egypt. He also added that highest parasitism percentage was on March. Ibrahim and Afifi (1991) found that the maximum rate of mummification was 11-30% on wheat plants infested with *S. avenae*. Hussein (1993), in Syria stated that the rate of parasitism in wheat field varied between 7% and 17%. Elliott *et al.* (1995) found that the average percentage of parasitized aphids to *S. graminum* was 96%. The same observations were recorded by Nassef *et al.* (2002), who identified three species of aphid parasitoids i.e. *Aphidius matricariae, A. coleman* and *Praon spp.* in wheat fields in Kafr El-Sheikh, Egypt. They also noticed that the high percentage of parasitism was on February and March and it was in harmony with the highest period of aphid infestation. The same observations were recorded by Abdel-Samad and Gomaa (2004) in El-Fayoum, Egypt who found that *D. rape, P. necans* and *Aphidius colemani* started at low density in the second week of January and reached the maximum at the end of February, then declined towards the end of the season. Also, the same observations were recorded by Abdel-Rahman (2005) in Assiut, Egypt.

3- Effect of certain variable factors affecting the population density of cereal aphids infesting wheat plants during 2004 and 2005 seasons:

The data in Table (3) show the multiple regression analysis of the relation between the population density of cereal aphids and the weather factors, as well as the age of the wheat plant and total number of parasitoids. Simple correlation analysis revealed that all the variables factors during 2004 and 2005 seasons were positive and the only factor, which was highly significant was total parasitoids during 2004 season. However, the age of the wheat plant, total parasitoids, maximum temperature and the minimum temperature were highly significant except for minimum temperature was significant during 2005 seasons, whereas the average relative humidity was insignificant.

The multiple regression analysis revealed that the five studied variables were responsible for 92.45 and

99.36% of the changes in cereal aphid populations during 2004 and 2005 seasons, respectively. Most of the changes in pest populations were due to the parasitoids and the age of wheat plant during 2004 season, while, in 2005 season, most of the changes due to the parasitoids, maximum temperature and the age of wheat plant.

The obtained results generally indicated that the parasitoids and the age of wheat plant during both seasons played the most important role in regulating cereal aphids populations. Abou-Elhagag and Abdel-Hafez (1998) mentioned that natural enemies (predators and parasitoids) played the most important role in controlling cereal aphid populations in wheat fields in upper Egypt.

Table(3): Multiple regression analysis between total number of cereal aphids and three variables of weather records as well as plant ages and total number of parasitoids during 2004 and 2005 seasons.

Variable removed	r	R	R^2 x 100	Decrease in R^2 x 100	Efficiency
2004 season					
None	--	0.9615**	92.45	--	--
Plant age (days) X_1	0.3822	0.9430**	88.93	3.52	4.047
Parasitoids X_2	0.9325**	0.4518	20.41	72.04	82.856
Max. temp. (C°) X_3	0.2415	0.9568**	91.56	0.89	1.019
Min. temp. (C°) X_4	0.3603	0.9466**	89.60	2.85	3.267
Avg. R.H (%) X_5	0.2604	0.9557**	91.35	1.10	1.261
2005 season					
None	--	0.9968**	99.36	--	--
Plant age (days) X_1	0.7543**	0.9963**	99.27	0.90	1.666
Parasitoids X_2	0.9930**	0.9707**	94.24	5.12	90.24
Max. temp. (C°) X_3	0.7153**	0.9951**	99.03	0.33	5.780
Min. temp. (C°) X_4	0.6751*	0.9963**	99.27	0.09	1.631
Avg. R.H (%) X_5	0.5252	0.9968**	99.36	0.00	0.026

r = Simple correlation coefficient. R = Multiple correlation coefficient.
R^2 = Coefficient determination. * = Significant at 0.05 level.
** = Significant at 0.01 level.

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تواجد من النجيليات والوفرة الموسمية لطفيلياته فى حقول القمح فى سوهاج (مصر العليا).

فرغل أحمد على سلمان
معهد بحوث وقاية النباتات ـ مركز البحوث الزراعية ـ دقى ـ جيزة

أقيمت تجارب بمحطة البحوث الزراعية بشندويل ـ محافظة سوهاج ـ جمهورية مصر العربية خلال موسمى 2004/2003 ، 2005/2004م لدراسة تواجد من النجيليات و طفيلياته فى حقول القمح صنف سخا93 .

ولقد أشارت النتائج إلى ما يلى :-

تصاب نباتات القمح بأربعة أنواع من المن وترتب حسب سيادتها كالتالى : -

1- من الشوفان *Rhopalosiphum padi* (L.)
2- من الغلال *Schizaphis graminum* (Rond.)
3- من أوراق الذرة الشامية *Rhopalosiphum maidis* (Fitch)
4- من الحبوب *Sitobion avenae* (Fab.)

وكان أكثر كثافة عددية هو من الشوفان تلاه من الغلال ثم من أوراق الذرة الشامية ثم من الحبوب خلال موسمى 2004 ، 2005م . وقد وجد أن حشرات المن تبدأ فى الظهور من 20 – 25 يناير خلال موسمى 2004 ، 2005 ، ثم يبدأ المجموع فى الزيادة حتى يصل لأقصى كثافة عددية من 16 – 22 مارس خلال موسمى 2004 ، 2005على التوالى ويأخذ تعداد حشرات المن بعد ذلك فى التناقص حتى يختفى تقريباً من نباتات القمح من 13 – 10 أبريل خلال موسمى 2004 ، 2005 على التوالى .

وفيما يتعلق بطفيليات المن فقد تم حصر خمسة أنواع من الطفيليات وهى حسب سيادتها كالتالى:-

1. *Diaretiella rape* (M'Intosh)
2. *Praon spp.*
3. *Aphidous matricariae* (Haliday)
4. *Aphidous colemani* (Viereck)
5. *Trioxys spp.*

ويعتبر النوع الأول والثانى ذاتا أهمية إقتصادية فى مجال المكافحة الحيوية نظراً لأعدادهما الوفيرة . وقد لوحظ أن أعلى نسبة مئوية للتطفل بالنسبة لكل الطفيليات كانت فى مارس وكانت أقلها فى فبراير خلال الموسمين . وبالنسبة للوفرة الموسمية لهذه الطفيليات فقد لوحظ أن الطفيل الأول والثانى يتواجدا خلال الأسبوع الأول من فبراير حتى الأسبوع الثالث من مارس خلال الموسمين . وبلانسبة للطفيل الثالث فقد لوحظ من 10-15 فبراير حتى نهاية الأسبوع الثالث من مارس خلال الموسمين . وبالنسبة للطفيل الرابع فقد لوحظ من 10-22 فبراير حتى الأسبوع الثالث من مارس خلال الموسمين. وبالنسبة للطفيل الخامس فقد إنتشر من نهاية الأسبوع الأول من مارس حتى نهاية الأسبوع الأخير من هذا الشهر ولكن بأعداد قليلة .

وقد أظهرت نتائج التحليل الإحصائى للانحدار المركب أن الطفيليات وعمر النبات عام 2004 وكذلك الطفيليات ودرجة الحرارة الصغرى وعمر النبات عام 2005 تعتبر من أهم العوامل التى تلعب دوراً فعالاً فى التأثير على تعداد حشرات المن فى حقول القمح .