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Studies on Pseudococcidae (Hemiptera Coccoidea) fauna of urban ecosystem of Ankara Province, Turkey

Abstract - Ornamental, greenhouse and wild plants were surveyed between 2001 and 2004 in a study of the pseudococcid fauna of the urban areas of the province of Ankara, Turkey. In this study 52 species belonging to 19 genera of the family Pseudococcidae were identified. *Atrococcus ater* Goux, *Atrococcus parvulus* (Borchsenius), *Coccidohystrix artemisiae* (Kiritchenko), *Helicoccus sulcii* Goux, *Heterococcopsis opertus* Borchsenius, *Heterococcus nudus* (Green), *Heterococcus tritici* (Kiritchenko), *Longicoccus affinis* (Ter-Grigorian), *Longicoccus clarus* (Borchsenius), *Longicoccus festucae* (Koteja), *Longicoccus longiventris* (Borchsenius), *Longicoccus psammophilus* (Koteja), *Mirococcopsis elongatus* Borchsenius, *Mirococcopsis stipae* Borchsenius, *Neotrionymus monstatus* Borchsenius, *Peliococcopsis priesneri* (Laing), *Peliococcus salviae* Hadzibejli, *Peliococcus tritubulatus* (Kiritchenko), *Phenacoccus ferulae* Borchsenius, *Phenacoccus interruptus* Green, *Phenacoccus loiki* Danzig, *Phenacoccus phenacocoides* (Kiritchenko), *Phenacoccus transcaucasicus* Hadzibejli, *Puto palinuri* Marotta & Tranfaglia, *Rhizoecus periolanus* (Goux) and *Spilococcus mamillariae* (Bouché) are new records for the Turkish pseudococcid fauna.

Riassunto - Studi sulla fauna dei Pseudococcidi (Hemiptera Coccoidea) nell'area urbana della provincia di Ankara, Turchia.

Sono state esaminate tra il 2001 e il 2004 piante ornamentali in serra e piante selvatiche per studiare la fauna degli Pseudococcidi nell'area urbana della provincia di Ankara (Turchia). Sono state identificate 52 specie appartenenti a 19 generi. *Atrococcus ater* Goux, *Atrococcus parvulus* (Borchsenius), *Coccidohystrix artemisiae* (Kiritchenko), *Helicoccus sulcii* Goux, *Heterococcopsis opertus* Borchsenius, *Heterococcus nudus* (Green), *Heterococcus tritici* (Kiritchenko), *Longicoccus affinis* (Ter-Grigorian), *Longicoccus clarus* (Borchsenius), *Longicoccus festucae* (Koteja), *Longicoccus longiventris* (Borchsenius), *Longicoccus psammophilus* (Koteja), *Mirococcopsis elongatus* Borchsenius, *Mirococcopsis stipae* Borchsenius, *Neotrionymus monstatus* Borchsenius, *Peliococcopsis priesneri* (Laing), *Peliococcus salviae* Hadzibejli, *Peliococcus tritubulatus* (Kiritchenko), *Phenacoccus ferulae* Borchsenius, *Phenacoccus interruptus* Green, *Phenacoccus loiki* Danzig, *Phenacoccus phenacocoides* (Kiritchenko), *Phenacoccus transcaucasicus* Hadzibejli, *Puto palinuri* Marotta & Tranfaglia, *Rhizoecus periolanus* (Goux) e *Spilococcus mamillariae* (Bouché) sono nuovi record per la fauna turca dei pseudococcidi.

periolanus (Goux) and *Spilococcus mamillariae* (Bouché) risultano essere nuovi reperti per la fauna degli Pseudococcidi della Turchia.

Key words: Coccoidea, Pseudococcidae, Scale insect, Ankara, Turkey

INTRODUCTION

Mealybugs or pseudococcids (Hemiptera: Coccoidea), comprise the second largest family of scale insects. They are usually covered in a thin or thick mealy or cottony wax secretion and feed by sucking the sap of plants (Ben-Dov & German, 2003). Scale insects are notorious pests, especially of perennial plants. They are serious pests of fruit and nut trees, ornamental shade trees and shrubs, forests trees, greenhouse and indoor plants, and often build high populations on trees, especially in urban environments (Kosztarab, 1996). The main damage is caused by direct feeding of the plant sap; but they cause also damage by reducing vigour and producing chlorotic areas at feeding locations; and by causing various symptoms such as premature leaf drop and distorting of the stem and bark. Ben-Dov & German (2003), and Ben-Dov & Miller, (2005) reported 1982 mealybugs species all over the world, while Kozár (1998) recorded 708 species in 115 genera in the Palaearctic region.

Studies on the scale insect fauna of Turkey, started by Bodenheimer (1949, 1952, 1953 a, 1953 b) and have been continued by several authors (Çanakçioğlu, 1977; Düzgüneş, 1982; Kozár *et al.*, 1979; Selmi, 1979; Ülgentürk and Toros, 1999; Uygun *et al.*, 1998). Öncüer *et al.* (2001) recorded 187 species belonging to 13 families and 84 genera. Several recent studies (e.g. Kaydan *et al.*, 2001a, b, 2004; Ülgentürk *et al.*, 2003) have added new information on the scale insect fauna of Turkey. Currently, forty-nine species have been recorded in Turkey.

This paper deals with new mealybug records in Turkey, their hosts and geographical distribution.

MATERIALS AND METHODS

A faunistic survey of the coccoid fauna of Ankara province in Turkey was conducted between 2001 and 2004. Scale insects from ornamental, greenhouse and other plants were examined. Specimens were taken from natural plants in the field, ornamental shade trees and shrubs, fruit trees, greenhouse and indoor plantations twice a week during spring and summer between 2001 and 2004 and totally 1060 samples were collected. The samples were put in plastic bags and taken to the laboratory for study. Specimens were slide-mounted and prepared for light microscopy using the methodology of Kosztarab & Kozár (1988). Dry and slide-mounted material were deposited at the Plant Protection Department, Faculty of Agriculture, Yüzüncü Yıl University, Van, Turkey.

RESULTS

In this study 52 species belonging to 19 genera of the family Pseudococcidae were identified. The list of the collected species contains host plant and phenological data. Mealybugs newly recorded from Turkey are marked with asterisk.

LIST OF SPECIES RECORDED

Antonina graminis (Maskell, 1897): Host: *Festuca* sp., on root crown; Date: V: 2003. Only females were collected. Previous records: *Lolium multiflorum*, collected around Van lake region on (Kaydan *et al.*, 2001a).

Atrococcus achilleae (Kiritchenko, 1936): Hosts: *Centaurea* sp., *Melilotus alba*, *Ranunculus* sp., *Scabiosa* sp., *Scolzenera* sp., *Sideritis* sp., *Stachys* sp., *Verbascum* sp., *Veronica multifida*, and *Veronica* sp. Found on the leaves, root crowns and roots of the host. Dates: V, VI, VII, VIII, X: 2001, 2002, 2003. Both females and males were collected. Previous records: *Acantholimon* sp., *Melilotus alba*, *Scabiosa ucranica*, and a plant belonging to the family Compositae at Ankara-Nevşehir road, Beynam, Kalecik and Şereflikoçhisar (Ankara) (Kaydan *et al.*, 2001b, 2004).

**Atrococcus ater* Goux, 1941: Host: *Setaria* sp., on leaf. Date: IX: 2002. Only females were collected.

Atrococcus paludinus (Green, 1921): Host: *Centaura* sp., on roots. Date: X: 2001. Only females were found. Previous records: Kaydan *et al.* (2001 b, 2004) found this species on *Senecio* sp., *Teucrium* sp., and on an undetermined plants at İhlara (Nevşehir) and Beynam and Kalecik (Ankara).

**Atrococcus parvulus* (Borchsenius, 1949): Hosts: *Artemisia* sp., *Digitalis* sp., *Euphorbia* sp., *Gallium* sp., and *Verbascum* sp. Found on the roots of their hosts. Dates: VI, VII, VIII, X: 2001, 2002, 2003. Only females were collected.

**Coccidohystrix artemisiae* (Kiritchenko, 1937): Host: *Artemisia* sp., on leaves. Date: VIII: 2003. Only females were found.

Helicoccoccus radicicola Goux, 1931: *Achillea millefolium*, *Cardus pycnophelus*, *Condrilla* sp., *Daucus* sp., *Diplotaxis tenuifolia*, *Erodium* sp., *Lactuca seriola*, *Lactuca* sp., *Malva* sp., *Sisymbrium* sp., *Stachys* sp., and *Verbascum* sp. Found on leaves and root crown of its hosts . Dates: VI, VII, VIII, X: 2002, 2003. Only females were collected. Previous records: *Dianthus* sp., and on a plant of the family Brassicaceae at Bala (Ankara) and Güzelyurt (Nevşehir) (Kaydan *et al.*, 2001b, 2004)

Helicoccoccus saxatilis Borchsenius, 1949: Hosts: *Cardus pycnophelus*, Compositae, and on an undetermined plant species. Found on leaves and root crown of its host. Dates: VI: 2003. Only females were found. Previous records: Found on the roots of *Nepeta* sp. at Van-Çatak road (Kaydan *et al.*, 2001a).

**Helicoccoccus sulcii* Goux, 1934: Hosts: *Marrubium* sp., and on an undetermined plant species. Found on leaves and root crown. Dates: VII: 2002, 2003. Only females were found.

**Heterococcopsis opertus* Borchsenius, 1949: Host: *Cynodon dactylon*, in the leaf sheaths of its host. Date: VIII: 2002. Only females were found.

**Heterococcus nudus* (Green, 1926): Hosts: *Agropyron* sp., *Agropyron repens*, *Echinochloa crusgalli*, *Festuca arundinaceae*, *Festuca rubra*, *Hordeum murinum*, *Lolium perenne*, *Lolium* sp., *Setaria viridis*, *Setaria* sp., *Sorghum* sp., and *Stipa* sp. Found in the leaf sheaths of its hosts. Dates: V, VI, VII, VIII, IX: 2002, 2003. Both females and males were found.

**Heterococcus tritici* (Kiritchenko, 1932): Hosts: *Avena* sp., *Cynodon dactylon*, *Elymus caput-medusae*, in leaf sheaths. Dates: V, VII, VIII, IX: 2002, 2003. Both females and males were collected.

**Longicoccus affinis* (Ter-Grigorian, 1967): Host: *Hordeum bulbosa*, in leaf sheaths. Date: VII: 2003. Only females were collected.

**Longicoccus clarus* (Borchsenius, 1949): Host: *Cynodon dactylon*, in leaf sheaths. Date: IX: 2001. Only females were collected.

**Longicoccus festucae* (Koteja, 1971): Hosts: *Poa pratensis*, *Stipa* sp. and another gramineous plant (Poaceae). Found in the leaf sheaths of its hosts. Dates: VIII, X: 2002, 2003. Only females were collected.

**Longicoccus longiventris* (Borchsenius, 1949): Hosts: *Hordeum bulbosa* and *Poa pratensis*, in leaf sheaths. Dates: VII, X: 2002, 2003. Only females were collected.

**Longicoccus psammophilus* (Koteja, 1971): Hosts: *Aegilops* sp., *Agropyron repens*, *Hordeum murinum*, *Poa bulbosa* and on an undetermined grass. Found in the leaf sheaths. Dates: V, VIII, XI: 2002, 2003. Only females were collected.

**Mirococcopsis elongatus* Borchsenius, 1948: Hosts: *Festuca* sp., and *Stipa* sp., in leaf sheaths. Dates: V, VII, VIII, IX, X: 2002, 2003. Only females were collected.

**Mirococcopsis stipae* Borchsenius, 1949: Hosts: *Aegilops* sp., and *Stipa* sp., in leaf sheaths. Dates: V, VI: 2002, 2003. Only females were collected.

Mirococcus inermis (Hall 1925): Hosts: *Amaranthus viridis*, *Atriplex* sp., *Cardaria draba*, *Chenopodium album*, *Chenopodium* sp., *Diplotaxis tenuifolia*, *Heliotropium europaeum*, *Polygonum aviculare*, *Roseda* sp., *Sinapis arvensis*, *Sisymbrium altissima*, *Xanthium strumarium*. Found on the roots of its hosts. Dates: V, VI, VII, VIII, IX: 2002, 2003. Only females were collected. Previous records: *Chenopodium album*, *Heliotropium europaeum*, *Polygonum* sp., *Salsola kali*, and on the roots of an undetermined plant at Van and Burdur (Kaydan *et al.*, 2001a, 2004).

**Neotrionymus monstatus* Borchsenius, 1948: Host: *Phragmites communis*, in leaf sheaths. Date: V: 2002. Only females were collected.

**Peliococcopsis priesneri* (Laing, 1936): Hosts: *Cynodon dactylon*, in leaf sheaths. Dates: VI, VII, VIII, IX: 2001, 2002, 2003. Only females were collected.

Peliococcus chersonensis (Kiritchenko, 1936): Hosts: *Cardaria draba*, *Sinapis arvensis*, *Trapogon* sp., *Veronica* sp. and a plant of the family Labiatae. Found on the roots and root crown of its host. Dates: V, VI: 2002, 2003. Previous records: on roots of *Artemisia* sp., *Artemisia fragrans*, *Cnopsis* sp., *Globularia* sp., and *Solanum tuberosum* collected at Bala, Kalecik, Beynam (Ankara) and at Van (Bodenheimer, 1953a; Kaydan *et al.*, 2001a, 2004).

Peliococcus manifestus Borchsenius, 1949: *Centaura solstitialis*, *Echium* sp., *Sonchus* sp.. Found on the roots of its hosts. Dates: VIII: 2002, 2003. Only females were collected. Previous records: on roots of *Euphorbia* sp., *Turgenia latifolia* at Saray (Van) (Kaydan *et al.*, 2001a).

**Peliococcus salviae* Hadzibejli, 1963: Host: on roots of a plant belonging to the family Brassicaceae. Date: V: 2002. Only females were collected.

**Peliococcus tritubulatus* (Kiritchenko, 1940): Host: on roots of a plant belonging to the family Compositae,. Date: VII: 2003. Only females were collected.

Peliococcus turanicus (Kiritchenko, 1932): Hosts: *Achillea millefolium*, *Artemisia* sp., *Cardaria* sp., *Cardaria draba*, *Cichorium intybus*, *Cichorium* sp., *Convolvulus arvensis*, *Crepis* sp., *Descuvaria saptia*, *Diplotaxis tenuifolia*, *Medicago* sp., *Salvia* sp., *Senecio* sp., *Scolzenera* sp., *Sisymbrium* sp., *Sonchus arvensis*, *Sonchus* sp., *Tragopogon* sp., *Xanthium strumarium*. Found on the roots of its host. Dates: V, VI, VII, VIII, IX: 2002, 2003. Only females were collected. A common species, especially outdoors. Previous records: on roots of *Achillea* sp., *Cardaria draba*, *Euphorbia* sp., *Falcaria vulgaris*, *Senecio* sp., and *Tragopogon* sp., at Gevaş, Saray and Erciş (Van). (Kaydan, 2001a).

Phenacoccus aceris (Signoret, 1875): Hosts: *Acer campestre*, *A. negundo*, *A. platanoides*, *A. pseudoplatanus*, *Acer* sp., *Aesculus hippocastanum*, *Betula* sp., *Cotoneaster* sp., *Crataegus* sp., *Cydonia oblonga*, *Euonymus* sp., *Ficus carica*, *Fraxinus americana*, *F. excelsior*, *Juglans regia*, *Malus communis*, *Mespilus germanica*, *Platanus orientalis*, *Prunus communis*, *P. domestica*, *P. persica*, *P. spinosa*, *Prunus* sp., *Pyrus communis*, *Robinia pseudacacia*, and *Tilia* sp. It is a polyphagous species found mostly on ornamental trees. This species is common in parks and roadside plantations throughout Ankara, and is considered a pest of economic importance. Dates: III, IV, V, VI, VII, VIII, IX: 2001, 2002, 2003. Both females and males were collected. Previous records: *Fraxinus* sp., *Platanus* sp., *Ulmus* sp. at Niğde, Ankara, Kayseri (Bodenheimer 1953; Düzgüneş 1982; Uygun *et al.*, 1998; Kaydan *et al.*, 2004).

Phenacoccus avenae Borchsenius, 1949: Hosts: *Avena* sp., *Bifora radians*, *Bromus inermis*, *Cardus pycnophelus*, *Cynodon dactylon*, *Centaura* sp., *Diplotaxis tenuifolia*, *Echium* sp., *Gallium* sp., *Hordeum murinum*, *Lactuca* sp., *Lamium* sp., *Roseda* sp., *Sisymbrium* sp., *Stachys* sp. Found on the roots, leaves, and in leaf sheaths of its host. Dates: V, VI, VII, VIII, X: 2002, 2003. Only females were collected. Previous records: on ornamental plants belonging to the plant families: Amaryllidaceae, Iridaceae, Liliaceae and Poaceae, which were imported by the U.S.A., Great Britain, and the Netherlands from Turkey (Williams & Miller, 1985)

Phenacoccus bicerarius Borchsenius, 1949: Hosts: *Agrostis tenius*, *Avena* sp., *Cynodon dactylon*. Found in the leaf sheaths of its host. Dates: V, VII, VIII, IX, X: 2001, 2002, 2003. Only females were collected. Previous records: *Cynodon dactylon* and *Lolium* sp. at Kalecik, Beynam, Sereflikoçhisar (Ankara) (Kaydan *et al.*, 2004).

**Phenacoccus ferulae* Borchsenius, 1949: Hosts: *Cynodon dactylon* and on an undetermined plant. Found in the leaf sheaths and roots of its host. Dates: VII: 2002, 2003. Only females were collected.

Phenacoccus hordei (Lindeman, 1886): Hosts: *Eryngium* sp., *Thymus* sp., and a plant belonging to the family Poaceae. Found in the leaf sheaths and roots of its host. Dates: VIII, X: 2001, 2002. Only females were collected. Previous records: on an undetermined host from Nevşehir (Kaydan *et al.*, 2001 b).

**Phenacoccus interruptus* Green, 1923: Hosts: *Bromus* sp., *Hordeum vulgare*, and a plant belonging to the family Poaceae. Found in the leaf sheaths of its host. Dates: V, VII: 2002, 2003. Only females were collected.

Phenacoccus karaberdi Borchsenius & Ter-Grigorian, 1956: Hosts: *Cardaria draba*, *Chenopodium album*, and a plant from the family Compositae. Found on the roots of its host. Dates: VI, VIII: 2002, 2003. Only females were collected. Previous records: on roots of *Triticum vulgare* at Saray (Van) (Kaydan *et al.*, 2001a).

**Phenacoccus loiki* Danzig, 2001: Host: *Hordeum murinum*, in the leaf sheaths. Date: V: 2003. Only females were collected.

**Phenacoccus phenacocoides* (Kiritchenko, 1932): Hosts: *Aegilops* sp. *Hordeum murinum*, and a plant of the family Poaceae. Found in the leaf sheaths of its host. Dates: VI, VII, IX: 2001, 2003. Only females were collected.

Phenacoccus pumilus Kiritchenko, 1936: Hosts: *Achillea* sp., *Ajuga* sp., *Amaranthus retroflexus*, *Amaranthus viridis*, *Anthemis* sp., *Artemisia* sp., *Atriplex* sp., *Buplerum* sp., *Caucalis* sp., *Centaurea depressa*, *C. solstitialis*, *Chenopodium botrys*, *Chenopodium* sp., *Cichorium intybus*, *Circium arvense*, *Circium* sp., *Condrrilla juncea*, *Condrrilla* sp., *Convolvulus gallaticus*, *Crepis* sp., *Crupina crupinastrum*, *Daucus* sp., *Descuraria saptia*, *Diplotaxis tenuifolia*, *Echium* sp., *Echinophora tenuifolia*, *Erodium cicutarium*, *Eryngium campestre*, *Eryssimum* sp., *Euclidium syriacum*, *Falcaria* sp., *Gallium* sp., *Glaucium flavum*, *Glaucium* sp., *Hirschfeldia incana*, *Lactuca* sp., *Lactuca serriola*, *Linaria* sp., *Lithospermum* sp., *Lotus corniculatus*, *Malva* sp., *Marrubium* sp., *Matthiola longipetala*, *Matricaria* sp., *Melilotus alba*, *Myosopsis* sp., *Polygonum* sp., *Raripa* sp., *Roseda lutea*, *Roseda* sp., *Salsola* sp., *Scabiosa* sp., *Scandix* sp., *Sideritis* sp., *Silene* sp., *Sinapis arvensis*, *Sisymbrium officinale*, *Sium* sp., *Sonchus arvensis*, *Sonchus* sp., *Trifolium* sp., *Tripleurospermum* sp., *Tragopogon* sp., *Turgenia* sp., *Valerianella* sp., *Verbascum* sp., *Veronica multifolia*, *Xanthium strumarium*, *Zosima absinthifolia*. Found on the roots of its host. Dates: V, VI, VII, VIII, IX, X: 2001, 2002, 2003. Both females and males were collected. It is a common species found outdoors throughout Ankara. Previous records: *Taralis* sp. and an undetermined plant species at Polatlı, Haymana (Ankara) and Nevşehir (Kaydan *et al.*, 2001b, 2004).

Phenacoccus tergrigoriana Borchsenius, 1956: Hosts: *Medicago rigidula* and plants of the family Compositae. Found on the roots of its host. Dates: VI, VIII: 2002, 2003. Only females were collected. Previous records: *Achillae* sp., *Artemisia* sp., *Beta vulgaris*, *Chenopodium album*, *Chenopodium* sp., *Cichorium* sp., *Eryngium* sp., *Hordeum vulgare*, *Onobrychis viciifolia*, *Melilotus* sp., *Scabiosa* sp., *Xanthum* sp., and *Zygophyllum tabacum* at Ankara, Nevşehir and Van (Kaydan *et al.*, 2001a, b, 2004).

**Phenacoccus transcaucasicus* Hadzibejli, 1960: Host: *Malus communis*, on the bark. Date: IV: 2002, 2003. Both females and males were collected.

Planococcus citri (Risso, 1813): Hosts: *Amarillus* sp., *Anthurium scherzeranum*, *Cissus antartica*, *Citrus limon*, *Citrus* sp., *Crisa* sp., *Cyperus alternifolius*, *Dracaena marginata*, *Euphorbia* sp., *Euonymus* sp., *Ficus elastica*, *Ficus* sp., *Kalanchoe blossfeldiana*, *Marantha leuconeura*, *Nerium oleander*, *Pelargonium peltatum*, *Saintpaulia ionantha*, *Yucca* sp. Found on the leaves and branches of its host. Dates: I, II, III, IV, VI, VII, IX, X: 2001, 2002, 2003. This species was collected from green house and indoor plants. Previous records: on citrus and ornamental plants in greenhouse and indoors plants (Ben-Dov, 1994; Bodenheimer, 1949, 1952, 1953a; Düzgüneş, 1982; Lodos, 1986). It is a pest of economic importance, especially on citrus growing areas in southern Turkey.

Planococcus ficus (Signoret, 1875): Hosts: *Anthurium scherzerianum*, *Chrysalidocarpus lutescens*, *Dracaena* sp., *Ficus* sp., *Ficus benjamina*, *Ficus carica*, *Hoya* sp., *Kalanchoe blossfeldka*, *Marantha leuconeura*, *Nerium oleander*, *Pelargonium peltatum*, *Saxifraga stolonifera*, *Schefflera* sp., *Syngonium podophyllum*, *Syngonium* sp., *Vitis vinifera*. Found on the leaves, bark and stems of its host. Date: II, IV, VI, VII, IX, XII: 2002, 2003. Both females and males were collected. It is a common species in greenhouse and indoor plants, and on *Vitis vinifera* in the field. This species is a polyphagous pest worldwide. Previous records: *Ficus* sp., *Punica granatum* and *Vitis* sp. at Ankara, Burdur, İzmir, Rize, Niğde and Marmara region (Düzgüneş, 1982; Lodos, 1986; Kaydan *et al.*, 2004).

Planococcus vovae (Nasonov, 1908): Hosts: *Cupressus arizonica*, *C. sempervirens*, *Juniperus chinensis*, *J. communis*, *J. horizontalis*, *J. sabinae*, *Taxus* sp., *Thuja* sp. Found on the leaves and branches of its host. Dates: V, VI, VII, VIII, IX, X: 2002, 2003. Both females and males were collected. It is a common species in parks throughout Ankara. It can be considered an important pest on *Juniperus* spp. Previous records: *Cupressus sempervirens*, *C. goveniana*, *Cupressus* sp., *Juniperus exelsa*, *Juniperus* sp., *Laurus nobilis*, *Libocedrus decurrens*, *Taxus baccata* and *Thuja occidentalis* at Kocapınar and Aziziye (Burdur), Eğirdir and Kovada (Isparta), Marmara Region, Middle Anatolia, Mediterranean regions (Çanakçıoğlu, 1977; Kaydan *et al.*, 2004; Selmi, 1979; Uygun *et al.*, 1998).

Pseudococcus longispinus (Targioni Tozzetti 1867): Hosts: *Cyclus* sp., *Dracaena marginata*, *Dracaena* sp.. Found on the leaves of its host. Dates: I, II, VII: 2001, 2002, 2003. Both females and males were collected. It was found on greenhouse and indoor plants. Previous records: *Acer* sp., *Ficus carica*, *Hedera helix*, *Nerium oleander*, *Robinia pseudoacacia* at Antakya, Ordu and Rize (Ben-Dov, 1994; Bodenheimer 1949, 1952, 1953a; Düzgüneş, 1982).

Pseudococcus viburni (Signoret, 1875): Host: *Citrus* sp., on leaves. Date: X, 2003. Only females were collected. It was found on greenhouse plants. Previous records: *Begonia* sp., *Citrus* sp., *Cydonia* sp., *Dianthus* sp., *Euphorbia* sp., *Prunus laurocerus*, *Quercus* sp., and *Salix* sp., in İstanbul and Black sea region. (Ben-Dov, 1994; Bodenheimer, 1949, 1952, 1953a; Düzgüneş, 1982).

Puto pilosellae (Šulc, 1898): Hosts: *Sanguisorba minor*, on leaves. Dates: VII, VIII, IX: 2002, 2003. Only females were collected. Previous records: on *Salvia* sp. and on an undetermined plants at Kovada (Isparta) and Bala and METU (Ankara) (Kaydan *et al.*, 2004)

Puto superbus (Leonardi, 1907): Host: *Digitalis* sp., on leaves. Date: VII, 2003. Only females were collected. Previous records: *Gallium* sp., *Quercus* sp., and on an undetermined grass (Poaceae) at Söğüt, (Burdur), Çay (Afyon), Sütçüler and Eğirdir (Isparta) (Kaydan *et al.*, 2004).

**Puto palinuri* Marotta & Tranfaglia, 1993: Host: Poaceae and other plants. Found on the leaves of its host. Date: V: 2003. Only females were collected.

**Rhizoecus periolanus* (Goux, 1985): Host: *Stipa* sp., on the roots. Date: V: 2003. Only females were collected.

**Spilococcus mamillariae* (Bouché, 1844): Hosts: *Euphorbia abyssinica* and *Mamillaria daschyaacantha*. Found on the stem of its host. Date: I: 2003. Both females and males were collected. It was collected only from greenhouse plants.

Trionymus aberrans Goux, 1938: Hosts: *Agropyron cristatum*, *Agropyron repens*, *Agropyron* sp., *Bromus tectorum*, *Cynodon dactylon*, *Echium* sp., *Echinochloa crusgalli*, *Festuca* sp., *Hordeum murinum*, *Hordeum vulgare*, *Lolium perenne*, *Triticum vulgare* and *Triticum* sp. Found in the leaf sheaths of its host. Dates: V, VII, VIII, IX, X: 2001, 2002, 2003. Both females and males were collected. Previous records: *Aegilops* sp., *Agropyron repens*, *Avena* sp., *Elymnus repens*, *Triticum* sp. at Haymana and Şereflikoçhisar (Ankara), Nevşehir and Van (Kaydan *et al.*, 2001a; Kaydan *et al.*, 2001b).

Trionymus multivorus (Kiritchenko, 1936): Hosts: *Anchusa* sp., *Cardaria* sp., *Caucalis* sp., *Centaura solstitialis*, *Centaura virgata*, *Cichorium intybus*, *Circium* sp., *Circium arvense*, *Crepis* sp., *Conyza canadensis*, *Daucus littoralis*, *Diplotaxis tenuifolia*, *Echium* sp., *Eryngium campestre*, *Euphorbia* sp., *Falcaria* sp., *Glaucom* sp., *Lactuca* sp., *Lithospermum* sp., *Marrubium* sp., *Onobrychis* sp., *Onopordum* sp., *Papaver* sp., *Phlomis* sp., *Salvia* sp., *Sedum* sp., *Sideritis* sp., *Sonchus* sp., *Stachys* sp., *Taraxacum* sp., *Tragopogon* sp., *Turgenia* sp., *Verbascum* sp., *Xeranthemum* sp. Found on leaves, stems, flowers, and root crown of its host. Dates: V, VI, VII, VIII, IX: 2001, 2002, 2003. Both females and males were collected. Previous records: *Cicer* sp., *Daucus guttatus* *Echinophora tenuifolia*, *Eryngium* sp., *Malva* sp., and *Medicago* sp., *Nepeta* sp. at Beynam, Çubuk and Çeltikçi (Ankara), Van, Osmaniye and Nevşehir by Bodenheimer (1953) and Kaydan *et al.* (2001a, b).

Trionymus perrisi (Signoret, 1875): Hosts: *Agropyron* sp., *Elymus* sp., *Hordeum murinum*. Found in the leaf sheaths of its host. Dates: VII, VIII: 2002, 2003. Only females were collected. Previous records: *Caucalis* (cf) *ptatycorpis* at Çatak (Van) as *T. graminellus* (Kaydan *et al.*, 2001a).

During the survey we found 52 species. The number of species for each genus is as follows: *Antonina*, 1; *Atrococcus*, 4; *Coccidohystrix*, 1; *Helioecoccus*, 3; *Hetero-*

coccopsis, 1; *Heterococcus*, 2; *Longicoccus*, 5; *Mirococcopsis*, 2; *Mirococcus*, 1; *Neotrionymus*, 1; *Peliococcopsis*, 1; *Peliococcus*, 5; *Phenacoccus*, 12; *Planococcus*, 3; *Pseudococcus*, 2; *Puto*, 3; *Rhizoecus*, 1; *Spilococcus*, 1; *Trionymus*, 3. A total of 26 species are new records for the scale insect fauna of Turkey.

Phenacoccus aceris is the most commonly collected species, being present on 40,19% of the sampled plants (Fig. 1) (1060 samples). This species was collected on ornamental plants such as *Acer* spp., *Aesculus* spp., *Fraxinus* spp., *Malus* spp., *Platanus* sp., *Prunus* spp. throughout the urban area of Ankara, especially parks and roadside plantations. Düzgüneş (1982) considered this species as a pest on ornamental plants, while Kosztarab & Kozár (1988) considered this species as a pest on ornamental plants and apple trees. Although the survey was concentrated on this species, and much more samples were collected relating to this species and this number is somewhat biased by overestimation. However we can regard this as most common species. The second most common species is *P. pumilus* which has an occurring rate of 16,13% and it was found generally on plants in the families Brassicaceae and Compositae. *Trionymus multivorus* is also a common species with a 7,64% rate of occurrence.

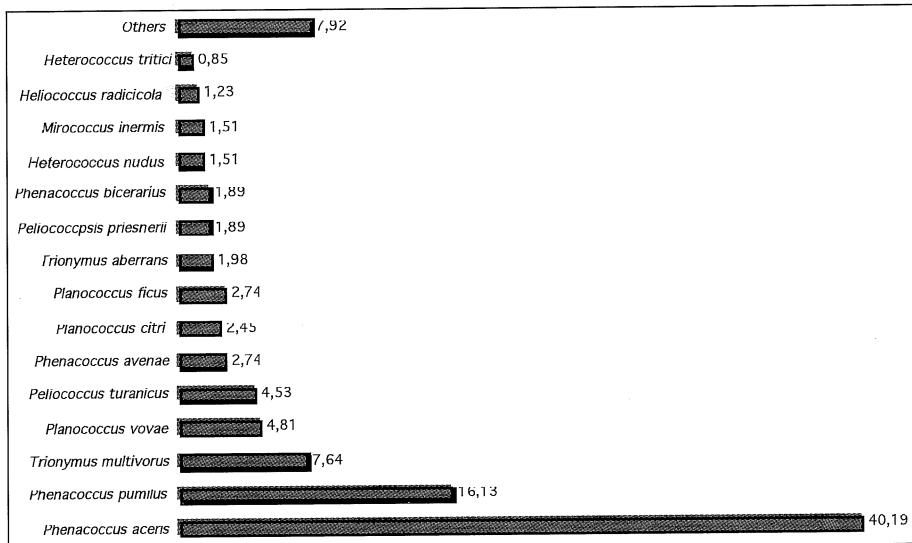


Fig. 1 - Frequency percentage of the species in samples

In summary, *Planococcus citri*, *P. ficus*, *Pseudococcus longispinus*, *Pseudococcus viburni* and *Spilococcus mamillariae* were recorded in greenhouse and indoor plants; *Phenacoccus transcaucasicus* and *Planococcus ficus* were found on horticultural plants; *Phenacoccus aceris* was recorded on ornamental and horticultural plants; and *Planococcus vovae* was found on ornamental plants, and are economically important

pests. Other species were collected from natural plants in the urban area of Ankara, and may be considered as an important part of the ecosystem, because they may serve as a reservoir of natural enemies that could potentially control those species causing damage.

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REFERENCES

BEN-DOV Y., 1994 - A systematic catalogue of the mealybugs of the world (Insecta: Homoptera: Coccoidea: Pseudococcidae and Putoidae) with data on geographical distribution, host plants, biology and economic importance. Intercept Limited, Andover, UK. 686 pp.

BEN-DOV Y., GERMAIN, V., 2003 - Scalenet: A Database of Scale Insects of the World. www.Sel.Barc.Usda.Gov.ScalenetScalenet.

BEN-DOV Y., MILLER D.R., 2005 - Scalenet: A Database of Scale Insects of the World. <http://www.sel.barc.usda.gov/scalenet/scalenet.htm>

BODENHEIMER F.S., 1949 - The Coccoidea of Turkey. Diaspididae. A monographic study. - Neşriyat Md., Sayı 670: 264 pp. (In Turkish).

BODENHEIMER F.S., 1952 - The Coccoidea of Turkey. I. - Revue de la Faculté des Sciences de l'Université d'Istanbul (Ser. B) 17: 315-351.

BODENHEIMER F.S., 1953a - The Coccoidea of Turkey. II. - Revue de la Faculté des Sciences de l'Université d'Istanbul 18: 1-61.

BODENHEIMER F.S., 1953b - The Coccoidea of Turkey III.- Revue de la Faculté des Sciences de l'Université d'Istanbul (Ser. B) 18: 91-164.

ÇANAKÇIOĞLU H., 1977 - A study of the forest Coccoidea (Homoptera) of Turkey (Systematic-Distribution-Host Plant-Biology). - İ.Ü. Yay. No: 2322, Or. Fak. Yay. No: 227, 122 pp. (In Turkish).

DÜZGÜNEŞ Z., 1982 - Studies on Turkish Pseudococcidae (Homoptera: Coccoidea) species. - A.Ü. Zir. Fak. Yay. 836, Bil.Ar. Inc: 498, 88 pp. (In Turkish).

KAYDAN M.B., KOZÁR F., YAŞAR B., ERKILIÇ L., 2001a - Initial studies on Pseudococcidae fauna in Van Province of Turkey. - Acta Phytopathologica et Entomologica Hungarica, 36: 377-382.

KAYDAN M.B., ÜLGENTÜRK S., KOZÁR F., TOROS S., 2001b - Scale Insects (Homoptera: Coccoidea) of Natural and Agriculture Areas in Kapadokya, Turkey. - Boll. Zool. agr. Bachic. Ser. II, 33 (3): 253-257.

KAYDAN M.B., ÜLGENTÜRK S., ZEKI C., TOROS S., GÜRKAN M., 2004 - Studies on Pseudococcidae (Homoptera: Coccoidea) fauna of Afyon, Ankara, Burdur and Isparta provinces, Turkey. - Turkish Journal of Zoology, 28: 219-224.

KOSZTARAB M., 1996 - Scale insects of Northeastern North America. Identification, biology, and distribution. - Virginia Museum of Natural History, Martinsburg, Virginia. 650 pp.

KOSZTARAB M., KOZÁR, F., 1988 - Scale Insects of Central Europe. Dr. W. Junk Publishers, Budapest, 456 pp.

KOZÁR, F., 1998 - Catalogue of Palaearctic Coccoidea. - Plant Protection Institute, Hungarian Academy of Sciences, Budapest, Hungary. 526 pp.

LODOS N., 1986 - Turkish Entomology II, Ege Üniversitesi Ziraat Fak. Yay. No: 426, Bornova-İzmir, 580 pp. (In Turkish)

ÖNCÜER C., UYGUN N., ERKILIÇ L.B., KARSAVURAN Y., 2001 - An Annotated List of Scale Insects (Homoptera: Coccoidea) from Turkey. - *Acta Phytopathologica et Entomologica Hungarica* 36 (3-4): 389-403.

SELMİ E., 1979 - Studies on the Coccoidea (Homoptera) species damaging conifers in the Marmara region (Systematic-Distribution-Host-Biology-Natural Enemies). - İstanbul University Faculty of Forestry. Ser. A. 29: 92-127 (In Turkish).

UYGUN N., ŞENGONCA Ç., ERKILIÇ, L., SCHADE M., 1998. The Coccoidea fauna and their host plants in cultivated and non-cultivated areas in the East Mediterranean Region of Turkey. - *Acta Phytopathologica et Entomologica Hungarica* 33, (1-2): 183-191.

ÜLGENTÜRK S., KAYDAN M.B., TOROS S., GÜRKAN M.O., 2003 - A survey of the Eriococcidae (Hemiptera: Coccoidea) of Ankara Province, Turkey. - *Phytoparasitica* 31 (5): 442-445.

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