

Seasonal Occurrence of the Aphid Parasitoid, *Aphidius colemani* Viereck (Hymenoptera: Aphidiidae) in Middle Delta, Egypt.

'H. M. Sobhy, *A. H. El-Heneidy *S. M. N. Abd-El Wahed and 'W. Z. A. Mikhail

'Institute of African Research and Studies, Cairo University, Giza, Egypt.

*Plant Protection Research Institute, ARC, Giza, Egypt.

ABSTRACT

Survey and seasonal occurrence of aphid parasitoid species, particularly *Aphidius colemani* Viereck, (Hym.: Aphidiidae) associated with aphid species on wheat plants were carried out in two Governorates; Gharbia and Menofia, Egypt for the two wheat seasons 2000/01 and 2001/02. The survey revealed the presence of the primary parasitoid species; *Aphidius colemani* Viereck, *A. matricariae* Haliday, *Diaeretiella rapae* McIntosh, *Praon necans* Mackauer, *Ephedrus persicae* Froggatt, *Aphidius* spp., and *Aphelinus* spp., and the hyperparasitoid species; *Alloxysta* spp., and other cynipids, pteromalids, and *Dendrocerus* spp. associated with different cereal aphid species in wheat fields. In both areas; Kafr El-Zayat (Gharbia) and El-Shuhada (Menofia), total numbers of primary and secondary parasitoids were higher in the second season 2001/02 than in the first season 2000/01. Percentages of *A. colemani* were generally higher during the first season than those of the second season. Among the surveyed primary parasitoid species, the total percentage of *A. colemani* reached 13.4 and 21.7 % in the first season, compared to 13.6 and 12.5 % in the second season at Kafr El-Zayat and El-Shuhada, respectively.

Key Words: Seasonal Occurrence, Aphid Parasitoid, *Aphidius colemani*, Middle Delta, Egypt

INTRODUCTION

Aphids (Homoptera: Aphididae) are the serious insect pests attacking wheat plants, not only in Egypt but also in many other countries. Aphids are also efficient vectors of different strains of plant viruses. Damage to the crop caused by aphids was estimated by up to 23%, particularly in Upper Egypt, where the highest infestation mostly occurs (Tantawi, 1985 and El-Heneidy *et al.*, 1991). Parasitoid species are mostly specific on a single or certain group of insect hosts. Aphidiids form the major part of the primary parasitoid spectrum of aphids. As well, the aphelinids form another small group of these primary parasitoids of aphids (Stary, 1976).

Aphidius colemani Viereck (Hymenoptera: Aphidiidae) is one of the most important primary parasitoid species of aphids. The host range of *A. colemani* is quite wide. Significant differences in the host range and preference for particular host species occur in some areas of its distribution range (Stary, 1975).

The present study focused on survey and seasonal occurrence of aphid parasitoid species, particularly *A. colemani*, associated with cereal aphid species on wheat plant in the Middle Delta of Egypt.

MATERIALS AND METHODS

Samples from wheat plants infested with cereal aphid species mainly; *Rhopalosiphum padi* L, *Shizaphis graminum* Rondani, *Rhopalosiphum maidis* Fitch and *Sitobion avenae* Fabricius, were collected weekly from two locations in the Middle Delta; Kafr El-Zayat (Gharbia Governorate) and El-Shuhada (Menofia Governorate) for two seasons 2000/01 and 2001/02, placed in paper bags and transferred to the laboratory. Each collected sample was placed in a plastic jar, labeled and kept under the laboratory conditions (23±1°C, 60±5% R.H.) until emergence of adult parasitoids. Emerged adult parasitoid species were collected daily, classified and then preserved in small glass vials containing 70% alcohol. Specimens were sent to Dr. P. Stary, Institute of Entomology, Academy of Science of the Czech Republic for identification. Accordingly, numbers of each parasitoid species, primary and/or secondary were counted separately and recorded. Percentage of *A. colemani* was estimated proportionally among the total number of primary emerged adult parasitoid species.

RESULTS AND DISCUSSION

Survey of primary and hyperparasitoid species.

The survey revealed the presence of primary and hyperparasitoid species associated with different cereal aphids species in wheat fields.

Primary parasitoid species.

Order: Hymenoptera, Family: Aphidiidae: *Aphidius matricariae* Haliday, *Aphidius colemani* Viereck, *Aphidius* spp., *Diaeretiella rapae* McIntosh, *Ephedrus persicae* Froggatt, *Praon necans*, and Family: Aphelinidae: *Aphelinus* spp.

The same primary parasitoid species were previously recorded on cereal aphids in wheat fields in different parts of the world by several authors; Aalbersberg *et al.*, 1988 in South Africa and Al-Dobai *et al.*, 1999 in Slovakia, as well as by El-Heneidy and Attia, 1989; Ibrahim, 1990; Ibrahim and Afifi, 1991; and El-Serafy, 1999 in Egypt

Hyperparasitoid Species

Fam.: Cynipidae: *Alloxysta* spp., *Cynipid* spp..

Fam.: Megaspilidae: *Dendrocerus* spp. and

Fam.: Chalcididae: *Pteromalid* spp.

The same hyperparasitoid species were recorded in wheat fields by Al-Dobai *et al.*, 1999 in Slovakia and by Ibrahim, 1990 and El-Heneidy *et al.*, 2001 in Egypt.

Primary parasitoid species were recorded early in the season, following the incidence of cereal aphids in the fields. Their numbers increased gradually from February to reach their peaks during March and then decreased again during April, El-Heneidy *et al.*, 2001. A total of 224 and 375 individuals at Kafr El-Zayat and 253 and 377 at El-Shuhada, were collected during the first and second seasons, respectively. In both areas, Kafr El-Zayat, and El-Shuhada, total numbers of primary parasitoids were higher in the second season 2001/02 by 40.3 and 32.9%, respectively than in the first season 2000/01 (Table 1). Among the primary parasitoid species recorded, percentage of the aphidiids and the aphelinids were represented by 40.6 and 59.4% at Kafr El-Zayat, and 96.3 and 3.7% at El-Shuhada in the two seasons. Monthly total numbers of the primary parasitoids were higher at El-Shuhada than at Kafr El-Zayat, particularly during March. Total numbers were higher during February in the two locations in season 2000/01 and vice versa during March in season 2001/02. Number of each of primary parasitoid species varied proportionally in different seasons and/or locations. Highest total percentages among the primary parasitoid species reached 56.3 and 61.3% for *Aphelinus* spp. at Kafr El-Zayat in the two seasons, respectively. Correspondent values of 45.1 and 36.1% were estimated for *P. necans* at El-Shuhada in the respective seasons. Lowest total percentages varied in the two sites. They were 3.1 and 4.3% for *Aphidius* spp. at Kafr El-Zayat and El-Shuhada, respectively in the first season, while they were 0.3 and 0.8% for *P. necans* and *E. persicae* in the respective locations in the second season. Available references in Egypt confirmed most of surveyed primary parasitoid species on cereal aphid species (Ibrahim, 1990; El-Heneidy *et al.*, 2001).

Table (1): Total numbers of parasitoid species recovered from key aphid species in Egyptian wheat fields during 2000/01 and 2001/02 seasons.

Parasitoids		Seasons					
		2000/2001		Total	2001/2002		Total
	Parasitoid species	Kafr El-Zayat	El-Shuhada		Kafr El-Zayat	El-Shuhada	
Primary parasitoids	<i>Aphidius olemani</i>	30	55	85	51	47	98
	<i>A. matricariae</i>	39	52	91	50	48	98
	<i>Aphidius</i> spp.	7	11	18	0	0	0
	<i>Diaeretiella rapae</i>	22	21	43	43	120	163
	<i>Ephedrus ersicae</i>	0	0	0	0	3	3
	<i>Praon necans</i>	0	114	114	1	136	137
	<i>Aphelinus</i> spp.	126	0	126	230	23	253
Total		224	253	477	375	377	752
Hyperparasitoids	<i>Alloxysta</i> spp.	3	10	13	2	7	9
	Cynipids	46	26	72	14	41	55
	<i>Dendrocerus</i> spp.	2	5	7	4	0	4
	Pteromalids	0	0	0	85	37	122
Total		51	41	92	105	85	190

Concerning hyperparasitoid species, total numbers of different hyperparasitoid species recorded on cereal aphid primary parasitoids in wheat fields at the two locations are summarized also in Table (1). Highest monthly means of the number of hyperparasitoid species were recorded during March, relatively few weeks following the peak of the primary species. The four surveyed hyperparasitoid species were recorded only at Kafr El-Zayat, during the second season of the study, while three species only were found at Kafr El-Zayat (first season) and at El-Shuhada, during the two seasons. Generally, numbers were higher at Kafr El-Zayat than those at El-Shuhada in the two seasons of the study by 19.2%. Total numbers of hyperparasitoids were lower in the first season by 51.4 and 51.8% at Kafr El-Zayat and El-Shuhada, respectively than in the second season. Cynipids were the dominant species (90.2%) at Kafr El-Zayat during the first season, while the pteromalids were the most abundant (81.0%) during the second season. Correspondent values were 63.4% for cynipids and 43.5% for pteromalids at El-Shuhada, where the same trend was observed. The same phenomenon was found in case of the lowest percentages of abundance among the hyperparasitoid species in the two seasons and the two locations. *Dendrocerus* followed by *Alloxysta* were the lowest species in numbers, where 3.9 and 1.9% at Kafr El-Zayat and 12.2 and 8.2% at El-Shuhada were recorded. Ibrahim, 1990 and El-Heneidy *et al.*, 2001 recorded earlier, almost the same species of hyperparasitoids in Egypt.

Seasonal occurrence of *Aphidius colemani* Viereck.

Seasonal occurrence of the target primary parasitoid species *A. colemani* on cereal aphid species in wheat fields, in the two previous sampling sites; Kafr El-Zayat and El-Shuhada during the two successive wheat growing seasons 2000/01 and 2001/02 was studied. Data presented in Table (2) and Figure (1) indicates that *A. colemani* was recorded first on cereal aphids during January in low rates. Its numbers increased to reach their peaks during second and third weeks of February and then during March in the two locations and in the two seasons 2000/01 and 2001/02. Its numbers were higher in season 2001/02 than in season 2000/01 in all months at Kafr El-Zayat. At El-Shuhada, they were higher during February in the first season 2000/01 and also, March and April in the second season. Data represented in Figure (1) illustrate that among the surveyed primary parasitoid species on cereal aphids, the total percentage of *A. colemani* reached 13.4 and 13.6 % at Kafr El-Zayat (Gharbia) and 21.7 and 12.5 % at El-Shuhada (Menofia) in the two seasons, respectively.

Table (2): Total monthly numbers of *Aphidius colemani* emerged from cereal aphid species in Egyptian wheat fields at Kafr El-Zayat and El-Shuhada during 2000/01 and 2001/02 seasons.

Months	2000/2001		Total	2001/2002		Total
	Kafr El-Zayat	El-Shuhada		Kafr El-Zayat	El-Shuhada	
January	0	0	0	1	0	1
February	23	38	51	27	6	33
March	9	17	26	18	37	55
April	0	0	0	5	4	9
Total	32	55	87	51	47	98

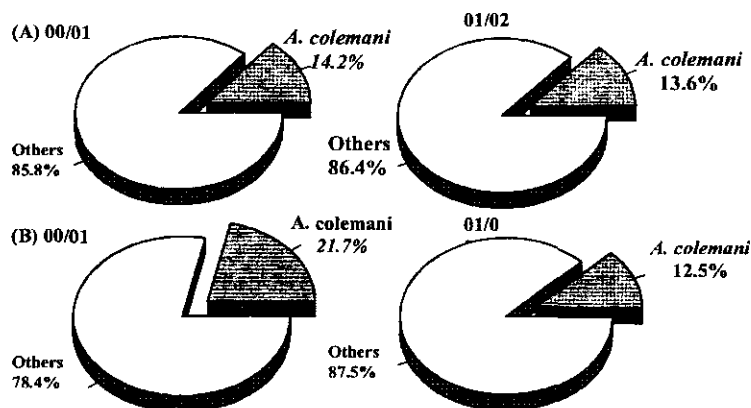


Fig. (1): Total percentages of *Aphidius colemani* among the recorded primary parasitoid species on cereal aphids in wheat fields at Kafr El-Zayat (A) and El-Shuhada (B), 2000/01 and 2001/02 seasons.

In conclusion the highest percentage of *A. colemani* 21.7 % among the collected primary parasitoid species was found during 2000/01 season, while the lowest 12.5 % was recorded during 2001/02 season. Highest numbers of the primary parasitoid *A. colemani*, occurred during February and March in the surveyed

locations. This result agrees with the finding of El-Heneidy *et al.*, (2001). This study provides baseline information essential for assessing future change in aphid parasitoid species dynamics.

REFERENCES

- Aalbersberg, Y. K., Westhuizen, M. C. van der and Hewitt, P. H. 1988. Natural enemies and their impact on *Diuraphis noxia* (Mordvilko) (Hemiptera: Aphididae) populations. *Bulletin of Entomologica Research*. 78(1): 111-120.
- Al-Dobai, S., Praslicka and J., Mistina, T. 1999. Parasitoids and hyperparasitoids of cereal aphids (Homoptera: Aphididae) on winter wheat in Slovakia. *Biologia Bratislava*. 45(5): 573-580.
- El-Heneidy, A. H. and Attia, A. A. 1989. Evaluation to the role of parasitoids and predators associated with aphids in wheat fields, Egypt. *Bulletin of the Entomological Society of Egypt. Economic Series* 17:137-147.
- El-Heneidy, A. H., Fayad, Y. H. and Mona, A. Shoeb. 1991. Influence of insecticidal application on aphid populations and their natural enemies in wheat fields. *Egyptian Journal of Biological Pest Control*. 1(2): 79-85.
- El-Heneidy, A. H., Gonzalez, D., Sary, P., Dalia, Adly. and El-Khawas, M. A. 2001. A survey of primary and secondary parasitoid species of cereal aphids on wheat in Egypt. *Egyptian Journal of Biological Pest Control*. 11(2): 193-194.
- El-Serafy, H. A. 1999. Population density of cereal aphids' parasitoids and their role in suppressing cereal aphids on wheat plantations at Mansoura district. *Archives of Phytopathology and Plant Protection*. 32(3): 257-264.
- Ibrahim, A. M. A. 1990. Corn leaf aphid, *Rhopalosiphum maidis* (F) (Hom., Aphididae) on wheat and associated primary parasitoids and hyperparasitoids. *Bulletin de la Societe Entomologique d'Egypt*. 69:149-157.
- Ibrahim, A. M. A. and Affi, A. I. 1991. Seasonal fluctuation of English grain aphid *Sitobion avenae* (Fab.) (Hom.: Aphididae) on wheat and its primary parasitoids and hyperparasitoids in Giza Governorate, Egypt. *Bulletin of Faculty of Agriculture, University of Cairo*. 42(1): 167-182.
- Sary, P. 1975. *Aphidius colemani* Viereck: its taxonomy, distribution and host range (Hymenoptera, Aphidiidae). *Acta. Ent. Bohemoslov.*, 72: 156-163.
- Sary, P. 1976. (ed). *Aphid parasites (Hymenoptera: Aphidiidae) of the Mediterranean area*. Academia Nakladatelstvi Ceskoslovenske Akademie Ved. Praha 95 pp.
- Tantawi, A. M. 1985. Studies on wheat aphids in Egypt. II germplasm evaluation and crop loss assessment. *Rachis*, 4:56-27.

Aphidius colemani Viereck (Hymenoptera: Aphidiidae) الظهور الموسمي لطفيال المن

في وسط الدلتا - مصر

حسن محمد صبحي^{*}، أحمد حسين الهندي^{**}، سميرة محمد عبد الواحد^{**} ووفائي عازر ميخائيل^{*}

^{*}معهد البحوث والدراسات الأفريقية، جامعة القاهرة، الجيزة، مصر

^{**}معهد بحوث وقاية النباتات، مركز البحوث الزراعية، الجيزة، مصر

تم إجراء الحصر وتسجيل الظهور الموسمي لطفياليات المن، وخاصة النوع *Aphidius colemani* Viereck (Hym.: Aphidiidae) المصاحب لأنواع من الحبوب على نباتات القمح في محافظتين بوسط الدلتا هما: الغربية والمنوفية بمصر وذلك خلال موسمي القمح ٢٠٠١/٢٠٠٠ و ٢٠٠٢/٢٠٠١. أسفر الحصر عن تسجيل أنواع الطفيليات الأولية: *Aphidius colemani* Viereck, *A. matricariae* Haliday, *Diaeretiella rapae* McIntosh, *Praon necans* Mackauer, *Epedrus persicae* Froggat, *Aphidius* spp., *Aphelinus* spp., *Alloxysta* spp., cynipids, pteromalids, وأنواع الطفيليات المفترسة: *Dendrocerus* spp. مصاحبة لأنواع من الحبوب المختلفة في حقول القمح. كان التعداد الكلي لأنواع الطفيليات الأولية والمفترسة أعلى في الموسم الثاني ٢٠٠٢/٢٠٠١ عن الموسم الأول ٢٠٠١/٢٠٠٠ في المنطقتين، كفر الزيات (محافظة الغربية) والشهداء (محافظة المنوفية). وكانت نسب النوع *A. colemani* أعلى في الموسم الأول عنه في الموسم الثاني حيث بلغت نسبة النوع *A. colemani* بين أنواع الطفيليات الأولية التي تم حصرها ١٤.٢% و ٢١.٧% في الموسم الأول مقارنة ١٣.٦% و ١٢.٥% في الموسم الثاني في كل من كفر الزيات والشهداء، على التوالي.