Egypt. J. Agric. Res., 81(3), 2003.

SEASONAL ABUNDANCE OF CERTAIN *APHYTIS* SPECIES (HYMENOPTERA : APHELINIDAE) FROM EGYPT

Aida Kamel[1], Shaaban Abd-Rabou[2], Nahed Hilmy[1], Somya Allam[1] and Mona Moustafa[2]

1 Entomology Department, Faculty of Science, Zagazig University, Benha, Egypt

2 Plant Protection Research Institute, Agricultural Research Centre, Dokki, Giza, Egypt.

(Manuscript received April 2002)

Abstract

Seasonal abundance of 18 species of the genus *Aphytis* Howard (Hymenoptera : Aphelinidae) from Egypt were observed on ten host plants infested with eleven armored scale insect species (diaspidids) in seven governorates between 1997 and 2000. Results indicate that some species (e.g. *Aphytis holoxanthus* DeBach, *Aphytis melinus* DeBach and *A. paramaculicornis* DeBach & Rosen) had effective rates of parasitism on the population of *Chrysomphalus aonidum*, *Aonidiella aurantii* and *Parlatoria oleae* (Colvee), respectively. The highest rates of parasitism were 70.9, 66.4 and 57.0%, respectively. This groups was followed by *Aphytis lepidosaphes* Compere, *Aphytis paramculicornis* De Bach & Rosen, *Aphytis chrysompjali* (Mercet), *Aphytis lingnanensis*, *Aphytis diaspidids* (Howard), *Aphytis libanicus* Traboulsi and *A. phoenicis* De Bach & Rosen with maximum parasitism rates of 59.2, 57.0, 41.4, 43.2, 29.3, 28.6 and 20.4, respectively. The rest of studied *Aphytis* species, maximum parasitism rates were between 0.8 and 14.6%.

INTRODUCTION

Armored scale insects (Homoptera: Diaspididae) are notorious plant pests on fruit and nut trees, ornamental shade trees, shrubs and ground covers, forest trees, greenhouses and on indoor plants (Miller and Kosztarab,1979).

The main injury caused by these insects is caused by from their ingestion of plant sap. The damage is manifested in reduction of plant vigor. Severely infested plants grow poorly, may drop leaves prematurely and suffer dieback of twigs and branches. The infested host plant can be so weakened that it dies. Control of these pests by the application of chemical insecticides is a quick and easy step towards the reduction of their population density. However, the use of pesticides is accompanied by many problems, which include the toxic effects on humanbeings and animals as well as beneficial insects. Pesticides also, badly affect soil fauna through their accumulation in the soil. However, the control of armored scale insects in Egypt still relies on the use of insecticides, such as organophosphates or mineral oils, especially in the summer during

heavy infestations (Abd-Rabou, 1997a). The abundance of Egyptian *Aphytis* have attracted many authors (e.g. Moursi & Mesbah 1985; Hafez *et al.*, 1987; Hafez, 1988; Abd-Rabou, 1997 b,c; Abd-Rabou & Hendaway, 2000).

The genus *Aphytis* Howard (Hymenoptera: Aphelinidae) constitutes the most effective natural enemy of armored scale insects. Several of its members have been used successfully in biological control against economically significant pests (Rosen, 1988).

The present work deals with the seasonal abundance of eighteen species of genus *Aphytis* from eleven scale insects on 10 host plants in 7 locations in Egypt.

MATERIALS AND METHODS

Samples of various armored scale insects were collected to study the population dynamics of *Aphytis* on ten host plants as follow:

Citrus sp.: 10 trees, 20 years old and 2.5m in height located at each of Qalyubiya, Minya, Giza and Alexandria.

Ficus nitida: 5 trees, many years old and 2m in height located at each of Minya and Qalyubiya.

Jasminum sp.: 10 trees, many years old and 1.5m in height located at Giza.

Laurus nobilis: 20 trees, many years old and 1m in height located at Alexandria.

Oleander sp.: 4 trees, many years old and 1.5m in height located at Qalyubiya.

Prunus armeniaca: 5 trees, 25 years old and 3m in height located at Qalyubiya.

Psidium guajava: 10 trees, 25 years old and 4m in height located at Alexandria.

Mangifera indica: 4 trees, 35 years old and 8 m in height located at Ismailia.

Olea europaea: 8 trees, 15 years old and 4.5m in height located at each of Northern Coast and Fayoum.

Phoenix dactylifera: 3 trees, many years old and 6m in height located at Ismailia.

The selected plants for the present investigation did not receive any chemical control for several years ago before this study. The samples from the first seven host plant species were collected half monthly from Alexandria, Giza, Qalyubiya and Minya

between January 1997 and December 1998. The samples from the remaining host plant species were collected half monthly from Fayoum, Ismailia and the Northern Coast between January 1999 and December 2000. For each host plant, the sample size was 30 leaves, with the exception of *Jasminum* sp. and *Olea* sp., from which 80 leaves were collected in each sample. Each leaf was stored in a well-ventilated emergency glass tube and monitored daily for the emergence of parasitoids.

Two methods were used to count the first and second nymphal instars, non gravid females and the males (preadult) (scale stages) of armored scale insects and their parasitoids on the plant leaves as follows;

1. Square-inch method: In this method, one square-inch was defined on the underside of each leaf and the armored scale insects and their parasitoids located in this area were counted and recorded. This technique was employed in the following plant species: *M. indica*, *Oleander* sp., *P. dactylifera*, and *P. guajava*.

2. Whole leaf area method: In this method, the scale found on the whole area of each leaf were counted and recorded. This method was employed in the case of *Citrus* sp., *F. nitida*, *Jasminum* sp., *L. nobilis*, *Olea* sp. and *P. armeniaca*.

The parasitism rate was determined by dividing the number of emerging parasitoids by the number of hosts.

RESULTS AND DISCUSSIONS

The obtained result of survey and abundance of the eighteen *Aphytis* species are presented in Table 1. Data is presented in accordance with the species activity rank. Rate of maximum parasitism as well as the mean rate over the year was considered.

Highest rate of parasitism was observed for *A. holoxanthus* on *Chrysomphalus aonidum* infesting *Citrus* sp. at Giza. Rate of parasitism reached 70.9 and 67.4% with means of 40 and 30.6% over 1997 and 1998, respectively. Dates of maximum activity were Nov. 1, 1997 and Nov. 15, 1998. The seasonal activity of this parasitoid on *C. aonidum* is presented in Fig. 1.

The second highest rate of parasitism rate was observed for *A. melinus* on *A. aurantii* infesting *Citrus* sp. at Minya. Rate of parasitism reached 66.4 and 51.5% with means of 33.3 and 26.5% over 1997 and 1998, respectively. Dates of maximum activity were Oct. 1, 1997 and Nov. 1, 1998. The seasonal activity of this parasitoid on *Aonidiella* aurantii is presented in Fig. 2.

The third highest rate of parasitism was observed for *A. mytilaspidis* on *Parlatoria oleae* infesting *P. armeniaca* at Qalyubiya. Rate of parasitism reached 66.0 and 48.7% with means of 30.0 and 18.9% over 1997 and 1998, respectively. Dates of maximum activity were Nov. 1, 1997 and Nov. 1, 1998. The seasonal activity of this parasitoid on *P. oleae* is presented in Fig. 3.

The fourth highest rate of parasitism was observed for *A. lepidosaphes* on Lepidosaphes *beckii* infesting *M. indica* at Ismailia. Rate of parasitism reached 59.2 and 49.9% with means of 25.9 and 22.1% over 1999 and 2000, respectively. Dates of maximum activity were Dec. 1, 1999 and Nov. 15, 2000. The seasonal activity of this parasitoid on *L. beckii* is presented in Fig. 4.

The fifth highest rate of parasitism was observed for *A. paramaculicornis* on *P. oleae* infesting *Olea europaea* at Northern Coast. Rate of parasitism reached 57.0 and 40.1% with means of 29.6 and 19.2% over 1999 and 2000, respectively. Dates of maximum activity were Mar 15, 1999 and April 15, 2000. The seasonal activity of this parasitoid on *P. oleae* is presented in Fig.5.

The sixth highest rate of parasitism was observed for *A. chrysomphali* on *Chrysomphalus dictyospermi* infesting *F. nitida* at Qalyubiya. Rate of parasitism reached 41.4 and 36.8% with means of 15.2 and 11.9% over 1997 and 1998, respectively. Dates of maximum activity were Nov. 15, 1997 and Dec. 1, 1998. The seasonal activity of this parasitoid on *C. dictyospermi* is presented in Fig. 6.

The seventh highest rate of parasitism was observed for *A. lingananensis* on *Parlatoria ziziphi* infesting *Citrus* sp. at Giza. Rate of parasitism reached 43.2 and 30.7% with means of 24.9 and 15.9% over 1997 and 1998, respectively. Dates of maximum activity were July 15, 1997 and Aug. 1, 1998. The seasonal activity of this parasitoid on *A. lingananensis* is presented in Fig. 7.

The eighth highest rate of parasitism was observed for *A. diaspidis* on *P. oleae* infesting *Oleae europea* at Northern Coast. Rate of parasitism reached 26.1 and 29.3% with means of 7.9 and 10.2% over 1999 and 2000, respectively. Dates of maximum activity were May 15, 1999 and May 1, 2000. The seasonal activity of this parasitoid on *P. oleae* is presented in Fig. 8.

The ninth highest rate of parasitism was observed for *A. libianicus* on *Lucaspis riccae* infesting *Olea europaea* at Fayoum. Rate of parasitism reached 28.6 and 20.3% with means of 6.8 and 9.0% over 1999 and 2000, respectively. Dates of maximum ac-

tivity were Nov. 1, 1999 and Oct. 15, 2000. The seasonal activity of this parasitoid on *L. riccae* is presented in Fig. 9.

The tenth highest rate of parasitism was observed for *A. phoenicis* on *Parlatoria blanchardi* infesting *P. dactylifera* at Ismailia. Rate of parasitism reached 20.4 and 18.5% with means of 12.7 and 7.2% over 1999 and 2000, respectively. Dates of maximum activity were Aug. 1, 1999 and Aug. 15, 2000. The seasonal activity of this parasitoid on *P. blanchardi* is presented in Fig. 10.

The rest of *Aphytis* sp., the parasitism rates reached between 0.8 and 14.6% with means between 0.1 and 7.4%, Table, 1.

Considering the date of maximum activity out of the 36 observed ones, 12, 9 and 4 dates occurred in Nov., Dec. and Oct., respectively. This time group was followed by 4 and 3 dates occurred in May and August, respectively. This observation indicated that most parasitism activity occurs mainly during autumn season to early winter. This time of the year in characterized by moderate temperature (with gradual decrease) as well as abundance of maturing females, which will go through the winter season to produce the spring generation as the temperature warmth up.

Considering this phenomena diaspidid host plants showed by inspected during Oct. – Nov. for level of infestation as well as rate of parazitism. This would give a clue for the following season level of infestation and can help in predicting the next season activity. Avoiding any chemical control measurements during this period of time is highly recommended.

Table 1. List of the studied *Aphytis* sp. from Egypt, their diaspidid and plant hosts, location, date of maximum activity and rate of parasitism observed over the study duration.

Aphytis sp.	Diaspidid host	Host plant	Location	% Parasitism rate		Date of maximum activity
				Max.	Mean.	
Holoxanthus De Bach	*Chrysomphalus aonidum (L.)*	*Citrus* sp.	Giza	70.9 67.4	40 30.6	Nov. 1st 1997 Nov. 15th 1998
Melinus De Bach	*A. aurantii* (Maskell)	*Citrus* sp.	Minya	66.4 51.5	33.3 26.5	Oct. 1st 1997 Nov. 1st 1998
Mytilaspidis (Le Baron)	*Parlatoria oleae* (Colvee)	*Prumus armeniaca*	Qalyubiya	66.0 48.7	30.0 18.9	Nov. 1st 1997 Nov. 1st 1998
Lepidosaphes Compere	*Lepidosaphes beckii* (Newman)	*Mangifera indica*	Ismailia	59.2 49.9	25.9 22.1	Dec. 15th 1999 Nov. 15th 2000
Paramaculicornis De Bach & Rosen	*Parlatoria oleae* (Colvee)	*Olea europaea*	Northern Coast	57.0 40.1	29.6 19.2	May. 15th 1999 April 15th 2000
Chrysomphali (Mercet)	*Chrysomphalus* dictyospermi (Morgan)	*Ficus nitida*	Qalyubiya	41.4 36.8	15.2 11.9	Nov. 15th 1997 Dec. 1st 1998
Lingnanensis Compere	*Parlatoria ziziphi* (Lucas)	*Citrus sp.*	Giza	43.2 30.7	24.9 15.9	Jul. 15th 1997 Aug. 1st 1998
Diaspidi (Howard)	*Parlatoria oleae* (Colvee)	*Olea europaea*	Northern Coast	26.1 29.3	7.9 10.2	May 15th 1999 May 1st 2000
Libanicus Traboulsi	*Lucaspis riccae* (Tragioni-Tozzetti)	*Olea europaea*	Fayoum	28.6 20.3	6.8 9.0	Nov. 15th 1999 Oct. 15th 2000

Table 1. Continued.

Aphytis sp.	Diaspidid host	Host plant	Location	% Parasitism rate		Date of maximum activity
				Max.	Mean.	
Phoenicis DeBach & Rosen	*Parlatoria blanchardi* (Tragioni-Tozzetti)	*Phoenix dactylifera*	Ismailia	20.4 18.5	12.7 7.2	Aug. 1st 1999 Aug. 15th 2000
Africans Quednau	*A. aurantii* (Maskell)	*Citrus* sp.	Qalyubiya	14.6 13.4	7.4 4.9	Oct. 1st 1997 Sept. 15th 1998
Opuntiae (Mercet)	*A. aurantii* (Maskell)	*Psidium guapava*	Alexandria	7.1 9.8	1.9 2.7	Dec. 1st 1997 Dec. 15th 1998
Hispanicus (Mercet)	*Insulaspis pallidula* (Green)	*Mangifera indica*	Ismailia	9.4 6.4	3.7 3.8	Oct. 1st 1999 Nov. 1st 2000
Coheni (DeBach)	*A. aurantii* (Maskell)	*Citrus* sp.	Alexandria	3.9 5.3	0.6 0.8	Dec. 15th 1997 Dec. 1st 1998
Chilensis (Howard)	*Chrysomphalus dictyospermi* (Morgan)	*Ficus nitida*	Minya	3.3 2.9	0.7 0.5	Dec. 1st 1997 Nov. 15th 1998
Aonidiae (Mercet)	*Anonidia lauri* (Bouche)	*Laurus nobilis*	Alexandria	0.9 5.7	0.07 0.3	May. 1st 1997 Sept. 1st 1998
Philippinesis (DeBach & Rosen)	*Chrysomphalus aonidum* (L.)	*Jasminum* sp.	Giza	1.4 3.3	0.1 0.2	Dec. 1st 1997 Dec. 1st 1998
Vandenboshi DeBach & Rosen	*Aspidiotus nerii* Bouche	*Oleander* sp.	Qalyubiya	1.1 0.8	0.1 0.2	Nov. 15th 1997 Nov. 1st 1998

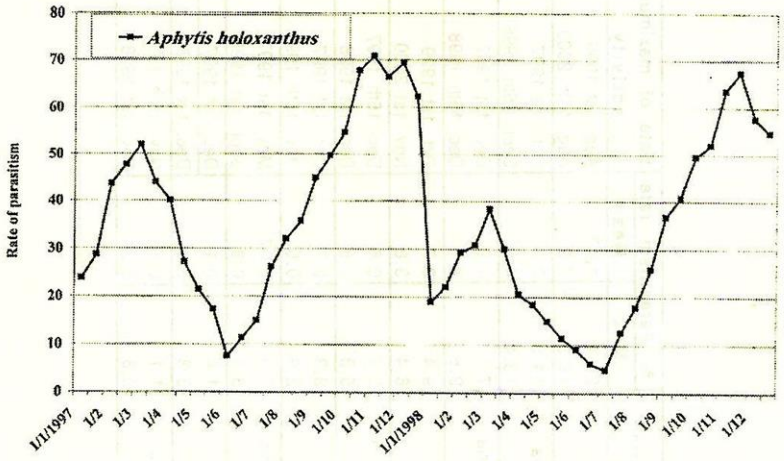

Fig.1. Rate of parasitism of *Aphytis holoxanthus* resulted from *Chrysomphalus aonidum* on *Citrus* sp. in Giza.

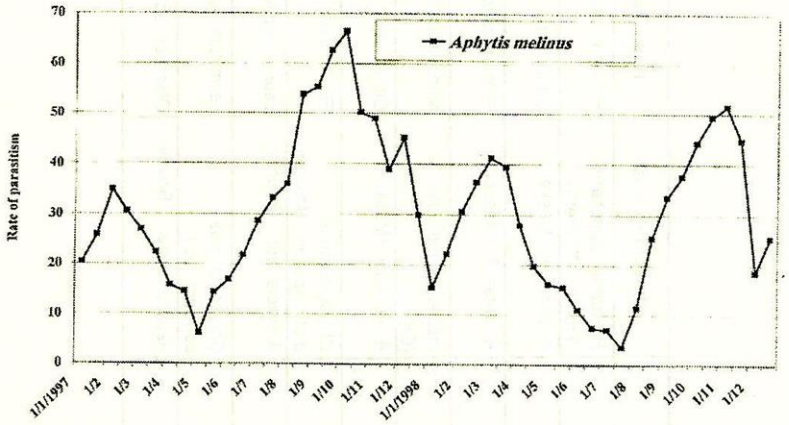

Fig.2. Rate of parasitism of *Aphytis melinus* resulted from *A. aurantii* on *Citrus* sp. in Minya.

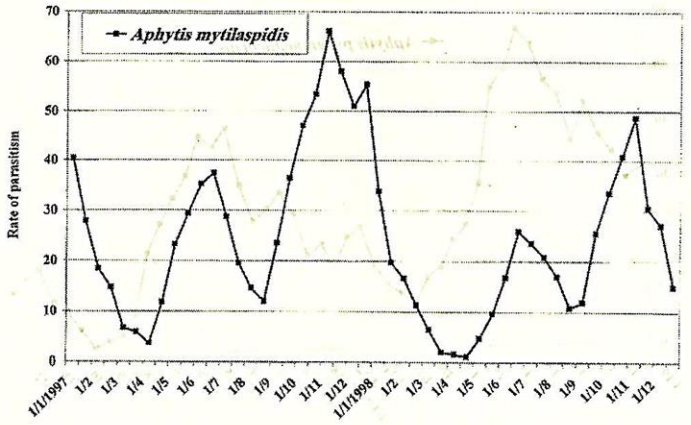

Fig.3. Rate of parasitism of *Aphytis mytilaspidis* resulted from *P. oleae* on *P.armeniaca* in Qalyubiya.

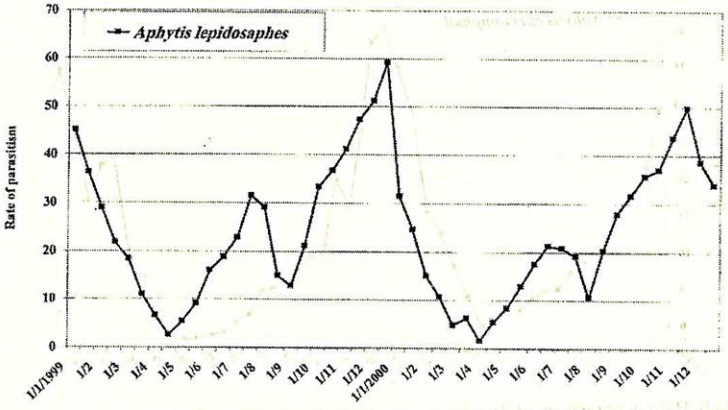

Fig.4. Rate of parasitism of *Aphytis lepidosaphes* resulted from *L. beckii* on *M. indica* in Ismailia.

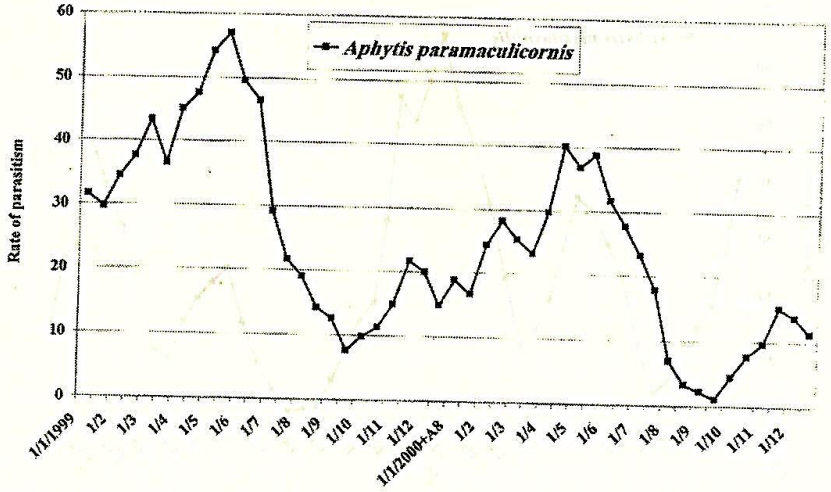

Fig.5. Rate of parasitism of *Aphytis paramaculicornis* resulted from *P. oleae* on *Oleae* sp. in Northern Coast.

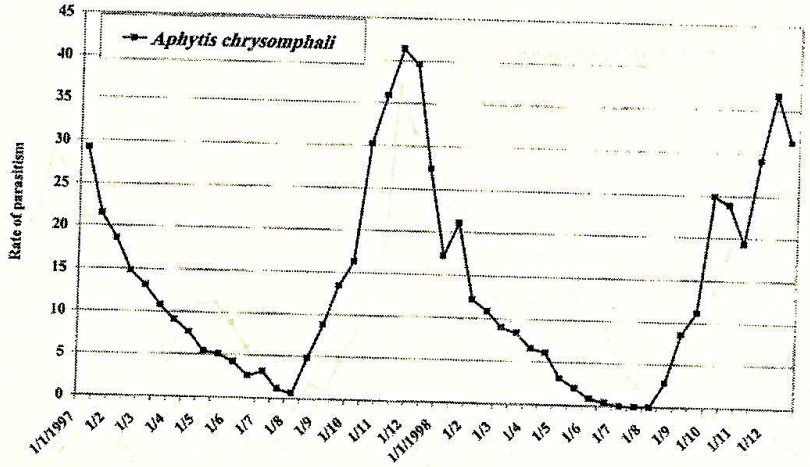

Fig.6. Rate of parasitism of *Aphytis chrysomphali* resulted from *C. dictyospermi* on *F.nitida* sp. in Qalyubia.

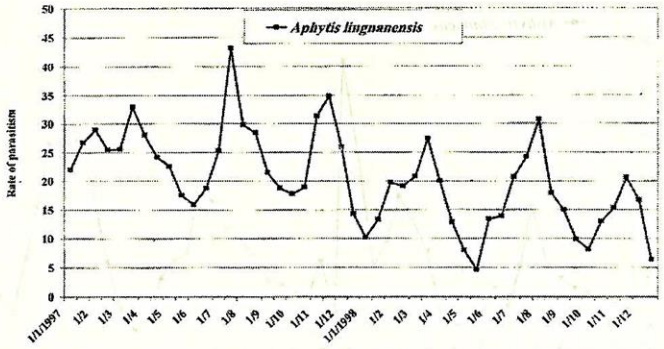

Fig.7. Rate of parasitism of *Aphytis linganananensis* resulted from *P.ziziphi* on *Citrus* sp. in Giza.

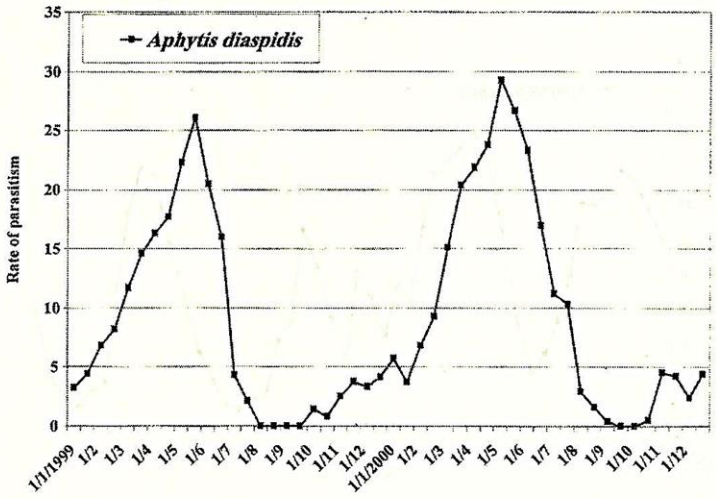

Fig.8. Rate of parasitism of *Aphytis diaspidis* resulted from *P. oleae* on *Oleae* sp. in Northern Coast.

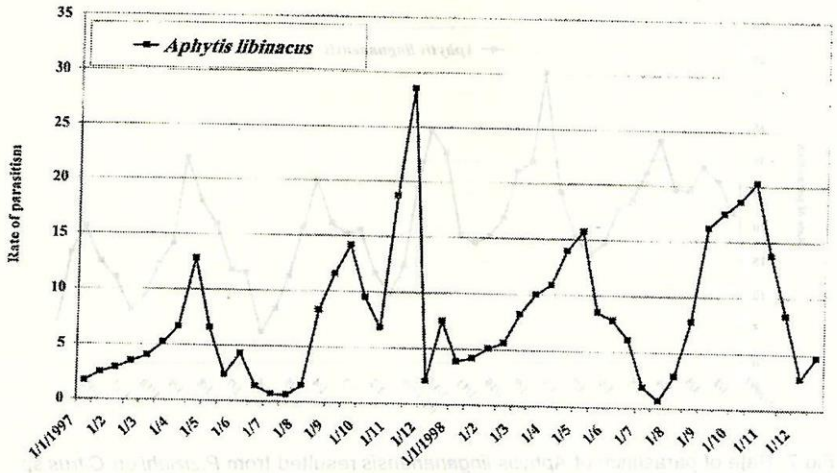

Fig.9. Rate of parasitism of *Aphytis libianicus* resulted from *L. riccae* on *Oleae* sp. in Fayoum.

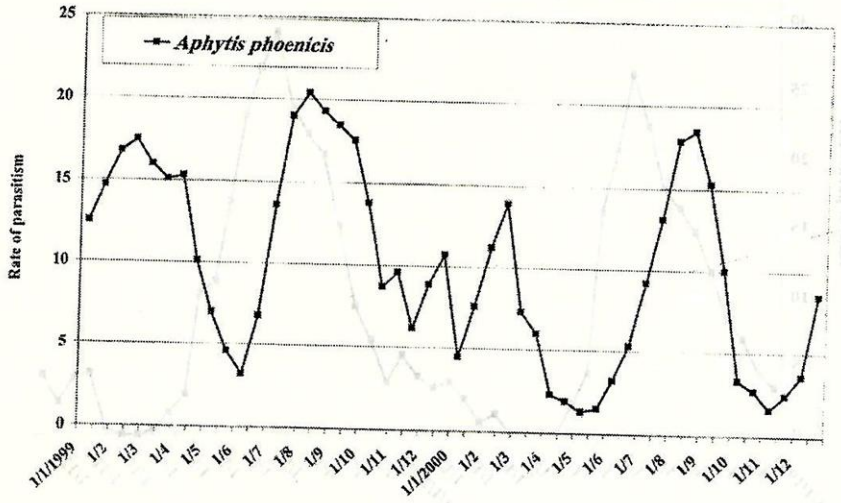

Fig.8. Rate of parasitism of *Aphytis phoenicis* resulted from *P. blanchardi* on *P. dactylifera* in Ismailia.

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دراسات موسمية علي أنواع من جنس أفيتس في مصر

عايدة كامل[1] و شعبان عبد ربه[2] وناهد حلمي[1] وسمية علام[1] و مني مصطفي[2]

١ قسم *الحشرات – كلية العلوم – جامعة الزقازيق – فرع بنها*
٢ معهد *بحوث وقاية النباتات – مركز البحوث الزراعية – الدقي – جيزة – مصر*

تم عمل دراسات موسمية لثمانية عشر نوعا من جنس أفيتس تصيب ١١ حشرة قشرية مسلحة على عشرة عوائل نباتية في سبعة محافظات خلال الفترة من ١٩٩٧–٢٠٠٠ . تشير النتائج أن بعض الأنواع من هذا الجنس مثل أفيتس هولوكاني وأفيتس ملينوس وميتيلاسبيدس لها دور جيد في خفض التعداد الحشري للحشرة القشرية السوداء والحشرة القشرية الحمراء علي الموالح وحشرة الزيتون القشرية علي الزيتون وأن أعلي نسبة تطفل قد وصلت الي ٧٠,٩ و٦٦,٤و٥٧,٩٪ علي الترتيب. ويليهم في الأهمية أفيتس ودبابيدس وليبيناكس وفونينس وأن أعلي نسبة تطفل قد وصلت ٥٩,٢ و٥٧,٠ و٤١,٤ و ٤٣,٢ و٢٩,٣ و٢٨,٦ و ٢٠,٤٪ علي الترتيب. أما بقية الأنواع فقد تراوح أعلي نسبة تطفل بين ٠,٨ و ١٤,٦٪.