

Three new species from the subfamily Phyllocoptinae (Acari, Trombidiformes, Eriophyidae) in Iran

Parisa Lotfollahi¹, Enrico de Lillo², Karim Haddad Irani-Nejad³

1 Department of Plant Protection, Faculty of Agriculture, Azarbaijan Shahid Madani University, Tabriz, Iran

2 Department of Soil, Plant and Food Sciences (Di.S.S.P.A.), Entomology and Zoology Section, University of Bari Aldo Moro, via Amendola, 165/a, 70126 Bari, Italy **3** Department of Plant Protection, Faculty of Agriculture, University of Tabriz, Tabriz, Iran

Corresponding author: Enrico de Lillo (enrico.delillo@uniba.it)

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Abstract

Three new eriophyid species (Phyllocoptinae), *Shevtchenkella denticulata* **sp. n.**, *Notallus pestehae* **sp. n.** and *Echinacrus ruthenicus* **sp. n.**, were described from *Eryngium thyrsoideum* Boiss. (Apiaceae), *Pistacia vera* L. (Anacardiaceae) and *Lycium ruthenicum* Murray (Solanaceae), respectively. All the three new species were collected from southwest of the East Azerbaijan province, Iran in 2011. It is the first record of an eriophyoid mite collected from *E. thyrsoideum* and *L. ruthenicum* and the first record of *Notallus* from Anacardiaceae plant family.

Keywords

East Azerbaijan, *Notallus*, *Echinacrus*, *Shevtchenkella*, Eriophyoidea, washing method

Introduction

As far as known concerning Iranian fauna, no eriophyoid species has been recorded from Apiaceae. Four eriophyoid species (*Aceria mangiferae* Sayed, 1946, *Aceria pistaciae* (Nalepa, 1899), *Aceria stefanii* (Nalepa, 1898) and *Calacarus citrifolii* Keifer, 1955) have been recorded from Anacardiaceae (Mehrnegad and Daneshvar 1991, Arbabi et al. 1999,

Mehrnejad and Ueckermann 2001, Khanjani and Haddad 2006), and five eriophyoid species [*Tetra lycopersici* Xue & Hong, 2005, *Aceria eucricotes* (Nalepa, 1892), *Aceria melongena* (Zaher & Abou-Awad, 1979), *Aculops lycopersici* (Tryon, 1917) and *Aculus solani* Boczek & Davis, 1984] have been recorded from Solanaceae (Sepasgozarian 1973, Ramazani et al. 2006, Xue et al. 2011, Gharezadeh et al. 2013).

Considering the relevance of this subject and the scientific importance of the evaluation of the mite fauna in scarcely known areas (de Lillo and Skoracka 2010), samples of *Eryngium thyrsoideum* Boiss. (Apiaceae), *Pistacia vera* L. (Anacardiaceae) and *Lycium ruthenicum* Murray (Solanaceae) plants were collected in Iran and their associated eriophyoid mites were studied.

Material and methods

The eriophyoid mite fauna of *E. thyrsoideum*, *P. vera* and *L. ruthenicum* was surveyed in the southwest of East Azerbaijan, Iran, during 2011. Mites were recovered from plant materials according to the modified washing method based on the protocol developed by Monfreda et al. (2007) and mounted on slides according to the protocol reported in Baker et al. (1996). The terminology and setal notation in the morphological descriptions follow mainly Lindquist (1996). The number of measured specimens (n) is given within parentheses in the description. All measurements were made with a phase contrast microscope Olympus BX50 according to Amrine and Manson (1996) and de Lillo et al. (2010), and are given in micrometres. Measurements and means are rounded off to the nearest integer when required, and refer to the length of the morphological characters unless specified otherwise. Since some measurements of the holotype could not be taken, due to the mounting position, the mean measurements of the paratypes are reported. Range values are given in parentheses except in case of constant value or unless specified otherwise. Drawings were made according to de Lillo et al. (2010) and abbreviations follow Amrine et al. (2003). The genus classification follows Amrine et al. (2003) and comparisons were also made with the new genera described since that publication.

Type materials are deposited in the collection of the Acarology Laboratory, Department of Plant Protection, Faculty of Agriculture, University of Tabriz, Tabriz (Iran) and of the Department of Soil, Plant and Food Sciences (Di.S.S.P.A.), section of Entomology and Zoology, University of Bari Aldo Moro (Italy).

Shevtchenkella denticulata sp. n.

<http://zoobank.org/5118BBE1-2C15-4BD4-9DCB-F0E129215103>

Fig. 1

Description. FEMALE. Body dorso-ventrally depressed, 205 (186–226, n = 10), 38 thick, 71 (68–77) wide. **Gnathosoma** 35 (31–38) projecting obliquely downwards, chelicerae 23 (23–32), setae *d* 6 (5–7) and unbranched. **Prodorsal shield** 44 (44–52)

included the frontal lobe, 73 (68–77) wide, semicircular in anterior shape with a broad, semicircular frontal lobe, 13 (12–16), over gnathosomal base provided with a spine on the lateral view. Shield pattern distinct and including 26 depressed cells; tubercles of setae *sc* on the rear shield margin 32 (32–37) apart, setae *sc* 8 (7–9), projecting posteriorly. **Leg I** 35 (32–37), femur 10, genu 4 (4–5), tibia 9 (8–10), tarsus 8 (7–8), ω 7 (6–7) and knobbed, empodium simple, 4 (4–4.5), 4-rayed; setae *bv* 10 (9–11), setae *l''* 17 (15–20), setae *l'* 4 (4–5), setae *ft'* 17 (15–20), setae *ft''* 20 (18–22). **Leg II** 32 (30–34), femur 10 (9–10), genu 4 (4–5), tibia 7 (6–7), tarsus 7 (7–8), ω 6 (6–7) and knobbed, empodium simple, 4, 4-rayed; setae *bv* 10 (8–12), setae *l''* 5 (5–7), setae *ft'* 5 (4–5), setae *ft''* 17 (17–20). **Coxae** with microgranules sometimes lined; setae *1b* 8 (7–10), tubercles *1b* 12 (11–19) apart, setae *1a* 27 (26–31), tubercles *1a* 8 (8–9) apart, setae *2a* 45 (44–53), tubercles *2a* 26 (23–26) apart. Prosternal apodeme 9 (8–10). **Opisthosoma** dorsally flat, with a large furrow and small lobes, 21 (21–24) broad and smooth dorsal semiannuli with the exception of the last two provided with spiny microtubercles protruding from the posterior margin of the annuli; 67 (67–81) narrow microtuberculated ventral semiannuli (counted since the first annulus after the coxae II); 9 (9–13) semiannuli between coxae and genital area plus 4–5 transversal rows of lined granules at the base of the genital coverflap. Small and circular microtubercles, closer to the posterior part of ventral semiannuli. Setae *c2* 25 (20–26) on ventral semiannulus 13 (12–17), setae *d* 59 (59–70) on ventral semiannulus 27 (27–35); setae *e* 15 (14–16) on ventral semiannulus 44 (44–57); setae *f* 28 (26–30) on ventral semiannulus 63 (63–77). Last 4 ventral semiannuli with elongated linear microtubercles protruding from the posterior margin of the annuli. Setae *h2* 62 (62–78) very thin at the apex, *h1* 1–2. **Genital coverflap** 15 (13–18), 23 (23–27) wide, with 14 (13–15) striae and denticulate margin; setae *3a* 20 (15–20) apart, 15 (14–17).

MALE. Similar in shape and prodorsal shield arrangement to female, 192 (n = 1). Prodorsal shield 48; setae *sc* 9, 34 apart; opisthosoma with 21 dorsal semiannuli and 68 ventral semiannuli; male genitalia 20 wide.

Type host plant. *Eryngium thyrsoideum* Boiss. (Apiaceae), Eringo or Sea Holly.

Relation to the host plant. Vagrant on leaves; no apparent damage was observed.

Type locality. Amir dizaj village, Azarshahr, Iran (37°40'17"N, 46°01'58"E), 1,950 m above sea level; late July 2011, coll. P. Lotfollahi.

Type material. Holotype: single female on a microscope slide (ET-IEA-AJ11L-1) (deposited at the Acarology Laboratory, Department of Plant Protection, Faculty of Agriculture, University of Tabriz, Tabriz, Iran). Paratypes: 12 females, 1 male and 2 nymphs mounted on separate microscope slides.

Other material. Mites preserved in Oudemans' fluid and extracted from the sample collected in the same locality on the same date above mentioned.

Etymology. This species is named based on the denticulate shape of the female genital coverflap.

Remarks. This is the first record of a species belonging to the genus *Shevtchenkella* collected on a plant of the family Apiaceae and the first record of an eriophyoid mite on *E. thyrsoideum*.

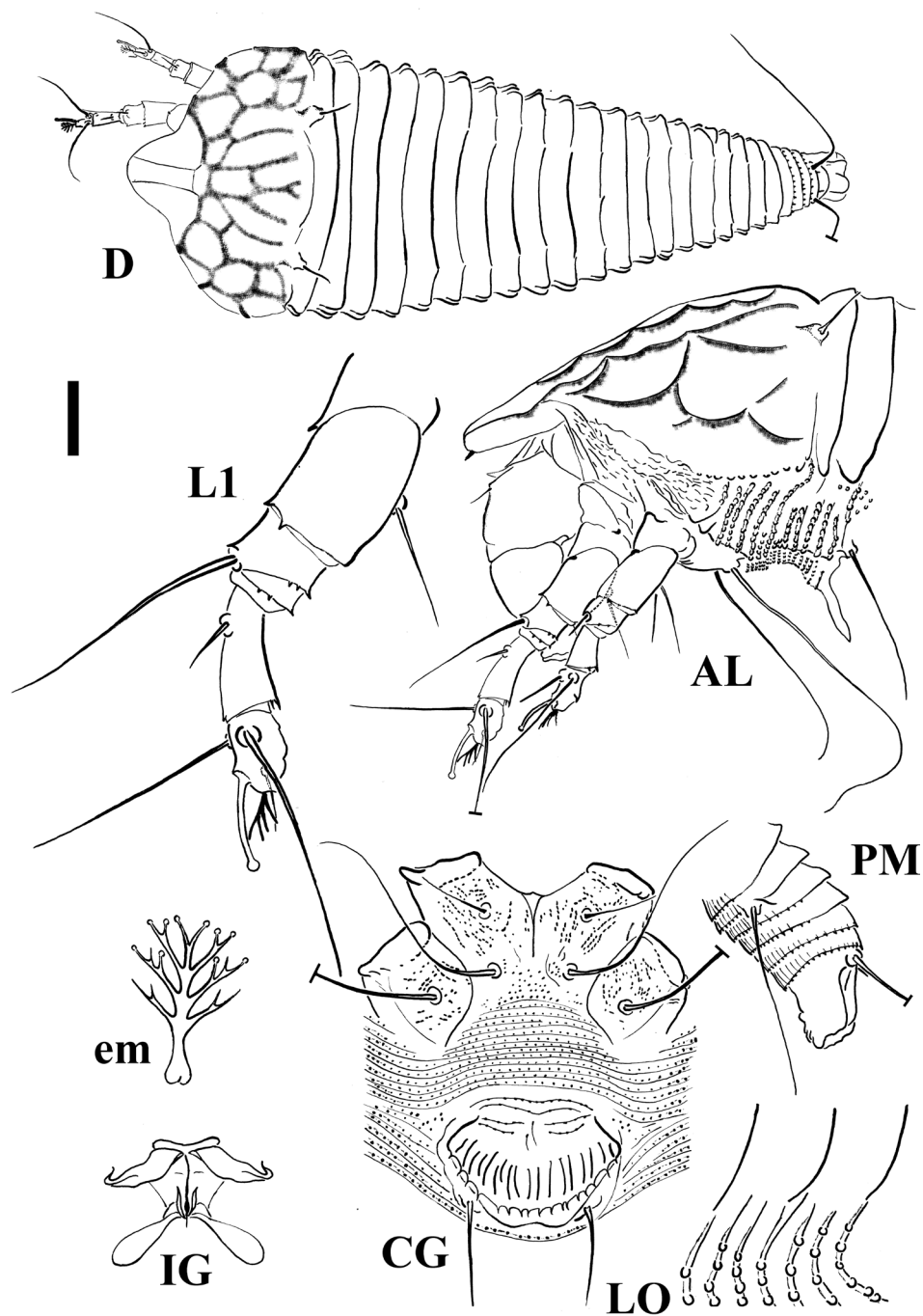


Figure 1. Schematic drawings of *Shevtschenkella denticulata* sp. n.: **AL** Lateral view of anterior body region **CG** Female coxigenital region **D** Dorsal view **em** Empodium **IG** Internal female genitalia **LO** Lateral view of annuli **L1** Leg I **PM** Lateral view of posterior opisthosoma. Scale bar: 17.5 μ m for **D**; 10 μ m for **AL**, **CG**, **IG**, **PM**; 5 μ m for **LO**, **L1**; 2.5 μ m for **em**.

Differential diagnosis. The new species herein described does not show any similarity with any known *Shevtchenkella* spp. whereas shows some similarities with *Aculus pimpinellae* (Liro, 1941) collected from *Pimpinella saxifraga* L. (Apiaceae) in Hollola, Hatsina, Tavastia australis Natural Province, Finland. Differences between these two species, other than those related to the fact they belong to two different genera, are: the ratio between the prodorsal shield length and the length of *sc* setae (5.5 in Iranian species *versus* 2 in Liro's species); number of dorsal annuli (21–24 in Iranian species *versus* 28 in Liro's species); size and shape of the female genital coverflap (15×23 with denticulate rear margin in Iranian species *versus* 15×16 with smooth margin in Liro's species).

***Echinacrus ruthenicus* sp. n.**

<http://zoobank.org/C54984F9-3B58-4756-A422-81683CE5C3A2>

Fig. 2

Description. FEMALE (n=10). Body spindle shaped, 195 (195–255, including gnathosoma), 73 thick, 68 (68–79) wide. **Gnathosoma** 26 (25–37) projecting obliquely downwards, chelicerae 26 (22–30), setae *d* 7 (7–9), unbranched. **Prodorsal shield** 47 (47–54) included the frontal lobe, 70 (60–74) wide, sub-triangular with a broad based and distally pointed frontal lobe, 10 (8–11) over gnathosomal base (starting from the distal motivator end). Shield pattern reticulated, composed of 22 cells resulted of connecting distinct median, admedian, submedian and lateral lines with transverse lines. Tubercles of setae *sc* on the rear shield margin, 33 (28–35) apart, setae *sc* 16 (15–19), directing backward. **Leg I** 37 (35–38), femur 11 (10–12), genu 6 (5–6), tibia 10 (8–10), tarsus 9 (8–9), ω 6.5 (6–7) distally knobbed, empodium simple, 4 (4–5), 4-rayed, rays distally funnel shaped; setae *bv* 13 (11–15), setae *l''* 24 (22–26), setae *l'* 4 (3–5), setae *ft'* 20 (19–20), setae *ft''* 22 (22–23). **Leg II** 36 (32–36), femur 11 (10–11), genu 5 (5–6), tibia 8 (7–8), tarsus 8 (8–9), ω 6.5 (6–7) distally knobbed, empodium simple, 4 (4–5), 4-rayed; setae *bv* 10 (9–11), setae *l''* 5 (4–7), setae *ft'* 4, setae *ft''* 21 (19–22). **Coxae** with lined dashes; setae *1b* 7 (5–8), tubercles *1b* 10 (9–12) apart, setae *1a* 38 (27–38), tubercles *1a* 7 (7–8) apart, setae *2a* 60 (60–73), tubercles *2a* 21 (21–26) apart. Prosternal apodeme 5 (5–6). **Opisthosoma** dorsally arched, with 44 (41–49) broad dorsal semiannuli, 76 (70–86) narrow ventral semiannuli (counted from the first annulus after the coxae II) and 11 semiannuli between coxae and genital coverflap plus 2–3 broken transversal rows of lined granules at the base of the coverflap. Triangular broad based microtubercles on the posterior margin of dorsal semiannuli with a lined longitudinal distribution; circular microtubercles, finely spiny, on the middle of ventral semiannuli; last 6 ventral semiannuli with elongated and linear microtubercles. Setae *c2* 45 (36–45) on ventral semiannulus 15 (12–17), setae *d* 70 (65–85) on ventral semiannulus 29 (25–34); setae *e* 58 (43–64) on ventral semiannulus 49 (44–57); setae *f* 29 (24–33) on ventral semiannulus 70 (64–80). 6 annuli after setae *f*. Setae *h2* 102 (92–112) very thin at the apex, *h1* 2 (2–3). **Genital coverflap** 14 (11–16), 22 (20–25) wide, with 12 (11–13) striae; setae *3a* 18 (18–23), 15 (15–17) apart.

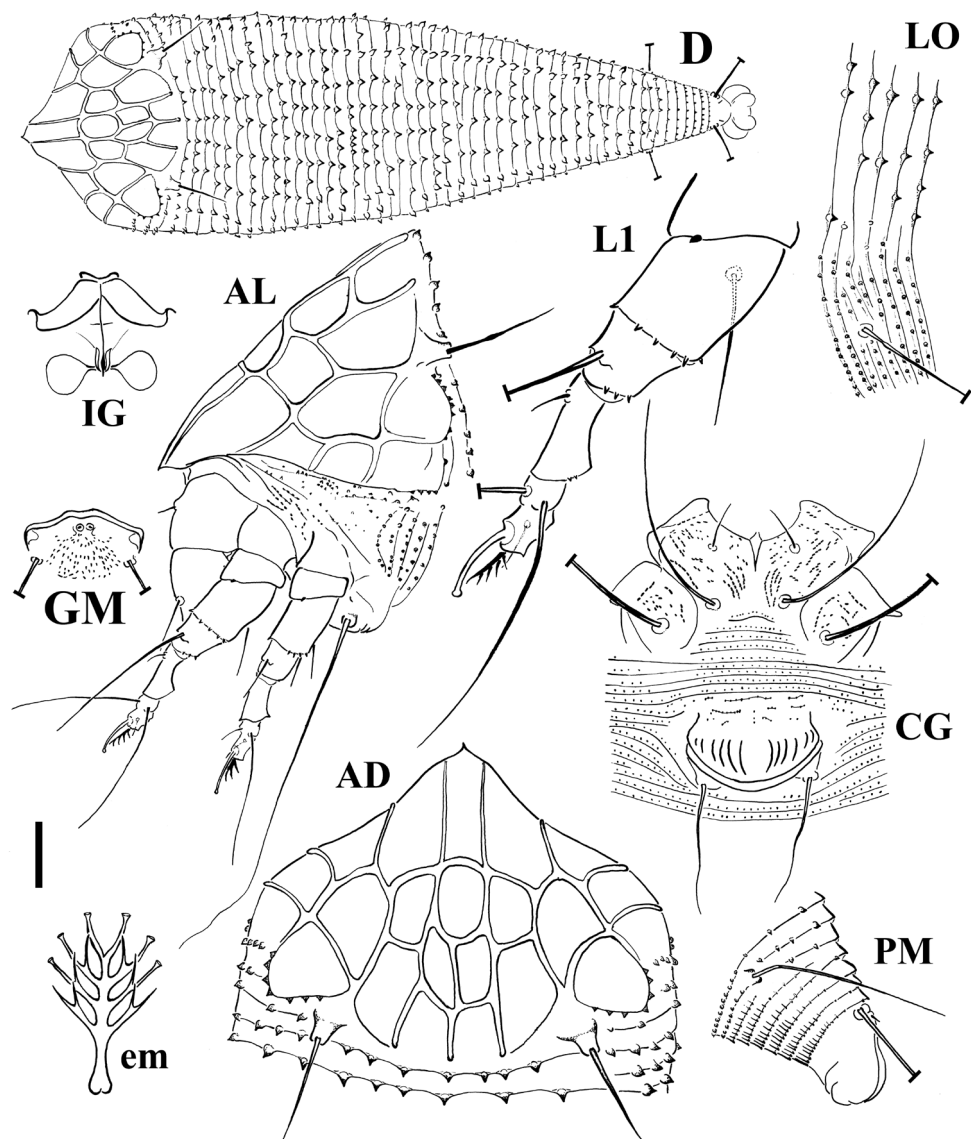


Figure 2. Schematic drawings of *Echinacrus ruthenicus* sp. n.: **AD** Dorsal view of anterior body region **AL** Lateral view of anterior body region **CG** Female coxigenital region **D** Dorsal view **em** Empodium **GM** Male genital region **IG** Internal female genitalia **LO** Lateral view of annuli **L1** Leg I **PM** Lateral view of posterior opisthosoma. Scale bar: 20 μ m for **D**; 10 μ m for **AD**, **AL**, **CG**, **IG**, **GM**, **PM**; 5 μ m for **LO**, **L1**; 2.5 μ m for **em**.

MALE (n=2). Similar in shape and prodorsal shield arrangement to female, 170–205. **Prodorsal shield** 45–50; setae *sc* 13–14, 23–32 apart. **Opisthosoma** with 39–44 dorsal semiannuli and 56–69 ventral semiannuli.

Type host plant. *Lycium ruthenicum* Murray (Solanaceae), Russian Box Thorn.

Relation to the host plant. Vagrant on leaves; no apparent damage was observed.

Type locality. Ilkhchi, Iran (37°57'02"N, 45°58'40"E), 1,300 m above sea level; late July 2011, coll. P. Lotfollahi.

Type material. Holotype: single female on a microscope slide (LR-IEA-II11L-1) (at the Acarology Laboratory, Department of Plant Protection, Faculty of Agriculture, University of Tabriz, Tabriz, Iran). Paratypes: 9 females, 2 males and 1 nymph mounted on separate microscope slides.

Other material. Mites preserved in Oudemans' fluid as extracted from the same sample as the type specimens.

Etymology. The specific epithet is coming from the host plant name *ruthenicum*, deleting "m" and adding "s" as suffix.

Remarks. This is the first record of the genus *Echinacrus* on plants of family Solanaceae, first record of this genus in Iran and the first record of eriophyoid mites on *L. ruthenicum*.

Differential diagnosis. The new species herein described was compared with all *Echinacrus* species and similarities along with *E. septemcarinatus* (Liro, 1941), collected on *Frangula dodonei* Ard. (the synonym *Rhamnus frangula* L. was originally listed by Liro) in Lintula, Isthmus karelicus, Finland, were observed. The empodial rays (4 of the Iranian species *versus* 5 of Liro's species), shape, number and density of dorsal microtubercles (denser and more numerous in the Iranian species than those of Liro's description) and prodorsal shield pattern (22 cells in the Iranian species *versus* a lower number of cells in part differently arranged) are the main differences between the two species.

***Notallus pestehae* sp. n.**

<http://zoobank.org/D550E12F-7D51-4AFA-AD2A-B5945717350D>

Fig. 3

Description. FEMALE (n=11). Body spindle shaped, 165 (156–185, including gnathosoma), 53 (48–57) thick, 52 (49–52) wide. **Gnathosoma** 41 (38–43) projecting obliquely downwards, chelicerae 37 (35–41), setae *d* 5 (4–5), unbranched. **Prodorsal shield** 39 (38–44) included the frontal lobe, 50 (46–50) wide, broad oval, with a broad based and distally truncated frontal lobe, 8 (7–11) over gnathosomal base. Shield pattern composed of a faint short median line on posterior ¼ of prodorsal shield, complete admedian lines close together in the middle of the prodorsal shield, and short first submedian lines on posterior 2/3 of the prodorsal shield, connected to admedian lines with a pair of transverse lines. Admedian lines delimit a median obscure strip (Fig. 3-AD). Tubercles of setae *sc* on the rear shield margin, 25 (24–26) apart, setae *sc* 42 (37–45), directing backward. **Leg I** 26 (25–28), femur 9 (7–9), genu 5 (4–5), tibia 5 (5–6), tarsus 6 (6–8), ω 7 (6.5–8) distally knobbed, empodium simple, 3.5 (3–4), 4-rayed; setae *bv* 11 (9–13), setae *l''* 19 (18–20), setae *l'* 7 (5–7), setae *ft'* 15 (12–16), setae *ft''* 17 (17–19). **Leg II** 20 (20–23), femur 7, genu 3 (3–4), tibia 4 (3–4), tarsus 6 (6–7), ω 7.5 (6.5–8) distally knobbed, empodium simple, 3.5 (3–4),

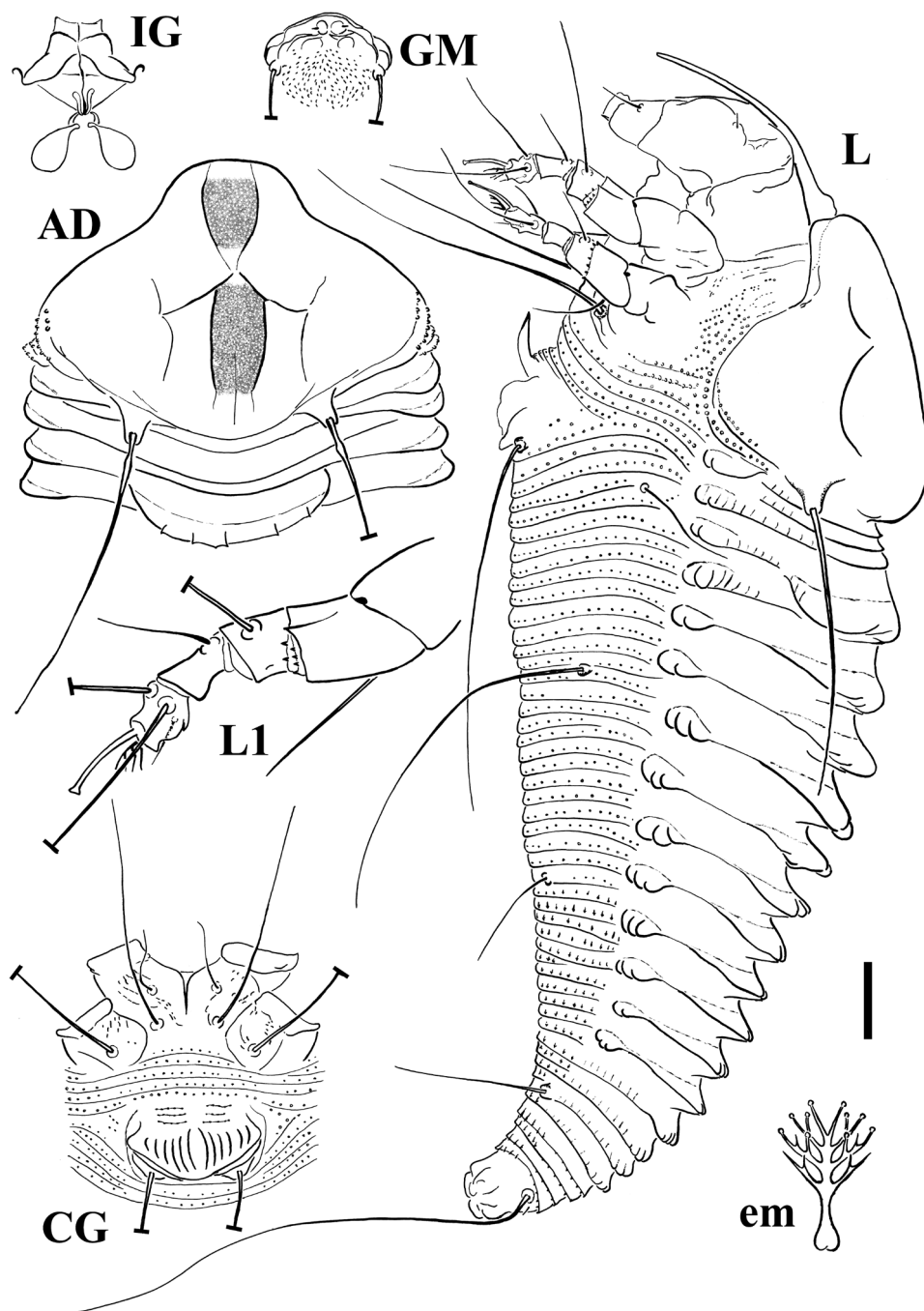


Figure 3. Schematic drawings of *Notallus pesthae* sp. n.: **AD** Dorsal view of anterior body region **CG** Female coxigenital region **em** Empodium **GM** Male genital region **IG** Internal female genitalia **L** Lateral view **L1** Leg I. Scale bar: 10 μ m for AD, CG, IG, GM, L, PM; 5 μ m for L1; 2.5 μ m for em.

4-rayed; setae *bv* 11 (10–12), setae *l''* 6 (6–7), setae *ft'* 6 (4–6), setae *ft''* 16 (15–18). **Coxae** with sparse dashes in part lined; setae *1b* 7 (7–9), tubercles *1b* 8 apart, setae *1a* 28 (27–33), tubercles *1a* 6 (6–7) apart, setae *2a* 45 (37–55), tubercles *2a* 17 (17–18) apart. Prosternal apodeme 6 (6–6.5). **Opisthosoma** with 22 (21–23) broad dorsal semiannuli provided with three dorsal ridges; median ridge from forth dorsal semiannulus extended up to 16 (16–17) semiannulus, lateral ridges from first dorsal semiannulus extended up to 16 semiannulus; faint elongated microtubercles on the ridges; 59 (53–59) narrow microtuberculated ventral semiannuli (counted from the first annulus after the coxae II) and 5 semiannuli between coxae and genital coverflap plus 3 transverse rows of lined granules at the base of the coverflap. Setae *c2* 13 (11–15) on ventral semiannulus 11 (9–11), setae *d* 50 (43–51) on ventral semiannulus 22 (20–22); setae *e* 13 (13–15) on ventral semiannulus 39 (33–39); setae *f20* (15–23) on ventral semiannulus 54 (48–54). 5 annuli after setae *f*. Setae *h2* 53 (40–70) very thin at the apex, *h1* very minute about 1. **Genital coverflap** 8 (8–11), 18 (18–19) wide, with 14 (12–14) striae; setae *3a* 52 (43–52), 11 (10–13) apart.

MALE (n=2). Similar in shape and prodorsal shield arrangement to female, 160–168. **Prodorsal shield** 37–41; setae *sc* 24–31, 23 apart. **Opisthosoma** with 22 dorsal semiannuli and 49–51 ventral semiannuli; genital region 17 wide; setae *3a* 41.

Type host plant. *Pistacia vera* L. (Anacardiaceae), Pistachio.

Relation to the host plant. Vagrant on leaves; no apparent damage was observed.

Type locality. Akhijahan village, Gogan, Iran (37°47'14"N, 45°57'03"E), 1,346 m above sea level; late July 2011, coll. P. Lotfollahi.

Type material. Holotype: single female on a microscope slide (PV-IEA-AN11L-1) (deposited at the Acarology Laboratory, Department of Plant Protection, Faculty of Agriculture, University of Tabriz, Tabriz, Iran). Paratypes: 11 females and 4 males mounted on separate microscope slides.

Other material. Mites preserved in Oudemans' fluid as extracted from the same sample as the type specimens.

Etymology. The specific epithet is coming from the Persian common name *pesteh* given to pistachio.

Remarks. This is the first record of a species belonging to the genus *Notallus* on plants of the Anacardiaceae family.

Differential diagnosis. The genus *Notallus* is characterized by both lateral and middorsal ridges beginning on the forth dorsal semiannulus (Amrine et al. 2003) while the Iranian mite is provided with lateral ridges beginning since the first dorsal semiannulus. In addition, *N. nerii* Keifer, 1975 has more dorsal semiannuli (about 26) and less ventral semiannuli (about 49) in respect to *N. pestheae* (about 22 and 59, respectively), its prodorsal shield is provided with a narrower frontal lobe and an almost "obsolete" pattern composed of faint admedian and converging submedian lines (*N. pesthae* displays a clear pattern). Finally, *N. pterocaryae* Kuang, Luo & Wang, 2005, has smooth prodorsal shield and coxae (both areas are provided with ornamentations in *N. pestheae*) and empodium 7-rayed (4-rayed in *N. pestheae*).

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