Diaspididae (Hemiptera: Coccoidea) of Important Species on Citrus Orchards in Antalya Province and Their Natural Enemies Population Fluctuations

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ABSTRACT---- ***In this study population fluctuations of important species of Diaspididae and their natural enemies were investigated in the mandarin, grapefruit, orange and lemon orchards of BATEM (West Mediterranean Agricultural Research Institute) in 2011-2012 years. As a result, Aonidiella aurantii (Maskell), Aonidiella citrina (Craw), Parlatoria pergandii Comstock species of scale insects were found. Natural enemies determined in the study were Chilocorus bipustulatus (L.) and Oenopiaconglobata (L.) (Coleoptera: Coccinellidae) as predators, and Aphytis melinus DeBach and Encarsia spp. (Hymenoptera: Aphelinidae) as parasitoids. In this study, population fluctuation of A. aurantii, A. citrina and P. pergandii, C. bipustulatus and O. conglobata, A. melinus and Encarsia spp. as their natural enemies,were investigated.***

Keywords— Scale insects, predators, parasitoids, citrus orchards, population fluctuations

1. INTRODUCTION

Citrus is one of the most important fruit crops all over the world. According to FAO data of 2010, the citrus production in the world is approximately 123 million tons in 8.645.339 hectares. Turkey is in 9th place in the world with approximately 3.5 million tons of production in 11.161 hectares [1]. Due to the ecological conditions, Antalya province has a significant potential and has a portion of 1/7 for the citrus production in Turkey [2]. Since the *Citrus* genus has different species and varieties, with their rich content of vitamin C, they are extremely important for the human health. increase the importance of these crops.There are a large number of pests on citrus [3]. The coccids among these pests causes important losses of production. Diaspididae family, which has the maximum species number with approximately 2400 species belonging to 380 genera, cause important damage by feeding on plants [4].

The aim of this study were determine the population fluctuations of important species of Diaspididae which cause damage on different species of citrus and their natural enemies in Antalya province.

2. MATERIAL AND METHODS

Population fluctuations were carry out in the mandarin, grapefruit, orange and lemon orchards of BATEM (West Mediterranean Agricultural Research Institute) 15-30 days period with in 2011-2012 years.

2.1.Population fluctuations of important species of Diaspididae

In total 100 leaves, 10 branches and 10 fruits were picked from 10 trees randomly selected at every turn in the gardens where each citrus spices exist. These sample types were counted under stereo binocular microscope in the laboratory. At counts the biological periods of Diaspididae (nymph1, nymph2, female, male) spices journalised as alive and parazitoid. Hence, diagrams and assesments were done over leaves by the reason of fruits being harvested and low population density on branches. In addition, a meteorological station was built in Muratpaşa BATEM so average temperature (°C) and balanced humidity (%) values were acquired (Figure 3).

2.2 Population fluctuations of predators species of Diaspididae

In order to collect the predators, the Steiner method was used [5]. Random branches from four directions of the trees in each orchard were selected and a total of 50 branches were hitten two times by a stick. The numbers of predators which were fallen in the Steiner hopper were counted and later on the predator species were identified by Dr. Nedim UYGUN (Çukurova University, Agricultural Faculty, Plant Protection Department, Adana).

2.3 Population fluctuations of parasitodes species of Diaspididae

In sampling gardens, approximately 2 meters height two yellow sticky traps (15x20 cm) were hanged. These traps brought to the laboratory tallied under stereo binocular microscope and population fluctuation of grown-up parasitoides were specified.

3. RESULTS AND DISCUSSION

During studying periods, population fluctuation of *A. aurantii*, *A. citrina*, *P. pergandii* and natural enemies were observed in the grapefruit, lemon, orange and mandarin gardens of BATEM. Figures the gardens grapefruit 'G', lemon 'L', orange 'O', mandarin 'M' have been symbolsimed for the years 2011 and 2012.

Population fluctuaiton of *A. aurantii* in the grapefruit, lemon, mandarin and orange gardens are given in Figure 1-2.

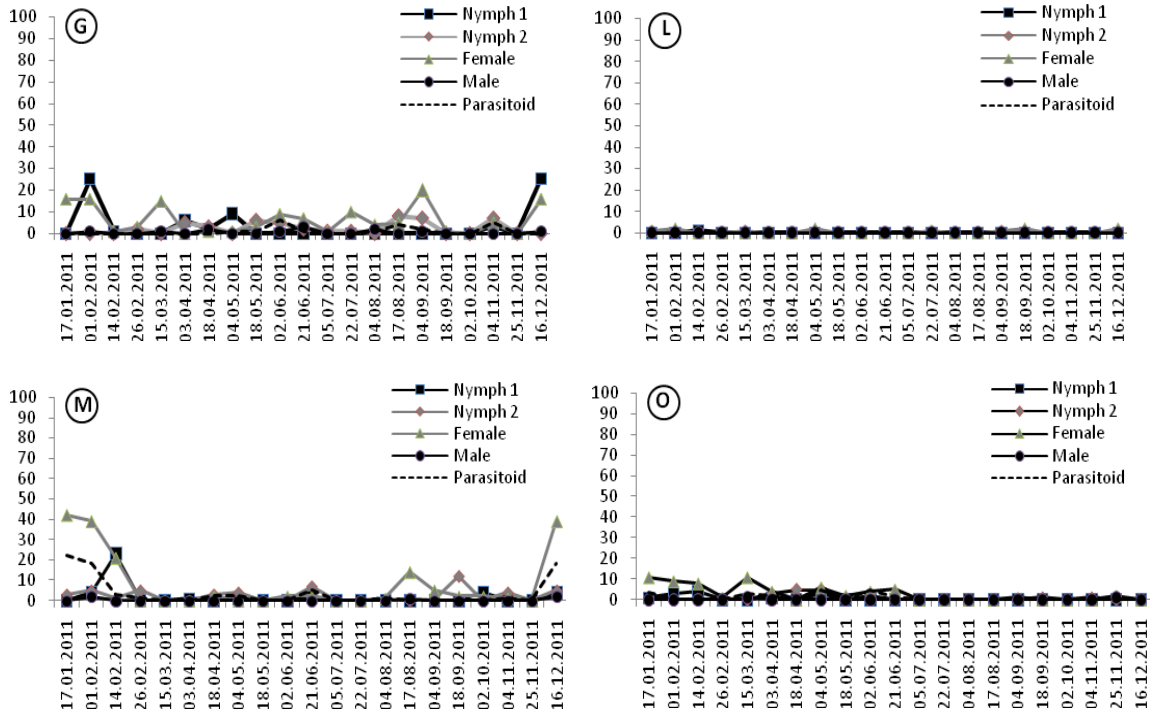


Figure 1. Population fluctuaiton of *A. aurantii* in the grapefruit, lemon, orange and mandarin gardens for the year 2011.

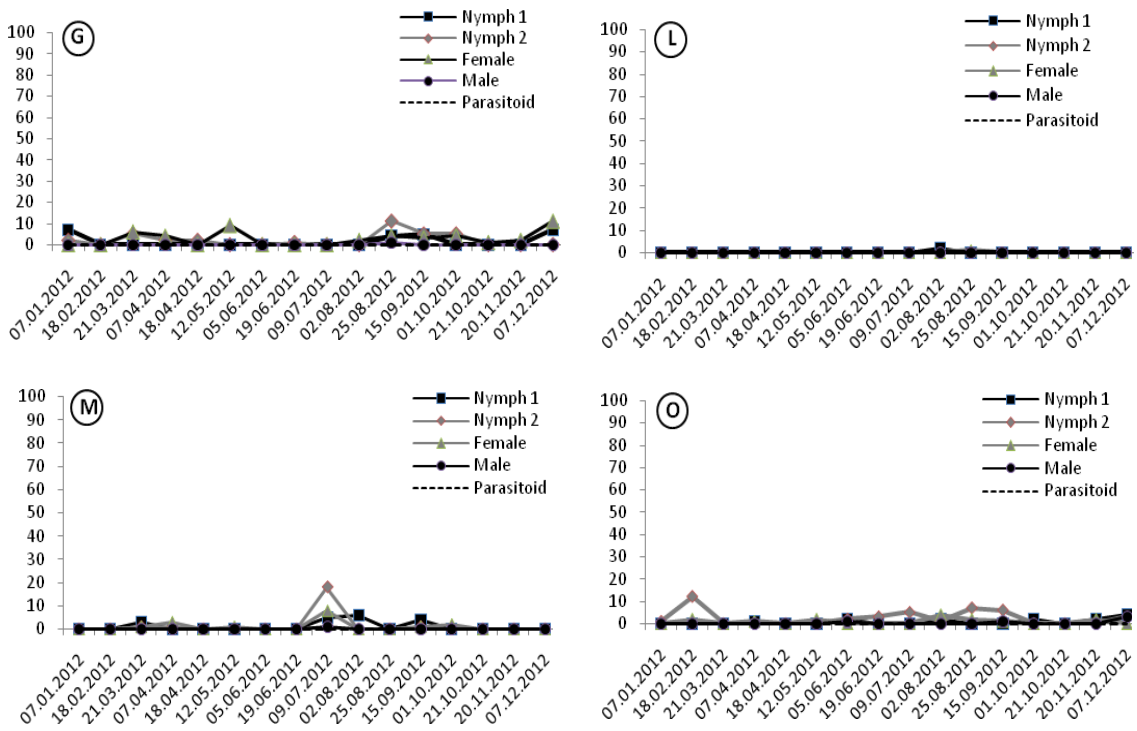


Figure 2. Population fluctuaiton of *A. aurantii* in the grapefruit, lemon, orange and mandarin gardens for the year 2012.

A meteorological station was built in Muratpaşa BATEM so average temperature (°C) and balanced humidity (%) values were acquired Figure 3.

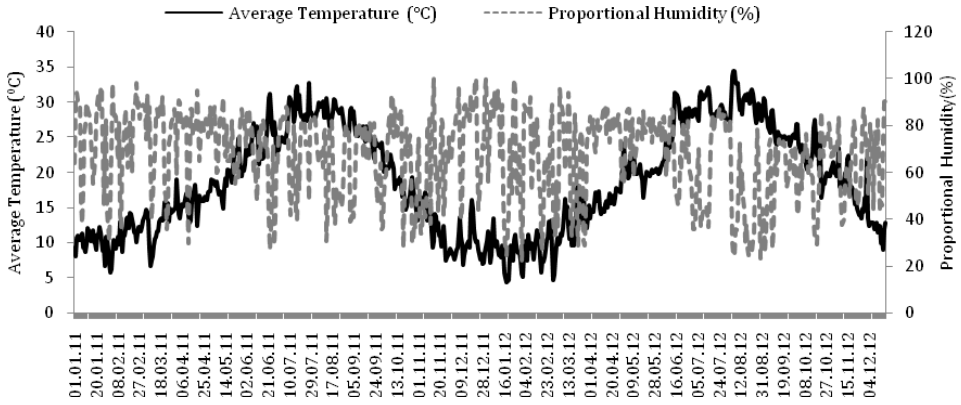


Figure 3. Average temperature (°C) and balanced humidity (%) values for years 2011-2012.

It was calculated that *A. aurantii* offspring 4.1-4.8 between 2011-2012 in Antalya. Rize and İstanbul *A. aurantii* offspring 2 [6], in İzmir it offspring 3[7], in Adana in May, June, August and October it totally offspring 4 [8] and in İzmir (Bornova-Çeşme) in May, July and end of September it totally offspring 3[9] (Önder, 1982). *A. aurantii*'s first offspring came into existance in April-May and its population density increased gradually. Reproduction rate lowered because of increasing the daily avarage temperature (30°C) and decreasing balanced humidity (%40) from the mid June till end of the August .However, in this term 2th(June-July) and 3th(August-September) offspring were observed. Since the climatic conditions were provient in October (average temperature 20°C, balanced humidity 80%) and in

consequence of beginning of 4th offspring, the population increase gained speed. Dynamic nimfs showing up after October died. On the other hand, the population increase was observed in January due to the accumulation of dead individuals belongs to scale insect's offsprings. Beginning from February, increase of the this high population in winter can be explained with plant phenology. Parasitoid individuals reached their highest level in 2011 when the population of scale insect is its highest level, in 2012 population change wasn't observed (Figure 1-2).

Population fluctuaiton of *A. citrina* in the grapefruit gardens are given in Figure 4.

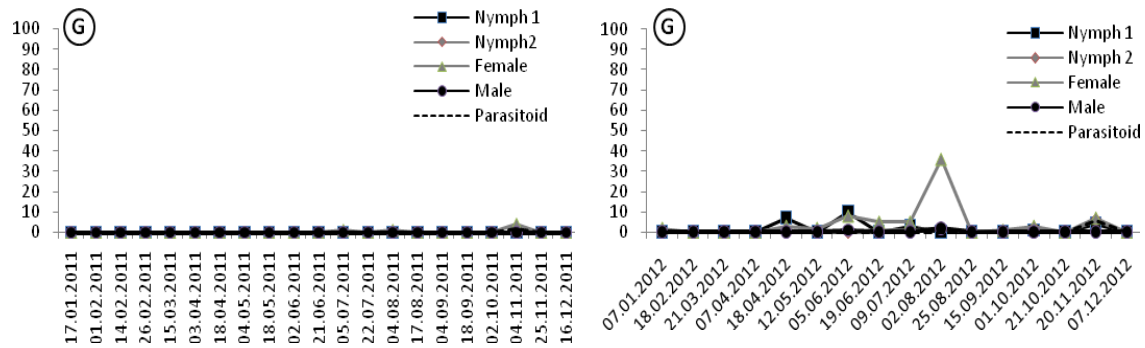
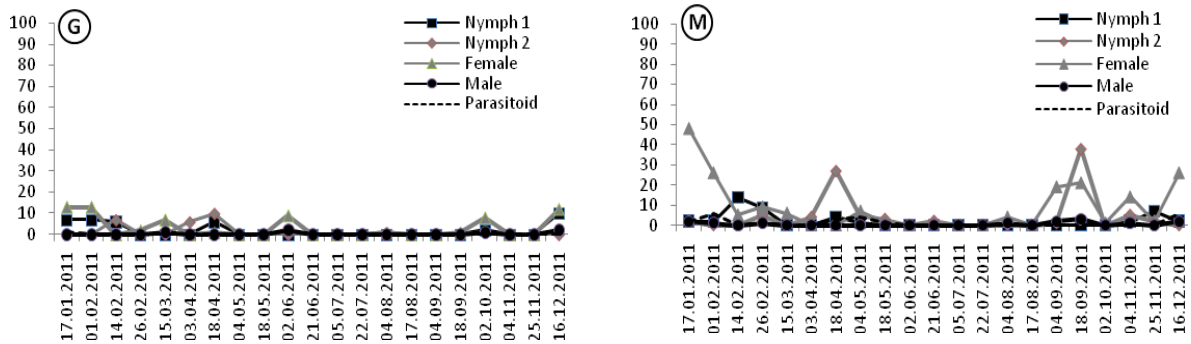


Figure 4. Population fluctuaiton of *A. citrina* in the grapefruit garden for the years 2011- 2012.

It was calculated that *A. citrina* offspring 3.9-4.8 in Antalya in 2011-2012. *A. citrina* offspring 3 at the end of May, June and September in İzmir (Bornova-Çeşme) [9]. The population changes of *A. citrina* was only observed in BATEM grapefruit garden. We can explain it as scale insects couldn't go half meter away on a tree during their active larva period and saplings were infected during the founding period of the gardens. Since *A. citrina* reproduced 4 times in April-May, June, September-October and November and these offsprings were mixed each other, it was encountered different biologic periods of scale insect during the whole year. It was determined that the population was low because of the effect of high temperature and low balanced humidity in summer and was high because of the effect of low temperature and high balanced humidity in autumn (Figure 4).

Population fluctuaiton of *P.pergandii* in the grapefruit, orange and mandarin gardens are given in Figure 5.



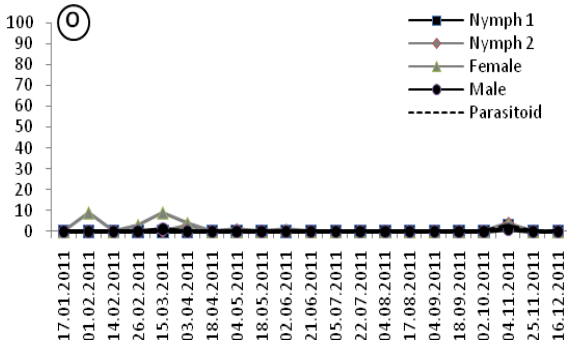


Figure 5. Population fluctuaiton of *P. pergandii* in the grapefruit, mandarin and orange gardens for the year 2011.

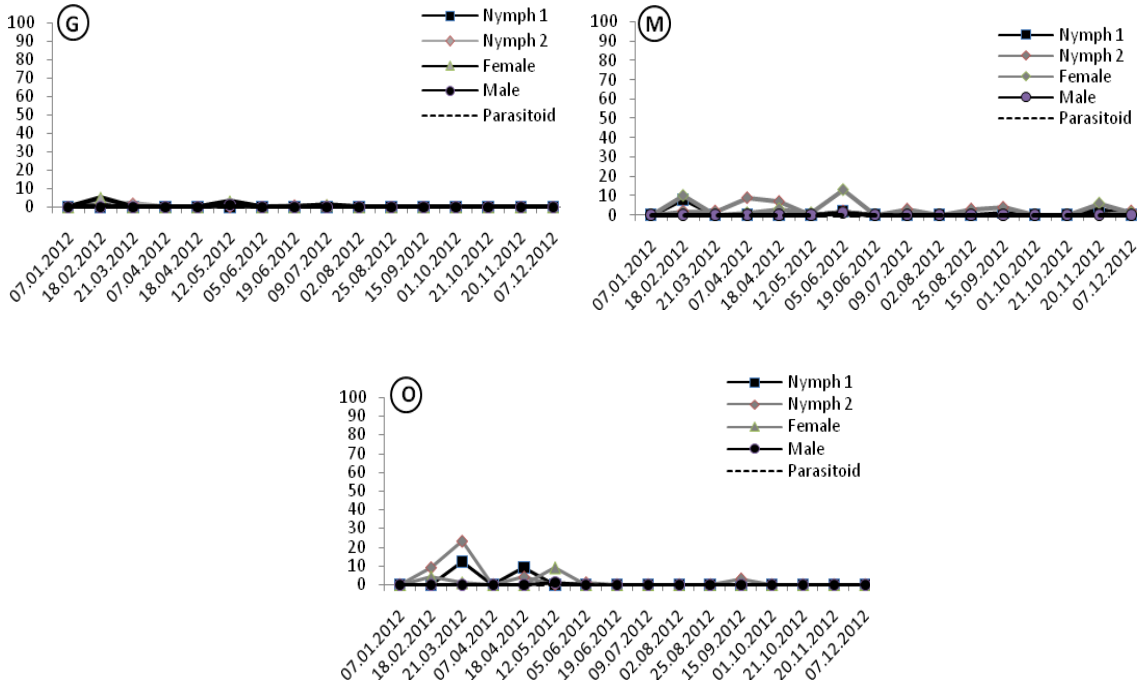


Figure 6. Population fluctuaiton of *P. pergandii* in the grapefruit, mandarin and orange gardens for the year 2012.

It was observed a high decreasewith the defoliation before spring on *P. pergandii* overwintered individuals. In the forthcoming months female individuals increased in total 4 periods which are April-May, July-June, August-September and October-November. On the other hand,parasitoid individuals increased in some periods when the population of scale insects increased (Figure 5-6).

Population fluctuaiton of predators and parasitoids in the grapefruit, lemon, orange and mandarin gardens for the years 2011-2012 are given in Figure 7-8.

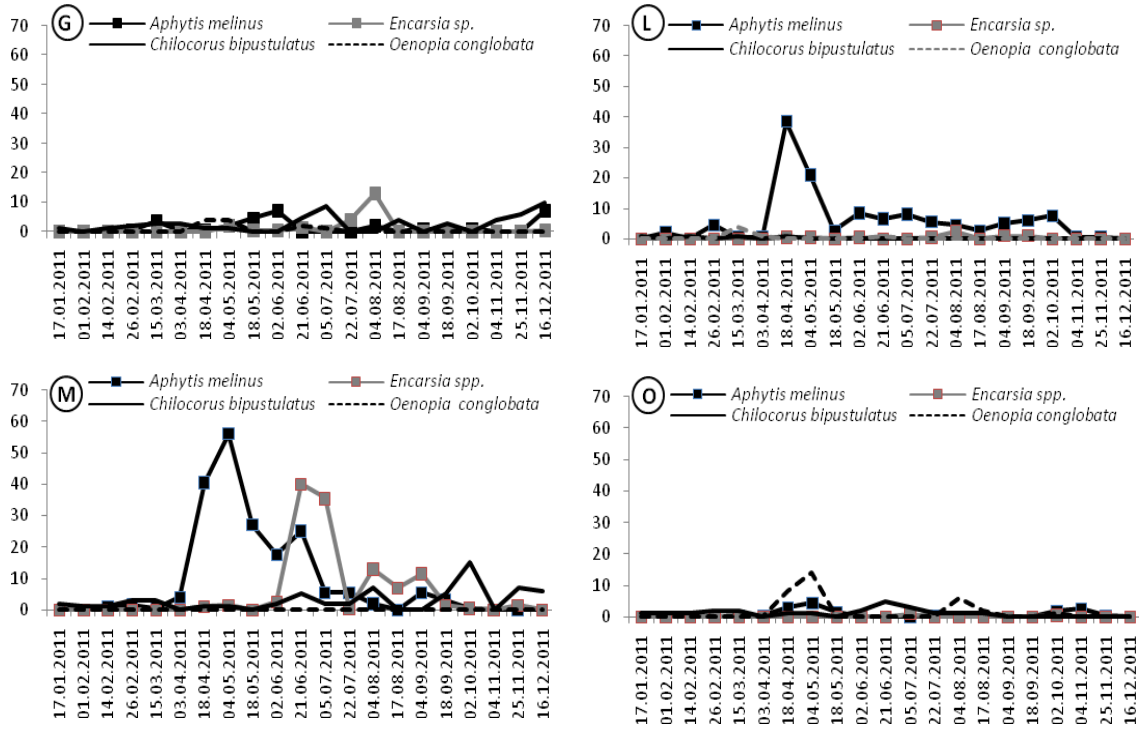


Figure 7. Population fluctuaiton of predators and parasitoids in the grapefruit, lemon, orange and mandarin gardens for the year 2011.

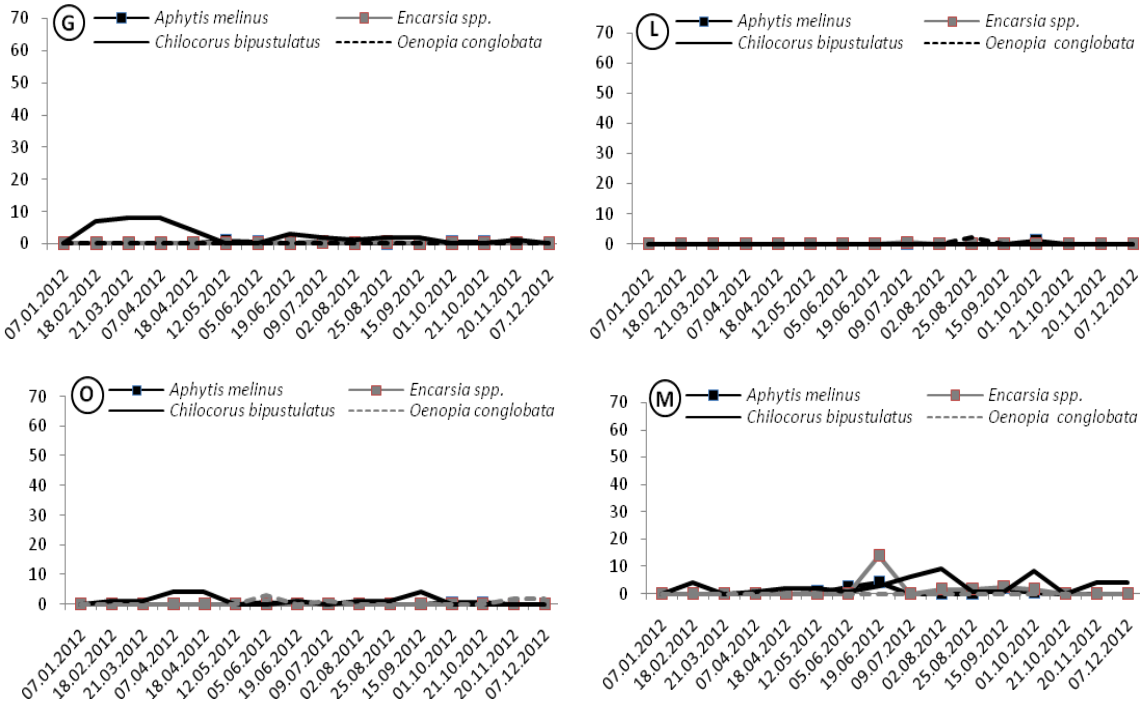


Figure 8. Population fluctuaiton of predators and parasitoids in the grapefruit, lemon, orange and mandarin gardens for the year 2012.

Aphytis melinus reached its highest population intensity in May and September in BATEM orange, lemon, mandarin and grapefruit gardens. However, *Encarsia* spp. reached maximum density during summer. The population of *Chilocorus*

bipustulatus and *Oenopia conglobata* generally increased during the months when scale insect population increased (Figure 8-9).

The increase of *A. melinus* was high mostly during September and November and was low in spring and in summer [9]. The parasitoids population was higher in autumn and in winter than other months [10]. Predator population increased in August and September around İzmir [9]. Hunter insects were high in parallel during the months when *A aurantii* was high density. *Rhyzobius lophanthae*, *C. bipustulatus* and *Cybocephalus fodori minor* were primary hunters of *A. aurantii* [10].

It was extrapolated that the female induviduals *A. aurantii*, *A. citirina* and *P. pergandii* offspring 4 times in April-May, June-July, August-September, October-November. If there is a chemical war it must be against the 1. and 2. terms nimfs which ocur in these months. The usage of white metal oils should be preferred against the scale insects in order to protect predator and parasitoids. Natural balance was founded in BATEM gardens due to the fact that unusage of wide-spectrum pasticides, regular cares (watering, fertilizing, pruning) and with the biological war preparations against the *Planococcus citri*. For this reason scale insects were suppressed by their enemies in BATEM gardens and the population level of harmfuls insects became very low density. Consequently,it is suggested to protect and support natural enemies which are effective on harmful insects and if necessary to make emission studies in the gardens where natural balance is founded.

4. ACKNOWLEDGMENT

This study was presented at the National Conference on 5thPlant Protection which held on 3-5 February 2014 in Antalya-Turkey. Thanks for supporting this study are due to Süleyman Demirel University,Scientific Research Projects Coordinatorship, (Project number: 2486-D-10).

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