

## Two new species and an additional record of eriophyoids (Acari: Trombidiformes: Eriophyidae) from semi-arid and arid environments in East Iran

ARASH HONARMAND<sup>1</sup>, HUSSEIN SADEGHI-NAMAGHI<sup>1\*</sup> & ENRICO DE LILLO<sup>2</sup>

<sup>1</sup>Department of Plant Protection, Faculty of Agriculture, Ferdowsi University of Mashhad, Mashhad, Razavi Khorasan, Iran (FUM); sadeghin@um.ac.ir; arashhonarmand68@gmail.com

<sup>2</sup>Department of Soil, Plant and Food Sciences (Di.S.S.P.A.), Entomology and Zoology Section, University of Bari Aldo Moro, Italy (UNIBA); enrico.delillo@uniba.it

\* Corresponding author. E-mail: sadeghin@um.ac.ir

### Abstract

Two new species and an additional record of eriophyid mites from semi-arid and arid environments in East Iran are reported. *Aculops ammodendris* **sp. nov.** from *Ammodendron persicum* Bunge ex Boiss. (Leguminosae) and *Aceria launaeae* **sp. nov.** from *Launaea acanthodes* (Boiss.) Kuntze (Asteraceae) are described and illustrated. No symptoms were observed on the infested host plants. These two new species are the first eriophyid mites on plant species within the genera *Ammodendron* and *Launaea*. Geographical distribution of *Aceria angustifoliae* Denizhan, Monfreda, de Lillo & Çobanoğlu, 2008, extended also into the currently studied Iranian area in addition to a previous record from Turkey and Northern Khorasan.

**Key words:** eriophyid mites, fauna, Iran, semi-arid environment, new records

### Introduction

Many plant species are adapted to survive in arid and semiarid areas of south Khorasan province in East Iran. *Ammodendron persicum* Bunge ex Boiss., belongs to the tribe Sophoreae of the family Leguminosae, is a perennial thorny, self-pollinated and endemic psammophyte shrub of the eastern and south eastern border regions of Iran. It is associated with sandy habitats in desert regions and important for the fixation of sand dunes (Safarnejad & Abbasi, 2010). This species is considered close to extinction because of its limited geographical distribution in a narrow ecological range (Naderi Shahab *et al.* 2018). *Launaea acanthodes* (Boiss.) Kuntze, belongs to the tribe Lactuceae of the family Asteraceae, it's an annual plant in semi-arid, saline and sandy regions of Iran. Most species in this genus are used as folk and herbal medicine for skin and stomach diseases. This species is reported to have antitumor, insecticide and cytotoxic ingredients (Sodeifian *et al.* 2016). *Elaeagnus angustifolia* (L.), in the family Elaeagnaceae, occurs in Eurasia but is an invasive plant which was also introduced into western USA and Canada (Denizhan *et al.* 2008).

In recent years, the eriophyoid fauna of Iran received lots of attention (e.g., Guo *et al.* 2015; Lotfollahi *et al.* 2015; Honarmand & Sadeghi, 2016; Xue *et al.* 2016; Soika *et al.* 2017; Gol *et al.* 2019; Sadeghi-Namaghi *et al.* 2019; and many more). Previously no eriophyoids were reported from *A. persicum* and *L. acanthodes*. This is the third report of *Aceria angustifoliae* Denizhan, Monfreda, de Lillo & Çobanoğlu, 2008, collected on *E. angustifoliae*, previously only known from Turkey and Northern Khorasan. As knowledge of eriophyoids on plant hosts in arid and semiarid environments in Iran is fragmentary it was decided to carry out surveys in south Khorasan province of East Iran.

## Materials and methods

Plant material were collected during summers of 2017 and 2018 in the vicinity of Birjand (South Khorasan, East Iran). Mites were collected from leaves of *A. persicum* and *E. angustifolia*, and from flowers and stems of *L. acanthodes* under a dissecting stereomicroscope. They were preserved in 70% ethanol and Oudemans' solution (Krantz & Walter 2009). *Aculops ammodendris* **sp. nov.** and *Aceria launaeae* **sp. nov.** were cleared in lactic acid at room temperature and mounted in Heinze's medium. Specimens of these two species were mounted without any kapok fiber in the mounting medium, between slide and coverslip. *Aceria angustifoliae* was cleared and mounted using Keifer's media (Amrine & Manson 1996) and some kapok fibers were added in the mounting medium, between slide and cover slip, to avoid pressure by the latter on the mites. The reason for this was to compare the specimens found in Iran with the type specimens of *A. angustifoliae* which were originally mounted with kapok fiber. The morphological terminology and setal notations follow Lindquist (1996). The genera were identified using the generic key by Amrine *et al.* (2003). All morphological measurements were taken using a phase contrast microscope Olympus BX50 according to Amrine and Manson (1996) as modified by de Lillo *et al.* (2010), and are given in micrometers ( $\mu\text{m}$ ). The holotype measurements of the new species are followed by the range in parentheses. Measurements are rounded off to the nearest integer, referring to the length of the morphological characters unless otherwise specified. A drawing tube mounted on the Olympus BX50 contrast microscope was used for the drawings according to de Lillo *et al.* (2010). Abbreviations used in the drawings follow Amrine *et al.* (2003). Names of the host plant species and their families are in accordance with The Plant List on-line database (2013).

Most type specimens are deposited in the collection of the Acarology Laboratory, Department of Plant Protection, Faculty of Agriculture, Ferdowsi University of Mashhad, Iran (FUM). Two paratypes of both new species are deposited at the Entomological and Zoological Section, Department of Soil, Plant and Food Sciences (DiSSPA), University of Bari Aldo Moro, Italy (UNIBA), formerly indicated as UBI by Zhang (2018).

## Results

### *Aculops ammodendris* Honarmand, Sadeghi-Namaghi & de Lillo **sp. nov.** (Fig. 1)

**Description.** FEMALE: (n = 10). Body vermiform, 190 (180–210, including gnathosoma), 50 (46–53) wide, 70 (68–70) thick. **Gnathosoma** 28 (27–29) projecting downwards, pedipalp coxal setae *ep* not detectable, dorsal pedipalp genual setae *d* 5 (5–6) unbranched, palp tarsus setae *v* 1 (1–2), cheliceral stylets 25 (24–25). **Prodorsal shield** sub-triangular, 38 (38–45), including frontal lobe, 50 (43–50) wide; with a short rounded frontal lobe, 5 (no range) over gnathosomal base; median line complete, admedian lines complete, subparallel, slightly diverging close to the rear margin of the shield, inner submedian lines incomplete on anterior half of shield and outer submedian lines complete with few granules; several granules on lateral sides of prodorsal shield. Tubercles of scapular setae *sc* on rear shield margin, 21 (no range) apart, scapular setae *sc* 24 (19–24), backward. **Leg I** 35 (34–36), femur 10 (10–11), genu 6 (5–6), tibia 7 (no range), tarsus 7 (6–7), solenidion  $\omega$  8 (8–9) distally slightly knobbed, empodium simple 5 (no range), 6-rayed; femoral setae *bv* 12 (11–12), genual setae *l''* 21 (19–21), tibial setae *l'6* (6–7), tarsal setae *ft'21* (21–23), setae *ft''* 16 (16–17). **Leg II** 31 (30–32), femur 10 (10–11), genu 5 (no range), tibia 6 (5–6), tarsus 7, solenidion  $\omega$  10 (9–10) distally slightly knobbed, empodium simple 5 (no range), 6-rayed; femoral setae *bv* 11 (10–12),

genual setae *l''* 9 (8–9), tarsal setae *ft'* 24 (23–25), setae *ft''* 5 (5–6). **Coxae** with granules, distinct dashes arranged in lines on first coxae; setae *lb* 11 (10–12), tubercles *lb* 7 (no range) apart, setae *la* 35 (25–36), tubercles *la* 7 (6–8) apart, setae *2a* 45 (38–49), tubercles *2a* 20 (18–21) apart, prosternal apodeme 5 (5–6). **Opisthosoma** dorsally arched with 47 (42–50) dorsal semiannuli; 63 (60–65) ventral semiannuli (counted from first complete annulus after coxae II); 7 (6–7) coxigenital semiannuli with fine microtubercles between coxae and genital coverflap. **Microtubercles** elliptical, on posterior margin of dorsal and ventral semiannuli. Setae *c2* 48 (40–48), on ventral semiannulus 11 (9–11); setae *d* 53 (53–70), on ventral semiannulus 23 (20–23); setae *e* 30 (26–37), on ventral semiannulus 40 (36–40); setae *f* 48 (31–49), on ventral semiannulus 59 (56–61), 4 (no range) annuli after setae *f*. Setae *h2* 110 (95–110); setae *h1* 2 (2–3). **Genital coverflap** 13 (13–15), 20 (19–21) wide, with 2 transverse rows of dashes arranged in transversal lines; 11 (11–12) longitudinal markings on coverflap; setae *3a* 63 (50–63), 15 (15–16) apart.

**MALE** (n = 1). Body vermiform, 160 (including gnathosoma), 40 wide. **Gnathosoma** 25 projecting downwards, chelicerae 20, palp coxal setae *ep* not detectable, palp genual setae *d* 5, unbranched. **Prodorsal shield** 37, including frontal lobe, 40 wide, frontal lobe 5. Shield pattern similar to that of the female. Tubercles of the scapular setae *sc* on the rear shield margin, 20 apart, setae *sc* 19. **Leg I** 30, femur 10, genu 5, tibia 7, tarsus 7, solenidion  $\omega$  8 slightly knobbed, empodium simple, 5, 6-rayed; femoral setae *bv* 11, genual setae *l''* 18, tibial setae *l'* 6, tarsal setae *ft'* 21, setae *ft''* 15. **Leg II** 28, femur 10, genu 5, tibia 5, tarsus 7, solenidion  $\omega$  9 slightly knobbed, empodium simple, 5, 6-rayed; femoral setae *bv* 10, genual setae *l''* 8, tarsal setae *ft'* 24, setae *ft''* 5. **Coxae** similar to that of the female; setae *lb* 10, tubercles *lb* 6 apart, setae *la* 26, tubercles *la* 5 apart, setae *2a* 41, tubercles *2a* 17 apart. **Opisthosoma** dorsally arched with 42 semiannuli; 61 ventral semiannuli; 5 semiannuli between coxae and genital region. Setae *c2* 32 on ventral semiannulus 11, setae *d* 58 on ventral semiannulus 22; setae *e* 27 on ventral semiannulus 38; setae *f* 41 on ventral semiannulus 57, 4 annuli after setae *f*. Setae *h2* 76; setae *h1* 2; setae *3a* 35, 14 apart.

**Type host plant** *Ammodendron persicum* Bunge ex Boiss. (Fam. Leguminosae).

**Relation to the host plant.** Vagrant on both sides of the leaves. No symptoms were observed on the infested plants.

Type locality. Hemmatabad desert, Birjand, Iran. 60°6'22.324"N, 33°32'37.262"E, 1228 m above sea level; 10 August 2017, coll. Arash Honarmand.

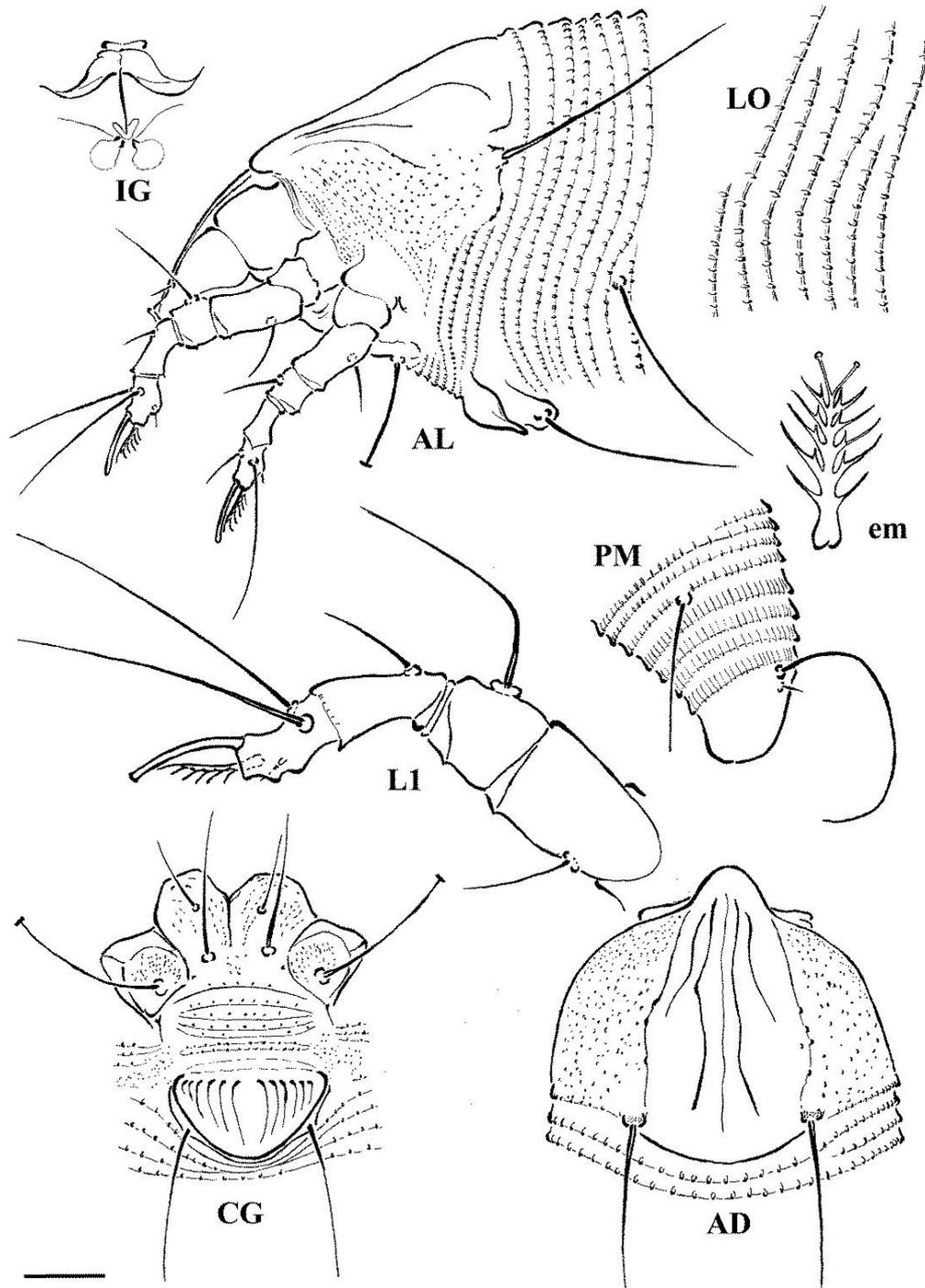
**Type material.** Holotype: single female on a microscope slide (AH96-19); paratypes: 15 females and 1 male mounted on separate microscope slides.

**Other material.** Mites preserved in 70% ethanol and Oudemans' solution extracted from the same plant sample as the type specimens.

**Etymology.** The specific designation is derived from host plant genus *Ammodendron* in the genitive case.

**Differential diagnosis.** The new species was compared with all known *Aculops* species. Some similarities were found with *A. alachuae* Keifer, 1966, described from leaf galls on *Rhus copalinum* L. subsp. *leucantha* (Jacq.) Murray (Anacardiaceae) in Florida, USA, and *A. sieberiana* Meyer (Smith) & Ueckermann, 1990, vagrant on leaves of *Acacia sieberiana* var. *woodii* (Burt Davy) Keay & Brennan (Leguminosae). Median line in *A. alachuae* and *A. sieberiana* is interrupted opposed to that of *A. ammodendris* **sp. nov.** which is complete. Inner submedian lines in *A. sieberiana* are on the anterior half of the prodorsal shield but they are bifurcated posteriorly, whereas those in *A. alachuae* reach the tubercles of the scapular setae *sc*, but those of *A. ammodendris* **sp. nov.** are simple and on the anterior half of the prodorsal shield. The frontal lobe in *A. alachuae* is shorter than that of *A. ammodendris* **sp. nov.**; finally, the empodium of *A. ammodendris* **sp. nov.** is 6-rayed and that of *A. alachuae* is 4-rayed.

**Remarks.** This is first report of an eriophyid mite on a plant species belonging to the genus *Ammodendron*.



**FIGURE 1.** Line drawings of *Aculops ammodendris* sp. nov.: AD. Prodorsal shield; AL. Lateral view of anterior body region; CG. Female coxigenital region; em. Empodium; IG. Internal female genitalia; LO. Lateral view of annuli; LI. Leg I; PM. Lateral view of posterior opisthosoma. Scale bar: 10  $\mu$ m for AD, AL, CG, IG, PM; 5  $\mu$ m for LO, LI; 2.5  $\mu$ m for em.

*Aceria launaeae* Honarmand, Sadeghi-Namaghi & de Lillo sp. nov. (Fig. 2)

**Description.** FEMALE: (n = 10). Body vermiform, 220 (190–232, including gnathosoma), 43 (38–45) wide, 48 (48–49) thick. **Gnathosoma** 18 (18–20) projecting downwards, pedipalp coxal setae *ep* 2 (no range), dorsal pedipalp genual setae *d* 6 (5–6), unbranched, palp tarsus setae *v* 1 (no range), cheliceral stylets 18 (18–21). **Prodorsal shield** 32 (30–32), including frontal lobe, 35 (33–35) wide; frontal lobe 5 (4–5) over gnathosomal base, square shaped; shield pattern composed of complete median and submedian lines, admedian lines complete but interrupted on about posterior one fourth of shield. Few short dashes medially and some short and long dashes on lateral margin of shield. Tubercles of scapular setae *sc* on rear shield margin, 20 (20–23) apart, scapular setae *sc* 36 (30–36), divergently backward. **Leg I** 27 (27–28), femur 9 (8–9), genu 4 (no range), tibia 5 (5–6), tarsus 6 (no range), solenidion  $\omega$  10 (9–10) distally slightly knobbed, empodium simple, 5 (no range), 5-rayed; femoral setae *bv* 9 (8–9), genual setae *l''* 24 (23–24), tibial setae *l'* 7 (no range), tarsal setae *ft'* 11 (9–11), setae *ft''* 23 (20–23). **Leg II** 26 (25–26), femur 9 (8–9), genu 4 (no range), tibia 5 (no range), tarsus 6 (no range), solenidion  $\omega$  10 (9–10) distally slightly knobbed, empodium simple, 5 (no range), 5-rayed; femoral setae *bv* 10 (9–11), genual setae *l''* 10 (9–10), tarsal setae *ft'* 6 (5–6), setae *ft''* 25 (23–25). **Coxae** ornamented by elongated granules; setae *lb* 10 (10–12), tubercles *lb* 9 (9–10) apart, setae *la* 33 (22–35), tubercles *la* 8 (7–8) apart, setae *2a* 46 (30–48), tubercles *2a* 21 (20–22) apart. **Opisthosoma** with 59 (59–63) dorsal semiannuli, with elliptical microtubercles, and 71 (69–74) ventral semiannuli, with rounded and small microtubercles on rear annulus margin; 7 (7–8) coxigenital semiannuli with fine microtubercles between coxae and genital coverflap; last 5 (no range) ventral and dorsal semiannuli with elongated microtubercles. Setae *c2* 30 (27–35), on ventral semiannulus 10 (10–11); setae *d* 75 (51–75), on ventral semiannulus 25 (23–26); setae *e* 54 (36–65), on ventral semiannulus 43 (40–45); setae *f* 26 (21–26), on ventral semiannulus 66 (64–69), 5 (no range) annuli after setae *f*. Setae *h2* 90 (88–105), setae *hl* 4 (no range). **Genital coverflap** 10 (10–16), 20 (19–21) wide, coverflap with 14 (14–16) lines, setae *3a* 21 (19–24), 15 (15–17) apart.

**MALE** (n = 1). Body vermiform, 180 (including gnathosoma), 35 wide. **Gnathosoma** 20 projecting downwards, chelicerae 20, palp coxal setae *ep* 1, palp genual setae *d* 5, unbranched, palp tarsus setae *v* 1. **Prodorsal shield** 24, including frontal lobe, 22 wide and 5 long. Shield pattern similar to that of the female. Tubercles of the scapular setae *sc* ahead of rear shield margin 20 apart, setae *sc* 25. **Leg I** 26, femur 8, genu 4, tibia 5, tarsus 6, solenidion  $\omega$  8 slightly knobbed, empodium simple, 4, 5-rayed; femoral setae *bv* 9, genual setae *l''* 22, tibial setae *l'* 7, tarsal setae *ft'* 9, setae *ft''* 16. **Leg II** 24, femur 8, genu 4, tibia 4, tarsus 5, solenidion  $\omega$  8 slightly knobbed, empodium simple, 4, 5-rayed; femoral setae *bv* 9, genual setae *l''* 9, tarsal setae *ft'* 5, setae *ft''* 22. **Coxae** similar to that of the female; setae *lb* 5, tubercles *lb* 8 apart, setae *la* 22, tubercles *la* 6 apart, setae *2a* 37, tubercles *2a* 17 apart. **Opisthosoma** dorsally arched with 54 semiannuli; 64 ventral semiannuli; 7 semiannuli between coxae and genital region. Setae *c2* 25 on ventral semiannulus 10, setae *d* 38 on ventral semiannulus 21; setae *e* 26 on ventral semiannulus 37; setae *f20* on ventral semiannulus 59, 5 annuli after setae *f*. Setae *h2* 50; setae *hl* 4; setae *3a* 16, 12 apart.

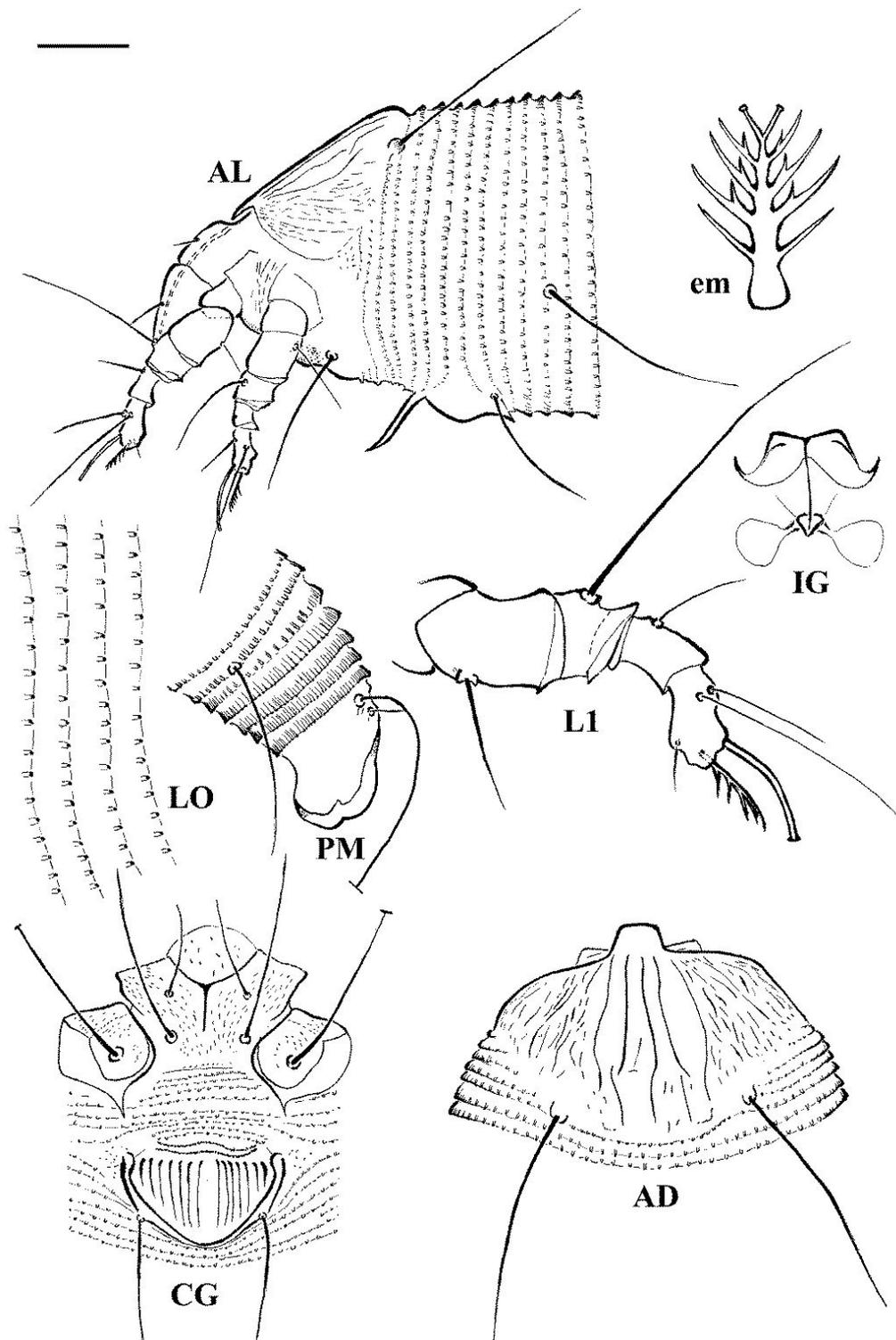
**Type host plant** *Launaea acanthodes* (Boiss.) Kuntze (Fam. Asteraceae).

**Relation to the host plant.** Vagrant on the stems and flowers. No symptom was observed on the infested plants.

Type locality. Kafki village, Birjand, Iran. 59°24'11.074"N, 32°44'2.368"E, 2099 m above sea level; 27 July 2016, coll. Arash Honarmand.

**Type material.** Holotype: single female on a microscope slide (AH95-4); paratypes: 13 females and 1 male mounted on separate microscope slides.

**Other material.** Mites preserved in 70% ethanol and Oudemans' solution extracted from the same sample as the type specimens.



**FIGURE 2.** Line drawings of *Aceria launaeae* sp. nov.: AD. Prodorsal shield; AL. Lateral view of anterior body region; CG. Female coxigenital region; em. Empodium; IG. Internal female genitalia; LO. Lateral view of annuli; L1. Leg I; PM. Lateral view of posterior opisthosoma. Scale bar: 10  $\mu$ m for AD, AL, CG, IG, PM; 5  $\mu$ m for LO, L1; 2.5  $\mu$ m for em.

**Etymology.** The specific designation is derived from host plant genus *Launaea* in the genitive case.

**Differential diagnosis.** *Aceria launaeae* sp. nov. is similar to *Aceria solcentaureae* de Lillo, Cristofaro & Kashefi, 2003, and *Aceria knorri* Keifer, 1962, respectively associated with *Centaurea solstitialis* L. and *Bidens pilosa* L. (both belonging to the Asteraceae). *Aceria launaeae* sp. nov. can be differentiated from the above-mentioned species by the median line (complete in *A. launaeae* sp. nov. and *A. knorrii*, interrupted in *A. solcentaureae*), admedian lines (interrupted in *A. launaeae* sp. nov. and complete in the other two species), lateral side of the prodorsal shield (with granules in *A. solcentaureae* and *A. knorrii*, and dashes in *Aceria launaeae* sp. nov.), frontal lobe shape (square in *A. launaeae* sp. nov. and semicircular in others), setae *sc* length (36 µm in *A. launaeae* sp. nov., 50 µm in *A. solcentaureae* and 45 µm in *A. knorrii*).

**Remarks.** This is the first report of eriophyid mites on a plant species belonging to the genus *Launaea*.

#### ***Aceria angustifoliae* Denizhan, Monfreda, de Lillo et Çobanoğlu, 2008**

**Material studied.** Mites of this species were collected from *Elaeagnus angustifolia* L. (Fam. Elaeagnaceae), Russian olive trees, in Esfahrood village, Birjand, Southern Khorasan of Iran (59°18'19.987"N, 32°48'9.252"E, 2010 m above sea level; 25 August 2017; coll. Arash Honarmand).

**Relation to the host.** This species causes distortion of the leaf lamina.

**Geographical distribution.** *Aceria angustifoliae* was first described from *Elaeagnus angustifolia*, Russian olive, in Kurtuluş Parkı, Ankara, Turkey, 852 m elev., 39°51'43N, 32°43'58E, collected in July 2005. There were no morphological differences between the current Iranian population and the original description. This species was previously reported in Shirvan (Chetverikov *et al.* 2015) and Mashhad (Schaffner *et al.* 2012) in North Khorasan province of Iran.

#### **Acknowledgements**

This research was partially supported by Ferdowsi University of Mashhad, Iran (FUM), and University of Bari Aldo Moro, Italy (UNIBA).

#### **References**

- Amrine, J.W.Jr. & Manson, D.C.M. (1996) Preparation, mounting and descriptive study of eriophyoid mites. *In: Lindquist, E.E., Sabelis, M.W. & Bruin, J. (eds.) Eriophyoid mites - their biology, natural enemies and control. World crop pests, 6.* The Netherlands, Elsevier, Amsterdam, pp. 383–396.  
[https://doi.org/10.1016/S1572-4379\(96\)80023-6](https://doi.org/10.1016/S1572-4379(96)80023-6)
- Amrine, J.W.Jr., Stasny, T.A.H. & Flechtmann, C.H.W. (2003) *Revised keys to world genera of Eriophyoidea (Acari: Prostigmata)*. West Bloomfield, Michigan, USA, Indira Publishing House, 244 pp.
- Chetverikov, P.E., Cvrković, T., Makunin, A., Sukhareva, S., Vidović, B. & Petanović, R. (2015) Basal divergence of Eriophyoidea (Acariformes, Eupodina) inferred from combined partial COI and 28S gene sequences and CLSM genital anatomy. *Experimental and Applied Acarology*, 67(2), 219–245.  
<http://dx.doi.org/10.1007/s10493-015-9945-9>
- de Lillo, E., Craemer, C., Amrine, J.W.Jr. & Nuzzaci, G. (2010) Recommended procedures and techniques for morphological studies of Eriophyoidea (Acari: Prostigmata). *Experimental and Applied Acarology*, 51(1–3), 283–307.  
<https://doi.org/10.1007/s10493-009-9311-x>
- de Lillo, E., Cristofaro, M. & Kashefi, J. (2003) Three new *Aceria* species (Acari: Eriophyoidea) on *Centaurea*

- spp. (Asteraceae) from Turkey. *Entomologica*, 36(2002), 121–137.  
<https://doi.org/10.15162/0425-1016/748>
- Denizhan, E., Monfreda, R., de Lillo, E. & Çobanoğlu, S. (2008) Two new species of eriophyoid mites (Acari: Eriophyoidea) associated with Elaeagnaceae in Turkey. *Zootaxa*, 1698, 41–48.  
<https://doi.org/10.11646/zootaxa.1698.1.2>
- Gol, A., Sadeghi-Namaghi, H. & de Lillo, E. (2019) A new species, a redescription of *Aceria lamii* (Liro, 1943) and two new records of eriophyoid mites (Acari: Trombidiformes: Eriophyoidea) on weeds in Golestan province, Iran. *Systematic & Applied Acarology*, 24(2), 198–208.  
<http://doi.org/10.11158/saa.24.2.3>
- Guo, J.-F., Sadeghi, H., Gol, A. & Xue, X.-F. (2015) A new species of the genus *Vittacus* Keifer (Acari: Eriophyidae) from Iran. *Persian Journal of Acarology*, 4(1), 57–63.
- Honarmand, A. & Sadeghi, H. (2016) New records of eriophyoid mites (Eriophyoidea: Eriophyidae, Diptilomiopidae) from Iran. *Entomofauna*, 37(18), 297–308.
- Keifer, H.H. (1962) Eriophyid studies B-8. *Bulletin of the California Department of Agriculture*, 14–15.
- Keifer, H.H. (1966) Eriophyid studies B-21. *Bulletin of the California Department of Agriculture*, 13–14.
- Krantz, G.W. & Walter, D.E. (2009) *A manual of acarology*. 3rd Edition. Lubbock, Texas Tech University Press, 807 pp.
- Lindquist, E.E. (1996) External anatomy and notation of structures. In: Lindquist, E.E., Sabelis, M.W. & Bruin, J. (eds.), *Eriophyoid mites - their biology, natural enemies and control*. *World crop pests*, 6. Amsterdam, The Netherlands, Elsevier, pp. 3–31.  
[https://doi.org/10.1016/S1572-4379\(96\)80003-0](https://doi.org/10.1016/S1572-4379(96)80003-0)
- Lotfollahi, P., de Lillo, E. & Irani-Nejad, K.H. (2015) Three new *Aculops* species (Acari: Trombidiformes: Eriophyidae) from Iran. *Systematic and Applied Acarology*, 20(4), 410–422.  
<http://dx.doi.org/10.11158/saa.20.4.6> 410.
- Meyer (Smith), M.K.P. & Ueckermann, E.A. (1990). African Eriophyoidea: the genus *Aculops* Keifer, 1966 (Acari: Eriophyidae). *Phytophylactica*, 22(2), 159–175.
- Naderi Shahab, A.M., Jebelly, M. & Jafari, A.A. (2018) Cryopreservation of *Ammodendron persicum* (Bunge ex Boiss.) seeds and evaluation of the cryogenic seeds under various conditions. *Journal of Rangeland Science*, 8(2), 103–116.
- Sadeghi-Namaghi, H., Gol, A. & de Lillo, E. (2019) Two new species of Eriophyidae (Acari: Trombidiformes: Eriophyoidea) on *Tilia begoniifolia* Steven (Tiliaceae) in Golestan province of Iran. *Systematic & Applied Acarology*, 24(5): 782–789.  
<http://doi.org/10.11158/saa.24.5.5>
- Safarnejad, A. & Abbasi, M. (2010) Karyology of *Ammodendron persicum* Bunge ex Boiss - an endemic psammophyte to Iran. *International Journal of Science and Nature*, 1(2), 198–201.
- Schaffner, U., Dingle, K., Swart, C. & Cristofaro, M. (2012) Annual Report 2011. Biological control of Russian olive, *Elaeagnus angustifolia*. CABI Ref: VM10015.
- Sodeifian, G., Sajadian, S.A. & Ardestani, N.S. (2016) Optimization of essential oil extraction from *Launaea acanthodes* Boiss: utilization of supercritical carbon dioxide and cosolvent. *The Journal of Supercritical Fluids*, 116, 46–56.  
<https://doi.org/10.1016/j.supflu.2016.05.015>
- Soika, G., Gol, A., Honarmand, A., Wozinska, A. & Sadeghi Namaghi, H. (2017) New records of eriophyoid mites from Iran (Acari: Trombidiformes: Eriophyoidea) and a description of a new *Brevulacus* Manson species. *Zootaxa*, 4212, 321–338.  
<https://doi.org/10.11646/zootaxa.4216.4.2>
- The Plant List (2013) Version 1.1. Published on the Internet. Available from: <http://www.theplantlist.org/> (Accessed 2 January 2019).
- Xue, X.-F., Sadeghi-Namaghi, H. & Honarmand, A. (2016) Three eriophyoid mite species (Acari: Eriophyoidea: Eriophyidae) from Iran. *Zootaxa*, 4132(3), 403–412.  
<http://dx.doi.org/10.11646/zootaxa.4132.3.8>
- Zhang, Z.Q. (2018) Repositories for mite and tick specimens: acronyms and their nomenclature. *Systematic and Applied Acarology*, 23(12), 2432–2447.  
<http://dx.doi.org/10.11158/saa.23.12.12>

*Submitted: 8 Apr. 2019; accepted by Eddie Ueckermann: 7 Jun. 2019; published: 19 Jun. 2019*