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Article

Tetra hajiqanbari Lotfollahi & Jafari (Acari: Eriophyidae), a new species from Iran

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ABSTRACT
A new Anthocoptini mite, *Tetra hajiqanbari* Lotfollahi & Jafari **sp. nov.** was discovered and described in the Lorestan province of Iran. The mites were vagrant on leaves of *Glycyrrhiza glabra* L. (Fabaceae). This is the fourth eriophyoid species found on this host plant.

KEYWORDS: Anthocoptini, *Glycyrrhiza*, Lorestan, Phyllocoptinae, vagrant.

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INTRODUCTION

The genus *Tetra* Keifer, 1944 has more than 125 species worldwide. It was established by Keifer based on the type species *Phyllocoptruta concave* Keifer collected on English elm. Its species are similar to other mites of the tribe Anthocoptini Amrine & Stasny in having: fusiform body somewhat dorsoventrally flattened; gnathosoma rather small, projecting obliquely downwards; prodorsal shield with frontal lobe; scapular tubercles on rear shield margin, scapular setae directed backwards; coxal setae *1b*, *1a* and *2a* present; legs with all common segments and setae, empodium simple; opisthosomal setae *c2*, *d*, *e* and *f* present; female genitalia with a moderate distance from coxae, coverflap with one row of longitudinal striae; and apodeme of normal length in ventral view. However, *Tetra* species are unique in having a middorsal longitudinal furrow that is at least as wide as the scapular tubercles are apart (Keifer 1944; Amrine *et al*. 2003).

Until now nine *Tetra* species were found in Iran and just one of them was collected on *Glycyrrhiza glabra* L. (Fabaceae). This plant species is very common in Iran with a rich fauna including three eriophyoid mites: *Tetra glycyrrhizae* Denizhan, Monfreda, Çobanoğlu & de Lillo, 2007, *Aculus lorestaniensis* Lotfollahi, Hayatolgheyb, Jafari & Shakarami, 2017 and *Tegolophus glycyglabri* Lotfollahi, Hayatolgheyb & Jafari, 2017 (Doryanizadeh *et al.* 2013, Delfan *et al.* 2015; Hayatolgheyb *et al.* 2017; Lotfollahi *et al*. 2017). Herein the fourth eriophyoid species found on this host plant is illustrated and described.

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MATERIAL AND METHODS

To study mite fauna of Lorestan Province of Iran, *G. glabra* plants were sampled. Eriophyoid mites were recovered from the plants using a modified washing method developed by Monfreda *et al.* (2007). The collected specimens were slide mounted according to Mehri-Heyran *et al*. (2020).

The terminology and the setal notation in the morphological description of the mite follow mainly Lindquist (1996) and the terminology of the internal female genital apparatus follows Chetverikov (2014) and Chetverikov *et al*. (2014).

All morphological measurements were taken using an Olympus BX53 microscope, through a phase contrast 100× oil immersion objective at 1,000 magnification, according to Amrine and Manson (1996) as modified by de Lillo *et al*. (2010). Counting of dorsal, ventral and coxigenital semiannuli follows Lotfollahi *et al*. (2020). Measurements and means are rounded off to the nearest integer when required, except for characters with very short lengths. Measurements refer to the length of the morphological trait unless otherwise specified and are in micrometers (µm). In the female description, the holotype measurements are followed by range values of the studied population (*i.e.* holotype and paratypes) set between parentheses; only the range values are given for males and immature stages. The mean values of the paratypes are reported in a few cases and when measurements of the holotype could not be taken, due to the slide mounting position of the specimens; these are marked by an asterisk (*).

Line drawings were hand-drawn through a *camera lucida* according to de Lillo *et al*. (2010). Abbreviations labelling schematic drawings in figures follow mainly Amrine *et al.* (2003). Plates were edited using Adobe Photoshop® CC 2017. The abbreviations used in schematic drawings in the figures follow mainly Amrine *et al.* (2003).

The genus classification follows Amrine *et al.* (2003) and comparisons were also made with new genera described since that publication.

Host plant names and their synonymies are in accordance with "*The World Flora Online*" (2022).

Type materials are deposited at the Acarology Laboratory, Department of Plant Protection, Faculty of Agriculture, Azarbaijan Shahid Madani University, Tabriz (Iran) exept one paratype which are deposited in the Acarological Collection, Jalal Afshar Zoological Museum (JAZM), Faculty of Agriculture, University of Tehran, Karaj, Iran.

RESULTS

Family Eriophyidae Nalepa, 1898
Subfamily Phyllocoptinae Nalepa, 1892
Tribe Anthocoptini Amrine & Stasny, 1994

***Tetra hajiqanbari* Lotfollahi & Jafari sp. nov.**

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Description

Female (Fig. 1; measured specimens = 9) – Body fusiform, 175 (175–190, excluding gnathosoma), 57* (56–58) thick, 55 (52–62) wide. **Gnathosoma** projecting obliquely downwards, cheliceral stylets 29* (28–31), palp 31* (31–32), palp coxal setae *ep* 2 (2–3), dorsal palp genual setae *d* 6 (5.5–6.5), unbranched. Suboral plate rounded anteriorly, with granules. **Prodorsal shield** 40 (39–47) including frontal lobe, 50 (48–54) wide, sub-triangular; with a broad-based distally rounded frontal lobe, 8 (8–9), over gnathosomal base; frontal lobe with an acuminate large protuberance under it. Shield pattern distinct, without median line, with long admedian lines extended on shield anterior ¾, short inner submedian lines on shield anterior half, short outer submedian lines on shield posterior half, long transverse lines started from shield lateral sides and

extended transversally up to the middle of the admedian lines, connecting submedian lines to admedian lines; whole prodorsal shield covered with a texture with fine or coarse lighter dots. Tubercles of scapular setae *sc* very near to the rear shield margin, 23 (22–30) apart, setae *sc* 50 (40–50), directed upward divergently. **Legs** with all usual segments and setae. Leg I 32 (29–33), trochanter 7 (6–8), femur 10 (9–10), genu 5 (no variation), tibia 7 (6–7), tarsus 9 (8–9.5), tarsal solenidion *ω* 9 (8.5–10), curved down, distally enlarged and tapered, empodium simple, 7 (6–7), 4-rayed; femoral setae *bv* 14 (11–14), genual setae *l″* 27 (26–28), paraxial tibial setae *l′* 5 (5–6.5), located about in middle of tibia, paraxial fastigial tarsal setae *ft*' 21 (16–21), antaxial fastigial tarsal setae *ft″* 28 (24–28), paraxial unguinal tarsal setae *u′* 5 (5–6). Leg II 29 (27–29), trochanter 6 (6–7), femur 9 (8–9), genu 4 (4–4.5), tibia 5 (4–5), tarsus 8 (7–8), tarsal solenidion *ω* 9 (9–11), curved down, distally enlarged and tapered, empodium simple, 6 (5.5–6), 4-rayed; femoral setae *bv* 16 (13–16), genual setae *l″* 7 (7–10), paraxial fastigial tarsal setae *ft′* 8 (7–8), antaxial fastigial tarsal setae *ft*" 25 (23–25), paraxial unguinal tarsal setae *u′* 5 (no variation). **Coxisternal region:** prosternal apodeme 7 (5–7), entire, anterior setae on coxisternum I *1b* 11 (10–13), 12 (11–13) apart; proximal setae on coxisternum I *1a* 33 (30–33), 10 (9–10) apart; proximal setae on coxisternum II *2a* 49 (43–49), 28 (25–29) apart; 6 (no variation) microtuberculate semiannuli between coxae and genital coverflap plus some disperse triangular microtubercles at the base of the coverflap. Coxae with granules. **External genitalia** 14 (11–14), 21 (20–22) wide, coverflap with one rank of 13 (11–14) longitudinal striae; setae *3a* 60 (51–60), 19* (18–21) apart. **Internal genitalia:** spermathecae ovoid, oriented posterolaterad; spermathecal tubes relatively short as long as 1/3 of spermatechae diameter, with tiny cone-shaped spermathecal process situated at the back center of spermathecal tube; transverse genital apodeme trapezoidal, distally folded. **Opisthosoma** dorsally with two lateral ridges extended on whole opisthosoma, more distinct on anterior 10 (10–11) dorsal semiannuli, with 19 (18–19) dorsal semiannuli, 62 (56–63) ventral semiannuli. **Microtubercles:** dorsal semiannuli mostly smooth just with some spiny microtubercles at their pleural parts, last 8 (8–9) dorsal semiannuli with microtubercles on rear margin that are spiny on 3 (no variation) last semiannuli; spiny on posterior margin of ventral semiannuli, elongated and linear on last 5 (no variation) ventral semiannuli. Setae *c2* 25 (21–25) on ventral semiannulus 14 (12–14), setae *d* 63 (52–63) on ventral semiannulus 27 (25–28); setae *e* 15 (13–16) on ventral semiannulus 41 (37–42); setae *f* 22 (19–23) on ventral semiannulus 58 (52–59); 4 (no variation) annuli posterior to setae *f*. Setae *h2* 64* (60–68) apically very fine, *h1* 5 (4–6).

Male (Fig. 1-GM; measured specimens = 3) – Similar in shape and prodorsal shield arrangement to female. Body smaller than female, 150–153, 53 wide, 48 thick; palp genual setae *d* 5–6; prodorsal shield 39–41, 49–51 wide, frontal lobe 6–7; setae *sc* 27–28, 20–21 apart. Opisthosoma with 17–18 dorsal semiannuli and 53–60 ventral semiannuli; 9 semiannuli between coxae and genitalia, with microtubercles similar to that of female. Setae: *1b* 8–11, 11–12 apart; *1a* 26–28, 9 apart; *2a* 40–50, 25–27 apart; *c2* 29, on ventral semiannulus 11–13; *d* 49–50, on ventral semiannulus 24–26; *e* 13–16, on ventral semiannulus 37–39; *f* 20–21, on ventral semiannulus 52–55; *h1* 4, *h2* 73–75. Male genitalia 20–22 wide, setae *3a* 44–49, 17–18 apart. Legs I and II with a 4-rayed empodium.

Nymph (measured specimen = 1) – Body vermiform, 137 (excluding gnathosoma), 44 wide; palp genual setae *d* 4. Prodorsal shield 34 including frontal lobe, 41 wide, sub-triangular; with a short frontal lobe, 4, over gnathosomal base. Shield pattern very faint, pattern similar to female but poorly formed, admedian lines more distinct. Tubercles of *sc* setae 45 on rear shield margin, 18 apart, setae *sc* 45, directed posterior. Opisthosoma with 54 dorsal semiannuli with round microtubercles set on rear margin of semiannuli, 43 ventral semiannuli with oval microtubercles, elongated on the posterior semiannuli. Setae: *1b* 9, 10 apart; *1a* 17, 8 apart; *2a* 28, 22 apart; *c2* 19, on ventral semiannulus 9; *d* 39, on ventral semiannulus 18; *e* 10, on ventral semiannulus 27; *f* 18, on ventral semiannulus 39; *h1* 4, *h2* 43. Setae *3a* 28, 21 apart on semiannulus 10 after coxae. Legs I and II with a 3-rayed empodium.

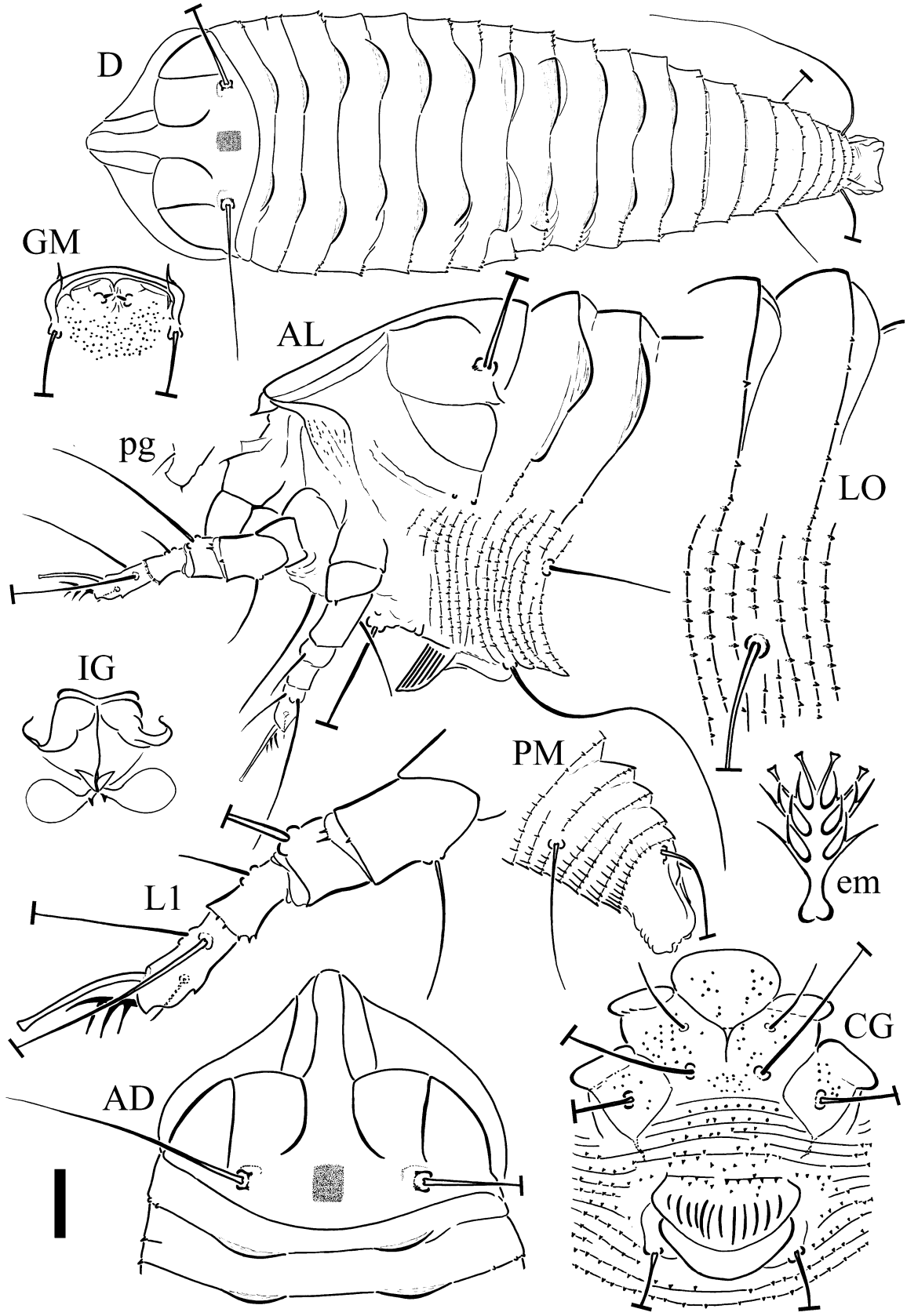

Figure 1. Schematic drawings of *Tetra hajiqanbari* Lotfollahi & Jafari **sp. nov. – AD.** Prodorsal shield; **AL.** Lateral view of anterior body region; **CG.** Female coxigenital region; **D.** Dorsal view; **em.** Empodium; **GM.** Male genital region; **IG.** Internal female genitalia; **LO.** Lateral view of annuli; **L1**. Leg I; **pg.** palp genua; **PM.** Lateral view of the posterior opisthosoma. **Scale bar:** 15 µm for D; 10 µm for AD, AL, CG, GM, IG, pg, PM; 7.5 µm for LO; 5 µm for LO, L1; 2.5 µm for em.

Type host plant

Glycyrrhiza glabra L. (Fabaceae); liquorice.

Type locality

Faculty of Agriculture, Lorestan University, Khorramabad, Lorestan Province, Iran (33° 25' 45.2" N, 48° 15' 34.5" E), 1,150 m above sea level, coll. S. Jafari, 19 July 2020.

Type material

Holotype female mounted on a microscope slide (GG-IL-LU19B-1) along with 1 paratype female and 1 paratype nymph. 35 paratype females and 6 paratype males mounted on 9 microscope slides (GG-IL-LU19B -2–10).

Relation to the host plant

Vagrant on leaves. No apparent damage was observed.

Distribution

Tetra hajiqanbari Lotfollahi & Jafari **sp. nov.** is at present recorded only from Lorestan province, Iran. However, liquorice is widely distributed in Iran so future surveys could reveal a wider distribution for this new mite species.

Etymology

The new species is named in memory of Dr. Hamidreza Hajiqanbar (1973–2021) for his outstanding contributions to the systematics of Heterostigmata of Iran.

Table 1. Gross comparison of some important characters among *Tetra glycyrrhizae* Denizhan *et al.*, 2007 and *Tetra hajiqanbari* Lotfollahi & Jafari **sp. nov.**

Characters	*Tetra glycyrrhizae* Denizhan *et al.*, 2007	*Tetra hajiqanbari* Lotfollahi & Jafari sp. nov.
Dorsal semiannuli number	18 (15–19)	19 (18–19)
Ventral semiannuli number	50 (41–54)	62 (56–63)
Number of semiannuli between coxae and genital coverflap	6	6
Empodium I rays number	4	4
Setae *sc* length	32 (30–39)	50 (40–50)
Setae *c2* length	18 (15–19)	25 (21–25)
Setae *d* length	40 (38–49)	63 (52–63)
Setae *e* length	11 (8–14)	15 (13–16)
Setae *f* length	21 (14–22)	22 (19–23)
Setae *h1* length	5 (4–5)	5 (4–6)
Setae *3a* length	45 (44–51)	60 (51–60)

Differential diagnosis

The new species is close to *Tetra glycyrrhizae* Denizhan *et al.*, 2007 found vagrant on flowers and leaves of *G. glabra* in Kalecik, Türkiye. They are similar in ornamentation of coxae and female genitalia coverflap, empodium rays number, number of dorsal semiannuli, semiannuli between coxae and genital coverflap and empodium rays, length of setae *e*, *f* and *h1* (Table 1). However, they are different in ventral semiannuli number (50 (41–54) in *T. glycyrrhizae* and 62 (56–63) in the new species), length of setae *sc* (32 (30–39) in *T. glycyrrhizae* and 50 (40–50) in the new species), *c2* (18 (15–19) in *T. glycyrrhizae* and 25 (21–25) in the new species), *d* (40 (38–49) in *T.*

glycyrrhizae and 63 (52–63) in the new species) and *3a* (45 (44–51) in *T. glycyrrhizae* and 60 (51–60) in the new species) (Table 1). Setae *sc* of the new species directed upward divergently, but it is directed to posterior in *T. glycyrrhizae*. The new species frontal lobe has an acuminate large protuberance under it, while the protuberance is absent in *T. glycyrrhizae*. *Tetra glycyrrhizae* has a short median line and without submedian lines, but the new species doesn't have a median line and with two pairs of submedian lines. In the new species the whole prodorsal shield is covered with a texture of fine or coarse lighter dots, while *T. glycyrrhizae* has been described without any texture. Microtubercles of *T. glycyrrhizae* ventral semiannuli are elliptical, but they are spiny in the new species.

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Tetra hajiqanbari Lotfollahi & Jafari (Acari: Eriophyidae)، گونهٔ جدیدی از ایران

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چکیده

کنهٔ جدیدی از قبیلهٔ Anthocoptini، *Tetra hajiqanbari* Lotfullahi & Jafari **sp. nov.** در استان لرستان ایران کشف و توصیف شد. کنه‌ها روی برگ‌های *Glycyrrhiza glabra* L. (Fabaceae) آزاد بودند. این چهارمین گونه اریوفیوئیدی است که روی این گیاه میزبان یافت می‌شود.

واژگان کلیدی: قبیلهٔ Anthocoptini، لرستان، *Glycyrrhiza*، زیرخانوادهٔ Phyllocoptinae، آزاد.

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