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Coccoidea species on fruit trees and ornamentals from Aydın and İzmir provinces of Turkey

Abstract - Scale insects (Coccoidea) on fruit trees and non-crop plants growing near orchards were surveyed in the Aydın and İzmir provinces of Turkey during 1996-2000. The family best represented was the Diaspididae (18 species); most of these species were of economic importance in fruit-growing ecosystems. The Coccidae (7 species) were also well represented. Pseudococcidae (3 species), Margarodidae and Asterolecaniidae (2 species each), and Cerococcidae (1 species) also were collected. The distribution, frequency and economic importance of these species discussed.

Key words: Coccoidea, fruit trees, ornamentals, Turkey

INTRODUCTION

Various scale insect studies have been conducted in Turkey, but not in a co-ordinated way (Bodenheimer, 1949, 1952-1953; Soylu, 1976; Öncüer, 1977; Çanakcioglu, 1977; Selmi, 1979; Kozár *et al.*, 1979; Düzgünes, 1982; Yasar, 1990, 1995; Yasar *et al.*, 1995; Erler *et al.*, 1996, Uygun *et al.*, 1998). There is a need for more systematic surveys to be conducted, to document the fauna country wide. The present study documents scale insects on fruit trees in two provinces in the Aegean Region of Turkey (Aydın and İzmir).

Aydın and İzmir provinces form one of the most intensive agricultural areas provinces in the Aegean Region of Turkey. Temperate and subtropical fruits, including citrus and fig, are grow intensively on plains in this region, which is also famous for seedless Sultana grapes. The area has a typical Mediterranean climate with mild, rainy winters and dry, hot summers. Some of the temperate crops, especially olives, are grown mostly on hills, which have a slightly colder climate than the plains.

MATERIALS AND METHODS

Coccoidea were sampled with irregular surveys at different locations in Aydın and İzmir provinces during 1996-2000; a few samples were take also from bordering pro-

vinces such as Manisa and Denizli, which have the same climate as the Aegean region of Turkey. The ecosystems sampled consisted mainly of woody plants (including fruit trees) both in agricultural and urban areas. Scale insects were collected after visual examination of different plant parts (leaves, branches, trunks, fruits and, in some cases, roots). Samples were wrapped in paper, packed in polythene bags and transported to the laboratory in an icebox.

In the laboratory, scale insects were carefully removed from plant surfaces using an insect pin, and mounted on microscope slides using the method given by Kosztarab and Kozár (1988). Specimens were identified using keys in Balachowsky (1937-1953), Öncüer (1974), Kosztarab and Kozár (1988), Danzig (1986, 1993), Hodgson (1993) and Ben-Dov (1995). The specimens also were compared with reference specimens from the collection of Dr F. Kozár (Plant Protection Institute, Budapest, Hungary). Voucher specimens of all the scale insect species identified were deposited in the collection at the Plant Protection Research Institute, Adana, Turkey.

RESULTS AND DISCUSSION

The samples collected from Aydın and İzmir provinces contained specimens from six families of Coccoidea. Diaspididae were most often sampled, followed in order of decreasing frequency by Coccidae, Pseudococcidae, Margarodidae, Asterolecaniidae and Cerococcidae. The material examined listed in Table 1. The number of samples was too small to allow detailed deductions to be made.

During this study, 18 species of Diaspididae were collected; this was the dominant scale insect family on fruit trees. All species were recorded in fruit ecosystems but two of them, *Mercetaspis halli* and *Cupressaspis mediterranea* were previously known under the genus *Nilotaspis* and *Aonidia* respectively, according to Kozár (1998). Among the most important diaspidid pests on fruit trees was *Parlatoria oleae*, which was found most frequently, on the widest range of host plants, at the largest number of localities. Kozár *et al.* (1979) studied scale insects on fruit in Turkey and found *P. oleae* to be the second commonest species after *Quadraspidiotus perniciosus*. It seems that *Q. perniciosus* populations have declined in recent years, as it only found in very small numbers in this study; this may be because of improved control measures. The second commonest diaspidid species found in our study was *Mercetaspis (Nilotaspis) halli*, based on the number of hosts and localities followed by *Pseudaulacaspis pentagona* (based on collection frequency). Both of these important pests were quite common on fruit trees. However, fruit growers were not aware of these pests, especially *Parlatoria oleae* and *M. halli*, because of their cryptic colouration and small size. The only diaspidid species record new to Turkey in this study may be *Aspidiotus spinosus*, which was found on an ornamental plant.

Seven species of Coccidae were collected from fruit trees and ornamentals in this study. *Coccus hesperidum* was found most often, on the highest number of host species and at the largest number of localities, followed by *Saissetia oleae* (on both fruit

Table 1 - Coccoidea collected from the Aydin and Izmir provinces of Turkey.

Scale insect species	Host plant	Location (month/year)
Diaspididae		
<i>Aonidia lauri</i> (Bouché)	<i>Laurus nobilis</i>	Aydin/Kusadasi (4/1998), Izmir/Buca (7/1998)
<i>Aonidiella aurantii</i> (Maskell)	<i>Citrus</i> spp.	Izmir/Narlhdere (12/1997), Izmir/Inciralti (8/1997), Izmir/Tire (9/1998)
	<i>Rosa</i> spp.	Aydin/Kusadasi (9/2000)
	<i>Prunus laurocerasus</i>	Aydin/Kusadasi (9/2000)
<i>Aspidiotus hedericola</i> (Leonardi)	<i>Hedera helix</i>	Izmir (8/1997), Izmir/Tire (8/1997), Aydin/ Kusadasi (4/1998), Izmir/Kemalpasa (6/1998)
<i>Aspidiotus nerii</i> Bouché	<i>Nerium oleander</i>	Izmir/Seferihisar (8/1997), Izmir/Bornova (twice in 10/1997)
	<i>Spartium junceum</i>	Aydin (8/1997)
<i>Aspidiotus spinosus</i> Comstock	Ornamental	Izmir/Bornova (8/1997)
<i>Chrysomphalus dictyospermi</i> (Morgan)	<i>Citrus</i> spp.	Izmir/Narlhdere (12/1997)
<i>Cupressaspis mediterranea</i> (Lindinger)	<i>Pinus</i> spp.	Aydin/Kusadasi (9/2000)
<i>Epidiaspis leperii</i> (Signoret)	<i>Pyrus</i> spp.	Aydin / Karacasu (7/1997), Izmir/Begrime (6/1998)
<i>Lepidosaphes conchyiformis</i> (Gmelin)	<i>Ficus</i> spp.	Izmir/Seferihisar (8/1997), Aydin/Erbeyli (5/1999), (6/1999), Izmir/Kusadasi (9/2000), Aydin/Bozdogan (1/2000)
<i>Leucaspis pini</i> (Hartig)	<i>Pinus</i> spp.	Aydin/Kusadasi (4/1998), (9/2000)
<i>Leucaspis riccae</i> Targioni Tozzetti	<i>Olea europaea</i>	Izmir/Seferihisar (8/1997), Izmir/Tire (8/1997) Izmir/Kiraz (6/1998), Izmir/Bergama (6/1998), Aydin/Kusadasi (9/2000),Aydin/Germencik (9/2000)
<i>Melanaspis inopinata</i> (Leonardi)	<i>Prunus</i> spp.	Izmir/Kemalpasa (5/1998)
<i>Mercetaspis halli</i> (Green)	<i>Persica vulgaris</i>	Izmir/ Ödemis (8/1997), Izmir/Bagyurdu (5/1998), Izmir/Selcuk (6/1998), Izmir/Beydag (6/1997), Izmir/ Kemalpasa (8/1998)
	<i>Cerasus microcarpa</i>	Izmir/Kemalpasa (5/1997), Izmir/Karaburun (7/1997), Izmir/ Ödemis (5/1998), Izmir/Gökçen (5/1998), Izmir/Bagyurdu (5/1998), Izmir/Torbalı (7/1998), Izmir/Bozdogan (6/1998), Izmir/Muradiye (8/1998), Izmir (12/1997)
	<i>Ceratonia siliqua</i>	Aydin/Nazilli (7/1997), Izmir/Buca (8/1997)
	Ornamental	Aydin (7/1997), Aydin/Erbeyli (4/1999)
	<i>Prunus amygdalus</i>	Izmir/Beydag (8/1997)
<i>Parlatoria oleae</i> (Colvée)	<i>Ficus</i> spp.	Aydin/Karacasu (8/1997), Izmir/Ürkmez (7/1997), Izmir/Yukari kizilca (7/1997), (5/1998), Izmir/Seferihisar (5/1998), Izmir/ Ödemis (5/1998), Izmir/ Kemalpasa (6/1998), Izmir/Dikili (6/1998), Izmir/Buca (5/1998), (7/1998), Izmir/Tire (6/1998)
	<i>Pyrus</i> spp.	Izmir(5/1997), (8/1997), Izmir/Boron (7/1997), Izmir/Tire (7/1997), Izmir/Buca (8/1997), Izmir/Bergama (8/1997), Izmir/Bagyurdu (5/1998), Izmir/Gökçen (5/1998), Izmir/Beydag (5/1998), Izmir/Ödemis (5/1998), (6/1998), Izmir/Özdere (6/1998), Aydin/ Kusadasi (5/1998), Izmir (7/1998), Aydin/Söke (7/1997), Aydin/_sabeyli (8/1997), (6/1998), Aydin/Sultanhisar (6/1998)
	<i>Prunus cerasus</i>	Izmir/Buca (6/1998), Izmir/Kiraz (6/1998), Izmir Bergama (7/1998), Manisa/Salihli (5/1998), Manisa/Turgutlu (6/1998), Izmir/Menderes (6/1998), Aydin/ Kusadasi (6/1998)
	<i>Pyrus elaeagnifolia</i>	
	<i>Juniperus</i> spp.	

(Table 1. continued)

	<i>Persica vulgaris</i>	Izmir/Bagyurdu (8/1997), Izmir/Dikili (5/1998), Aydin/Kusadasi (6/1998)
	<i>Olea europaea</i>	Izmir/Bornova (8/1997), Izmir/Seferihisar (6/1998), Aydin/ Kusadasi (8/1997), (9/2000)
	<i>Prunus amygdalus</i>	Aydin/Germencik (8/1997), Izmir/Bergama (9/2000)
	<i>Malus</i> spp.	Izmir/Menders (8/1997), Izmir/Buca (7/1998), Aydin/Söke (7/1997), Aydin (7/1997), Aydin/Karacasu (8/1997), Aydin/Koçarli (5/1998)
<i>Pseudaulacaspis pentagona</i> (Targioni Tozzetti)	<i>Morus alba</i>	Izmir/Selçuk (5/1997), Izmir (8/1997), Izmir/Bayindir (6/1998), Aydin/ Kusadasi (9/2000)
	<i>Persica vulgaris</i>	Izmir/Bagyurdu (7/1997), (5/1998), Izmir/Selçuk (5/1997), (6/1998), Izmir/Tire (7/1997), (5/1998), Izmir/Ödemis (7/1997), Izmir/Torbalı (5/1998), Izmir/Kemalpaşa (6/1998), (5/1998), Aydin/ Kusadasi (5/1997), (6/1998), (9/2000), Manisa/Salihli (7/1997), Izmir/Kemalpaşa (6/1998)
	<i>Juglans regia</i>	Aydin/Söke (8/1997)
	<i>Prunus armeniaca</i>	Aydin/ Kusadasi (9/2000)
	<i>Prunus</i> spp.	Aydin/ Kusadasi (9/2000)
	<i>Robinia pseudacacia</i>	Aydin/ Kusadasi (9/2000)
<i>Quadraspidiotus perniciosus</i> (Comstock)	<i>Prunus cerasus</i>	Izmir/Bornova (9/1997)
	<i>Pyrus</i> spp.	Izmir/Tire (5/1998)
<i>Unaspis euonymi</i> (Comstock)	<i>Prunus laurocerasus</i>	Izmir/Bornova (3/1998), Aydin/ Kusadasi (9/2000)
Coccidae		
<i>Ceroplastes rusci</i> (Linnaeus)	<i>Ficus</i> spp.	Izmir/Tire (8/1997), Izmir (8/1997), Izmir/Bornova (12/1997), Izmir/Menderes (5/1998), Izmir/Ödemis (5/1998)
	<i>Malus</i> spp.	Aydin/Kuyucak (7/1997)
	<i>Prunus armeniaca</i>	Aydin/Kuyucak (8/1996)
	<i>Citrus</i> spp.	Aydin/Kusadasi (9/2000)
<i>Coccus hesperidum</i> Linnaeus	<i>Hedera helix</i>	Izmir/Bornova (8/1997), Izmir/Tire (8/1997)
	<i>Tilia</i> spp.	Izmir/Tire (8/1997)
	<i>Viscum album</i>	Izmir/ Kemalpaşa (8/1997), Manisa/Turgutlu (12/1998)
	<i>Castanea sativa</i>	Izmir/Kemalpaşa (8/1997), (7/1998)
	Ornamental	Izmir/Bornova (8/1997)
	<i>Ficus</i> spp.	Izmir/Bornova (12/1997), Manisa/Pazarköy (9/1997), Izmir/Beydag (8/1997), Izmir/Bozdoğan (6/1999), Aydin/Erbeyli (6/1999), Aydin/Kusadasi (9/2000)
	<i>Larus nobilis</i>	Aydin/Kusadasi (4/1998)
	<i>Ceratonion siliqua</i>	Izmir/ Kemalpaşa (5/1998)
	<i>Morus alba</i>	Izmir / Inciralti (6/1998)
	<i>Citrus</i> spp.	Izmir/Selçuk (6/1998), Izmir/Narlıdere (6/1998), (12/1997), Aydin/Söke (4/1996)
	<i>Lilium</i> spp.	Izmir/Ödemis (5/1998), Aydin/Koçarli(12/1997)
	<i>Spartium junceum</i>	Aydin (6/1997)
<i>Eulecanium</i> sp.	<i>Malus</i> spp.	Aydin/Söke (7/1997)
<i>Parthenolecanium corni</i> (Bouché)	<i>Robinia pseudoacacia</i>	Aydin/Kusadasi I(9/2000)
	<i>Ficus</i> spp.	Denizli(9/1998)
<i>Parthenolecanium persicae</i> (Fabricius)	<i>Persica vulgaris</i>	Izmir/ Kemalpaşa (5/1998), Izmir/Dikili (6/1998)
	<i>Castanea sativa</i>	Izmir/ Kemalpaşa (7/1998)
	<i>Prunus</i> spp.	Aydin/Söke (7/1997)
<i>Saissetia oleae</i> (Olivier)	<i>Citrus</i> spp.	Izmir/Selçuk (6/1998), Izmir/Seferihisar (7/1998)
	<i>Olea europaea</i>	Aydin/ Kusadasi (8/1998), (9/2000), Izmir/Eskifoça (6/1998)
	<i>Malus</i> spp.	Izmir/Bagarasi (12/1997)
	<i>Persica vulgaris</i>	Aydin/Söke (7/1998)

(Table 1. continued)

	<i>Ficus</i> spp.	Aydin/ Kusadasi (7/1997), Aydin (6/1999), Aydin/Germencik (9/2000), Aydin/Bozdogan (9/2000), (6/1999), Aydin/Erbeyli (9/2000), (7/1999), (8/1999), (8/1999)
<i>Sphaerolecanium prunastri</i> (Fonscolombe)	<i>Prunus</i> spp.	Izmir/ Kemalpaşa (6/1998), (5/1998), Manisa/Ahmetbeyli (5/1998) Izmir/Dikili (6/1998), Izmir/Tire (8/1997) Izmir/Kemalpaşa (5/1997), (5/1998) Izmir/Buharkent (4/1996) Izmir/Bozdag (7/1997), Aydin/Bagarasi (7/1997)
	<i>Malus</i> spp.	
Pseudococcidae		
<i>Planococcus citri</i> (Risso)	<i>Citrus</i> spp.	Izmir/Narlıdere (9/1996)
<i>Planococcus ficus</i> (Signoret)	<i>Ficus</i> spp.	Aydin/Erbeyli (9/1999)
<i>Planococcus</i> spp.	<i>Quercus ilex</i>	Izmir/ Kemalpaşa (10/1996), (7/1998), Izmir/Karagöl (7/1998), Izmir/Kozak (8/1996), Izmir/Buca (8/1997)
Margarodidae		
<i>Icerya purchasi</i> (Maskell)	<i>Pittosporum tobira</i>	Izmir (6/1996)
<i>Marchalina hellenica</i> (Gennadius)	<i>Pinus</i> spp.	Izmir/Bornova (5/1997)
Asterolecanidae		
<i>Asterodiaspis quercicola</i> (Bouché)	<i>Quercus</i> spp.	Izmir/ Kemalpaşa (5/1998)
Cerococcidae		
<i>Pollinia pollini</i> (Costa)	<i>Olea europaea</i>	Izmir (8/1997)

trees and ornamentals) and *Sphaerolecanium prunastri* (on fruit trees only); both species were common in the study area. *Ceroplastes rusci* was also common on various host plants. It only found in the Aegean region - in other parts of Turkey, the common species of *Ceroplastes* is *C. floridensis* (Soylu, 1976; Öncüer, 1977).

The species of Pseudococcidae, Margarodidae, Asterolecanidae and Cerococcidae found in this study were all species known from the region. Of the mealybugs, the species of *Planococcus* found on *Quercus ilex* on several occasions could not be identified to species due to the poor quality of the material. *Planococcus citri* and *P. ficus* were also present. In the Margarodidae, *Icerya purchasi* was widespread and common, whereas *Marchalina hellenica* only found in the Aegean region, on *Pinus*. The asterolecaniids, *Asterodiaspis quercicola* and *Pollinia pollini*, were common on *Quercus* and olive trees respectively.

The information gathered in this study provided an overview of economically important scale insects on fruit trees in the Aydın and İzmir provinces of the Aegean region of Turkey. More detailed studies of the Turkish scale insect fauna and its ecology are required.

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