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Two torymid species (Hymenoptera: Chalcidoidea, Torymidae) developing on *Artemisia* gall midges (Diptera: Cecidomyiidae)

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Abstract: Two parasitoid wasps, *Torymus artemisiae* Mayr and *Torymoides violaceus* (Nikol'skaya), were reared on *Artemisia herba-alba* (Asteraceae) galles, in central Iran. *Torymus artemisiae* and *T. violaceus* were developed from the gall midges: *Rhopalomyia navasi* Tavares and *R. hispanica* Tavares, respectively. The occurrence of these two parasitic wasps in Iran, and their associations with *R. navasi* and *R. hispanica*, are new. Data on the wasps' biological associations and geographical distribution are provided. The parasitoid compositions of the genus *Rhopalomyia* (Diptera: Cecidomyiidae) were also discussed.

Key words: distribution, new records, parasitoids, *Torymoides, Torymus*

Introduction

The family Torymidae has about 986 existing species. Torymidae usually develop inside galls or developing seeds. The Torymidae larvae may be parasitoids of gall makers, phytophagous or even of both (Noyes 2013). Torymids of Iran are now represented by 48 species in 16 genera (Lotfalizadeh and Gharali 2005, 2012; Tatogh *et al*. 2008; Zarnegar *et al*. 2008; Fallahzadeh *et al.* 2009; Nazemi-Rafie and Lotfalizadeh 2012), but there is no biological association available. Only limited biological information has been reported about chalcidoids in Iran (Sohrabi *et al*. 2014).

Recently two gall midges, *Rhopalomyia navasi* Tavares, 1904 and *R. hispanica* Tavares, 1904 (Diptera: Cecidomyiidae), have been reported from the Yazd province in central Iran (Skuhravá *et al.* 2014). Larvae of *R. navasi* and *R. hispanica* caused large, dense, white, pubescent stem and small pitcher-shaped (globular) bud galls on *Artemisia herba-alba* (Asteraceae), respectively (Skuhravá *et al*. 2014). Species of the genus *Rhopalomyia* are parasitized by 65 species of Chalcidoidea including 12 species of Torymidae in two genera (Noyes 2013). Here, we report two torymids parasitizing *R. navasi* and *R. hispanica* for the first time in Iran.

Materials and Methods

This study was carried out in Gharbalbiz, Mehriz county, Yazd province, central Iran (31°31'N, 54°23'E, elevation 1580–1720 m a.s.l.). White, pubescent stem galls of *R. navasi* (Fig. 1A) and pitcher-shaped bud galls of *R. hispanica* (Fig. 1B) were randomly sampled on *A. herba-alba* from March–June 2011. The galls were put separately inside plastic bags and transported to the laboratory. They were reared in suitable 500 cc plastic jars, in shade, and at room temperature, until the adults of the gall midges and/or their associated parasitoids, emerged.

Reared parasitoids were conserved in ethanol 75%. Specimens were card-mounted, based on Noyes (1982). The identification and illustrations were made using an Olympus™ SZH stereomicroscope which was equipped with a Canon™ A720 digital camera. The specimens were identified according to reliable keys and descriptions (Nikol'skaya 1952; Peck *et al.* 1964; Nikol'skaya and Zerova 1978; Doğanlar 1989; Graham and Gijswijt 1998).

The specimens are deposited in the insect collection of the Department of Plant Protection, Agricultural and Natural Resources Research of East-Azarbaijan, Tabriz, Iran.

Results

This study showed that two torymids from the subfamily Toryminae and tribes Torymini and Torymoidini, parasitised the gall making cecidomyiids on *Artemisia*, *R. navasi* and *R. hispanica*, in the province of Yazd, Iran.

Torymus artemisiae Mayr, 1874 (Hym.: Toryminae, Torymini)

1) *Callimome artemisiae* (Mayr, 1874), in: Erdös, 1946: 54;
2) *Torymus* (*Torymus*) *artemisiae* Mayr, 1874, in: Zavada, 2003: 114.

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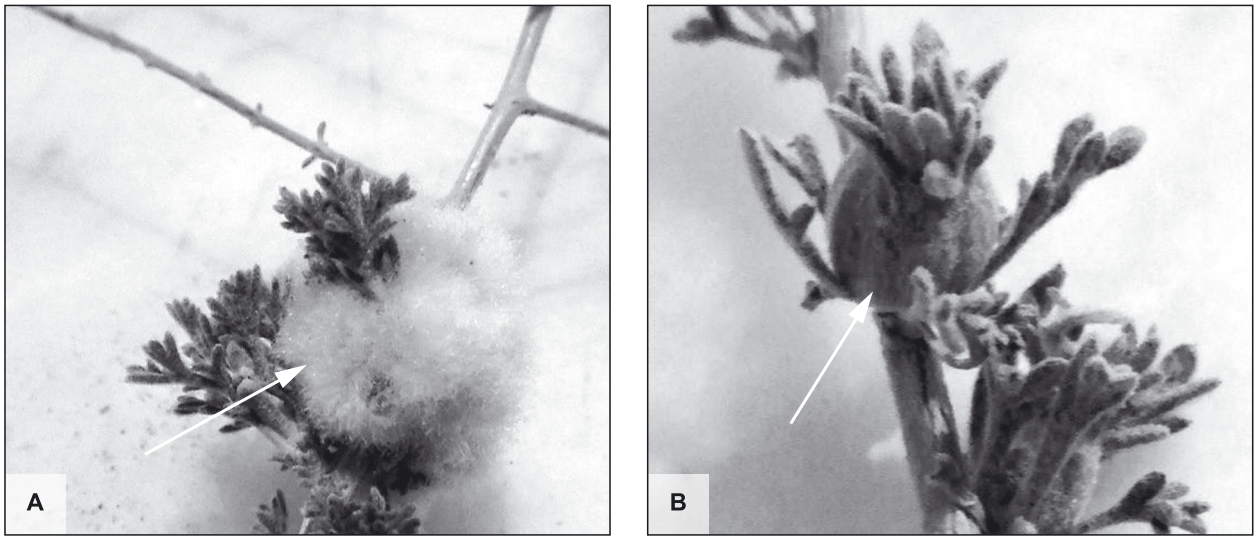

Fig. 1. Two types of galls on *Artemisia herba-alba:* A – white, pubescent stem galls of *Rhopalomyia navasi*; B – pitcher-shaped bud galls of *R. hispanica*

Material examined

Iran, Yazd province, Mehriz county, Gharbalbiz, 25.iii.2011, 3♀♀ & 5♂♂, *ex* large globular stem galls of *R. navasi* on *A. herba-alba, A.* Mohammadi-Khoramabadi leg.

Diagnostic characters

This species is close to *Torymus valerii* Graham & Gijswijt, 1998 that was reared from *Rhopalomyia valerii* Tavares on *Juniperus oxycedrus*. Separating characters of these species are pedicellus + flagellum 1.17–1.25 times of head breath (1.25–1.35 times in *T. valerii*) and postocellar line slightly less than 1.9 times ocello-ocular line (1.9–2.1 times in *T. valerii*) (Graham and Gijswijt 1998).

Note

Host-parasitoid association of *T. artemisiae* and *R. navasi* on the plant *A. herba-alba* is newly established. *Rhopalomyia navasi* has a wide zoogeographical distributional area in Spain, Romania, Morocco, Algeria, Tunisia, Libya, Egypt, Syria, and Iran (Skuhravá *et al*. 2014). This species was reared from large globular stem galls of *R. navasi* with white pubescent galls (Fig. 1A). *Torymus artemisiae* has also been recorded on *Rhopalomyia artemisiae* Bouche (reported as *Cecidomyia artemisiae*) and *Rhopalomyia baccarum* (Wachtl) (reported as *Misospatha baccarum*) (Diptera: Cecidomyiidae) (Noyes 2013).

Distribution

Europe (France, Hungary, Romania, Russia), Asia (Turkmenistan) (Noyes 2013), and Iran (new record).

***Torymoides violaceus* (Nikol'skaya, 1954) (Hym.: Toryminae, Torymoidini)**

1) *Ameromicrus violaceus* Nikol'skaya, 1954, in: Nikol'skaya & Kyao, 1954: 412;
2) *Liodontomerus bifasciatus* Szelényi, 1973, in: Szelényi, 1982: 379;
3) *Torymoides* (*Ameromicrus*) *violaceus* (Nikol'skaya, 1954), in: Askew *et al*., 2001: 14.

Material examined

Iran, Yazd province, Mehriz county, Gharbalbiz, 25.iii.2011, 1♀ & 2♂♂, *ex* small pitcher-shaped bud galls of *R. hispanica* on *A. herba-alba,* A. Mohammadi-Khoramabadi legs.

Diagnostic characters

Body dark bluish-violaceous, mid and hind tibiae concolorous with femora; forewing bare basally, with two transverse bands; ovipositor as long as body; flagellar segments squared, flagellum + pedicellus 1.15 times as long as width of head.

Note

Torymoides violaceus was reared for the first time from *R. hispanica* on *A. herba-alba*. Its host, *R. hispanica* is recorded only from Spain and Iran (Skuhravá *et al.* 2014). *Asphondylia mikii* Wachtl and *Dasineura loewei* (Mik) (Diptera: Cecidomyiidae) are known as other hosts of *T. violaceus* (Noyes 2013).

Distribution

Europe (Bulgaria, Moldova, Russia, Spain), Caucasus (Azerbaijan, Georgia), Asia (Kazakhstan), (Noyes 2013), Japan (Askew *et al.* 2001), and Iran (new record).

Discussion

With the introduction of these two torymids to the fauna of Iran, the number of reported species of the family Torymidae reached 50, and the genera *Torymus* reached 6, and *Torymoides* to 2 species (Lotfalizadeh and Gharali 2005, 2012; Tatogh *et al*. 2008; Zarnegar *et al*. 2008; Fallahzadeh *et al*. 2009; Nazemi-Rafie and Lotfalizadeh 2012).

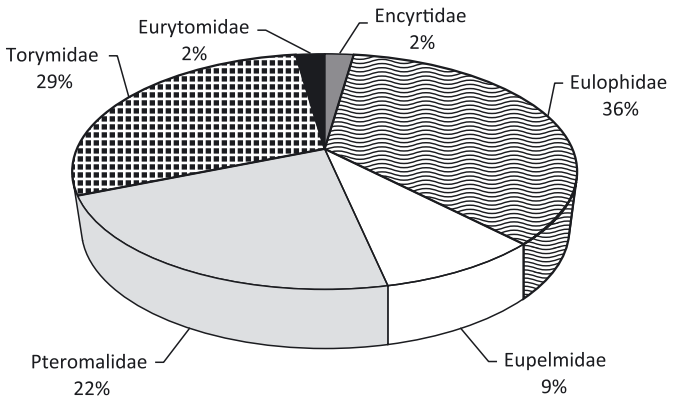

Fig. 2. Composition of associated parasitoids with *Rhopalomyia* species, after Noyes (2015) and present study

Torymus artemisiae and *Torymoides violaceus* have been found for the first time on *R. navasi* and *R. hispanica*, respectively. Eleven species of *Torymus* and an unknown species of *Torymoides* have been reported on different species of *Rhopalomyia* (Noyes 2013). Including these two species, 45 chalcidoid species from six families are now known as parasitoids of *Rhopalomyia* species: Eulophidae 36% with 16 species, Torymidae 29% with 13 species, Pteromalidae 22% with 10 species, Eupelmidae 9% with four species, Encyrtidae 2% with one species, and Eurytomidae 2% with one species (Fig. 2). The fauna of the family Cecidomyiidae of Iran is considerably rich and composed of 61 species (Skuhravá *et al.* 2014). Future rearing studies will hopefully reveal new associations.

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