Predators of scale insects (Hemiptera: Coccoidea) and their role in control in Egypt.

Abd-Rabou, S.; Ahmed, N. and Moustafa, M.
Plant Protection Research Institute, Agriculture Research Center, Dokki, Giza, Egypt

ABSTRACT

Predators are one of the most important bioagents in natural and biological control of scale insects (Hemiptera: Coccoidea). This review includes the literatures of Egyptian scale insects predators including lists of armored scale insects, soft scale insects, mealybugs and other scale insects families predators.

Keywords: Predators of scale insects, control, Egypt

INTRODUCTION

Predators is a major component of natural control and integrated pest management programs of scale insects (Hemiptera: Coccoidea). A predator is an organism that attacks, kills, and feeds on several to many other individuals in its lifetime. Scales are often controlled by predators as beetles, bugs, lacewings and mites. The ladybird beetle, Rodolia cardinalis (Mulsant) is one of the most important one as scale insects predators. Predation by Chilocorus, Hyperaspis and Rhyzobius species lady beetles (ladybugs) can easily be overlooked because they are tiny, colored and shaped like scales or feed beneath scales. Hyperaspis species are tiny, shiny, black lady beetles with several red, orange or yellow spots on the back. Rhyzobius lophanthae has a reddish head, underside and a grayish back densely covered with tiny hairs. The present review includes the role of predators in controlling scale insects in Egypt.

RESULTS

1. Predators of armored scale insects in Egypt:
1.1. list of recorded predators of armored scale insects in Egypt:

Coleoptera: Coccinellidae
1. Chilocorus bipustulatus L.
2. Coccinella undecimpunctata L
3. Exochomus flavipes Thunb.
4. Pharoscyrmus various Kirsch.
5. Rhyzobius lophanthae (Blaisdell)
6. Rodalia cardinals Muls
7. Scymnus syriacus Mars.
8. Stethorus sp.

Hemiptera: Anthocoridae

Neuroptera: Chrysopidae
11. Chrysopa vulgaris L

Acarina: Phytoseiidae
12. Typhlodromus sp.
1.2. Abundance of recorded predators of armored scale insects in Egypt:

Osman (1971) found that *Mycetaspis personata* (Comstock) (Hemiptera: Diaspididae) was predated by *Chrysopa vulgaris*. Hamed and Fawzi (1991) carried out a survey on the predators of important scale insects. They recorded nine predators belonging to Coccinellidae and Chrysopidae. Eight predaceous insect species and seven predatory mite species were reported on branches infested with *Parlatoria oleae* Colvée from different host plants at different locations (Asfoor, 1997). Morsi (1999) recorded eleven predators and eight predacious mites on 7 armored scale insects. *Chilocorus bipustulatus* L. (Coleoptera: Coccinellidae) was found to be the most promising predator of armored scale insects (Abd-Rabou, 2001). Predatory mite *Typhlodromus* sp. and coccinellid species were found associated with *Aonidiella aurantii* Maskell (Mohamed, 2002). Tawfik et al. (1970) recorded the insect predators associated with the black scale, *Chrysomphalus ficus* Ashmead in Egypt. These predators were *C. bipustulatus*, *Scymnus syriacus* Muls., *Pharoscymnus varius* Kirsch., *R. cardinalis*. The larvae of *Chrysopa carnea* Steph. (Neuroptera: Coccinellidae) and *C. bipustulatus* seemed to be the most important predators of this scale infesting citrus orchard. They were obtained in considerable numbers especially in May, June and August. Larvae and adults of these predators were observed feeding on different stages of *C. ficus*. *R. cardinalis* occurred in moderate numbers in infested citrus orchards. The latania scale, *Hemiberlesia lataniae* (Signoret) (Hemiptera: Diaspididae) had 9 species of predators. They were: *C. bipustulatus*, *C. carnea*, *Coccinella undecimpunctata* L., *Exochomus flavipes* Thunb. *R. cardinals*, *Scymnus syriacus* Mars. (Coleoptera: Coccinellidae); *Orius laevigatus* Fieb. (Hemiptera: Anthocoridae), *Pharoscymnus various* Kirsch. and *Syrphus corollae* Fabricius (Diptera: Syrphidae) (Moustafa and Abd-Rabou, 2011). The insect population of *Parlatoria oleae* Leonardi (Hemiptera: Diaspididae) and the predator *C. bipustulatus* L. reached maximum during February and March over two years, respectively (Abd-Rabou and Ahmed, 2011).

2. Predators of soft scale insects in Egypt:
2.1. List of recorded soft scale insects predators in Egypt:

**Coleoptera:** Coccinellidae
1. *Chilocorus bipustulatus* L.
2. *Clitostethus arcuatus* Rossi
3. *Coccinella septempunctata* L.
4. *Coccinella undecimpunctata* L.
5. *Cydonia vicina isis* Cr.
9. *Rhizobius lophanthe* (Blaisdell)
11. *Rodalia cardinals* Muls
12. *Scymnus interruptus* Goeze
14. *Stethorus* sp.

**Coleoptera:** Steaphilinidae
15. *Paederus alfieri* Koch

**Diptera:** Syrphidae
Predators of scale insects (Hemiptera: Coccoidea) and their role in control in Egypt

18. Orius laevigatus Fieb.
19. Orius albidipennis (Reuter)

Neuroptera: Chrysopidae
20. Chrysoperla carnea Steph.
22. Chrysopa vulgaris aegyptica (Schneider)*

Neuroptera: Phloeothripidae
23. Haplothrips andresi Priesner

2.2. Abundance of soft scale insects predators in Egypt:

Abd Allah (1988) recorded that coleopterous predators fed on soft scales infesting citrus, mango and ledge plants in Mansoura region were Cydonia vicina isis Cr., C. v. nilotica Muls., Coccinella septempunctata L., C. undecimpunctata, Scymnus interruptus Goez, S. cyriacus, Exochomus flavipes Thunb., R. cardinalis and Paederus alfieri Koch. He added two neuroptetous predators, C. carnea and C. septempunctata Wesm.; two hemipterous predators, Orius laevigatus Fieb. and O. albidipennis and two dipterous predators, Metasyrphus corollae Fab. and Paragus compeaitus Wied. The predators, C. bipustulatus, S. syriacus, Pharaohoscymnus Varius Kirsch and R. cardinalis were found feeding on some soft scale insects. Chryso sp. larvae were very common and polyphagous predators feeding on many soft scale insects (Hamed and Hassanein, 1991). C. bipustulatus, S. syriacus, C. carnea, C. septempunctata and Orius laevigatus Fab. were recorded associated with different species of soft scale insects in Kafr El-Sheikh (El-Agamy et al., 1994). El-Batan (1997) investigated the searching behavior of larvae of Exochomus flavipes (Thunberg) and C. carnea for Coccus hesperidum L. She found that larvae of C. carnea and early instars (1st and 2nd) of E. flavipes showed equal searching capacity for C. hesperidum placed on both the top and bottom surfaces of glass plates. The 3rd and 4th larval instars of E. flavipes showed a preference for prey attached to the bottom surface. Before contacting prey, straved 3rd instar larvae of C. carnea and 4th instar larvae of E. flavipes searched relatively rapidly with a low turning rate. After contacting prey, searching speed decreased and turning rate increased by about double fold. Hendawy (1999) mentioned that the highest peak of soft scale insects was detected in November, which coincided with the highest peak of predator. Then the population of predators gradually declined and peaked in May before the peak of scale insects. However, the last peak of the predators occurred during August, directly after a peak of scale insects. He concluded that, peaks of scale insects and those of the predators were coincided. Scymnus syriacus Marseul was recorded as a predator of C. rusci (Morsi, 1999). Badary (2002) recorded 19 predators of Saissetia oleae Olivier and studied the population dynamics of six of them. They were C. bipustulatus, C. carnea, C. undecimpunctata (L.), E. flavipes, Orius sp. and Scymnus syriacus Marseul. Two peaks were recorded annually for C. bipustulatus and C. undecimpunctata while one peak in case of C. carnea and S. syriacus, E. flavipes and Orius sp. were recorded as a low population throughout the two years under considerations. Badary (2011) stated taht genus Saissetia was recorded associated with 16 predator species. Numbers by the predator Scymnus syriacus Mars., (Coleoptera: Coccinellidae) reached maximum (2/60 leaves) during August, in the first year and during September in the second year. The predators, Coccinella undecimpunctata L. and E. flavipes reached maximum of 5.8 and 28/ 60 leaves and 30 twigs during September and August, in the first year, respectively and 24, 19.4 and 22 / 60 leaves and 30 twigs during September in the second year, respectively.

The abundance of the predator, *S. syriacus* of *Saissetia coffeae* (Walker) (Hemiptera: Coccidae) reached maximum during October during two successive years. The predator *E. flavipes* (Coleoptera: Coccinellidae) reached maximum during October during two successive years, respectively (Abd-Raboou and Ahmed, 2011).

### 2.3. Applied biocontrol using predators of soft scale insects in Egypt:

Six releases of the predator, *E. flavipes* on the green shield scale, *Pulvinaria psidii* Maskell (Hemiptera: Coccidae) on guava trees in Gahrbiya was conducted. This predator was reared under defined climatic conditions (25–27°C and 65–75% RH) in the laboratory. A significant reduction in the number of *P. psidii* population was recorded compared with control plots. Six months after the release, the average population of *P. psidii* was decreased from 1897 to 475/30 leaves in the treated plot. The present study indicated that *E. flavipes* is a potential biocontrol agent of *P. psidii* on guava in Egypt (Abd-Rabou, 2011).

### 3. Predators of mealybugs in Egypt:

#### 3.1. List of reported predators of mealybugs in Egypt:

**Coleoptera : Coccinellidae**
1. *Cryptolaemus montrouzieri* Mulsant
2. *Rodolia cardinalis* (Muls.)
3. *Scymnus interruptus* Goeze

**Diptera: Cecidomyiidae**
5. *Diadiplosia* sp.

**Lepidoptera: Noctuidae**
6. *Autoba beraudi* Joannis
7. *Autoba gayncri* Rothsch

**Lepidoptera: Oecophoridae**

**Neuroptera: Chrysopidae**
10. *Chrysopa vulgaris aegyptica* (Schneider)

#### 3.2. Abundance of predators of mealybugs in Egypt:


### 3.3. Applied biocontrol using predators of mealybugs in Egypt:

Biological control measures against mealybugs using *C. montrouzieri* started in 1926. It was reared and distributed on a limited scale (as its rearing was time consuming). The insect fed freely on various species of mealybugs. Due to its low
reproductive potential, slow spreading, the necessary protection to stand our winter condition and the annual release of new colonies, the work on this predator species was abandoned (Kamal, 1951). Second trial to introduce and rear this coccinellid predator from France to Egypt was conducted. Releasing *C. montrouzieri* against the striped mealybug, *Ferrisia virgata* gave a positive effect in reduction of the mealybug population. The percent of reduction reached to 100.0, 98.9 and 94.4% for crawlers, nymphs and adults of *F. virgata*, respectively after 3 months of release (Attia and El Arnaouty, 2007). The coccinellid predator, *C. montrouzieri* was used to control the citrus mealybug, *Planococcus citri* (Risso.) (Hemiptera: Pseudococcidae) on the croton ornamental shrubs, *Codiaeum variegatum* L. at Giza governorate, Egypt. *C. montrouzieri* as 50 adults/Croton shrub, were released once on October 27, 2008 in the open field. Obtained results indicated that percentages of reduction among the egg masses, nymphs and adults of *P. citri*, one month after releasing the predator reached to 41.5, 42.3 and 57.5%, respectively. Two months later, the corresponding rates were 80.6, 86.5 and 91.5%. Finally, after three months of releasing the predator, reduction rates reached to 100% for all stages of the pest (Afifi *et al.*, 2010).

**4. Predators of other families of scale insects:**

Moustafa (2012a) recorded two species of predators attacked the red date scale, *Phoenicococcus marlatti* Cockerell (Hemiptera:Phoenicococcidae). These species belonging to Order: Coleoptera, Family Coccinellidae, *Pharoscymnus varius* (Kirsch) and *Scymnus punetillum* Weise. The predator recorded in El-Arish region was *P. varius*. During the first year (2009-2010). No occurrence of predators was noticed from October 15th 2009 to February 15th 2010. The population reached its maximum numbers of individuals as 62 individuals /sample. During the second year (2010-2011) no occurrence of predators was noticed from November 1st to February 15th 2011. The population reached maximum numbers of individuals 58 individuals per samples. Ahmed (2011) recorded three species of predators attacked *Pollinia pollini* (Costa) (Hemitera: Asterolecanidea) in Egypt. These were the coccinelids, *Coccinella undecimpunctata* L., *Scymnus seriacus* Mars. and the Neuroptera species, *C. carnae* Moustafa and Abd-Rabou (2010) recorded seven species of predators attacked, the guava soft scale, *Pulvinaria psidii* (Maskell) (Hemiptera : Coccidae).

**REFERENCES**


Predators of scale insects (Hemiptera: Coccoidea) and their role in control in Egypt


ARABIC SUMMARY

مفترسات الحشرات القشرية ودورها في المكافحة في مصر

شعار عبدربه و نهان أحمد و منى مصطفى

معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقي – جيزة – مصر

المفترسات من أهم العناصر البيولوجية في المكافحة القشرية. هذا المقال يتضمن المراجع العلمية التي لها علاقة بمفترسات الحشرات القشرية المختلفة. و بعض فصائل الأخطئ القشرية الأخرى في مصر.