

Survey of the Parasitoids of the Fruit Scale Insect, *Parthenolecanium corni* Bouché (Homoptera: Coccidae) on Almond Trees at Kalamon, Damascus Countryside, Syria

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ABSTRACT

A survey of the parasitoid species parasitizing the fruit scale insect, *Parthenolecanium corni* Bouché (Homoptera: Coccidae) in almond orchards at Kalamon region, Damascus, Syria was conducted from June 2007 to October 2008. Eight species of parasitoids belong to the families; Aphelinidae, Encyrtidae, Eulophidae and Pteromalidae (Superfamily: Chalcidoidea) were recorded to attack the insect pest. Five were primary parasitoids (*Metaphycus* sp. *Blastothrix confuse*, *Microterys flavus*, *Coccophagus lycimnia* and *Coccobius fulvus*), and three were secondary parasitoids (*Aprostocetus* sp. *Pachyneuron* sp. and *Marietta picta*). *Metaphycus* sp. was the most abundant species. Differences of parasitism % were significant on different instars of the host. Highest percentage of parasitism occurred on the virgin females, followed by the second nymphal instar, while the lowest rate was found on the adult females during the two seasons.

Key words: Survey, Almond, Fruit Scale Insect, *Parthenolecanium corni* Bouché, Parasitoids.

INTRODUCTION

The fruit scale insect, *Parthenolecanium corni* Bouché (Homoptera: Coccidae) is a cosmopolitan and polyphagous pest species infests 40 families of host plants (Ben-Dov, 1993). It is considered a serious pest on deciduous fruit trees, peach and ornamental plants. The pest causes economic damage by excreting large amounts of honeydew, coats the foliage and serves as a substrate for black sooty mould which reduces respiration and photosynthesis in the host plant (Kasztarab, 1996). Infestation on the shoots and leaves may cause dryness of the trees (Gill, 1988). Many insecticides are used against the pest that increase production costs and affect human health and the environment, therefore biological control comes first among the alternative tools (Yarpuzlu *et al.*, 2008). Many natural enemies were recorded on *P. corni* (Alford, 1984). The complex of natural enemies of the pest includes several species of endoparasitoids; *Blastothrix longipennis*, *Encyrtus californicus*, *Coccophagus lycimnia*, *Coccophagus caridei*, *Coccophagus proximus*, *Microterys lunatus*, *Metaphycus flavus* and *Scutellista caerulea* (Blahutiak, 1973a and b).

This study was undertaken to survey the parasitoid species of *P. corni* in almond orchards at Kalamon region, Damascus-Countryside, Syria.

MATERIALS AND METHODS

A survey of the parasitoid species parasitizing the fruit scale insect, *P. corni* in almond orchards (received no chemicals) at Kalamon region was conducted from June 2007 to the end of October 2008. Ten almond trees were randomly sampled

weekly. Samples of ten infested twigs, 25 cm long and of the same age were collected randomly from each tree. Each sample was transferred to the Parasitoids Laboratory in Center of Research and Studies of Biological Control at Damascus University, Syria. Each twig was kept in a well-ventilated glass tube and microscopically inspected daily. Twigs were inspected for the presence of parasitized scales (*i. e.* after parasitoids reach the pupal stage, the scales become mummified). Scale mummies were removed from the twig with a fine brush and placed individually in a 3.0 X 0.8 mm glass vial, provided with honey droplets on a streak and stoppered with a cotton plug. The mummies were inspected two to three times during the subsequent 15 days. Emerged parasitoid adults were collected and placed into a screw top vial containing 75% ethyl alcohol and glycerin using a soft brush. Identification of specimens to the genus level based on the key of Prinsloo (1983), whereas identification to the species level based on the keys of Anneck and Mynhardt (1971, 1972 and 1981) and Compere (1931).

Percentage of parasitism was calculated as follows:

$$\text{Par}\% = [A/(A+N+D)] \times 100 \text{ (Kavaca et al., 1999) where:}$$

A: Number of parasitized scales.

N: Number of living scales.

D: Number of dead scales.

RESULTS AND DISCUSSION

The survey revealed the presence of eight species of parasitoids;

- Primary parasitoid species:
Metaphycus sp., *Blastothrix confuse* and *Microterys flavus* (Hym.: Encyrtidae)

Coccophagus lycimnia and *Coccobius fulvus* (Hym.: Aphelinidae),

- Secondary parasitoid species:
- *Aprostocetus* sp. (Hym.: Eulophidae) and *Pachyneuron* sp. (Hym.: Pteromalidae) and *Marietta picta* (Hym.: Chalcidoidea).

Metaphycus sp. was the most abundant among the primary parasitoid species in the first year (2007). It accounted 43.6% of the total parasitoids emerged, followed by *B. confuse* (23.1%), *M. flavus* (13.9%), *C. lycimnia* (17.9%) and *C. fulvus* (15.4%) (Table 1). In the second year (2008), it was also the most abundant parasitoid, represented (38%), followed by *B. confuse* (31%), *C. lycimni* (18%), *M. flavus* (8%) and *C. fulvus* (5%) (Table 2). According to Japoshvili *et al.*, (2008), 23 species of chalcidoid parasitoids were recorded on *P. corni* in Georgia, USA and south-eastern Europe. *Blastothrix longipennis* was the most common parasitoid species.

Population fluctuation of recorded parasitoids

Metaphycus sp. was the dominant endoparasitoid on *P. corni* in 2007, represented the majority of the total number of emerged species. It was represented by 17 individuals/ sample in June, accounted 43.6% of the total emerged parasitoids. It showed 2 population peaks (17.75 and 17.5 individuals) in June and July, respectively. Statistical analysis showed no significant difference between its numbers in June and July, but there was

a significant difference between the two months and the other months of study at 0.05. Population density of the parasitoid species decreased sharply in August (7.50±3.2) and September (5.50±1.3 individuals/ sample (Table 1 and Fig. 1). In 2008, the parasitoid species occurred in April, with a low density of 7 individuals/ sample, accounted (21.2% of the total emerged parasitoids). It continued to recover until September (17.0±0.87). It was the single parasitoid species found in this month. The parasitoid showed two population peaks in June (17±1.1) and July (20.25 ±2.18 individuals). *Metaphycus* sp. is a facultative gregarious endoparasitoid of soft scales (Kapranas, 2006). *Metaphycus insidiosus* was recorded on *P. corni* in Greece (Santas, 1985). *Metaphycus* sp. appeared during the period June-September in both years 2007 and 2008, when preferable stages of *P. corni* for the parasitoid (second nymphal instar, virgin females and adult females) were available. Obtained results agree with those of Santas, 1985, Lampson *et al.*, 1996 and Wepler *et al.*, 2003.

B. confuse was found to be fairly abundant on *P. corni*, represented by 23% in 2007. It showed one peak in July (13.75±1.6 individuals/ sample), with no significant difference between July and June (10.75±0.85 individuals). *B. confuse* ranked second from the importance point of view. Many studies reported its effectiveness as a parasitoid on *P. corni* (Blahutiak, 1973a; Lagowska, 1987 and Japoshvili *et al.*, 2008).

Table (1): Mean monthly population densities of *Parthenolecanium corni*, primary parasitoid species during 2007

Parasitoid sp.	<i>Metaphycus</i> sp.	<i>Blastothrix confuse</i>	<i>Microterys flavus</i>	<i>Coccophagus lycimnia</i>	<i>Coccobius fulvus</i>	LSD 5%
June	17.75±0.75 a	10.75±0.85 a	—	9.76±1.7	5.75±0.63	25.12
July	17.50±0.86 a	13.75±1.6 a	10.25±1.7	—	2	
August	7.50±3.2 b	6 ±1.5 b	6	—	—	
September	5.50±1.3 b	—	—	—	—	
LSD 5%	11.24	9.44				

Means within the same column sharing the same letter do not differ significantly at $P = 0.05$

Table (2): Mean monthly population densities of *Parthenolecanium corni*, primary parasitoids during 2008

Parasitoid sp.	<i>Metaphycus</i> sp.	<i>Blastothrix confuse</i>	<i>Microterys flavus</i>	<i>Coccophagus lycimnia</i>	<i>Coccobius fulvus</i>	LSD 5%
April	7±0 c	9 bc	—	—	—	21.99
May	13.5±1.32 b	12.5±1.55 ab	—	—	4	
June	17±1.1 ab	19.25±0.63 a	7	7	7.5±0.87	
July	20.25±2.18 a	18±1.78 a	12.5±1.4	12.5±1.4	3±1.0	
August	12.25±2.69 b	4.75±1.93 c	3	3	—	
September	4.5±0.87 c	—	—	—	—	
LSD 5%	10.74	9.6				

Means within the same column sharing the same letter do not differ significantly at $P = 0.05$.

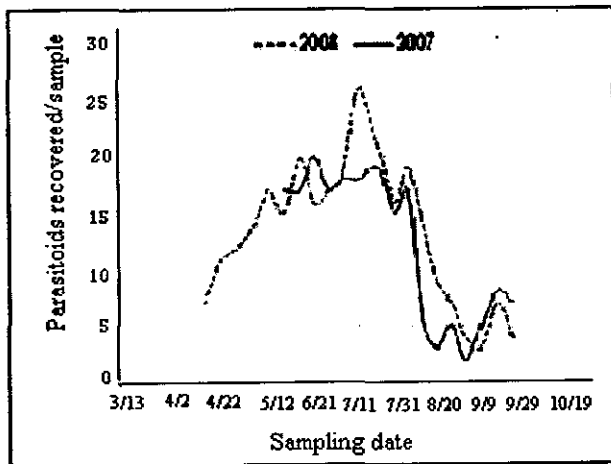


Fig. (1): Population fluctuation of the parasitoid species, *Metaphycus* sp. during 2007-2008.

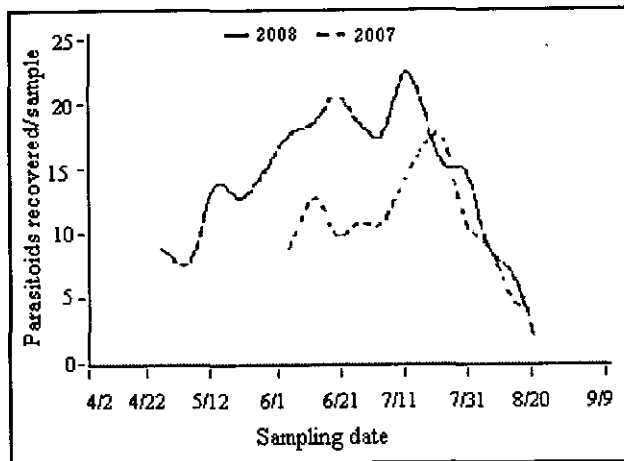


Fig (2): Population fluctuation of the parasitoid, *Blastothrix confuse* during 2007-2008.

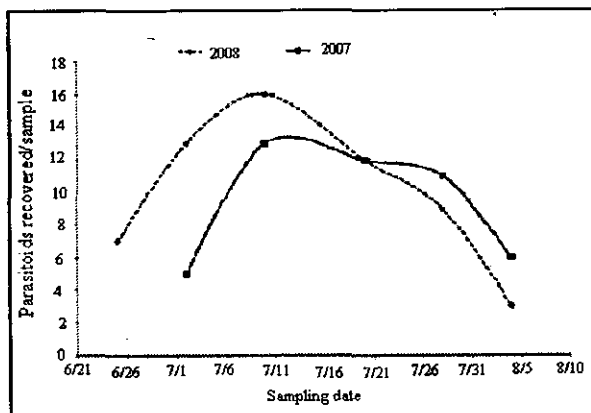


Fig (3): Population fluctuation of the parasitoid, *Microterys flavus* during 2007-2008.

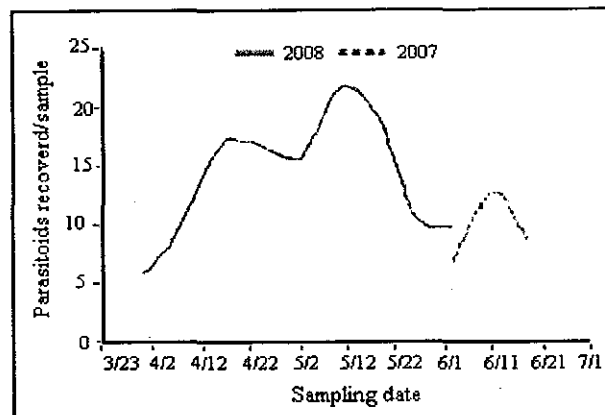


Fig. (4): Population fluctuation of the parasitoid, *Coccophogus lycimnia* during 2007-2008.

B. confuse occurred in lowest population (6 ± 1.5) in June, 2007 (Table 1 and Fig. 2). First appearance in 2008 was in April by 9 individuals/ sample represented by 27.3% of the total emerged parasitoids. Densities of the parasitoid species recorded were; 12.5 ± 1.55 , 19.25 ± 0.63 , and 18 ± 1.78 individuals/ sample in May, June and July, respectively, with significant differences (Table 2 and Fig. 2).

M. flavos was recorded first in July, 2007, with 10.25 individuals/ sample, represented 13.9% and in August, with 6 individuals/ sample, represented 18.75%. Statistical analysis indicated that there was no significant difference between its numbers in July and August, 2007 ($P > 0.05$) (Table 1 and Fig. 3). First appearance of *M. flavus* in 2008 was in June, with 7 individuals/ sample, represented 14.3%. The parasitoid showed one peak in July (12.5 ± 1.4 individuals/ sample). The lowest population was found in August (3 individuals/ sample). Statistical analysis indicated that there was no significant difference between its numbers in June and July (7

individuals/ sample), but the difference was significant between its numbers in June, July and August at 0.05 (Table 2 and Fig. 3). *M. flavus* was more prevalent in July in the two seasons of study, because it parasitizes adult stage of female of the host. Japoshvili *et al.*, (2008) reported that *M. flavus* was known to occur on adult female of *P. corni* in Georgia, USA, but its effectiveness was not ascertained.

C. lycimnia was observed only in June, 2007 (9.76 individuals/ sample (Table 1 and Fig. 4). It was recorded in June 2008, with 7 individuals/ sample. The parasitoid showed one peak in July, with 12.5 individuals/ sample (Table 2 and Fig. 4). *C. lycimnia* was recorded parasitizing *P. corni* in Greece and Bulgaria (Arnaudov *et al.*, 2006 and Santas, 1985).

C. fulvus was found only in June in low number 5.75 individuals/ sample on *P. corni* in 2007 (Table 1 and Fig. 5). It was recorded three times in 2008; in May, June and July with 4, 6.5 and 3 individuals/ sample, respectively represented 8.51, 20.4, and 8.51%.

Statistical analysis indicated that there was no significant difference between June and July at 0.05 ($P > 0.05$) (Table 2 and Fig. 5). *C. fulvus* recovered from virgin and adult females of the host. Similar results were recorded by Japoshvili *et al.* (2008).

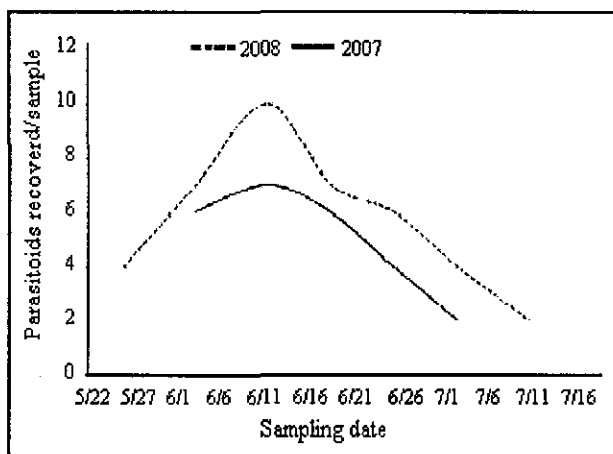


Fig. (5): Population fluctuation of the parasitoid, *Coccobius fulvus* during 2007-2008.

The secondary parasitoid species recovered in the study, occurred in relatively few individuals.

Percentages of parasitism

Total mean percentage of parasitism by all the primary parasitoids was 20.45 in 2007. It was the lowest in June (11.83%), increased to 23.3% in July to 27.3% in August. In 2008, the lowest parasitism % was in March (0.8%), followed by April (20.2%), while the highest was in May (54.3%). The lowest parasitism % on virgin females was in May (25.3%), and the highest was in June (62.96%). Parasitized female adults were seen during June with 11.64% parasitism and July with 17.45% parasitism.

Obtained results suggest that the parasitoids of *P. corni* could be able to maintain the scale at a relatively low population level (Japoshvili *et al.*, 2008).

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