

(ISSN) 1110-1571

EGYPTIAN JOURNAL OF APPLIED SCIENCE

Vol. (10), No. (1)

January

1995

**EDITED AND PUBLISHED BY THE EGYPTIAN
SOCIETY OF APPLIED SCIENCE IN
COLLABORATION WITH
ZAGAZIG UNIVERSITY**

STUDIES ON THE POPULATION DENSITIES OF
APHIDS AND THEIR NATURAL ENEMIES IN
WHEAT FIELDS OF EGYPT

by

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ABSTRACT

Studies on the population densities of aphids and their natural enemies in wheat fields were carried out at Shandaweel (Sohag), Sedis (Beni-Suef), and Zagazig (Sharkia) for two successive growing seasons; 1991/92 and 1992/93.

Rates of aphid infestation, mean number of aphids/plant, number of predators and percentage of parasitism were estimated weekly in the three working sites. The highest population of aphids was observed during February and March, while the maximum number of predators and maximum rate of parasitism were recorded during March and April.

Mostly, a sharp decline in the number of predators (61-100%) and in the percentage of parasitism was found after insecticidal applications. High level of aphid infestation was recorded at Zagazig (Sharkia), which might reflect wheat aphid problem in Delta unless an integrated pest management programme is developed.

INTRODUCTION

Aphid represent the major insect pest of wheat in Egypt (El-Hariry, 1979, Tantawi, 1985a, b and El-Heneidy, 1991). Yield loss due to aphid infestation was estimated as maximum as 23% in Middle and Upper Egypt (Ghanem et. al., 1984; Tantawi, 1985b and El-Heneidy et. al., 1991). Recently, similar levels of aphid infestation

have been observed by the authors in some Governorates of the Delta, particularly, in Sharkia and Dakahlia.

Current practice of aphid control in wheat fields still depends on chemical control, regardless to its harmful effect on the environment and especially on the role of natural enemies (El-Heneidy et. al., 1991).

The present investigation was carried out to study the population densities of wheat aphids and their associated predators and parasitoids. the role of these beneficial insects and effect of insecticides on aphids and their natural enemies in wheat fields under regular government control programmes in three different agro-ecosystems, representing Upper, Middle and Lower Egypt. Such study, might assist in development and implementation of an integrated pest management programme in wheat fields in Egypt.

MATERIALS AND METHODS

The present study was carried out for two successive seasons (1991/92 and 1992/93) in wheat fields at two locations during the first season i.e. Shandaweel Res. Station (Sohag Governorate, Upper Egypt) and Seds Res. Station (Beni - Suef Governorate, Middle Egypt). During the second season, Zagazig district (Sharkia Governorate, Lower Egypt) was considered beside the other two locations.

An area of about 5 feddāns of wheat plantation was selected in each location for sampling. Weekly samples were collected and examined throughout each growing season, starting from January (early incidence of aphid infestation in wheat fields) until May, (the harvest time) at the three studied sites. Yield was estimated at harvesting time in all considered fields.

Aphid infestation:

Twenty five wheat plants were weekly selected at random from each location for aphid population count. Rate of aphid infestation was estimated weekly by examining 100 randomized wheat plants/location according to the relative categories as follows: 0: no infestation, 1: light infestation, 2: moderate infestation and 3: severe infestation.

Natural enemies:

Predatory species were determined by direct count on 100 wheat plants and recorded weekly. Samples of infested wheat plants were collected and transferred to the laboratory for estimating the percentage of parasitism by dissecting 100 randomized living aphids/location.

Insecticidal applications:

Each location of the three studied wheat fields received two insecticidal sprays except at Zgazig where only one treatment was applied mostly during March using Malathion.

RESULTS AND DISCUSSION

APHID INFESTATION

1- Aphid Species:

Four species of aphids; Rhopalosiphum padi L., R. maidis F., Shizaphis graminum R., and Sitibion avenae F. were recorded on wheat plant in the three Governorates during the two considered seasons. R. padi seemed to dominate the other aphid species in all wheat fields under investigation.

2- Rate of Aphid Infestation :

Data presented in Tables 1, 2, 3 and illustrated in Fig.1 indicate the following:

- The occurrence of aphid species was first observed by mid-January at Shandaweel (Upper Egypt), while it delayed to late January at Seds and Zagazig (Middle and Lower Egypt), respectively.

- The highest rates of aphid infestation were recorded at Shandaweel during February (47% in the fourth week and 16% in the third week during the two seasons, respectively) and continued relatively high in 1991/92 season only (Table 1).

- At Seds, the highest rates of aphid infestation were observed during the fourth week of February in 1991/1992 and during the second week of March in 1992/1993 showing percentages of 45 and 27, respectively (Table 2).

- At Zagazig, the highest rates of aphid infestation during 1992/1993 season were noticed during the third week of February and the first week of April recording 16% and 15%, respectively (Table 3).

3- Number of Aphids / Wheat Plant:

Data summarized in Tables 1,2,3 and presented graphically in Fig.2 indicate that the highest mean numbers of aphids/plant were found at Shandaweel during March and February in 1991/92 and 1992/93 seasons, respectively. They reached a peak of 29.8 aphids/plant during the second week of March in the first season and 25.0 aphids/plant in the 3rd. week of February during the second one.

- At Seds, the highest mean numbers of aphids/plant were recorded during the second half of March in the two seasons with a maximum of 31.2 aphids/plant in 1991/92 and 28.2 aphids/plant in 1992/1993.

Table 1: Population density of aphids and their natural enemies in wheat fields at Shandaweel Res. Station (Upper Egypt) during 1991/92 and 1992/93 seasons.

Sampling week	% infested plants		Mean no. of aphids per plant		No. of predators per 100 plants		% parasitism per plant	
	1992	93	1992	93	1992	93	1992	93
Jan. 1	0	0	0.0	0.0	0	0	0	0
2	0	1	0.0	0.0	0	0	0	0
3	2	2	1.2	0.0	0	0	0	0
4	11	12	2.8	5.3	0	3	0	0
Feb. 1	37	9	13.8	16.8	8	2	0.8	4.5
2	21	12	11.4	17.3	16	5	2	9.7
3	32	16	15.2	25.0	19	6	4	2.0
4	47	14	18.6	11.3	20	12	4	4.4
Mar. 1	35	13	16.1	13.5	12	18	6*	1.0*
2	34	0	29.8	0.0	11	3	9	0.0
3	32	6	21.0	8.4	30	6	12	5.5
4	15	4	24.8	19.5	45	13	7	21.3
Apr. 1	4	4	7.3	14.0	30	18	0*	23.0*
2	22	5	4.4	7.8	41	11	1	20.7
3	23	3	3.2	0.0	39	23	0	7.2
4	5	3	0.2	0.0	27	11	0	0.0

Grain yield 1993

Ardab/feddan

10

* Date of insecticidal application.

Table 2: Population density of aphids and their natural enemies in wheat fields at Seds Res. Station (Middle Egypt) during 1991/92 and 1992/93 seasons.

Sampling week	% infested plants		Mean No. of aphids/plant		No. of predators/100 plants		% parasitism	
	1992	93	1992	93	1992	93	1992	93
Jan. 1	0	0	0.0	0.0	0	0	0	0
2	0	0	0.0	0.0	0	0	0	0
3	3	0	0.6	0.0	0	0	0	0
4	2	10	0.4	2.5	0	0	0	0
Feb. 1	0	7	0.0	6.3	0	0	0	0
2	8	14	1.6	22.5	0	7	0	1.3
3	25	19	20.6	20.5	0	9	3	9.8
4	45	4	17.6	4.3	4	0	4	0*
Mar. 1	32	13	20.4	10.5	14	4	4	0
2	31	27	7.0	17.9	12	8	2*	4.5
3	38	19	24.5	28.2	29	13	5	2.9
4	23	2	31.2	1.6	51	2	7	0
Apr. 1	6	6	11.4	6.8	32	13	1*	6.0
2	13	5	3.8	7.7	30	16	1	0
3	15	3	2.4	0.0	31	15	0	0
4	2	0	0.6	0.0	32	10	0	0

Grain yield 1993

Ardab/feddan

10

* Date of insecticidal application.

- At Zagazig, the highest mean number of aphids/plant (85.5) was noticed during the second week of March in 1992/93 season. This mean number represents the highest peak of infestation among the three studied Governorates.

From the results obtained, it could be stated that the highest level of aphids population in wheat fields mostly occurred during March in the three locations, especially during the last three weeks.

NATURAL ENEMIES

1- Predators:

Data shown in Tables 1, 2, 3 and illustrated in Fig.3 represent the total number of predators in wheat fields. The common aphidophagous predators counted were; coccinellids, chrysopids, anthocorids, syrphids and true spiders. Among these group of predators, coccinellids and the true spiders were the most abundant species associated with aphid infestations on wheat plants.

- In both seasons, it was noticed that the number of predators increased towards the end of the season in the three locations. Relatively moderate numbers of predators were presented in wheat fields in April during the two growing seasons (Fig.3).

Generally, the numbers of predators were relatively lower during the second season, (1992/93) than during the first one (1991/92) and this may be due to the changes in the environment conditions prevailing in the regions.

2- Parasitoids:

- As shown in Tables 1, 2, 3 and Fig.4, it is obvious that the highest percentage of parasitism was recorded during March and April in

the three locations to coincide with the population level of aphids infestation. The highest level of parasitism occurred at Shandaweel and Zagazig locations, especially in the second season recording percentages of 25.0 and 19.3 during the first week of April in the two locations, respectively.

EVALUATION OF INSECTICIDAL EFFECT ON APHIDS AND THEIR NATURAL ENEMIES IN WHEAT FIELDS :

- In most cases, a sharp decline in the number of predators (ranged between 61-100%) was recorded after the insecticidal application (Tables 1, 2, 3). Similar trends were also observed with regard to the percentage of parasitism which was reduced with values ranged between 20-100%.

These declines in the number of predators and the percentage of parasitism reflect the harmful effect of insecticidal treatments on the natural enemies and suppressing their appreciated role in controlling aphids in wheat fields as well as in many other crops.

Fast recovery of aphid population after the insecticidal application, indicates that these treatments were uneffectively applied and/or some kind of aphid resistance to the insecticide was developed. This could be attributed, among other factors, to the dependance on Malathion as the only recommended insecticide to control aphids in wheat fields, and the unreasonable time of insecticidal application.

GRAIN YIELD

Grain yield of the three studied fields was only estimated in the second season. Ten 9 and 18 Ardab/ feddan were yielded at Shandaweel, Seds and Zagazig, respectively. The lowest grain yield obtained at Shandaweel shows that the second spray was not suitable. This due to

Table 3: Population density of aphids and their natural enemies in wheat fields at Zagazig district (Lower Egypt) during 1992/93 seasons.

Sampling week	% infested plants	Mean no. of aphids/plant	No. of predators /100 plants	% parasitism
Jan. 1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	2	2.3	1	0
Feb. 1	9	1.5	0	0
2	12	25.0	0	16.7
3	16	22.8	3	6.5
4	12	21.5	4	2.2
Mar. 1	13	25.4	17	7.2
2	13	85.5	20	16.3*
3	1	0.0	7	0.0
4	9	11.7	15	3.0
Apr. 1	18	22.0	15	19.3
2	11	12.8	16	11.8
3	6	5.0	24	9.0
4	5	2.3	15	0.0
Grain yield 1993 Ardab/feddan				18

* Date of insecticidal application.

Fig.1: Ave. % of aphid infestation on wheat plants at Shandaweel, Seds and Zagazig during 1991/92 & 1992/93 seasons

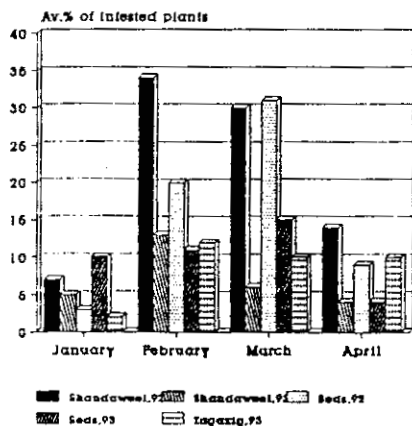


Fig.2: Ave. No. of Aphids/wheat plant at Shandaweel, Seds and Zagazig during 1991/92 & 1992/93 seasons.

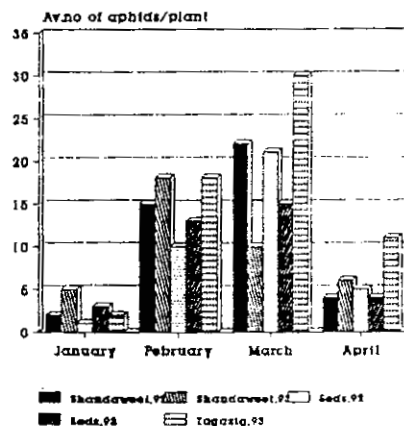


Fig.3: Ave.No. of predators/100 wheat plants at Shandaweel, Seds & Zagazi during 1991/92 and 1992/93 seasons.

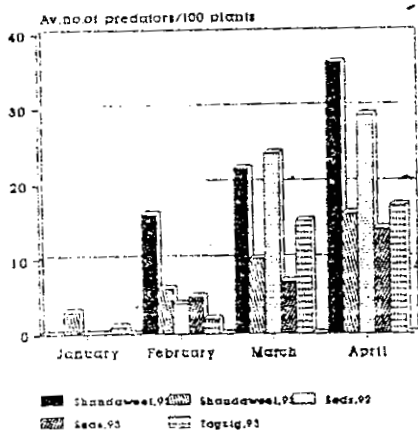
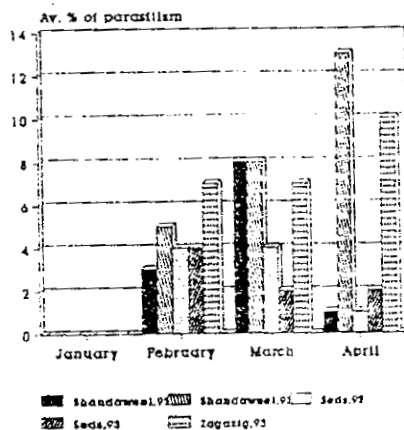


Fig.4: Ave.% of parasitism on wheat aphids at Shandaweel, Seds & Zagazi during 1991/92 and 1992/93 seasons.



the fact that the use of insecticides against aphids after the wheat ripening stage is not recommended since it does not affect yield increase and for its residues in wheat grains.

CONCLUSION

It could be concluded that aphid infestation has become a serious problem in Delta and Lower Egypt to be more or less at the same level of importance in Upper and Middle Egypt. Out of the data obtained throughout the two growing seasons, it has to be mentioned that biological control agents; mainly predators and parasitoids play an important role in maintaining and controlling aphid population in wheat fields. However, insecticidal treatment - if needed - should be minimized to the lowest number of applications and to the lowest dose. The timing of treatment is considered as a critical factor in order not to disturb the natural balance.

Accordingly, an integrated pest management programme in wheat fields should be urgently developed in order to control aphids, maintain natural enemies and gain high crop yield.

REFERENCES

- EL-HARIRY, A.M.1979. Biological and ecological studies on aphids attacking corn and wheat in Egypt. M.Sc. thesis, Fac. of Agric., Ain Shams Univ., Egypt.
- EL-HENEIDY, A.H.,1991. Seasonal abundance of aphids and their natural enemies in wheat fields in Upper Egypt. Egypt Jour. Biol. Pest Cont.1(1): 5 - 10.
- EL-HENEIDY, A.H., Y.H. FAYAD and M.A. SHOEB,1991. Influence of insecticidal application on aphid population and their natural enemies in wheat fields. Egypt Jour. Biol. Pest Cont. 1(2): 79 - 85.
- GHANEM, E.H., A.M. TANTAWI, A. ABDEL-SHAFI, R.MATKES and A.F.EL-SAYED, 1984. Assesment of losses in wheat grain yield due to aphid infestation. 2nd. General Conf.Giza Egypt, April 9-11.
- TANTAWI. A.M., 1985a. Studies on wheat aphids in Egypt. I. Surveys.RACHIS, 4(2):25-26.
- TANTAWI.A.M.,1985b. Studies on wheat aphids in Egypt.II.Germplasm evaluation and crop loss assesment.RACHIS, 4(2) : 26-27.

دراسات على الكثافة العددية للممن و أعداده الجوية في حقول القمح في مصر

أحمد حسين الهندي
بجى حسين قياض
قسم بحوث مكافحة الحويبة - معهد بحوث وقاية النباتات - مركز البحوث الزراعية

الجيزة - ج . م . ع

تم خلال موسمي زراعة القمح 1991/1992، 1992/1993 إجراء دراسات على الكثافة العددية للممن و أعداده الجوية في حقول القمح بكل من محطة البحوث الزراعية بشندويل (سوهاج) ومحطة البحوث الزراعية بسدس (سى شريف) و مركز الزقازيق (الشرقية) و قد قدر أسويًا معدلات الإصابة سائلًا و متوسط أعداد أفراد الممن على النبات، و أعداد القترسات، و نسب التطفل على الممن بكل من المناطق الثلاث تحت الدراسة. و قد سجلت أعلى معدلات للإصابة بالممن خلال شهري فبراير و مارس، بينما أوضحت الدراسة أن أعلى معدلات التطفل و أعلى تعداد للمقترسات قد سجلت خلال مارس و أبريل كما دلت الدراسة على حدوث إختصاص حاد في أعداد القترسات و نسب التطفل تراوحت بين 61-100% بعد البرش بالتبديد مباشرة.

كذلك أوضحت الدراسة الحالية وجود مستوى عالي من الإصابة بالممن في حقول القمح بمركز الزقازيق بمحافظة الشرقية؛ مما يعكس تطور مشكلة الممن في حقول القمح و تزايدها حديثًا بمنطقة الدلتا بعد أن كانت محصورة في سقنقى مصر الوسطى و العليا. مما يوجب إعداد برنامج مكافحة متكاملة لهذه الآفة بأسرع وقت ممكن.