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***Orijinal araştırma* (*Original article*)**

A new larval parasitoid of *Heliothis peltigera* (Denis & Schiffermüller) (Lepidoptera: Noctuidae), *Aleiodes* (*Chelonorhogas*) *miniatus* (Herrich-Schäffer) (Hymenoptera: Braconidae: Rogadinae)

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Heliothis peltigera (Denis & Schiffermüller) (Lepidoptera: Noctuidae)'nın yeni bir larva parazitoiti; *Aleiodes* (*Chelonorhogas*) *miniatus* (Herrich-Schäffer) (Hymenoptera: Braconidae: Rogadinae)

Özet: Aspir, geniş kullanım alanlarına sahip endüstriyel bir bitkidir. *Heliothis peltigera* (Denis & Schiffermüller, 1775) (Lepidoptera: Noctuidae) Ankara ilinde önemli bir aspir zararlısıdır. Bu türün larvalarının *Aleiodes* (*Chelonorhogas*) *miniatus* (Herrich-Schäffer, 1838) (Hymenoptera: Braconidae: Rogadinae) tarafından parazitlendiği tespit edilmiştir. Bu parazitoit türünün konukçusu Dünya' da ilk defa ortaya konmuştur.

Anahtar kelimeler: *Heliothis peltigera, Aleiodes miniatus, Carthamus tinctorius,* aspir, ilk kayıt

Abstract: Safflower is a plant grown for a wide range of industrial uses. A survey revealed that the larvae of *Heliothis peltigera* (Denis & Schiffermüller, 1775) (Lepidoptera: Noctuidae), an important safflower pest in Ankara Province, Turkey, are parasitized by *Aleiodes* (Chelonorhogas) *miniatus* (Herrich-Schäffer, 1838) (Hymenoptera: Braconidae: Rogadinae). This is the first report of this host-parasitoid relationship worldwide.

Keywords: *Heliothis peltigera, Aleiodes miniatus, Carthamus tinctorius,* safflower, first record

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Introduction

Safflower (*Carthamus tinctorius* L. (Asteraceae) is an annual plant that can be grown on stony, arid and steppe soils. It is more productive than many oilseed crops in arid regions. In Turkey, it is grown on approximately 25,000 ha and 35,000 tons are produced annually (TÜİK, 2018). *Heliothis peltigera*, which is among the major pests of safflower in Great Britain, India, Iran, Italy, Turkey and the United States of America, been reported to feed on safflower, chickpeas, beans, corn, vegetables, ornamental plants, cotton, oregano, jimsonweed and *Paulownia* (Keyder, 1961; İyriboz, 1971; Manjunanth et al, 1976; Kornoşor & Düzgüneş, 1980; Meierrose et al, 1989; Parisi & Ranalli, 1997; Bajwa & Gul, 2000; Tezcan et al, 2004; Saeidi et al, 2011). In Turkey, *H. peltigera* damages chickpeas, corn, cotton, safflower and thyme in the Adana, Adapazari, Aegean, Çukurova, Hatay, Istanbul, Izmir, Konya, Mersin, Salihli and Turgutlu regions (Keyder, 1961; İyriboz, 1971; Kornoşor & Düzgüneş, 1980; Şengonca, 1983; Tezcan, 2004; Damkacı, 2013). Safflower producers have been greatly affected by *H. peltigera* damage in parallel with the increase in safflower cultivation in Ankara Province since 2014. The Ministry of Agriculture and Forestry in Turkey has allowed the temporary use of some chemicals for the control *H. peltigera.* For this reason, research on the bio-ecology of *H. peltigera* has been initiated in Ankara Province.

Parasitoids of *H. peltigera* have been reported from various countries, including *Aspilota insidiatrix* Marsh., *Orthostigma pumilia* Nees, *Meteorus pulchicornus* Wesm., *Chelonus heliopae* Gupta, *Apanteles spp*., *Microgaster similis* Nees, *Microgaster demolitor* Wilkinson (Braconidae); *Hemiteles* sp., *Campoletis maculipes* Tschek, *Eriborus* sp., *Pristomerus* sp., *Pristomerus* sp. *Campoletis chlorideae* Uchıda, *Netelia* sp., *Charops bicolor* Szepligets, *Sinophorus xanthostomus* Gravenhorst (Ichneumonidae); *Tachina fera* L., *Eucarcelia illota* Curran, *Palexorista laxa* Curran, *Exorista xanthaspis* Wied. (Tachinidae); *Winthemia quadripustulata* F. *Trichogramma chilotraeae* Nag and Nagar. and *Trichogramma chilonis* Ishii (Trichogrammatidae) (Thompson, 1946; Manjunath, 1976; Calbukov, 1978, Meierrose et al, 1989; Iqbal & Mohyuddin, 1990). Two endoparasitoid species of *H. peltigera* have been reported in Turkey, namely *Chelonus oculator* Fabricius in the Marmara and Black Sea regions (Aydoğdu & Beyarslan, 2007), and *Habrobracon hebetor* Say (Hym.: Braconidae) is very common (Beyarslan, 2014).

In this study, *A.* (*C.*) *miniatus,* which is first reported as a parasitoid of *H. peltigera* globally, is described.

Materials and Methods

Surveys were carried out in the safflower cultivation areas of Ankara Province in 2018 - 2019 to determine the natural enemies of *H.peltigera*. For this purpose, 100 butterfly larvae were collected from randomly selected plants from safflower fields in the towns of Bala, Gölbaşı, Haymana, Polatlı and Şereflikoçhisar in Ankara

Province. The larvae were cultured and monitored under laboratory conditions of 25±1°C and 65±5 % humidity and 16:8 h D:L) on safflower leaves in Petri dishes. Fresh safflower leaves were placed daily in all Petri dishes. The larvae suspected to be parasitized were placed in separate Petri dishes and observed until the adult parasitoids emerged. Healthy larvae of the butterfly were fed until pupation and the identification of emerged adults of *H. peltigera* was made by Dr. M. Özdemir (Ankara Plant Protection Central Research Institute) according to the description of Fibiger et al. (2009). The obtained parasitoid samples were placed in tubes containing 70% alcohol. Identification of the parasitoid was made according to the descriptions of Tobias (1986), Belokobylskij (2000; 2005) and Beyarslan (2015).

Result and Discussion

During studies of the natural enemies of *H. peltigera* in safflower in Ankara Province, *Aleiodes (C.) miniatus* adults were obtained from three of the cultured larvae. This parasitoid was described by Herrich-Schäffer (1838) as *Rogas miniatus*. The species was linked to the genus *Aleiodes* Wesmael, 1838 in a revision (Papp, 1985). In a later arrangement, the *Chelonorhogas* Enderlein, 1912 subgenus was included (Belokobylskij, 2000).

***Aleiodes (Chelonorhogas) miniatus* (Herrich-Schäffer,1838)**

Material examined. Ankara, Gölbaşı, Karaali, 07.vi.2018, 39° 37' 30"N 32° 54' 32"E, 1166 m a.s.l., 3♀; Ankara, Gölbaşı, Karaali, 07.vi.2018, 39° 37' 55"N 32° 54' 32"E, 1178 m a.s.l, 1♀, 1♂; Ankara, Polatlı, Yeniköseler, 24.v.2019, 39° 45' 5"N 31° 53' 53"E, 857 m a.s.l., 1♂.

Diagnostic features. Third segment of maxillary palp of usual shape, not wider (Fig. 1a). Eyes usually oval or weakly reniform, genae well developed, their height not more than half longitudinal diameter of eye. Temples bulged, approximately as long as transverse diameter of eye. Antennae setiform and with about 65 segments. Sides of mesosoma, hind coxae and apical metasomal tergites usually lacking granulose sculpture, smooth, lustrous. Nervulus of forewing postfurcal (Fig. 1b). Radial cell of hind wing apically broadened (Fig. 1c). Larger spur of hind tibia not shorter than one-third length of 1st tarsal segment. Propodeum densely punctate, rarely also rugose, without areolae, usually longitudinally sculpted. Length of 1st metasomal tergite usually not more than its width at apex; metasomal tergites with coarse punctures, without distinct longitudinal folds (Fig. 1d).

Figure 1. *Aleiodes* (*Chelonorhogas*) *miniatus* (Herrich-Schäffer,1838) Lateral habitus of females (a), fore wing (b), hind wing (c), metasona in dorsal wiev (d) (photos by A.Beyarslan).

Aleiodes (C.) miniatus is distributed widely in the Palaearchtic region: Austria, Czech Republic and Slovakia (formerly Czechoslovakia), Finland, Germany, Hungary, Italy, Kazakhstan, Lithuania, Mongolia, Poland, Russia, Slovakia, Sweden, Syria and Turkey (Yu et al. 2016).

Aleiodes miniatus was recorded in Sarıkamış (Kars) (Beyarslan, 2015) and in Aegean region Turkey (Aydoğdu, 2015).

In this study, the adult *H. peltigera* parasitoids emerged after the field collected larvae had been reared for 12 days. Initially, the larvae continued feeding for 2 days, then stopped feeding and after a while they became completely mummified. The parasitoids completed their development within the host larvae and emerged from as adult wasps.

Species belonging to the genus *Aleiodes* are known to parasitize the larvae of the families Geometridae and Noctuidae (Lepitoptera), and to be coinobiont endoparazitoids (Shaw, 1997). Butterfly larvae parasitized by species of the genus *Aleiodes* continue to feed for a while, and then the larvae become fully mummified (Achterberg & Mark, 2016).

Research on the bio-ecology of *H. peltigera* has been very limited, although there is a considerable amount of literature on its parasitoids and predators in the worldwide (Thompson, 1946; Manjunath, 1976; Calbukov (1978; Meierrose et al. 1989; Iqbal & Mohyuddin, 1990; Shaw, 1997; Achterberg & Mark, 2016). A review of this literature revealed that in the present study *H. peltigera* is recorded for the first time as a host of *A.(C.) miniatus* worldwide.

The biology of *A. (C.) miniatus* is unknown and therefore should be studied. In addition, its effectiveness as a biological control agent of *H. peltigera* should be determined.

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