

SEASONAL OCCURRENCE OF THE APHID PARASITOID, *APHIDIUS MATRICARIAE* HAL. (HYMENOPTERA: APHIDIIDAE) IN EGYPTIAN WHEAT FIELDS

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ABSTRACT

Survey and seasonal occurrence of aphid parasitoid species, particularly *Aphidius matricariae*, associated with cereal aphid species on wheat plants were carried out in different wheat regions in Egypt for the two seasons 1998/99 and 1999/2000. The survey revealed the presence of the primary parasitoids species *Aphidius matricariae* Haliday, *A. colemani* Viereck, *Diaeretiella rapae* M'Intosh, *Praon necans* Mackauer, *Ephedrus persicae* Froggott., and *Aphelinus* spp. and the hyperparasitoid species; *Alloxysta* spp., and other cynipids, pteromalids (*Asaphes* and *Pachyneuron*), and *Dendrocerus* spp. associated with different cereal aphid species in wheat fields. Highest percentage of total primary parasitoid species (84%) and the lowest percentage of hyperparasitoid species (16%) were recorded at Sharkia Governorate, during season 1999/2000. Percentages of *A. matricariae* were higher during the first season than those of the second season. Among the surveyed parasitoids species, the total percentages of *A. matricariae* reached 42.8, 50.5, and 51.8%, in the first season, compared to 18.7, 14.2, and 6.1% in the second season at Sharkia, Beni-Suef, and Sohag Governorates, respectively.

Key Words: Seasonal occurrence, *Aphidius matricariae*, cereal aphids, wheat, Egypt

INTRODUCTION

Aphids are the serious insect pests attacking wheat plants, not only in Egypt but also in many other countries; i.e. Southern Russia, Iran, Afghanistan, and countries bordering the Mediterranean Sea (Kindler *et al.*, 1991). In Egypt, damages to the crop caused by aphids were estimated by up to 23%, particularly in Upper Egypt, where highest infestation mostly occurs (Enayat *et al.*, 1984, Tantawi, 1985, and El-Heneidy *et al.*, 1991). Aphids are also efficient vectors of different strains (types) of barley yellow dwarf virus (BYDV). The virus has recently been identified as economically important in some parts of Egypt (ICARDA 1995).

Utilization of aphid parasitoids in biological control has given significant results in many countries of the world. 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. While the aphelinids form the other small group. *Aphidius matricariae* Hal. is the widely distributed aphidiid in almost all the Mediterranean countries, and has a wide range of hosts in agroecosystems. (Stary, 1976).

The present study focused on survey and seasonal occurrence of aphid parasitoid species, particularly *Aphidius matricariae* Hal., associated

with cereal aphid species on wheat plants in different wheat regions in Egypt.

MATERIALS AND METHODS

Samples from wheat plants infested with cereal aphid species mainly; *Rhopalosiphum padi* L., *Schizaphis graminum* Rond., and *R. maidis* Fitch, were collected weekly from three locations; Sharkia (representing Lower Egypt; Delta), Beni-Suef (representing Middle Egypt), and Sohag (representing Upper Egypt) for the two seasons 1998/99 and 1999/2000. , placed in paper bags and transferred to the laboratory. Each collected sample was placed in a plastic transparent jar, labeled and kept under the laboratory conditions (23±1°C) until emergence of adult parasitoids.

Emerged adult parasitoid species were collected daily, classified and then preserved in small glass vials containing 70% alcohol and 5% glycerin. 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. matricariae* 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 aphid species in wheat fields.

Primary parasitoid species

Family: Aphidiidae; *Aphidius matricariae* Haliday, *A. colemani* Viereck, *Diaeretiella rapae* M'Intosh, *Praon necans* Mackauer, *Ephedrus persicae* Froggott.

Family: Aphelinidae; *Aphelinus* spp.

Hyperparasitoid species

Family: Cynipidae; *Alloxysta* spp., and other cynipids.

Family: Pteromalidae; pteromalids (*Asaphes* and *Pachyneuron*)

Family: Megaspilidae; *Dendrocerus* spp.

Among the total numbers of both primary and secondary parasitoid species emerged from the key cereal aphid species in the two seasons, the primary and secondary species represented 78.76 and 21.24%, respectively.

Family Aphidiidae and Aphelinidae represented respective rates of 94.79 and 5.21% of the total primary parasitoids recorded in the two successive seasons.

All the primary parasitoid species were found in the three Governorates (Sharkia, Beni-Suef, and Sohag) in relatively large numbers, except the two parasitoid species; *E. persicae*, throughout the two seasons in all locations, and *Aphelinus* spp., during the second season 1999/2000 which were found in very few numbers.

As shown in Table (1), numbers of the species *A. matricariae*, *A. colemani*, and *Aphelinus* spp. were higher in the first than in the second season, and vice-versa for *D. rapae* and *P. necans*. Among the recorded primary parasitoid genera, the highest percentage (71.61%) was recorded for *Aphidius* spp. (*A. matricariae* + *A. colemani*) followed by *Diaeretiella* (13.19%), *Aphelinus* (10.8%), and *Praon* (4.0%) during 1998/99 season. Highest percentages during 1999/2000 season reached 42.66, 36.29, 19.25, and 0.97%, for *Praon*, *Diaeretiella*, *Aphidius*, and *Aphelinus*, respectively.

In general, the highest percentage (84%) of total primary parasitoid species among the surveyed parasitoids in all Governorates was recorded at Sharkia, during season 1999/2000, and it was relatively higher than that of season 1998/99 (76.44%). The same phenomenon was found at Beni-Suef, where the highest percentage (79.08%) was recorded during season 1999/2000, which was also higher than that of season 1998/99 (65.26%). At Sohag, the percentages of the primary parasitoids were nearly equivalent in both seasons recording 80.81% in 1998/99 and 79.45% in 1999/2000.

Available references in Egypt confirmed most of the surveyed primary parasitoid species on cereal aphid species, *A. matricariae* was recorded by El-Hariry (1979), Ibrahim (1990 a,b), Ibrahim and Affi (1991), El-Serafy (1999), and El-Heneidy *et al.* (2001).

Table (1): Total numbers of native parasitoid species recovered from key aphid species in Egyptian wheat fields during 1998/99 and 1999/2000 seasons

Parasitoids		Seasons							
		1998/1999			Total	1999/2000			Total
Parasitoid species	Sharkia	Beni - Suef	Sohag	Sharkia		Beni - Suef	Sohag		
Primary parasitoids	<i>Aphidius matricariae</i>	68	55	144	267	51	22	18	91
	<i>A. colemani</i>	32	26	66	124	27	5	16	48
	<i>Diaeretiella rapae</i>	20	13	39	72	80	63	119	262
	<i>Ephedrus persicae</i>	0	2	0	2	3	0	3	6
	<i>Praon necans</i>	6	3	13	22	109	65	134	308
	<i>Aphelinus</i> spp.	33	10	16	59	3	0	4	7
	Total	159	109	278	546	273	155	294	722
Hyper parasitoids	<i>Alloxysta</i> spp.	0	0	0	0	3	12	9	24
	Cynipids	44	48	48	140	42	26	50	118
	<i>Dendrocerus</i> spp.	5	10	18	33	6	0	5	11
	Pteromalids	0	0	0	0	1	3	12	16
	Total	49	58	66	173	52	41	76	169

Concerning the hyperparasitoid species, only the cynipids and *Dendrocerus* spp., were recorded from the collected samples during season 1998/99 while the species; *Alloxysta* spp., cynipids, *Dendrocerus* spp., and pteromalids were recorded during the second season 1999/2000. The cynipids predominated the other species in both seasons by 80.92 and 84.02%, followed by *Dendrocerus* spp. 19.08 and 6.5% in 1998/99 and 1999/2000 seasons, respectively. *Alloxysta* spp. and the pteromalids represented by 14.2% and 9.47%, respectively during 1999/2000 season (Table 1).

In general, at Sharkia and Beni-Suef Governorates, recorded percentages of hyperparasitoids among the surveyed parasitoids attained 23.55 and 34.73 %, respectively, during 1998/99 season. They were lower than those of 1999/2000 season (16 and 20.91 %, respectively). At Sohag, the percentages of the hyperparasitoids were nearly close in both seasons reaching 19.18 % during 1998/99 and 20.54 % during 1999/2000 season.

Ibrahim (1990 a,b) and El-Heneidy *et al.* (2001) recorded almost the same species of hyperparasitoids.

Seasonal Occurrence of *Aphidius matricariae* Haliday

Seasonal occurrence of the target primary parasitoid species, *A. matricariae* on cereal aphid species in wheat fields, in the three Governorates (Sharkia, Beni-Suef, and Sohag) during the two successive wheat growing seasons 1998/99 and 1999/2000 was studied.

Data presented in Table (2) and Fig. (1) indicated that in season 1998/99, *A. matricariae* was recorded first on cereal aphids during January in low rates of 2.94, 9.09, and 2.78% at Sharkia, Beni-Suef, and Sohag, respectively. Its numbers increased to reach their peaks during February at Sharkia 76.47 and Beni-Suef 63.64 % and during

March at Sohag (65.97%), then decreased to attain the lowest levels during April recording 2.94, 5.45, and 0.69% at Sharkia, Beni-Suef, and Sohag, respectively.

In season 1999/2000, *A. matricariae* was recorded also during January but in a relative high numbers only at Sharkia (56.86%), then its numbers decreased to reach the lowest level during March (15.69%). At Beni-Suef and Sohag, the parasitoid did not occur during January, while, highest numbers of the parasitoid (86.36%) and (88.89%), were recorded during February, then its numbers decreased to attain the lowest levels during April (4.55%) and March (11.11%) at Beni-Suef and Sohag, respectively.

Data represented in Fig. (2) illustrate that among the surveyed primary parasitoid species on cereal aphids, the highest (51.8%) and lowest (6.1%) percentages of *A. matricariae* were recorded at Sohag in seasons 1998/99 and 1999/2000, respectively. Generally, the percentages of *A. matricariae* recorded during the first season were always higher than those recorded in the second season. The percentages reached 42.8, 50.5, and 51.8%, in the first season, compared to 18.7, 14.2, and 6.1% in the second season at Sharkia, Beni-Suef, and Sohag, respectively.

In conclusion, the highest percentage of *A. matricariae* (48.9%), among the collected primary parasitoid species, was found during 1998/99 season, while the lowest (12.6%) was recorded during 1999/2000 season. Highest numbers of the primary parasitoid *A. matricariae* occurred during February and March in the surveyed locations. This result agrees with the findings of Ibrahim (1990 a,b), and disagrees with those found by El-Serafy (1999) who reported that *A. matricariae* peaked in the middle of April.

Table (2): Total monthly numbers of *Aphidius matricariae* on cereal aphid species in Egyptian wheat fields at three different Governorate during 1998/99 and 1999/2000 seasons.

Months	1998/1999			1999/2000		
	Sharkia	Beni - Suef	Sohag	Sharkia	Beni - Suef	Sohag
January	2	5	4	29	0	0
February	52	35	44	14	19	16
March	12	12	95	8	2	2
April	2	3	1	0	1	0
0	68	55	144	51	22	18

Fig.(1) : Total monthly numbers of *A. matricariae* in Egyptian wheat fields at three different Governorates during 1998/99 (A) and 1999/2000 (B) seasons.

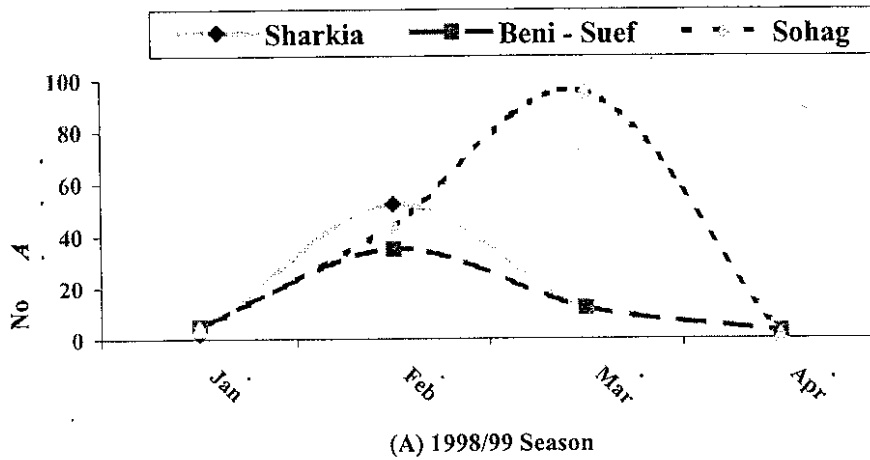
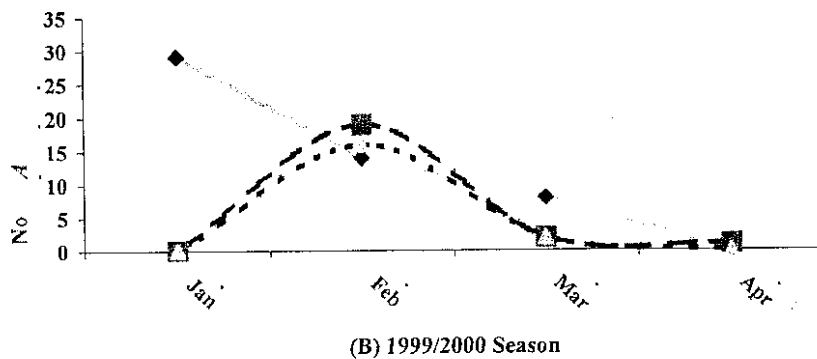


Fig.(2) : Percentage of *Aphidius matricariae* among the surveyed primary parasitoid species on cereal aphids in Egyptian wheat fields during 1998/99 and 1999/2000 seasons.



In the present study, also the percentage of *A. matricariae* collected among the primary parasitoid species was lower than the percentage recorded by Ibrahim (1990 a) as 78.2 and 64% in 1988 and 1989 on *R. padi*, respectively, and Ibrahim (1990 b) as 60, and 58% in 1988 and 1989 on *S. graminum* at Giza, respectively. On the other hand, the percentage of *A. matricariae* estimated in this study was higher than those recorded by El-Serafy (1999) at Mansoura district as 27.6, and 25.9% in 1997, and 1998, respectively.

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