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## Contribution to the Knowledge of Scale Insects (Homoptera: Coccoidea) of Coniferous Trees from Turkey

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**Abstract:** To date, a total of 31 species of scale insects have been recorded on coniferous trees in Turkey. The scale insect families Margarodidae, Pseudococcidae, Coccidae, Eriococcidae and Diaspididae consist of 3, 3, 6, 1 and 18 species, respectively. Thirteen out of 31 species were found in the European part of Turkey. From the zoogeographical standpoint, 3 are native, 11 are cosmopolitan and 17 are palearctic species.

**Key words:** Coccoidea, coniferous trees, Turkey

### INTRODUCTION

Scale insects are a large one and contains forms that are minute and highly specialized. Many are so modified that they look very little like other Homoptera (Borror *et al.*, 1992). About 150 species of scale insects are known to develop on coniferous trees in different countries of the world. They cause various types of damage, including discoloration, premature needle fall, reduction of shoot growth, death of branches and even of the whole tree (Kozarzhevskaya, 1995).

The scale insect fauna on coniferous trees of Turkey was studied in some detail by several researchers (Lindinger, 1906, 1909, 1912; Fahringer, 1922; Hovasse, 1930a, b; Özek and Hovasse, 1931; Acatay, 1943; Selmi, 1979; Düzgüneş, 1982; Yaşar, 1995; Kaydan *et al.*, 2004; Ülgentürk *et al.*, 2004). The purpose of this study was to improve the knowledge on the coniferous tree damaging scale insect fauna of Turkey.

### MATERIALS AND METHODS

This study was conducted during 2003 and 2004 in Turkey (39° 90' N, 35° 00' E). Some scale insects mentioned in the present study were collected in the field and the rest previously recorded in Turkey were taken from the literature. Collecting and preserving methods used in this study were based on the literatures of Schauff (1986) and Çanakçıoğlu (1993).

Group and family of the scale insects given bellow are based mainly on the generic classification taken from Schmutterer (1972). Species under families are arranged in alphabetical order.

### RESULTS

To date, totally 31 scale insect species on coniferous trees have been recorded by several researchers in Turkey. Distribution and host plants of these species were given below:

- Group Archaeococcoidea
- Family Margarodidae

**Marchalina hellenica (Gennadius, 1883):** Recorded on *Pinus* sp., *P. brutia*, *P. pinea* and *P. sylvestris* in İstanbul, Çanakkale, Tekirdağ, Balıkesir, Denizli, İzmir, Muğla, Antalya, Adana and Ankara (Hovasse, 1930a,b; Özek and Hovasse, 1931; Acatay, 1943; Schimitschek, 1944; Ermin, 1950; Bodenheimer, 1953; Besceli and Ekici, 1968; Giray, 1970; Tosun, 1975; Çanakçıoğlu, 1977; Selmi, 1979, 1983; Çanakçıoğlu *et al.*, 1982; Karsavuran *et al.*, 2001).

**Matsucoccus josephi (Bodenheimer and Harpaz, 1955):** Recorded on *Pinus brutia* and *P. halepensis* in Samsun, Sinop, İstanbul, İzmir, Aydın, Muğla, Antalya, İçel, Niğde, Adana and Hatay (Mendel, 1992).

**Palaeococcus fuscipennis (Burmeister, 1835):** Recorded on *Pinus brutia* in İstanbul (Schimitschek, 1944).

- Group Neococcoidea
- Family Pseudococcidae

**Planococcus vovae (Nasonov, 1909):** Recorded on *Calocedrus decurrens*, *Cupressus* sp., *C. goveniana*, *C. sempervirens*, *Juniperus* sp., *J. excelsa*, *J. virginiana*,

*Taxus baccata* and *Thuja occidentalis* in İstanbul, Çanakkale, Bursa, Uşak, Antalya, Isparta, Burdur, Adana and Hatay (Çanakçioğlu, 1972, 1977; Selmi, 1979; Çanakçioğlu *et al.*, 1982; Düzgüneş, 1982; Cox and Ben-Dov 1986; Şengonca *et al.*, 1998; Uygun *et al.*, 1998; Williams and Moghaddam, 1999; Japoshvili and Karaca 2002; Kaydan *et al.*, 2004).

***Pseudococcus caricus* (Gennadius, 1883):** Recorded on *Pinus nigra* in Muğla (Gennadius, 1883).

***Pseudococcus viburni* (Signoret, 1875):** Recorded on *Cephalotaxus harringtonia* in İstanbul and Bursa (Selmi, 1979).

- Family Coccidae

***Coccus hesperidum* Linnaeus, 1758:** Recorded on *Abies concolor*, *A. nordmanniana* subsp. *bornmuelleriana*, *Cedrus atlantica*, *C. libani*, *Cephalotaxus harringtonia*, *Pinus pinaster*, *P. pinea* and *Taxus baccata* in İzmir, İstanbul, Bursa, Balıkesir, Kocaeli and Sakarya (Çanakçioğlu, 1977; Selmi, 1979; Çanakçioğlu *et al.*, 1982).

In this study, *C. hesperidum* was found on *Cedrus libani* in İstanbul and Adapazarı. Selmi (1979) reported that *C. hesperidum* had 3 generations per year in Marmara region.

***Coccus pseudomagnoliarum* (Kuwana, 1914):** Recorded on *Pinus sylvestris* in Eskişehir and Trabzon (Çanakçioğlu, 1977).

***Nemolecanium aptii* (Bodenheimer, 1941):** Recorded on *Abies nordmanniana* in Bolu (Bodenheimer, 1941, 1953).

***Parthenolecanium pomeranicum* (Kawecki, 1954):** Recorded on *Taxus baccata* in Ankara and İstanbul (Selmi, 1979; Ülgentürk and Toros, 1999).

***Physokermes piceae* (Schrank, 1801):** Recorded on *Abies nordmanniana* subsp. *bornmuelleriana*, *A. pinsapo*, *Picea abies*, *P. orientalis* and *P. pungens* in Ankara and İstanbul (Çanakçioğlu, 1972, 1977; Selmi, 1979; Çanakçioğlu *et al.*, 1982; Özkazanç and Yücel, 1985; Ülgentürk and Toros, 1999).

***Pulvinaria floccifera* (Westwood, 1870):** Recorded on *Cephalotaxus harringtonia* and *Taxus baccata* in İstanbul and Bursa (Selmi, 1979).

- Family Eriococcidae

***Eriococcus araucariae* Maskell, 1879:** Recorded on *Araucaria* sp. in İstanbul (Bodenheimer, 1953).

- Family Diaspididae

***Acanthomytilus cedricola* (Balachowsky and Alkan, 1956):** Recorded on *Cedrus atlantica*, *C. deodara* and *C. libani* in İstanbul, Kocaeli, Bursa, Balıkesir, Antalya, Isparta, Edirne, İzmir, Ankara, Afyon, Uşak and Gaziantep (Balachowsky and Alkan 1956; Çanakçioğlu, 1977; Selmi, 1979; Çanakçioğlu *et al.*, 1982; Özkazanç and Yücel, 1985; Yaşar, 1995; Ülgentürk and Toros, 1996; Japoshvili and Karaca, 2002).

In this study, *A. cedricola* was found on *Cedrus libani* in Afyon. Selmi (1979) found that *A. cedricola* overwintered as the adult stage in Marmara Region.

***Aonidia mediterranea* (Lindinger, 1910):** Recorded on *Cupressus sempervirens* and *Pinus* sp. in Antalya and Aydın (Erler *et al.*, 1996; Karsavuran *et al.*, 2001).

***Aspidiotus nerii* (Bouche, 1833):** Recorded on *Cedrus libani*, *Picea abies* and *Taxus baccata* in İzmir, İçel and İstanbul (Tuatay *et al.*, 1972; Çanakçioğlu, 1977; Selmi, 1979).

***Carulaspis juniperi* (Bouché, 1851):** Recorded on *Cedrus libani*, *Cupressus sempervirens*, *Juniperus* sp., *J. excelsa*, *J. sabina*, *Platyclusus orientalis*, *Thuja* sp. and *T. occidentalis* in Amasya, Ankara, Antalya and İzmir (Lindinger, 1912; Bodenheimer, 1949; Gül-Zümreoğlu, 1972; Yaşar, 1995; Ülgentürk and Toros, 1996).

***Carulaspis minima* (Targioni-Tozzetti, 1868):** Recorded on *Chamaecyparis lawsoniana*, *Cupressus* sp., *C. arizonica*, *C. goveniana*, *C. sempervirens*, *Juniperus communis*, *J. drupacea*, *J. foetidissima*, *J. oxycedrus*, *J. sabina*, *Platyclusus orientalis*, *Sequoia sempervirens*, *Thuja gigantea*, *T. occidentalis* and *T. plicata* in İstanbul, Edirne, Tekirdağ, Kocaeli, Bursa, Sakarya, Balıkesir, Çanakkale, İzmir, Yalova, Isparta, Antalya and İçel (Çanakçioğlu, 1972, 1977; Selmi, 1979; Çanakçioğlu *et al.*, 1982; Yaşar, 1995; Erler *et al.*, 1996; Uygun *et al.*, 1998; Japoshvili and Karaca, 2002).

***Chrysomphalus dictyospermi* (Morgan, 1889):** Recorded on *Taxus baccata* in İstanbul (Selmi, 1979).

***Dynaspidiotus abieticola* (Koroneos, 1934):** Recorded on *Abies concolor*, *A. nordmanniana* subsp.

*bornmuelleriana* and *Picea pungens* in Ankara (Çanakçıoğlu, 1977; Ülgentürk and Toros, 1996).

**Dynaspidiotus abietis (Schrank, 1776):** Recorded on *Abies* sp., *A. nordmanniana* subsp. *bornmuelleriana*, *A. nordmanniana* subsp. *equi-trojani*, *Cedrus libani*, *Picea* sp., *Pinus* sp., *P. brutia* and *P. nigra* in Bolu, Çanakkale, Isparta, Çankırı and Bursa (Bodenheimer, 1949, 1952; Defne, 1954; Selmi, 1979; Ülgentürk and Toros, 1996; Japoshvili and Karaca, 2002).

**Lepidosaphes juniperi (Lindinger, 1912):** Recorded on *Cedrus libani*, *Juniperus* sp., *J. excelsa*, *Pinus brutia*, *P. nigra*, *Platyclusus orientalis* and *Thuja occidentalis* in İzmir, Balıkesir, Eskişehir, Konya and Amasya (Lindinger, 1912; Bodenheimer, 1949, 1953; Aysu, 1950; Selmi, 1979).

**Lepidosaphes newsteadi (Sulc, 1895):** Recorded on *Abies nordmanniana* subsp. *bornmuelleriana*, *A. pinsapo*, *Picea pungens*, *Pinus* sp. and *P. nigra* in İstanbul, Konya, Çankırı and Isparta (Bodenheimer, 1949, 1953; Selmi, 1979).

**Lepidosaphes ulmi Linnaeus, 1758:** Recorded on *Cupressus* sp. (Bodenheimer, 1953).

**Leucaspis knemion Hoke, 1925:** Recorded on *Pinus* sp. in Gaziantep (Uygun *et al.*, 1998).

**Leucaspis lowi Colvee, 1882:** Recorded on *Pinus* sp., *P. brutia*, *P. halepensis*, *P. nigra*, *P. pinea* and *P. sylvestris* in İstanbul, Bursa, İzmir, Manisa, Antalya, Eskişehir, Bolu, Kastamonu, Çankırı, Niğde, Trabzon, Ankara, Burdur, Isparta and Samsun (Lindinger, 1912; Özek and Hovasse, 1931; Acatay, 1943; Schimitschek, 1944; Bodenheimer, 1949, 1953; Tuatay *et al.*, 1972; Yaşar, 1995).

**Leucaspis pini (Hartig, 1839):** Recorded on *Pinus* sp., *P. brutia*, *P. halepensis*, *P. nigra* and *P. pinea* in İzmir, Aydın, İstanbul, Antalya, Adana and Hatay (Lindinger, 1906, 1912; Fahringer, 1922; Bodenheimer, 1949, 1953; Aysu, 1950; Nizamlıoğlu and Gökmen, 1964; Gül-Zümreoğlu, 1972; Tosun, 1975; Yaşar, 1995; Uygun *et al.*, 1998; Karsavuran *et al.*, 2001).

**Leucaspis pusilla Loew, 1883:** Recorded on *Pinus* sp., *P. brutia*, *P. elderica*, *P. halepensis*, *P. nigra*, *P. pinaster*, *P. pinea*, *P. ponderosa*, *P. radiata*, *P. roxburghii*, *P. strobus* and *P. sylvestris* in İstanbul, Edirne, Kocaeli,

Sakarya, Bursa, Balıkesir, Çanakkale, Manisa, İzmir, Isparta, Antalya, Adana, Aydın, Ankara, Zonguldak, Karabük, Kahramanmaraş, Konya and Samsun (Lindinger, 1906, 1909; Bodenheimer, 1949, 1953; Aysu, 1950; Gül-Zümreoğlu, 1972; Tuatay *et al.*, 1972; Çanakçıoğlu, 1977; Selmi, 1979; Çanakçıoğlu *et al.*, 1982; Yaşar, 1995; Şengonca *et al.*, 1998; Uygun *et al.*, 1998).

**Lineaspis striata (Newstead, 1897):** Recorded on *Arceuthobium* sp., *Cupressus* sp., *C. sempervirens*, *Thuja* sp. and *T. occidentalis* in Antalya, Adana, İçel, Hatay and Gaziantep (Lindinger, 1912; Bodenheimer, 1949, 1953; Balachovsky, 1954; Çanakçıoğlu, 1977; Yaşar, 1995; Erler *et al.*, 1996; Şengonca *et al.*, 1998; Uygun *et al.*, 1998; Erler and Tunç, 2001).

**Parlatoria oleae (Colvee, 1880):** Recorded on *Juniperus* sp. and *Pinus* sp. in İzmir and Aydın (Gül-Zümreoğlu, 1972; Karsavuran *et al.*, 2001).

**Parlatoria parlatoriae (Sulc, 1895):** Recorded on *Abies nordmanniana* subsp. *bornmuelleriana* in Bursa, Bolu and Çankırı (Bodenheimer, 1941, 1949, 1953).

## DISCUSSION

Ülgentürk *et al.* (2004) reported that 25 coccid species have been recorded on coniferous species in Turkey. The number of scale insect species recorded has reached 31 on coniferous trees in Turkey, recently.

*Acanthomytilus cedricola* Balach. and Al., *Aspidiotus nerii* Bch., *Carulaspis minima* (Targ.), *Coccus hesperidum* L., *Eriococcus araucariae* Mask., *Lepidosaphes newsteadi* (Sulc), *Leucaspis lowi* Colv., *Leucaspis pusilla* Lw., *Marchalina hellenica* (Genn.), *Parthenolecanium pomericum* (Kaw.), *Physokermes piceae* (Schr.), *Pseudococcus viburni* (Sign.) and *Pulvinaria floccifera* (Westw.) were recorded in the European part of Turkey. The other scale insect species were only recorded in the Asian part of Turkey.

*Pseudococcus viburni* (Sign.) (Selmi, 1979), *Coccus hesperidum* L. (Çanakçıoğlu, 1977; Çanakçıoğlu *et al.*, 1982; Selmi, 1979), *C. pseudomagnoliarum* (Kuw.) (Çanakçıoğlu, 1977), *Pulvinaria floccifera* (Westw.) (Selmi, 1979), *Eriococcus araucariae* Mask. (Gül-Zümreoğlu, 1972), *Aonidia mediterranea* (Lind.) (Erler *et al.*, 1996), *Aspidiotus nerii* Bch. (Çanakçıoğlu, 1977; Selmi, 1979; Tuatay *et al.*, 1972), *Chrysomphalus dictyospermi* (Morg.) (Selmi, 1979), *Lepidosaphes ulmi* (L.) (Bodenheimer, 1953) and *Parlatoria oleae* (Colv.) (Gül-Zümreoğlu, 1972; Karsavuran *et al.*, 2001) cause damage on deciduous trees besides conifers.

From the zoogeographical standpoint, native species are *Acanthomytilus cedricola* Balach. and Al., *Nemolecanium aptii* (Bod.), *Pseudococcus caricus* (Genn.), cosmopolitan species are *Aspidiotus nerii* Bch., *Carulaspis juniperi* (Bch.), *Carulaspis minima* (Targ.), *Chrysomphalus dictyospermi* (Morg.), *Coccus hesperidum* L., *Coccus pseudomagnoliarum* (Kuw.), *Eriococcus araucariae* Mask., *Lepidosaphes ulmi* (L.), *Parlatoria oleae* (Colv.), *Pseudococcus viburni* (Sign.), *Pulvinaria floccifera* (Westw.) and the rest are palaeartic species.

### REFERENCES

- Acatay, A., 1943. Insect species harmful to forest trees in İstanbul and especially in Belgrad Forest: their control methods and effects on the forest enterprise. Turkish Ministry of Agriculture, High Institute of Agriculture, No. 142, Ankara, Turkey (In Turkish).
- Aysu, R., 1950. The Coccoidea of Turkey. J. Plant Dis., (Crop Doctor), 3: 87-91; 3: 112-115 (in Turkish).
- Balachovsky, A.S., 1954. Palaeartic scale insect species belonging to the tribe Diaspidini. Mem. Sci. Institut. Pasteur, Paris, France, (In French).
- Balachowsky, A.S. and B. Alkan, 1956. *Acanthomytilus Borkhn.* (Coccoidea-Diaspidini): A new species living on cedar trees in Turkish mountains. Bull. Ann. Soc. R. Ent. Belg., 92: 11-12, 319-323 (In French).
- Besçeli, O. and M. Ekici, 1968. *Monophlebus hellenicus* Genn. and beekeeping. J. Forestry Res. Inst., 14: 73-78 (In Turkish).
- Bodenheimer, F.S., 1941. Seven new species of Coccidae from Anatolia. Istanbul Uni. Fac. Sci. Bull., 6: 65-84.
- Bodenheimer, F.S., 1949. The Coccoidea of Turkey. Vol I Diaspididae. (Translated by N. Kenter). Turkish Ministry of Agriculture, No. 670 (In Turkish).
- Bodenheimer, F.S., 1952. The Coccoidea of Turkey I. Istanbul Uni. Fac. Sci. Bull., 17: 315-351.
- Bodenheimer, F.S., 1953. The Coccoidea of Turkey II-III. Istanbul Uni. Fac. Sci. Bull., 18: 1-61: 91-164.
- Borror, D.J., C.A. Triplehorn and N.F. Johnson, 1992. An introduction to the study of insects, Saunders Collage Publishing, USA.
- Çanakçıoğlu, H., 1972. Some coccid species new in Turkey (Coccoidea: Homoptera). Istanbul Uni. Rev. Fac. Forestry, Series A, 22: 80-94 (In Turkish).
- Çanakçıoğlu, H., 1977. A study of the forest Coccoidea (Homoptera) of Turkey. Publication of Forestry Fac. Istanbul Uni. No: 227, Istanbul, Turkey (in Turkish).
- Çanakçıoğlu, H., 1993. Collecting, Mounting, Preserving and Identifying Insects. Publication of Forestry Fac. Istanbul Univ. No: 3768/422, Istanbul, Turkey, (In Turkish).
- Çanakçıoğlu, H., E. Selmi and A. Küçükosmanoğlu, 1982. Entomological records in İstanbul-Princes Islands. Istanbul Univ. Rev. Fac. Forestry, Series A, 32: 44-55 (In Turkish).
- Cox, J.M. and Y. Ben-Dov, 1986. Planococcine mealybugs of economic importance from the Mediterranean Basin and their distinction from a new African genus (Hemiptera: Pseudococcidae). Bull. Entomol. Res., 76: 481-489.
- Defne, M.O., 1954. Damaging insects of Uludağ fir (*Abies bornmülleriana*) in the Western Blacksea region and their control. Ministry of Forestry, General Directorate of Forests in Turkey, Series No. 12, No. 105, Ankara, Turkey (In Turkish).
- Düzgüneş, Z., 1982. Studies on Turkish Pseudococcidae (Homoptera: Coccoidea) species. Faculty of Agric. Ankara Univ. No. 836, Ankara, Turkey (In Turkish).
- Erler, F. and I. Tunç, 2001. A survey (1992-1996) of natural enemies of Diaspididae species in Antalya, Turkey. Phytoparasitica, 29: 299-305.
- Erler, F., F. Kozar and I. Tunç, 1996. A preliminary study on the armoured scale insect (Homoptera: Coccoidea: Diaspididae) fauna of Antalya. Acta Phytopathol. Entomol. Hung., 31: 53-59.
- Ermin, R., 1950. Investigations on honey-type exudates of Turkish firs. Istanbul Univ. Fac. Sci. Bull. 15: 185-224. (in German).
- Fahringer, J., 1922. A new Rhynchototen species from Turkey, Minor Asia and the neighboring area. Konowia, 1: 305-307 (In German).
- Gennadius, P., 1883. Descriptions de trois nouvelles espèces de cochenilles. Annales de la Société Entomologique de France, 3: 31-32.
- Giray, E., 1970. Harmful and useful species of Coccinellidae (Coleoptera) from Aegean region with notes on their localities, collecting dates and hosts. Yearbook of the Fac. Agric., 1: 35-52.
- Gül-Zümreoğlu, S., 1972. A Catalogue of the Insects and general pests of Izmir Plant Protection Res. Institute, Part I (1928-1969) (In Turkish).
- Hovasse, R., 1930a. An investigation on monography of *Marchalina hellenica* (Gennadius). Bull. Biol. de la France et de la Belgique, LXIV(4), 389-449.
- Hovasse, R., 1930b. Some new findings on *Marchalina hellenica* (Genn.). C. R. Acad. Des Sci., 190: 1025.
- Japoshvili, G. and I. Karaca, 2002. Coccid (Homoptera: Coccoidea) Species of Isparta province and their parasitoids from Turkey and Georgia. Turk. J. Zool., 26: 371-376.
- Karsavuran, Y., T. Akşit and E.L. Bakırçioğlu, 2001. Coccoidea species on fruit trees and ornamentals from Aydın and İzmir provinces of Turkey. Boll. Zool. Agric. Bachic. Ser., 33: 219-225.

- Kaydan, M.B., S. Ülgentürk, C. Zeki, S. Toros and M.O. Gürkan, 2004. Studies on Pseudococcidae (Homoptera: Coccoidea) Fauna of Afyon, Ankara, Burdur and Isparta Provinces, Turkey. Turk. J. Zool., 28: 219-224.
- Kozarzhevskaya, E., 1995. Scale insects (Homoptera: Coccoidea) of coniferous plants in the parks of Russia. Israel J. Entomol., 29: 157.
- Lindinger, L., 1906. Leucaspis: the genus of scale insects. Jahrb. Hamburg Wiss. Antst. 23(1905) Beiheft 3 (In German).
- Lindinger, L., 1909. Contributions to the knowledge of scale insects and their distributions. Insektenbiol., 5: 105-110, 147-152, 220-226 (In German).
- Lindinger, L., 1912. The scale insects (Coccidae) of Europe, North Africa and Front-Asia including the Azoren, the Kanaren and Madeiras. Ulmer, Stuttgart. (In German).
- Mendel, Z., 1992. Occurrence of *Matsucoccus josephi* in Cyprus and Turkey and its relation to decline of Aleppo pine (Homoptera: Matsucoccidae). Entomologia Generalis, 17: 299-306.
- Nizamlioğlu, K. and N. Gökmen, 1964. Pests of Olive in Turkey. Yenilik Press, İstanbul, Turkey (In Turkish).
- Özek, S. and R. Hovasse, 1931. Natural Enemies of Pine Trees in İstanbul Islands. Şirketi Mürettibiye Press, İstanbul, Turkey.
- Özkazanç, O. and M. Yücel, 1985. Researches on the harmful insects of semi-arid region plantations. Technical Bull. Forestry Res. Institute, No. 153, Turkey.
- Schauff, M.E., 1986. Collecting and preserving insects and mites. Systematic entomology laboratory, USDA National Museum of Natural History, NHB-168, Washington DC. 20560, USA.
- Schimitschek, E., 1944. Forest insects of Turkey and their habitats. Prag.
- Schmutterer, H., 1972. Coccoidea, Scale Insects. In: Schwenke, W. (Ed.): European Forest Pests, Verlag Paul Parey, Hamburg und Berlin, (In German). 1: 387-391. .
- Selmi, E., 1979. Studies on the Coccoidea (Homoptera) species harmful to conifers in Marmara Region. İstanbul Univ. Rev. Fac. Forestry, Series A, 29: 92-127 (In Turkish).
- Selmi, E., 1983. The biology of *Marchalina hellenica* (Gennadius) (Homoptera, Margarodidae) in Marmara Region. İstanbul Uni. Rev. Fac. Forestry, Series A, 33: 93-103 (In Turkish).
- Şengonca, C., N. Uygun, I. Karaca and M. Schade, 1998. Primary studies on the parasitoid fauna of Coccoidea in cultivated and non-cultivated areas in the east Mediterranean region of Turkey. Anz. Schadlingsk., 71: 128-131.
- Tosun, I., 1975. Investigations on harmful insects, parasites and major predators of coniferous trees in the Mediterranean region of Turkey. Ministry of Forestry, General Directorate of Forests in Turkey, No. 62, Series No: 24, Ankara, Turkey (In Turkish).
- Tuatay, N., A. Kalkandelen and N. Aysev, 1972. An Insect Catalogue of Plant Protection Museum (961-1971). Yenigün Press, Ankara, Turkey (In Turkish).
- Uygun, N., C. Şengonca, L. Erkıılıç and M. Schade, 1998. The Coccoidea fauna and their host plants in cultivated and non-cultivated areas in the east Mediterranean region of Turkey. Acta Phytopathol. Entomol. Hung., 33: 183-191.
- Ülgentürk, S., H. Çanakçıoğlu and A. Toper Kaygın, 2004. Scale insects of the conifer trees in Turkey and their zoogeographical distribution. J. Pest Sci., 77: 99-104.
- Ülgentürk, S. and S. Toros, 1996. Diaspididae (Homoptera: Coccoidea) species from ornamental trees in Ankara province. In: Proceedings of the 3rd Turkish Entomology Congress, 24-28 September 1996, Ankara, Turkey (In Turkish).
- Ülgentürk, S. and S. Toros, 1999. Faunistic studies on the Coccidae on ornamental plants in Ankara. Turkey. Entomologica, 33: 213-217.
- Williams, D.J. and M. Moghaddam, 1999. Mealybug species of the genus *Planococcus* Ferris in Iran (Homoptera: Coccoidea: Pseudococcidae) with a discussion of *Planococcus vovae* (Nasonov). J. Entomol. Soc. Iran, 18: 32-43.
- Yaşar, B., 1995. A taxonomic study on the Turkish Diaspididae species (Homoptera: Coccoidea). Yüzüncü Yıl Univ. Van, Turkey (In Turkish).