Bitki Koruma Bülteni / Plant Protection Bulletin

http://dergipark.gov.tr/bitkorb

Original article

Host relationships and Heteropterans as aphid predators in Turkey

Afit predatörü Heteropter'ler ve konukçu ilişkileri

Gülten YAZICI[a*]

[a]*Directorate of Plant Protection Central Research Institute Gayret Mah. Fatih Sultan Mehmet Bulv. 06172 Yenimahalle, Ankara, Turkey*

ARTICLE INFO

Article history:
DOI: 10.16955/bitkorb.576075
Received : 11.06.2019
Accepted : 04.09.2019

Keywords:
Anthocoridae, Miridae, Lygaeidae, Heteroptera, aphid, predator

* Corresponding author: Gülten YAZICI
gultenkulekci@hotmail.com

ABSTRACT

Many insect families contain one or more predatory species. In some of these families, all species are predators. Many predators are important as biological control agents against crop pest insects in agricultural pest management. Among them are true bugs (Hemiptera) with about dozen families of predators that they prey on insects and other small invertebrates. This study is based upon material of predatory Heteroptera collected from different localities of Turkey between 1967 and 2015. In this study, predatory Heteroptera and their potential prey species are investigated and 19 species of true bugs from the families Anthocoridae, Lygaeidae and Miridae, feeding on aphids are revealed in Turkey. In addition, information on their sampling localites is given.

INTRODUCTION

Agroecosystems are rather simplified environments, unfit for natural enemies that, due to the lack of alternative preys and of shelters, are less efficient in controlling pests. Food sprays or flowering perennial plants can be used in order to favour predators and parasitoids. Phytophagous and zoophagous Heteroptera form an important section of entomofauna in crops and orchards (Fauvel 1999).

The presence of numerous species of Heteroptera is particularly efficacious in the control of Arthropod pests, as predation increases from spring to summer. Moreover, the main part of phytophagous Heteroptera colonizes were non cultivated plants and trees and represent an economic problem when the host plant dries up, due to the lack of water or to herbicide treatment or to mowing; only in these cases they start feeding on cultivated plants (Cravedi and Carli 1988, Fauvel 1985, Limonta et al. 2003, Lozzia et al. 2000, Tavella et al. 1994).

Heteropterans have been successfully used as agents of biological control of pests such as whiteflies, thrips and mites (Pons et al. 2009).

Turkey occupies Asia Minor between the Mediterranean Sea and the Black Sea and stretches into continental Europe. It has been known to possess a rich fauna of Hereroptera. Thus,

some faunistic and systematic studies about the Heteroptera have been conducted by both foreign and native researchers in Turkey (Dursun 2011a, 2011b, 2012, Dursun and Fent 2010, 2011a, 2011b, 2013, 2015, 2017, Dursun and Salur 2013, Fent et al. 2010a, 2010b, Kaçar and Dursun 2015, Lodos et al. 1978, 1998, 1999, 2003, Önder et al. 2006, Reuter 1881, 1882, 1896, 1909, Seidenstücker 1963a, 1963b, 1963c, 1964, 1965, 1966a, 1966b, 1967). Yet, such a study is essential for researchers who are interested in Heteropterans as aphids predatory in West Palaearctic region including Turkey. In this study, the relationship between predatory Heteroptera and their potential prey species are investigated and 19 species of true bugs on 29 hosts from 93 localities from the families Anthocoridae, Lygaeidae and Miridae, feeding on aphids are revealed in Turkey. In addition, a list of host for the bug species and information about their morphologies are given.

MATERIALS AND METHODS

The material of the predatory Heteroptera was collected from different localities of Turkey from 1967 to 2015. Studies were carried out to determine of species of predatory Heteroptera in May and October during the seasons of spring, summer and autumn from 2011 to 2015. The insect materials were collected by sweeping insects net from different fields. The insect samples were killed in ethyl asetate and brought to the laboratory. The Heteroptera species were identified. In additional, museum materials which were identified and collected between 1967- 2010 were also evaluated. The materials mentioned in this study were deposited in the Entomology Museum (EMET), Erzurum and Nazife Tuatay Entomology Museum, Ankara, Turkey. Plant specimens were collected by hand and were pressed and they were deposited at the Herbarium of Plant Protection Department. Species of aphids were given either through the host or from the knowledge of the literature.

RESULTS AND DISCUSSION

In this study, predatory Heteroptera 19 species of true bugs on 29 hosts from 93 localities from the families Anthocoridae, Lygaeidae and Miridae, feeding on aphids are revealed in Turkey. As a result, it has been revealed that the variety of Heteroptera fauna in this region depends on the rich wild plant flora. Besides, the high host specificity observed among the major of species *Orius minutus* (Linnaeus), *Orius niger* (Wolff), *Deraeocoris serenus* (Douglas & Scott) and *Deraeocoris punctulatus* (Fallén). In addition, insects maximum *Aphis fabae* Scopoli, *Aphis gossypii* Glover, *Aphis pomi* de Geer, *Eriosoma lanigerum* (Hausmann) and *Myzus persicae* (Sulzer) of their choice is determined preferred. There are studies on predatory Heteroptera in Turkey and its districts having various biotopes and climatically conditions. At the end of this study, the fauna of predatory Heteroptera has been demonstrated considerably and added many species to the present fauna predatory Heteroptera of Turkey.

Anthocoridae

1) *Anthocoris nemoralis* (Fabricius, 1794)

The forewings are shiny only on the cuneus and embolium (along the outer edge), and at the apex of the corium. The 1st antennal segment is dark, and the 2nd partly pale at the base. Length 3.5-4 mm.

Material examined: Ankara: Sincan, Yenikent, 2.VII.1995, 10 ♀♀, 4 ♂♂ (*Pyrus communis* L.) (Leg: H. Er); Erzurum: Oltu, Çamlıbel, 1661 m, 30.VI.2012, 2 ♀♀ (*Falcaria vulgaris* L.) (Leg: G. Yazıcı); İçel: 15.X.1974, ♀, ♂ (*Pyrus malus* L.) (Leg: C.I.E.).

Remarks: It has also been reported that this species feeds with *Myzus persicae* (Sulzer) (Meyling et al. 2003), *Chaitophorus leucomelas* Koch., *Pemphigus bursarius* (L.), *P. immunis* Buckton, *P. spyrothecae* Passerini, *P. vesicarius* Passerini (Şahbaz and Uysal 2006), *Aphis pomi* de Geer, *Brachycaudus cardui* (L.), *B. helichrysi* (Kaltenbach), *Hyalopterus pruni* (Geoffroy) (Kocadal 2006).

2) *Anthocoris nemorum* (Linnaeus, 1761)

The forewings are entirely reflective (right) and the pronotum entirely black. The legs are mostly orange-brown, with variable development of small dark patches near the tip of the femora, especially on the hind leg. The antennae are largely pale in the 2nd and 3rd segments, with dark tips to the segments, and dark 1st and 4th segments. The dark patch on the membrane is typically hourglass-shaped. Length 3-4 mm.

Material examined: Erzurum: Oltu, İnanmış, 1823 m, 6.VII.2012, ♀ (*Melilotus officinalis* L.) (Leg: G. Yazıcı), Uzundere, Yayla, 2005 m, 6.VII.2012, ♂ (*Echium italicum* L.) (Leg: G. Yazıcı).

Remarks: It has also been reported that this species feeds with *Myzus persicae* (Sulzer), *Aulacorthum solani* (Kaltenbach), *Macrosiphum euphorbiae* (Thomas) and *Aphis gossypii* Glover (Meyling et al. 2003).

3) *Anthocoris gallarumulmi* (De Geer, 1773)

The forewings are shiny and brownish black, cuneus, clavus and apex of the corium black. The legs are brown and small black patches on of the femora. The 1st antennal segment is dark, and the 2nd partly pale at the base. Length 3.4-4.1 mm.

Material examined: İzmir: Bornova, no collecting data, 2 ♀♀, 4 ♂♂ (*Prunus dulcis* L.) (Leg: N. Şevket).

Remarks: It has also been reported that this species feeds with *E. lanigerum* (Hausmann), *E. ulmi* (Linnaeus), *E. lanuginosum* (Hartig).

4) *Anthocoris sibiricus* Reuter, 1875

The forewings are entirely reflective (right) dark brown and covered with small pits. The legs are mostly yellow-brown, second and third femora are darker brown. The first antennae are brown other segments are yellowish. Length 2-3 mm.

Material examined: Ankara: Sincan, Yenikent, 29.IX.1994, 3 ♀♀, ♂ (*P. malus* L.) (Leg: H. Er), Yenimahalle, 10.VII.1981, 2 ♂♂, 2 ♀♀ (*Pyrus malus* L.) (Leg: Z. Soylu); Bolu: Mudurnu, 26.VII.1994, ♀ (*Solanum tuberosum* L.) (Leg: R. Kedici); Çankırı: Eldivan, 12.VIII.1999, ♂ (*Prunus avium* L.) (Leg: A. Özdem); Nevşehir: Göreme, 2.IX.1969, ♀, ♂ (*Medicago sativa* L.) (Leg: S. Kornoşor).

Remarks: It has also been reported that this species feeds with *Myzus persicae* (Sulzer) (Hofsvang 1976); *Aphis caccivora* Koch, *A. fabae* Scopoli, *A. gossypii* Glover, *A. pomi* de Geer, *Hyalopterus pruni* (Geoffroy), *Hyperomyzus lactucae* (L.) (Kocadal 2006).

5) *Orius minutus* (Linnaeus, 1758)

Head is black, shiny, second antennal segment is pale yellow, fuscous at apex, incrassate, terminal segments black; pronotum and scutellum black, shiny; clavus, corium, and embolium are pale yellowish brown, cuneus black, shiny, pubescence long and dense; legs pale brown. Length 2.24-2.38 mm.

Material examined: Ankara: Ayaş, Başbereket, 5.VI.1990, ♀ (*Medicago sativa* L.) (Leg: M. Aydemir), Çubuk, Sarıkoz, 14.VI.1990, ♂ (*Onobrychis sativa* L.) (Leg: M. Aydemir), Polatlı, Kocahacılı, 12.VI.1990, ♀ (*M. sativa* L.) (Leg: M. Aydemir), Sazılar, 4.VI.1990, 2 ♀♀ (*M. sativa* L.) (Leg: M. Aydemir), Yenimahalle, 10.VII.1981, 14 ♀♀, 6 ♂♂ (*Pyrus malus* L.) (Leg: Z. Soylu), Sincan, Yenikent, 21.IX.1994, 15 ♀♀, 12 ♂♂, 11.X.1994, 2 ♀♀, 2 ♂♂ (*P. communis* L.) (Leg: H. Er); Bartın: Kozpınarı, 6.X.1988, ♀ (*Corylus avellana* L.) (Ö. Ataç); Erzurum: Kümbet, 1832 m, 5.VIII.2011, ♀ (*M. sativa* L.) (Leg: G. Yazıcı), Yağmurcuk, 2010 m, 9.VIII.2011, ♀, ♂ (*Mentha longifolia* L.) (Leg: G. Yazıcı), Çat, Yukarı Çat, 2162 m, 23.VII.2011, ♂ (*Artemisia absinthium* L.) (Leg: G. Yazıcı), Horasan, Değirmenli, 1643 m, 13.VIII.2011, ♀ (*M. sativa* L.) (Leg: G. Yazıcı), Pasinler, Espemce, 1666 m, 21.VIII.2011, ♀ (*Cichorium intybus* L.) (Leg: G. Yazıcı), Şenkaya, İkizpınar, İkizpınar, 1589 m, 31.VII.2011, 2 ♀♀ (*Echium vulgare* L. and *Melilotus officinalis* L.) (Leg: G. Yazıcı); Karaman: Çakırbağ, 12.VIII.1986, ♀, ♂ (*Helianthus annuus* L.) (Leg: H. Zeki); Konya: Beyşehir, Üstünler, 14.V.1991, ♀ (*M. sativa* L.) (Leg: M. Aydemir); Niğde: Aksaray, Sağlık, 25.VIII.1987, ♀, 2 ♂♂ (*H. annuus* L.) (Leg: H. Zeki), Bor, Havuzlu, 26.VIII.1987, ♂ (*H. annuus* L.) (H. Zeki); Zoguldak: Ereğli, Çamlıbel, 24.III.1988, 2 ♀♀ (*Corylus avellana* L.) (Leg: Ö. Ataç), Kabalar, 7.IV.1988, ♂ (*C. avellana* L.) (Leg: Ö. Ataç).

Remarks: It has also been reported that this species feeds with *A. gossypii* Glover (Ito et al. 2005), *Metopolophium dirhodum* (Walker), *M. persicae* (Sulzer) (Luettge and Sell 1996), *Acrytosiphum pisum* Harris, *A. craccivora* Koch (Atakan 2012); *A. caccivora* Koch, *A. pomi* de Geer, *Brachycaudus helichrysi* (Kaltenbach) (Kocadal 2006).

6) *Orius niger* (Wolff, 1811)

O. niger is the only easily recognisable species, being almost entirely black except for the antennae and front tibiae; even the membrane dark; paler examples common and only the darkest forms particularly distinctive; a single hair present on both the anterior and posterior angles of the pronotum. Length 1.5-2 mm.

Material examined: Ankara: Ayaş, Uğurçayırı, 5.VI.1990, ♀ (*Medicago sativa* L.) (Leg: M. Aydemir), Çubuk, Sarıkoz, 14.VI.1990, ♂ (*Onobrychis viciifolia* L.) (Leg: M. Aydemir); Erzurum: Kümbet, 1832 m, 5.VIII.2011, ♀, ♂ (*M. sativa* L.) (Leg: G. Yazıcı), Yağmurcuk, 2010 m, 9.VIII.2011, 2 ♀♀, ♂ (*Mentha longifolia* L.) (Leg: G. Yazıcı), Çat, Yukarı Çat, 2162 m, 23.VII.2011, ♀ (*Artemisia absinthium* L.) (Leg: G. Yazıcı), Horasan, Değirmenli, 1643 m, 13.VIII.2011, ♀, 2 ♂♂ (*M. sativa* L.) (Leg: G. Yazıcı), Köprüköy, Ataköy, 1788 m, 26.VI.2011, ♀, ♂ (*Papaver rhoeas* L.) (Leg: G. Yazıcı), Eğirmez, 1670 m, 13.VIII.2011, 2 ♀♀, 2 ♂♂ (*Sinapis arvensis* L.) (Leg: G. Yazıcı), Olur, Boğazgören, 1168 m, 19.VII.2012, ♀ (*M. sativa* L.) (Leg: G. Yazıcı), Pasinler, Espemce, 1666 m, 21.VIII.2011, 2 ♀♀ (*Cichorium intybus* L.) (Leg: G. Yazıcı), Şenkaya, İkizpınar, 1589 m, 31.VII.2011, 6 ♀♀, 3 ♂♂ (*Echium vulgare* L. and *Melilotus officinalis* L.) (Leg: G. Yazıcı); Karaman: 1.X.1992, 2 ♀♀ (*Pyrus malus* L.) (Leg: C. Zeki), Göztepe, 12.VIII.1986, ♀, ♂ (*Helianthus annuus* L.) (Leg: H. Zeki); Konya: Cihanbeyli, Akköy, Keklik Yaylası, 9.VII.1986, ♀ (*H. annuus* L.) (Leg: H. Zeki); Niğde: Aksaray, Ağaçlı, 25.VIII.1987, ♀, ♂ (*H. annuus* L.) (Leg: H. Zeki), Ortaköy, 20.VII.1987, 2 ♀♀, 2 ♂♂ (*H. annuus* L.) (Leg: H. Zeki).

Remarks: It has also been reported that this species feeds with *A. fabae* Scopoli (Hashempour et al. 2014), *Acrytosiphum pisum* Harris, *A. craccivora* Koch (Atakan 2012), *A. gossypii* Glover (Salehi et al. 2011), *Therioaphis maculata* Buckton (Falamarzi et al. 2009), *M. persicae* (Sulzer) (Kocadal 2006).

Lygaeidae

1) *Geocoris* (*Piocoris*) *erythrocephalus* (Lepeletier & Serville, 1825)

Geocoris erythrocephalus is a pretty little bug that has large eyes facing forward and a very arched head. Head orange yellow, the first three antennal segments black, the ends are yellow banded, 4th antennal segment yellow, Geocoris are predatory bugs, excellent hunters who use their huge eyes to spot prey. Length 3.5-5 mm.

Material examined: Adana: 30.VII.1971, ♀, ♂ (*Gossypium* sp.) (Leg: T. Süzer); Erzurum: Pasinler, Yayla, 1990 m, 17.VII.2011, ♀ (*Conium maculatum* L.) (Leg: G. Yazıcı); Konya: Beyşehir, Üstünler, 14.V.1991, ♀ (*Medicago sativa* L.) (Leg: M. Aydemir).

Remarks: It has also been reported that this species feeds with *A. gossypii* Glover, *M. persicae* (Sulzer) (Kocadal 2006).

2) *Geocoris* (*Geocoris*) *megacephalus* (Rossi, 1790)

Long-winged (Macropteer) and shiny black bug. Black antennae, top of segment 4 is sometimes brownish. Head, pronotum and scutellum are black, pronotum is a slight rear edge and slight rear vertices. The wings are light brown; the membrane is whitish, transparent. Light brown to brown legs are sometimes dark brown thighs. Length 3-4.5 mm.

Material examined: Ankara: Yenimahalle, 15.IX.1967, 2 ♀♀ (*Fragaria vesca* L.).

Remarks: L. It has also been reported that this species feeds with *A. craccivora* Koch, *A. pisum* Harris (Rakhshani et al. 2010).

Miridae

1) *Atractotomus mali* (Meyer-Dür, 1843)

This species comprises small black or dark red-brown bugs in which the upper surface is covered in flattened golden or silver hairs. The 2nd antennal segment is often strongly thickened. The 1st antennal segment is almost triangular and much thinner at the base, while the 2nd segment is much thickened in both sexes, particularly so in females. The body shape is rather oval and convex. Length 3-3.5 mm.

Material examined: Bolu: Abant, 3.VII.2003, ♀ (*Malus domestica* L.) (Leg: I. Özdemir); Kayseri: 17.VII.1980, ♀, ♂ (*Pyrus communis* L.) (Leg: Z. Soylu).

Remarks: This species was reported feeding on *P. malus* L., *P. communis* L., *P. scopulina* L., *Cydonia* sp., and *Crataegus* sp. (Bodenheimer and Swirski 1957, Çanakçıoğlu 1975). It has also been reported that this species feeds with *A. pomi* de Geer, *B. helichrysi* (Kaltenbach) (Kocadal 2006).

2) *Campylomma diversicornis* Reuter, 1878

Body small and oval, pale yellowish white; eyes brown and big; first antennal segment black, tin yellow, second antennal segment black, third and fourth antennal segment whitish yellow; pronotum yellowish; scutellum yellow, tip vertebrae; hemielytra yellowish white, membrane transparent; legs whitish yellow, front femur 2-3, middle and back femora 4 black stained, middle and rear tibiae spines from black spots, no black spots on front tibiae. Length 2.3-2.7 mm.

Material examined: Diyarbakır: 2.VII.1975, 4 ♀♀, 2 ♂♂ (*Gossypium* sp.) (Leg: C.I.E.); Muğla: Fethiye, 18.VII.1978, ♂ (*Sesamum indicum* L.); Şanlıurfa: Siverek, Feribotyolu, 22.VIII.2015, ♀, ♂ (*Solanum lycopersicum* L.) (Leg: G. Yazıcı).

Remarks: It has also been reported that this species feeds with *A. craccivora* Koch (Öncüer 1991); *M. persicae* (Sulzer) (Kocadal 2006).

3) *Campylomma verbasci* (Meyer-Dür, 1843)

This species are very small pale bugs which have a characteristically short 2nd antennal segment (equal to or less than the head width). The tibial spines are set in black spots. The 1st antennal segment has a black ring. Length 2.6-3 mm.

Material examined: Ankara: Ayaş, Bayram, 11.IX.1990, 2 ♀♀, 2 ♂♂ (*Medicago sativa* L.) (Leg: M. Aydemir), Uğurçayırı, 5.VI.1990, ♂ (*M. sativa* L.) (Leg: M. Aydemir), Güdül, Güneyce, 31.VII.1990, ♂ (*M. sativa* L.) (Leg: M. Aydemir), Polatlı, Düç, 30.VII.1990, ♀ (*M. sativa* L.) (Leg: M. Aydemir).

Remarks: It has also been reported that this species feeds with *Aphis pomi* de Geer (Prodanović and Protić 2013).

4) *Deraeocoris* (*Knightocapsus*) *lutescens* (Schilling, 1837)

A generally orange-brown species with blackish markings and translucent forewings. Although sometimes rather variable, there are usually two dark bars on the scutellum, which is unpunctured. The two dark bars on the scutellum and the dark bands on the tibia might suggest this species. Length 3.8-4 mm.

Material examined: Ankara; Bağlum, 4.V.1994, 2 ♀♀ (*Pyrus communis* L.) (Leg: H. Er), Sincan, Yenikent, 4.V.1994, 2 ♀♀, 21.VI.1994, 2 ♂♂, 13.VII.1994, 6 ♀♀, 2 ♂♂, 26.VII.1994, ♂, 2.VIII.1994, ♀, 9.VIII.1994, ♀, ♂, 24.VIII.1994, ♀, ♂, 31.VIII.1994, ♀, ♂, 15.IX.1994, 2 ♀♀ (*P. communis* L.) (Leg: H. Er); Çankırı: Eldivan, 26.VIII.1999, 3 ♀♀, ♂, 29.VII.1999, ♀, ♂ (*Prunus avium* L.) (Leg: A. Özdem).

Remarks: It has also been reported that this species feeds with *A. pomi* de Geer (Öncüer 1991) and *A. caccivora* Koch

(Kocadal 2006).

5) *Deraeocoris* (*Camptobrochis*) *serenus* (Douglas & Scott, 1868)

A generally species with variable coloration: from light to dark brown, often with stains. The head is usually bright and relatively short. Pronotum convex, its sides turned outward, yellow-brown to gray-yellow. Half-bright, with black spots, which occasionally form a transverse band in the posterior part. Legs red yellow, femur and tibia with dark rings. Length 3.5-4 mm.

Material examined: Afyon: Bahçecik, ♀ (*Solanum tuberosum* L.); Ankara: Ayaş, Bayram, 5.VI.1990, ♀, ♂ (*M. sativa* L.) (Leg: M. Aydemir), Bala, Beynam, 18.VIII.1983, ♂ (*Vitis vinifera* L.) (Leg: A. Kalkandelen), Kahramankazan, 12.VI.1996, ♂ (*M. sativa* L.) (Leg: Y. Özdemir), Saray, 16.V.1990, ♀ (*M. sativa* L.) (Leg: M. Aydemir), Kızılcahamam, Çatak, 20.VII.1994, ♀ (*S. tuberosum* L.) (Leg: R. Kedici), Polatlı, Sazlar, 4.VI.1990, 2 ♂♂ (*Medicago sativa* L.) (Leg: M. Aydemir), Sincan, Yenikent, 19.X.1994, ♂, 29.IX.1994, ♂ (*Helianthus annuus* L.) (Leg: H. Er), Yenimahalle, 10.VII.1981, 4 ♀♀, 3 ♂♂ (*Pyrus malus* L.) (Leg: Z. Soylu); Antalya: Fethiye, 18.VII.1978, ♀ (*Sesamum indicum* L.); Balıkesir, 26.VII.1978, 2 ♂♂ (*S. indicum* L.); Çankırı: 23.VI.1997, ♀ (*P. malus* L.) (Leg: Y. Özdemir); Denizli: 3.VIII.1978, ♀, ♂ (*S. indicum* L.); Kahramanmaraş: Akdoğan, 30.VI.1983, ♀ (*Quercus* sp.) (Leg: N. Çarkacı); Karaman: Çakırbağ, 12.VIII.1986, 2 ♀♀, 2 ♂♂ (*H. annuus* L.) (Leg: H. Zeki); Konya: Cihanbeyli, Altınekin, 9.VII.1986, ♀ (*H. annuus* L.) (Leg: H. Zeki).

Remarks: It has also been reported that this species feeds with *A. craccivora* Koch (*Robinia* sp.), *A. gossypii* Glover (*Cucurbita pepo* L.), *A. pomi* de Geer (*P. malus* L.), *Hyslopterus pruni* (Geoffroy), *M. persicae* (Sulzer) (Kocadal 2006, Öncüer 1991).

6) *Deraeocoris* (*Camptobrochis*) *pallens* (Reuter, 1904)

Color usually varies from yellowish brown to greyish brown; head reddish yellow, patterned black; antennae are black, the middle of the second antennal segment is light; pronotum yellow, hemielytra yellow on black, cuneus tip black; femur reddish yellow, the middle of tibia yellow rings. Length 3.5-4.4 mm.

Material examined: Antalya: Fethiye, 18.VII.1978, 2 ♀♀, 2 ♂♂ (*Sesamum indicum* L.).

Remarks: It has also been reported that this species feeds with *A. fabae solanella* Theobald, *A. gossypii* Glover, *M. persicae* (Sulzer) (Kocadal 2006); *A. pomi* de Geer, *Acyrthosiphon pisum* Harris, *A. craccivora* Koch, *Macrosiphum euphorbia* Thomas (Öncüer 1991).

7) *Deraeocoris* (*Deraeocoris*) *rutilus* (Herrich-Schäffer, 1838)

Head, pronotum and scutellum black; In the back end cutting of corium and at the end near the clavus a black-stained; the tip of the first antennal segment is 1.5 times thicker of the second antennal segment. Length 6.7-8 mm.

Material examined: Ankara: Ayaş, Ilıca, 16.VII.1987, ♀ (*Lens culinaris* Medik) (Leg: Y. Özdemir), Kızılcahamam, Akdoğan, 30.VI.1983, ♀ (*Quercus* sp.) (Leg: A. Kalkandelen), Sincan, Yenikent, 1.VI.1994, ♀, ♂ (*Pyrus communis* L.) (Leg: H. Er); Manisa: Akhisar, 13.VI.2003, ♀ (*Prunus dulcis* L.), Harmandalı, 13.VI.2003, ♀ (*P. dulcis* L.).

8) *Deraeocoris* (*Deraeocoris*) *ruber* (Linnaeus, 1758)

The ground colour (including the scutellum) ranges from red-orange to almost fully black, although the cuneus is always red to some extent. The forewings are very shiny. The tibiae are unbanded and the 1st antennal segment and at least the base of the 2nd are black. Length 6-8 mm.

Material examined: Ankara: Bağlum, 13.VII.1994, ♂ (*Pyrus communis* L.) (Leg: H. Er), Yenimahalle, 19.VI.1981, 3 ♀♀, 6 ♂♂ (*Malus domestica* L.) (Leg: H. Er); Zonguldak: Ereğli, 9.VI.1994, ♀ (*Carpinus betulus* L.) (Leg: A. Kalkandelen).

Remarks: It has also been reported that this species feeds with *A. pomi* de Geer, *Aphis* sp., (*Carduus crispus* L.), *Brachycaudus helichrysi* (Kaltenbach) (*Prunus domestica* L.), (*P. domestica* L., *P. persica* L.) (Kocadal 2006, Öncüer 1991).

9) *Deraeocoris* (*Camptobrochis*) *punctulatus* (Fallén, 1807)

Body yellowish brown or grayish brown with black stain on; antennae, head and legs black; pronotum superficial pit; the second antennal segment 1.5 times the total length of the third and fourth antennal segments. Length 3.8-4.5 mm.

Material examined: Adana: 6.VII.1971, 2 ♀♀ (*Gossypium hirsutum* L.) (Leg: T. Süzer); Ankara: Bağlum, 13.VII.1994, ♂ (*Pyrus communis* L.) (Leg: H. Er), Sincan, Yenikent, 15.IX.1994, 3 ♀♀, 2 ♂♂ (*P. communis* L.) (Leg: H. Er); Çankırı: Eldivan, 12.VIII.1999, ♂ (*Prunus avium* L.) (Leg: A. Özdem); Düzce: Akçakoca, Akkaya, 1.XI.1989, ♀ (*Corylus avellana* L.) (Leg: Ö. Ataç); İçel: 15.X.1974, ♀, 2 ♂♂ (*Malus domestica* L.) (Leg: C.I.E.A.); Konya: Karapınar, Kayalı, 6.VI.1991, ♂ (*Medicago sativa* L.) (Leg: M. Aydemir).

Remarks: It has also been reported that this species feeds with *A. gossypii* Glover (*Gossypium* sp.) (Kocadal 2006, Öncüer 1991).

10) *Macrolophus costalis* Fieber, 1858

Body tiny, yellow, yellowish green, tiny yellowish white little hairy over; head pentagon, yellowish green, side edges stripes

longitudinal black; the back of the eyes extended to the neck; antennae yellowish, only the first antennal segment black; pronotum and scutellum yellow. Length 3.5-3.8 mm.

Material examined: Şanlıurfa: Karacadağ, Savcak, 20.VIII.2015, 4 ♀♀, 3 ♂♂ (*Solanum lycopersicum* L.) (Leg: G. Yazıcı).

Remarks: It has also been reported that this species feeds with *M. persicae* (Sulzer) (Margaritopoulos et al. 2003).

11) *Pilophorus perplexus* Douglas & Scott, 1875

Head dark cinnamon-brown, very little narrower than the base of the pronotum; the colour of the elytra cinnamon-brown; the posterior band of the corium quite straight (the band across the clavus in a line therewith); the second joint of the antenna only about one-fifth; longer than the basal width of the pronotum. Length 3.3-3.9 mm.

Material examined: Bartın: 21.VI.1989, 2 ♀♀ (*Corylus avellana* L.) (Leg: C. Zeki), Kozpınarı, 22.VI.1989, 2 ♀♀, ♂ (*C. avellana* L.) (Leg: C. Zeki), 28.VII.1988, 4 ♀♀, 2 ♂♂ (*C. avellana* L.) (Leg: Ö. Ataç); Düzce: Cumayeri, 26.VII.1989, ♀ (*C. avellana* L.) (Leg: Ö. Ataç), Kaynaşlı, 18.VII.1988, ♀ (*C. avellana* L.) (Leg: Ö. Ataç), Yeşilköy, 27.VII.1989, ♀ (*C. avellana* L.) (Leg: Ö. Ataç), Yukarıköy, 20.VI.1989, ♂ (*C. avellana* L.) (Leg: C. Zeki); Zonguldak: Ereğli, Çamlıbel, 24.VIII.1989, ♂ (*C. avellana* L.) (Leg: C. Zeki), Çayköy, 21.VI.1989, 5 ♀♀, ♂ (*C. avellana* L.) (Leg: C. Zeki).

Remarks: It has also been reported that this species feeds with *A. pomi* de Geer, *Dysaphis plantaginae* (Passerini) (*C. avellana* L.), *Cacopsylla pyricola* Först., *Dysaphis plantaginea* (Passerini) (*Pyrus malus* L.), *Dysaphis pyri* (B. de F.) (*Pyrus communis* L., *P. elaeagrifolia* Pall.), *Hyalopterus pruni* (Geoffroy) (*Prunus domestica* L., *P. persica* S. et Z.), *M. cerasi* (Fabr.) (*P. avium* L.) (Öncüer 1991).

ACKNOWLEDGEMENTS

I would like to thank Dr. Rauno Linnavuori (Finland) and Dr. Pierre Moulet (France) for the Heteroptera identification. The study was supported by the TAGEM (Project Number: TAGEM/BSAD/16/3/01/03).

ÖZET

Birçok böcek familyasında bir veya daha fazla avcı böcek bulunmaktadır. Bu familyaların bazılarında tüm türler avcı böcek olabilir. Çoğu avcı böcek tarımsal zararlı yönetiminde, zararlılara karşı biyolojik kontrol ajanı olarak kullanılmada önemlidirler. Heteroptera alttakımı içerisinde de böcekleri ve diğer küçük organizmaları avlayan birçok predatör familya bulunmaktadır. Bu çalışma, 1967-2015 yılları arasında Türkiye'nin farklı yörelerinden toplanan predatör Heteroptera materyallerine dayanmaktadır. Çalışmada, predatör Heteroptera ve bunların potansiyel av türleri araştırılmış ve Türkiye'de yaprak bitleri ile beslenen Anthocoridae, Lygaeidae ve Miridae familyasından 19 predatör tür tespit edilmiştir. Ayrıca, türlerin bir listesi ve örneklere ait lokalite bilgileri verilmiştir.

Anahtar kelimeler: Anthocoridae, Miridae, Lygaeidae, Heteroptera, afit, predatör

REFERENCES

Atakan E., 2012. Abundance patterns of predatory bugs, *Orius* spp. (Hemiptera: Anthocoridae) and their some insect preys on faba bean with different planting dates in Adana province, Turkey. Turkish Bulletin of Entomology, 2 (1), 37-48.

Bodenheimer F.S., Swirski E., 1957. The Aphidoidea of the Middle East. The Weigmann Science Press of Israel, Jerusalem, 378 pp.

Cravedi P., Carli G., 1988. Mirides nuisibles au pêcher. IOBC/WPRS Bulletin, XI, 7, 22-23.

Çanakçıoğlu H., 1975. The Aphidoidea of Turkey. İstanbul Üniversitesi Orman Fakültesi Yayınları, İ. Ü. Yayın No: 1751, O. F. Yayın No: 189, 309 pp.

Dursun A., 2011a. A study on the Nepomorpha (Hemiptera) species of some provinces of Anatolia, Turkey, with new records of *Anisops debilis perplexus* Poisson, 1929 and *Notonecta reuteri* Hungerford, 1928. Turkish Journal of Entomology, 35 (3), 461-474.

Dursun A., 2011b. Additional records of Coreidae (Hemiptera: Heteroptera) from Turkey, with checklist. Entomological News, 122 (2), 134-147.

Dursun A., 2012. Additional records of Gerromorpha (Hemiptera: Heteroptera) and redescription of *Rhagovelia nigricans nigricans* (Burmeister, 1835) from Anatolia (Turkey). Turkish Journal of Zoology, 36 (5), 652-661.

Dursun A., Fent M., 2010. Systematische und faunistische Untersuchungen über die Überfamilie Pentatomoidea (Insecta: Heteroptera) aus dem Kelkit-Tal der Türkei. Linzer Biologische Beiträge, 42 (1), 587-598.

Dursun A., Fent M., 2011a. Additional records on the Halyini, Carpocorini, Aeliini and Eysarcorini (Hemiptera: Pentatomidae: Pentatominae) of the Kelkit Valley, Turkey. Biharean Biologist, 5 (2), 151-156.

Dursun A., Fent M., 2011b. Kelkit Vadisi *Sciocorini* Amyot & Serville, 1843 ve *Strachiini* Mulsant & Rey, 1866 (Hemiptera:

Pentatomidae: Pentatominae) faunası üzerine çalışmalar. Türkiye Entomoloji Bülteni, 1 (3), 181-188.

Dursun A., Fent M., 2013. Overview of the subgenus *Ventocoris* s. str. (Hemiptera: Heteroptera: Pentatomidae) with new records and a revised key to the *Ventocoris* species of Turkey. Zootaxa, 3682 (1), 151-177. http://dx.doi.org/10.11646/zootaxa.3682.1.8

Dursun A., Fent M., 2015. Notes on some little known species of Heteroptera from Turkey with new records for the fauna of Europe and the Turkish Thrace. North-Western Journal of Zoology, 11 (1), 92-96.

Dursun A., Fent M.,. 2017. Type localities of Heteroptera (Insecta: Hemiptera) from Turkey. Zootaxa, 4227 (4), 451-494.

Dursun A., Salur A., 2013. Presence of *Sphedanolestes sanguineus* (Fabricius, 1794) in Turkey, followed by an annotated checklist of Reduviidae (Hemiptera: Heteroptera). Turkish Journal of Zoology, 37, 610-620.

Falamarzi S., Asadi G., Hosseini R., 2009. Species inventory, preys and host plants of Anthocoridae sensu lato (Hemiptera: Heteroptera) in Shiraz and its environs (Iran, Fars province). Acta Entomologica Musei Nationalis Pragae, 49 (1), 33-42.

Fauvel G., 1985. Les *Nysius* (Hétéroptères: Lygéides) et leurs attaques surprises. Prog. Agric.Vitic. (Montpellier), 102, 93-94.

Fauvel G., 1999. Diversity of Heteroptera in agroecosystem: role of sustainability and bioindication. Agriculture, Ecosystems and Environment, 74, 275-303.

Fent M., Gözüaçık C., Yiğit A., 2010a. Türkiye Bagrada Stål, 1862 (Pentatomidae: Strachiini) cinsi türlerinin gözden geçirilmesi ve yeni bir kayıt: *Bagrada amoenula* (Walker, 1870). Turkish Journal of Entomology, 34 (1), 75–87.

Fent M., Dursun A., Karsavuran Y., Tezcan S., Demirözer O., 2010b. A review of the tribe Halyini in Turkey (Hemiptera: Heteroptera: Pentatomidae) with two new records: *Apodiphus integriceps* and *Mustha vicina*. Journal of the Entomological Research Society, 12 (2), 1-13.

Hashempour M., Jalalizad A., Hatami B., Dehghani M., Karimy A., 2014. Integrated control of aphid by predator bug *Orius albidipeenis* and confidor pesticide and effects of pesticide on predator in green house. The 1st International Conference on New Ideas in Agriculture Islamic Azad University Khorasgan Branch, 26-27 January 2014, Isfahan, Iran.

Hofsvang L., 1976. Development of *Anthocoris sibiricus* Reuter (Het., Anthocoridae) at constant and fluctuating temperatures with the green peach aphid *Myzus persicae* (Sulzer) as prey. Norwagian Journal of Entomology, 23, 29-34.

Ito K., Furukawa K., Okubo T., 2005. Conservation biological control of aphids in potato fields with reduced use of insecticides in Hokkaido, Japan. Japanese Journal of Applied Entomology and Zoology, 49 (1), 11-22.

Kaçar G., Dursun A., 2015. Survey and abundance of suborder Heteroptera: pest and beneficial species in olive grove of Turkey. Egyptian Journal of Biological Pest Control, 25 (2), 499-502.

Kocadal E., 2006. Kuzey Kıbrıs Türk Cumhuriyeti'ndeki Aphidoidea (Homoptera) türleri, bunların konukçuları, parazitoit ve predatörlerinin belirlenmesi. Department of Plant Protection Institute of Natural and Applied Sciences University of Cukurova, M.Sc. Thesis, 82 pp.

Limonta L., Dioli P., Denti A., 2003. Heteroptera present in two different plant mixtures. Bollettino di Zoologia agraria e di Bachicoltura, Ser. II, 35 (1), 55-66.

Lodos N., Önder F., Pehlivan E., Atalay R., 1978. Ege ve Marmara Bölgesinin zararlı böcek faunasının tespiti üzerinde çalışmalar [Curculionidae, Scarabaeidae (Coleoptera); Pentatomidae, Lygaeidae, Miridae (Heteroptera)]. (The study of the harmful insects fauna of Marmara and Aegean regions). T.C. Gıda-Tarım ve Hayvancılık Bakanlığı, Zirai Mücadele ve Zirai Karantina Genel Müdürlüğü, Ankara, 301 pp.

Lodos N., Önder F., Pehlivan E., Atalay R., Erkin E., Karsavuran Y., Tezcan S., Aksoy S., 1998. Faunistic studies on Pentatomoidea (Plataspidae, Acanthosomatidae, Cydnidae, Scutelleridae, Pentatomidae) of Western Black Sea, Central Anatolia and Mediterrannean regions of Turkey. Ege University, İzmir, 75 pp.

Lodos N., Önder F., Pehlivan E., Atalay R., Erkin E., Karsavuran Y., Tezcan S., Aksoy S., 1999. Faunistic studies on Lygaeidae (Heteroptera) of Western Black Sea, Central Anatolia and Mediterranean regions of Turkey. 66 pp. Free Entomological e-Library. Available from: http://www.entomoloji.org.tr/3dergi/library.htm (accessed date: 13 May 2013).

Lodos N., Önder F., Pehlivan E., Atalay R., Erkin E., Karsavuran Y., Tezcan S., Aksoy S., 2003. Faunistic studies on Miridae (Heteroptera) of Western Black Sea, Central Anatolia and Mediterranean Regions of Turkey. Meta Basım, Bornova, İzmir, 85 pp.

Lozzia G.C., Dioli P., Manachini B., Rigamonti I.E., Salvetti

M., 2000. Effects of soil management on biodiversity of Hemiptera, Heteroptera in vineyards of Valtellina (Northern Italy). Bollettino di Zoologia agraria e di Bachicoltura, Ser. II, 32, 141-155.

Luettge H., Sell P., 1996. Suitability of different aphid species for the predatory flower bug *Orius minutus* (Heteroptera: Anthocoridae). International Information System for the Agricultural Science and Technology, 59 (2a), 287-295.

Margaritopoulos J.T., Tsitsipis J.A., Perdikis D.C., 2003. Biological characteristics of the mirids *Macrolophus costalis* and *Macrolophus pygmaeus* preying on the tobacco form of *Myzus persicae* (Hemiptera: Aphididae). Bulletin of Entomological Research, 93, 39–45.

Meyling V.N., Enkegaard A., Brødsgaard H., 2003. Two *Anthocoris* bugs as predators of glasshouse aphids voracity and prey preference. Entomologia Experimentalis et Applicata, 108 (1), 59-70.

Öncüer C., 1991. A catalogue of the parasites and predators of insect pests of Turkey. 279 pp.

Önder F., Karsavuran Y., Tezcan S., Fent M., 2006. Türkiye Heteroptera (Insecta) Kataloğu. Meta Basım Matbaacılık Hizmetleri, İzmir, 164 pp.

Pons X., Lumbierres B., Albajes B., 2009. Heteropterans as aphid predators in inter-mountain alfalfa. European Journal of Entomology, 106, 369-378.

Prodanović D., Protić L., 2013. True bugs (Hemiptera, Heteroptera) as psyllid predators (Hemiptera, Psylloidea). ZooKeys, 319: 169–189.

Rakhshani H., Ebadi R., Mohammadi A.A., 2010. Population dynamics of alfalfa aphids and their natural enemies, Isfahan, Iran. Journal of Agricultural Science and Technology, 11, 505-520.

Reuter O.M., 1881. Monographia Generis *Holotrichius* Burm. Acta Societatis Scientiarum Fennicae, 19, 1-39.

Reuter O.M., 1882. Monographia generis *Oncocephalus* Klug. Acta Societatis Scientiarum Fennicae, 12, 673-758.

Reuter O.M., 1896. Dispositio generum palaearcticorum divisionis *Capsaria* familiae Capsidae. Ofversikt af Finska Vetenskskaps-Societetens Förhandlingar, 38, 156-171.

Reuter O.M., 1909. Ad cognitionem *Reduviidarum palaearcticarum* fragmenta. Ofversikt af Finska Vetenskskaps-Societetens Förhandlingar, 51 (17), 1-30.

Salehi F., Baniameri V., Sahragard A., Hajizadeh J., 2011. Investigation on prey preference and switching behavior of the predatory bug, *Orius niger* Wolff under laboratory conditions (Het.: Anthocoridae). Munis Entomology Zoology, 6 (1), 425-432.

Seidenstücker G., 1963a. *Macrotylus hamatus* n. sp. (Heteroptera, Miridae). Reichenbachia, 2 (41), 29-32.

Seidenstücker G., 1963b. Über *Emblethis*-Arten Kleinasiens (Heteroptera, Lygaeidae). Acta Entomologica Musei Nationalis Pragae, 35, 649-665.

Seidenstücker G., 1963c. Anatoliens *Coptosoma*-Arten (Heteroptera, Plataspidae). Reichenbachia, 1 (20), 155-160.

Seidenstücker G., 1964. Über *Dimorphocoris* (Heteroptera, Miridae). Reichenbachia, 3 (17), 209-221.

Seidenstücker G., 1965. Zwei neue *Eremocoris* aus Anatolien (Heteroptera, Lygaeidae). Reichenbachia, 5 (17), 161-171.

Seidenstücker G., 1966a. Neue *Psallus*-Arten aus der Türkei (Heteroptera, Miridae). Reichenbachia, 6, 291-302.

Seidenstücker G., 1966b. Ein neuer *Alampes* aus Ost-Anatolien (Heteroptera, Lygaeidae). Reichenbachia, 8, 63-68.

Seidenstücker G., 1967. Eine Phylinae mit *Dicyphus*-Kralle (Heteroptera, Miridae). Reichenbachia, 8, 215-220.

Şahbaz A., Uysal M., 2006. The predators and parasitoids of the aphid species (Homoptera: Aphididae) on poplars in Konya Province of Turkey. Selçuk Üniversitesi Ziraat Fakültesi Dergisi, 20 (38), 119-125.

Tavella L., Alma A., Arzone A., Galliano A., Bricco D., Rinaudo M., 1994. Indagini bioetologiche su *Lygus rugulipennis* Poppius in *Pescheti piemontesi* (Rhynchota Miridae). Informatore Fitopatologico, 7-8, 43-48.

Cite this article: Yazıcı, G. (2019). Host relationships and Heteropterans as aphid predators in Turkey, Plant Protection Bulletin, 59-4. DOI: 10.16955/bitkorb.576075

Atıf için: Yazıcı, G. (2019). Türkiye'de afit predatörü Heteropter'ler ve konukçu ilişkileri, Bitki Koruma Bülteni, 59-4. DOI: 10.16955/bitkorb.576075