

## ECOLOGICAL STUDIES ON CEREAL APHID *SCHIZAPHIS GRAMINUM* (RONDANI) ON WHEAT PLANTS AND ASSOCIATED NATURAL ENEMIES IN FAYOUM GOVERNORATE

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### ABSTRACT

*S. graminum* (Rondani) activity on wheat at Fayoum Governorate was evident from the 1<sup>st</sup> week of Feb. to mid May with two peaks. The first peak of infestation occurred at the early of April, with 90 and 49 aphids/10 plants during 2000/2001 and 2001/2002 seasons, respectively. Also, five species of predators and three species of parasitoids were recorded in association with this aphid. *C.undecimpunctata* and *C.carnea* were the dominant predators during the activity period from mid Mar. to mid April. On the other hand the parasitoids, *Aphidius* sp. was the most common species, followed by *Aphelinus* sp. and *Diaeretiella rapae*. The major weather factors (max. temp., min. temp. and RH.) showed insignificant effect on population of aphid , predators and parasitoids.

**Key words:** Wheat, Aphid, Natural enemies.

### INTRODUCTION

Aphids cause qualitative and quantitative damage to wheat plantation not only in Egypt but also in many parts of the world, (Rabe *et. al.* 1989, El-Heneidy and Attia 1991, Ali *et. al.* 1999 and Mannaa 2000). The parasitoids and predators attacking cereal aphids are important factors to be considered in an Integrated Pest Management (IPM) program (s). The reported parasitoid species are *Diaeretiella rapae* (M'ntosh), *Aphidius* spp. and *Aphelinus* sp. (Sary, 1976 and Alhag *et al.* 1996). Several publications reported the effect of parasitoids on the population dynamics of cereal aphids abroad (Feng *et al.* 1992 and Pike *et. al.* 1997), while the main predators associated with aphids on wheat plants are *Coccinella undecimpunctata* L., *Orius albidipennis* Reuter., *Paederus alfieri* Koch., *Syrphus* spp and *Chrysopelo carnea* Steph. (Ibrahim and Afifi 1991 and Hesler *et al.* 2000). An overall evaluation of the role of natural enemies in Integrated Pest Management of cereal aphids in Fayoum is unavailable, therefore the present study is an approach to evaluate the role of parasitoids and predators in wheat fields during the seasonal occurrence of aphids.

### MATERIAL AND METHODS

The present study was carried out in Dar- El Ramad experimental farm, El-Fayoum Faculty of Agriculture, in half feddan during the two seasons of 2000/2001 and 2001/2002, This area was divided into 4 sections, 400 m<sup>2</sup> each (66 m. long x 6 m wide) and was cultivated with wheat of Sakh 69 variety during two planting dates, i.e., Nov. 25 and Dec. 14. The normal agricultural practices were applied without using any pesticides. Survey of cereal aphids and the associated natural enemies were made during the two growing seasons, at regular interval of 15 days. Sampling started four weeks after sowing and continued until wheat harvest.

Two sampling methods were applied; a) Sweeping with a net 30 cm. diameter and 60 cm., deep at 100 strokes/sample/kirat); and b) examination of whole plant 10 randomly selected plant / each plant date of sample.

The collected samples were kept, in polyester bags, taken to the laboratory, the aphids and the associated natural enemies were identified, then counted. The relationships between the population densities of aphids, natural enemies and certain weather factors were established. These factors were maximum, minimum temperature and daily relative humidity. Data obtained were statistically analyzed (Sendecor and Cochran 1990).

## RESULTS AND DISCUSSION

### 1) Population fluctuation of cereal aphid, *S. graminum*:

Data presented in tables (1 & 2) and Fig. (1 & 2) showed that the cereal aphid, *S. graminum* had 1-2 peaks during the two seasons 2000/2001 and 2001/2002. The infestation of wheat plants with *S. graminum* appeared in few numbers and reached a 1<sup>st</sup> peak (34 aphids/10 plants) in March 5. Population slightly decreased, then increased and reached a 2<sup>nd</sup> peak (90 aphids/10 plants) in April 2 (2000/2001). In 2001/2002 season few numbers of aphids were recorded during the period from early Feb. to late Mar., then population increased to 1<sup>st</sup> peak (49 aphids/10 plants) in April 4.

### 2) Natural enemies associated with cereal aphid *S. graminum*

Predators and parasitoids collected from wheat plants which existed in association with cereal aphids are shown in table (3). Five insect predators belonging to five families and four orders; namely *Coccinella undecimpunctata*, *Paederus alfieri*, *Orius albidipennis*, *Syrphus* ssp. and *Chrysopela carnea* were found. The parasitoids belonging to one order and one family, namely *Aphidius* sp, *Aphelinus* sp. and *Diaeretiella rapae* were also recorded. These results are in general agreement with those observed by Manna (2000), who recorded the same species of predators.

### 3) Population fluctuation of predators:

As shown in tables (2 and 3) and Fig. (1), the population density of predators per 100 strokes on wheat plants during the 1<sup>st</sup> season (2000/2001) began with low numbers (2 individuals.) in Feb 19. Then the numbers increased reaching a peak (64 individuals.) in April 2, and the population of the predators gradually decreased till mid.- May.

The data clearly show that *C. undecimpunctata* and *C. carnea* were found to be dominant species during the period from mid.- March to mid April, with a peak (23 individuals) for *C. undecimpunctata* in March 19 and (13 individuals) for *C. carnea* and *Syrphus* spp. in April 2.

In the second season (2001/2002) the total number of predators increased gradually from Feb.7 to mid May with one peak (62 individuals) in Apr. 4.

*C. undecimpunctata* was the most common species during this season with total number (80 individuals) and one peak (34 individuals) in Apr.4 (table 2 and fig. 2). On the other hand, *Orius albidipennis* and *Paederus alfieri* were found at lowest population in the 2<sup>nd</sup> season (23 and 18 individuals) respectively.

**Table 1**

**Table 2**

**Fig. 1, 2**

**Table (3): Classification of natural enemies collected from wheat plants cultivated during two seasons (2000 /2001 and 2001/2002).**

<b>Order</b>	<b>Family</b>	<b>Scientific name</b>
<b><i>a) predators:</i></b>		
Coleoptera	Coccinellidae	<i>Coccinella undecimpunctata</i> L.
	Staphylinidae	<i>Paedrus alfieri</i> Kock.
Hemiptera	Anthocoridae	<i>Orius albidipennis</i> (Reuter)
Diptera	Syrphidae	<i>Syrphus</i> spp.
Neuroptera	Chrysopidae	<i>Chrysopela carnea</i> Steph.
<b><i>b) parasitoids:</i></b>		
Hymenoptera	Aphidiidae	<i>Aphidius</i> sp.
		<i>Aphelinus</i> sp.
		<i>Diaeretiella rapae</i> M .

#### 4) Population fluctuation of parasitoids:

In the 1<sup>st</sup> season (2000/2001), the total number of parasitoids started with few numbers during Feb. 19 and March 19 (1-2 individuals), then the population of parasitoids increased and reached a peak (24 individuals) in Apr.16. *Aphidius* sp. was the most common species of parasitoids during this season (21 individuals). *Aphidius* sp. started to appear in Feb.19. The highest parasitoids (13 individuals) were found during mid-April. (table 1 and fig. 1). In the 2<sup>nd</sup> year (2001/2002) the total number of parasitoids was higher than that of the 1<sup>st</sup> season (2000/2001). It began to appear from Feb.7 to mid- May with a peak (14 individuals) in Apr. 4. Also, *Aphidius* sp. was the most common species among all parasitoids found. This species started to appear in the last Feb. reaching a peak (10 indiv.) on Apr.4, then the number of this parasitoid decreased till the end of this season (2001/2002). On the other hand, the other parasitoids (*Aphelinus* sp. and *D. rapae*) appeared in few numbers during the 2<sup>nd</sup> season (12 and 11 individuals, respectively).

#### 5) Correlations between experimental insects and weather factors:

As for statistical analysis during the two seasons (2000/2001) and (2001/2002), the simple correlation values of max. temperature, min. temp. and R.H were insignificant on aphid, predators and parasitoids. While the effect of predators was highly significant ( $r = 0.968^{**}$  and  $0.913^{**}$ ) in the 1<sup>st</sup> season (2000/2001) and in the 2<sup>nd</sup> season 2002, respectively on aphid. Also the effect of parasitoids were significant ( $r = 0.643^{*}$ ) in the 1<sup>st</sup> season (2000/ 2001) on aphid numbers.

Ibrahim and Afifi (1991) and Ali *et al.*, 1997 reported that the fluctuation of aphid number occur due to the effect of natural enemies. Also El-Heneidy and Attia (1988), stated that the highest rates of aphid infestation were observed during March. Populations of aphidphagous predators increased gradually towards the end of the season and reach their maximum during April. Also the highest percentages of parasitism were estimated during March.

#### REFERENCES

- Alhag, E.A.; Al-Rokaibah, A.A. and Zaitoon, A.A. (1996):** Natural enemies of cereal aphids in sprinkler – irrigated wheat in central Saudi Arabia. Bull. Fac. Agric., Univ. Cairo, 47: 4, 649-663.
- Ali, A.M.; Darwish, Y.A.; Khalil, F.M .and Abdel-Rhman, M.A.A. (1999):** Effect of certain cultural practices for controlling cereal aphids on wheat plants in Upper Egypt. Conf. On "Strategy for Safe Agriculture Production in Arab Countries", Cairo Uni., Cairo, Egypt, 27–29 Oct.,1, 628–637.
- El-Heneidy, A.H. and Attia, A.A. (1991):** Evaluation of the role of parasitoids and predators associated with aphids in wheat fields, Egypt. Bull. of the Entomol. Society of Egypt, Econo. Ser. 1988–1989, publ.1991, No.17, 137–147.
- Feng. M.G.; Johanson, J.B. and Halbert, S.E. (1992):** Parasitoids (Hymenoptera: Aphidiidae and Aphelinidae) and their effect on aphid (Homoptera: Aphididae) populations in, irrigated grain in southwestern Idaho. Environ. Entomol. 21: 1433– 1440.

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- Hesler, L.S.; Kieckhefer, R.W. and Evenson, P.D. (2000):** Abundance of cereal aphids (Homoptera: Aphididae) and their predators in spring wheat. alfalfa intercrops under different crop management intensities. Great-lakes-Entomologists. 33:1,17-31.
- Ibrahim, A.M.A. and Afifi, A.I. (1991):** Seasonal fluctuations of English grain aphid *Sitobion avenae* (Fab.) (Hom: Aphididae) on wheat and its primary parasitoids and hyperparasitoids in Giza Governorate, Egypt. Bull. Fac. Agric., Univ. Cairo, 42: 167 -182.
- Mannaa, S.H. (2000):** Cereal aphids on wheat in new valley: Natural enemies, seasonal activity of a late forms and susceptibility of certain varieties to natural infestation. Assiut J. Agric. Science, 31: 2, 287-297.
- Pike, K. S.; Stary, P.; Miller, T.; Allison, D. and Boydston, L. (1997):** Small – grain aphid parasitoids (Hymenoptera: Aphelinidae and Aphidiidae) of Washington : Distribution, relative abundance, seasonal occurrence, and key to known north American species. Environ. Entomol. 26: 1299-1311.
- Rabe, E.C.; Westhuizen, M.C; Van der Hewitt, P.H.; Van der Westhuizen, M.C.: and Vander Westhuizen, M.C. (1989):** Aspects of the ecology of the wheat aphids *Rhopalosiphum padi* and *Schizaphis graminum* in South Africa . Phytophylactica. 21: 2, 165 – 169.
- Sendecor, G. W.; and Cochran, W. G. (1990):** Statistical Methods. Iowa state, College Press. Iowa, USA.
- Stary, P. (1976):** Parasite spectrum and relative abundance of parasites of cereal phids in Czechoslovakia (Hymenoptera: Aphidiidae; Homoptera: phidoidea). Acta Entomol. Bohemoslav, 73: 216. 223.

دراسات أيكولوجية لمن القمح علي نبات القمح وأعدائها الطبيعية في الفيوم

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أجريت هذه الدراسة علي نباتات القمح في الفيوم خلال موسمين ٢٠٠٠/٢٠٠١، ٢٠٠١/٢٠٠٢ بهدف دراسة فترات تواجد من القمح علي نبات القمح واهم الأعداء الحيوية الموجودة عليه. وقد أظهرت النتائج المتحصل عليها أن فترات الإصابة بالمن خلال الأسبوع الأول من فبراير وحتى منتصف مايو. بالإضافة إلي ظهور ٥ أجناس من المفترسات تقع تحت ٥ عائلات وأربع رتب تهاجم المن.

وكذلك يهاجم المن ثلاث أنواع من الطفيليات وكان أكثرهم انتشاراً طفيل *Aphidius sp*.