

## Orijinal araştırma (Original article)

# Investigation on scale insects (Hemiptera: Coccoomorpha) on ornamental plants in Kayseri province<sup>1</sup>

Kayseri ilinde süs bitkileri üzerinde bulunan kabuklubit, koşnil ve unlubitler (Hemiptera: Coccoomorpha) üzerine araştırmalar

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### Abstract

This study was conducted to determination of Coccoomorpha (Coccidae, Diaspididae and Pseudococcidae) species on ornamental plants in park, road plantation and landscape areas in districts of Kayseri Province in Turkey between the years 2013-2015. At the end of the study, seven species of Coccidae (Hemiptera: Coccoomorpha), six species of Diaspididae, and two of Pseudococcidae, total of fifteen species were determined. These species are *Eulecanium ciliatum* (Douglas), *Eulecanium tiliae* (Linnaeus), *Parthenolecanium corni* (Bouché), *Parthenolecanium persicae* (Fabricius), *Physokermes piceae* (Schrank), *Pulvinaria vitis* (Linnaeus), *Sphaerolecanium prunastri* (Fonscolombe), (Coccidae) *Chionaspis salicis* (Linnaeus), *Diaspidiotus armenicus* (Borchsenius), *Diaspidiotus ostreaeformis* (Curtis), *Lepidosaphes malicola* (Borchsenius), *Pseudaulacaspis pentagona* (TargioniTozzetti), *Unaspis euonymi* (Comstock) (Diaspididae), *Planococcus vovae* (Nasanov), *Pseudococcus comstocki* (Kuwana) (Pseudococcidae).

**Keywords:** Coccidae, Diaspididae, Pseudococcidae, ornamental plant, Kayseri

### Öz

Bu çalışma 2013-2015 yılları arasında Kayseri ilçelerinde park, yol ağaçlandırması ve peyzaj alanlarındaki süs bitkilerinde bulunan Coccoomorpha (Coccidae, Diaspididae and Pseudococcidae) türlerinin saptanması amacıyla yürütülmüştür. Araştırma sonucunda, Coccidae familyasından 7, Diaspididae familyasından 6 ve Pseudococcidae familyasından 2 olmak üzere toplam 15 tür saptanmıştır. Bu türler *Eulecanium ciliatum* (Douglas), *Eulecanium tiliae* (Linnaeus), *Parthenolecanium corni* (Bouché), *Parthenolecanium persicae* (Fabricius), *Physokermes piceae* (Schrank), *Pulvinaria vitis* (Linnaeus), *Sphaerolecanium prunastri* (Fonscolombe), *Chionaspis salicis* (Linnaeus), *Diaspidiotus armenicus* (Borchsenius), *Diaspidiotus ostreaeformis* (Curtis), *Lepidosaphes malicola* (Borchsenius), *Pseudaulacaspis pentagona* (Targioni-Tozzetti), *Unaspis euonymi* (Comstock), *Planococcus vovae* (Nasanov), *Pseudococcus comstocki* (Kuwana)'dir.

**Anahtar sözcükler:** Coccidae, Diaspididae, Pseudococcidae, süs bitkisi, Kayseri

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## Introduction

Scale insects are one of the most important pest groups that causing damage on ornamental plants in urban areas (Çanakçıoğlu, 1977; Ülgentürk & Toros, 1996; Ülgentürk & Toros, 1999). Up to now, while from 51 families and 8.000 species of scale insects are identified in the World, 359 scale insect species are determined in Turkey (Garcia Morales et al., 2018; Kaydan et al., 2013). Scale insects cause important economical damage by sucking the sap of plants. They attach themselves to the twigs, leaves, branches and fruits of host plants and resulting in wilted, distorted and yellowed (chlorotic) leaves; premature leaf drop; stunted growth; and occasionally death of infested plants or plant parts. Also, some scale insects excrete honeydew andsootymolds colonizes the honeydew-coated leaves causing them to look dark and unsightly and to lead to lowered plant vitality though loss of photosynthetic capacity (Kosztarab & Kozár, 1988). Moreover, some species are vector of plant virus diseases (Cabaleiro & Segura, 2006).

The Infraorder Coccoomorpha include 51 family and families Diaspididae, Pseudococcidae and Coccidae are the largest ones both in the world and Turkey (Garcia Morales et al., 2018; Kaydan et al., 2013). The family Diaspididae that called Armored scale insects is the largest family of Coccoomorpha, with 2,595 species in 418 genera worldwide (Garcia Morales et al., 2018). The family Diaspididae is the most abundant with 134 species in 42 genera in Turkey (Kaydan et al., 2013). Armored scale insects secrete a hard protective covering over themselves, which is not attaching to the body. The hard scale lives and feeds under this spherical armor and does not move about the plant after the first larval stage. They do not secrete honeydew.

The family Pseudococcidae called mealybug is the second largest family of scale insects, with 1989 species in 259 genera worldwide (Garcia Morales et al., 2018). Also, 101 species in 32 genera were identified from Pseudococcidae in Turkey until now (Kaydan et al., 2013). Female mealybug body elongate-oval and segmented. They have well developed legs and secrete honeydew.

The family Coccidae, called soft scale insects is the third largest family of scale insects, with 1184 spp. in 169 genera worldwide (Garcia Morales et al., 2018). The family Coccidae has 67 species in 28 genera in Turkey (Kaydan et al., 2013). Female soft scale individuals secrete a waxy film that is part of the body. Soft scales vary in shape from flat to almost spherical. In most cases, they are able to move short distances and produce copious amounts of honeydew.

Until now, many studies that aim to the determining of scale insect species on ornamental plants in different provinces and regions of Turkey were conducted (Yaşar, 1990; Ülgentürk & Toros, 1996, 1999; Karsavuran et al., 2001; Karsavuran et al., 2004; Kaydan et al., 2005; Ülgentürk et al., 2008; Yaşar & Küçükçakal, 2013; Çalışkan et al., 2017; Çalışkan Keçe & Ulusoy, 2017; Kaymak & Yaşar, 2017). In this study, it was aimed to the determining of scale insect species belonging to the families Diaspididae, Pseudococcidae and Coccidae on ornamental plants in Kayseri province.

## Materials and Methods

The study was conducted between the years 2013 and 2015. Scale insect samples were collected from 16 districts in Kayseri province (Fig. 1). Specimens were taken from ornamental plants in park, road plantation and landscape areas with irregular surveys between the months April and October. Each plant sample infected by scale insects was cut and put into first a paper bag and then a plastic bag. Separately labelled samples were taken away to the laboratory for preparation and examination. Scale insects on plants were put into Eppendorf tubes with 70% alcohol for further examination. Specimens were prepared for light microscopy using the slide-mounting method given by Kosztarab & Kozár (1988). Morphological terminology follows that of Kozár (2004). Materials were deposited in the Coccoomorpha Collection of Çukurova University (Adana), Turkey.



Figure 1. Districts of Kayseri province.

## Results and Discussion

In this study, total of 15 scale insect species including 7 species of Coccidae, 6 species of Diaspididae, and 2 species of Pseudococcidae were found on ornamental plants in Kayseri province. These species are listed in below.

### Family: Coccidae

#### *Eulecanium ciliatum* (Douglas)

Synonym: *Lecanium ciliatum* Douglas, *Lecanium (Eulecanium) ciliatum* (Douglas), *Eulecanium ciliatum* (Douglas), *Palaeolecanium ciliatum* (Douglas) (Garcia Morales et al., 2018).

Material examined: 2 ♀♀, *Betula pendula* Roth. (Betulaceae), Yahyagazi İkokulu (Yahyalı), N: 38° 11'634", E: 35° 36' 793", 1171 m, 28.VI.2014.

Distribution in the World: Palaearctic region (Garcia Morales et al., 2018).

Distribution in Turkey: Central Anatolia (Kaydan et al., 2013).

### ***Eulecanium tiliae* (Linnaeus)**

Synonym: *Coccus tiliae* Linnaeus, *Coccus coryli* Linnaeus, *Coccus capreae* Linnaeus, *Coccus rotundus salicis* De Geer, *Coccus alni* Modeer, *Coccus quercus fuscus* Goeze, *Coccus ulmi* Modeer, *Coccus lapreae* (Linnaeus), *Coccus mali* Schrank, *Coccus salicum* Fabricius, *Coccus fuscus* Gmelin, *Coccus aceris* Fabricius, *Coccus aceris campestris* Schrank, *Coccus pyri* Schrank, *Coccus rubi* Schrank, *Coccus xylostei* Schrank, *Coccus cypraeola* Dalman, *Coccus gibber* Dalman, *Calypticus fasciatus* Costa, *Coccus aceris* Curtis, *Coccus gibba* Westwood, *Lecanium juglandis* Bouché, *Coccus aesculi* Kollar, *Coccus cypreola* (Linnaeus), *Lecanium fasciatum* (Linnaeus), *Lecanium rubi* (Linnaeus), *Lecanium genevense* Targioni Tozzetti, *Lecanium alni* (Linnaeus), *Lecanium pyri* (Linnaeus), *Coccus rotundus* Signoret, *Lecanium aesculi* Signoret, *Lecanium berberidis* (Linnaeus), *Lecanium cerasi* Goethe, *Lecanium variegatum* Goethe, *Lecanium fuscum* (Linnaeus), *Lecanium (Eulecanium) aesculi* Cockerell, *Lecanium (Eulecanium) capreae* (Linnaeus), *Lecanium (Eulecanium) cerasi* (Linnaeus), *Lecanium (Eulecanium) genevense* (Linnaeus), *Lecanium (Eulecanium) juglandis* (Linnaeus), *Lecanium (Eulecanium) rubi* (Linnaeus), *Lecanium (Eulecanium) variegatum* (Linnaeus), *Eulecanium fuscum* (Linnaeus), *Eulecanium coryli* Cockerell, *Eulecanium aesculi* Fernald, *Eulecanium alni* (Linnaeus), *Eulecanium capreae* (Linnaeus), *Eulecanium cerasi* (Linnaeus), *Eulecanium fasciatum* (Linnaeus), *Eulecanium pyri* (Linnaeus), *Eulecanium rubi* (Linnaeus), *Eulecanium tiliae* (Linnaeus), *Eulecanium variegatum* (Linnaeus), *Eulecanium websteri mirabile* (Linnaeus), *Lecanium (Saissetia) capreae* (Linnaeus), *Lecanium (Eulecanium) hoferi* King, *Lecanium websteri mirabilis* King, *Eulecanium aceris* (Linnaeus), *Eulecanium curtisi* Kirkaldy, *Lecanium (Globulicoccus) fuscum* (Linnaeus), *Eulecanium emerici* (Linnaeus), *Parthenolecanium coryli* Šulc, *Physokermes coryli* Lindinger, *Globulicoccus fuscus* (Linnaeus), *Eulecanium coryli cimbricus* Wunn, *Coccus corylus-avellanae* Fulmek, *Eulecanium mali* (Linnaeus), *Eulecanium ibericum* Hadzibejli, *Eulecanium gyrcanicum* Hadzibejli and Imamculiev, *Lecanium aesculi* Boratynski, *Lecanium tiliae* (Linnaeus); Bartlett, *Eulecanium gyrcanicum* (Linnaeus) (Garcia Morales et al., 2018).

Material examined: 2 ♀♀, İncesu Park (İncesu), *Castanea sativa* (Fagaceae), N: 38° 62'210", E: 35° 11'801", 1085m, 10.V.2014; 2 ♀♀, *Prunus cerasifera* (Rosaceae), Pınarbaşı Türklük Anıtı Park (Pınarbaşı), N: 38° 71'141", E:36° 37'868", 1525m, 10.V.2014; 2 ♀♀, *Rosa* sp. (Rosaceae), 1. İnönü Park (Kocasinan), N: 38° 73'287", E:35° 49'212", 1081m, 17.V.2014; 2 ♀♀, *Malus floribunda* (Rosaceae), Kocasinan Belediyesi Erciyes Evler Park (Kocasinan), N: 38° 73'681", E:35° 52'140", 1052 m, 06.IX.2014.

Distribution in the World: Nearctic Region and Palaearctic Region (Garcia Morales et al., 2018).

Distribution in Turkey: Black Sea Region, Central Anatolian Region, Eastern Anatolian Region, Marmara Region and Mediterranean Region (Kaydan et al., 2013).

### ***Parthenolecanium corni* (Nuzzaci)**

Synonym: *Lecanium corni* Bouché, *Coccus tiliae* Fitch, *Lecanium vini* Bouché, *Lecanium corylifex* Fitch, *Lecanium cynosbati* Fitch, *Lecanium juglandifex* Fitch, *Lecanium ribis* Fitch, *Coccus rosarum* Snellen van Volenhoven, *Lecanium fitchii* Signoret, *Lecanium rugosum* Signoret, *Lecanium tarsalis* Signoret, *Lecanium wistariae* Signoret, *Lecanium robiniarum* Douglas, *Lecanium armeniacum* Craw, *Lecanium assimile* Newstead, *Lecanium caryae canadense* Cockerell, *Lecanium lintneri* Cockerell & Bennett, *Lecanium pruinosum armeniacum* (Nuzzaci), *Lecanium (Eulecanium) corylifex* (Nuzzaci), *Lecanium (Eulecanium) lintneri* (Nuzzaci), *Lecanium (Eulecanium) rugosum* (Nuzzaci), *Lecanium canadense* (Nuzzaci), *Eulecanium crawii* (Nuzzaci), *Lecanium (Eulecanium) caryarum* Cockerell, *Lecanium crawii* Ehrhorn, *Lecanium (Eulecanium) kingii* Cockerell, *Lecanium (Eulecanium) maclurorum* Cockerell, *Lecanium kansasense* Hunter, *Lecanium (Eulecanium) armeniacum* (Nuzzaci), *Lecanium (Eulecanium) canadense* (Nuzzaci), *Lecanium (Eulecanium) crawii* (Nuzzaci), *Lecanium (Eulecanium) cynosbati* (Nuzzaci), *Lecanium (Eulecanium) fitchii* (Nuzzaci), *Lecanium (Eulecanium) ribis* (Nuzzaci), *Lecanium (Eulecanium) tarsale* (Nuzzaci), *Lecanium maclurae* Hunter, *Lecanium (Eulecanium) aurantiacum* Hunter, *Eulecanium corylifex* (Nuzzaci), *Eulecanium fitchii* (Nuzzaci), *Eulecanium maclurorum* (Nuzzaci), *Eulecanium vini* (Nuzzaci), *Eulecanium guignardi* King, *Eulecanium rosae* King,

*Lecanium adenostomae* Kuwana, *Lecanium rehi* King, *Lecanium websteri* Cockerell & King, *Lecanium (Eulecanium) vini* (Nuzzaci), *Eulecanium cynosbati* (Nuzzaci), *Eulecanium kansasense* (Nuzzaci), *Eulecanium robiniarum* (Nuzzaci), *Eulecanium websteri* (Nuzzaci), *Eulecanium fraxini* King, *Eulecanium adenostomae* (Nuzzaci), *Eulecanium armeniacum* (Nuzzaci), *Eulecanium assimile* (Nuzzaci), *Eulecanium aurantiacum* (Nuzzaci), *Eulecanium canadense* (Nuzzaci), *Eulecanium caryarum* (Nuzzaci), *Eulecanium corni* (Nuzzaci), *Eulecanium crawii* (Nuzzaci), *Eulecanium kingii* (Nuzzaci), *Eulecanium lintneri* (Nuzzaci), *Eulecanium obtusum* (Nuzzaci), *Eulecanium rehi* (Nuzzaci), *Eulecanium ribis* (Nuzzaci), *Eulecanium rugosum* (Nuzzaci), *Eulecanium tarsale* (Nuzzaci), *Lecanium (Eulecanium) assimile* (Nuzzaci), *Lecanium (Eulecanium) ribis* (Nuzzaci), *Lecanium (Eulecanium) robiniarum* (Nuzzaci), *Lecanium (Eulecanium) rosarum* (Nuzzaci), *Lecanium folsomi* King, *Lecanium obtusum* Thro, *Eulecanium websteri* (Nuzzaci), *Eulecanium folsomi* (Nuzzaci), *Lecanium corni robiniarum* Marchal, *Lecanium coryli* (Nuzzaci), *Lecanium persicae crudum* Green, *Parthenolecanium coryli* (Nuzzaci), *Lecanium corni robiniarum* (Nuzzaci), *Eulecanium corni corni* (Nuzzaci), *Parthenolecanium corni* (Nuzzaci), *Eulecanium corni apuliae* Nuzzaci, *Lecanium vini* (Nuzzaci), *Parthenolecanium corni apuliae* (Nuzzaci), *Lecanium websteri* (Nuzzaci), *Parthenolecanium corni* (Nuzzaci) (Garcia Morales et al., 2018).

Material examined: 2 ♀♀, *Acacia* sp. (Fabaceae), Alparslan Türkeş Park (Pınarbaşı), N: 38° 71'874", E: 36° 39'923" 1535 m, 30.VII.2013; 2 ♀♀, *Acacia* sp. (Fabaceae), Centrum (Yahyalı), N: 38° 11'403", E:35° 36'236" 1180 m, 07.VIII.2013; 2 ♀♀, *Morus nigra pendula* (Moraceae), Gültepe Park (Melikgazi), N: 38° 71'741", E:35° 49'996" 1069 m, 24.VIII.2013; 2 ♀♀, *Prunus cerasifera* (Rosaceae), İncesu Park (İncesu), N: 38° 62' 210", E: 35° 11' 801", 1085m, 24.VIII.2013; 2 ♀♀, *Acacia* sp. (Fabaceae), Centrum (Yeşilhisar), 24.VIII.2013; 2 ♀♀, *Prunus cerasifera* (Rosaceae), Meydan Şelale Park (Hacılar), N: 38° 64'595", E:35° 45'183", 1378 m, 15.IX.2013; 2 ♀♀, *Acacia* sp. (Fabaceae), Alparslan Türkeş Park (Pınarbaşı), N: 38° 71'874", E:36° 39'923", 1535 m, 24.IV.2014; 2 ♀♀, *Acacia* sp. (Fabaceae), Centrum (Develi), N: 38° 39'290", E:35° 50'818", 1354 m, 26.IV.2014; 2 ♀♀, *Prunus armeniaca* (Rosaceae), Devlet Hastanesi Park (Bünyan), 03.V.2014; 2 ♀♀, *Acacia* sp. (Fabaceae), Devlet Hastanesi Park (Bünyan), 03.V.2014; 2 ♀♀, *Malus domestica* (Rosaceae), Devlet Hastanesi Park (Bünyan), 03.V.2014; 2 ♀♀, *Cydonia oblonga* (Rosaceae), Centrum (Özvatın), 03.V.2014; 2 ♀♀, *Morus* sp. (Moraceae), İncesu Park (İncesu), N: 38° 62' 210", E: 35° 11' 801" 1085 m, 10.V.2014; 2 ♀♀, *Platanus* sp. (Platanaceae), Üçgöz Park (İncesu), N: 38° 62'360", E:35° 18'200" 1079 m, 10.IV.2014; 2 ♀♀, *Platanus* sp. (Platanaceae), Gençlik Park (İncesu), N: 38° 62'827", E:35° 18'434" 1074 m, 10.IV.2014; 2 ♀♀, *Viburnum orientale* (Caprifoliaceae), İncesu Park (İncesu), N: 38° 62' 210", E: 35° 11' 801" 1085 m, 10.V.2014; 2 ♀♀, *Corylus avellana contorta* (Betulaceae), 1. İnönü Park (Kocasinan), N: 38° 73'287", E:35° 49'212" 1081 m, 17.V.2014; 2 ♀♀, *Tilia* sp. (Tiliaceae), Erciyes University (Talas), N: 38° 70'517", E:35° 52'185" 1115 m, 07.VI.2014; 2 ♀♀, *Tilia* sp. (Tiliaceae), Gültepe Park (Melikgazi), N: 38° 71' 741", E: 35° 49' 996" 1069 m, 07.VI.2014; 2 ♀♀, *Morus nigra pendula* (Moraceae), Gültepe Park (Melikgazi), N: 38° 71'741", E:35° 49'996" 1069 m, 07.VI.2014; 2 ♀♀, *Viburnum opulus* (Caprifoliaceae), Kayseri Manucipity (Kocasinan), N: 38° 72'492", E:35° 49'625" 1060 m, 07.VI.2014; 2 ♀♀, *Betula pendula* (Betulaceae), Buket Park (Melikgazi), N: 38° 74'519", E:35° 39'205" 1062 m, 05.VII.2014; 2 ♀♀, *Quercus* sp. (Fagaceae), Buket Park (Melikgazi), N: 38° 74'519", E:35° 39'205" 1062 m, 05.VII.2014; 2 ♀♀, *Pyracantha coccinea* (Rosaceae), 19 Mayıs Park (Melikgazi), N: 38° 73'964", E:35° 38'870" 1079 m, 05.VII.2014; 2 ♀♀, *Cornus mas* (Cornaceae), 19 Mayıs Park (Melikgazi), N: 38° 73'964", E:35° 38'870" 1079 m, 05.VII.2014; 2 ♀♀, *Malus floribunda* (Rosaceae), Belsin Şehitler Park (Melikgazi), N: 38° 73'773", E:35° 38'391" 1085 m, 05.VII.2014; 2 ♀♀, *Fraxinus* sp. (Oleaceae), Seyrani Park (Kocasinan), 12.VII.2014; 2 ♀♀, *Morus nigra pendula* (Moraceae), Mimarsinan Park (Kocasinan), N: 38° 72'409", E:35° 48'463" 1073 m, 12.IV.2014; 2 ♀♀, *Pyracantha coccinea* (Rosaceae), Mimarsinan Park (Kocasinan), N: 38° 72'409", E:35° 48'463" 1073 m, 12.IV.2014; 2 ♀♀, *Fraxinus* sp. (Oleaceae), Mimsin Park (Melikgazi), 19.VII.2014; 2 ♀♀, *Acacia* sp. (Fabaceae), TOKİ Tepe Park (Melikgazi), 19.VII.2014; 2 ♀♀, *Morus nigra pendula* (Moraceae), Yıldız Park (Melikgazi), N: 38° 72'309", E:35° 51'278" 1072 m, 26.VII.2014; 2 ♀♀, *Corylus avellana* (Betulaceae), Yıldız Park (Melikgazi), N: 38° 72'309", E:35° 51'278" 1072 m, 26.VII.2014; 2 ♀♀, *Tilia* sp. (Tiliaceae), Papatya Park (Melikgazi), 26.VII.2014; 2 ♀♀, *Malus floribunda* (Rosaceae), Yalçın Garden (Melikgazi), N: 38° 71'980", E: 35° 50'264" 1063 m, 26.VII.2014; 2 ♀♀, *Malus floribunda* (Rosaceae), Turan Garden (Melikgazi), N: 38° 79'462", E:35° 69'792" 1327 m, 09.VIII.2014; 2

♀♀, *Betula* sp. (Betulaceae), Turan Garden (Melikgazi), N: 38° 79'462", E:35° 69'792" 1327 m,09.VIII.2014; 2 ♀♀, *Acacia* sp. (Fabaceae), Turan Garden (Melikgazi), N: 38° 79'462", E:35° 69'792" 1327 m,09.VIII.2014; 2 ♀♀, *Fraxinus* sp. (Oleaceae), Turan Garden (Melikgazi), N: 38° 79'462", E:35° 69'792" 1327 m,09.VIII.2014; 2 ♀♀, *Prunus cerasifera* (Rosaceae), Erciyes Başbuğ Park (Melikgazi), N: 38° 62'407", E:35° 51'405" 1580 m, 16.VIII.2014; 2 ♀♀, *Quercus* sp. (Fagaceae), Erciyes Başbuğ Park (Melikgazi), N: 38° 62'407", E:35° 51'405" 1580 m, 16.VIII.2014; 2 ♀♀, *Fraxinus* sp. (Oleaceae), Serçe 1 Garden (Melikgazi), N: 38° 71'247", E:35° 45'764" 1071 m,30.VIII.2014; 2 ♀♀, *Morus nigra pendula* (Moraceae), Turan Elmaağaçlı Park (Melikgazi), N: 38° 71'420", E:35° 47'097" 1065 m,30.VIII.2014; 2 ♀♀, *Prunus cerasifera* (Rosaceae), Turan Elmaağaçlı Park (Melikgazi), N: 38° 71'420", E:35° 47'097" 1065 m,30.VIII.2014; 2 ♀♀, *Malus floribunda* (Rosaceae), Dudayev Park (Kocasinan), N: 38° 73'162", E:35° 52'193" 1066 m, 06.IX.2014; 2 ♀♀, *Fraxinus* sp. (Oleaceae), Galericiler Park (Kocasinan), N: 38° 74'830", E:35° 54'146" 1082 m,13.IX.2014; 2 ♀♀, *Fraxinus* sp. (Oleaceae), Engelliler Park (Kocasinan), N: 38° 73'085", E:35° 48'133" 1068 m,13.IX.2014; 2 ♀♀, *Pyracantha coccinea* (Rosaceae), Nilüfer Bahçesi Park (Melikgazi), N: 38° 71'713", E:35° 47'435" 1095 m,13.IX.2014; 2 ♀♀, *Pyracantha coccinea* (Rosaceae), Kayseri Kadir Has Stadium (Melikgazi), N: 38° 73'996", E:35° 42'349" 1062 m,11.X.2014; 2 ♀♀, *Morus nigra pendula* (Moraceae), Tacettin Bahçesi Park (Melikgazi), N: 38° 71'099", E:35° 49'043" 1078 m,25.X.2014; 2 ♀♀, *Pyracantha coccinea* (Rosaceae), Tacettin Bahçesi Park (Melikgazi), N: 38° 71'099", E:35° 49'043" 1078 m,25.X.2014.

Distribution in the World: Nearctic region, Neotropical region and Palaearctic region (Garcia Morales et al., 2018).

Distribution in Turkey: Aegean Region, Black Sea Region, Central Anatolian Region, Eastern Anatolian Region and Marmara Region (Kaydan et al., 2013).

#### ***Parthenolecanium persicae* (Fabricius)**

Synonym: *Chermes persicae* Fabricius, *Coccus persicorum* Sulzer, *Coccus clematidis* Goeze, *Coccus costatus* Schrank, *Coccus clematidis* Gmelin, *Coccus berberidis* Schrank, *Lecanium persicae* (Fabricius), *Lecanium berberidis* (Fabricius), *Lecanium cymbiformis* Targioni Tozzetti, *Lecanium persicochilense* Targioni Tozzetti, *Lecanium elongatum* Signoret, *Lecanium genistae* Signoret, *Lecanium mori* Signoret, *Lecanium rosarum* (Fabricius), *Lecanium sarothamni* Douglas, *Coccus spini* Heyden, *Lecanium (Eulecanium) mori* (Fabricius), *Lecanium magnoliarum* Cockerell, *Lecanium berberidis* (Fabricius), *Lecanium berberidis major* Maskell, *Lecanium magnoliarum* Cockerell, *Lecanium (Eulecanium) berberidis* (Fabricius), *Lecanium (Eulecanium) magnoliarum* (Fabricius), *Coccus mori* (Fabricius), *Coccus elongatus* (Fabricius), *Coccus genistae* (Fabricius), *Eulecanium berberidis major* (Fabricius), *Eulecanium magnoliarum hortensiae* Cockerell, *Lecanium (Eulecanium) persicae* (Fabricius), *Eulecanium ceconi* Leonardi, *Lecanium ceconi* (Fabricius), *Lecanium nigrofasciatum* (Fabricius), *Lecanium cymbyformis* (Fabricius), *Lecanium persicae* (Fabricius), *Lecanium (Parthenolecanium) persicae* (Fabricius), *Palaeolecanium costatum* (Fabricius), *Palaeolecanium persicae* (Fabricius), *Lecanium (Eulecanium) spinosum* Brittin, *Parthenolecanium persicae* (Fabricius), *Lecanium persicae goidanichi* Kawecki, *Parthenolecanium thymi* Danzig, *Lecanium berberidis* (Fabricius), *Lecanium persicae* (Fabricius), *Parthenolecanium persicae spinosum* (Fabricius) (Garcia Morales et al., 2018).

Material examined: 2 ♀♀, *Rosa* sp. (Rosaceae), Gültepe Park (Melikgazi), N: 38° 71' 741", E: 35° 49' 996", 1069 m, 24.VIII.2013; 2 ♀♀, *Rosa* sp. (Rosaceae), İncesu Park (İncesu), N: 38° 62' 210", E:35° 11' 801", 1085m, 10.V.2014.

Distribution in the World: It is a cosmopolitan species (Garcia Morales et al., 2018).

Distribution in Turkey: Central Anatolian Region and Marmara Region (Kaydan et al., 2013).

***Physokermes piceae*** (Schrank)

Synonym: *Coccus abietis* (Schrank), *Coccus abietis* (Schrank), *Coccus piceae* Schrank, *Coccus racemosus* Ratzeburg, *Lecanium piceae* (Schrank), *Lecanium racemosum* (Schrank), *Physokermes racemosus* (Schrank), *Lecanium piceae* (Schrank), *Physokermes piceae* (Schrank), *Physokermes latipes* Borchsenius.

Material examined: 2 ♀♀, *Picea pungens* (Pinaceae), İncesu Park (İncesu), N: 38° 62' 210", E: 35° 11' 801", 1085m, 10.V.2014; 2 ♀♀, *Picea pungens* (Pinaceae), Fuar Park (Kocasinan), N: 38° 74' 741", E: 35° 49' 420", 1038m, 17.V.2014.

Distribution in the World: Palaeartic region (Garcia Morales et al., 2018).

Distribution in Turkey: Central Anatolian Region and Marmara Region (Kaydan et al., 2013).

***Pulvinaria vitis*** (Linnaeus)

Synonym: *Coccus betulae* Linnaeus, *Coccus vitis* Linnaeus, *Coccus carpini* Linnaeus, *Coccus oxyacanthae* Linnaeus, *Coccus crataegi* Linnaeus, *Coccus crataegi* Fabricius, *Coccus betulae* Fabricius, *Coccus mespili* Goeze, *Coccus mespili* Gmelin, *Chermes carpini* (Linnaeus), *Chermes crataegi* (Linnaeus), *Calypticus spumousus* Costa, *Coccus salicis* Fitch, *Lecanium crataegi* (Linnaeus), *Lecanium macluræ* Fitch, *Lecanium americanum* Targioni Tozzetti, *Pulvinaria betulae* (Linnaeus), *Pulvinaria carpini* (Linnaeus), *Pulvinaria oxyacanthae* (Linnaeus), *Pulvinaria vitis* (Linnaeus), *Pulvinaria populi* Signoret, *Pulvinaria ribesiae* Signoret, *Pulvinaria betulae alni* Douglas, *Pulvinaria macluræ* (Linnaeus), *Pulvinaria innumerabilis tiliae* King & Cockerell, *Pulvinaria tiliae* (Linnaeus), *Pulvinaria hunteri* King, *Pulvinaria vitis opacus* King, *Pulvinaria vitis sorbusae* Reh, *Pulvinaria vitis sorbusae* King, *Pulvinaria vitis verrucosae* Reh, *Pulvinaria vitis verrucosae* King, *Pulvinaria (Pulvinaria) betulae* (Linnaeus), *Pulvinaria vites* (Linnaeus), *Pulvinaria vitis* (Linnaeus), *Pulvinaria vitis* (Linnaeus).

Material examined: 2 ♀♀, *Acer* sp. (Acerceae), Centrum (Develi), N: 38° 36' 613", E: 35° 45' 263", 1180 m, 26.IV.2014.

Distribution in the World: Nearctic region, Neotropical region and Palaeartic region (Garcia Morales et al., 2018).

Distribution in Turkey: Aegean Region, Central Anatolian Region, Eastern Anatolian Region and Marmara Region (Kaydan et al., 2013).

***Sphaerolecanium prunastri*** (Boyer de Fonscolombe)

Synonym: *Coccus prunastri* Boyer de Fonscolombe, *Lecanium blanchardii* Targioni Tozzetti, *Lecanium prunastri* (Boyer de Fonscolombe), *Lecanium (Eulecanium) prunastri* (Boyer de Fonscolombe), *Eulecanium prunastri* (Boyer de Fonscolombe), *Sphaerolecanium prunastri* (Boyer de Fonscolombe), *Eulecanium piligerum* Leonardi, *Lecanium (Sphaerolecanium) prunastri* (Boyer de Fonscolombe), *Sphaerolecanium prunastri* (Boyer de Fonscolombe).

Material examined: 2 ♀♀, *Prunus cerasifera* (Rosaceae), Gültepe Park (Melikgazi), N: 38° 71' 741", E: 35° 49' 996", 1069m, 24.VIII.2013; 2 ♀♀, *Prunus cerasifera* (Rosaceae), Yerköy Mahallesi Parkı (Yahyalı), N: 38° 18' 440", E: 35° 35' 544", 1092m, 26.IV.2014; 2 ♀♀, *Prunus cerasifera* (Rosaceae), Centrum (Develi), N: 38° 39' 290", E: 35° 50' 818", 1354m, 26.IV.2014; 2 ♀♀, *Prunus armeniaca* (Rosaceae), Bünyan Devlet Hastanesi Park (Bünyan), 03.V.2014; 2 ♀♀, *Prunus cerasifera* (Rosaceae), İncesu Park (İncesu), N: 38° 62' 210", E: 35° 11' 801", 1085m, 10.V.2014; 2 ♀♀, *Prunus cerasifera* (Rosaceae), Meydan Şelale Park (Hacılar), N: 38° 64' 595", E: 35° 45' 183", 1378m, 10.V.2014; 2 ♀♀, *Prunus cerasifera* (Rosaceae), 3. İnönü Park (Kocasinan), N: 38° 73' 844", E: 35° 51' 128", 1061m, 17.V.2014; 2 ♀♀, *Prunus cerasifera* (Rosaceae), Seyrani Agriculture Faculty (Develi), N: 38° 38' 135", E: 35° 45' 520", 1119m, 21.VI.2014; 2 ♀♀, *Prunus cerasifera* (Rosaceae), Turan Elmaağaçlı Park (Melikgazi), N: 38° 71' 420", E: 35° 47' 097", 1065m, 30.VIII.2014.

Distribution in the World: Nearctic region and Palaeartic region (Garcia Morales et al., 2018).

Distribution in Turkey: Aegean Region, Black Sea Region, Central Anatolian Region, Eastern Anatolian Region, Marmara Region and Mediterranean Region (Kaydan et al., 2013).





*ostreaformis* (Curtis), *Diaspidiotus ostreaformis* (Curtis), *Aspidiotus hippocastini* (Curtis), *Quadraspidiotus ostreaformis* (Curtis), *Quadraspidiotus ostreaformis* (Curtis), *Aspidiotus hippocaastani* (Curtis), *Diaspidiotus oestroformis* (Curtis), *Diaspidiotus ostreaformis* (Curtis) (Garcia Morales et al., 2018).

Material examined: 2 ♀♀, *Platanus* sp. (Platanaceae), Gözbaşı Garden (Yahyalı), N: 38° 09' 504", E: 35° 36' 167", 1191m, 28.VI.2014.

Distribution in the World: Australian Region, Nearctic Region, Neotropical Region, Oriental Region, Palaeartic Region (Garcia Morales et al., 2018).

Distribution in Turkey: Aegean Region, Black Sea Region, Central Anatolian Region, Eastern Anatolian Region and Marmara Region (Kaydan et al., 2013).

***Lepidosaphes malicola*** (Borchsenius)

Synonym: *Lepidosaphes malicola* Borchsenius, *Lepidosaphes kirgisica* Borchsenius, *Lepidosaphes kalandadzei* Hadzibejli, *Mytilococcus kirgisica* (Borchsenius), *Lepidosaphes kalandadzei* Hadzibejli (Garcia Morales et al., 2018).

Material examined: 2 ♀♀, *Cornus* sp. (Cornaceae), İsa Yusuf Alptekin Park (Melikgazi), N: 38° 74' 098", E: 35° 38' 969", 1094m, 05.VII.2014.

Distribution in Turkey: Central Anatolian Region and Eastern Anatolian Region (Kaydan et al., 2013).

Distribution in the World: Oriental Region and Palaeartic Region (Garcia Morales et al., 2018).

***Pseudaulacaspis pentagona*** (Targioni Tozzetti)

Synonym: *Diaspis pentagona* Targioni Tozzetti, *Diaspis amygdali* Tryon, *Diaspis lanatus* Morgan & Cockerell, *Diaspis patelliformis* Sasaki, *Aspidiotus vitiensis* Maskell, *Epidiaspis lanata* (Targioni Tozzetti), *Diaspis geranii* Maskell, *Aulacaspis (Diaspis) pentagona* (Targioni Tozzetti), *Aulacaspis pentagona* (Targioni Tozzetti), *Diaspis (Aulacaspis) pentagona* (Targioni Tozzetti), *Pseudaulacaspis pentagona* (Targioni Tozzetti), *Sasakiaspis pentagona* (Targioni Tozzetti), *Diaspis (rosae) geranii* (Targioni Tozzetti), *Epidiaspis vitiensis* (Targioni Tozzetti), *Aspidiotus lanatus* (Targioni Tozzetti), *Diaspis geranii* (Targioni Tozzetti), *Pseudaulacaspis pentagona* (Targioni Tozzetti) (Garcia Morales et al., 2018).

Material examined: 2 ♀♀, *Morus nigra pendula* (Moraceae), Kiranardı Adnan Menderes Park (Melikgazi), N: 38° 63' 504", E: 35° 51' 714", 1463m, 24.V.2014; 2 ♀♀, *Malus floribunda* (Rosaceae), Yalçın Garden (Melikgazi), N: 38° 71' 980", E: 35° 50' 264", 1063m, 26.VII.2014; 2 ♀♀, *Morus nigra pendula* (Moraceae), Devali Türbesi Park (Develi), N: 38° 36' 371", E: 35° 49' 356", 1386m, 21.VI.2014.

Distribution in the World: It is a cosmopolitan species (Garcia Morales et al., 2018).

Distribution in Turkey: Black Sea Region, Central Anatolian Region, Eastern Anatolian Region, Marmara Region and Mediterranean Region (Kaydan et al., 2013).

***Unaspis euonymi*** (Comstock)

Synonym: *Chionaspis euonymi* Comstock, *Chionaspis evonymi* (Comstock), *Chionaspis nemausensis* Targioni Tozzetti, *Unaspis euonymi* (Comstock), *Unaspis nakayamai* Takahashi & Kanda, *Unaspis evonymi* (Comstock), *Unaspis evonymi* (Comstock), *Unaspis hakayamai* (Comstock), *Unaspis euoyymi* (Comstock), *Unaspis euconymi* (Comstock) (Garcia Morales et al., 2018).

Material examined: 2 ♀♀, *Euonymus japonica* (Celastraceae), Gültepe Park (Melikgazi), N: 38° 71' 741", E: 35° 49' 996", 1069m, 07.VI.2014; 2 ♀♀, *Euonymus japonica* (Celastraceae), Dudayev Park (Kocasinan), N: 38° 73' 162", E: 35° 52' 193", 1066m, 06.IX.2014.

Distribution in the World: Nearctic Region, Neotropical Region, Oriental Region and Palaeartic Region (Garcia Morales et al., 2018).

Distribution in Turkey: Aegean Region, Black Sea Region, Central Anatolian Region, Eastern Anatolian Region Mediterranean Region and Marmara Region (Kaydan et al., 2013; Kaymak & Yaşar, 2017).

### **Family: Pseudococcidae**

#### ***Planococcus vovae* (Nasonov)**

Synonym: *Coccus gossypifera* Rondani, *Pseudococcus (Dactylopius) vovae* Nasonov, *Pseudococcus gossypifer* (Nasonov), *Pseudococcus gossypifer* (Nasonov), *Pseudococcus inamabilis* Hambleton, *Pseudococcus junipericola* Borchsenius, *Allococcus inamabilis* (Nasonov), *Allococcus vovae* (Nasonov), *Planococcus vovae* (Nasonov), *Planococcus taigae* Danzig, *Planococcus juniperus* Tang in Tang & Li, *Allococcus taigae* (Nasonov), *Crisicoccus juniperus* (Nasonov), *Crisicoccus taigae* (Nasonov), *Planococcus taigae* (Nasonov) (Garcia Morales et al., 2018).

Material examined: 2 ♀♀, *Thuja occidentalis* (Cupressaceae), Devali Türbesi Park (Develi), N: 38° 36' 371", E: 35° 49' 356", 1386m, 21.VI.2014.

Distribution in the World: Neotropical region and Palaeartic region (Garcia Morales et al., 2018).

Distribution in Turkey: Central Anatolian Region, Eastern Anatolian Region, Marmara Region and Mediterranean Region (Kaydan et al., 2013).

#### ***Pseudococcus comstocki* (Kuwana)**

Synonym: *Dactylopius comstocki* Kuwana (Garcia Morales et al., 2018).

Material examined: 2 ♀♀, *Morus nigra pendula* (Moraceae), Yalçın Garden (Melikgazi), N: 38° 71' 980", E: 35° 50' 264", 1063m, 26.VII.2014.

Distribution in the World: Nearctic Region, Neotropical Region, Oriental Region and Palaeartic Region (Garcia Morales et al., 2018).

Distribution in Turkey: Black Sea Region and Eastern Anatolian Region (Kaydan et al., 2013).

In this study, because of the low plant diversity of Kayseri Province, 15 scale insect species were determined. The most common species *Parthenolecanium corni* was widely observed in different district of Kayseri and on ornamental plants. The other common species *Sphaerolecanium prunastri* was frequently found on *Prunus* spp. Both of species have often to create too dense population caused to dry of host plants was observed. The populations of all these pest species should be monitored and started control againts to the pest when their populations exceeds economic treshold.

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