

Seasonal Abundance of the Hemispherical Soft Scale Insect, *Saissetia coffeae* (Walker) (Homoptera: Coccidae) and its Parasitoids on Olive in Middle Egypt

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ABSTRACT

Seasonal fluctuations of the population density of the hemispherical soft scale insect, *Saissetia coffeae* (Walker) (*S. hemispherica* Targ.) (Homoptera: Coccidae) and its parasitoids were estimated on olive leaves from May 2007 until April 2009 at Beni-Suif Governorate, Egypt. Six parasitoid species were recovered, *Coccophagus lycimnia* Walker, *Encyrtus inflex* (Embleton), *Metaphycus helvolus* Comp., *Microterys flavus* (Howerd), *Scutellista cyanea* Motch. and *Eublemma scitula* Ramb. the hyperparasitoid, *Marietta leopardina* Motch. was also found associated with *S. coffeae*. *S. coffeae* had three and two periods of activity during the first and second seasons, respectively. The highest counts were 1333, 1384 and 1309 individuals/ 200 leaves by mid-July, mid-October and early March, respectively, in the first season. In the second season, early June and October, respectively recorded 2 peaks of 652 and 911 scales / 200 leaves. Total rate of parasitism on *S. coffeae* in the first year showed three peaks of 52, 55 and 39 % by mid-June, early August and early March, respectively. In the second year, three peaks represented 45, 46 and 41 % parasitism occurred by early July, September and January, respectively.

Key words: *Saissetia (Hemispherica) coffeae*, Seasonal fluctuations, Parasitoids, Egypt.

INTRODUCTION

The hemispherical or brown soft scale insect, *Saissetia coffeae* (Walker) (*S. hemispherica* Targ.) is considered as the most serious pest distributed in the tropical and sub-tropical areas as a polyphagous species attacking citrus, guava, olive, fig, ficus trees and latania palm (Hammon and Williams, 1984). The pest feeds on plant juices and causes a deformation of infested parts, loss of leaves, retarded plant growth and even plant death. It also secretes the honeydew, on which the black fungus grows up and prevents photosynthesis and respiration of leaves. The fungus also disfigures the fruits and appreciably reduces their market value. Scales are found clustered on the shoots, leaves and young fruits of host plants (Hill, 1983).

Available literature showed few studies on population fluctuations and annual number of generations of *S. coffeae* (Monaco and Abbico, 1987; Abdel-Rahman, 1995 and Li and Su, 2002).

Many parasitoid and predatory species of *S. coffeae* and their role in regulating its abundance were reported by several authors e.g. Oncuer (1977); Prinsloo (1984); Hamed and Hassanien, Fawzeia, (1991) and Abd-Rabou (2004 and 2005).

Therefore, the present work aimed to study the following aspects:

- 1- Survey of the parasitoids and predators of *S. coffeae*,
- 2- Seasonal changes in the population dynamics of the pest on olive leaves at Beni-Suif Governorate, and
- 3- Evaluation of the mortality rate of the pest

by parasitoids.

MATERIALS AND METHODS

I- Survey of *S. coffeae* natural enemies:

A survey of the brown scale insect, *S. coffeae* parasitoids and predators was carried out at Beni-Suif, Giza and Minia Governorates, Egypt throughout two years, from May 2007 till April 2009.

Samples of olive leaves infested with *S. coffeae* were randomly collected from the orchards throughout the year, packed in paper bags and transferred to the laboratory for careful examination. All insects except *S. coffeae* were removed to survey its parasitoids. Leaves were enclosed in plastic jars of 15-cm. diameter and 20-cm. height covered with muslin, held in position by a rubber band and kept under laboratory conditions for securing any emergence of parasitoids.

Parasitoids were collected, classified into species and preserved in vials containing 70% ethanol and 5% glycerin, additional to prepared mounting slide specimens were used for identification. In addition, the associated predacious species were separated from the collected leaves during the initial examination. Feeding tests were run to ensure that predators prey on this scale insect. The parasitoids and predators were identified to the species levels at the Biological Control Res. Dept., Plant Prot. Res. institute, Agric. Res. Center, Giza, Egypt.

II- Seasonal abundance of *S. coffeae*

Seasonal abundance of the population density of *S. coffeae* was studied for two years at Beni-Suif

District, Beni-Suif Governorate. A grove about five feddans, with 20 years old olive trees, *Olea europea* L. was chosen for this study. The selected grove was not exposed to any chemical treatment during the two years prior the present study and throughout the investigation period. Twice monthly samples of 200 olive leaves heavily infested with different stages of *S. coffeae* were collected randomly from different directions of the grove. Leaves represented different sides, peripheral, inner zones, lower and middle strata of the tree. The leaves were kept in paper bags, transferred to the laboratory for careful examination and for counting nymphs, virgin and ovipositing females.

III- Rate of parasitism

Total rates of parasitism in different stages of *S. coffeae* on olive leaves were also estimated. Heavily infested leaves were collected randomly from cardinal directions and central cores of olive trees. Half-monthly samples of 100 randomly selected scales were chosen. These samples represented nymphs, virgin and ovipositing females. Each scale was removed, transferred and mulched on a glass slide in water film. Scales were dissected under a binocular stereomicroscope, and classified into alive un-parasitized individuals and parasitized ones having larvae, pupae or emergence holes. Total percentages of parasitism of the hemispherical scale insect were estimated.

RESULTS AND DISCUSSION

I- Survey of *S. coffeae* natural enemies

Obtained results show that, the natural enemies of *S. coffeae* are:

a: Parasitoids:

Six primary parasitoid species were recorded, one species belong to family Aphelinidae, three species of Encyrtidae, one of Pteromalidae and one of Noctuidae. The respective species are; *Coccophagus lycimnia* Walker, *Encyrtus inflex* (Embleton), *Metaphycus helvolus* Comp., *Microterys flavus* (Howard), and *Scutellista cyanea* Motsch. One secondary parasitoid (hyperparasitoid); *Marietta leopardina* Motsch. was recorded.

Present results agree with those obtained by Priesner and Hosny, 1940 and Hamid and Hassanien, Fawzeia, 1991 (in Egypt); Rosen *et al.*, 1971 (in Israel); Oncuer, 1977 and Kaydan *et al.*, 2006 (in Turkey); Hayat, 1971 (in India) and Al-Ahmed and Badawi, 1992 (in Saudi Arabia).

b. Predators:

Larvae and adults of two species of Coccinellidae: *Pharoscyrnus ovoids* Sicard and

Chilocorus bipustulatus and larvae of *Eublemma scitula* (Noctuidae) were found feeding on different stages of this insect pest. In this respect, Ponsonby and Copland (2007) recorded *Chilocorus nigritus* (Coleoptera: Coccinellidae) as a biological control agent of hemispherical scale insects in temperate glasshouses in UK. Samuel *et al.* (1993) in India recorded *Eublemma* sp., *Chrysopa* sp., *Cryptolaemus montrouzieri* as predators on this insect pest.

II- Seasonal population of *S. coffeae*

Half-monthly counts of the different stages of the hemispherical scale insect, *S. coffeae* on leaves of olive trees are given in Figures 1 and 2. It is obvious that this insect species had three annual peaks of abundance in the first year, 2007/08 by mid-July at 39.4°C max., 21.9°C min. temp. and 51.3% R.H., mid-October at 29.9°C max., 16.4°C min. temp. and 54.8% R.H. and early March (at 26.7°C max., 10.50°C min. temp. and 52.6% R.H. (Fig. 1). The population density of these peaks reached 1333, 1384 and 1309 individuals/ 200 leaves, respectively. A sharp decline in the population density occurred in May.

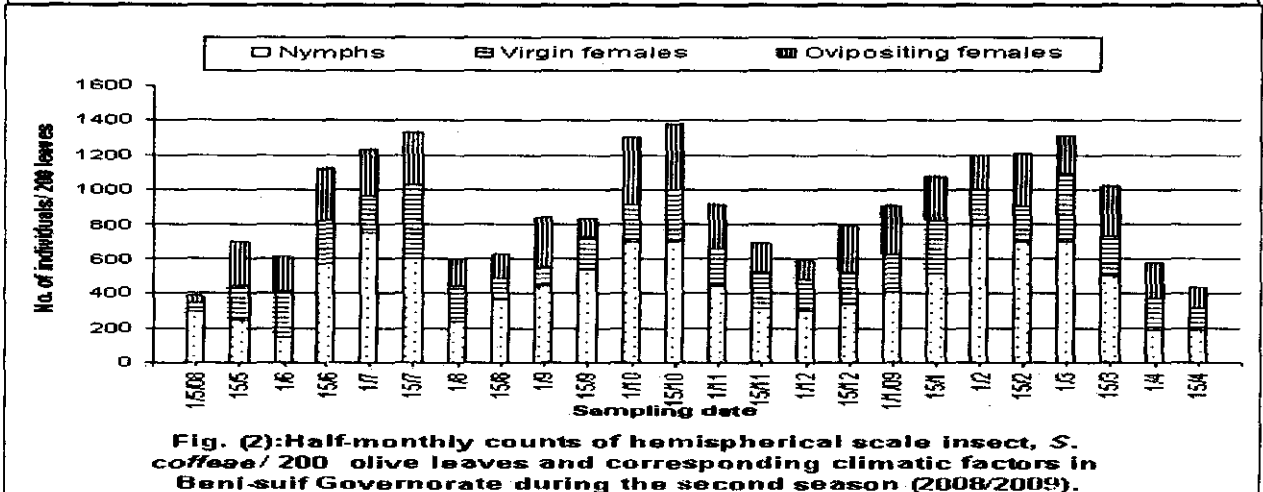
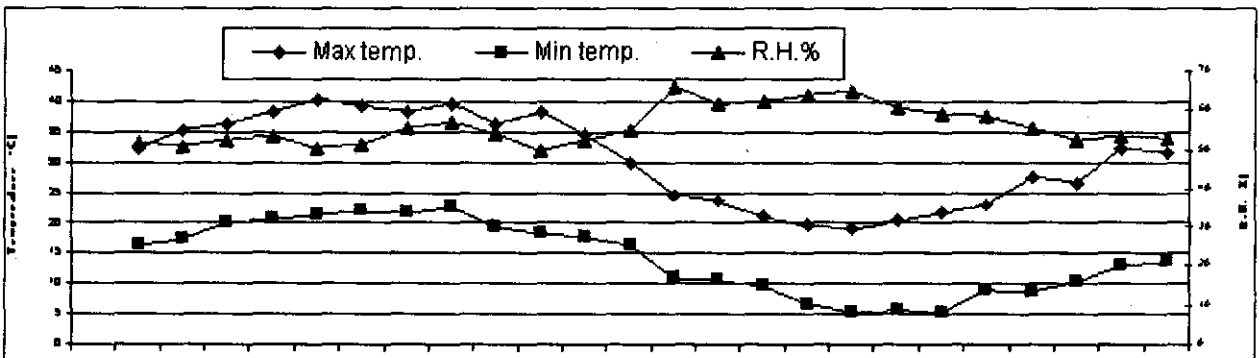
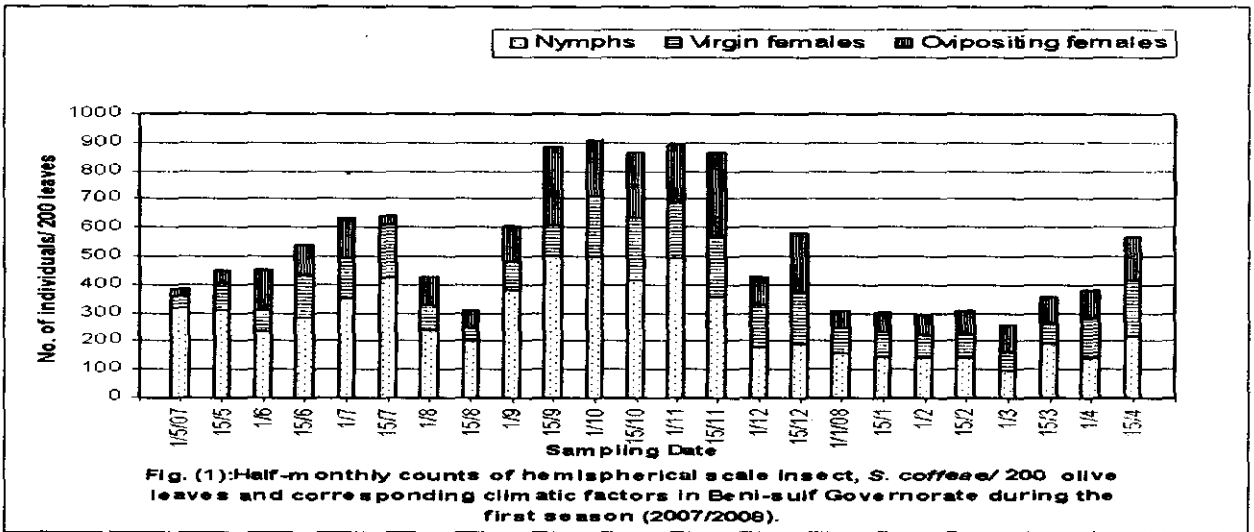
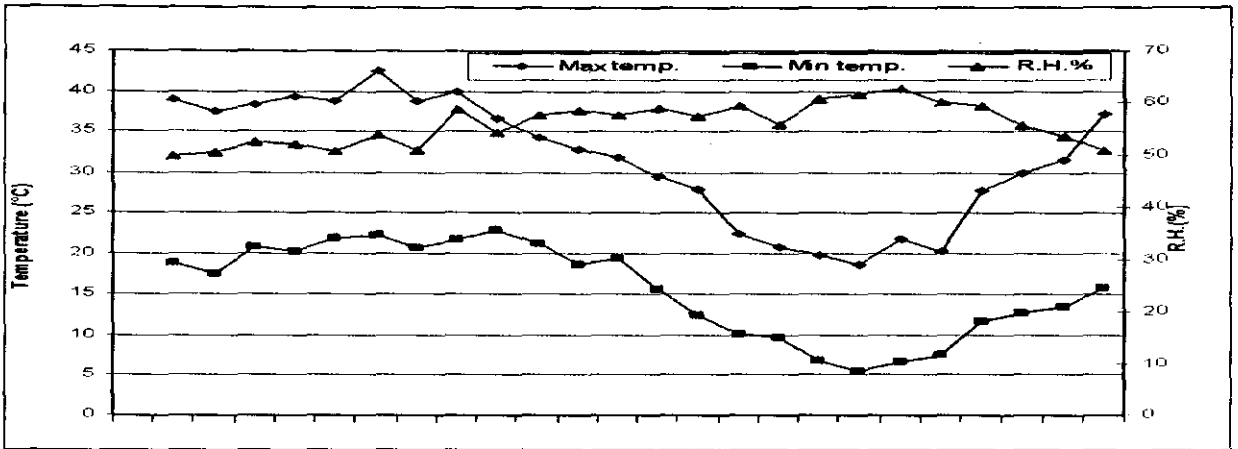
In the second year of study, 2008/09, 2 peaks of 652 and 911 scales/ 200 leaves were recorded by early June and October, respectively at 38.4°C max., 20.8°C min. temp. and 52.5% R.H., as well as 32.8°C max., 18.6 °C min. temp. and 56.5% R.H., respectively.

These results coincide with those of Rosen *et al.* (1971) who stated that *S. coffeae* had 3-4 generations a year on irrigated olive in the southern coastal plain in Israel. Monaco and Abbicco (1987) found that this pest had three annual generations on fig in May – September, August- November and September – June of the following year. Abdel-Rahman (1995) reported that there were two peaks of abundance of *S. coffeae* on olive in two dates; in early spring (February and March) and in autumn (September, October and November) in Egypt.

III: Rate of parasitism

In the first season, results showed three parasitism peaks of 52, 55 and 39 % by mid-June, early August and March, respectively (Fig. 3). In the second season, total rate of parasitism fluctuated and three parasitism peaks of 45, 46 and 41 %, occurred on early July, September and January, respectively.

These results are in agreement with those obtained by Prinsloo (1984) who recorded the encyrtid parasitoid, *M. helvolus*, as a solitary parasitoid on the genera, *Saissetia* and *Coccus* infesting citrus from July to December in South Africa.



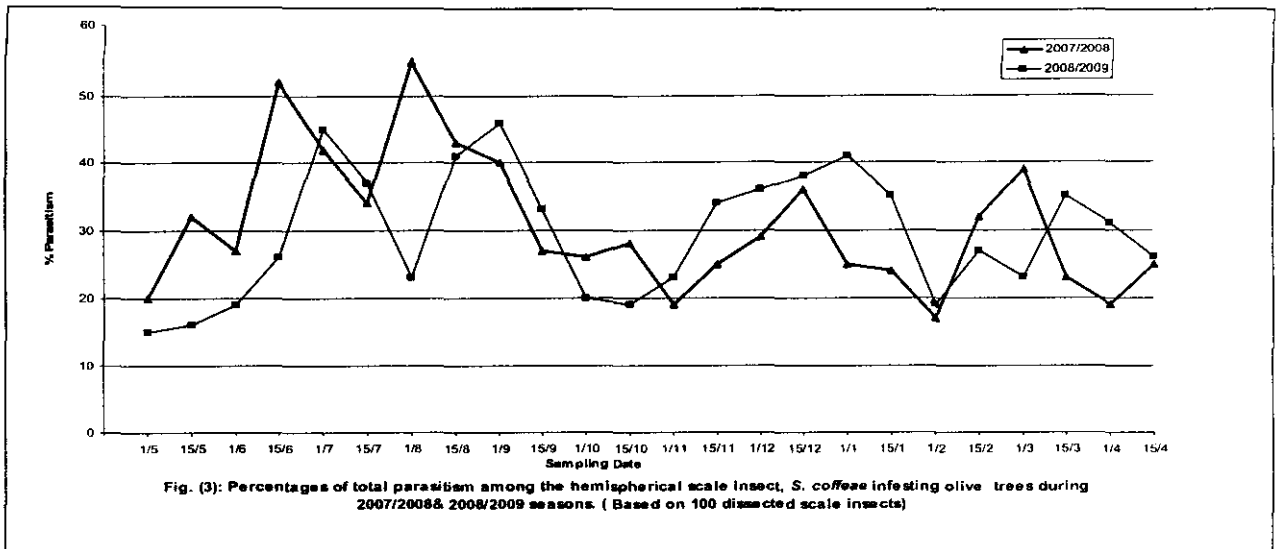


Fig. (3): Percentages of total parasitism among the hemispherical scale insect, *S. coffeae* infesting olive trees during 2007/2008 & 2008/2009 seasons. (Based on 100 dissected scale insects)

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