

**APHID PARASITOID ASSOCIATIONS ON STONE FRUIT  
TREES IN KHORASAN RAZAVI PROVINCE (IRAN)  
(HYMENOPTERA: BRACONIDAE: APHIDIINAE)**

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**ABSTRACT:** During 2009-2010, Aphid parasitoids wasps (Hymenoptera: Braconidae: Aphidiinae) were studied in Khorasan Razavi province, North East of Iran. Eight species from six genus, including *Aphidius matricariae* Haliday, *A transcaspicus* Telenga, *Binodoxys acalephae* Marshall, *B angelicae* Haliday, *Diaeratiella rapae* McIntosh, *Ephedrus persicae* Froggatt, *Lysiphlebus fabarum* Marshall and *Praon volucre* Haliday were reared from 26 associations in different location in Khorasan Razavi province in North East of Iran. *Aphidius transcaspicus* was the most abundant parasitoid species with 62% in our survey. The activity of hyperparasitoids was including, *Alloxysta castanea* Hartig, *Asaphes suspensus* Nees, *Dendrocerus carpenteri* Curits, *Pachyneuron aphidis* Bouche, *Phaenoglyphus vilosa* Hartig and *Syrphophagus aphidovorius* Mayr.

**KEY WORDS:** stone fruit trees, aphid parasitoids, *Aphidius transcaspicus*, Iran.

In Iran, stone fruit trees are including peach, apricot, plum, almond, cherry and black-cherry that are cultivated in the most areas (Esmaili, 1983). According to the statistics of the year 2008, the state of Khorasan Razavi, with 668447 hectares of stone fruit trees, is in the second rank in Iran (Radmehr, 2010). Aphids on stone fruit trees are an important group of plant insect pests which show a high biological potential in reducing the quality and quantity of ornamental plants (Rajabi, 1989). The most usual control method of pests is spraying the plants with insecticides that cause some problems, such as danger of poison residue, increase of second pest population and decrease of useful insects (Rajabi, 1989). Parasitoids have a critical impact on reduction of the population of aphids and 80% of parasitoid species belong to the Hymenoptera (Quicke, 1997). Aphid parasitoids of Aphidiinae play the most important role (Aphidiinae are solitary obligatory endoparasitoids of aphids (Stary & Schlinger, 1967). So many species of which have been considered as potential biocontrol agents (Stary & Schlinger, 1967; Lozier et al., 2008; Latham & Mills, 2010). Stary et al. (2000) reviewed the Aphidiine species of Iran and listed 49 species. Since then this number has increased to a total of 59 recognized species (Rakhshani et al., 2005-2008; Stary et al., 2005; Tomanovic et al., 2007). Importance of integrated pest management, the lack of information about diversity of parasitoid wasps associations to invasive aphids on stone fruit trees in Khorasan Razavi-Iran and also the importance of stone fruit trees, lead us to study on aphid parasitoids.

#### **MATERIAL AND METHODS**

Sampling on stone fruit trees was carried out during 2009 – 2010 in five different location of Khorasan Razavi-Iran. Samples from the host trees bearing aphid colonies consisting of live and mummified aphids and host plants were collected. Branches with leaves from each tree were carefully cut off and 15 branches with 8-10 cm were transported to plastic boxes which were labeled with date of sampling, host plants and

location and covered with mesh for ventilation (Figure 1). Boxes were held at room temperature for 2-3 weeks till the adult parasitoids emerged. The emerged wasps were clipped daily using an aspirator and dropped into 96% ethanol. Selected fresh specimens of aphids were immersed in 75% ethanol (Rezwani, 2001) and preserved there for later identification. The collected specimens were deposited in the Insect Collection of Agriculture Faculty, Ferdowsi University of Mashhad, Mashhad-Iran.

## RESULTS

We have determined the presence of eight parasitoid species from six genus reared in associations of aphids on stone fruit trees at different locations of Khorasan Razavi province, North East of Iran.

### Aphid, parasitoids and plant association

#### *Aphidius matricariae* Haliday, 1834 (Fig. 2a)

*Brachycaudus divericata* Shaposhnikov on plum: Khorasan Razavi-Kardeh, 3 May 2010, (2♀).

*Brachycaudus helichrysi* Kaltenbach on apricot: Khorasan Razavi-Mashhad, 5 May 2010, (2♀); Khorasan Razavi-Torghabe, 12 May 2010, (32♀, 11♂); on plum: Khorasan Razavi-Torghabe, 5 May 2010, (2♀).

*Hyalopterus amygdali* Blanchard on apricot: Khorasan Razavi-Torghabe, 12 May 2010, (5♀, 2♂).

*Myzus persicae* Sulzer on apricot: Khorasan Razavi-Mashhad, 27 April 2010, (2♀, 1♂); on Peach: Khorasan Razavi-Torghabe, 20 April 2010, (4♀, 2♂); 12 May 2010, (8♀, 3♂).

#### *Aphidius transcaspicus* Telenga, 1958 (Fig. 2b)

*Hyalopterus amygdali* Blanchard on almond: Khorasan Razavi-Golmakan, 29 May 2010, (2♀, 1♂); Khorasan Razavi-Torghabe, 20 April 2010, (11♀, 5♂); 9 May 2010, (12♀, 6♂); 12 May 2010, (9♀, 5♂); 19 May 2010, (17♀, 8♂); on apricot: Khorasan Razavi-Mashhad, 5 May 2010, (8♀, 6♂); on peach: Khorasan Razavi-Faragard, 30 April 2010, (5♀, 3♂).

*Hyalopterus pruni* Geoffroy on apricot: Khorasan Razavi-Faragard, 20 September 2009, (12♀, 5♂); Khorasan Razavi-Mashhad, 25 April 2010, (6♀, 2♂); 27 April 2010, (6♀, 11♂); 3 May 2010, (4♀, 3♂); 5 May 2010, (3♀, 2♂); 11 May 2010, (30♀, 26♂); 18 May 2010, (127♀, 79♂); 20 May 2010, (17♀, 9♂); 23 May 2010, (15♀, 12♂); Khorasan Razavi-Torghabe, 5 May 2010, (9♀, 7♂); 11 May 2010, (4♀, 4♂); 18 May 2010, (3♀, 1♂); on peach: Khorasan Razavi-Faragard, 23 October 2009, (6♀); 30 April 2010, (19♀, 10♂); Khorasan Razavi-Golmakan, 29 May 2010, (2♀, 1♂); on plum: Khorasan Razavi-Faragard, 10 September 2009, (5♀, 1♂); 25 October 2009, (8♀, 3♂); 9 May 2010, (6♀, 2♂); Khorasan Razavi-Kardeh, 29 October 2009, (2♀); Khorasan Razavi-Mashhad, 5 May 2010, (13♀, 7♂); 18 May 2010, (1♀, 1♂).

#### *Binodoxys acalephae* Marshall, 1896 (Fig. 2c)

*Brachycaudus helichrysi* Kaltenbach on plum: Khorasan Razavi-Mashhad, 3 May 2010, (7♀, 6♂); 5 May 2010, (9♀, 5♂).

#### *Binodoxys angelicae* Haliday, 1833 (Fig. 2d)

*Brachycaudus helichrysi* Kaltenbach on plum: Khorasan Razavi-Mashhad, 3 May 2010, (3♀, 2♂); 5 May 2010, (5♀, 4♂).

***Diaeratiella rapae*** M'Intosh, 1855 (Fig. 2e)

*Hyalopterus pruni* Geoffroy on apricot: Khorasan Razavi-Mashhad, 27 April 2010, (1♀, 1♂); on plum: 5 May 2009, (2♀, 1♂).

*Myzus persicae* Sulzer on peach: Khorasan Razavi-Faragard, 30 April 2010, (2♀).

***Ephedrus persicae*** Froggatt, 1904 (Fig. 2f)

*Hyalopterus amygdali* Blanchard on almond: Khorasan Razavi-Torghabe, 3 May 2010, (9♀, 4♂); 5 May 2010, (18♀, 9♂); 9 May 2010, (13♀, 6♂); 11 May 2010, (20♀, 11♂); 12 May 2010, (7♀, 1♂); 17 May 2010, (6♀, 3♂); 18 May 2010, (10♀, 8♂); 19 May 2010, (10♀, 6♂).

*Brachycaudus amygdalinus* Schout on almond: Khorasan Razavi-Torghabe, 9 May 2010, (5♀, 3♂); 11 May 2010, (5♀, 4♂); 12 May 2010, (19♀, 11♂); 17 May 2010, (6♀, 3♂); 18 May 2010, (3♀, 1♂); 19 May 2010, (4♀, 2♂).

***Lysiphlebus fabarum*** Marshall, 1896 (Fig. 2g)

*Hyalopterus pruni* Geoffroy on apricot: Khorasan Razavi-Mashhad, 5 May 2010, (1♀, 1♂); on plum: Khorasan Razavi-Mohamadabad, 27 April 2010, (3♀, 1♂); 5 May 2010, (4♀, 2♂).

*Brachycaudus helichrysi* Kaltenbach on plum: Khorasan Razavi-Mashhad, 10 May 2009, (2♀, 1♂).

***Praon volucre*** Haliday, 1833 (Fig. 2h)

*Myzus persicae* Sulzer on peach: Khorasan Razavi-Faragard, 30 April 2010, (2♀, 1♂).

*Hyalopterus pruni* Geoffroy on apricot: Khorasan Razavi-Mashhad, 25 April 2010, (3♀, 2♂); 27 April 2010, (2♀, 1♂).

*Brachycaudus helichrysi* Kaltenbach on apricot: Khorasan Razavi-Mashhad, 5 May 2010, (5♀, 6♂); on plum: Khorasan Razavi-Mashhad, 5 May 2010, (1♀, 1♂); on peach: Khorasan Razavi-Kardeh, 30 April 2010, (2♀, 1♂).

In this survey the most abundant aphid was *Hyalopterus pruni* (Hom: Aphididae) on plum and apricot in all places of sampling and this species was also the most frequently parasitized. From the parasitoids, *Aphidius transcaspicus*, with 62%, was the most abundant parasitoid (Figure 3a). In our survey *Pterochlorus persicae* Chold (Hom: Aphididae) was free of parasitoid in all places of sampling (Khorasan Razavi-Faragard on plum, Khorasan Razavi-Mashhad on almond, and plum). Female parasitoids, with 63%, were more numerous than the male parasitoids with 37% (Figure 3b). Also, in this survey among hyperparasitoids, *Pachyneuron aphidis* Bouche, with 86%, was the most abundant hyperparasitoid (Fig. 3c).

## DISCUSSION

We have observed that different species of parasitoids attack different species of aphids on different plant hosts such as *Aphidius matricariae*, *Lysiphlebus fabarum* and *Praon volucre*. However we have observed that *Aphidius transcaspicus*, as a specialized endo-parasitoid restricted to the genus *Hyalopterus* spp. (Kavallieratos et al., 2001; Rakh-shani et al., 2008). This species has a good biological potential since, as we have seen in Khorasan Razavi-Mashhad, this species parasitized all of the *Hyalopterus pruni* species on a plum

tree (data unpublished). In fact, it has been shown that this species can be used as a powerful biological control agent against the mealy plum aphid, *Hyalopterus pruni* in plum orchards (Lozier et al., 2006, 2008; Latham & Mills, 2010). *Ephedrus persicae* Froggatt only found in Khorasan Razavi-Torghabe on almond, probably, because of that many of association are limited to their host plants and respective habitats in the biocorridors (Rakhshani et al., 2007). In addition, among aphid parasitoids, *Diaeratiella rapae* M'Intosh was found rarely. It has been recorded from a limited host rang from Iran (Stary et al., 2000; Rakhshani et al., 2005, 2006). The abundance of aphid parasitoids primarily depends on associated aphid abundance and other factors such as plant communities (Stary, 1968), altitude, geographical area and year of sam-pling (Rakhshani et al., 2008). The activity of hyperparasitoids seems to impair the efficacy of parasitoids since they destroy colonies of the mummified aphids. Our col-lected hyperparasitoids were including, *Alloxysta castanea* Hartig, *Asaphes suspensus* Nees, *Dendrocerus carpenteri* Curits, *Pachyneuron aphidis* Bouche, *Phaenoglyphus villosa* Hartig and *Syrphophagus aphidovor*us Mayr.

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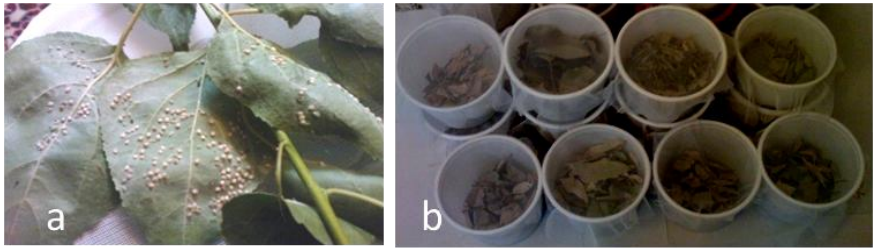


Figure 1- a- Apricot leaves with mummified aphids of *Hyalopterus pruni* Geoffroy, b- Plastic boxes covered with mesh.



Figure 2. Female parasitoids: a- *Aphidius matricariae* Haliday, b- *A transcaspicus* Telenga, c- *Binodoxys acalephae* Marshall, d- *B. angelicae* Haliday, e- *Diaeratiella rapae* M'Intosh., f- *Ephedrus persicae* Froggatt, g- *Lysiphlebus fabarum* Marshall, h- *Praon volucre* Haliday.

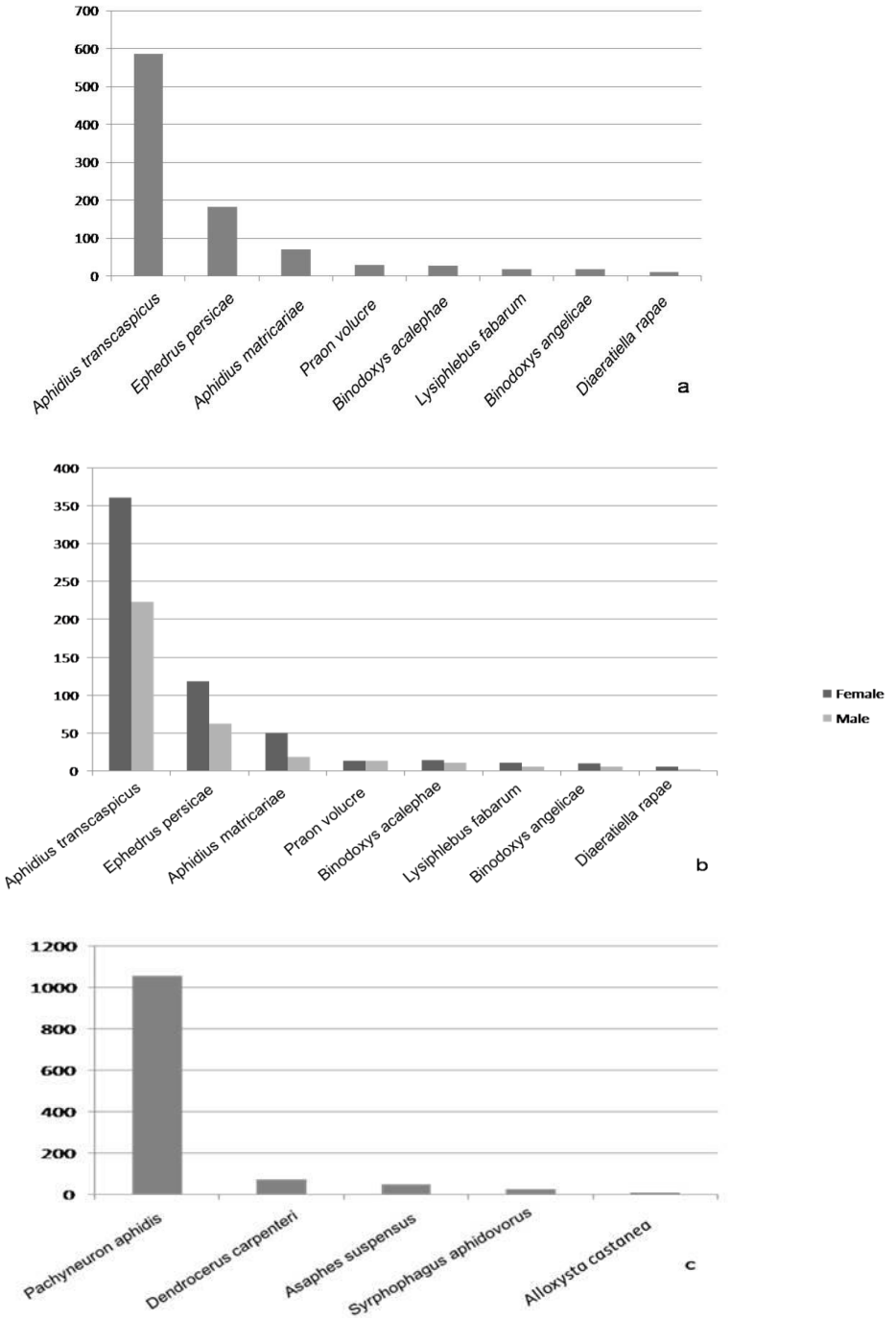


Figure3- Total numbers of aphid parasitoids (a), total numbers of sexes (b) and total numbers of hyperparasitoids on stone fruit trees in Khorasan Razavi, Iran.