

FIRST RECORDS OF NATURAL ENEMIES OF KERMES HERMONENSIS SPODEK & BEN-DOV (*Hemiptera: Sternorrhyncha: Kermesidae*) IN TURKEY

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Abstract

This study was carried out on *Quercus infectoria* Oliv. (*Fagaceae*) trees infested with the coccid *Kermes hermonensis* Spodek & Ben-Dov (*Hemiptera: Sternorrhyncha: Kermesidae*) between 2013 and 2014, in Diyarbakır. As a result of the study, two parasitoids and two predators were obtained. These are: *Cheiloneurus claviger* Thomson, 1876; *Metaphycus* sp. (*Hymenoptera: Encyrtidae: Encyrtinae*) and *Brumus* (*Exochomus*) *quadripustulatus* (Linnaeus, 1758), *Chilocorus bipustulatus* (L.) (*Coleoptera: Coccinellidae*). *B. (Exochomus) quadripustulatus* and *C. bipustulatus* are the first records on *K. hermonensis* as predators in Turkey. *K. hermonensis: Cheiloneurus claviger* and *Metaphycus* sp. are the first records on *K. hermonensis* as parasitoids in Turkey.

Key words: *Kermes hermonensis*, *Cheiloneurus claviger*, *Metaphycus* sp., *Brumus (Exochomus) quadripustulatus*, *Chilocorus bipustulatus*, Turkey.

INTRODUCTION

Kermesidae family (*Kermesidae: Hemiptera*) with 91 species in 9 genera (1 fossil species in 1 fossil genus) generally specialized on the plants belonging to *Fagaceae*. Family of *Kermes* Boitard genus is the richest species in the world as well as in Palaearctic region with 33 species (Ben-Dov et al., 2013; Spodek, Ben-Dov, 2014). All species were recorded on *Quercus* spp. Although in general for all scale insect, almost all of the description of *Kermes* species based on adult female stages, first instar stages were used for the systematic studies as well (Bodenheimer, 1953; Balachowsky, 1950, 1953; Borchsenius, 1960; Pellizzari et al., 2012; Spodek, Ben-Dov, 2014).

Ten species have been recorded up to now belonging to genus *Kermes* and *Nidularia* Targioni-Tozzetti in Turkey (Ülgentürk et al. 2013). Bodenheimer himself described three *Kermes* species in Turkey between 1951 and 1953, but unfortunately either the type material and dry materials are not in good conditions and they need more attention indeed. Although *K. bekirii* Bodenheimer, *K. muhlisi* Bodenheimer, *K. sadrii* Bodenheimer and *K. safinazae* Özkök were described from Turkey, there are not complementary studies on the

Kermesidae species in Turkey. The other members of the family *Nidularia balackhowskii* were found recently on *Quercus* spp. in many places. (Ülgentürk et al., 2013). *Kermes hermonensis* Spodek & Ben-Dov was described as a new species in Turkey by Kaydan et al. (2014).

Scale insect family species *Kermesidae (Hemiptera: Coccoidea)* are restricted to the northern hemisphere and they are distributed throughout the Nearctic, Oriental and Palaearctic regions (Ben-Dov et al., 2015). The family contains about one hundred valid species in ten genera and the majority of species of the family are known to develop exclusively on *Quercus* species (*Fagaceae*) (Ben-Dov et al., 2015). Females and males develop mainly on twigs, branches and in bark crevices, while some species develop on leaves (Sternlicht, 1969; Bullington, Kosztarab, 1985; Hu, 1986; Podsiadlo, 2005).

Most *Kermesidae* species are not known that they cause any visible damage to their host trees. However there are reports of infestations of some species that have led to branch dieback, flagging, reduced growth rates and occasionally tree death. These occurrences are mainly in urban areas (Kozár, 1974; Hamon, 1977; Solomon et al., 1980; Viggiani, 1991;

Pellizzari et al., 2012; Podsiadlo, 2012). *Kermesidae* species belong to two genera named *Nidularia* Targioni-Tozzetti and *Kermes* Boitard in the Mediterranean and European regions. Species of *Kermes* (*Hemiptera: Kermesidae*) are specialist sap-feeders on species of *Quercus* and they can be economically important at high population densities.

On the other hand, these insects can be important for honey bees in honey production. Among the most important natural enemies of *Kermes* species are encyrtids within the genus *Psilophrys* (Japoshvili, 2005; Japoshvili, Noyes, 2006a). However, there are some *Blastothrix* species that also parasitize *Kermes* spp. (Trjapitzin, 1989; Japoshvili, Karaca, 2003). Undoubtedly, these parasitoids have an important effect on scale about the population of the species.

The *Encyrtidae* constitute the majority of parasitoids attacking to the psyllid insects. Members of the family are important in biological control. More than 400 encyrtid species have been used or are used today for suppression of various crop pests (Japoshvili, Noyes, 2006b). There are more than 1270 described species of encyrtids in the Palaearctic Region (Yasnosh, Japoshvili, 1999; Japoshvili, 2005-2007a, b; Japoshvili, Karaca, 2003; Japoshvili, Noyes 2005-2006b).

The *Coccinellidae* are generally considered as an useful insects, because many species of it feed on aphids which are pests in gardens, agricultural fields, orchards, and similar places. Colonies of such plant-eating pests lay hundreds of eggs and then the larvae commences feeding immediately. However, some species do have unwelcome effects; among these, the most prominent are the subfamily *Epilachninae*, which are plant eaters. Thirteen genera contain 66 species that are placed here into this large trophic group that has scale insects as its prey. Members of the superfamily *Coccoidea* (the scale insects); this superfamily includes various related families, notably *Coccidae* (soft scales), *Diaspididae* (armored scales), *Pseudococcidae* (mealybugs), *Dactylopiidae* (cochineal scales), *Kermesidae* (gall-like scales), *Eriococcidae* (felt scales), *Cerococcidae* (ornate pit scales), and

Asterolecaniidae (pit scales) (Anonymous 2016a).

The aim of this study was to determine the natural enemies of the harmful *Kermes hermonensis* on *Quercus infectoria* trees in Diyarbakır.

MATERIALS AND METHODS

Soft scale insect samples were collected from the province of Diyarbakır in the Southeastern Part of Turkey in 2013. Specimens were taken from both wild and cultivated plants during irregular surveys carried out in the spring and summer seasons of the one-year study. Each sample was put into a plastic bag and taken to the laboratory for examination.

Representative specimens were sent to various taxonomic specialists for confirmation of identification. Host identification (*Kermes hermonensis*) was made by Dr. Malkie Spodek (Department of Entomology, Agricultural Research Organization The Volcani Center, P.O. Box 6, Bet Dagan, 50250 ISRAEL), the coccinellids identification was made by Prof. Dr. Nedim Uygun (Çukurova University, Faculty of Agriculture, Department of Plant Protection, 01330 Adana, Turkey) and the parasitoids identification was made by Prof. Dr. George Japoshvili (Institute of Entomology agricultural University of Georgia-Georgia).

Samples were collected from ornamental plants from Diyarbakır in Turkey. Each sample was placed into a plastic bag and taken to the laboratory for examination.

RESULTS AND DISCUSSIONS

As a result of this study, two parasitoids species *Cheiloneurus claviger* Thomson, 1876, *Metaphycus* sp. (*Hymenoptera: Encyrtidae: Encyrtinae*) and two predators species *Brumus* (*Exochomus*) *quadripustulatus* (Linnaeus, 1758), *Chilocorus bipustulatus* (Linnaeus, 1758). (*Coleoptera: Coccinellidae*) were obtained.

Kermes hermonensis Spodek, Ben-Dov (*Hemiptera: Sternorrhyncha: Kermesidae*)

Distribution in World: Israel (Spodek, Ben-Dov, 2014),

Distribution in Turkey: Diyarbakır (Kaydan et al., 2014).

Host plant: *Quercus species* (Fagaceae) (Ben-Dov et al. 2015), *Quercus infectoria* Oliv. (Fagaceae) (Kaydan et al., 2014).

Material examined: Diyarbakır (38° 09' 41° 12' 54'E at altitude of about 663 m.).

Cheiloneurus claviger Thomson, 1876 (Hymenoptera: Encyrtidae: Encyrtinae)

Recorded hosts: *Acanthopulvinaria orientalis* (Nasonov) (Coccidae: *Acanthopulvinaria*) (Japoshvili, Çelik, 2010; Myartseva, 1984); *Ceroplastes ceriferus* (Fabricius) (Hemiptera, Coccidae) (Japoshvili, Çelik, 2010; Xu, Huang, 2004); *Ceroplastes japonicus* Green (Hemiptera: Coccoidea: Coccidae) (Japoshvili, Çelik, 2010; Japoshvili, Noyes, 2005; Japoshvili, 2000); *Chloropulvinaria aurantii* (Cockerell) (Hemiptera: Coccidae) (Xu, Huang, 2004); *Coccus hesperidum* L. (Hemiptera: Coccoidea: Coccidae) (Japoshvili, Çelik, 2010); *Kermes hermonensis* Spodek, Ben-Dov (Hemiptera: Sternorrhyncha: Kermesidae) (Japoshvili et al., 2015); *Kermes vermilio* Planchon (Hemiptera: Sternorrhyncha: Kermesidae) (Japoshvili, Çelik, 2010; Marotta et al., 1999)

New record host in Turkey: In the present study *Kermes hermonensis* was recorded as a new host of *Cheiloneurus claviger* in Turkey.

Distribution: Armenia, Austria, Azerbaijan, Bulgaria, Croatia, Czech Republic, Czechoslovakia, Egypt, Europe, France, Georgia, Germany, Greece, Hungary, Iran, Israel, Italy, Japan, Kazakhstan, Moldova, Montenegro, Netherlands, Palaearctic, Romania, Russia, Serbia, Slovakia, Spain, Sweden, Tadzhikistan, Transcaucasus, Turkey, Turkmenistan, Ukraine, United Kingdom, USSR, Uzbekistan, Yugoslavia (Federal Republic) (Anonymous, 2016b).

Material examined: 2♀♀ Locality: Diyarbakır (Diyarbakır 38° 09' 41° 12' 54'E at altitude of about 663 m.).

Metaphycus sp. (Hymenoptera: Encyrtidae: Encyrtinae)

Target Pests: Soft brown scale, black scale and citricola scale.

Crops suitable: Citrus, olives, passion fruit, figs, custard apples and a wide range of ornamentals including gardenia, oleander, ferns and palms.

New record host in Turkey. In the present study *Kermes hermonensis* was recorded as a new host of *Metaphycus* sp. for Turkey.

Material examined: 2♀♀ Locality: Diyarbakır (Diyarbakır 38° 09' 41° 12' 54'E at altitude of about 663 m.).

Brumus (Exochomus) quadripustulatus (Linnaeus, 1758) (Coleoptera: Coccinellidae)

Recorded hosts. The pine ladybird a polyphagous predatory in both adult and larval stages preys aphids and scale insects (Uygun, 1981; Çelik, 1983; Bolu, 2002; Bolu, 2004; Bolu et al., 2007).

New record host in World. In the present study *Kermes hermonensis* was recorded as a new host of *Brumus (Exochomus) quadripustulatus* from Turkey for world.

Distribution in World: Albania, Austria, Balearic Is., Belarus, Belgium, Bosnia and Herzegovina, Britain I., Bulgaria, Corsica, Crete, Croatia, Cyprus, Czech Republic, Danish mainland, Estonia, European Turkey, Finland, French mainland, Germany, Greek mainland, Hungary, Italian mainland, Latvia, Lithuania, Luxembourg, Macedonia, Moldova, Norwegian mainland, Poland, Portuguese mainland, Romania, Russia Central, Russia North, Russia South, San Marino, Sardinia, Sicily, Slovakia, Slovenia, Spanish mainland, Sweden, Switzerland, Netherlands, Ukraine, Yugoslavia (Anonymous, 2016b).

Distribution in Turkey: Balıkesir, Denizli, İzmir (Giray, 1970); Aegean Region (Soydanbay-Tunçyürek, 1976); Artvin, Rize (Bozan, Aslıtürk, 1975); İzmir (Öncüler, 1977); Eastern Mediterranean Region (Uygun, 1981); Ankara (Düzgüneş et al., 1982); Gaziantep (Çelik, 1983); Erzurum (Özbek, Çetin, 1991); Southeastern Anatolia Region (Bolu, Uygun, 2003; Bolu, 2002-2004; Bolu et al., 2007); Adana, Niğde (Ulusoy et al., 1999); Diyarbakır, Elazığ, Mardin (Bolu, 2005).

Material examined: 10 adult ladybirds was obtained in total.

Locality: Diyarbakır (Diyarbakır 38° 09' 41° 12' 54' E at altitude of about 663 m.).

Chilocorus bipustulatus (L.) (Coleoptera: Coccinellidae)

Recorded hosts: Heather ladybirds feed on aphids and scale insects, small insects mainly belonging to the family of Coccidae and

Diaspididae (Uygun, 1981; Bolu, 2005; Bolu et al., 2007).

New record host in world. In the present study *Kermes hermonensis* was recorded as a new host of *Chilocorus bipustulatus* (L.) from Turkey for world.

Distribution in World: Albania, Austria, Azores, Balearic Is., Belarus, Belgium, Bosnia and Herzegovina, Britain, Bulgaria, Corsica, Crete, Croatia, Cyprus, Czech Republic, Danish mainland, Estonia, European Turkey, Finland, French mainland, Germany, Greek mainland, Hungary, Ireland, Italian mainland, Latvia, Lithuania, Luxembourg, Macedonia, Madeira, Malta, Norwegian mainland, Poland, Portuguese mainland, Romania, Russia Central, Russia North, Sardinia, Sicily, Slovakia, Slovenia, Spanish mainland, Sweden, Switzerland, The Netherlands, Ukraine, Yugoslavia (Anonymous, 2016b).

Distribution in Turkey: Aegean Region (Soydanbay-Tunçyürek, 1976); Artvin, Rize (Bozan, Aslıtürk, 1975); İzmir (Öncüer, 1977); Aydın, Denizli, İzmir (Uygun, 1981); Adana, Niğde (Ulusoy et al., 1999); İzmir, Manisa (Tezcan, Uygun, 2003); Southeastern Anatolia Region (Bolu, Uygun, 2003; Bolu et al., 2007); Diyarbakır, Elazığ, Mardin (Bolu, 2005).

Material examined. Total obtained was 1 adult ladybirds. Locality: Diyarbakır (Diyarbakır 38° 09' 41" 12' 54" E at altitude of about 663 m.).

This study showed that there are many hitherto unrecorded parasitoids and predators of *Kermes hermonensis* in Turkey. More studies should be conducted on the parasitoid fauna of *Kermes hermonensis*, including studies on their biology.

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