Entomofauna

ZEITSCHRIFT FÜR ENTOMOLOGIE

Band 37, Heft 18: 297-308 ISSN 0250-4413 Ansfelden, 4. Januar 2016

New records of eriophyoid mites (Eriophyoidea: Eriophyidae, Diptilomiopidae) from Iran

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Abstract

Four eriophyoid species were identified as new records for the Iranian fauna from South and Razavi Khorasan provinces. These species are *Aceria amaranthi* Abou-Awad & El-Banhawy, 1992 (Eriophyinae) on *Haloxylon aphyllum* (Minkw.) Iljin (Amaranthaceae), *Aceria larreae* (Keifer, 1940) (Eriophyinae) on *Zygophyllum eurypterum* Boiss. & Buhse (Zaygopyllaceae), *Aceria paramacrodonis* Kuang, 1988 (Eriophyinae) on *Lycium depressum* Stocks (Solanaceae) and *Rhinotergum cerasifoliae* Petanovic, 1988 (Rhyncaphytoptinae) on *Prunus cerasus* L. (Rosaceae).

Key words: Acari, Trombidiformes, *Aceria amaranthi*, *Aceria larreae*, *Aceria paramacrodonis*, *Rhinotergum cerasifoliae.*

Zusammenfassung

Vier Eriophyoidea Arten werden als Erstnachweise für die Fauna des Iran aus dem Süden und den Provinzen Razavi Khorasan eingeführt: *Aceria amaranthi* Abou-Awad &

El-Banhawy, 1992 (Eriophyinae) an *Haloxylon aphyllum* (Minkw.) Iljin (Amaranthaceae), *Aceria larreae* (Keifer, 1940) (Eriophyinae) an *Zygophyllum eurypterum* Boiss. & Buhse (Zaygopyllaceae), *Aceria paramacrodonis* Kuang, 1988 (Eriophyinae) an *Lycium depressum* Stocks (Solanaceae) and *Rhinotergum cerasifoliae* Petanovic, 1988 (Rhyncaphytoptinae) an *Prunus cerasus* L. (Rosaceae).

Introduction

Eriophyoidea is a large and diverse group of mites including a number of species of economic importance, due to the direct damage they can cause to their host, their ability to transmit several plant diseases and also due to the possibility of using them as biological agents for weed control (Lindquest et al. 1996). Despite their importance the knowledge on eriophyoid mite fauna of Iran is limited which is similar to the situation in the rest of the world (Amrine 1996). Reviewing literature showed that up to 2009 only 89 eriophyoid species have been discovered and described from Iran. Since then more eriophyoids have been recorded and described by several authors (e.g., Kamali & Jalaeian 2011; Xue et al. 2011; Lotfollahi et al. 2012; Xue et al. 2012; Kamali & Jalaeian 2013; Xue et al. 2013; Lotfollahi et al. 2013a, Lotfollahi et al. 2013b, Lotfollahi et al. 2013c, Lotfollahi et al. 2013d; Gharezadeh et al. 2013; Lotfollahi et al. 2014; Rahim Panah & Sadeghi Namaghi 2014). As a result of these studies, the list of eriophyoid mites recorded in Iran has reached up to 154 species. However, the eriophyoid fauna of many parts of Iran still remains undiscovered. The present survey was conducted in some localities in South and Razavi Khorasan provinces where no a faunistic study of eriophyoid mites already has been conducted.

Material and Methods

During a survey of the eriophyoid fauna of Razavi and south Khorasan provinces of Iran which was conducted during seasonal growth 2014, mites were collected from a variety of host plants.

Mite specimens were collected directly from symptomatic and non symptomatic plant materials under a dissecting microscope. Mite specimens were cleared in lactic acid for 7-10 days and then mounted in Hoyer's medium. Systematic knowledge and synonyms of the identified species were obtained from Amrine & Stasny (1994). The species presented here were identified or confirmed by GRAZYNA SOIKA (Research Institute of Horticulture, Skierniewice, Poland) and Xiao-Feng Xue and Jing-Feng Guo (Nanjing Agricultural University, Jiangsu, China). The distribution of some species was obtained from the recent update of Fauna of Europaea (www.faunaeur.org). Voucher specimens were deposited at the Department of Plant Protection, Faculty of Agriculture, Ferdowsi University of Mashhad, Research Institute of Horticulture, Skierniewice, Poland), and Department of Entomology, Nanjing Agricultural University, Jiangsu, China. Those identified as new records for Iranian fauna and first records for the study area are presented in this paper.

Results and discussion

***Aceria amaranthi* Abou-Awad & El-Banhawy, 1992**

Aceria amaranthi Abou-Awad & El-Banhawy, 1992: 71-72.

Diagnosis characters: Female- elongate wormlike, narrowed anteriorly and posteriorly 220 um long, 65 wide, white in color. Gnathosoma 20 um long, projecting diagonally ahead and down, chelicerae 11 um long. Prodorsal shield 25 um long, 40 wide, without projecting over gnathosoma, triangular in shape, with complete median, admedian and submedian lines, submedian lines diverging posteriorly and two curved dashes between it, no granules on prodorsal shield (Figure 1-a). Scapular tubercles 20 um apart on rear margin, Sc setae 25 um long and projecting backward. Leg I 23 um long, femur 8, genu 4, seta 17, tibia 4, seta 5, tarsus 5, outside seta 17, claw 7, curved with slight knob at tip. Empodium 5- rayed and shorter than claw (Figure 1-b). Leg II 20 um long, femur 6, genu 4, seta 6, tibia 3, without seta, tarsus 5, outside seta 17, claw 6, empodium 5- rayed. Coxae ornamented, two setae on each. Opisthosoma with 65 dorsal annuli and 70 ventral annuli. Microtubercles rounded and located in posterior margin of annuli (Figure 1-c). *c*2 setae 11, *d* setae 37 um on annulus 24, *e* setae 9 um on annulus 41, *f* setae 16 um on 4th annulus from rear. *h*2 setae 47 um, *h*1 setae absent. Female genital setae 19 um, genital cover flap (Figure 1-d) 21 wide with 12 longitudinal markings (Abou-Awad & El-Banhawy 1992).

Material: 8 ♀♀ (IR93-AH1); *Haloxylon aphyllum* (Minkw.) Iljin (Amaranthaceae); South Khorasan, Birjand, Bojd (32°49'55.65"N 59°19'42.77"E, 5154 ft); 4 April 2014; Leg. A. Honarmand.

Relation to host plant: galls on both leaf surfaces.

Distribution: Tanzania (Abou-Awad & El-Banhawy 1992), Iran (this study).

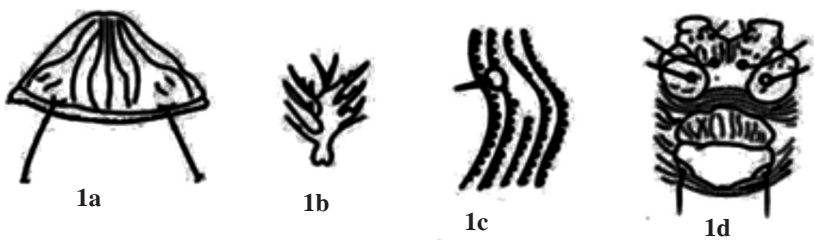

Plate 1. *Aceria amaranthi*: (Figure 1a) prodorsal shield; (Figure 1b) Empodium; (Figure 1c) Lateral microtubercles; (Figure 1d) Female coxigenital area (c & d from Abou-Awad & El-Banhawy 1992).

***Aceria larreae* (Keifer 1940)**
Eriophyes larreae Keifer, 1940: 26, pl. 121.

Diagnosis characters: Female - spindle form, 130-135 um in length, 38 wide, 40 tick, light yellowish. Gnathosoma 40 long, curved down. Prodorsal shield 26 long, 37 wide, median line present to rear, admedian lines complete, submedians curved (Figure 2a). Scapular tubercles26 apart, on rear margin. Scapular setae 25 long, projecting backward. Leg I 30 um long, tibia 7 um long, tarsus 7 um, claw 7 um, empodium 5-rayed (Figure 2b). Leg II 26 um long, tibia 5 um, tarsus, 7 um, claw 7.5 um long. Opisthosoma with 52 annuli. Microtubercles bearing a spine (Figure 2c). *c*2 setae 27 long, on ventral annulus 7, *d* setae 50 long, on ventral annulus 17, *e* setae 9, on ventral annulus 30, *f* setae 20, on ventral annulus 5 from rear. *h*1 setae absent. Female genitalia 21 um wide, 15 um long, coverflap with 12 ridges, genital setae 38 um long (Figure 2d) (Keifer 1940).

Material: 9 ♀♀(IR93-AH3); *Zygophyllum eurypterum* Boiss. & Buhse (Zaygopyllaceae); South Khorasan, Birjand, Khoosf, (32°45'59.39"N 58°52'48.48"E, 4257 ft); 23 April 2014; Leg. A. Honarmand.

Relation to host plant: no specific damage was observed.

Distribution: USA (California) (Keifer 1940), Iran (this study).

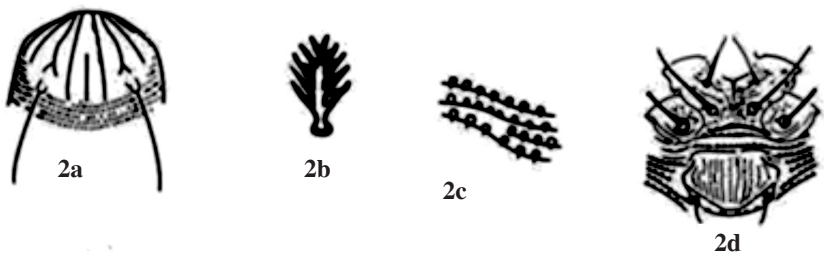

Plate 2. *Aceria larreae*: (Figure 2a) prodorsal shield; (Figure 2b) Empodium; (Figure 2c) Lateral microtubercles; (Figure 2d) Female coxigenital area.

***Aceria paramacrodonis* Kuang, 1988**
Aceria paramacrodonis Kuang, 1988: 49–50, figures 1–6.

Diagnosis characters: Female-body wermiform, 190 um in length, 60 wide, 65 thick. Gnathosoma 20 um long, slightly projected. Prodorsal shield 30 long, 43 wide. Frontal lobe absent. Admedian lines incomplete, located between scapular tubercles, porodorsal shield with granules at base and lateral (Figure 3a). Scapular tubercles located at rear annular margin, 30 apart, scapular setae 25, projecting posterior. Coxae with three pairs of setae, with granules. Leg I 26, leg II 25, with typical setation, tibial seta located at basal 1/3, empodium simple, 5-rayed (Figure 3b). Opisthosoma with 55 dorsal annuli and 60 ventral annuli, with spiny microtubercles (Figure 3C). *c*2 setae 25, on ventral annulus 12, *d* setae, on ventral annulus 21, *e* setae 25, on ventral annulus 35, *f* setae 32, on the 5ᵗʰ ventral annulus form rear, *h*1 setae present. Female genitalia 14 um

long, 18 um wide, coverflap smooth, genital setae 12 um long (Figure 3d) (Kuang 1988).

Material: 7 ♀♀(IR93-AH4); South Khorasan, Birjand, Nehbandan, (31°28'7.06"N 60° 4'28.52"E , 4881 ft); 29 March 2014; Leg. A. Honarmand.

Host: *Lycium depressum* Stocks (Solanaceae).

Relation to Host: Leaf gall; mites produce pocket galls on the lower side of host plant leaves.

Distribution: China (Li et al. 2012), Iran (this study).

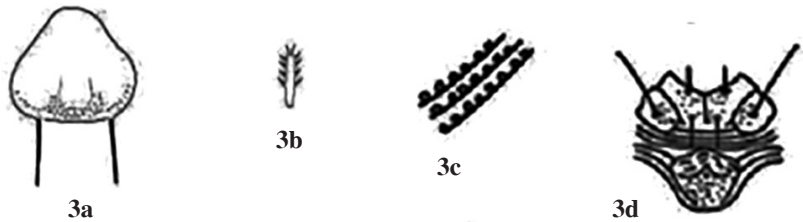

Plate 3. *Aceria paramacrodonis*: (Figure 3a) prodorsal shield; (Figure 3b) Empodium; (Figure 3c) Lateral microtubercles; (Figure 3d) Female coxigenital area (from Kuang 1988).

***Aceria pistaciae* (Nalepa 1899)**
(syn. Amrine & Stasny 1994:75)
(=*Eriophyes pistaciae* Nalepa 1899)

Diagnosis characters: wormlike, with a 4-rayed feather claw. The central shield pattern is rather obscure with lines only appearing on the rear half. According to Jeppson et al. (1975), there is the suggestion of a median and two admedian lines at the rear shield margin and a curved line extends back just centrad of the dorsal tubercle. Coxae are ornamented with granules, and the sternal line is short and bifurcate at both ends. Thanosomal microtubercles are subcircular and rounded off. The female genital coverflap has two transverse lines of granules across the base; the longitudinal ribs are irregular and tend to be broad. There are about 12 ribs (Jepppson et al. 1975).

Material: 6 ♀♀(IR93-AH 8); Rech, Birjand, South Khorasan, Iran (32°50'7.35"N 59° 5'31.87"E, 5278 ft); 29 April 2014, leg. A. Honarmand.

Host: *Pistacia atlantica* DESF. (Anacardiaceae).

Relation to host plant: leaf deformation, flower stalk brooming

Distribution: Italy (Scicily), Bosnia and Herzegovina, Croatia, Cyprus, France, Greece, Hungary, Macedonia, Slovenia, Nearctic region (www.faunaeur.org), Iran (Mehrnejad & Daneshvar 1991; Mehrnejad & Ueckermann 2001, and this study).

***Aceria oleae* (Nalepa 1900)**
(syn. Amrine & Stasny 1994:70)
Eriophyes oleae Nalepa, 1900
Aceria oleae (Nalepa 1900); Mohiseni & Craemer, 2000: 275.

Diagnosis characters: Worm like, 170 um in length,and has 4-rayed feather claws. The central shield design is of strong longitudinal lines. The median line is present on the rear half. Admedian lines are nearly complete and gradually diverge. The first submedian line runs back toward the dorsal tubercle and ends in a diagonal line extending inwardly across in front of the dorsal tubercle. There are two more short submedian lines and lateral granules. The abdominal microtubercles are subcircular and slightly ahead of ring margins. The coxae are ornamented with coarse granules. The female genitalia coverflap has about 6 rather broad longitudinal ribs (Jeppson et al. 1975).

Material: 7♀♀(IR93-AH 5); South Khorasan, Birjand, Chaj village (32°44'50.36"N 59°22'23.58"E 6521 ft); 13 April 2014; Leg. A.Honarmand.

Host: *Olea europaea* L. (Oleaceae).

Relation to host plant: leaf twisting was observed, but other damages such as erineum, fruit deformation and shoot killing also have been cited (Amrine and Stasny 1994).

Distribution: Crete, Cyclades Is., Cyprus, Dodecanese Is., Greece, Italy, North Aegean Is., Portuguese mainland, Sardinia, Spanish mainland, Ukraine, Yugoslavia Incl. Serbia, Kosovo, Voivodina, Montenegro, Afro-tropical region, Near East Incl. Asian Turkey, Caucasian Russian republics, Georgia, Armenia, Azerbaidjan, Lebanon, Syria, Israel, Jordan, Sinai Peninsula (Egypt), Arabian peninsula, Iran, Iraq, and North Africa (www.faunaeur.org).

***Rhinotergum cerasifoliae* Petanovic, 1988**
Rhinotergum cerasifoliae Petanovic, 1988: 390-393.

Diagnosis characters: Female-fusiform, 230 um in length, 85 wide, 80 tick. Gnathosoma 56 um long, chelicerae 60 um long. Prodorsal shield 40 long, 73 wide, with distinct shield pattern (Figure 4-a). Scapular tubercles slightly ahead of the rear margin, 25 um apart. Scapular setae 26 long, directing up and foreward converging. Leg I 70 um long, tibia II um, tarsus 12 um, claw 7 um. Foretibial setae is approximately three times shorter than patellar. Leg II 64 um long, tibia 11 um, tarsus 8 um, claw 9 um. Empodium 4-rayed (Figure 4b). Forecoxae with 1st setae 10 um apart; 2nd coxal setae 12 um apart. Hind coxal setae 26 um apart. Opisthosoma usually with 26 (23-26) dorsal annuli and 28 ventral annuli. Dorsal annuli smooth with deep indentations. Ventral annuli microtuberculated. Small, acuminate and frequent microtubercles (Figure 4-c). c2 setae 12 um long on ventral annulus 3, *d* setae 11 um long on ventral annulus 11. e setae 14 um long, on ventral annulus 16. *f* setae 40 um long on ventral annulus 24. *h*2 setae 80 um long. *h*1 setae 2 um long. Female genital cover flap 19 um long, 27 um wide, smooth; genital setae 12 um long, 18 um apart (Figure 4-d) (Description from Petanovic 1988). According to the latter, this species is close to *Rh.*

schestovici Petanovic, 1988 and can be distinguished by the prodorsal shield pattern, length of Scapular setae which are twice longer, and the presence of only one kind of microtubercles (small, acuminate and frequent) on ventral annuli.

M a t e r i a l : 8 ♀♀, 1 ♂ (IR92-13); Razavi Khorasan, Mashhad, Dehbar village (36°14'44.15"N 59°16'42.81"E 5502ft); 4 August 2013; Leg. A. Honarmand.

H o s t : *Prunus cerasus* L. (Rosaceae).

R e l a t i o n t o h o s t p l a n t : vagrant under surface of leaves.

D i s t r i b u t i o n : Yugoslavia (Cavat and Belgrade) (Petanovic 1988), Croatia, Portuguese mainland, Voivodina, Montenegro (www.faunaeur.org), Iran (this study).

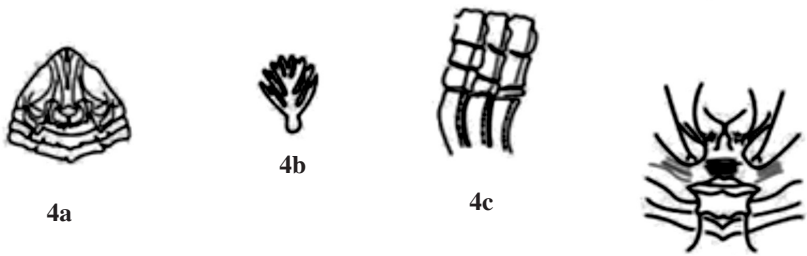

Plate 4. *Rhinotergum cerasifoliae*: (Figure 4a) prodorsal shield; (Figure 4b) Empodium; (Figure 4c) Lateral microtubercles; (Figure 4d) Female coxigenital area (c & d from Petanovic 1988).

Discussion

This study added four new records of eriophyoids to the fauna of Iran indicating a range extension. Among them, the geographical distribution of *A.amaranthi* which has been limited to Tanzania (Africa) is expanded northwards to Iran in North hemisphere. The occurrence of *A. larreae* in Iran which has been reported from USA only shows an intercontinental extension. The geographical distribution of *A.paramacrodonis* reported only from China is expanded westwards to Iran. Also, the occurrence of *Rhinotergum cerasifoliae* in Iran represents a range extension from Central Europe towards South west Asia. These and the two new provincial records of eriophyoid mites extend the knowledge of mite (Acari: Eriophyoidea) distribution in Asia. Considering the great floristic diversity of Iran and the narrow spectrum of host plants, it is expected that the number of known Iranian eriophyoid fauna will increase considerably with further research in different parts of the country.

Acknowledgment

We thank Grazyna Soika (Research Institute of Horticulture, Konstytucji, Skierniewice, Poland) Xiao-Feng Xue and Jing-Feng Guo (Nanjing Agricultural University, Jiangsu, China) who helped with identification of some species presented in this work. This work was partly supported by Ferdowsi University of Mashhad, Iran (Project No. 31006/2).

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