

# Population Development of *Ceroplastes floridensis* on Grapefruit and Oranges

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**ABSTRACT----** *In this study, population development of Ceroplastes floridensis (Hemiptera: Coccidae) on Marshseedless variety of grapefruit, Valencia and Jaffa varieties of orange in citrus orchard of Batu Akdeniz Agricultural Research Institute that belongs to Ministry of Food, Agriculture and Livestock, Turkey, were investigated in 2015. Ten twig samples in 20 cm length, and 100 leaf samples of each parcel which was randomly selected in the citrus orchards that has all citrus species, were taken. Leaf and twig samples brought to the laboratory were examined under microscope. Numbers of both present nymph and adult of C. floridensis were recorded according to biologic stages in the counting, each of alive, death and parasitized individuals were considered. Moreover, two sticky yellow traps for each parcels were put into the parcels in which each species exist and natural enemies were viewed. Beating technique was used for determination of C. floridensis predators and observation of population change in the sample orchards. Each of collected predators were included to the collection, being identified. Population level was higher on marshseedless more than valencia and jaffa C. floridensis has two generations each year. Chilocorus bipustulatus species was the most encountered one in the predators. Coccophagus scutellaris was detected as parasitoid on yellow sticky traps.*

**Keywords----** *Ceroplastes floridensis*, population fluctuation, citrus, grapefruit, orange

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## 1. INTRODUCTION

Citrus is one of the most important fruit group cultivated in the World and Turkey. According to FAO's data of 2014, citrus production is 136 billion ton on 9.679.000 hectares area in Turkey (FAO, 2015). Turkey is number 9 in the production list with 3.7 billion ton. Turkey has a great climate advantage for citrus production. There are more than 90 pests species, 34 diseases species, 16 nematodes, and 155 weed species in citrus cultivating areas in Turkey. This situation causes serious damage to economic level (Uygun et al., 2001; Uygun and Satar, 2008). Florida wax scale (*Ceroplastes floridensis*) (Hemiptera: Coccidae) is one of the citrus pests. This pests were spread to Central and tropical North America, Iran, Java, Hong Kong, North Africa, Madagascar, India, China, North East Asia, Egypt, Cyprus, France, Israel, Italy, Lebanon, Turkey, Madeira, Mariana Islands, Palau and Australia (Ben-Dov, 1993). Florida wax scale is the most common pest in the Mediterranean Region, among the coccids (Luck et al., 1996; Karaca and Şenal, 1998; Elekçioğlu et al., 2006; Elekçioğlu and Şenal, 2007). Nymph stages feed on the leaves and twigs, in the severe infected status loss of leaves and dry twigs are the results, in addition, due to their production of adrenal sweetish substance saprophyte fungus are emerge and polluted the surface of the leaves and it reduces the amount of photosynthesis and respiration. There is no study about Florida wax scale in and around province of Antalya orange and grapefruit orchards. In this study, pest development, population changes and its natural enemies were investigated.

## 2. MATERIALS AND METHODS

This study was carried out at Muratpaşa district in Antalya province in 2015. Study area is citrus orchards belongs to Western Mediterranean Research Institute, Ministry of Food, Agriculture and Livestock. Samples were collected from Jaffa and Valencia varieties of orange and a marshseedless variety of grapefruit. No chemicals were applied to the orchards.

### 2.1. Leaves and twigs samples

Leaves and twigs samples were taken every week from Jaffa, Valencia and Marshseedless varieties. 100 leaves and 10 twigs with 20 cm long samples were taken at random from each variety. In this way, each sampling date was taken a total of 300 leaves and 30 twigs, then were put in polyethylene bags. These samples were brought to the Biological Control Research and Application Laboratory and the numbers of live, dead and parasitized wax scale individuals were counted under the stereo binocular microscope.

### 2.2. Yellow Sticky Traps

Two yellow sticky traps were hanged to each orchard. Traps were placed by about 180 cm above the ground, in the mid part of the orchards and in the south direction of trees. Traps were changed every week during the warm period of the year

(spring, summer and autumn) and monthly during the winter months. Traps have been brought to the lab for counting of the captured predators and parasitoids.

### 2.3. Collecting the Predators

For collecting of predators of Florida wax scale stroke method (100 strokes for each orchard) was used (Steiner, 1962). Adult predators were also collected with an aspirator when they were observed on the trees. Thereafter the samples were brought to the lab and identified under the stereo binocular microscope.

All insect materials were stored at EMIT (Entomological Museum of Isparta, Turkey).

## 3. RESULTS AND DISCUSSION

Population fluctuations of florida wax scale and parasitized individuals on leaves of grapefruit (Marshseedless) and orange (Valencia and Jaffa) are given in Figure 1.

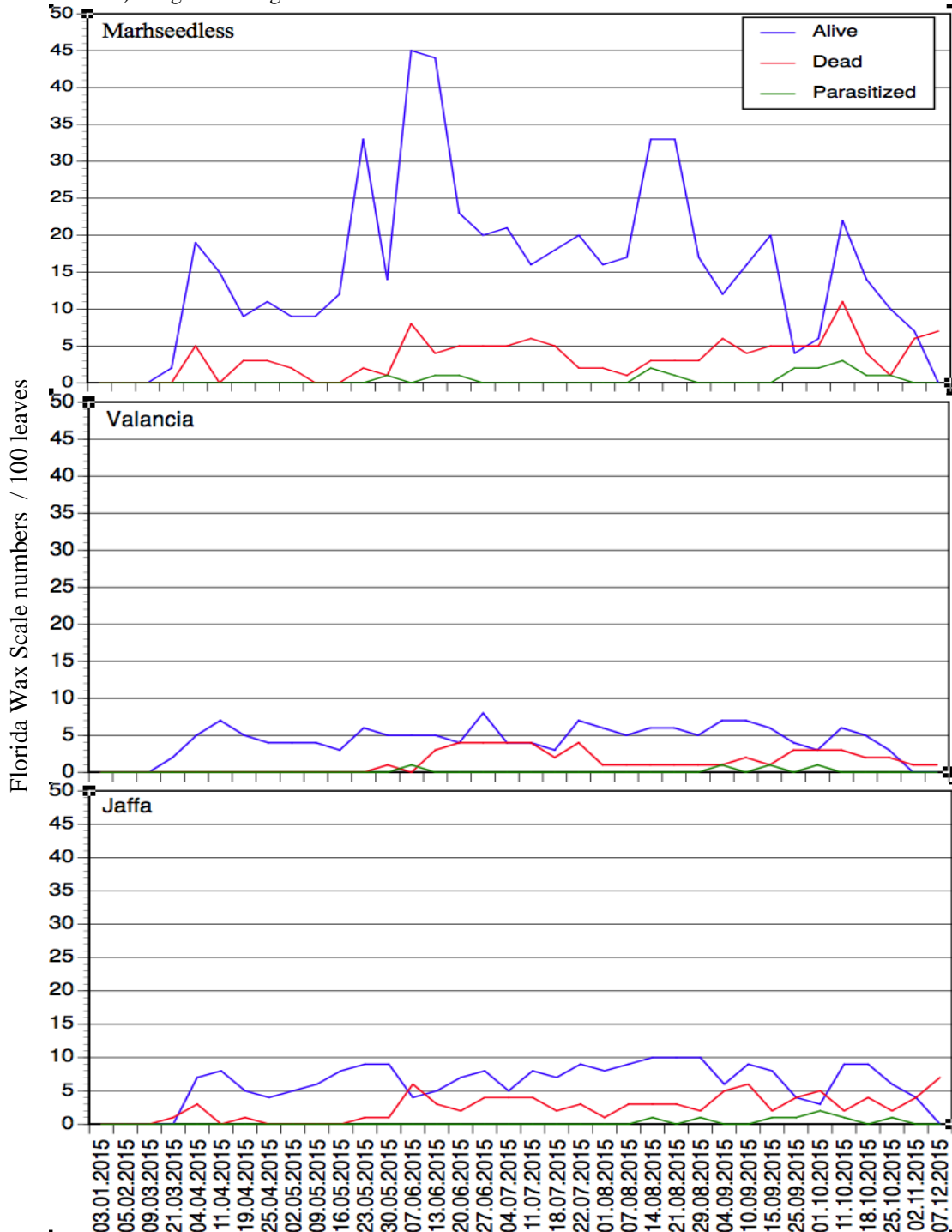


Figure 1. Population development of *Ceroplastes floridensis* on the Marshseedless, Valencia and Jaffa leaves.

Florida wax scale was started to development in the last week of March and the fluctuations were continued all year round. Population level was higher on marshseedless more than valencia and jaffa (Figure 1). Number of florida wax scale reached on per leaf of 45 individuals in June. The numbers of parasitized individuals quite at low levels were and the first parasitized individuals were seen on marshseedless in May, on Valencia in June and on the jaffa in August, respectively. Population fluctuations of florida wax scale and parasitized individuals on twigs of grapefruit (Marshseedless) and orange (Valencia and Jaffa) are given in Figure 2. The population levels on twigs were lower than on leaves. As on the leaves, the florida wax scale population on the twigs was higher on marshseedless than valencia and jaffa. Parasitized individuals on twigs are observed only on marshseedless. The temperature values increased smoothly up until July and at the beginning of August has reached the maximum level, since then also decreased the occurrence of decline.

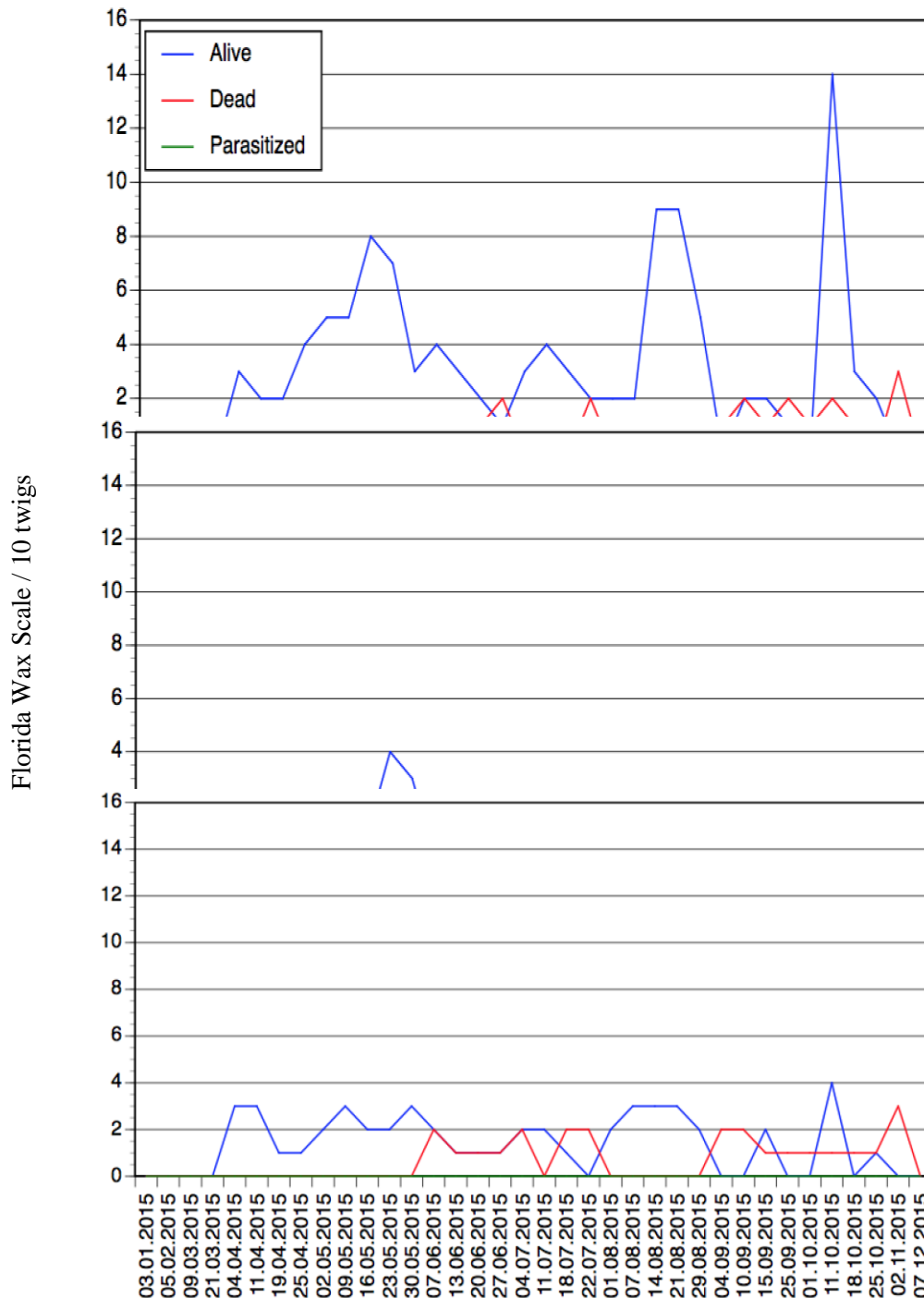


Figure 2. Population development of *Ceroplastes floridensis* on Marshseedless, Valencia and Jaffa twigs.

Climate data of the experiment area was shown in Figure 3.

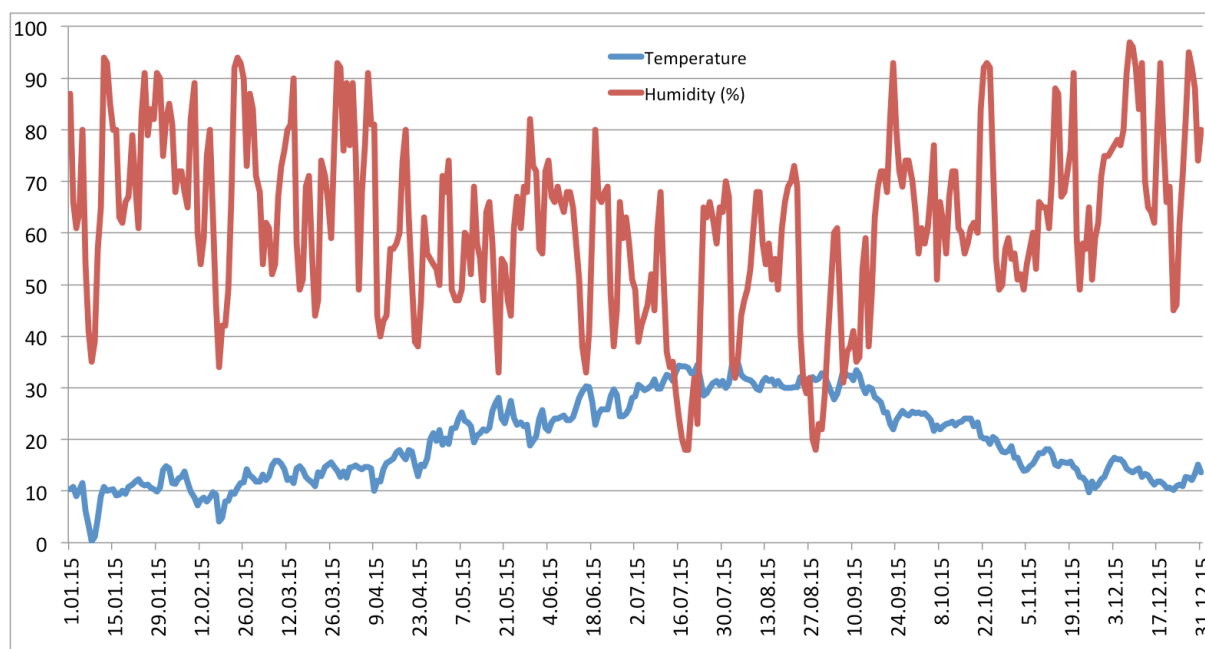


Figure 3. Temperature and humidity data in the experiment area.

Thermal constant value is calculated on the basis of the findings of a previously research (Gerson, 2015). In this study development threshold and thermal constant value were 10 °C and thermal constant 1700 degree-days, sincerely. In our research, total degree-days was calculated as 3678 degree-days depending on the study of Gerson (2015). Generation number was calculated as 2.1 when this value was divided by 1700. Podoler et al. (1981) and Argov et al. (1992) in Israel, Huang and Huang (1998) in the Fuji (China), Waterhouse and Sands, (2001) in Australia and Moustafa (2012) in Egypt were reported that the pest was given two generations per year. Results of literature and our studies were similar. Parasitized individual numbers were higher on leaves more than on twigs. The highest numbers of parasitized individual were on marssedless variety.

Predators collected by the Steiner (1962) method were shown in figure 4.

*Chilocorus bipupustulatus* is a common predator of scale insect included florida wax scale (Podoler et al., 1981; Elekçioğlu and Şenal, 2007; Kapranas, 2012). Also, Elekçioğlu and Şenal (2007) reported that *Scymnus* species fed on florida wax scale.

Parasitoid species captured by yellow sticky traps were given in Figure 5. *Coccophagus scutellaris* and *Metaphycus* sp. were detected as parasitoids of florida wax scale.

There are many studies shown that *C. scutellaris* fed on *C. floridensis* (Morse et al., 1996; Noyes, 1998; Şengonca et al., 1998; Uygun et al., 2001; Kapranas, 2012).

As a result, protecting, supporting and releasing (when it is necessary) natural enemies in the orchards with natural balance is very important in terms of sustainability.



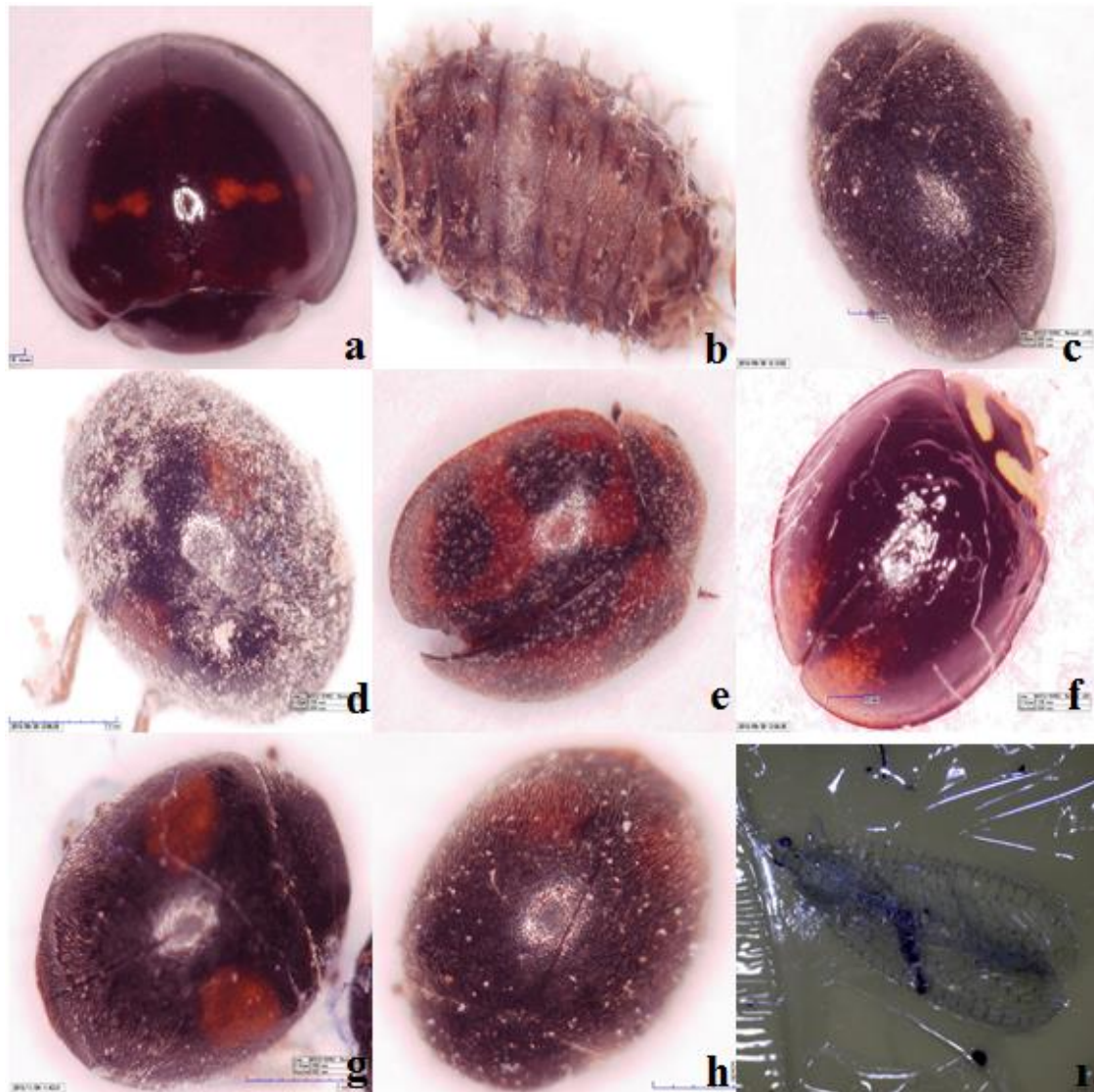


Figure 4. a) *Chilocorus bipustulatus* adult, b) *Chilocoru sbipustulatus* larvae, c) *Scymnus rupromaculatus*, d) *Scymnus sapetzi*, e) *Rodelia cardinalis*, f) *Cheilomenes propinqua*, g) *Scymnus pallipediformis*, h) *Scymnus nicricans* i) *Chrysoperla carnea*

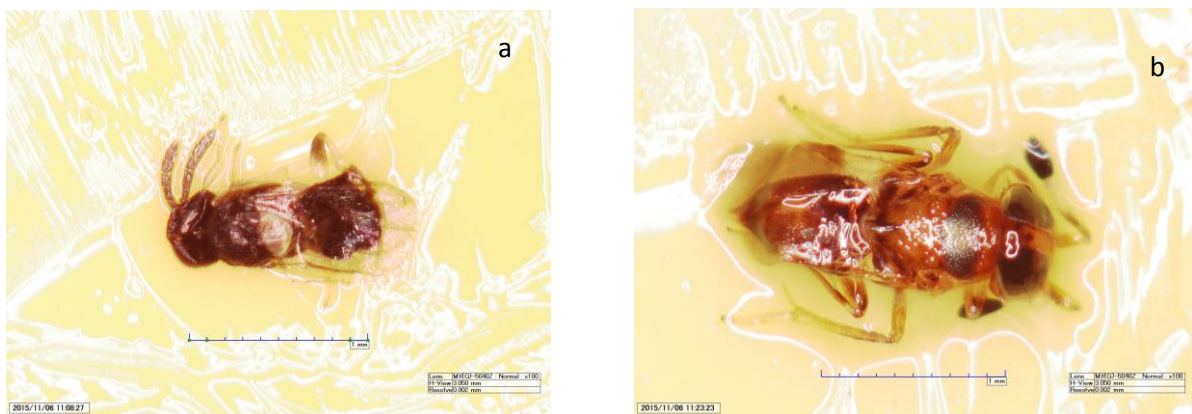


Figure 5. a) *Coccophagus scutellaris*, b) *Metaphycus* sp.

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#### 5. REFERENCES

- Argov, Y.; Schneider, B.; Rosen, D., 1992. Parasitism of Florida wax scale, *Ceroplastes floridensis* Comstock, on citrus in Israel. Journal of the Entomological Society of Southern Africa, Vol. 55 No. 1, 21-31.
- Ben-Dov, Y. 1993. A systematic catalogue of the soft scales of the World (Homoptera: Coccidae: Coccidae) with data on geographical distribution, host plants, biology and economic importance. Flora and Fauna Handbook No. 9., Sandhill Crane Press, Inc. Gainesville, Florida, 536 pp.
- Elekcioğlu N.Z., Pala H., Temel N., Özaslandan A., Kara H., Balki N.K., 2006. In East Mediterranean Region of Turkey Marshseedless specy of grapefruit , Jaffa specy of orange Cultivation with Organic Production Plant Protection Practies, Turkey III. Organic Agriculture Symposium , YALOVA, TURKEY, 1-4 October 2006, 203-212.
- Elekcioğlu N.Z., Şenal D., 2007. Pest and Natural Enemy Fauna in Organic Citrus Production in East Mediterranean Region of Turkey, International Journal of Naturel and Engineering Sciences, vol.1, 29-34.
- FAO, Food and Agriculture Organization of The United Nations, Erişim Tarihi: 10.08.2015, <http://www.fao.org/statistics/en/> Freeborn, S.T., 1931. Citrus Scale Distribution in the Mediterranean Basin. Journal of Economic Entomology, 24, 1025-1031.
- Gerson, U. 2015. Plant Pests of the Middle East, *Ceroplastes floridensis* (Comstock) [http://www.agri.huji.ac.il/mepests/pest/Ceroplastes\\_floridensis/](http://www.agri.huji.ac.il/mepests/pest/Ceroplastes_floridensis/).
- Huang, J.; Huang, B. K., 1988. Bionomics of *Ceroplastes floridensis* Comstock (Hom. Coccidae) and its hymenopterous parasites (Hym., Chalcidoidea). Journal of Fujian Agricultural College, 17 (1), 31-37.
- Kapranas, A., 2012. Coccidae, Integrated Control of Citrus Pests in the Mediterranean Region, 2012, 183-191, In Vacante, V. and Gerson, U. (Eds.) Integrated Control of Citrus Pests in the Mediterranean Region. Bentham Science Publishers.
- Karaca, İ. ve D. Şenal, 1998. *Ceroplastes floridensis* (Comstock) (Homoptera: Coccidae) and pest control on citrus .Citrus bulletin, 9 (27), 10-12.
- Luck, R. F., J. G. Morse, and D. J. Gumpf. 1996. California, United States. pp 257-305. In Morse, J. G., R. F. Luck, and D. J. Gumpf. (Eds.) Citrus Pest Problems and their Control in the Near East.FAO Plant Production and Protection Paper 135.Food and Agricultural Organization of the United Nations. Rome.
- Morse, J.G., Luck, R. F., Gumpf, D. J., 1996. Citrus pest problems and their control in the Near East / edited by J.G. Morse, R.F. Luck, and D.J. Gumpf Food and Agriculture Organization of the United Nations, 1996 xi, 403 p
- Moustafa, M., 2012. Scale insects (Coccoidae: Hemiptera) infested citrus trees and thier natural enemies, with a key of these pests in Egypt. Egypt. Acad. J. biolog. Sci., 5(1): 1- 23.
- Noyes, J.S. 1998. Catalogue of the Chalcidoidea of the world. Biodiversity catalogue database and image library. London, Natural History Museum, CD-ROM Series.
- Podoler, H.; Dreishpoun, Y.; Rosen, D., 1981. Population dynamics of the Florida wax scale, *Ceroplastes floridensis* (Homoptera: Coccidae) on citrus in Israel. 1. A partial life-table. Acta Oecologica, Oecologia Applicata Vol. 2 (1), 81-91.
- Şengonca, Ç., N. Uygun, İ. Karaca and M. Schade, 1998. Primary studies on the parasitoid fauna of Coccoidea in cultivated and non-cultivated areas in the east Mediterranean region of Turkey. Anzeigerfür, Schadlingskunde Pflanzenschutz Umweltschutz, 71 (7): 128-131.
- Steiner, N. 1962. Methoden Zur Untersuchung der Population Dynamikin Obstanlagen, Entomophaga 7(13), 207-214.
- Uygun, N. , Satar, S., 2008. The Current Situation Of Citrus Pest and Their Control Methods in Turkey. Integrated Control in Citrus Fruit Crops , 38, 2-9.
- Uygun, N., İ. Karaca, M.R. Ulusoy, D. Şenal, 2001. İntegrated Control of Citrus Pests. Editor N.Uygun, Integrated Control in Citrus Orchards in Turkey, 157 s. TÜBİTAK, Turkey Agriculture Research Project Publications, Ankara, 9-57.
- Waterhouse, D.F. and Sands, D.P.A. 2001. Classical biological control of arthropods in Australia. ACIAR Monograph No. 77, 560 p.