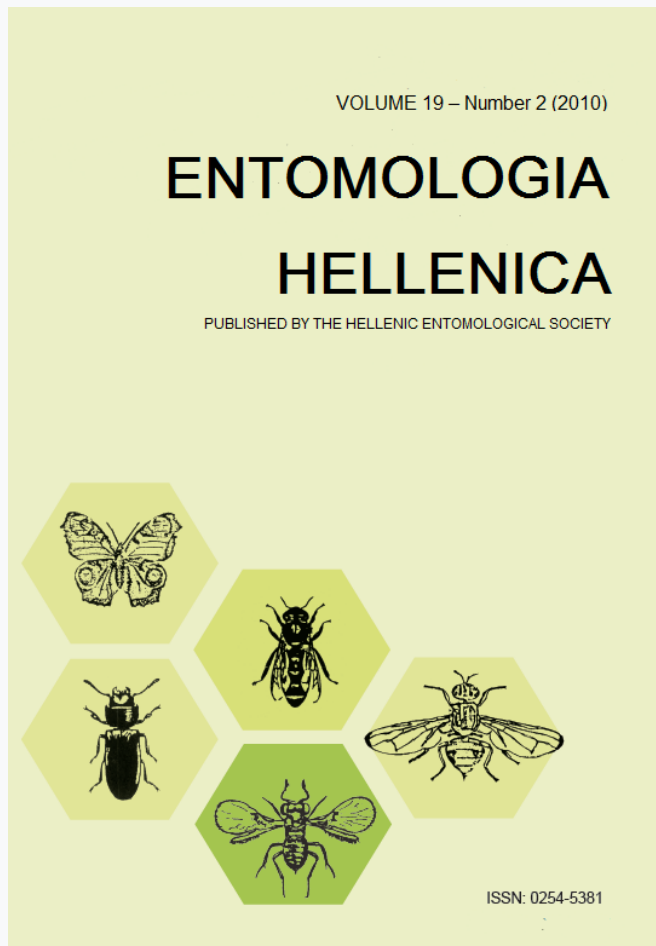


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Preliminary survey of the scale insects fauna in Kermanshah, western Iran

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ABSTRACT

The Coccoidea on cultivated and non-cultivated vegetation in Kermanshah, western Iran, were investigated between 2007 and 2009. More than 63 samples from cultivated and non-cultivated plants were collected. The identified species mainly belonged to the following families: Diaspididae (12 species), Coccidae (7), Pseudococcidae (4), Margarodidae (3), Eriococcidae (2) and Ortheziidae (1). The economically important species are discussed. This project is part of an MSc on Coccoidea studies which has still some time to run and so we expect that more species will be found in future.

KEYWORDS: Coccoidea, Iran, Kermanshah, fauna.

Introduction

Scale insects are widely distributed throughout the world with the exception of the cold extremes of the Arctic and Antarctic. They are found as parasites on a wide diversity of vascular plants. Because of its geographical location between the Mediterranean in the west and the mountainous areas with a cool climate in the East, the province of Kermanshah has a high floristic and faunistic diversity. Among these, coccoids are common and economically important pests but a ScaleNet search (Ben-Dov et al. 2010) shows that the scale insect fauna of Iran has been poorly studied.

Previous studies: Kaussari (1952, 1954, 1955, 1956, 1957, 1958, 1959, 1964, 1970, 1971a, 1971b, 1974) was the first Iranian to study the scale insects (Hemiptera: Coccoidea) in Iran but he was mainly interested

in the armoured scale insects (Diaspididae) on fruit trees, willow (*Salix spp.*), citrus and other host plants in various areas of Iran and published a monograph (Kaussari and Farahbakhch 1968) on the subtribe Aspidiotina, tribe Aspidiotini (Diaspididae) in Iran. Some of these were new species. In addition, Balachowsky and Kaussari (1951, 1953) worked on Diaspinae and also described four new species from Iran. Davachi and Taghizadeh (1955) studied Citrus pests, including scale insects, in north of Iran. The first complete list of scale insects in Iran was published by Bodenheimer (1944), who reported 89 species, including 27 species from Diaspididae. He also studied the Coccoidea of Iraq from which he reported 60 species in 8 families (Bodenheimer 1943). Fowjhan and Kozár (1994) recorded six scale insects species on fruit plants in Afghanistan. Kozár et al. (1996) also gave a check-list of 202

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species of both Coccoidea and Aleyrodoidea from Iran and Afghanistan; this list includes 185 species of Iranian' Coccoidea. However, Irano-Turanian subregion Coccoidea still is under explored, comparing the given number with published 302 coccids (Kozár 1998). Balachowsky (1967) described *Fiorinia phaenicis* (Coccoidea: Diaspididae) from Iran. Seghatoleslami (1977) published a list of the Diaspidoidea (Phoenicococcidae and Diaspididae) that included 93 species in 53 genera, along with collection data. Asadeh and Mosaddegh (1991) did an investigation on the mealybug fauna (Pseudococcidae) in Khuzestan province and recorded eight mealybug species, four of them new for Iran. Moghaddam (1998), in her MSc dissertation, surveyed the fauna of armoured scales (Diaspididae) in Fars province (southern Iran) and reported 36 species in 21 genera. Takagi and Moghaddam (2005) worked on twelve armoured scale insects occurring in Iran. Moghaddam (2006) also studied the mealybug fauna of southern Iran (Systan, Balachestan, Hormozgan, Bushehr, Khuzestan and Fars provinces) where she found 17 mealybug species. Moghaddam and Tavakoli (2010) recorded 48 species of forestry area scale insects, in central Zagros region. In addition, the morphology, bioecology and impact of cultural methods on the population fluctuation of *Porphyrophora tritici* as a pest of wheat have been studied in East Azarbaijan, Hamadan and Kermanshah provinces (Safaralizadeh and Bahador 1987, Vahedi 1992, Akbarinoshad 1993, Akbarinoshad 1995, Vahedi and Hodgat 1996, Akbarinoshad 1999), while other subterranean margarodids (*Porphyrophora* and *Neomargarodes* spp.) were studied by Vahedi (2002, 2004, 2007) and Vahedi and Hodgson (2002, 2007). Finally, Archangelskaya (1937), Borchsenius (1966) and Danzig (1993) mention some Iranian coccids, although their work was not directed especially to Iran.

No comprehensive investigation on coccids has been undertaken previously in Kermanshah region (western Iran) and the purpose of this study is to determine the distribution, species composition and host plants (of both cultivated and non-cultivated vegetation) of the Coccoidea in this region.

Materials and Methods

Scale insect samples on various host plants were collected during irregular surveys in different locations in Kermanshah region between 2007 and 2009. The specimens were carefully removed from the infested plant surfaces (fruits, leaves, stems) and placed in 75% alcohol or put in plastic bags and transported to the Razi University, where all specimens were mounted on microscope slides using the methodology of Hodgson and Henderson (2000). Representative specimens were sent to various taxonomic specialists for confirmation of identification. The slide-mounted material of all species has been deposited in the Department of Plant Protection, Razi University, Kermanshah, Iran.

Results and Discussion

A total of 29 species in 21 genera and 6 families were collected on 63 samples off cultivated and non-cultivated plants in Kermanshah (Table 1). The families were as follows: with Diaspididae (12 species: 8 genera), Coccidae (7: 5), Pseudococcidae (4: 4), Margarodidae (3: 2), Eriococcidae (2: 1) and Ortheziidae (1: 1). Among these species, the soft scale *Eulecanium tiliae* (L.) on *Armeniaca vulgaris* and the diaspidids *Lepidosaphes malicola* (Borchsenius) on *Malus domestica* and *Chlidaspis asiatica* (Archangelskaya) on *Prunus domestica* and *Amygdalus domestica* all occur in large populations throughout the region and are likely to be economically important.

TABLE 1. Scale insects species found in the Kermanshah region, western Iran.

| Family | Species | Host plants | GPS | Location | Sampling date |
|--------------------|---|--|--------------------------------------|-------------------------|---------------|
| | <i>Aonidiella aurantii</i> (Maskell 1879) | <i>Malus domestica</i> | 34° 19' 32.46" N 47° 06' 32.63" E | Agriculture University | 27 Apr 09 |
| | <i>Aulacaspis rosae</i> (Bouché, 1833) | <i>Armeniaca vulgaris</i> | 34° 79' 31.25" N 47° 58' 93.12" E | Songhor, Mazzeralla | 11 Sep 09 |
| | | <i>Armeniaca vulgaris</i> | 34° 27' 55.92" N 47° 41' 28.68" E | Sahne | 27 May 09 |
| | <i>Chlidaspis asiatica</i> (Archangel'skaya, 1930) | <i>Prunus domestica</i> | 34° 27' 54.82" N 47° 40' 52.08" E | Sahne | 27 May 09 |
| | | | 34° 19' 24.00" N 47° 06' 26.22" E | Agricultural University | 20 Jul 08 |
| | | <i>Amygdalus</i> sp. | 34° 79' 31.25" N 47° 58' 93.12" E | Songhor, Mazzeralla | 10 Dec 08 |
| Diaspididae | | | | | |
| | <i>Chortinaspis salavatiani</i> (Balachowsky & Kaussari, 1951) | Rhizomes of <i>Agropyron repens</i> | 34° 58' 49.73" N 45° 44' 37.14" E | Songhor, Mazzeralla | 11 Sep 09 |
| | <i>Diaspidiotus elaeagni</i> (Borchsenius, 1939) | <i>Amygdalus</i> sp. | 34° 79' 31.25" N 47° 58' 93.12" E | Songhor, Mazzeralla | 11 Sep 09 |
| | <i>Diaspidiotus perniciosus</i> (Comstock, 1881) | <i>Prunus domestica</i> | 34° 29' 12.61" N 46° 22' 77.22" E | Kerende gharb | 21 Apr 08 |
| | <i>Diaspidiotus prunorum</i> (Laing, 1931) | <i>Amygdalus</i> sp. | 34° 79' 31.25" N 47° 58' 93.12" E | Songhor, Mazzeralla | 10 Dec 08 |
| | <i>Diaspidiotus</i> sp. | <i>Amygdalus scoparia</i> | 34° 39' 38.84" N 47° 09' 66.68" E | ImamReza hospital | 17 Apr 08 |

TABLE 1 (continued). Scale insects species found in the Kermanshah region, western Iran.

| Family | Species | Host plants | GPS | Location | Sampling date |
|--------------------|--|--|---|--------------------------------------|------------------------|
| Diaspididae | <i>Lepidosaphes malicola</i> (Borchsenius, 1947) | <i>Malus domestica</i> | 34° 36' 17.5" N 46° 57' 36.2" E | Vermenjeh village | 10 May 09 |
| | <i>Lepidosaphes ulmi</i> (Linnaeus, 1758) | Cherry tree | 34° 29' 2.26" N 47° 41' 15.26" E | Sahne | 9 Apr 09 |
| | <i>Lopholeucaspis</i> sp. | <i>Pinus</i> sp. | 34° 19' 30.28" N 47° 5' 55.65" E | Agricultural University | 16 Aug 09 |
| | <i>Parlatoria bianchardii</i> (Targioni Tozzetti) | <i>Phoenix</i> sp. | 34° 52' 18.75" N 45° 58' 48.22" E | Ghasre Shirin | 22 Apr 09 |
| | <i>Coccus hesperidum</i> (Linnaeus, 1758) | <i>Yucca gloriosa</i> <i>Ficus elastic</i> | 34° 19' 29.37" N 47° 5' 58.06" E 34° 34' 77.59" N 47° 08' 65.12" E | Agricultural University 22 bahman | 12 May 09 28 Feb 09 |
| Coccidae | <i>Didesmococcus unifasciatus</i> (archangeliskaya, 1923) | <i>Malus domestica</i> | 34° 28' 35.01" N 47° 38' 57.14" E | Sahne | 9 Apr 09 |
| | | <i>Amygdalus</i> sp. | 34° 22' 27.22" N 47° 5' 50.34" E | Shahrake Azmayesh | 24 Apr 09 |
| | <i>Amygdalus scoparia</i> | Unknown location | Unknown location | Kermanshah | 16 May 09 |
| | | 34° 46' 45.54" N 47° 01' 25.44" E 34° 39' 74.08" N 47° 12' 78.46" E | Bistoon Sanandaj Road | 19 Apr 09 11 Mar 09 | |

TABLE 1 (continued). Scale insects species found in the Kermanshah region, western Iran.

| Family | Species | Host plants | GPS | Location | Sampling date |
|------------------------|---|------------------------------|--------------------------------------|------------------------|---------------|
| | <i>Eulecanium rugulosum</i> (Archangelskaya, 1937) | <i>Malus domestica</i> | 34° 33' 92.26" N 47° 42' 57.18" E | Harsin Road | 27 May 09 |
| | <i>Eulecanium</i> sp. | <i>Quercus brantii</i> | 34° 39' 74.08" N 47° 12' 78.46" E | Parke Koohestan | 2 Jul 08 |
| | | <i>Amygdalus scoparia</i> | 34° 23' 35.84" N 47° 6' 38.29" E | Razi University | 12 Apr 09 |
| | | | 34° 23' 55.66" N 47° 7' 40.91" E | Parke Koohestan | 12 Apr 09 |
| Coccidae | <i>Eulecanium tiliae</i> (Linnaeus, 1758) | <i>Prunus domestica</i> | 34° 44' 44.75" N 47° 42' 57.18" E | Mian Darband | 4 May 09 |
| | | <i>Armeniaca vulgaris</i> | 34° 47' 52.76" N 47° 00' 52.29" E | Sanandaj Road | 18 Apr 09 |
| | | <i>Rosa</i> sp. | 34° 20' 57.81" N 47° 4' 51.39" E | Kermanshah city | 10 May 09 |
| | <i>Hadzibejliaspis stipae</i> (Hadzibejli, 1960) | grasses | 34° 23' 54.36" N 47° 7' 38.49" E | Parke Koohestan | 12 Apr 09 |
| | <i>Rhodococcus</i> sp. | <i>Ficus johannis</i> | 34° 23' 56.35" N 47° 7' 41.30" E | Tagh Bostan | 15 May 09 |
| Pseudo-coccidae | <i>Crittinococcus</i> sp. | <i>Euphorbia helioscopia</i> | 34° 79' 31.25" N 47° 58' 93.12" E | Songhor, Mazzeralla | 27 Aug 09 |
| | <i>Planococcus vovae</i> (Nasonov, 1908) | <i>Cupressus arizonica</i> | 34° 19' 27.98" N 47° 5' 55.51" E | Agriculture University | 11 Apr 09 |

TABLE 1 (continued). Scale insects species found in the Kermanshah region, western Iran.

| Family | Species | Host plants | GPS | Location | Sampling date |
|------------------------|---|--|--------------------------------------|------------------------------|---------------|
| Pseudo-coccidae | <i>Pseudococcus</i> sp. | <i>Lactuca</i> sp. | 34° 19' 30.28" N 47° 5' 55.65" E | Agricultural University | 2 Aug 09 |
| | <i>Trabutina crassispinosa</i> (Borkhsenius, 1936) | <i>Tamarix</i> sp. | 34° 78' 82.05" N 48° 11' 57.68" E | Songhor. Hoseyn Abad | 27 Aug 09 |
| | <i>Neomargarodes</i> sp. | <i>Hordeum balbosum</i> | 34° 78' 01.41" N 47° 56' 03.87" E | Pardis, Kermanshah | 15 Aug 09 |
| Margarodidae | <i>Porphyrophora cynodontis</i> (Archangelskaya, 1935) | <i>Cynodon dactylon</i> | 34° 75' 02.45" N 47° 53' 70.41" E | Songhor, Satar, Mazralleh | 3 Aug 09 |
| | <i>Porphyrophora tritici</i> (Bodenheimer, 1941) | <i>Triticum</i> spp <i>Bromus</i> spp | 34° 76' 77.33" N 47° 52' 68.55" E | Songhor, Satar, Mazralleh | 4 May 09 |
| | <i>Acanthococcus costatus</i> (Danzig, 1975) | <i>Ulmus</i> sp. | 34° 23' 23.51" N 47° 6' 22.00" E | Olum University | 12 Apr 09 |
| Eriococcidae | <i>Acanthococcus isacanthus</i> (Danzig, 1975) | <i>Ulmus</i> sp. | 34° 29' 15.35" N 47° 41' 40.21" E | Songhor | 27 May 09 |
| | <i>Orthezia urticae</i> (Linnaeus, 1758) | <i>Astragalus gossypinus</i> | 34° 77' 18.12" N 47° 49' 33.26" E | Songhor, Mazralleh | 10 Dec 08 |

C. asiatica is particularly destructive and causes desiccation in man-made, non-irrigated almond orchards. Additionally, this study shows that *C. asiatica* and *E. tiliae* are both highly polyphagous and are both widely distributed in association with Rosaceae. *Di-desmococcus unifasciatus* (Archangelskaya) (Hemiptera: Coccidae) and *Diaspidiotus* sp. (Diaspididae) also occur in uncultivated areas on *Amygdalus scoparia* (Rosaceae), a mid-altitude shrub on the hillsides. *D. unifasciatus* is often abundant in both natural conditions and in man-made hillside orchards, particularly on *Amygdalus vulgaris*, *Armeniaca vulgaris*, and *Prunus domestica*. Many of the scale insect species now known from Kermanshah are potentially dangerous to cultivated perennial trees in non-irrigated areas. Because of this, we do not recommend the establishment of nut and fruit orchards under such natural conditions and are concerned about those which have been planted in the last two or three decades.

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Προκαταρκτική μελέτη των κοκκοειδών εντόμων στην περιοχή Kermanshah, στο δυτικό Ιράν

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ΠΕΡΙΛΗΨΗ

Στην παρούσα εργασία έγινε προσπάθεια καταγραφής των κοκκοειδών εντόμων σε καλλιεργούμενα και μη φυτά στην περιοχή Kermanshah, στο δυτικό Ιράν, την περίοδο 2007 με 2009. Περισσότερα από 63 δείγματα συλλέχθηκαν από καλλιεργούμενα και μη φυτά. Τα είδη που αναγνωρίστηκαν ανήκουν στις οικογένειες: Diaspididae (12 είδη), Coccidae (7), Pseudococcidae (4), Margarodidae (3), Eriococcidae (2) και Ortheziidae (1). Η οικονομική σημασία ορισμένων ειδών συζητάται. Η εργασία είναι μέρος μεταπτυχιακής διατριβής που δεν έχει ολοκληρωθεί και αναμένονται και άλλα είδη να βρεθούν και να καταγραφούν μέχρι την ολοκλήρωσή της.