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RESEARCH ARTICLE Open access

A study of Coccinellid species with a focus on those associated with *Pistacia* spp. (Anacardiacae) in western part of Iran

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Abstract
The coccinellid fauna in Kermanshah province, were studied between 2020 and 2023. More than 4418 individuals were collected from different plants and ecosystems. Consequently, a total of 26 species were identified, half of them were recorded on both cultivated and wild pistachios, which mainly infested by Sternorrhyncha suborder. The identified species belonged to five tribes: Chilocorini (five species, three genera), Coccinellini (11 species, seven genera), Hyperaspidini (one species, one genus), Scymnini (eight species, four genera), Sticholotidini (one species, one genus). Among the 26 species identified, ten were recognized as new records for the Kermanshah region, indicated with a single star*.Thirteen species associated with pistachio trees in the same area were marked with two stars**. Data about collection of each species including prey species and host plants are presented with synonyms, previous records, present records, distribution, and remarks. Color plates of adult specimens and genitalia are given.

Key words: Faunistic, Predator, Anacardiacae, Checklist, Distribution.

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INTRODUCTION

Coccinellidae is a family of beetles with a global distribution, including more than 6000 species, classified in 370 genera (Ślipiński 2007). Iranian coccinellid fauna includes 17 tribes, 41 genera and 142 species (Abdolahi Mesbah et al., 2016). In the coccinellid fauna of Iran, there are 25 species that are linked to pistachio trees, in Kerman province (Salehi et al., 2011). In the above-mentioned publication, only 24 species were reported from Kermanshah province. In general, the fauna of ladybugs, particularly those associated with pistachio trees, is still poorly known in Kermanshah province.

Majority of coccinellids or ladybirds are entomophagous and many are used as a biological control agent against economically important pests. Those are associated with Sternorrhyncha (Aphidoidea, Coccoidea, Aleyrodoidea, Psylloidea, Cicadelloidea) and others, such as, Lepidoptera larvae and mites.

To reduce the overuse of chemical substances (or chemical control) for managing pistachio pests, it is necessary to conduct research aimed at identifying the predatory ladybird species present in the study area, particularly those species associated with pistachio pests. Regarding the rare studies on ladybirds

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within pistachio orchards, it is expected that certain species will be discovered that play a significant role in the biological control of these pests.

This study was conducted to record ladybird species, particularly those associated with pistachio trees in Kermanshah province, which will be of value to ecology, biology, systematics and other trends in agricultural and biological sciences. The aim of this article is to present the first overview of the coccinellid fauna including their prey species, distribution, and host plants in Western Iran.

MATERIAL AND METHODS

Ladybird samples on various infested host plants, including Pistachio trees, were collected during irregular surveys in different locations in Kermanshah region between 2020 and 2023. Sampling was done using direct sampling, insect nets, a beating white tray and the samples were collected manually or with a brush. In each sample, coccinellids were separated and placed in a jar with etylacetate, after which they were transferred to labeled 96% alcohol containers. Microscopic slides with male genitalia were prepared using Canada balsam medium by the methodology of Slipinski and Tomaszewska (2005). Images were taken using the Blue Light model of the Eyepist (Scaled Loop) and SSC-DC50AP digital camera, model XTS3022, and Olympus BX microscope with an attached digital Dino eye-piece camera. For identification of specimens, we used the following literature: Raimundo and van Harten, (2000); Larson (2013); Bieńkowski (2018); Biranvand et al. (2019). Identification of selected specimens were confirmed by Dr. Amir Biranvand and Professor Oldřich Nedvěd. The slide-mounted material of all species has been deposited in the Department of Plant Protection, Razi University, Kermanshah, Iran. Iranian coccinellid literature review was made. The nomenclature is based on classification of Coccinellidae by Kovář (2007) and Nedvěd (2020).

RESULTS

A total of 26 species of coccinellids in 16 genera and 5 tribes including 4418 individuals were collected on 37 plant species, including *Pistacia vera* Linnaeus and *P. mutica* (Fisch. & C.A. Mey.), in Kermanshah. Half of these species (13) were collected on both cultivated pistachio and mountain pistachios. Both tree mainly infested by Sternorrhyncha group. Also, among these species, the lady beetle *Coccinella septempunctata* L.,1758 on *Medicago sativa*, *Hippodamia variegata* (Goeze, 1777) on *Carthamus* sp. and *Oenopia conglobata* (Linnaeus, 1758) on *Prunus persica* all occur in large numbers throughout the region and are likely to be biologically important.

Species accounts
Tribe CHILOCORINI
Genus *Chilocorus* Leach, 1815

***Chilocorus bipustulatus* (Linnaeus, 1758)**
(Figures 1, 27A)

Syn.: *Coccinella bipustulata* Linnaeus, 1758

Notes: *Chilocorus bipustulatus* (Figs. 1, 27A) was collected directly by hand and beating tray. The host plants were infested by Aphidoidea. Previously, this species has been reported by Khosravi *et al.* (2014), on *Trabutina mannipara* (Hemprich & Ehrenberg) (Hemiptera: Pseudococcidae) infested branches and leaves from Kermanshah.

Material studied: Kermanshah province: Kermanshah, *Prunus armeniaca* (Rosaceae), 8 adults (5♂, 3♀), 15.Apr.2021, 18.Apr.2021, 25.Apr.2021, Abedin Safari; Dalaho, *Prunus persica* (Rosaceae), 4 adults (1♂, 3♀), 22.Jul.2021, Abedin Safari; Islamabad-e-Gharb, *Malus domestica* (Rosaceae), 23 adults (10♂, 13♀), 29.Apr 2021, 3.May.2021, Abedin Safari; Ravansar, *Cydonia vulgaris* (Rosaceae), 23 adults (8♂, 15♀), 8.Jun.2021, Abedin Safari.

Regional distribution in Iran: Hamedan (Sadeghi & Khanjani, 1998), Isfahan (Jafari *et al*., 2002), Razavi Khorasan (Farahi & Sadeghi, 2009), Kerman (Jafari *et al*., 2013), Kermanshah (Khosravi *et al.*, 2014 and

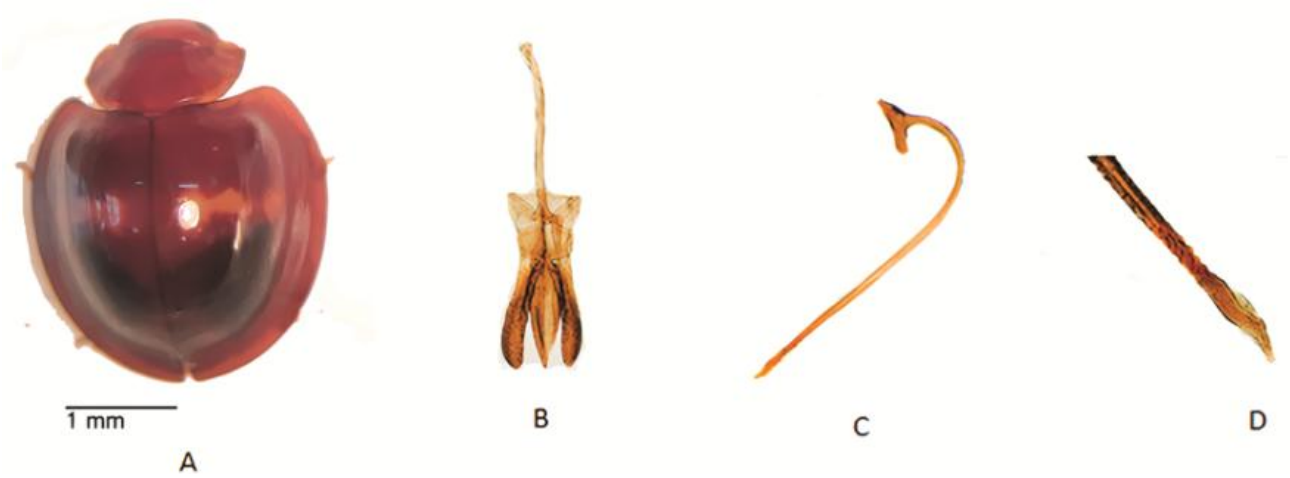

FIGURE 1. *Chilocorus bipustulatus*: A. Dorsal view, B. Ventral view of tegmen, C. Penis, D. Tip of penis, Body size : Length 3.2- 3.7 mm; Width 2.5- 2.8 mm (n = 5).

Naim, 1971), Tehran (Abdi *et al*., 2013), Lorestan (Mohammad poor *et al*., 2013), Yazd (Zare Khormizi *et al*., 2013), Semnan (Toozandejani and Ajamhassani, 2021).
Worldwide distribution: Afrotropical: Sudan (Yousof *et al*., 2013); Nearctic: USA (Gordon, 1985); wide distribution in Palearctic (Mader, 1955; Kovar, 2007) including Mongolia (Bielawski, 1975).

Genus *Exochomus* Redtenbacher, 1844

Exochomus quadripustulatus* (Linnaeus, 1758)
(Figures 2, 27C)
Syn.: *Coccinella 4-pustulata* Linnaeus, 1758
Notes: *Exochomus quadripustulatus* (Figs. 2, 27C) is commonly found on aphid infested oak and almond trees (branches and leaves) and collected manually. This is the first record of *E. quadripustulatus* from Kermanshah province.
Material studied: Dalaho, *Quercus* sp. (Fagaceae), *Prunus* sp. and *Amygdalus* sp. (Rosaceae), 24 adults (6♂, 18♀), 7.Apr.2021, 9.Apr.2021, 12.May.2021, Abedin Safari; Salas-Babajani, *Quercus* sp. (Fagaceae), 1 adult (1♂), 29.Mar.2021, Abedin Safari; Guilan-e-gharb, *Quercus* sp. (Fagaceae), 5 adults (1♂,4♀), 2.Apr.2021, Abedin Safari; Kermanshah, *Prunus* sp. and *Amygdalus* sp. (Rosaceae), 10 adults (2♂, 8♀), 15.Apr.2021, 30.Apr.2021, Abedin Safari.
Regional distribution in Iran: Alborz, Hamadan, Kohgiluyeh and Boyer-Ahmad, North Khorasan and Zanjan (Abdolahi *et al*., 2017), Lorestan (Mohammad poor *et al*., 2013), Kerman (Salehi *et al*., 2011), Tehran (Abdi *et al*., 2013 and Abdolahi *et al*., 2017) and Yazd (Zare Khormizi *et al*., 2013), Semnan (Toozandejani and Ajamhassani, 2021).
Worldwide distribution: USA (Gordon, 1985); Oriental: India (Poorani, 2004); Palearctic: wide distribution in western Palearctic (Mader, 1955; Kovar, 2007) and Russia (Poorani, 2004).

***Exochomus undulatus* Weise, 1878**
(Figures 3, 27B)
Notes: In this research, the ladybird, *Exochomus undulatus* (Figs. 3, 27B) was collected from the mountain pistachio trees, *Pistacia mutica*, which were infected by both the common pistachio psylla, *Agonoscena pistaciae* Burckhardt & Lauterer (Aphalaridae), and pistachio galling aphids (Aphididae). It was collected manual and direct methods, beating tray and netting.

Previously, it was collected from Pistachio in Kerman (Salehi *et al*., 2011), and by Khosravi et al. (2014), on *Trabutina mannipara* (Hemiptera: Pseudococcidae) infested *Tamarix* branches and leaves, from Kermanshah. Also, it has already been reported by Gholami Moghadam et al., (2014) from Kermanshah and found on *Euphyllura olivina* (Hemiptera: Psyllidae) (Moddarres-Awal 2012).

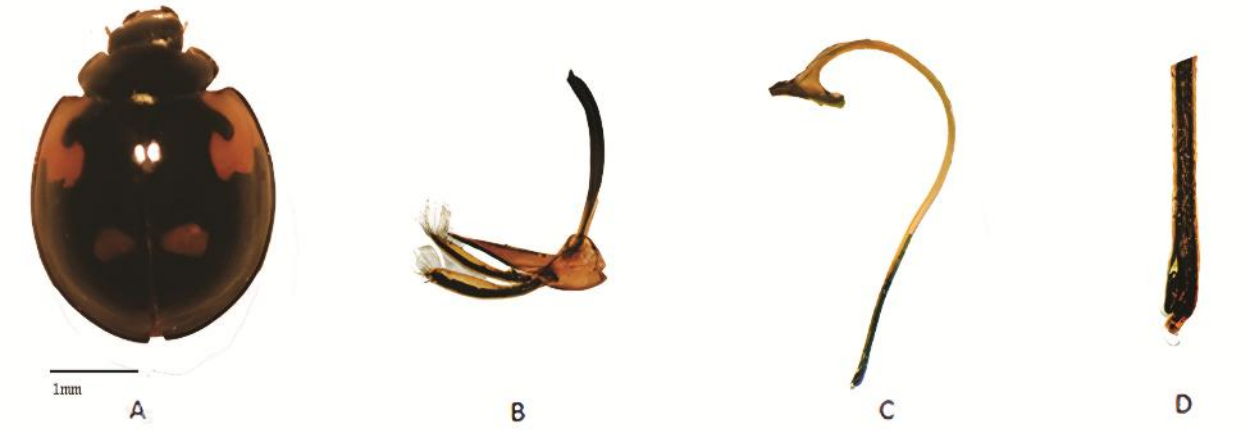

FIGURE 2. *Exochomus quadripustulatus*: (A) Dorsal view, (B) Tegmen, (C) Penis, (D) Tip of penis, Body size : Length 3.5- 4.2 mm; Width 2.7- 3.6 mm (n = 5).

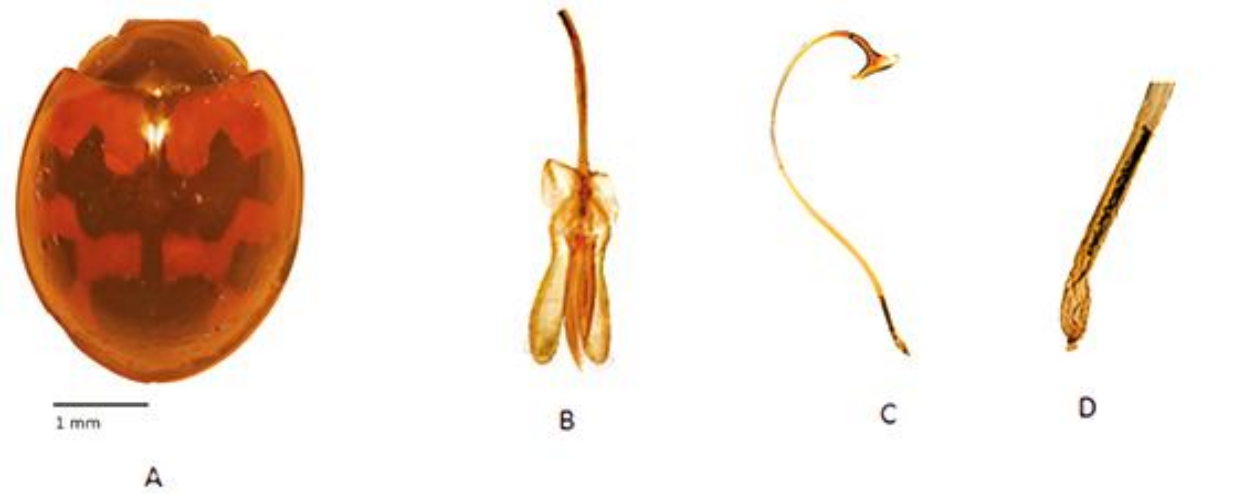

FIGURE 3. *Exochomus undulatus*: (A) Dorsal view of adult female, (B) Tegmen, (C) Penis, (D) Tip of penis, Body size : Length 3.2- 4.3 mm; Width 2.5- 3.6 mm (n = 5).

Material studied: Kermanshah, *Pistacia mutica* (Anacardiaceae), 15 adults (8♂, 7♀), 29.Aug.2020, 28.Sep.2020, 6. Oct. 2020, 1.Sep.2021, 9.Aug.2021, 8.Sep.2021 Hadis Nehrangi. *Salix* sp. (Salicaceae), 25 adults (8♂,17♀), 25.Oct.2020, 30.Oct.2020, 12.Nov.2020, 18.Nov.2020, 14.Feb.2021, Abedin Safari; Qasr-e Shirin and Sarpol-Zahab, *Punica* sp. (Lythraceae), *Quercus* sp. (Fagaceae), 38 adults (17♂,21♀), 18.Nov.2020, 27.Nov.2020, Abedin Safari; Islamabad-e-Gharb, *Quercus* sp. (Fagaceae), 13 adults (4♂, 9♀), 8.Dec.2020, 15.Dec.2020, Abedin Safari; Dallaho, *Vitis* sp. (Vitaceae), *Quercus* sp. (Fagaceae), *Prunus* sp., *Amygdalus* sp. and *Malus domestica* (Rosaceae), 41 adults (14♂, 27♀), 4.Mar.2021, 9.Mar.2021, 13.Mar.2021, Abedin Safari; Sonqor, *Robinia* sp. and *Medicago sativa* (Fabaceae), 33 adults (10♂, 23♀), 15.May.2021, 29.Sep.2021, Abedin Safari.

Regional distribution in Iran: Hamadan, Kohgiluyeh and Boyer-Ahmad, Tehran and Zanjan (Abdolahi *et al*., 2017), Kerman (Salehi *et al*., 2011), Kermanshah (Khosravi *et al.*, 2014 and Gholami Moghadam *et. al*. 2014), Razavi Khorasan (Farahi & Sadeghi, 2009), Tehran (Ghanbari *et al*., 2012), Lorestan (Mohammad poor *et al*., 2013).

Worldwide distribution: Palearctic: Afghanistan, Albania, Egypt, Georgia, Iran, Iraq, Israel, Lebanon, Syria, (Kovar, 2007), Uzbekistan (Mader, 1955).

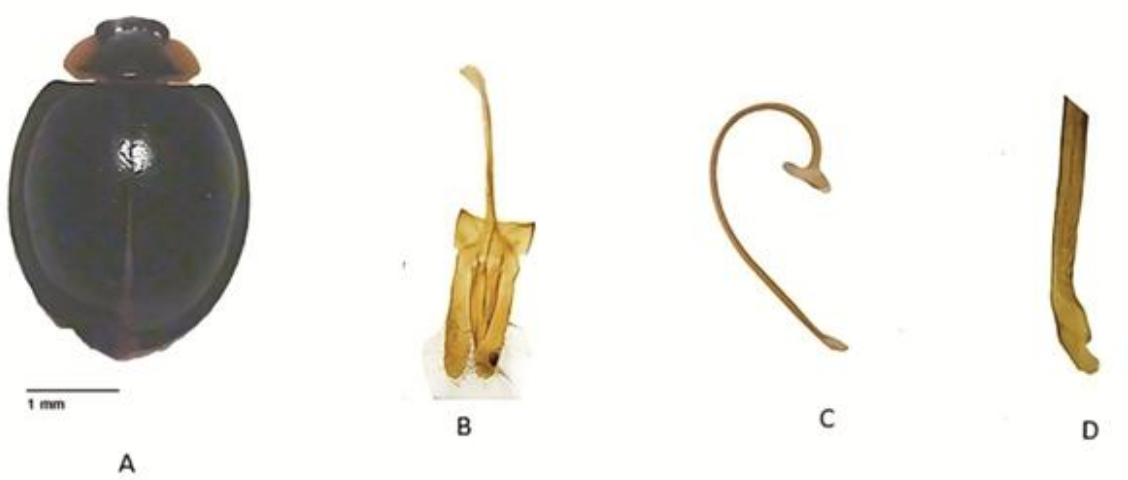

FIGURE 4. *Parexochomus nigromaculatus*: (A) Dorsal view of the ladybug, (B) Tegmen, (C) Penis, (D) Tip of penis, Body size : Length 3.2- 4 mm; Width 2.7- 3 mm (n = 5).

Genus *Parexochomus* Barovskij, 1922

***Parexochomus nigromaculatus* (Goeze, 1777)**
(Figures 4, 27D)
Syn.: *Coccinella nigromaculata* Goeze, 1777
Notes: In this study, the ladybird species *P. nigromaculatus* (Figs. 4, 27D) was collected from mountain pistachio trees, *Pistacia mutica*, which were affected by both the common pistachio psylla, *Agonoscena pistaciae* Burckhardt & Lauterer (Aphalaridae), and galling aphids (Aphididae). Furthermore, specimens were also collected from cultivated pistachio trees, *Pistacia vera*, which were similarly infested by the common pistachio psylla, *Agonoscena pistaciae* Burckhardt & Lauterer (Aphalaridae). The ladybird *Parexochomus nigromaculatus* has been reported by Khosravi *et al.* (2014), as *Exochomus nigromaculatus* (Goeze, 1777) on *Trabutina mannipara* (Hemiptera: Pseudococcidae), on *Tamarix* sp. from Kermanshah.
Material studied: Kermanshah, *Pistacia mutica*, 5 adults (1 ♂, 4♀), 29.Aug.2020, Hadis Nehrangi; *Pistacia vera*, 7 adults (2 ♂, 5♀), 16.Aug.2021, Hadis Nehrangi. *Medicago sativa* and *Astragalus* sp., (Fabaceae), 25 adults (12 ♂, 13♀), 8.Sep.2020, 18.Sep.2021, 7.Oct.2021, Abedin Safari;Dalaho, *Carthamus tinctorius* (Asteracae), *Astragalus* sp., (Fabaceae), 25 adults (8♂, 17♀), 6.May.2020, 9.May.2020, 4.Jun.2021, 13.Jun.2021, Abedin Safari; Islamabad-e-Gharb, *Medicago sativa* (Fabaceae), 19 adults (7♂, 12♀), 27.Sep.2020, 3.Oct.2021, 11.Oct.2021, 15.Nov.2021, Abedin Safari; Javanrod, *Medicago sativa* (Fabaceae), 7 adults (5♂,2♀), 23.Jun.2021, Abedin Safari; Sahneh, *Amaranthus* sp., (Amaranthacae), *Medicago sativa* (Fabaceae), which infested by Aphidoidea; 11 adults (3♂, 8♀), 1.Sep.2021, Abedin Safari.
Regional distribution in Iran: Kermanshah (Khosravi *et al.*, 2014), Lorestan (Jafari et al., 2007), Mazandaran (Pahlavani *et al*., 2017), Razavi Khorasan (Farahi & Sadeghi, 2009), Kerman (Jafari *et al*., 2011), Tehran (Ghanbari *et al*., 2012), Semnan (Toozandejani and Ajamhassani, 2021).
Worldwide distribution: Nearctic: USA (Gordon, 1985); Palearctic: wide distribution (Mader, 1955; Kovar, 2007)

Parexochomus pubescens* (Kuster, 1848)
(Figures 5, 27E)
Syn.: *Exochomus pubescens* Kuster, 1848
Notes: The ladybird *Parexochomus pubescens* (Figs. 5, 27E) is associated with Aleyrodioidea, Coccoidea and Acari.This is the first record of *Parexochomus pubescens* from Kermanshah province. The sample was collected directly by hand, beating tray and netting.

Figure 5. *Parexochomus pubescens*: (A) Dorsal view of adult, (B) Tegmen, (C) Penis, (D) Tip of penis, Body size : Length 2.3- 3 mm; Width 1.9- 2.6 mm (n = 5).

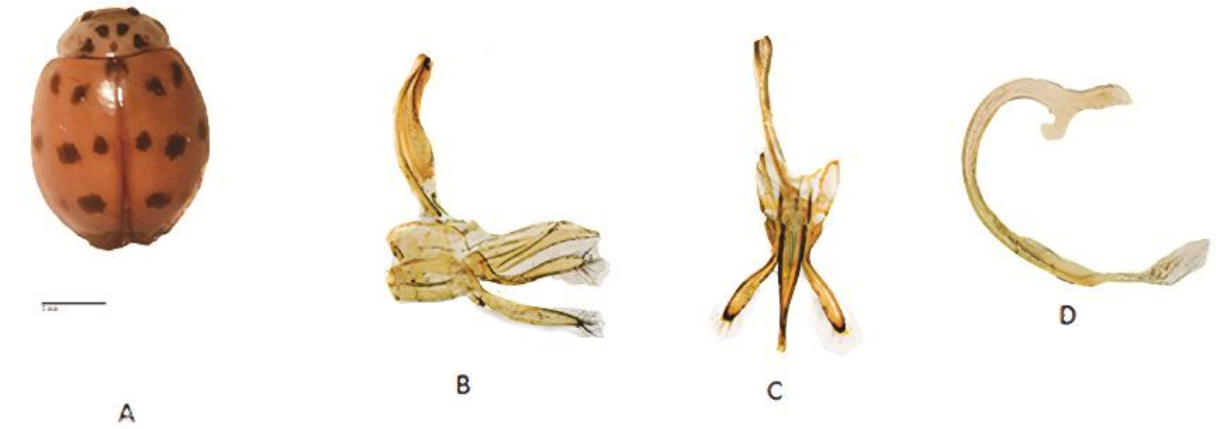

FIGURE 6. *Adalia bipunctata*: (A) Dorsal view, (B) Lateral sides of tegmen, (C) Ventral view of tegmen, (D) Penis, Body size : Length 3.4- 4.1 mm; Width 2.7- 3.4 mm (n = 5).

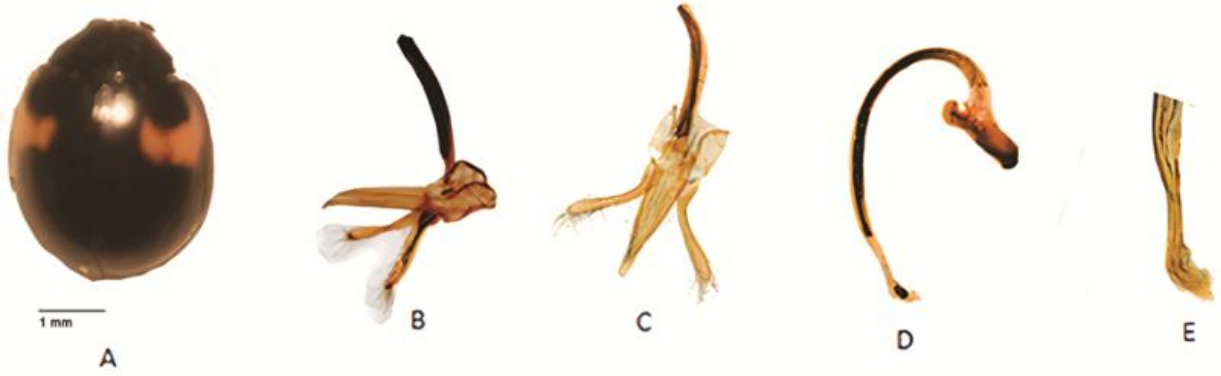

FIGURE 7. *Adalia decempunctata*, (A) Dorsal view, (B) Lateral sides of tegmen, (C) Ventral view of tegmen, (D) Penis, (E) Tip of penis, Body size: Length 3.5- 4.4 mm; Width 2.8- 3.7 mm (n = 5)**.**

Material studied: Gahvareh, *Echinops* sp. (Asteraceae) and *Astragalus* sp. (Fabaceae), 33 adults (18♂, 15♀), 10.Aug.2021, 13.Aug.2021, 19.Aug.2021, Abedin Safari; Islamabad-e-Gharb, *Carthamus* sp. (Asteracae), 10 adults (5♂, 5♀), 7.Sep.2021, 13.Sep.2021, Abedin Safari.
Regional distribution in Iran: Alborz, Hamadan, Sistan and Baluchistan and Tehran (Abdolahi *et al*., 2017), Lorestan (Mohammad poor *et al*., 2013), Kerman (Jafari *et al*, 2011), Tehran (Samin & Shojai, 2013).
Worldwide distribution: Africa (Raimundo & Van Harten, 2000); Oriental: India (Raimundo *et al*., 2008); Palearctic: Afghanistan, Algeria, Egypt, France, Germany, Iran, Iraq, Israel, Italy, Lebanon, Morocco, Pakistan, Saudi Arabia, Spain, Tunisia (Kovar, 2007), Transcaucasia (Mader, 1955) and Turkey (Efil *et al*., 2010).

Tribe COCCINELLINI
Genus *Adalia* Mulsant, 1846

***Adalia bipunctata* (Linnaeus, 1758)**
(Figures 6, 28C)
Syn.: *Coccinella 2-punctata* Linnaeus, 1758
Notes: *Adalia bipunctata* (Figs. 6, 28C) shows a morphological variation in the background color and spot number, which is reliable with the results of (Honek et al., 2005; Zare et al., 2012). It was collected from Pistachio, apple and peach trees, directly by hand and from aphid colonies. Different forms were collected during the sampling. Previously it has been reported by Gholami Moghadam *et. al*. (2014) from Kermanshah. Also, it was collected from Pistachio trees in Kerman (Salehi *et al*., 2011)
Material studied: Kermanshah, *Pistacia mutica*, 7 adults (2 ♂, 5♀), 29.Aug.2020, Hadis Nehrangi; *Pistacia vera*, 5 adults (2 ♂, 3♀), 16.Aug.2021, Hadis Nehrangi. *Prunus persica* (Rosaceae), *Malus domestica* (Rosaceae), 40 adults (17♂, 23♀), 30.May.2021, 11.Jul.2021, 19Jul.2021, Abedin Safari; Gahvareh, *Prunus persica* (Rosaceae), 27 adults (8♂, 19♀), 25.Apr.2021, 13,Jun.2021, 28.Jun.2021, Abedin Safari; Hersin, *Prunus persica* (Rosaceae), *Malus domestica* (Rosaceae), 18 adults (5♂, 13♀), 6.May.2021, 9.May.2021, Abedin Safari;
Regional distribution in Iran: Golestan (Abdolahi *et al*., 2017), Isfahan (Jafari *et al*., 2002), Mazandaran (Pahlavani *et al*., 2017), Kerman (Jafari *et al*., 2011), Kermanshah (Gholami Moghadam *et. al*. 2014), Lorestan (Mohammad poor *et al*., 2013), Yazd (Zare Khormizi *et al*., 2013) and Semnan (Toozandejani and Ajamhassani, 2021).
Worldwide distribution: Afrotropical: Middle of Africa (Bielawski, 1975); Nearctic: USA (Gordon, 1985) and Canada (Larson, 2013); Neotropical: introduced to Chile (Rebolledo et al., 2007); Oriental: India, (Poorani, 2004); Palearctic: wide distribution (Kovar, 2007), including Mongolia (Beilawski, 1975) and China (Poorani, 2004).

Adalia decempunctata* (Linnaeus, 1758)
(Figures 7, 28B)
Syn.: *Coccinella decempunctata* Linnaeus, 1758
Notes: *Adalia decempunctata* (Figs. 7, 28B) is reported for the first time from Kermanshah province. This species has a morphological variation in the background color and spot number (Honek *et al*., 2005). This species was collected by hand, from the oak forest, during winter time, on the leaves left on the tree. Additionally, from the peach, walnut and grape trees, infested by aphid, during spring and summer.
Material studied: Iran: Gilan-Gharb, *Quercus* sp. (Fagaceae), 23 adults (8♂, 15♀), 22.Dec.2020, 25.Dec.2020, 8.Feb.2021, Abedin Safari; Islamabad-e-Gharb, *Quercus* sp.p (Fagaceae), 29 adults (14♂, 25♀), 29.Dec.2020, 28.Feb.2020, Abedin Safari; Dalaho, *Prunus persica* (Rosaceae), 79 adults (25♂, 54♀), 1.Mar.2021, 8.Mar.2021, 12.Mar.2021, 25.Mar.2021, 8.Apr.2021, Abedin Safari; Kermanshah, *Juglans* sp. (Juglandaceae), 26 adults (9♂, 17♀), 15.Apr.2021, 22.Apr.2021, Abedin Safari; Hersin, *Prunus persica* (Rosaceae), 16 adults (5♂, 11♀), 7.May.2021, 9.May.2021, Abedin Safari; Ravansar and Javanrod, *Prunus persica* (Rosaceae), *Juglans* sp. (Juglandaceae), 40 adults (9♂, 31♀), 11.Jun.2020, 20.Jun.2021, Abedin Safari.

Regional distribution: Iran: Alborz, Golestan, Hormozgan and North Khorasan and Tehran (Abdolahi *et al*., 2017), Fars (Yazdani, 1990), Mazandaran (Pahlavani *et al*., 2017), Isfahan (Haghshenas *et al*., 2004), Kerman (Jafari *et al*., 2011), Markazi (Haghshenas *et al*., 2004), Lorestan (Mohammad poor *et al*., 2013), Hamedan (Akhavan *et al*., 2013 and Abdolahi *et al*., 2017)), Semnan (Toozandejani and Ajamhassani, 2021).
Worldwide distribution: western Palearctic (Kovar, 2007), including Mongolia (Bielawski, 1975); Oriental: India (Lal & Kanakavalli, 1960).

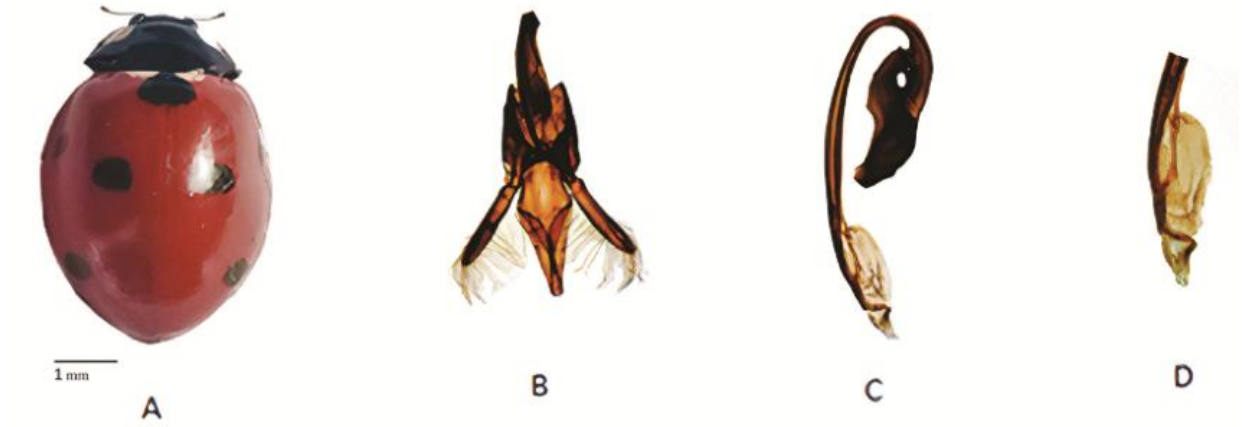

FIGURE 8. *Coccinella septempunctata*: (A) Dorsal view, (B) Tegmen, (C) Penis, (D) Tip of penis, Body size : Length 4.5- 6.2 mm; Width 3.5- 5.5 mm (n = 5)**.**

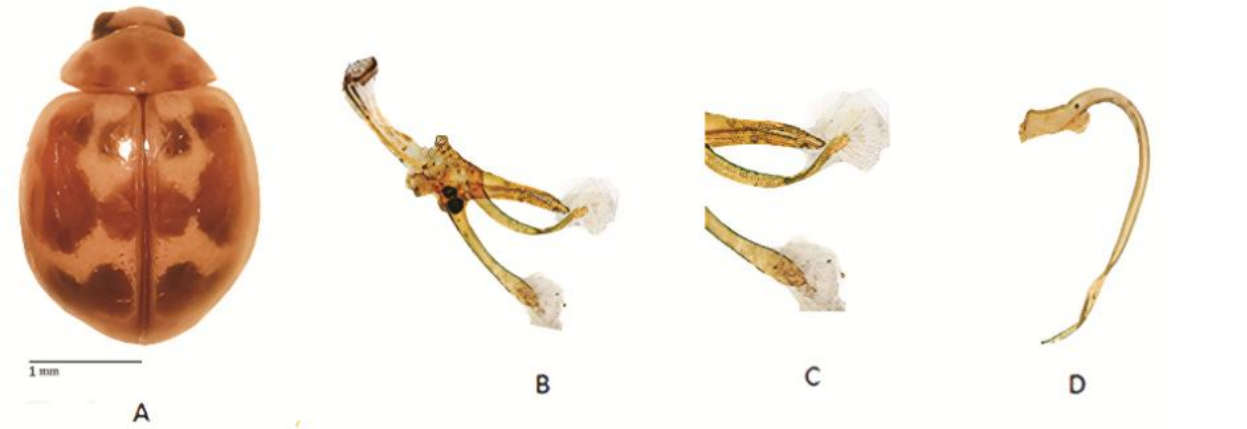

FIGURE 9. *Coccinula elegantula*, (A) Dorsal view (B) Tegmen, (C) Basal lobe and parameres, (D) Penis, Body size : Length 2.5- 2.9 mm; Width 1.8- 2.2 mm (n = 5).

Genus *Coccinella* Linnaeus, 1758

Coccinella septempunctata Linnaeus, 1758
(Figures 8, 27F)

Notes: The ladybug, *Coccinella septepunctata* (Figs. 8, 27F) was collected from natural habitats and agroecosystems on different crop plants, weeds and trees, including Pistachio trees infested by galling aphids (Aphididae), *A. pistaciae* (Aphalaridae) and *S. stali* (Cicadellidae) in Kermanshah province. Also, it was collected from Pistachio trees in Kerman (Salehi *et al*., 2011).
Material studied in Iran: With wide geographic distribution in Kermanshah. *Pistacia mutica*, 12 adults (4♂, 8♀), 29.Aug.2020, Hadis Nehrangi; *Pistacia vera*, 6 adults (3♂, 3♀), 16.Aug.2021, Hadis Nehrangi;

various plants, 137 adults (30♂, 107♀), 10.Jun.2020, 16.Jun.2020, 4.Jul.2020, 3.Aug.2020, 14.Aug.2020, 5.Sep.2020, 22.Sep.2020, 8.Oct.2020, 27.Oct.2020, 4.Nov.2020, 12.Mar.2021, 13.May.2021, 14.Jun.2021, 11.Aug.2021, 10.Sep.2021, 15.Oct.2021, 25.Feb.2022, Abedin Safari; Dalaho, 173 adults (80♂, 93♀), 28.Feb.2020, 10.Mar.2020, 22.Mar.2020. 14.Apr.2020, 25.Apr.2020, 5.May.2020, 12Jun.2020, 19.Jun.2020, 8.Jul.2020, 7.Aug.2020, 13.Sep.2020, 2.Oct.2020, 22.Oct.2020, 13.Mar.2021, 25.Mar.2021,22.Jun.2021, 28.Jul.2021, 6.Aug.2021, 3.Sep.2021, 19.Oct.2021, 1.Nov.2021, 5.Mar.2022, Abedin Safari; Islamabad-e-Gharb, 139 adults (49♂, 70♀), 5.May.2020, 4.Jun.2020, 28.Aug.2020, 8.Nov.2020, 9.Aug.2021, 17.Sep.2021, 9.Oct.2021, 28.Feb.2021, Abedin Safari; Ravansar, 63 adults (23♂, 40♀), 23.Mar.2021, 18.Jun.2021, 7.May.2022, Abedin Safari; Gilane-Gharb, 84 adults (24♂, 60♀), 6.Mar.2021, 2.Apr.2021, 14.Apr.2021, Abedin Safari; Salas- Babajani, 27 adults (7♂, 20♀), 29.Mar.2021, 26.Apr.2021, 13.Jun.2021, Abedin Safari; Sonqor, 48 adults (8♂, 40♀), 15.May.2021, 14.Jul.2021,Abedin Safari; Sahneh, 45 adults (12♂, 33♀), 15.Jul.2021, 19.Sep.2021, 1.Oct.2021; Javanrod, 99 adults (20♂, 79♀), 23.Mar.2021, 18.Jun.2021, 7.May.2022; Kangavar, 32 adults (14♂, 18♀), 15.Jul.2021, 19.Sep.2021, 1.Oct.2021, Abedin Safari; Sarpol-Zahab, 49 adults (22♂, 27♀), 11.Mar.2021, 18.Mar.2021, 9.Apr.2021, Abedin Safari; Qasr-Shirin, 40 adults (8♂, 32♀), 11.Mar.2021, 18.Mar.2021, 9.Apr.2021, Abedin Safari; Harsin, 39 adults (9♂, 30♀), 3.Apr.2021, 19.Sep.2021, Abedin Safari; Paveh, 15 adults (4 ♂, 11♀), 18.Oct.2022, Abedin Safari.

Notes: Many samples were strongly female-biased, which might be of an indication of presence of male killing bacteria in the populations.

Regional distribution in Iran: This species exhibits a broad geographic range, including, Lorestan (Mohammad poor *et al*., 2013), Razavi Khorasan (Farahi & Sadeghi, 2009), Kerman (Jafari *et al*., 2011), Tehran (Ghanbari *et al*., 2012), Mazandaran (Pahlavan *et al*., 2017).

Worldwide distribution: USA (Gordon, 1985), Canada (Larson, 2013); Oriental: India (Bielawski, 1968; Canepari, 2011), Sri Lanka (Ashfaque, 2012), Pakistan (Poorani, 2004); Palearctic: wide distribution; Afrotropical (Kovar, 2007).

Genus *Coccinula* Dobzhansky, 1925

***Coccinula elegantula* Weise, 1890**

(Figures 9, 28F)

Notes: *Coccinula elegantula* (Figs. 9, 28F) was collected directly by hand from both Pistachio and pine trees. This species was previously reported by Jalilvnd (2014) from Kermanshah province.

Material studied: Kermanshah (Taq-e-Bostan mountains), *Pistacia mutica*, 5 adults (3 ♂, 2♀), 29.Aug.2020, Hadis Nehrangi; (Agricultural College), *Pistacia vera*, 4 adults (0 ♂, 4♀), 16.Aug.2021, Hadis Nehrangi; *Pinus* sp. (Pinaceae), 7 adults (3♂, 4♀), 9.Dec.2020, 19.Dec.2020, 8.Jan.2021, 30.Apr.2021, Abedin Safari.

Regional distribution in Iran: Kermanshah (Jalilvnd, 2014), Razavi Khorasan (Yaghmaee & Kharaji, 1995), Isfahan (Jafari *et al*., 2002), Lorestan (Mohammad poor *et al*., 2013), Yazd (Zare Khormizi *et al*., 2013)

Worldwide distribution: Palearctic: Russia, Iran, Kazakhstan, Mongolia, Uzbekistan, Kyrkyzstan, Tadzhikistan (Kovar, 2007), Mongolia and Turkestan (Duverger, 1983)

Coccinula redimita* Weise, 1885

(Figures 10, 28G)

Notes: *Coccinula redimita* (Figs. 10, 28G) is reported for the first time from Kermanshah province.

Material studied: Dalaho (Gahvareh, Ghale-Ghazi Village), *Astragalus* sp. (Fabaceae), 8 adults (3♂, 5♀), 19.Jul.2021, 26.Jul.2021, Abedin Safari.

Regional distribution: Iran: Chaharmahal Bakhtiari (Bagheri & Mossedegh, 1995), Tehran (Borumand, 2000), Isfahan, Lordegan (Ghanbari Kohyani *et al*., 2013)

Worldwide distribution: Palearctic: Afghanistan, Iran, Tadzhikistan, Uzbekistan (Kovar, 2007), Turkey & Pakistan (Ashfaque, 2012) and Mongolia (Bielawski, 1975)

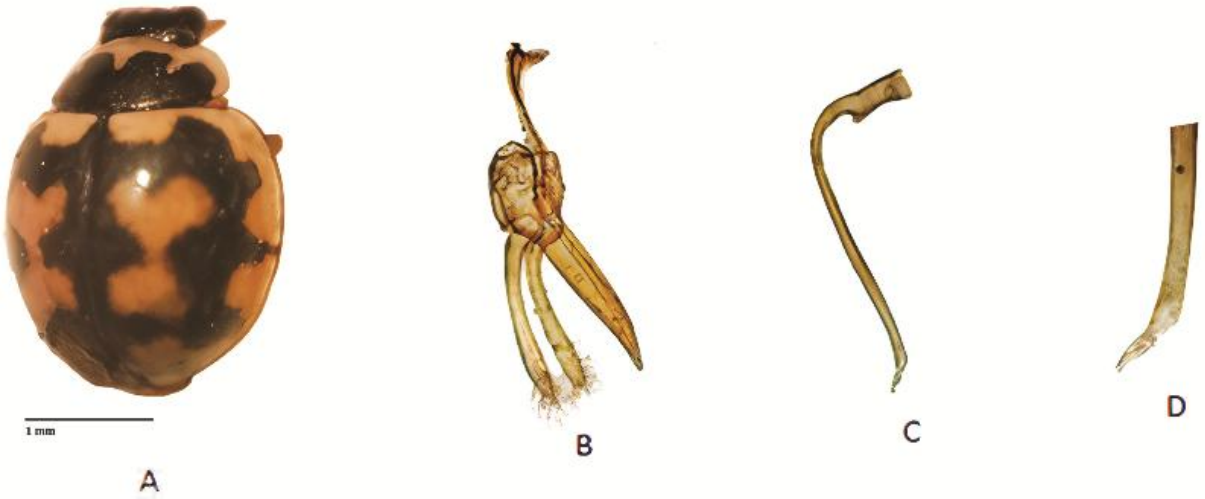

FIGURE 10. *Coccinula redimita*, (A) Dorsal view, (B) Tegmen, (C) Penis, (D) Tip of penis, Body size : Length 2.8- 3.4 mm; Width 2.1- 2.6 mm (n = 5).

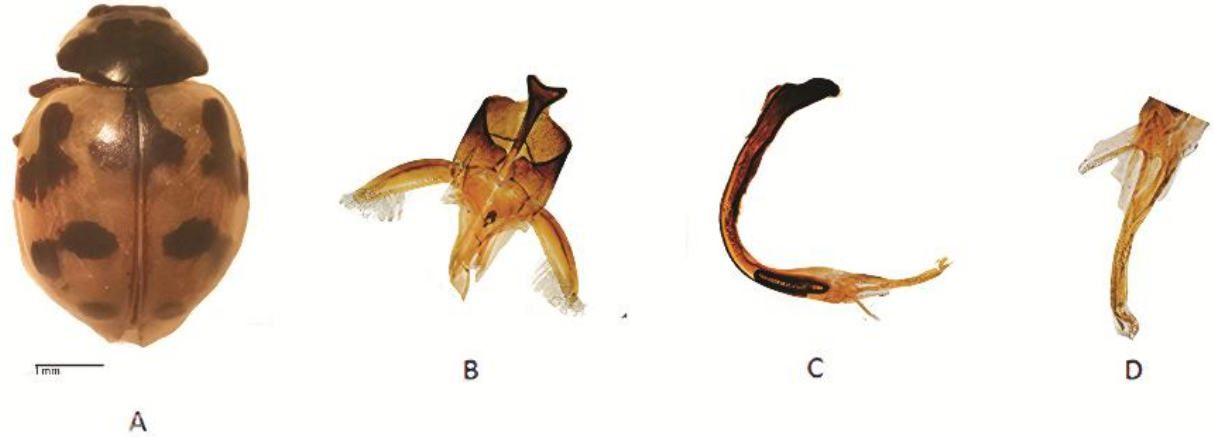

FIGURE 11. *Hippodamia undecimnotata*, (A) Dorsal view, (B) Tegmen, (C) Penis, (D) Tip of penis, Body size : Length 4.2- 5.1 mm; Width 3.6- 4.5 mm (n = 5).

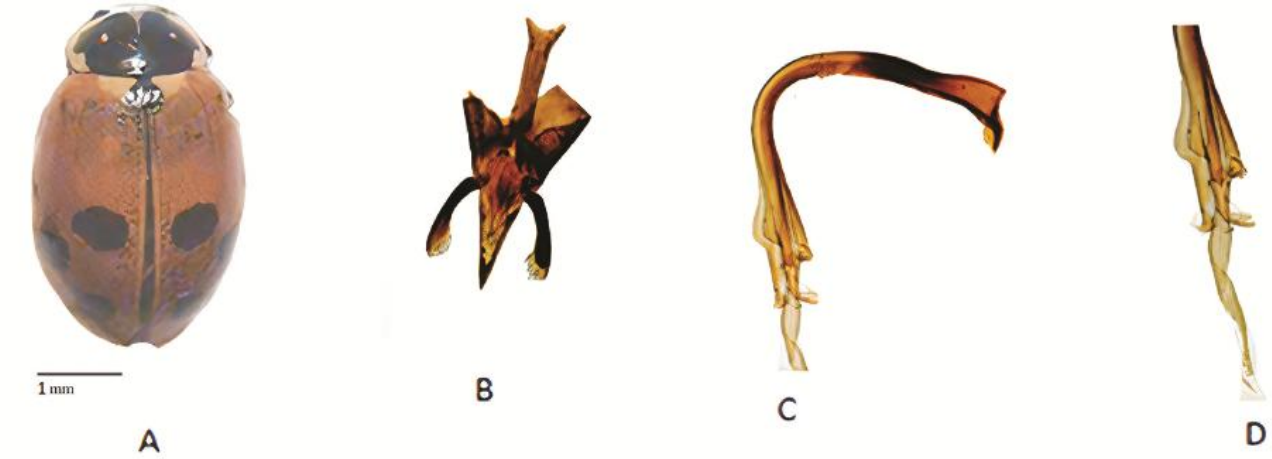

FIGURE 12. *Hippodamia variegata*: (A) Dorsal view of female, (B) Tegmen, (C) Penis, (D) Tip of penis, Body size : Length 3.5- 4.7 mm; Width 2.6-3.5 mm (n = 5).

Genus *Hippodamia* Chevrolat, 1836

***Hippodamia undecimnotata* (D.H. Shneider, 1793) ***
(Figures 11, 28D)
Syn.: *Coccinella undecimnotata* D.H.Schneider, 1792
Ceratomegilla undecimnotata (Schneider, 1792)
Semiadalia undecimnotata (Schneider, 1792)
Notes: *Hippodamia undecimnotata* (Figs. 11, 28D) is reported for the first time from Kermanshah province. It was collected from *Centaurea*, weed plants, directly by hand, within aphid colony. It appears in molecular phylogeny that *Ceratomegilla undecimnotata* belongs to *Hippodamia*.
Material studied: Gahvareh (Chegha Bor village), *Centaurea* sp., 12 adults (5♂, 7♀), 2.May.2020, 12.May.2020, Abedin Safari.
Regional distribution: Iran: First time recorded from Iran by Kovar (2007*)*, without specification of province.
Worldwide distribution: Palearctic: wide distribution in western Palearctic (Kovar, 2007), Caucasus, Western Siberia, Asia Minor (Iablokoff-Khnzorian, 1982).

***Hippodamia variegata* (Goeze, 1777)**
(Figures 12, 27G)
Syn.: *Adonia variegata* Goeze, 1777
Notes: *Hippodamia variegata* (Figs. 12, 27G) is an entomophagous ladybird. It is associated with Aphidoidea, Coccoidea, leafhoppers, psylloidea and Lepidoptera larvae which linked with *Pistacia* spp (Anacardiacae).This species occur abundantly in natural habitats and agro-ecosystems on different crops and ornamental plants, weeds and trees. This species collected directly by hand and beating tray, with close observation. The largest number of the field collected samples belong to *H. variegata* (430♂, 800♀), which shows a morphological variation in the number and location of the elytral spots, which is reliable with the results of (Honek et al., 2012; Biranvand and Shakarami, 2015). Previously, it was collected from Pistachio in Kerman (Salehi *et al*., 2011).
Material studied in Iran: Kermanshah (Taq-e-Bostan mountains), *Pistacia mutica*, 7 adults (2 ♂, 5♀), 29.Aug.2020, Hadis Nehrangi; (Agricultural College), *Pistacia vera*, 5 adults (1 ♂, 4♀), 16.Aug.2021, Hadis Nehrangi; various plants, 199 adults (80♂, 119♀), 11.May.2020, 25.May.2020, 10.Jun.2020, 16.Jun.2020, 4.Jul.2020, 3.Aug.2020, 14.Aug.2020, 5.Sep.2020, 22.Sep.2020, 8.Oct.2020, 27.Oct.2020, 4.Nov.2020, 12.Mar.2021, 13.May.2021, 14.Jun.2021, 11.Aug.2021, 10.Sep.2021, 15.Oct.2021, 25.Feb.2022, Abedin Safari; Dalaho, 429 adults (123♂, 306♀), 28.Feb.2020, 1.Mar.2020, 10.Mar.2020, 22.Mar.2020. 14.Apr.2020, 25.Apr.2020, 5.May.2020, 12Jun.2020, 19.Jun.2020, 8.Jul.2020, 7.Aug.2020, 13.Sep.2020, 2.Oct.2020, 22.Oct.2020, 28.Oct.2020, 13.Mar.2021, 25.Mar.2021, 22.Jun.2021, 28.Jul.2021, 6.Aug.2021, 3.Sep.2021, 19.Oct.2021, 1.Nov.2021, 5.Mar.2022, Abedin Safari; Islamabad-e-Gharb, 119 adults (47♂,72♀), 5.May.2020, 4.Jun.2020, 28.Aug.2020, 8.Nov.2020, 9.Aug.2021, 17.Sep.2021, 9.Oct.2021, 28.Feb.2021, Abedin Safari; Ravansar, 102 adults (34♂, 68♀), 23.Mar.2021, 18.Jun.2021, 7.May.2022, Abedin Safari; Gilane-Gharb, 61 adults (18♂, 43♀), 6.Mar.2021, 2.Apr.2021, 14.Apr.2021, Abedin Safari; Salas-Babajani, 12 adults (3♂, 9♀), 29.Mar.2021, 26.Apr.2021, 13.Jun.2021, Abedin Safari; Sonqor, 52 adults (17♂, 35♀), 15.May.2021, 14.Jul.2021, Abedin Safari; Sahneh, 58 adults (21♂, 37♀), 15.Jul.2021, 19.Sep.2021, 1.Oct.2021; Javanrod, 22 adults(9♂, 13♀), 23.Mar.2021, 18.Jun.2021, 7.May.2022; Kangavar, 45 adults (19♂, 26♀), 15.Jul.2021, 19.Sep.2021, 1.Oct.2021, Abedin Safari; Sarpol-Zahab, 76 adults (34♂, 42 ♀), 11.Mar.2021, 18.Mar.2021, 9.Apr.2021, Abedin Safari; Qasr-Shirin, 25 adults (8♂, 17♀), 11.Mar.2021, 18.Mar.2021, 9.Apr.2021, Abedin Safari; Harsin, 12 adults (4♂, 8 ♀), 3.Apr.2021, 19.Sep.2021, Abedin Safari; Paveh, 13 adults (4 ♂, 9 ♀), 18.Sep.2022, 18.Oct.2022, Abedin Safari.
Note: Many samples were female-biased, which suggests a presence of male killing bacteria in the populations.

Regional distribution in Iran: Lorestan (Mohammad poor *et al*., 2013), Razavi Khorasan (Farahi & Sadeghi, 2009), Kerman (Jafari *et al*., 2011), Tehran (Ghanbari *et al*., 2012), Mazandaran (Pahlavani *et al*., 2017).

Worldwide distribution: Afrotropical: Kenya (Canepari, 2007), Central Africa (Raimundo & Van Harten, 2000), Eastern Africa (Ashfaque, 2012); Neotropical: introduced to Chile (Rebolledo et al., 2007); Oriental: India (Bielawski, 1968; Canepari, 2007), Nepal (Ashfaque, 2012); Palearctic: common distribution in China and other east Palearctic countries (Kovar, 2007), Tibet, China (Ashfaque, 2012) and Pakistan (Poorani, 2004).

Genus *Oenopia* Mulsant, 1850

Oenopia conglobata (Linnaeus, 1758)

(Figures 13, 27H)

Syn.: *Coccinella conglobata* Linnaeus, 1758;
Harmonia buphthalmus Mulsant, 1850;

Notes: *Oenopia conglobata* (Figs. 13, 27H) was collected directly by hand and beating tray technique, with a close observation on Pistachio trees infested by galling aphids (Aphididae), *A. pistaciae* (Aphalaridae) and *S. stali* (Cicadellidae). Previously, it was reported from Pistachio in Kerman (Salehi *et al*., 2011). Additionally, *Oenopia conglobata* specimens were collected from apple, walnut, plum, peach trees and alfalfa and corn fields infested by Aphidoidea. *Oenopia conglobata* has worldwide distribution, but originally belong to Asia, Europe and Africa. Reported as a psyllophagous and coccidophagus coccinellid (Mehrnejad, 2010 and Jalilvnd *et al*., 2014) from Iran, and as a predator of *Matsucoccus feytaudi* Ducasse (Hemiptera, Matsucoccidae) (Covassi et al., 1991).

Material studied in Iran: Kermanshah (Taq-e-Bostan mountains), *Pistacia mutica*, 21 adults (5♂, 16♀), 29.Aug.2020, Hadis Nehrangi; (Agricultural College), *Pistacia vera*, 4 adults (1♂, 3♀), 16.Aug.2021, Hadis Nehrangi; *Prunus persica* (Rosacea), *Juglans* sp. (Juglandaceae), *Medicago* sp. (Fabaceae) and *Zea mays* (Poaceae), 71 adults (28♂, 43♀), 9.Jun.2020, 19.Jun.2020, 18.Sep.2020, 17.Oct.2020, 29.Oct.2020, 11.Feb.2021, 26.Mar.2021. 19.Jun.2021, Aedin Safari; Dalaho, *Malus domestica*, *Prunus armeniaca* and *Prunus persica* (Rosacea), *Juglans* sp. (Juglandaceae), 73 adults (25♂, 48♀), 2.May2020, 5.May.2020, 17.May.2020, 15.Jun.2020, 5.Aug.2020, 13.Sep.2020, 25.Mar.2021, 22.May.2021, 17.Jun.2021, 1.Jul.2021, Abedin Safari; Gilan-Gharb, *Malus domestica*, *Prunus armeniaca* and *Prunus persica* (Rosacea), 14 adults (5♂, 9♀), 2.Apr.2021, 4.Apr.2021, Abedin Safari; Ravansar, *Juglans* sp. (Juglandaceae), 17 adults (10♂, 7♀), 7.May.2021, 18.Jun.2021, Abedin Safari Islamabad-e-Gharb, *Medicago* sp. (Fabaceae), *Malus domestica*, *Prunus armeniaca* and *Prunus persica* (Rosaceae), 47 adults (15♂, 32♀), 4.Jul.2020, 10.Jul.2021. 27Jul. 2021, Abedin Safari; Sahneh, *Malus domestica*, *Prunus armeniaca* and *Prunus persica* (Rosaceae), *Medicago* sp. (Fabaceae), 27 adults (8♂, 19♀), 18.May.2020, 22.Jun.2021, 1.Oct.2021, Abedin Safari; Paveh, *Prunus persica* (Rosaceae), 4 adults (1♂, 3♀), 18.Oct.2022, Abedin Safari.

Regional distribution in Iran: Kermanshah (Jalilvnd *et al*., (2014), Fars (Yazdani, 1990), Chaharmahal and Bakhtiari (Bagheri & Mosadegh, 1995), Gilan (Hajizadeh *et al*., 2002), Mazandaran (Pahlavan *et al*., 2017), Khuzestan (Ebrahimzadeh & Mosadegh, 2004), Lorestan (Mohammad poor *et al*., 2013), Isfahan (Jafari *et al*., 2002), Razavi Khorasan (Farahi & Sadeghi, 2009), Kerman (Salehi *et al*., 2011), Semnan (Toozandejani and Ajamhassani, 2021).

Worldwide distribution: North America (Ashfaque, 2012); Oriental: India (Sicard, 1907); Palearctic: wide distribution (Kovar, 2007), Northern China (Ashfaque, 2012) and Pakistan (Poorani, 2004).

Oenopia oncina (Olivier, 1808)

(Figures 14, 27I)

Notes: The ladybug, *Oenopia oncina* (Figs. 14, 27I) was collected from *Pistacia mutica*, infested by galling aphids (Aphididae) and *A. pistaciae* (Aphalaridae). Addition to this, collected from Pistachio in Kerman (Salehi *et al*., 2011). Also collected from an aphid colony associated with the host plant belonging to Asteraceae. The samples were directly collected by hand, with a close observation on the specimens. *Oenopia oncina* displays a sexual dimorphism. Male elytra with < 3 small brown spots, but

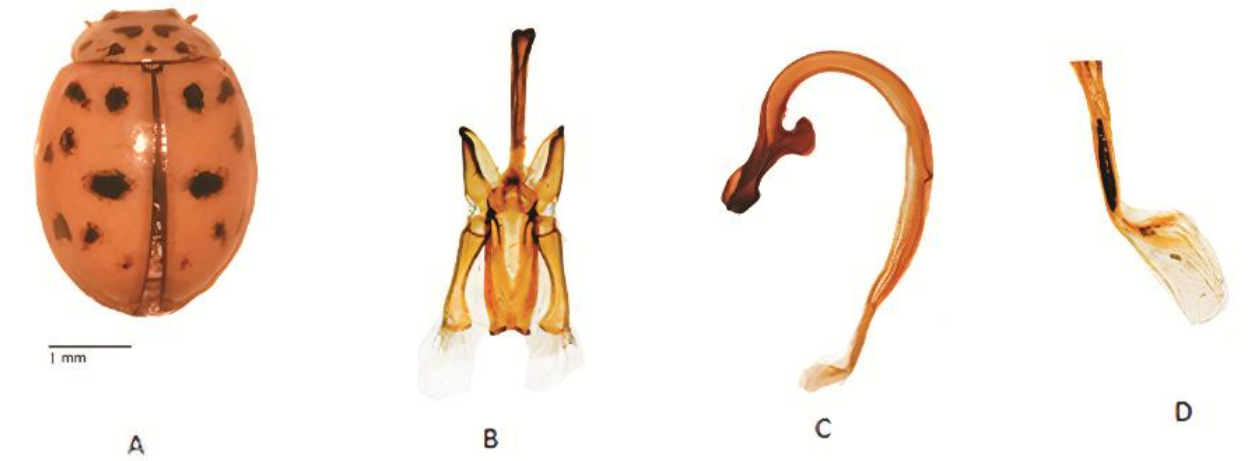

FIGURE 13. *Oenopia conglobata*: (A) Dorsal view, (B) Tegmen, (C) Penis, (D) Tip of penis, Body size : Length 3.3- 4.2 mm; Width 2.3- 3.4 mm (n = 5).

FIGURE 14. *Oenopia oncina* : (A) Dorsal view, (B) Ventral view of tegmen, (C) Lateral sides of tegmen, (D) Penis, (E) Tip of penis, Body size : Length 3.2- 4.1 mm; Width 2.4- 3.2 mm (n = 5).

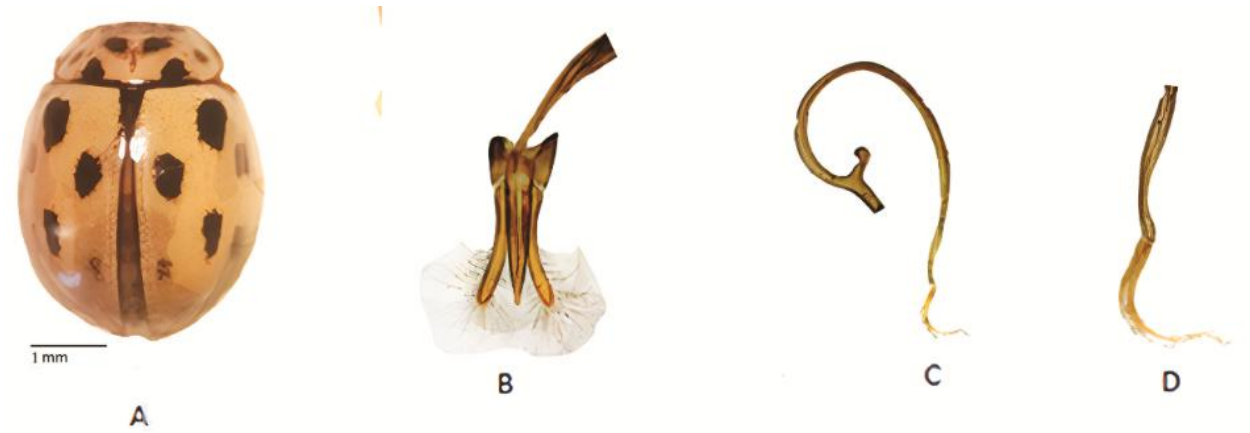

FIGURE 15. *Propylea quatuordecimpunctata*: (A) Dorsal view of female, (B) Tegmen, (C) Penis, (D) Tip of penis, Body size : Length 3.8- 4.6 mm; Width 3.1- 4.2 mm (n = 5).

female elytra with ≥ 3 large brown spots. Previously, it was reported by Gholami Moghadam *et al*. (2014) from Kermanshah.

Material studied: Kermanshah (Taq-e-Bostan mountains), *Pistacia mutica*, 15 adults (5 ♂, 10♀), 29.Aug.2020, Hadis Nehrangi; Kermanshah, *Picnomon* sp. (Asteraceae), 8 adults (3♂, 5♀), 25.May.2021, 17.Sep.2021, Abedin Safari. Gehvareh, *Picnomon* sp. (Asteraceae), *Euphorbia* sp. (Euphorbiaceae), 29 adults (9♂, 20♀), 6.Oct.2020, 16.Oct.2020, 1.Nov.2021, Abedin Safari.

Regional distribution in Iran: Kermanshah (Gholami Moghadam *et. al*. 2014), Kerman (Jafari *et al*., 2011), Lorestan (Mohammad poor *et al*., 2013), Hamadan (Akhavan *et al*., 2013), Yazd (Zare Khormizi *et al*., 2013).

Worldwide distribution: Western Palearctic, Iran (Kovar, 2007)

Genus *Propylea* Mulsant, 1846

***Propylea quatuordecimpunctata* (Linnaeus, 1758) ***

(Figure 15, 28E)

Syn.: *Coccinella 14-punctata* Linnaeus, 1758

Notes: *Propylea quatuordecimpunctata* (Figs. 15, 28E) is reported for the first time from the Kermanshah province. It was collected by netting method from alfalfa fields infested by Aphidoidea. *Propylea quatuordecimpunctata* shows a sexual dimorphism. Male head yellow and in the middle part, female with dark spot on the clypeus.

Material studied: Kermanshah, *Medicago sativa* (Fabaceae), 68 adults (25♂, 43♀), 18.May.2021, 5.Jun.2021, 14.Jul.2021, Abedin Safari; Islamabad-e-Gharb, *Medicago sativa* (Fabaceae), 42 adults (15♂, 27♀), 4.Jun.2021, 16. Jun.2021, 3.Jul.2021, Abedin Safari.

Regional distribution: Iran: Alborz, Hormozgan, North Khorasan and Zanjan (Abdolahi *et al*., 2017), Gilan and Golestan (Abdolahi *et al*., 2017), Hamedan (Sadeghi & Khanjani, 1998 and Abdolahi *et al*., 2017)), Isfahan (Haghshenas *et al*., 2004), Razavi Khorasan (Farahi & Sadeghi, 2009), Kerman (Jafari *et al*., 2011), Tehran (Abdi *et al*., 2012 and Abdolahi *et al*., 2017), Lorestan (Mohammad poor *et al*., 2013), Semnan (Toozandejani and Ajamhassani, 2021).

Worldwide distribution: USA & Canada (Hoebeke & Wheeler, 1996); Oriental: India (Ashfaque, 2012), Bangladesh (Poorani, 2004); Palearctic: wide distribution (Kovar, 2007), including China (Ashfaque, 2012) and Pakistan (Poorani, 2004)

Genus *Psyllobora* Dejean, 1836

Psyllobora vigintiduopunctata* (Linnaeus, 1758)

(Figures 16, 28A)

Syn.: *Coccinella vigintiduopunctata* Linnaeus, 1758

Coccinella vigintipunctata Fabricius, 1775

Coccinella bisdecempunctata Duméril, 1817

Notes: *Psyllobora vigintiduopunctata* (Figs. 16, 28A) is reported for the first time from Kermanshah province. It is a mycophagous ladybird, associated with mildew. This species was collected from an alfalfa field with fungal disease (gray downy growth on the underside of leaflets) by netting and manual shaking plants. This ladybird shows sexual dimorphism, the pronotum background in male is lighter than the elytra.

Material studied: Gehvareh, *Torilis* sp. (Apiaceae), 33 adults (10♂, 23♀), 5.Sep.2020, 11.Oct.2020, 22.Oct.2020, 15.Jun.2021, Abedin Safari; Kermanshah, *Medicago sativa* (Fabaceae), 62 adults (27♂, 35♀), 19.May.2021, 23.May.2021, 28.Sep.2021, Abedin Safari; Biston, *Alhagi maurorum* and *Medicago sativa* (Fabaceae), 70 adults (28♂, 42♀), 27.May.2021, 7.Jun.2021, 29.Sep.2021, Abedin Safari.

Notes: Samples were female-biased, which suggests a presence of male killing bacteria in the populations.

Regional distribution: Iran: Lorestan (Mohammad poor *et al*., 2013), Mazandaran (Pahlavani *et al*., 2017), Hamedan (Sadeghi & Khanjani, 1998), Ardabil, Moghan (Lotfalizadeh, 2001), Semnan (Toozandejani and Ajamhassani, 2021).

Worldwide distribution: Palearctic (Kovar, 2007).

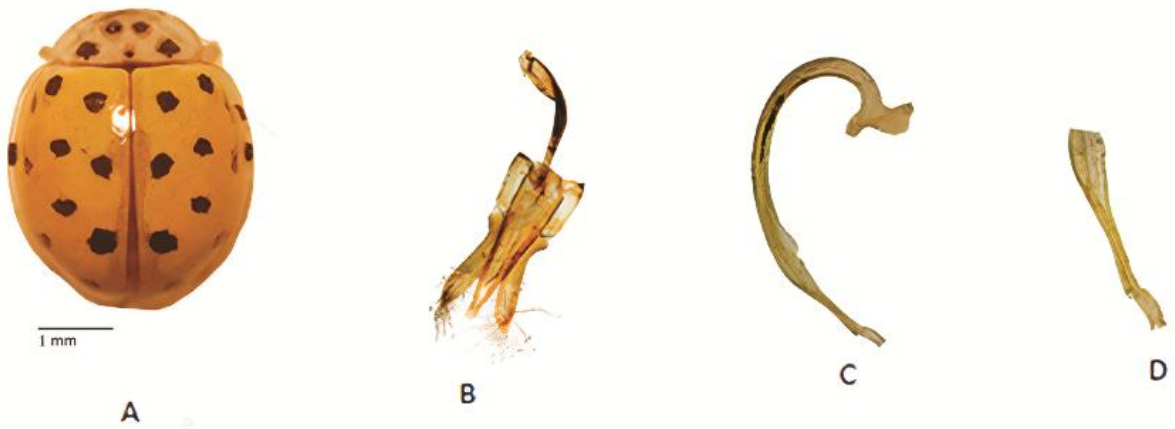

FIGURE 16. *Psyllobora vigintiduopunctata*, (A) Dorsal view, (B) Tegmen, (C) Penis, (D) Tip of penis, Body size : Length 3.5- 4.5 mm; Width 2.6- 3.4 mm (n = 5)**.**

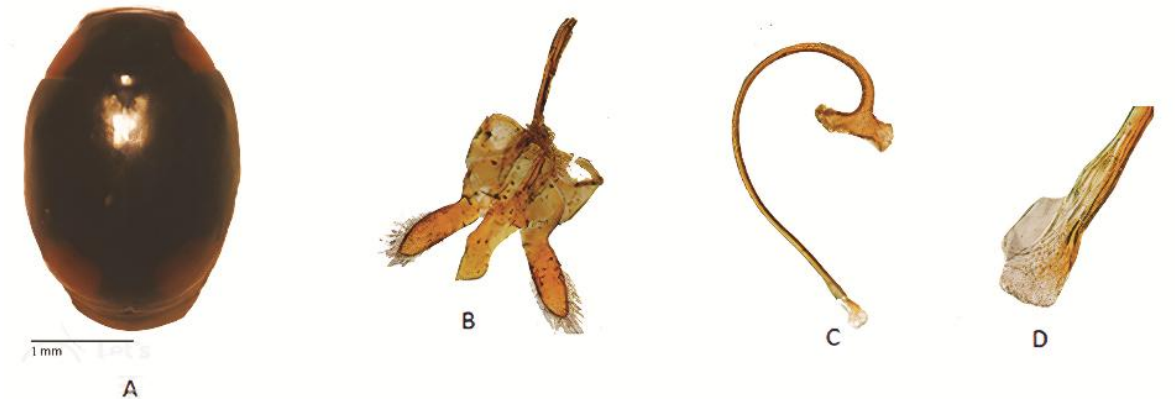

FIGURE 17. *Hyperaspis pseudopustulata*, (A) Dorsal view, (B) Tegmen, (C) Penis, (D) Tip op penis, Body size : Length 2.5- 3.8 mm; Width 2.2- 2.8 mm (n = 5)**.**

FIGURE 18. *Clitostethus arcuatus*, (A) Dorsal view, (B) Penis, (C) Tegmen, (D) Parameres and basal lobe, Body size : Length 1.6- 1.8 mm; Width 1.1- 1.3mm (n = 3)**.**

Tribe HYPERASPINIINI
Genus *Hyperaspis* Chevrolat 1837

***Hyperaspis pseudopustulata* Mulsant, 1853**
(Figures 17, 29G)

Notes: *Hyperaspis pseudopustulata* (Figs. 17, 29G) is a coccidophagus ladybird. It is associated with scale insect, *Anapulvinaria pistaciae* Bodenheimer, 1926 (Hem.: Coccidae) occurring sparsely in woodland areas on *Pistacia mutica*. This pistachio species is growing into shrubs and small trees, mainly in mountainous areas, 1500-2000 m above sea level. Also, collected from Pistachio in Kerman (Salehi *et al*., 2011). Additionaly, *H. pseudopustulata* is associated with other scale insect, *Orthezia urticae* (Linnaeus, 1758) (Orthzeiidae), occurring abundantly in hillside areas on three main host plants: *Eryngium thyrsoides* (Apiaceae), *Astragalus* sp. (Fabaceae) and *Euphorbia* sp. (Euphorbiaceae) (Karimi, 2018).

This ladybird species shows a fair degree of sexual dimorphism. Males with an additional small white spot on the head, anteriorly.

Material studied in Iran: Kermanshah (Taq-e-Bostan mountains), *Pistacia mutica*, 16 adults (5 ♂, 11♀), 29.Aug.2020, Hadis Nehrangi; Kermanshah, Sahneh, Dinavar, Balesht village, *Eryngium thyrsoides* (Apiaceae); *Astragalus* sp. (Fabaceae) and *Euphorbia* sp. 25 adults (9♂, 16♀), 22.Aug.2018, Hassanali vahedi and Samira Karimi; Dalaho, Gahvareh, Ghale-Ghazi village, *Astragalus* sp. (Fabaceae) and *Euphorbia* sp. (Euphorbiaceae), 20 adults (9♂, 11♀), 10.Aug.2021, 17.Aug.2021, Abedin Safari.

Regional distribution in Iran: Kermanshah (Karimi, 2018).

Worldwide distribution: Palearctic: Kazakhstan, Turkey and Asian parts of Russia (Kovář, 2007), semiaquatic plants in Europe (Nedvěd, 2015), Iran: Kermanshah (Karimi, 2018) and (Biranvand et al., 2019)**.**

Tribe SCYMNINI
Genus Clitostethus Weise, 1885

Clitostethus arcuatus* (Rossi, 1794)
(Figures 18, 29F)

Syn.: *Scymnus abeillei* Weise, 1884

Notes: *Clitostethus arcuatus* (Figs. 18, 29F) is reported for the first time from Kermanshah province. This species is very rare. It was collected with a beating tray.

Material studied: Iran: Kermanshah (Agricultural College), *Juglans* sp. (Juglandaceae), 3 adults (1♂, 2♀), 30.May.2021, Abedin Safari.

Regional distribution: Iran: ChaharMahal and Bakhtiari (Bagheri & Mosadegh, 1995), Golestan, North Khorasan and Tehran (Abdolahi *et al*., 2017), South Khorasan (Moadi & Mossadegh, 1995), Semnan (Toozandejani and Ajamhassani, 2021)

Worldwide distribution: western Palearctic, Iran (Kovar, 2007); Neotropical: introduced to Chile (Canepari, 2011); Afrotropical (Kovar, 2007).

Genus *Diomus* Mulsant, 1850

***Diomus rubidus* (Motschulsky, 1837)**
(Figures 19, 29E)

Syn.: *Scymnus rubidus* Motschulsky, 1837

Notes: *Diomus rubidus* (Figs. 19, 29E) was reported by Jalilvand *et al*. (2014) from Kermanshah province.

Material studied: Iran: Kermanshah, *Convolvulus* sp. (Convolvulaceae), 29 adults (12♂, 17♀), 14.May.2021, 17.May.2021, 8.Jun.2021, Abedin Safari.

Regional distribution: Iran: Kerman (Kouhpayezadeh & Mosadegh, 1991) and Kermanshah (Jalilvand *et al*., 2014).

Worldwide distribution: Western Palearctic (Kovar, 2007).

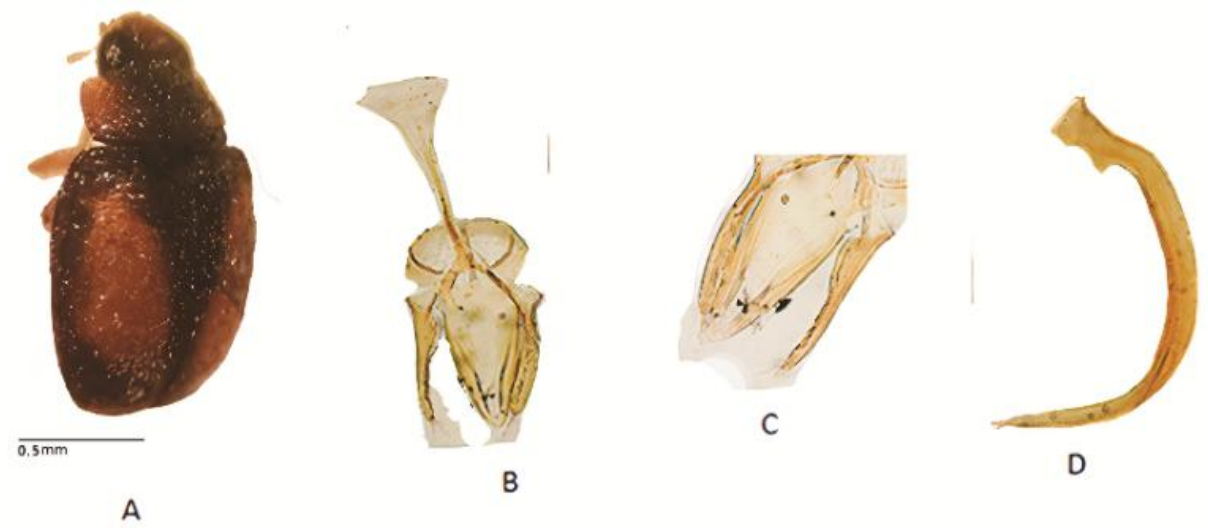

FIGURE 19. *Diomus rubidus*, (A) Dorsal view, (B) Tegmen, (C) Parameres and basal lobe, (D) Penis, Body size : Length 1.5- 1.7 mm; Width 0.8- 1 mm (n = 5)**.**

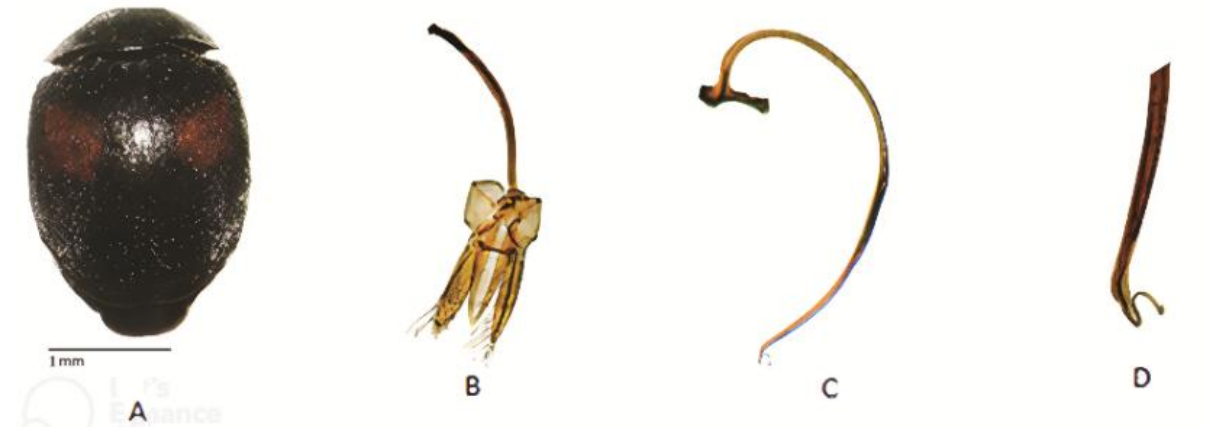

Figure 20. *Scymnus apetzi*, (A) Dorsal view of female, (B) Tegmen, (C) Penis, (D) Tip of penis, Body size : Length 2.5- 3 mm; Width 1.8- 2.3 mm (n = 5)**.**

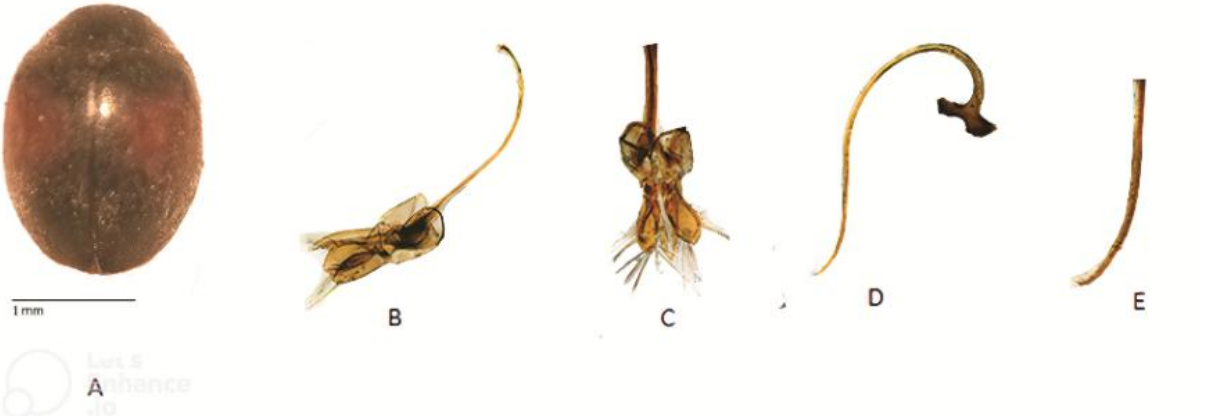

FIGURE 21. *Scymnus flavicollis*: (A) Dorsal view, (B) Lateral sides of tegmen, (C) Ventral view of tegmen, (D) Penis, (E) Tip of penis. Body size : Length 1.8- 2.5 mm; Width 1.3- 1.7 mm (n = 5).

Genus *Scymnus* Kugelann, 1794

***Scymnus apetzi* Mulsant, 1846**
(Figures 20, 29D)

Notes: *Scymnus apetzi* (Figs. 20, 29D) is reported for the first time from Kermanshah province. This species was collected manually and directly from pistachio trees infested with galling aphids and psylla, *A. pistaciae* and also this species collected from Pistachio in Kerman (Salehi *et al*., 2011). Furthermore, it was collected from Euphorbiaceae and Asteraceae plants infested with aphids and mealybugs.

Material studied: Kermanshah (Taq-e-Bostan mountains), *Pistacia mutica*, 12 adults (3 ♂, 9♀), 29.Aug.2020, Hadis Nehrangi; (Agricultural College), *Pistacia vera*, 6 adults (2 ♂, 4♀), 16.Aug.2021, Hadis Nehrangi; Gahvareh (Ghaleh-Ghazi village); *Euphorbia* sp. (Euphorbiaceae), *Cirsium vulgare* and *Centaurea* sp. (Asteraceae), 60 adults (25♂, 35♀) 6.May.2020, 13.May.2020, 25.Jul.2020, 19.Aug.2020, 8.Jul.2021, 3.Aug.2021, Abedin Safari.

Regional distribution in Iran: Alborz, Golestan, North Khorasan, Tehran (Abdolahi *et al*., 2017), West Azerbaijan (Parvizi *et al*., 1987), Fars (Yazdani, 1990), Chaharmahal and Bakhtiari (Bagheri & Mosadegh, 1995), Lorestan (Mohammad poor *et al*., 2013), Hamedan (Akhavan *et al*., 2013 and Abdolahi *et al*., 2017).

Worldwide distribution: Palearctic (Kovar, 2007).

***Scymnus flavicollis* (Redtenbacher, 1843)**
(Figures 21, 29A)

Syn.: *Scymnus triangulifer* Fleischer 1900
Scymnus araxicola Fleischer 1900
Scymnus rufithorax Baudi 1894.

Notes: *Scymnus flavicollis* (Figs. 21, 29A) is reported for the first time from Kermanshah province. This species was collected manually from pistachio trees infested by galling aphids and psylla, *A. pistaciae* and also collected from Pistachio in Kerman (Salehi *et al*., 2011). This species show a sexual dimorphism. Male with brown pronotum margin, but female having black pronotum.

Material studied: Kermanshah (Taq-e-Bostan mountains), *Pistacia mutica*, 6 adults (6♀), 29.Aug.2020, Hadis Nehrangi; *Medicago sativa* (Fabaceae), 28 adults (10♂, 18♀), 2.Jun.2021, 17.Jul.2021, Abedin Safari; Gehvareh, *Euphorbia* sp. (Euphorbiaceae), 45 adults (13♂, 32♀), 13.May.2020, 17.May.2020, 14.Jul.2020, 8.Sep.2020, 13.Aug.2021, Abedin Safari; Biston, *Medicago sativa* (Fabaceae), 29 adults (12♂, 17♀), 19.Sep.2021, 27.Sep.2021, Abedin Safari; Sahneh, *Medicago sativa* (Fabaceae), 33 adults (10♂, 23♀), 19.Sep.2021, Abedin Safari.

Regional distribution in Iran: Fars (Yazdani, 1990), Chaharmahal and Bakhtiari (Bagheri & Mosadegh, 1995), Isfahan (Haghshenas *et al*., 2004), Gilan (Hajizadeh *et al*., 2001), Lorestan (Mohammad poor *et al*., 2013), Semnan (Toozandejani and Ajamhassani, 2021).

Worldwide distribution: Algeria, France, Italy, Morocco, Tunisia (Kovar, 2007), Iran (Fursch, 1977), Syria (Mader, 1955), Lebanon (Fursch, 1977).

***Scymnus pharaonis* (Motschulsky, 1851)**
(Figures 22, 29C)

Syn.: *Scymnus araraticus* Lablokoff-Khnzorian, 1969

Notes: *Scymnus pharaonis* (Figs. 22, 29C) was collected from host trees infested by mites, It was reported by Fürsch (1997) from Kermanshah.

Material studied: Iran: Gahvareh, *Astragalus* sp. (Fabaceae), *Ficus carica* (Moraceae), 51 adults (18♂, 43♀), 9.Jun.2020, 12.Jun.2020, 31.Jul.2021, 16.Oct.2021, Abedin Safari; Kermanshah, *Populus* sp. (Salicaceae), *Juglans* sp. (Juglandaceae), 75 adults (23♂, 52♀), 19.Sep.2021, 23.Sept.2020, 27.Sep.2021, 30 Sep.2021, Abedin Safari; Islamabad-e-Gharb, Prunus *amygdalus* (Rosaceae), *Prunus armeniaca* (Rosaceae), 40 adults (10♂, 30♀), 9.Aug.2021, 17.Aug.2021,5.Oct.2021, Abedin Safari; Sahneh, *Malus domestica* (Rosaceae), 34 adults (9♂, 25♀), 15.July.2021, 28.Sept.2021, Abedin Safari.

Notes: Samples were strongly female-biased, which suggests a presence of male killing bacteria in the populations.

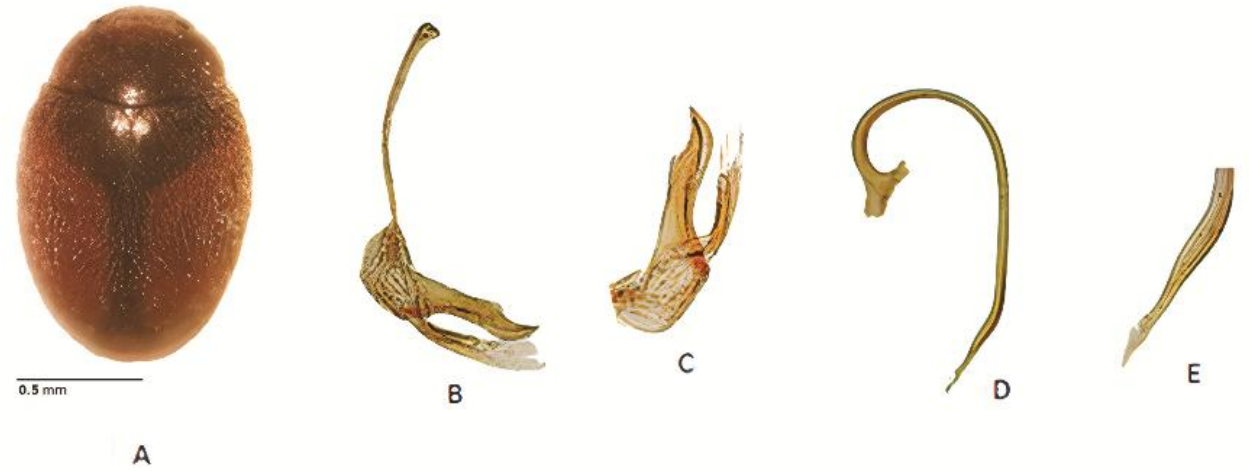

FIGURE 22. *Scymnus pharaonis*, (A) Dorsal view, (B) Tegmen, (C) Parameres and basal lobe, (D) Penis, (E) Tip of penis, Body size : Length 1.3- 1.5 mm; Width 0.9- 1.2 mm (n = 5).

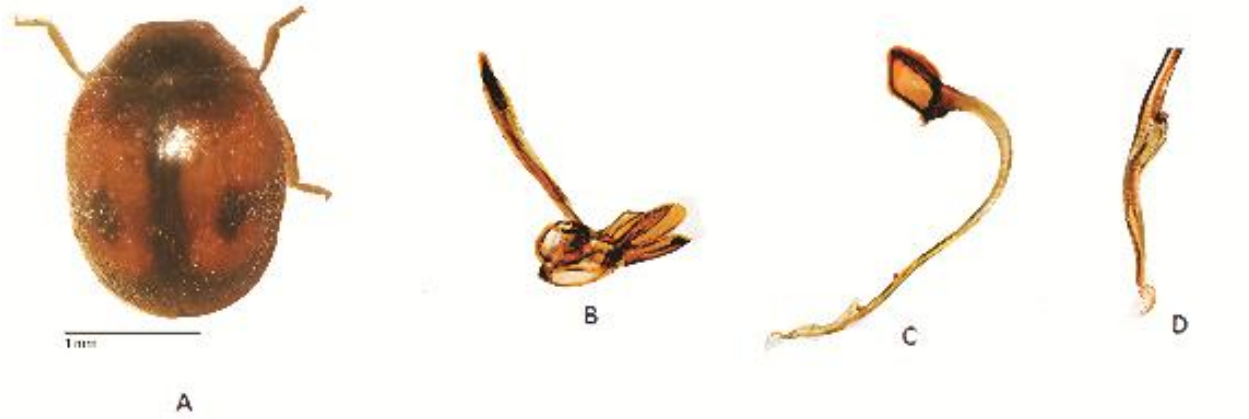

FIGURE 23. *Scymnus rubromaculatus*, (A) Dorsal view, (B) Ventral view of tegmen, (C) Lateral sides of tegmen, (D Penis, (E) Tip of penis, Body size: Length 1.9- 2.5 mm; Width 1.4- 1.8 mm (n = 5).

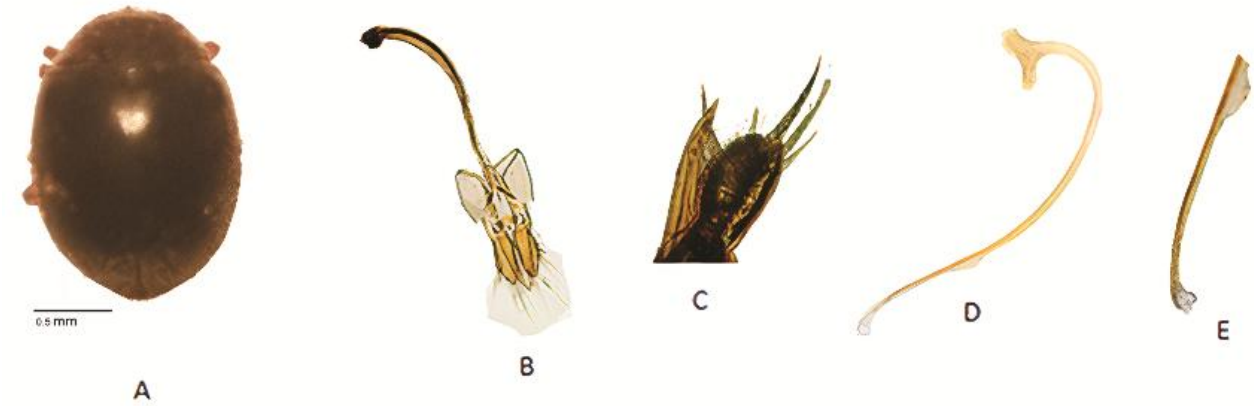

FIGURE 24. *Scymnus subvillosus*, (A) Dorsal view, (B) Tegmen, (C) Penis, (D) Tip of penis, Body size: Length 1.6- 2.3 mm; Width 1.2- 1.8 mm (n = 5).

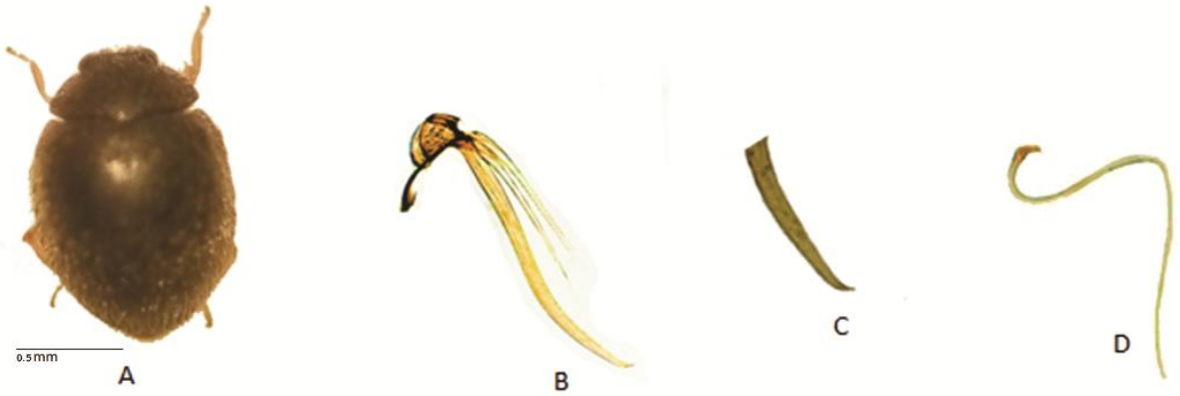

FIGURE 25. *Stethorus gilvifrons*: (A) Dorsal view, (B) Tegmen, (C) Basal lobe, (D) Penis, Body size : Length 1.3- 1.5 mm; Width 0.8- 1 mm (n = 5)**.**

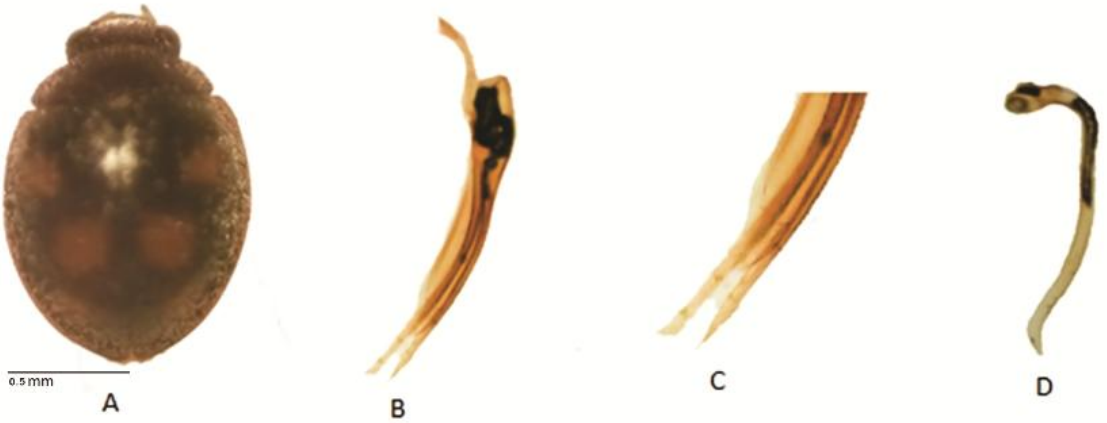

FIGURE 26. *Pharoscymnus pharoides*, (A) Dorsal view, (B) Tegmen, (C) Parameres and basal lobe, (D) Penis. Body size : Length 1.4- 1.6 mm; Width 0.9- 1.1 mm (n = 2)**.**

Regional distribution: Iran: Kerman (Kouhpayezadeh-esfahani & Mosadegh, 1991), Kermanshah (Fürsch, 1997), Fars (Yazdani, 1990), Chahar Mahal Bakhtiari (Bagheri & Mosadegh, 1995), Guilan (Hajizadeh *et al*., 1998), Lorestan (Mohammad poor *et al*., 2013).
Worldwide distribution: Palearctic: Armenia, Egypt, France, Germany, Iraq, Jordan, Turkey (Kovar, 2007), Iran (Fürsch, 1977; Kovar, 2007), Lebanon (Fürsch, 1977).

***Scymnus rubromaculatus* (Goeze, 1777)**
(Figures 23, 28I)
Syn.: *Coccinella rubromaculata* Goeze, 1777
Notes: *Scymnus rubromaculatus* (Figs. 23, 28I) is sexually dimorphic, males has a red margin of the pronotum, females have a black pronotum and head.
Material studied: Kermanshah; *Convolvulus* sp. (Convolvulaceae), *Medicago sativa* (Fabaceae), 125 adults (40♂, 85♀), 12.May.2021, 4.Jun.2021, 22.Jun.2021, 2.Jul.2021, 9.Jul.2021, Abedin Safari.
Regional distribution: Iran: Fars (Yazdani, 1990), Golestan (Abdolahi *et al*., 2017), Hamadan, Hormozgan, Golestan and Zanjan (Abdolahi *et al*., 2017) and Lorestan (Mohammad poor *et al*., 2013).
Worldwide distribution: Western Palearctic (Kovar, 2007); Afrotropical (Kovar, 2007).

Scymnus subvillosus* (Goeze, 1777)
(Figures 24, 29B)
Syn.: *Coccinella subvillosus* Goeze, 1777;
Pullus subvillosus (Goeze, 1777) in Kapur, 1959

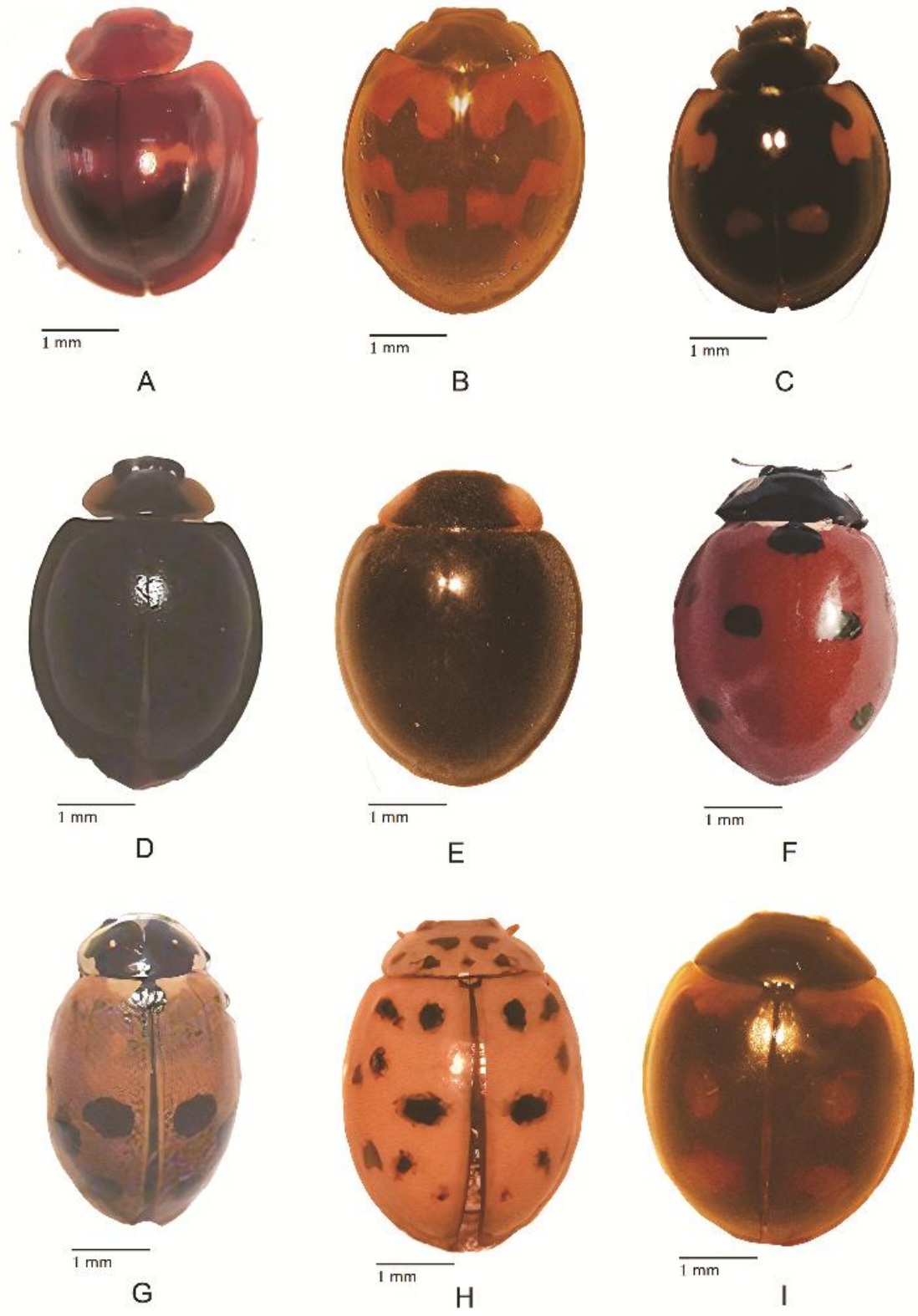

FIGURE 27. A: *Chilocorus bipustulatus*, B: *Exochomus undulatus*, C: *Exochomus quadripustulatus*, D: *Parexochomus nigromaculatus*, E: *Parexochomus pubescens*, F: *Coccinella septempunctata*, G: *Hippodamia variegata*, H: *Oenopia conglobata*, I: *Oenopia oncina***.**

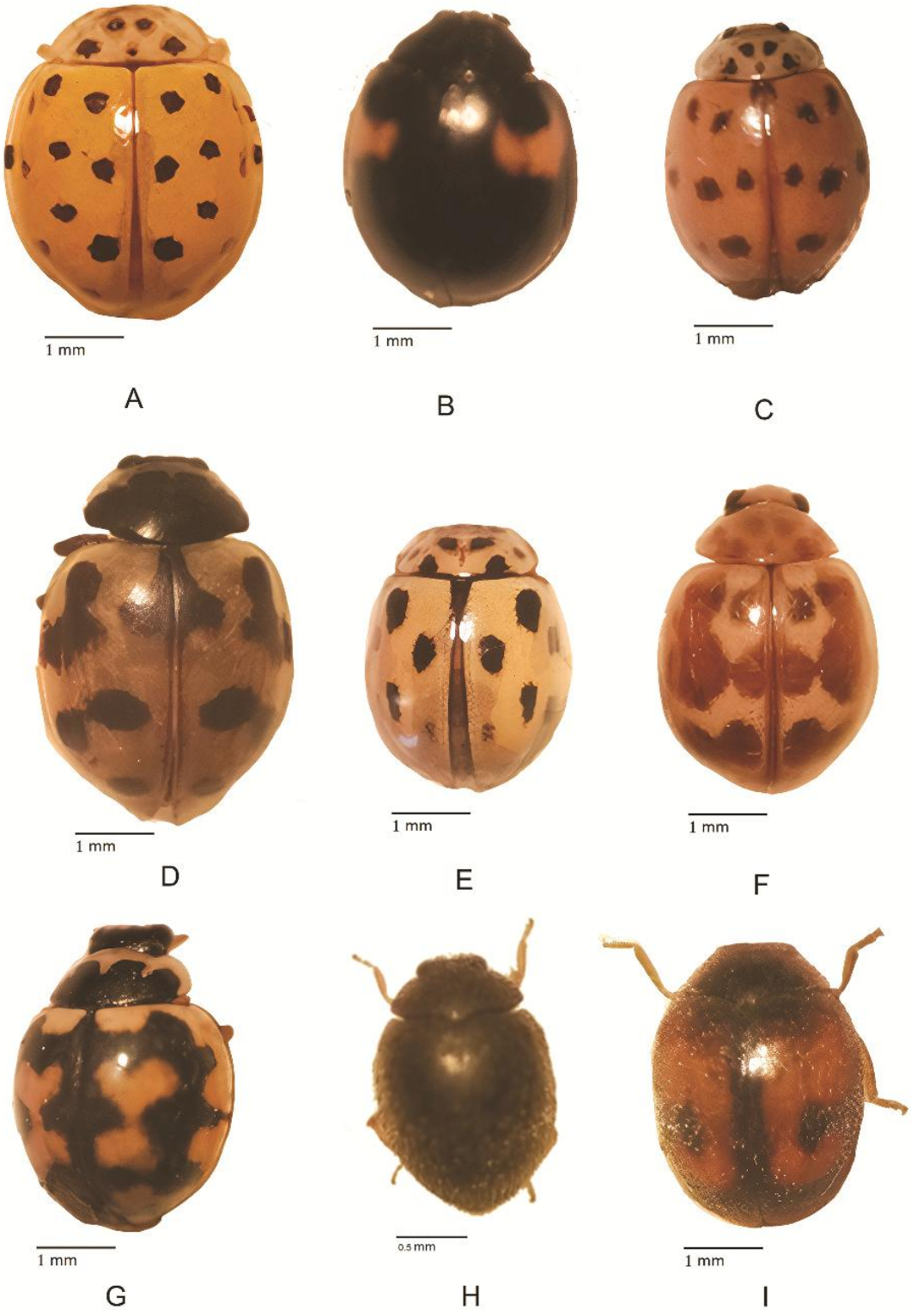

FIGURE 28. A: *Psyllobora vigintiduopunctata*, B: *Adalia decempunctata*, C: *Adalia bipunctata*, D: *Hippodamia undecimnotata*, E: *Propylea quatuordecimpunctata*, F: *Coccinula elegantula*, G: *Coccinula redimita*, H: *Stethorus gilvifrons*, I: *Scymnus rubromaculatus*.

Notes: *Scymnus subvillosus* (Figs. 24, 29B) is reported for the first time from Kermanshah province. This species was collected manually, from Pistachio trees infested by galling aphids and psylla, *A. pistaciae*. Also before reported on Pistachio in Kerman (Salehi *et al*., 2011). Besides those plants, it was collected from peach trees and okra (*Abelmoschus esculentus* Linnaeus) field infested by aphids. *Scymnus subvillosus* is sexually dimorphic, the males have a light brown head while, female have a black brown head.
Material studied: Kermanshah (Agricultural College), *Pistacia vera*, 6 adults (3 ♂, 3♀), 16.Aug.2021, Hadis Nehrangi; *Abelmoschus esculentus* (Malvaceae), 31 adults (8♂, 23♀), 15.Sep.2021, 17.Sep.2021, Abedin Safari. Gehvareh, *Prunus persica* (Rosaceae), 34 adults (12♂, 22♀), 22.May.2020, 25.May.2020, 1.Jul.2020, 5Jul..2020, 15.Jul.2021, Abedin Safari.
Regional distribution: Iran: Alborz and Sistan and Baluchistan (Abdolahi *et al*., 2017), Kerman (Kouhpayezad- Ehesfahani & Mosadegh, 1991), Fars (Yazdani, 1990), Mazandaran (Pahlavani *et al*., 2017), Lorestan (Mohammad poor *et al*., 2013), Semnan (Toozandejani and Ajamhassani, 2021).
Worldwide distribution: Palearctic, Iran (Kovar, 2007); Afrotropical (Kovar, 2007)

Genus *Stethorus* Weise, 1885

***Stethorus gilvifrons* (Mulsant, 1850)**
(Figures 25, 28H)
Syn.: *Scymnus* (*Pullus*) *gilvifrons* Mulsant, 1850
Notes: The ladybird, *Stethorus gilvifrons* (Figs. 25, 28H) was collected from the trunks of pistachio trees that were affected by mite infestations (the common pistachio mite, *Tenuipalpus granati* Sayed (Acari, Tenuipalpidae). The majority of the mites, along with their eggs and nymphs, were found in the fissures and crevices of the tree bark. Previously, this species reported by Gholami Moghadam *et al*., (2014) from Kermanshah.
Material studied: Kermanshah (Taq-e-Bostan mountains), *Pistacia mutica*, 4 adults (1 ♂, 3♀), 21.Jul.2020, Hadis Nehrangi; *Juglans* sp. (Juglandaceae), *Cupressus* sp. (Cupressaceae), *Populus* sp. (Salicaceae), 48 adults (13♂, 35♀), 29.Apr.2021, 31.Apr.2021, 6.May.2021, Abedin Safari; Islamabad-e-Gharb, *Prunus persica*, *Prunus amygdalus* and *Malus domestica* (Rosaceae), 37 adults (10♂, 27♀), 24.May.2020, 3.Jun.2020, 12.Jun.2020, 12.Jul.2021, Abedin Safari; Dalaho, *Prunus amygdalus* and *Malus domestica* (Rosaceae), 83 adults (30♂, 53♀), 12.Aug.2020, 29.Sep.2020, 4.Oct.2020, 18.Oct.2020, 26.Oct.2021, Abedin Safari; Gilan-Gharb, *Malus domestica* (Rosaceae), 22 adults (7♂, 15♀), 6.Apr.2021, 8.Apr.2021, Abedin Safari.
Notes: Samples were female-biased, which suggests a presence of male killing bacteria in the populations, which was not previously reported in this genus.
Regional distribution in Iran: Kermanshah (Gholami Moghadam *et. al*. 2014), Fars (Yazdani, 1990), Gilan and Golestan (Montazeri & Mosadegh, 1995), Chaharmahal Bakhtiari (Bagheri & Mosadegh, 1995), Ardabil (Razmjo & Hajizadeh, 2000), Isfahan (Haghshenas *et al*., 2004). Mazandaran (Pahlavani *et al*., 2017), Lorestan (Mohammad poor *et al*., 2013), Hamadan (Eghbalian *et al*., 2008) and Yazd (Zare *et a*l., 2014),
Worldwide distribution: Palearctic: Afghanistan, Armenia, Azerbaijan, Bulgaria, Croatia, Cyprus, Egypt, France, Greece, Iran, Iraq, Italy, Lebanon, (Kovar, 2007), Pakistan (Ashfaque, 2012), Turkey (Efil et al., 2010), Saudi Arabia (Raimundo & Van Harten, 2000).

Tribe STICHOLOTIDINI
Genus *Pharoscymnus* Bedel, 1906

***Pharoscymnus pharoides* Marsuel, 1868**
(Figures 26, 29H)
Notes: *Pharoscymnus pharoides* (Figs. 26 and 29H) was collected with a beating tray. This ladybird was previously reported by Jalilvand *et al* (2014) from Kermanshah province.

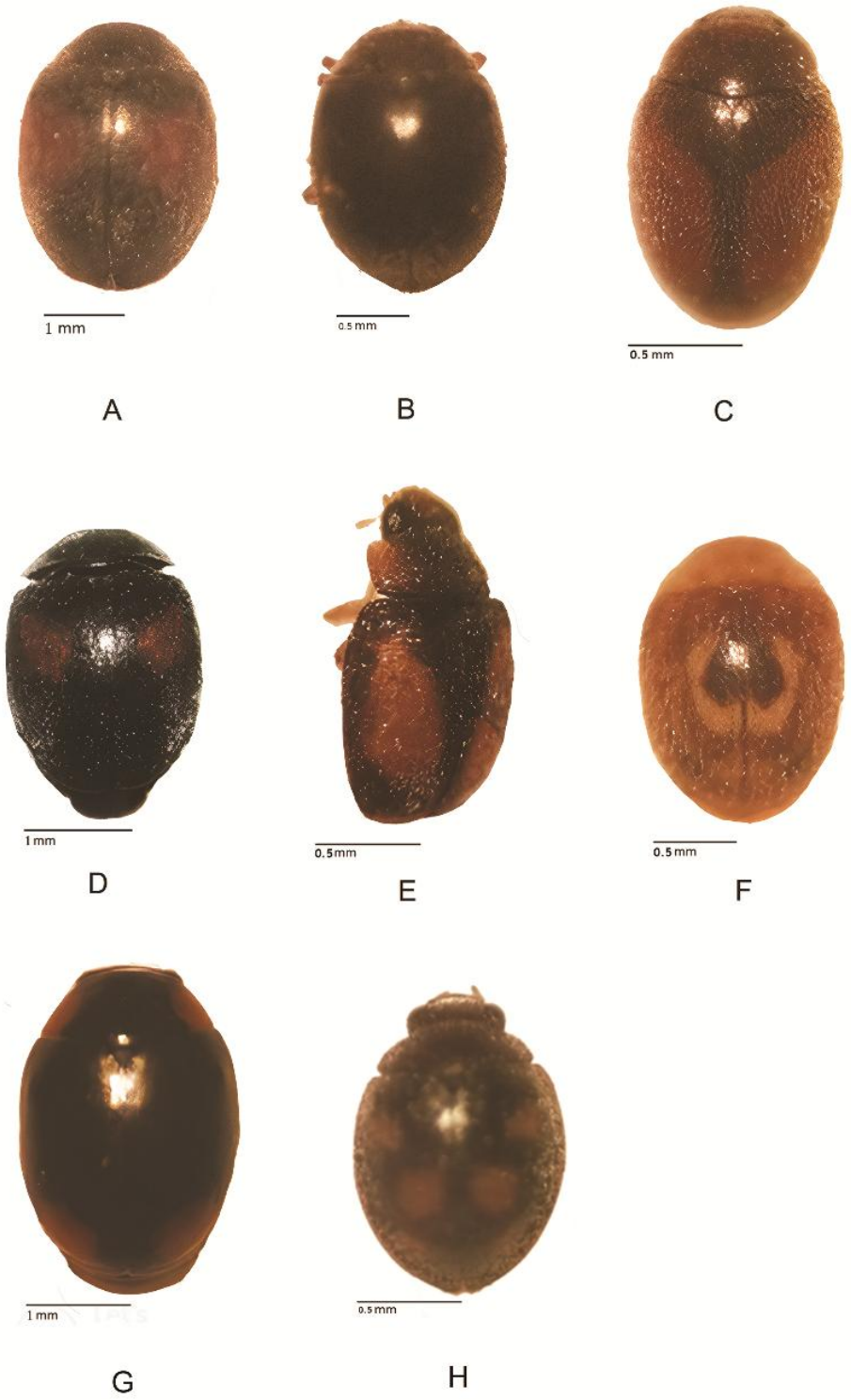

FIGURE 29. A: *Scymnus flavicollis*, B: *Scymnus subvillosus*, C: *Scymnus pharaonis*, D: *Scymnus apetzi*, E: *Diomus rubidus*, F: *Clitostethus arcuatus*, G: *Hyperaspis pseudopustulata*, H: *Pharoscymnus pharoides*.

Material studied: Iran: Kermanshah, *Fraxinus excelsior* (Oleacae), 1 Adult (1♀), 25 Jun 2020, Abedin Safari; Gehvareh, *Prunus amygdalus* (Rosaceae), 1 adult (1♂) 18.Aug.2022, Abedin Safari; infested by mites.
Regional distribution: Iran: Chahar Mahal Bakhtiari (Bagheri & Mossadegh, 1995) and Kermanshah (Jalilvand *et al*., 2014).
Worldwide distribution: Palearctic: Egypt, Israel, Syria, Libya, Saudi Arabia, Turkey, Iran; Afrotropical (Kovar, 2007).

DISCUSSION

According to the results, *Coccinella septempunctata* L.,1758 on *Medicago sativa*, *Hippodamia variegata* (Goeze, 1777) on *Carthamus* sp. and *Oenopia conglobata* (Linnaeus, 1758) on *Prunus persica* all occur in large numbers throughout the region and are likely to be biologically important. These three species were also collected from pistachio trees infested by members of Sternorrhyncha. Below, the focus of our discussion is on ladybird, *Coccinella septempunctata*, from which we will extend our discussion to cover two other ladybird species.

As we said, *Coccinella septempunctata*, in alfalfa field, *Medicago sativa*, which infested with Aphids is present in large numbers throughout the region. This ladybug is biologically important. It can be said that planting a row of alfalfa in the pistachio orchard can attract the ladybird, *C. septempunctata* , in the pistachio orchard. Since this ladybug is a polyphagous predator, its attraction and distribution in the garden can play an effective role in reducing pistachio pests.

Acknowledgments
This study combines findings from two thesis conducted at Razi University. The undergraduate students involved demonstrated considerable diligence despite facing constraints in resources and budget. The practical outcomes achieved are noteworthy. The findings presented in this article have the potential to contribute to a decrease in the use of chemical pesticides and to enhance biological control methods in pistachio orchards. The contributions and dedication demonstrated by both students are praiseworthy.

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