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NATURAL ENEMIES OF THE OAK SCALE INSECT, *EULECANIUM CILIATUM* (DOUGLAS) (HEMIPTERA: COCCIDAE) IN TURKEY.

ABSTRACT

NATURAL ENEMIES OF THE OAK SCALE INSECT, *EULECANIUM CILIATUM* (DOUGLAS) (HEMIPTERA: COCCIDAE) IN TURKEY.

Eulecanium ciliatum Douglas is an important pest of ornamental plants in the Palaearctic region and has a wide range of natural enemies. In Ankara, Turkey, eight hymenopterous parasitoids and one hyperparasitoid species have been bred from this scale, and nine predators were collected in association with it, seven Coleoptera and two Hemiptera.

Key words: urban, ornamental plantings, parasitoid hosts, predator hosts, Aphelinidae, Encyrtidae, Eulophidae, Pteromalidae, Anthribidae, Coccinellidae, Cybocephalidae, Miridae.

INTRODUCTION

Eulecanium ciliatum (Douglas) is a harmful soft scale, common on ornamental and forest plants in the Palaearctic Region. It has one generation a year and overwinters as 2nd-instar nymphs (Kosztarab & Kozár, 1988). Previous records of parasitoids in this species are the encyrtids *Blastothrix britannica* Girault, *B. sericea* (Dalman), *Cheiloneurus formosus* (Boheman) and *Microterys tricolocornis* (De Stefani), while the beetle *Anthribus nebulosus* Förster has been recorded as a predator (Schmutterer, 1952; Sugonyaev, 1976; Trjapitzin, 1973; Kosztarab & Kozár, 1988).

This paper discusses the natural enemies of *E. ciliatum* in the parks of Ankara, Turkey, where it is a common pest of amenity trees.

MATERIALS AND METHODS

This survey was carried out on park and ornamental trees in Ankara between 1994 and 1996. Ten centimetre lengths of 1-2 year old branches of each infested host-plant of *E. ciliatum* were collected once a week between 1st April and 15th June and twice a month between 15th June and 30th November from four sides of each plant; the parasitoids were then bred out in the laboratory. The predators were collected by shaking the infested branches over a muslin tray.

RESULTS AND DISCUSSION

The results of this survey are given in Table 1. Eight parasitoid and 1 hyperparasitoid species were collected from *E. ciliatum*, belonging to 4 families of Hymenoptera. The most common parasitoid in Ankara was *Encyrtus infidus* (Rossi), which made up 66% of all parasitoids collected. The remaining species were as follows: *Pachyneuron muscarum* (L.) (9%); *Metaphycus dispar* Mercet (5%); *M. bellae* Triapitzin (4%); *Aprostocetus trjapitzini* (Kostjukov); *Coccophagus aterrimus* Vikberg, *Encyrtus* sp. nr. *albitarsus* (Zetterstedt), *Microterys hortulans* Erdös and *Psyllaephagus procerus* (Mercet) with 3%, and *Eunotus areolatus* (Tatzeburg) with 1%.

The predators (Table 2) belonged to three families of Coleoptera and one hemipteran. The anthribid *Anthribus fasciatus* (Förster) was by far the most common coleopteran, comprising 73% of all predators. In addition, there were *Exochomus quadripustulatus* L. (17%); *Atractotomus mali* (Meyer-Dür) (3%); *Deraeocoris ruber* (L.) and *Adalia fasciatopunctata revelieri* (Mulsant) (2%), and *Synharmonia conglabata* (L.), *Chilocorus bipustulatus* (L.) and *Adalia bipunctata* (L.) (1%). *C. bipustulatus* has also been commonly observed in Izmir, Turkey (Öncüer, 1977).

Anthribus fasciatus is reported to have one generation a year in Turkey (Öncüer, 1991), overwintering as an adult. It is an effective predator of *E. tiliae* (Ülgentürk & Toros, 1996).

In addition to the above parasitoids, the encyrtid *Homalotylus flaminius* Dalman was collected from samples of *E. ciliatum* on *Acer campestre* in June, 1996, on the campus of the University of Ankara. This is a known parasite of predators, such as *C. bipustulatus,* in Turkey (Öncüer, 1977) and it has been suggested (Nikolskaya, 1952) that it is also an important parasitoid of *Exochomus quadripustulatus* and *Hyperaspis guttalata* Fairm.

This study has shown that there are a number of common and effective parasitoids of *E. ciliatum* which might be used in the control of this coccid. However, more detailed studies on the rearing and release of these beneficial insects are required.

Table 1. Hymenopterous parasitoids and host plants of *Eulecanium ciliatum* (Douglas) in Turkey.

Family/Species	Host plants of *E. ciliatum* plus parasitoid (Dates collected)	Other hosts of parasitoids: References
Aphelinidae *Coccophagus aterrimus*	*Crataegus monogyna* (June 1995 & 1996)	*Eulecanium caraganae* Borchsenius, *E. douglasi* (Šulc): Kosztarab & Kozár, 1988.
Encyrtidae *Encyrtus infidus*	*Acer campestre, A. pseudoplatanus, A. pseudoplatanus* var. *atropurpurea, A. platanoides, Crataegus* sp., *C. monogyna, C. oxyacantha, Prunus domestica, Ribes aureum* (June 1994 & 1996; May 1995)	*Eulecanium caraganae, E. douglasi, E. franconicum* (Lindinger), *E. kunoensis* Kuwana, *E. tiliae* (L.), *Kermes* sp., *Parthenolecanium corni* (Bouché): Vu Quang Kon & Sugonyaev, 1974; Kosztarab & Kozár, 1988; Öncüer, 1991.
Encyrtus sp. nr. *albitarsus*	*Acer campestre* (8.v.1996)	*Pulvinaria vitis* (L.): Kosztarab & Kozár, 1988.
Metaphycus bellae	*Acer campestre, A. pseudoplatanus, Crataegus monogyna, C. oxyacantha* (June 1995 & 1996)	
Metaphycus dispar	*Acer campestre, A. pseudoplatanus* (June 1996)	*Ceroplastes rusci* (L.), *Eulecanium tiliae* (L.), *Parthenolecanium persicae, Sphaerolecanium prunastri* (Fonscolombe): Öncüer, 1977; Kosztarab & Kozár, 1988.
Microterys hortulans	*Acer campestre, A. pseudoplatanus, Crataegus oxyacantha* (June 1994, 1995, 1996)	*Didesmococcus unifasciatus* (Archangelskaya), *Sphaerolecanium prunastri*: Sugonyaev, 1976; Moglan, 1995.
Psyllaephagus procerus	*Acer campestre, A. pseudoplatanus, Prunus* sp., *Ribes* sp. (July 1995)	
Eulophidae *Aprostocetus trjapitzin*	*Acer campestre, A. pseudoplatanus* (June 1994 & 1996)	*Eulecanium secretum* (Borchsenius), *E. rugulosum* (Archangelskaya), *E. tiliae, Parthenolecanium corni, Physokermes piceae* (Schrank), *P. sugonyaevi* Danzig: Kustyukov, 1976; Graham, 1987.
Pteromalidae *Eunotus areolatus*	*Acer pseudoplatanus, Crataegus oxyacantha* (June 1996)	*Coccus* sp., *Rhodococcus spiraeae* (Borchsenius): Bouçek, 1972.

Table 2. Predators and plants of *Eulecanium ciliatum* (Douglas) in Turkey.

Order/Family/Species	Host plant of *E. ciliatum* plus predator (dates collected)	Other hosts of predators: references
COLEOPTERA **Anthribidae** *Anthribus fasciatus*	*Acer campestre*, *A. pseudoplatanus*, *A. pseudoplatanus* var. *purpurea*, *Crataegus* sp., *C. monogyna*, *C. oxyacantha*, *Prunus amygdalis*, *P. domestica*, *P. persicae* var. *rosa plena*, *P. spinosa*, *Ribes aureum* (May 1994 & 1995; June 1994, 1995 & 1996)	*Eulecanium tiliae* (L.), *Parthenolecanium corni* (Bouché), *Pulvinaria vitis* (L.), *Rhodococcus perornatus* (Cockerell & Parrott): Canard, 1980; Kosztarab & Kozár, 1988; Öncüer, 1991; Ülgentürk & Toros, 1996)
Coccinellidae *Adalia bipunctata*	*A. pseudoplatanus* (May 1995)	*Parthenolecanium corni*, *Saissetia oleae* (Olivier), *Sphaerolecanium prunastri* (Fonscolombe): Gürkan, 1974; Soydanbay, 1976; Kosztarab & Kozár, 1988.
Adalia fasciopunctata revelierei	*Crataegus oxyacantha* (June 1995; July 1996)	*Lepidosaphes ulmi* (L.), *Palaeolecanium bituberculatum* (Signoret): Erol & Yaşer, 1996.
Chilocorus bipustulatus	*A. pseudoplatanus* (June 1996)	*Ceroplastes rusci* (L.); *Coccus hesperidum* (L.), *C. pseudomagnoliarum* (Kuwana), *Filippia follicularis* (Targioni Tozzetti), *Saissetia oleae*: Öncüer, 1977.
Exochomus quadripustulatus	*Acer pseudoplatanus*, *Crataegus monogyna*, *C. oxyacantha*, *Prunus domestica* (April 1995; June 1995 & 1996; July 1996)	*Chloropulvinaria floccifera* (Westwood), *Coccus hesperidum*, *C. pseudomagnoliarum*, *Palaeolecanium bituberculatum*, *Physokermes piceae* (Schrank), *Saissetia oleae*, *Sphaerolecanium prunastri*: Öncüer, 1977; Selmi, 1978; Erol & Yaşer, 1996.
Synharmonia conglabata	*Acer pseudoplatanus* (June 95)	*Coccus pseudomagnoliarum*, *Ceroplastes rusci*, *Filippia follicularis*, *Palaeolecanium bituberculatum*, *Saissetia oleae*, *Sphaerolecanium prunastri*: Soydanbay, 1976; Öncüer, 1977; Erol & Yaşer, 1996.
Cybocephalidae *Cybocephalus fodori minor*	*Crataegus oxyacantha* (June 1996)	*Planococcus citri* (Risso), *Sphaerolecanium prunastri*: Kansu & Uygun, 1980.
HETEROPTERA **Miridae** *Atractotomus mali*	*Crataegus monogyna*, *C. oxyacantha* (May 1995 & 1996)	*Hyalopterus pruni* (Geoffroy): Remaudiére & Leclant, 1971.
Deraeocoris ruber	*Crataegus monogyna*, *C. oxyacantha* (May 1995 & 1996)	*Aphis* sp., *Pulvinaria vitis*: Düzgünes *et al.*, 1982; Malumphy, 1991.

Pachyneuron muscarum (hyperparasitoid)	*Acer campestre*, *A. pseudoplatanus*, *Crataegus monogyna*, *C. oxyacantha* (April 1992; June 1994 & 1996; May 1996)	*Acanthococcus aceris* Signoret, *Aphis fabae* Scop., *Ceroplastes floridensis* Comstock, *C. rusci*, *Coccus hesperidum* L., *C. pseudomagnoliarum* (Kuwana), *Didesmococcus* sp., *Eriopeltis festucae* (Fonscolombe), *Filippia follicularis* (Targioni Tozzetti), *Parthenolecanium corni*, *Planococcus citri* (Risso), *Pulvinaria vitis*, *Saissetia oleae* (Olivier), *Sphaerolecanium prunastri*: Nikolskaya, 1952; Peck *et al.*, 1964; Rosen, 1967; Gürkan, 1974; Öncüer, 1977; Moglan, 1995

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