

Aphid parasitoids (Hymenoptera: Braconidae: Aphidiinae) and their tritrophic relationships in Kerman province, Southeastern Iran

Barahoei H.^{a*}, Madjdzadeh, S.M.^b, Mehrparvar, M.^c

^a *Agricultural Research Institute, University of Zabol, Zabol, Iran.*

^b *Department of Biology, Faculty of Sciences, Shahid Bahonar University of Kerman, Kerman, Iran.*

^c *Department of Ecology, International Center for Science, High Technology & Environmental Sciences, Kerman, Iran.*

Aphid parasitoids (Braconidae: Aphidiinae) in several localities of Kerman province, Southeastern Iran were studied between 2007 and 2008 and 20 species belonging to eight genera were identified. Parasitoids were reared from 25 field-collected aphid species occurring on 31 host plant species. In the present study, 83 parasitoid-aphid-plant associations, their aphid hosts, and the respective host plants were determined. Nineteen species (except *Lysiphlebus fabarum* (Marshall, 1896)) were new records for Kerman province and two species (*Praon flavinode* (Haliday, 1833) and *Praon unium* Mescheloff and Rosen, 1988) were new records for Iran. An illustrated identification key to species is presented.

Key words: Aphid parasitoids, Aphidiinae, tritrophic associations, new record, Kerman, Iran

INTRODUCTION

Aphids are an economically important group of insects, which belong to Hemiptera. They have worldwide distribution and cause great damage to plants directly by different type of gall, leaf deformation, flower and young fruit drop, underdeveloped shoots and honeydew residues causing sooty mold or indirectly by plant viruses transmission (Aslan et al., 2004; Kavallieratos et al., 2005, 2008a). One of the major groups of aphid parasitoids belongs to the subfamily Aphidiinae within the family Braconidae. These are considered as natural enemies of aphids that play an important role in biological control programs (Starý, 1970; Kavallieratos et al., 2001, 2004, 2008a and b; Aslan et al., 2004; Rakhshani et al., 2006). They are specialized solitary endoparasitoids of aphids (Starý, 1970; Kavallieratos et al., 2001, 2004; Rakhshani et al., 2007; Tomanović et al., 2003b, 2004, 2008).

The subfamily Aphidiinae includes more than 55 genera and about 400 known species (Mescheloff and Rosen, 1988; Kavallieratos et al., 2001; Aslan et al., 2004; Rakhshani, 2006). Starý et al. (2000) reviewed host associations of aphid parasitoids in Iran. Several studies have been carried out on aphid parasitoids in some provinces of Iran including Guilan (Yaghoobi, 1998), Khuzestan (Mossadegh, 1991) and North Khorasan (Kazemzadeh, 2009). In a study, Rakhshani (2006) considered morphological and phylogenetic relationships of Aphidiinae in Iran but to date no faunistic survey have yet been carried out on aphid parasitoids in Kerman province. The aim of the present study was to identify the aphid parasitoids and their tritrophic associations in different areas

of Kerman province, Southeastern of Iran. An identification key to the species occurring in Kerman province is provided.

MATERIAL AND METHODS

Samples were collected from wild plants, which were infected by aphid colonies at several localities in Kerman province from autumn 2007 to autumn 2008. Aphids and their host plants were transferred to laboratory into the small plastic buckets with lid. Then these were kept for 3-4 weeks in laboratory until emergence of parasitoids. The emerged wasps placed into vials containing 96% ethanol (Rakhshani, 2006) and some adult samples were also mounted in Hoyer medium as microscopic slides. To prepare microscopic slides, some of the adult aphids transferred into 75% ethanol. The adult parasitoids were dissected in several parts namely, head, forewing, mesoscutum, propodeum, petiole, hind leg and the female genitalia.

The species Identification was based on available keys (Mescheloff and Rosen, 1988; Starý, 1979; Rakhshani, 2006).

Morphological characters of all species were drawn under a microscope (Olympus phase contrast) equipped with drawing tube. The plants get dried and were identified. The morphological terminology used in the parasitoid species description is based on Starý (1973, 1979), Kavallieratos et al. (2001), Takada (2002), Tomanović et al. (2003a, 2003b, 2003c), Rakhshani (2006) and Rakhshani et al. (2006, 2007, 2008).

Information for each specimen is listed as follows: host aphid, host plant, locality (city or village, altitude and coordinates data using GPS), date and sample data (number and gender). New records of parasitoid species, host aphids, host plants and host aphid-host plant combinations are indicated by an asterisk (*), a dagger (†), two dagger (††) and double dagger (‡), respectively. Material examined in this study is deposited in the insect collection of Zoological Museum of Shahid Bahonar University of Kerman, Iran (ZMSBUK).

RESULTS

Twenty species belonging to eight genera of Aphidiinae were reared from 25 aphid species occurring on 31 host plant species and identified. Eighty-three parasitoid-aphid-plant associations were recorded. Nineteen species ((except *Lysiphlebus fabarum* (Marshall, 1896) that already was reported by Takallozadeh (2003)) were recorded for the first time from Kerman province from which two species (*Praon flavinode* (Haliday, 1833) and *Praon unitum* Mescheloff and Rosen, 1988) were recorded for the first time from Iran (Barahoei et al., 2010).

Parasitoid-Aphid-Plant Associations

Adialytus salicaphis (Fitch, 1855) (Figs. 2a, 4a, 6a)

Chaitophorus sp. on *Populus nigra* L., (Lalehzar, 2461m, N 29° 30' E 56° 39') 09 October 2007 (1♀ 5♂); †*Sipha maydis* Pass. on ††*Cynodon dactylon* (L.), (Kerman, 1771m, N 30° 15' E 57° 06') 22 November 2007 (1♀ 4♂).

Aphidius cf. *colemanni* Viereck, 1912 (Figs. 1g, 2b, 4b, 5f, 6b)

Aphis sp. on *Solanum* sp., (Bardsir, 2057m, N 29° 56' E 56° 34') 31 October 2007 (1♀); *Aphis craccivora* Koch on ††*Polygonum* sp., (Mahan, 1772m, N 30° 13' E 57° 06') 4 December 2007 (1♀); *Aphis fabae* Scop. on ††*Centaurea iberica* Trev., (Bidkhan, 2480m, N 29° 39' E 56° 30') 31 October 2007 (1♀ 2♂); Ditto, on ††*Rumex* sp., (Shahdad, 929m, N 30° 23' E 57° 32') 28 November 2007 (2♀ 2♂); *Aphis gossypii* Glover. on *Cucurbita pepo* L., (Sirch, 1734m, N 30° 11' E 57° 33') 28 November 2007 (15♀ 5♂); Ditto, on *Cucurbita pepo* L., (Kerman, 1759m, N 30° 15' E 57° 06') 02 November 2007 (1♀); †*Aphis solanella* Theob. on ††*Solanum alatum* Moench., (Kouhpayeh, 2204m, N 30° 31' E

57° 14') 24 October 2007 (4♀ 1♂); *Ditto*, on *Solanum* sp., (Sirch, 1723m, N 30° 11' E 57° 33') 28 November 2007 (2♀ 2♂); *Brachycaudus helichrysi* (Kalt.) on *Calendula* sp., (Sirjan, 1773m, N 29° 28' E 55° 41') 21 November 2007 (83♀ 55♂); †*Brachycaudus tragopogonis* (Kalt.) on ††*Tragopogon graminifolius* DC., (Sirjan, 1756m, N 29° 27' E 55° 41') 21 November 2007 (1♀); *Ditto*, on *Tragopogon graminifolius* DC., (Kerman, 1773m, N 30° 14' E 57° 06') 08 November 2007 (18♀ 8♂); *Myzus persicae* (Sulzer) on †*Convolvulus arvensis* L., (Kerman, 1767m, N 30° 17' E 57° 04') 07 December 2007 (9♀); †*Rhopalosiphum maidis* (Fitch) on ††*Sorghum bicolor* (L.), (Mahan, 1926m, N 30° 02' E 57° 14') 31 October 2007 (1♀ 1♂); †*Uroleucon* sp. on ††*Artemisia biennis* Willd., (Kouhpayeh, 2500m, N 30° 30' E 57° 10') 24 October 2007 (2♀ 1♂); †*Uroleucon sonchi* (L.) on ††*Sonchus oleraceus* (L.), (Kerman, 1763m, N 30° 15' E 57° 06') 09 November 2007 (1♀).

***Aphidius funebris* Mackauer, 1961 (Fig. 6c)**

Uroleucon sp. on *Acroptilon repens* DC., (Kerman, 1812m, N 30° 15' E 57° 06') 10 November 2007 (8♀ 2♂).

***Aphidius* cf. *matricariae* Haliday, 1834 (Figs. 2c, 4c, 5g, 6d)**

‡*Myzus persicae* (Sulzer) on *Convolvulus arvensis* L., (Mahan, 1920m, N 30° 02' E 57° 14') 20 November 2007 (2♀); *Rhopalosiphum maidis* (Fitch) on ††*Setaria glauca* (L.), (Bardsir, 2062m, N 29° 56' E 56° 34') 31 October 2007 (3♀ 1♂); *Ditto*, on ††*Sorghum bicolor* (L.) P. Beauv., (Mahan, 1926m, N 30° 02' E 57° 14') 31 October 2007 (2♀ 18♂).

***Aphidius persicus* Rakhshani and Starý, 2006 (Figs. 2d, 4d, 6e)**

Uroleucon sp. on ††*Launaea acanthodes* (Boiss.), (Kouhpayeh, 2172m, N 30° 31' E 57° 14') 24 October 2007 (2♀); *Ditto*, on ††*Picnomon acarna* (L.), (Mahan, 1770m, N 30° 12' E 57° 05') 13 May 2008 (1♀); *Uroleucon sonchi* (L.) on *Sonchus* sp., (Kerman, 1773m, N 30° 15' E 57° 06') 22 November 2007 (1♀ 1♂); *Ditto*, on ††*Sonchus oleraceus* (L.), (Lalehzar, 2848m, N 29° 30' E 56° 48') 09 October 2007 (2♀).

***Aphidius popovi* Starý, 1978 (Figs. 2e, 6f)**

†*Metopolophium dirhodum* (Walk.) on ††*Rosa begeriana* Schrenk., (Sarcheshmeh, 2558m, N 29° 59' E 55° 51') 14 April 2008 (1♀ 1♂).

***Aphidius smithi* Sharma and Subba Rao, 1959 (Fig. 6g)**

†*Aphis fabae* Scop. on ††*Raphanus sativus* L., (Sirch, 1732m, N 30° 11' E 57° 33') 28 November 2007 (1♀).

***Binodoxys acalephae* (Marshall, 1896) (Figs. 2f, 5a, 6l)**

Aphis (*Protaphis*) sp. on ††*Tragopogon graminifolius* DC., (Lalehzar, 2708m, N 29° 32' E 56° 46') 09 October 2007 (7♀ 7♂).

***Binodoxys angelicae* (Haliday, 1833) (Fig. 5b)**

‡*Aphis fabae* Scop. on *Rumex* sp., (Shahdad, 929m, N 30° 23' E 57° 32') 28 November 2007 (16♀ 7♂); †*Aphis solanella* Theob. on *Solanum alatum* Mench., (Kouhpayeh, 2204m, N 30° 31' E 57° 14') 24 October 2007 (15♀ 5♂).

***Diaeretiella rapae* (M'Intosh, 1855) (Figs. 2g, 4e, 6h)**

Brevicoryne brassicae (L.) on ††*Brassica rapa* L., (Kouhpayeh, 2204m, N 30° 31' E 57° 14') 20 May 2008 (68♀ 82♂); *Ditto*, on *Brassica oleracea* L., (Sirjan, 1772m, N 29° 28' E 55° 41') 21 November 2007

(212♀ 228♂); *Ditto*, on *Brassica oleracea* L., (Sirch, 1726m, N 30° 11' E 57° 33') 28 November 2007 (33♀ 38♂).

***Ephedrus niger* Gautier, Bonnamour and Gaumont, 1929 (Figs. 2h, 6i)**

Uroleucon sp. on *Acroptilon repens* DC., (Kerman, 1812m, N 30° 15' E 57° 06') 10 November 2007 (16♀ 11♂); *Ditto*, on *Acroptilon repens* DC., (Mahan, 1776m, N 30° 13' E 57° 06') 03 December 2007 (4♀ 5♂); *Ditto*, on ††*Artemisia biennis* Willd., (Kouhpayeh, 2500m, N 30° 30' E 57° 10') 24 October 2007 (1♀ 5♂); †*Uroleucon cichorii* (Koch) on ††*Cichorium intybus* L., (Kouhpayeh, 1836m, N 30° 28' E 57° 18') 24 October 2007 (1♀); *Uroleucon jaceae* (L.) on ††*Centaurea iberica* Trev., (Kerman, 1769m, N 05° 12' E 33° 45') 21 June 2008 (6♀ 8♂); *Uroleucon sonchi* (L.) on *Sonchus* sp., (Kerman, 1773m, N 30° 15' E 57° 06') 22 November 2007 (2♀ 2♂); *Ditto*, on ††*Sonchus oleraceus* (L.), (Lalehzar, 2848m, N 29° 30' E 56° 48') 09 October 2007 (16♀ 38♂); *Ditto*, on ††*Sonchus oleraceus* (L.), (Kerman, 1756m, N 30° 15' E 57° 06') 02 November 2007 (2♂).

***Ephedrus persicae* Froggatt, 1904 (Figs. 3a, 6j)**

Aphis craccivora Koch on ††*Polygonum* sp., (Mahan, 1772m, N 30° 13' E 57° 06') 03 December 2007 (1♀ 3♂); †*Rhopalosiphum maidis* (Fitch) on ††*Setaria glauca* (L.) P. Beauv., (Sirch, 1721m, N 30° 11' E 57° 33') 28 November 2007 (2♀ 1♂).

***Lysiphlebus confusus* Tremblay and Eady 1978 (Figs. 3b, 4f, 6k)**

†*Uroleucon* sp. on ††*Picnomon acarna* (L.), (Mahan, 1770m, N 30° 12' E 57° 05') 13 May 2008 (2♀).

***Lysiphlebus fabarum* (Marshall, 1896) (Fig. 3c)**

Aphis (*Protaphis*) sp. on ††*Picnomon acarna* (L.), (Mahan, 1780m, N 30° 12' E 57° 07') 04 December 2007 (2♀ 1♂); *Aphis fabae* Scop. on ††*Centaurea iberica* Trev., (Bidkhan, 2480m, N 29° 39' E 56° 30') 31 October 2007 (5♀ 1♂); *Ditto*, on ††*Raphanus sativus* L., (Sirch, 1732m, N 30° 11' E 57° 33') 28 November 2007 (3♀ 4♂); *Aphis craccivora* Koch on *Kochia* sp., (Bardsir, 2106m, N 29° 56' E 56° 34') 31 October 2007 (41♀ 46♂); *Ditto*, on ††*Kochia scoparia* (L.) Schard., (Kerman, 1772m, N 30° 14' E 57° 06') 17 May 2007 (4♀ 5♂); *Ditto*, on ††*Portulaca oleracea* L., (Shahdad, 481m, N 30° 24' E 57° 41') 28 November 2008 (8♀ 11♂); *Ditto*, on *Robinia pseudoacacia* L., (Kerman, 1785m, N 30° 15' E 57° 06') 18 October 2007 (11♀ 16♂); *Ditto*, on ††*Tragopogon graminifolius* DC., (Lalehzar, 2737m, N 29° 31' E 56° 46') 18 May 2008 (35♀ 46♂); *Aphis gossypii* Glover on ††*Chrysanthemum* sp., (Kerman, 1812m, N 30° 15' E 57° 06') 07 December 2007 (4♀ 7♂); *Ditto*, on ††*Cucurbita pepo* L., (Kerman, 1759m, N 30° 15' E 57° 06') 02 November 2007 (12♀ 10♂); *Brachycaudus tragopogonis* (Kalt.) on *Tragopogon graminifolius* DC., (Sirjan, 1769m, N 29° 28' E 55° 41') 21 November 2007 (1♀); †*Brachyunguis zygophylli* on ††*Zygophyllum fabago* L., (Kerman, 1712m, N 30° 15' E 57° 06') 03 November 2007 (48♀ 56♂); †*Melanaphis* sp. on ††*Sorghum halepense* (L.) Pers., (Kerman, 1770m, N 30° 15' E 57° 06') 03 November 2007 (18♀ 23♂); †*Uroleucon jaceae* (L.) on ††*Centaurea iberica* Trev., (Kerman, 1769m, N 05° 12' E 33° 45') 21 April 2008 (1♀ 1♂).

*** *Praon flavinode* (Haliday, 1833) (Figs. 1a, 3d, 4g)**

††*Tinocallis nevskiyi* Rem., Quednau and Heie on ††*Ulmus campestris* L., (Bardsir, 2082m, N 29° 56' E 56° 34') 31 October 2007 (1♀).

***Praon rosaecola* Starý, 1961 (Figs. 1b, 1e, 3e, 4h, 5c)**

Macrosiphum rosae (L.) on *Rosa damascena* Mill., (Lalehzar, 2692m, N 29° 31' E 56° 45') 09 October 2007 (5♀).

*** *Praon unitum* Mescheloff and Rosen, 1988 (Figs. 1c, 3f, 4i)**

†*Uroleucon acroptilidis* on ††*Acroptilon repens* DC., (Kerman, 1773m, N 30° 14' E 57° 07') 08 November 2007 (2♀ 2♂).

***Praon volucre* (Haliday, 1833) (Figs. 1d, 1f, 3g, 4j, 5d)**

†*Amphorophora catharinae* (Nevsky) on ††*Rosa damascena* Mill., (Kouhpayeh, 1961m, N 30° 29' E 57° 16') 24 October 2007 (1♂); *Aphis craccivora* Koch on ††*Portulaca oleracea* L., (Shahdad, 481m, N 30° 24' E 57° 41') 28 November 2007 (2♀); *Aphis solanella* Theob. On *Solanum* sp., (Sirch, 1723m, N 30° 11' E 57° 33') 28 November 2007 (2♀ 3♂); *Macrosiphum rosae* (L.) on ††*Rosa damascena* Mill., (Lalehzar, 2524m, N 29° 34' E 56° 40') 09 October 2007 (7♀ 8♂); *Rhopalosiphum maidis* (Fitch) on ††*Setaria glauca* (L.) P.Beauv., (Sirch, 1721m, N 30° 11' E 57° 33') 28 November 2007 (1♀ 1♂); *Uroleucon sonchi* (L.) on *Sonchus oleraceus* (L.), (Lalehzar, 2848m, N 29° 30' E 56° 48') 09 October 2007 (2♀).

***Praon yomenae* Takada, 1968 (Figs. 3h, 4k)**

†*Acyrtosiphon lactucae* (Pass.) on ††*Sonchus oleraceus* (L.), (Lalehzar, 2979m, N 29° 29' E 56° 48') 09 October 2007 (2♀ 3♂); *Uroleucon* sp. on *Acroptilon repens* DC., (Kerman, 1812m, N 30° 15' E 57° 06') 10 November 2007 (7♀ 4♂); *Ditto*, on *Acroptilon repens* DC. (Mahan, 1776m, N 30° 13' E 57° 06') 03 October 2007 (3♀ 4♂); *Ditto*, on ††*Picnomon acarna* (L.), (Mahan, 1770m, N 30° 12' E 57° 05') 13 May 2008 (1♀ 1♂); †*Uroleucon acroptilidis* on *Acroptilon repens* DC., (Kerman, 1773m, N 30° 14' E 57° 07') 09 October 2007 (5♀ 8♂); †*Uroleucon cichorii* (Koch) on ††*Cichorium intybus* L., (Kouhpayeh, 1836m, N 30° 28' E 57° 18') 24 October 2007 (2♀ 3♂); *Uroleucon jaceae* (L.) on ††*Centaurea iberica* Trev., (Kerman, 1769m, N 05° 12' E 33° 45') 21 April 2008 (1♀ 1♂); *Uroleucon sonchi* (L.) on *Sonchus* sp., (Kerman, 1773m, N 30° 15' E 57° 06') 22 November 2007 (1♀ 1♂); *Ditto*, on *Sonchus* sp., (Kerman, 1682m, N 30° 14' E 57° 07') 09 October 2007 (1♀ 1♂); *Ditto*, on ††*Sonchus oleraceus* (L.), (Lalehzar, 2704m, N 29° 32' E 56° 46') 09 October 2007 (2♀); *Ditto*, on ††*Sonchus oleraceus* (L.), (Kerman, 1763m, N 30° 15' E 57° 06') 09 November 2007 (2♀ 3♂).

***Trioxys pallidus* (Haliday, 1833) (Figs. 3i, 5e, 6m)**

Chromaphis juglandicola (Kalt.) on *Juglans regia* L., (Bidkhan, 2744m, N 29° 35' E 56° 30') 03 August 2007 (1♀ 1♂).

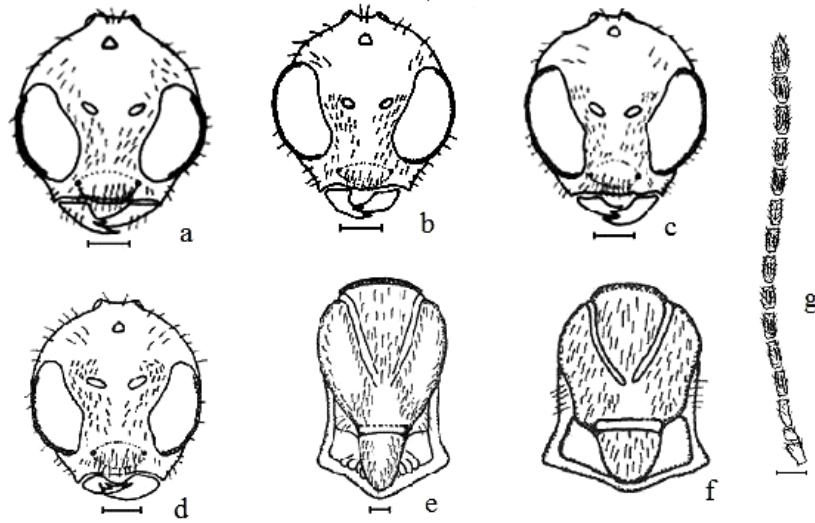


FIGURE 1. Head. a, *Praon flavinode*; b, *P. rosaecola*; c, *P. unitum*; d, *P. volucre*; **Mesoscutum.** e, *P. rosaecola*; f, *P. volucre*; **Antenna.** g, *Aphidius cf. colemani*; **Scale bar-** Head: 100 micrometer, Mesoscutum and Antenna: 50 micrometer.

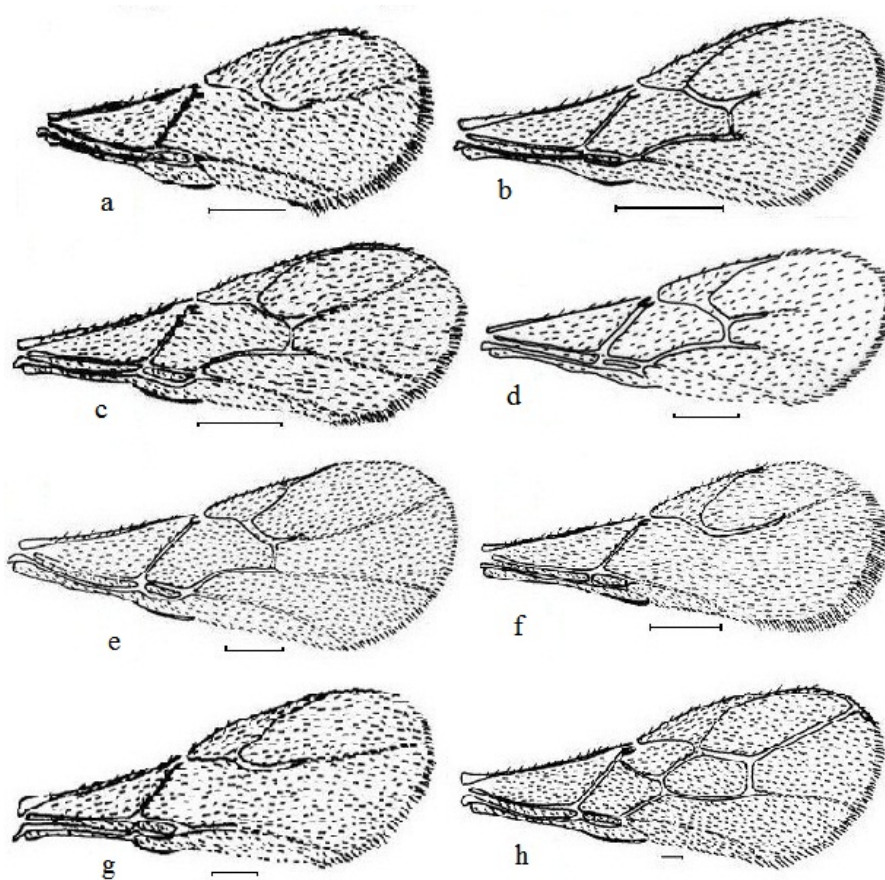


FIGURE 2. Forewing. a, *Adialytus salicaphis*; b, *Aphidius cf. colemani*; c, *A. cf. matricariae*; d, *A. persicus*; e, *A. popovi*; f, *Binodoxys aculephae*; g, *Diaeretiella rapae*; h, *Ephedrus niger*; **Scale bar:** 100 micrometer.

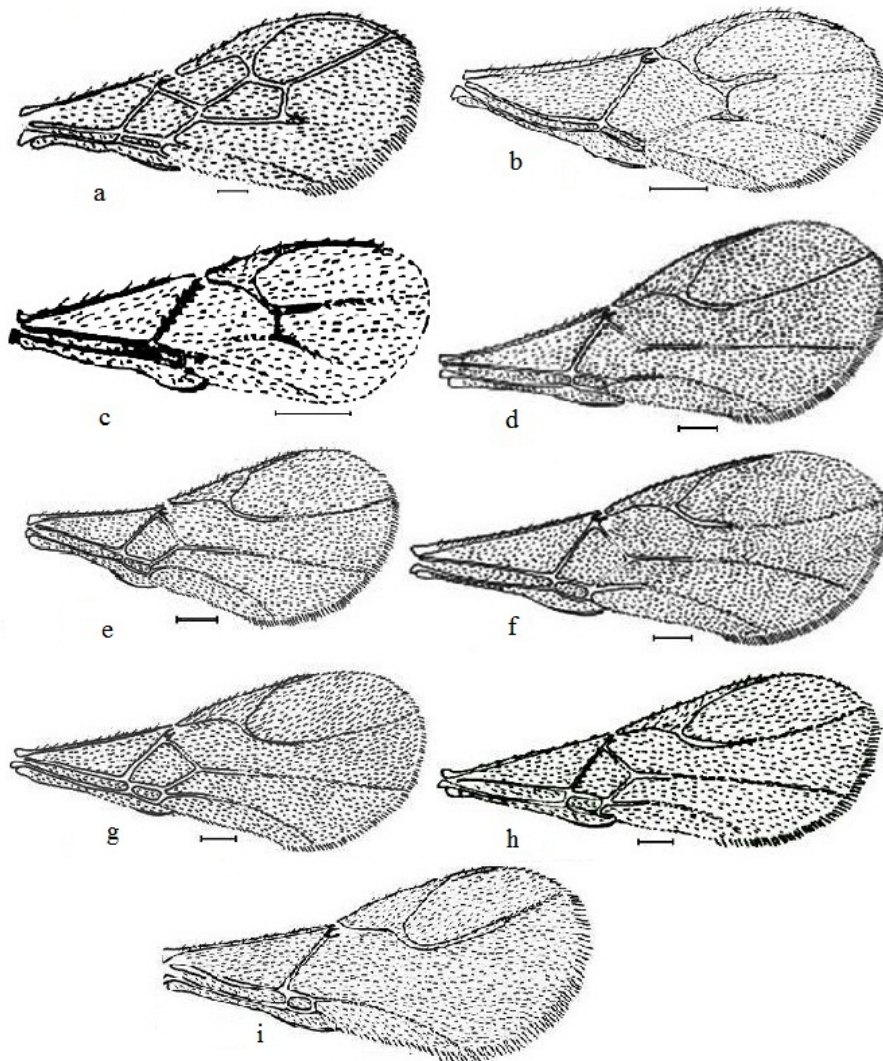


FIGURE 3. Forewing. a, *Ephedrus persicae*; b, *Lysiphlebus confusus*; c, *L. fabarum*; d, *Praon flavinode*; e, *P. rosaeicola*; f, *P. unitum*; g, *P. volucre*; h, *P. yomenae*; i, *Trioxys pallidus*; **Scale bar:** 100 micrometer.

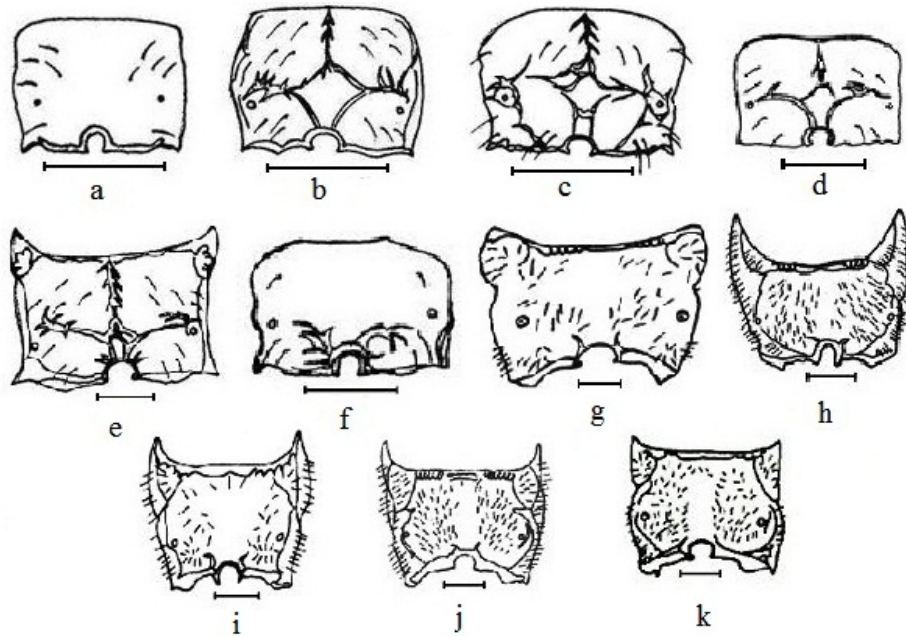


FIGURE 4. Propodeum. a, *Adialytus salicaphis*; b, *Aphidius* cf. *colemanni*; c, *A.* cf. *matricariae*; d, *A. persicus*; e, *Diaeretiella rapae*; f, *Lysiphlebus confusus*; g, *Praon flavinode*; h, *P. rosaeicola*; i, *P. unitum*; j, *P. volucre*; k, *P. yomenae*; **Scale bar:** 100 micrometer.

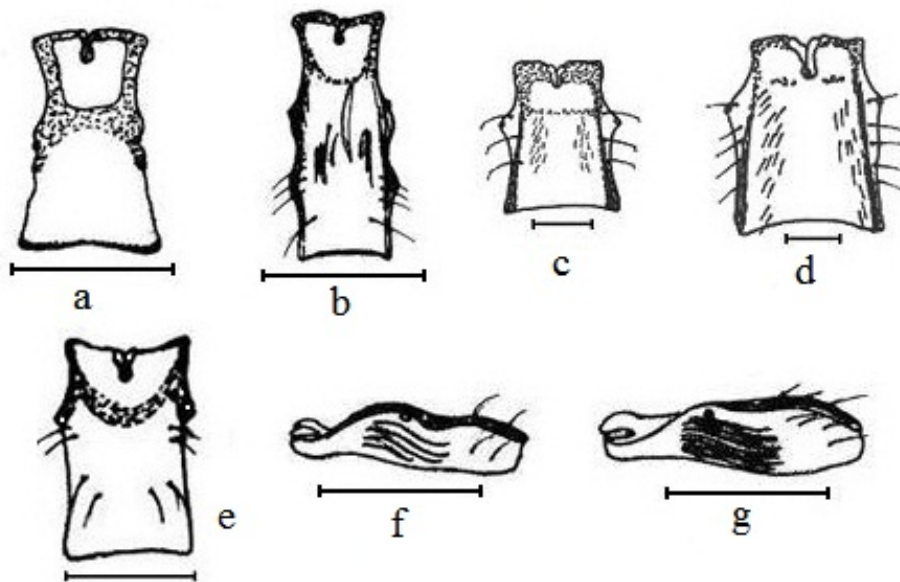


FIGURE 5. Petiole (Dorsal view). a, *Binodoxys aculephae*; b, *B. angelicae*; c, *Praon rosaeicola*; d, *P. volucre*; e, *Trioxyis pallidus*; **Petiole (Lateral view).** f, *Aphidius* cf. *colemanni*; g, *A.* cf. *matricariae*; **Scale bar:** 100 micrometer.

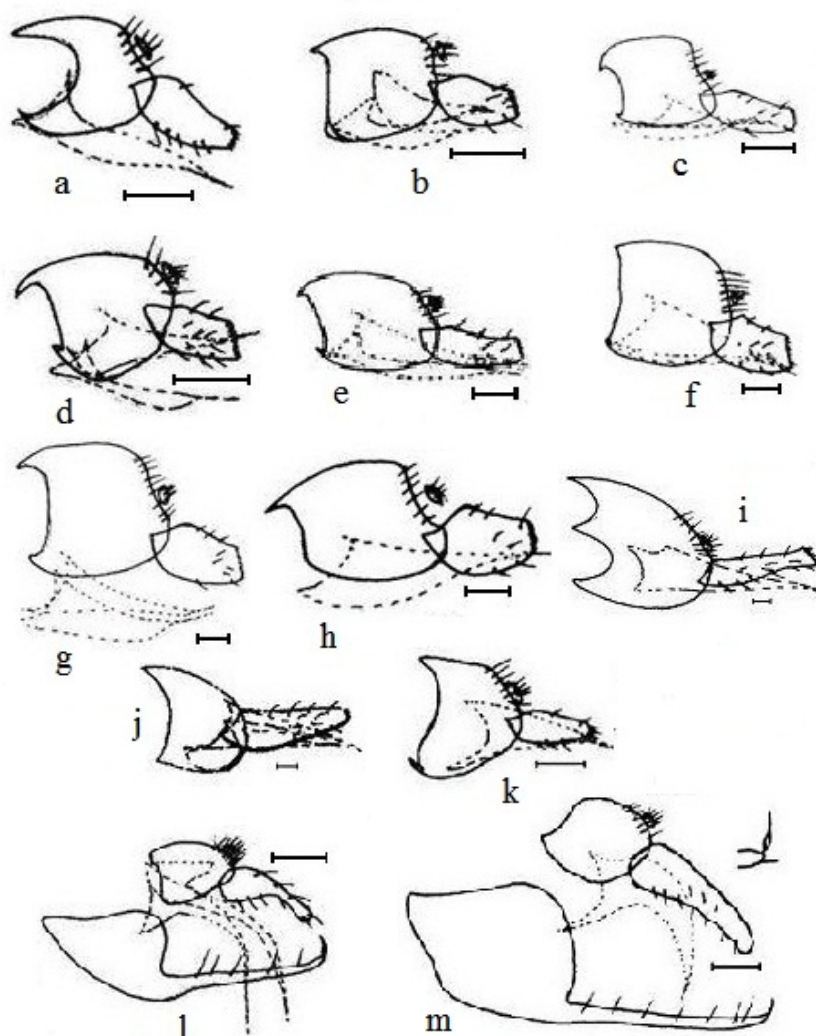


FIGURE 6. Female Genitalia. a, *Adialytus salicaphis*; b, *Aphidius* cf. *colemanni*; c, *A. funebris*; d, *A. cf. matricariae*; e, *A. persicus*; f, *A. popovi*; g, *A. smithi*; h, *Diaeretiella rapae*; i, *Ephedrus niger*; j, *E. persicae*; k, *Lysiphlebus confusus*; l, *Binodoxys acalephae*; m, *Trioxys pallidus*; **Scale bar:** 50 micrometer.

TABLE 1- Comparison of morphological characters of *Praon* species in Kerman and other records from Iran.

Species	Location	No. Antennal segments	Multiporus plate sensilla	Hairs number of clypeus
<i>P. rosaecola</i>	Iran	16-17 (15)	0	10-12
	Kerman	17-18	0-1	15-17
<i>P. volucre</i>	Iran	17-18 (19)	0	15-18
	Kerman	17-19	1-2	18-24
<i>P. yomenae</i>	Iran	18-19 (20)	2	20-22
	Kerman	17-19	2-3	22-24

Identification Key to the member of Aphidiinae genera and species in Kerman province based on the females.

1. Median vein developed throughout, separating radial cell 1 from median cell (Figs. 2h - 3d) 2
 - Median vein effaced frontally or entirely (Figs. 2a - 2b - 3b) 8
2. Venation complete, R2 cell open, forewing with less than 5 closed cell, both interrarial veins developed (Fig. 2h) 3
 - Venation incomplete, R2 cell close, forewing with 5 closed cell, Ir vein effaced (Fig. 3d) 4
3. Ovipositor sheath trumpet shape and elongate (Fig. 6i), R2 vein equal to interrarial vein 1 (Fig. 2h) *Ephedrus niger*
 - Ovipositor sheath oval shaped (Fig. 6j), R2 vein shorter than interrarial vein 1 (Fig. 3a) *Ephedrus persicae*
4. Antennae 16-17 segmented, propodeum with large hairless median area (Figs. 4g - 4i) 5
 - Antennae 17-19 segmented, propodeum with small hairless median area (Figs. 4h - 4j - 4k) 6
5. M-cu vein unclear (Fig. 3d), F1 throughout yellow, clypeus with 18-20 long hairs (Fig. 1a) *Praon flavinode*
 - M-cu vein complete and clear (Fig. 3f), F1 yellow at base, clypeus with 22-24 long hairs (Fig. 1c) *Praon unitum*
6. F1 throughout yellow, Rs+m and M-cu veins complete but light (Fig. 3h) *Praon yomenae*
 - F1 yellow at base or at least 1/3 apical dark, Rs+m and M-cu veins complete (Figs. 3e - 3g), Rs+m completely and 1/3 M-cu colored 7
7. Lateral lobes of mesoscutum with large hairless area (Fig. 1e), petiole with 3-4 lateral hairs and several hairs at dorsal surface in median area of segment (Fig. 5c), clypeus with 15-17 long hairs (Fig. 1b) *Praon rosaecola*
 - Lateral lobes of mesoscutum covered with long hairs (Fig. 1f), petiole with 4-5 lateral hairs and several hairs at dorsal surface that continue to end of segment (Fig. 5d), clypeus with 18-24 long hairs (Fig. 1d) *Praon volucre*
8. Confused area of median and radial cells complete with Ir2 at external ridge (Figs. 2b - 3b)..... 9
 - Confused area of median and radial cells open, only with radial vein, without M-cu and median veins (Figs. 2a - 2f - 2g - 3i) 16
9. Propodeum pentagonal with small median areola (Fig. 4b), ovipositor sheath oval shaped (Fig. 6b), M-cu and M veins confused together (Fig 2b) 10
 - Propodeum smooth (Fig. 4f), ovipositor sheath egg shaped (Fig. 6k), a part of M-cu and M veins present (Fig. 3b) 15
10. Anterolateral area of petiole costate (Fig. 5f), antennae 15-16 segmented (Fig. 1g) *Aphidius cf. colemani*
 - Anterolateral area of petiole costulate (Fig 5g) 11
11. Labial palpus with 2 palpomeres 12
 - Labial palpus with 3 palpomeres 14

12. Maxillary palpus with 4 palpomeres, metacarpus very small (Fig. 2e), antennae 16-17 segmented, ovipositor sheath small (Fig. 6f) *Aphidius popovi*
 - Maxillary palpus with 3 palpomeres 13
13. Antennae 15-16 segmented, metacarpus long (Fig. 2c), propodeum with complete central areola (Fig. 4c), ovipositor sheath small (Fig. 6d) *Aphidius cf. matricariae*
 - Antennae 16-17 segmented, metacarpus small (Fig. 2d), propodeum with incomplete central areola or two carina (Fig. 4d), ovipositor sheath long (Fig. 6e)..... *Aphidius persicus*
14. Antennae 18 segmented, ovipositor sheath long (Fig. 6c) *Aphidius funebris*
 - Antennae 20 segmented, ovipositor sheath small (Fig. 6g) *Aphidius smithi*
15. Lower and apical margin of forewing with short hairs which are not longer than those on the surface (Fig. 3c) *Lysiphlebus fabarum*
 - Lower and apical margin of forewing with long hairs which are longer than those on the surface (Fig. 3b) *Lysiphlebus confusus*
16. Terminal abdominal sternite with two prongs (Figs. 6l - 6m) 17
 - Terminal abdominal sternite without prongs (Figs. 6a - 6h) 19
17. Petiole with only primary tubercles on dorsal surface (Fig. 5e)..... *Troxys pallidus*
 - Petiole with primary and secondary tubercles on dorsal surface (Fig. 5a) 18
18. Distance between primary and secondary tubercles small (Fig. 5a) *Binodoxys acalephae*
 - Distance between primary and secondary tubercles large (Fig. 5b) *Binodoxys angelicae*
19. Propodeum pentagonal with small central areola (Fig. 4e) *Diaeretiella rapae*
 - Propodeum smooth or with two short divergent carinae (Fig. 4a) *Adialytus salicaphis*

DISCUSSION

In this study, 20 species of Aphidiinae belonging to eight genera in Kerman province are reported of which 19 species are new record for this province and two species are reported for the first time from Iran. Some differences in morphological characters for each collected species in Kerman province were found. These are compared with characters that are already described for other Iranian species by Rakhshani (2006) as follows:

***Aphidius cf. colemani* Viereck, 1912**

Differences in number of antennal segments (15-16 segmented in Kerman species and 14-15 in other Iranian species) and maxillary palpus palpomeres (4 in Kerman species and 3-4 in other Iranian species).

***A. cf. matricariae* Haliday, 1834**

Differences in number of antennal segments (15-16 segmented in Kerman species and 14-15 in other Iranian species).

***A. persicus* Rakhshani and Starý, 2006**

Differences in maxillary palpus palpomeres (3 in Kerman species and 3-4 in other Iranian species) and shape of propodeum areola (with two carina or incomplete central areola in Kerman species and with completed central areola in other Iranian species).

***Lysiphlebus fabarum* (Marshall, 1896)**

This species is complex that is very difficult taxonomically and needs further studies.

Genus: *Praon* Haliday, 1833

Different characters may be used to identify the species of this genus. These characters are listed in Table 1 with more details. So, differences were observed in mesoscutum, propodeum areola and ovipositor sheath in some species.

The biodiversity of Aphidiinae has been little studied in this region and there is no complete information on this valuable group. However, some habitats in various parts of the province have not been visited in detail till now. It is expected that more species are present in the region. Probably with more extensive investigations, the number of species in the future checklists will increase and even new species and/or new records for Kerman province and Iran may be added.

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