

Scale Insects (Hemiptera:Coccoidea) in the Fruit Markets in Ankara, Turkey

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Abstract: Fruits and potted ornamental plants sold in the markets and bazaars in Ankara are frequently infested by scale insects (Hemiptera:Coccoidea). Samples of these scale insects were collected irregularly between 2008-2013 years and identified. So far, 11 species have been detected, of which the most frequent were the diaspidids *Aonidiella aurantii* (MASKELL) and *Parlatoria pergandii* COMSTOCK on citrus fruits, and *Pseudaulacaspis pentagona* (TARGIONI-TOZZETTI) on kiwi fruits. The reasons for the presence of these scale insects are discussed.

Keywords: infested fruits, *Aonidiella aurantii*, *Parlatoria pergandii*, *Pseudaulacaspis pentagona*, Turkey

Introduction

Turkey produces a very rich variety of agricultural products because of its different climatic and geographical conditions. In the Aegean, Mediterranean and Marmara regions, a wide variety of fruits, vegetables and ornamentals are grown, such as apples, banana, citrus, fig, grape, loquat, olive, peach, pears, persimmon, pomegranate etc. The Blacksea Region has large plantations of tea, hazel nut, kiwifruit and citrus, whilst other regions produce apples, pears, apricots, cherries, grapes, plums and several other fruit, many of which have been produced and consumed for centuries. On the other hand, some fruits have been newly introduced and new varieties of some traditional fruits have been developed in the last century, such as citrus (*Citrus* sp., Rutaceae), persimmon (*Diospyros kaki*, Ebenaceae), loquat (*Eriobotrya japonica*, Rosaceae) and Kiwifruit (*Actinidia deliciosa*, Actinidiaceae) (AKSOY 1995). These crops are becoming increasingly abundant and some have arrived with new pest species or are more susceptible to indigenous pests. For example *Dysmicoccus brevipes* (COCKERELL, 1875)

(Hemiptera: Pseudococcidae) was found on *Ananas comosus* in Van (KAYDAN, KOZAR 2010)

Scale insects (Coccoidea) include some of the most important insect pests affecting these crops. Feeding by scale insects causes reduced vigour, leaf drop and dieback, and an increased susceptibility of the host plants to other insects and diseases. Some scales also eliminate honeydew, which is almost pure sugars and this acts as a substrate on which sooty moulds grow. Depending on the species and populations level, scale insects can be found on all parts of the plant (KOSZTARAB, KOZÁR 1988, KOSZTARAB 1990, YAŞAR 1995, MILLER, DAVIDSON 200).

In the markets and bazaars of Ankara, it was noticed that scale insects were frequent on fruit and potted ornamental plants and this short paper discusses the results of our survey.

Material and Methods

The surveys were carried out in the markets and bazaars in Ankara between 2008-2013. Samples of infested fruits or ornamental plants were col-

lected irregularly, preserved in 70% alcohol, and then mounted on glass slides according to the procedure described by KOSZTARAB, KOZÁR (1988). The identifications were made using the publications by KOSZTARAB, KOZÁR (1988), WILLIAMS (2004) and MILLER, DAVIDSON (2005). Dry and mounted specimens are deposited in Ankara University, Agricultural Faculty, Plant Protection Department, Dışkapı, Ankara, Turkey.

Results and Discussion

So far, 11 species have been detected (Table 1). The diaspidids *Aonidiella aurantii* (Maskell, 1879), *Lepidosaphes beckii* (Newman, 1869) and *Parlatoria pergandii* Comstock were frequent on lemon (*Citrus limon*), grapefruit (*Citrus paradisi*) and sweet orange (*Citrus sinensis*). Large populations were observed on the cheaper fruits in the markets and bazaars. As predicted, *A. aurantii*, was the commonest species as it is one of the most widespread and important pests in the citrus growing areas of Turkey and has 2-4 generations each year (UYGUN *et al.* 2010). *Parlatoria pergandii* Comstock, 1881 was slightly less frequent than *A. aurantii*. *P. pergandii* is harmful in some years (UYGUN *et al.* 2010) and has reached pest status in some citrus growing areas (personal obs.). It appears to be a common and widespread species and could become a serious problem on citrus in the future.

On persimmon fruits, *Coccus hesperidum* LINNAEUS 1758 (Coccidae) was detected only on the sepals, together (Diaspididae), whilst *Lepidosaphes ulmi* (L., 1758) *Planococcus citri* (Risso, 1813) (Pseudococcidae) were found on both the sepals and fruit and the latter species was also found on the sepals and fruits of *Diospyros kaki* along with fumagine sooty moulds. Both *C. hesperidum* and *P. citri* have been recorded on persimmon in Israel (BEN-DOV, DRISHPOU 2012) and *L. ulmi* and *P. oleae* have been recorded of *Diospyros kaki* in Japan and United States (MILLER, DAVIDSON 2005, BEN-DOV *et al.* 2014).

The San José scale, *Diaspidiotus perniciosus* (COMSTOCK, 1881) was found in large populations on medlar fruit, *Mespilus germanica* (Rosaceae). This species was a serious pest between 1960 and 1970 in Turkey (DÜZGÜNEŞ 1969, ALTAY *et al.* 1971, ÜLGENTÜRK 2013) but is no longer significant although it survives in some regions (KAYDAN *et al.* 2009, ÜLGENTÜRK 2013). It is listed by EPPO (European Plant Protection Organization) among the quarantine

pests in the List A2 (ANONYMOUS, 2013) (“pest present, not widely distributed and officially controlled”), and for this reason it is treated when noted.

Parlatoria oleae (Colvee, 1880) was detected well-hidden around the peduncle and sepals on apple, pear and medlar fruits. It is a polyphagous and important pest on olive, apple, pear, citrus, and some ornamentals and forest trees in Turkey (KAYDAN *et al.* 2007, ÜLGENTÜRK *et al.* 2008, KAÇAR *et al.* 2012).

In addition, *Pseudaulacaspis pentagona* (Targioni-Tozzetti, 1886) (Diaspididae) was observed many times on kiwifruits and medlar fruits. This polyphagous species is an important pest of mulberry, peach trees and, recently, kiwifruit plantations in the Blacksea, Marmara and Mediterranean Regions (KIROĞLU 1981, GÜRKAN 1982, ERKILIÇ, UYGUN 1995, ÜLGENTÜRK *et al.* 2009). *Hemiberlesia rapax* (Comstock, 1881) (Diaspididae) and *P. pentagona* are also potentially important pests on kiwiplants in Rize Province, Turkey (ÜLGENTÜRK *et al.* 2009).

The species found on potted ornamental *Dracaena marginata* were *Chrysomphalus adonidum* (L., 1758), and *Pinnaspis aspidistrae* (Signoret). Both are cosmopolitan species (KAYDAN *et al.* 2007).

When a scale insect species is found on fruit in markets or bazaar, it implies a heavy infestation on the original plants. This may be because: (1) scale insects are not noticed by the farmers because of their cryptic habit and small size; (2) the waxy or cottony covers serve as a protective barrier to traditional contact insecticides; (3) miss-timing of control measurements; (4) pesticide resistance; and (5) the high cost of pesticides and low yields. For example, during the last 10 years, Turkish farmers were not interested in the control of citrus pests because the financial returns from this crop were too low to justify them.

To prevent damage from scale insects, cultural practices such as the planting of resistant cultivars and certified plants should be used. Additionally, optimal conditions for the crops (irrigation, pruning, fertilization), and monitoring of insect populations are also important. In addition, the native and ornamental vegetation surrounding plantations frequently serve as reservoirs for re-infestation, although they are a source of the biocontrol agents. Therefore, the presence of parasitoids and predators should be determined in these locations before pesticide application. Besides, spraying should be undertaken only when the insect populations are above the economic threshold. Training of farmers on pest control methods would also be beneficial.

Table 1. Scale insect on fruits and ornamental plants in market and bazaar in Ankara, where + - +++ shows relative frequency

Scale insects	Citrus	Apple	Pear	Persimmon	Medlar fruits	Kiwi fruit	Ornamental plants
<i>Coccus hesperidum</i> Linnaeus, 1758				+			
<i>Aonidiella aurantii</i> (Maskell, 1879)	+++						
<i>Chrysomphalus adonidum</i> (Linnaeus, 1758)							+
<i>Diaspidiotus perniciosus</i> (Comstock, 1881)		+	+		+		
<i>Lepidosaphes beckii</i> (Newman, 1869)	+						
<i>Lepidosaphes ulmi</i> (Linnaeus, 1758)				+			
<i>Parlatoria pergandii</i> Comstock, 1881	++						
<i>Parlatoria oleae</i> (Colvee, 1880)		++	++	+	+		
<i>Pinnaspis aspidistrae</i> (Signoret, 1869)							+
<i>Pseudaulacaspis pentagona</i> (Targioni-Tozzetti, 1886)					+	+++	
<i>Planococcus citri</i> Risso 1813				+			

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