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

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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. paramaculicoris DeBach & Rosen) had effective rates of parasitism on the population of Chrysomphalus aonidium, Aonidiella aurantii and Parlatoria citrae (Coleopteran), respectively. The highest rates of parasitism were 79.9, 66.4 and 57.0%, respectively. This group was followed by Aphytis lepidophaeae Compere, Aphytis paramaculicoris DeBach & Rosen, Aphytis chrysomphali (Mercet), Aphytis lingnanensis, Aphytis diaspidis (Howard), Aphytis ibanicus Trabula and A. phoenicis DeBach & Rosen with maximum parasitism rates of 69.2, 57.0, 41.4, 49.2, 29.3, 28.0 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 in 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 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 human beings 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. Morsy & 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.

*Launus 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 ameniaca*: 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 8m 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. ameniacas*.

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 aonidium* 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. aonidium* 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. mytilaspisidis* on *Parlatoria oleae* infesting *P. Armeniaca* at Qalyubiya. Rate of parasitism reached 66.0 and 46.7% 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 dicyospermi* infesting *F. nitida* at Qalyubiya. Rate of parasitism reached 41.4 and 36.3% 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. dicyospermi* is presented in Fig. 6.

The seventh highest rate of parasitism was observed for *A. lingnanensis* 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. lingnanensis* is presented in Fig. 7.

The eighth highest rate of parasitism was observed for *A. diaspidis* on *P. oleae* infesting *Olea europaea* 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. libanensis* on *Lucaspis riccae* infesting *Olea europaea* at Fayoum. Rate of parasitism reached 26.8 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
19.5% with means of 12.7 and 7.2% over 1999 and 2000, respectively. Dates of max-
imum activity were Aug. 1, 1999 and Aug. 15, 2000. The seasonal activity of this par-
asitoid 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 is 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 diaspid host plants showed by inspected during
Oct. – Nov. for level of infestation as well as rate of parasitism. 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 high-
ly 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.

<table>
<thead>
<tr>
<th>Aphytis sp.</th>
<th>Diaspidid host</th>
<th>Host plant</th>
<th>Location</th>
<th>% Parasitism rate</th>
<th>Date of maximum activity</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Max.</td>
<td>Mean.</td>
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<tr>
<td>Holoxanthus De Bach</td>
<td>Chrysochephalus aonidum (L.)</td>
<td>Citrus sp.</td>
<td>Giza</td>
<td>70.9</td>
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<td>87.4</td>
<td>30.6</td>
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<td>Melinus De Bach</td>
<td>A. aurantii (Maskell)</td>
<td>Citrus sp.</td>
<td>Minya</td>
<td>86.4</td>
<td>33.3</td>
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<td></td>
<td>51.5</td>
<td>26.5</td>
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<tr>
<td>Mytilaspisla (La Baron)</td>
<td>Parlatoria oleae (Colvée)</td>
<td>Prunus armeniaca</td>
<td>Qalyubiya</td>
<td>86.9</td>
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<td></td>
<td>48.7</td>
<td>18.9</td>
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<td>Lapidosaphes Compere</td>
<td>Lapidosaphes beckii (Newman)</td>
<td>Mangifera indica</td>
<td>Ismailia</td>
<td>50.2</td>
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<td>Paramaculicornia De Bach &amp; Rosen</td>
<td>Parlatoria oleae (Colvée)</td>
<td>Olea europaea</td>
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<td>Chrysochephalus (Mercat)</td>
<td>Chrysochephalus dicyasperti (Morgan)</td>
<td>Ficus nitida</td>
<td>Qalyubiya</td>
<td>41.4</td>
<td>15.2</td>
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<td>36.8</td>
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<td>Lingnanensis Compere</td>
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<td>Diaspilus (Howard)</td>
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<td>Locustella ricca (Traglioni-Tozetti)</td>
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<td>20.3</td>
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Table 1. Continued.

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<thead>
<tr>
<th>Aphytis sp.</th>
<th>Diaspidid host</th>
<th>Host plant</th>
<th>Location</th>
<th>% Parasitism rate</th>
<th>Date of maximum activity</th>
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<tr>
<td><em>Phoenicopterus DeBach &amp; Rosen</em></td>
<td>Parlatoria blanchardi (Tragion-Tuzzelli)</td>
<td>Phoenix decyiifera</td>
<td>Ismailia</td>
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<td></td>
<td>18.5</td>
<td>7.2</td>
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<td>A. aurantii (Maskell)</td>
<td>Citrus sp.</td>
<td>Qalyubiya</td>
<td>14.6</td>
<td>7.4</td>
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<td>Pediium guapava</td>
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<td>9.8</td>
<td>2.7</td>
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<td><em>Hesperus (Mercel)</em></td>
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<td>Mangifera indica</td>
<td>Ismailia</td>
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<td><em>Coheni (DeBach)</em></td>
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<td>Alexandria</td>
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<td>0.8</td>
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<td><em>Chilesia (Howard)</em></td>
<td>Chrysophalus dictyosperm (Morgan)</td>
<td>Ficus nitida</td>
<td>Minya</td>
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<td>Laurus nobilis</td>
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<td><em>Philippohesia (DeBach &amp; Rosen)</em></td>
<td>Chrysophalus aonidum (L.)</td>
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Fig. 1. Rate of parasitism of *Aphytis holoxanthus* resulted from *Chrysomphalus aonidi-um* 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 mytilaspis* 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 *Olea* 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 irinanaensis* 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. riccaea* on *Olea* sp. in Fayoum.

Fig. 8. Rate of parasitism of *Aphytis phoenicus* resulted from *P. Blanchardi* on *P. dactylifera* in lemailla.
REFERENCES


دراسات موسمية على أنواع من جنس أفقيس في مصر

عادية كمال، وشعبان عبد ربه، وناهد حلمي، وسميحة علام، ودني مصطفى

1 قسم الحشرات - كلية العلوم - جامعة الزقازيق - فرع بنها
2 معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقي - جيزة - مصر

تم عمل دراسات موسمية لمدة عشرة أشهر تقريباً من جنس أفقيس تصب في 11 حشرة قشرية
محلية على عشرة عوائل نباتية في مساحة محلات فلكلورة خلال الفترة من 1997-2002. تشير النتائج أن
بعض الأنواع من هذا الجنس مثل أفقيس هولوكنتي وأفقيس ميلتونوس وميتيبلاغيسيس لها دور جيد
في خفض التعداد الخطي للحشرة القشرية السوداء والحشرة القشرية الحمراء على التوالي. وحشرة
الزيفون القشرية على أفقيس وتصل إلى 80.9 و 67.3% على
الترتيب، وهما في البيئة أعلى أفقيس وليديانيكس وفونتيسيس، وأن أعلى نسبة تلف قد
وصلت إلى 85 و 84.2 و 79.2 و 61.2 و 58 و 53 و 50.4% على الترتيب. أما بالنسبة للأنواع فقد تراوح
أعلى نسبة تلف بين 84.2 و 14.0%.